CHAPTER VI
ARID FOREST RESEARCH INSTITUTE JODHPUR

Arid Forest Research Institute (AFRI), Jodhpur (Rajasthan) is one of the eight Institutes under the control of ICFRE. The objective of the Institute is to carry out scientific forestry research in order to provide technologies to enhance bioproductivity, increase the vegetative cover and conserve the biodiversity in the hot arid and semi-arid regions of Rajasthan, Gujarat and Dadra & Nagar Havelli.

PROJECTS COMPLETED DURING THE YEAR 2003-2004

Project 1: Agroforestry research for sustainable production in arid and semi-arid regions of Rajasthan [AFRI-2/FEDD-2/1999-2003]

Principal Investigator - Dr G. Singh

Findings :

Experiment 1: Effect of tree density on crop yields and plant growth in agroforestry systems

Optimum density was 208 trees per ha at 9-12 years of tree age. Fruit yield of *Prosopis cineraria* ranges from 350-1040 g per tree at the age of 7 and 8 years. Utilizable biomass was 19.96 tonnes per ha including leaf fodder of 0.85 tonnes per ha at 12 years of age. Therefore, *P. cineraria* and *Tecomella undulata* could be grown at 208 trees per ha up to 12 years of age without significant reduction in agricultural production.

Experiment 2: Effect of different intercrops on yield and productivity of agroforestry systems

P. cineraria was found to be less competitive than *T. undulata* as it production is 7-15 percent less than the agricultural produce. However, the loss in agricultural is compensated by values and usufructs if a farmer integrates *T. undulata*. Pearlmillet was found to be more competitive with tree than mungbean as evidenced by reduction in tree incremental

(a) (b)

Stand of (a) *P. cineraria* and (b) *T. undulata* at varying tree density with *Vigna radiata* as the intercrop in the year 2003.

growth. Association of *Cassia angustifolia* with *T. undulata* was better in terms of yield of leaf than those in *P. cineraria*. Production of utilizable biomass was 21-32 tonnes per ha for *P. cineraria* and 17-30 tonnes per ha for *T. undulata* at the age of 8 years.

Experiment 3: Maximising food, fodder and fruit yield in agroforestry in arid region

Colphospermum mopane produced 3.0-4.0 kg dry fodder/ fuel wood per tree per year at the 7-8 years of age whereas fruit production ranges from 0.5 to 1.25 kg/tree at 5 to 9 years of age. Fruit yield was less when bajra (*Pennisetum glaucum*) or guar (*Cymopsis tetragonoloba*) was the intercrop. *C. mopane* extracts more soil water compared to *Hardwickia binata* and *Emblica officinalis*. The biomass harvested from *H. binata* was slightly less.

Soil conditions indicated a lesser loss in SOC (3.2 to 35 percent) in agroforestry plots compared to that in control plot (56 percent) indicating benefits of tree integration in terms of carbon sequestration. *C. mopane* in block plantation was found to be more suitable for rehabilitation of degraded lands than that of its integration with agricultural crops.

H. binata and *C. mopane* are hardy to arid climate with deep penetrating root systems but *C. mopane* can only be raised under site preparation and by direct seeding with better survival. Facilitating effects of trees were more during dry period than in the good rainfall year.

(a)

(b)

(a) *Vigna radiata* with *Hardwickia binata* and (b) *Colophospermum mopane* in 2003 cropping season

Project 2: Comprehensive community drought preparedness programme to improve quality of life of women and children in Jodhpur District [AFRI-27/Silvi-3/UNICEF/2001-03]

Principal Investigator - Shri H.C. Chaudhary

Findings: Comprehensive survey of all the 3,278 community forests called Oran, Gauchars, Parat and Agor etc. and the village ponds located in Jodhpur District were completed. Two days workshop on 'Development of suitable strategy for rehabilitation of Oran and Gauchars in Rajasthan' was organised. Officials of the various development departments, research institutes at Jodhpur and NGOs gave deliberations in the

workshop. One week training programme on PLA and micro-planning was organized for AFRI personnel, NGOs and cluster co-ordinators. Microplans for 15 villages located in three clusters of 5 villages each, were prepared in consultation with the local district administration, which have been submitted to the UNICEF for funding. Data collected during the survey have been utilised in formulation of a special project on rehabilitation of community forests located in Jodhpur district in association with DRDA which led to the launching of the '*Maru Gauchar Project*' with an outlay of Rs. 100 crores, in the western Rajasthan from 2003-2004.

Project 3: Studies on the pest problems in forest nurseries and their management in arid and semi-arid region [AFRI-12/FP-2/1993-2003]
Principal Investigator - Dr Seema Kumar

Findings : Out of 53 tree species screened in different forest nurseries only 19 tree species exhibited insect-pest infestation. The important potential insect nursery pests. *Microtermes* species was initially found, damaging the tree saplings but later on proved to be beneficial in breaking down the dead and decaying material, thereby enhancing the soil nutrients.

The non-insect pests reported like molluscs, nematode, mites and rodents were also recorded.

PROJECTS CONTINUED DURING THE YEAR 2003-2004

Project 1: Studies on the role of trees in reclamation of water logged area and their impact on soil [AFRI-29/FEDD-6/2002-2006]
Principal Investigator - Dr N. Bala

Status:

Experiment 1: Transpirational capabilities of different species and their impact on soil at different age

Eight experimental plots have been marked in plantations raised by the State Forest Department. Tree height and DBH recorded. Soil samples have been collected. Analysis of soil samples is in progress.

Project 2 : Provenance trial on arid zone species [AFRI-16/FGTB-3/1992-2005]
Principal Investigator - Dr C.J.S.K. Emmanuel

Status: Neem-The provenance trial of *Azadirachta indica* with 39 seed sources from all over India was laid out in 1992. The studies conducted on floral morphology revealed that in terms of inflorescence length and number of flower per inflorescence, Palanpur provenances faired better than others. In terms of oil content, Azadiractin content and girth also Palanpur provenance faired better than others. In case of height, the Rewa (M.P.) provenance (6.62 metres) was highest and that of Palanpur as runners up (6.27 metres).

National Provenance Trial of Neem

Rohida: The provenance trial of *Tecomella undulata* was planned in the year 1992 with 13 seed sources from Rajasthan. Though the state is facing severe drought but no mortality was observed in this trial. This indicates that Rohida adapt itself even in drought conditions. The growth data collected indicates that the

Sunderpur Bir (Sikar) provenance is superior in growth with a height of 3.81 m.

Provenance Trial of *Tecomella undulata*

Shisham: Provenance trial for *Dalbergia sissoo* has been laid out in August, 1995, from the seeds sent by FRI, Dehradun in the year 1994. This year best performance was recorded for height in Etawah provenance (8.07 m) followed by Pilibhit provenance (7.81 m), Allahabad provenance (7.35 m), Pratapgarh provenance (6.14 m) and Kasganj provenance (6.13 m) and the lowest for Agra provenance (4.00 m). In case of girth Pilibhit provenance had given the best result (77.00 cms) followed by Lalitpur provenance (46.99 cms), Allahabad provenance (45.30 cms), Pratapgarh provenance (45.00 cms) and the lowest by Agra provenance (30.25 cms).

Project 3 : International Neem Network Provenance trial [AFRI-17/FGTB-2/1995-2005]

Principal Investigator - Dr C.J.S.K. Emmanuel

Status: The International provenance trial on Neem was initiated by the FAO Neem Network and the seeds were exchanged between the participating countries during 1995. The field trials had been laid out during the July to August, 1996 at Jodhpur, Jaipur, Palanpur, Jabalpur, and Coimbatore, with 18 provenances including control. At present the trial is continuing only at Jodhpur, Jaipur and Coimbatore. The performance of the International Neem Provenance Trial at Jodhpur is good.

Project 4: Provenance trials on *Acacia nilotica* and *Ailanthus excelsa* [AFRI-18/FGTB-3/WB/ 1995-2005]

Principal Investigator - Dr C.J.S.K. Emmanuel

Status: *Acacia nilotica* - Provenance trial was laid out in the year 1992 with 28 provenances collected from major states of India. Out of these Parlekhmundi provenance performed better than other both in terms of height as well as girth.

Ailanthus excelsa - Provenance trial was laid out from the seeds collected from 13 different seed sources were sown in the nursery and transplantable seedlings could be obtained from 8 provenances only. The provenance trial was laid out at two different sites at Jaipur and Jodhpur. This trial has also been affected by the prolonged drought and low humidity conditions prevailing in the state. The data collected shows that the Control Jaipur provenance (5.55 m) was the best followed by Sonbhadra provenance (5.16 m).

Project 5: Multilocational trials of Eucalyptus and Dalbergia clones [AFRI-31/FGTB-7/ 2002-2006]

Principal Investigator - Dr U.K. Tomar

Status: Multilocational clonal trials of *Eucalyptus camaldulensis* and *Dalbergia sissoo* were established in August 2003 at four different locations namely Deesa, Kheralu, Gandhinagar, Rajpipala in Gujarat state. These clones are superior germplasm selected under WB project and other sources.

Research station Gandhinagar

Research station Deesa

Project 6: Micropropagation of an important medicinal plant of the arid and semi-arid regions - Commiphora [AFRI-32/FGTB-8/2002-2006]
Principal Investigator - Dr Tarun Kant

Status: Experiments involving two kinds of pathways are underway with the aim of in vitro mass multiplication of *Commiphora wightii.*

Project 7: Genetic improvement of *Tecomella undulata* [AFRI- 33/FGTB-9/200205]
Principal Investigator - Dr C.J.S.K. Emmanuel

Status: Survey conducted for availability of candidate plus trees (CPTs) in different areas. Selected 30 CPTs in the irrigated tract of IGNP canal area from the plantation raised in 1987 and 35 CPTs in the unirrigated areas in the farmers field.

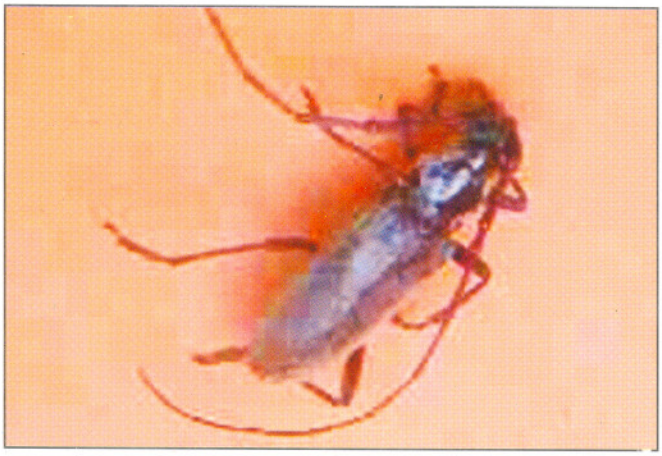
CPTs of *Tecomella undulata*

Project 8: Screening of high oil and Azadirachtin in Neem [AFRI-34/FGTB-10/2002-05]
Principal Investigator - Dr C.J.S.K. Emmanuel

Status: Clonal material of high oil and azadirachtin (Az) yielding CPTs (32 CPTs) of neem has been raised and is ready for laying out field trial in the coming monsoon season. Twelve hectares of progeny trials of summer and winter flowering CPTs at AFRI, Jodhpur and high Az and high oil CPTs at Govindpura, Jaipur are being maintained. Data on growth parameters of high Az and high oil CPT's progenies have been recorded.

Project 9: Identification of mortality factors of *Prosopis cineraria* and development of suitable management strategies [AFRI-26/FP-3/2001-2005]
Principal Investigator - Dr S.I. Ahmed

Status: *Entomological observations and findings:* The extensive surveys on the Khejri mortality in north-west Rajasthan have been taken up and the observations on various biotic and abiotic aspects were initiated during January, 2003.

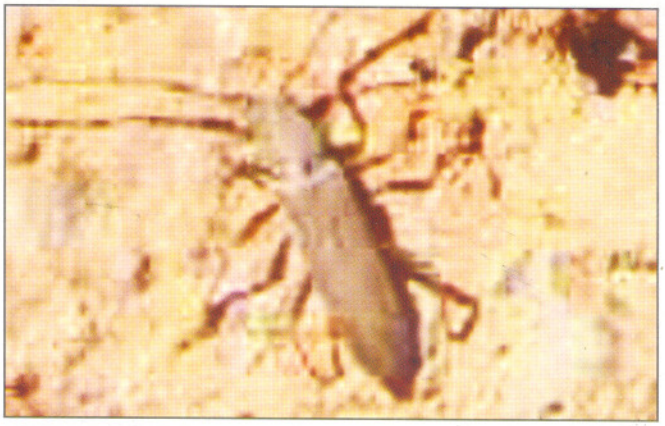


Derolus iranensis - Khejri shoot borer

Khejri root and shoot borer,
Aelesthes holosericea Fab.

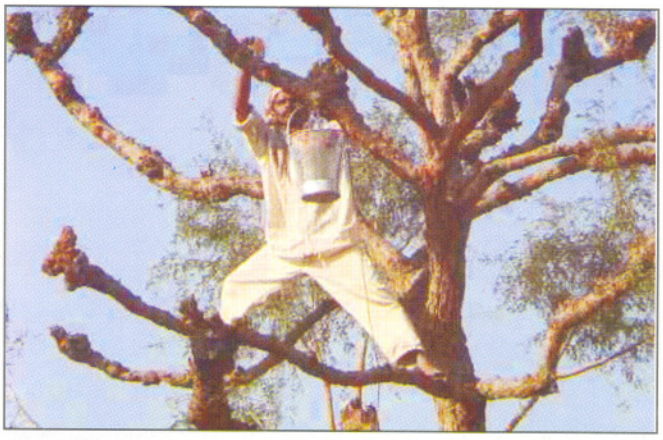
Boring larvae of *Acanthophorus serraticornis*, infesting Khejri root and shoot system

Maximum percentage of Khejri mortality in the four north-western districts of Rajasthan viz., Nagaur, Sikar, Jhunjhunu and Churu have been recorded as being 36.52, 38.87, 42.78 and 26.08, respectively. The analysis of data to find out the factors for mortality is in progress.



Hypoeschrus indicus Gahan,
Khejri shoot borer

Field experimental trial: A field experimental trial for the management of Khejri mortality has been laid out at Basuwa in Sikar district during January, 2004 in order to test the relative efficacy of different treatments for the management of infected Khejri trees. The diseased samples were analysed in the laboratory and *Colletotrichum* sp. was isolated and identified.



Shoot treatment of infected khejri tree with AFRI paste

Root treatment of infected khejri tree at Basuwa (Sikar)

Studies have been initiated and are in progress to study the impact of biotic and abiotic stresses on the Khejri mortality in Rajasthan. (i) Studies on the bionomics of potential insect borers with particular reference to *Derolus iranensis (=descicollis)*. (ii) Pathological observations and findings : The high incidence of mortality in Khejri trees was noticed in agroforestry as compared to trees grown in undisturbed land i.e. Oran and Gochar lands at Salasar Tahsil, Sikar District. Deep ploughing with tractor (adopting modern agricultural practices) resulting lateral roots injury and subsequently attacked by soil borne pathogens like, *Fusarium* sp., *Rhizoctonia solani* and root borers are the probable causative factor of Khejri mortality in Sikar. *Collestrotrichum* spp. is observed as a new species affecting Khejri. Other species found are *Aspergillus flavus, A. niger, A. niveus, A. ocraenus, Mucor* spp. and *Fomes* spp. etc.

Project 10: Studies on improving tree productivity of *P. cineraria* through VAM/ Biofertilizers [AFRI-36/Silvi-8/2002-06]

Principal Investigator - Dr K.K. Srivastava

Status: VAM population studies showed that maximum number of propagules were isolated from agroforestry plantations of *P. cineraria* at Sikar and minimum from Churu.

Nursery experiment on biofertilizer *P. cineraria* has been laid out in Completely Randomised Design (CRD) with eight treatments with different combinations of bacterial biofertlizers and VAM and three replications. The work is in progress.

Project 11: Studies on seed quality improvement in respect of various tree species of arid and semi-arid areas [AFRI-35/Sil-7/2002-07]

Principal Investigator - Dr D.K. Mishra

Status: Neem seeds physiologically mature, green, greenish yellow and yellow fruits showed more than 90 percent germination. However, in storage, seeds from yellow green fruits performed better.

Seeds of *Capparis decidua* were found extremely dormant probably due to physical reasons. Untreated seeds showed less than 10 percent germination whereas, scarified seeds gave above 70 percent germination. Seeds collected in summer season showed above 95 percent viability, while seeds collected in winter season gave only 40 percent viability.

Project 12: Screening of exotic and indigenous plant species for their performance on salt affected soil with different management project [AFRI-6/FRME-4/1997-2003]

Principal Investigator - Dr Ranjana Arya

Status: A total of eight experimental trials exist at the salt affected area of Gangani in Jodhpur district laid out in different years (from 1997 to 2003). Out of these Experiment 1 and 4 were concluded this year.

Experiment 1: Trial on *Atriplex* lentiformis was laid in 1997 with three levels of gypsum: Control (G_0), Gypsum @ 100 percent soil GR (G_1), and Gypsum @ 150 percent soil GR (G_2) and six nitrogen levels: 0 (N_0), 20 (N_1), 40 (N_2), 60 (N_3), 80 (N_4) and 100 (N_5) g of urea leading to 18-treatment combinations. This trial was concluded in August 03. G_2 treated bushes recorded 11 percent more survival as compared to G_0 andG_1 levels. In general G_1 and N_4 combination recorded higher biomass.

Experiment 4: A trial of *Acacia lentiformis* was planted in August, 1999 on double ridge mound with three levels of gypsum: control (G_0), half gypsum requirement (G_1) and full gypsum requirement (G_2). Three doses of nitrogen 9, 18 and 27 g of N from two nitrogen sources, Urea and calcium ammonium nitrate (CAN) were applied in August, 2000. Survival of *A. lentiformis* on double ridge mound ranged from 22 percent to 78 percent in different treatments in August, 2003. Analysis of variance showed that there is no effect of either gypsum doses or nitrogen application on survival. Due to normal rainfall salt tolerant grasses mainly Sporobolus sp., *Chloris virgata* and *Dactyloctenium* spp. dominates. An average of 284.6 g m^{-2} dry biomass was available from the experimental area. The trial is concluded in August, 2003 but the bushes are maintained as seed source.

Project 13: Quantitative estimation of biologically active secondary metabolites in some of the arid zone medicinal plants to ascertain correct harvesting time [AFRI-15/ NWFP-4/ 2002-2005]

Principal Investigator - Dr Mala Rathore

Status: On the basis of literature and field survey two species have been selected for the study : *Calotropis procera* and *Boerhaavia diffusa*. It was proposed to work on flowers and roots of these species, respectively. The preliminary examination of these extracts has shown the presence of steroids and absence of flavonoids. Further investigations are in progress.

Project 14: Transfer of technology on forestry through training and demonstration [AFRI-38/ SF-1/2002-2006]

Principal Investigator - Dr S. Mohan

Status: An Extension and Interpretation Centre is being established. Civil works and installation of display boards, backlight printing board, metallic folding photo album and laminated photographs, etc depicting the research activities of the institute are completed.

Project 15: Identification of key indicators and suitable strategies for sustainable Joint Forest Management in Gujarat and Rajasthan [AFRI-39/JFM-1/2002-2006]

Principal Investigator - Dr Sunil Kumar

Status: The detailed questionnaire for socio-economic status and present status of Joint Forest Management were prepared. 39 JFM committees (28-Rajasthan and 11-Gujarat) from as many villages have been covered and the sampling survey have been completed. The committee members and villagers were interviewed and information regarding JFM Committees were collected.

Project 16: Standardization of nursery practices in respect of selected species suitable for arid and semi-arid region [AFRI-33/ Silvi-5/ DRDA/ 2002-06]

Principal Investigator - Shri H.C. Chaudhary

Status: On funding from the DRDA, Jodhpur under the Member of Parliament's Local Area

Development Scheme about 40,000 superior quality seedlings were raised and supplied to various Government Departments, farmers, NGOs etc. Oxfam India Trust sponsored two days training on nursery technology was organised for the representatives of various NGOs. Planting stock required by various research divisions for undertaking various experimental trials during the year have been successfully raised and supplied. Various aspects of nursery technology suitable for raising planting stock in arid and semi-arid region were explained to IFS and SFS probationers, farmers, trainee forest rangers/ foresters/forest guards, members of various watershed development committees who visited the nursery during the year.

NEW PROJECTS INITIATED DURING THE YEAR 2003-2004

Project 1: Identification and screening of some suitable nitrogen fixing species of dry region for their utilization in improvement of soil fertility and biomass [AFRI-41/FEDD-6/2003-2007]

Principal Investigator - Dr S.P. Chaukiyal

Status: *Alysicarpus longifolius, Crotalaria burhia, C. meticaginea, Indigofera ungentea, I. linaei, I. sessiliflora, Clitoria ternatea, Mucuna prurience, Mimosa hamata* and *Rhynchosia minima* were selected for soil enzymes and soil nutrients estimation. Enzyme activity was significantly higher near the root zone of these species as compared to that in control. Seeds of *A. longifolius, C. burhia, I. ungentea, I. sessiliflora, C. ternatea, M. prurience, M. hamata* and *R. minima* were collected for sowing and further assessment. Analysis of collected soil samples for other nutrient is in progress.

Project 2: Screening different phenotypes of *Dalbergia sissoo* and *Acacia nilotica* for their tolerance to salinity and sodicity [AFRI-42/ FEDD-7/2003-07]

Principal Investigator - Dr Pramod Kumar

Status: Site for the experiment has been selected in Tharad range of Banaskantha Forest Division, Gujarat. Plus trees of *Acacia nilotica* and *Dalbergia sissoo* have been identified from salt affected area. Seeds of *D. sissoo* have been collected and raising of seedlings is in progress.

Project 3: Survey of sandal population in Rajasthan and Gujarat states and evaluation of heartwood content and oil content [AFRI-44/ NWFP-6/2003-2007]

Principal Investigator - Shri S.H. Jain

Status: A survey has been carried out for sandal population in Udaipur, Rajasmand, Chittorgarh, Pratapgarh, Sirohi, Banswara, Dungarpur, Jhalwar, Ajmer, Jaipur and Karoli Forest Divisions. It is found that sandal population is depleted, but some stands still exist. Very good population of sandal were found in Haldighati forest of Nathdwara Range and Bhavarmatha block in Pratapgarh Range. The oil content of the heartwood varies from tree to tree and is higher in older trees. The oil content in trees of Rajasthan varies between 0.9 to 3.0 percent.

Project 4: Development of suitable multi-tier farm forestry models in IGNP Command area [AFRI-40/SF-2/2003-2007]

Principal Investigator - Dr S. Mohan

Status: After visiting the four available sites, the best suitable site at 155 RD Charan Wala Branch was finalized. This is a forest land and temporary allotment of site has been made by CCF (IGNP) Bikaner to carry out the project. The activities like collection and analysis of initial soil

samples, raising of nursery of medicinal plants and other species are being taken up.

PROJECTS COMPLETED DURING THE YEAR 2003-2004

(Externally Aided)

NIL

PROJECTS CONTINUED DURING THE YEAR 2003-2004

(Externally Aided)

Project 1 : Development of silvipasture model for Maru Gaucher Project suitable for arid and semi arid region of Rajasthan [AFRI-45/ Silvi-9 / MGP/ 2003-06]

Principal Investigator - Shri H.C. Chaudhary

Status: The silvi-pastoral rehabilitation of *Orans* and Gauchars at two sites (each having area of 16 ha) are being developed with the concerned gram panchayats at :

- Tulesar charnan
- Ostra

Planting of grasses with shrubs and trees yielding high quality fodder will enhance the fodder productivity of the area and will ensure the fodder availability during scarcity period. The grasses, shrubs and tree species planted in the models are:

Grasses: Sevan (*Lasiurus sindicus*), Dhaman (*Cenchrus ciliaris*), Anjan (*C. setigerus*) and Bhurat (*C. biflorus*).

Shrubs: Bar bor (*Zyzyphus mauritiana*) and Jhar beri (*Z. numularia*)

Trees: Khejri (*Prosopis cineraria*), Mopane (*Colophospermum mopane*), Ardu (*Ailanthus excelsa*) and Kumat (*Acacia senegal*).

Project 2 : Development of suitable models for urban aesthetic forestry suitable for arid and semi arid region of Rajasthan [AFRI-28/ Silvi-4 / UIT / 2001-06]

Principal Investigator - Shri H.C. Chaudhary

Status: 2.23 kilometre long experimental avenue plantation raised during the year 2001-2002 on funding from UIT Jodhpur has been maintained during the year.

- 1.04 kilometre long experimental avenue plantation on funding from the Jodhpur Pardushan Nivaran Trust, Jodhpur has been raised and maintained during the year.
- Advance work for raising 3.50 kilometre long experimental avenue plantations on funding from the Asian Development bank (ADB) funded Rajasthan Urban Infrastructure Development Project (RUIDP) have been initiated.
- Growth and survival data in respect of the plants raised under the experimental plantations have been recorded. Average height and diameter growth of various ornamental tree species raised under the experimental plantations have been observed in the order of *Dalbergia sissoo> Azadirachta indica > Cassia siamia > Tecomella undulata >Pongamia pinnata> Alstonia scholaris > Cassia fistula > Delonix regia.*
- In *D. regia* even under the liberal irrigation condition, severe die back have been observed during the winter season making the species less suitable for urban aesthetic forestry in arid region.
- Under the liberal watering of sewage water exceptionally high average top height have

been observed in respect of *D. sissoo*, *C. siamia* and *A. indica* etc.

- Foliar spray of dilute monocrotophos solution at an average interval of 15 days has been found very cost-effective solution for controlling browsing of *A. indica* by blue bulls.
- Recognizing the sincere and hard work undertaken in raising and maintenance of the experimental plantations raised under the project, AFRI employee associated in the implementation of the Project Shri Sadul Ram Deora, Research Assistant-II have been publicly felicitated by the local district administration during the independence day ceremony.

Project 3 : Raising of arboretum cum botanical garden for native flora of Rajasthan [AFRI-34/ Silvi-6/2002-06]

Principal Investigator - Shri K.K. Chaudhuri

Status: Pitting completed and planting of 230 native tree species of Rajasthan is in progress.

- Seedlings of 78 tree species have already been planted.
- Seedlings for the another 20 tree species are being raised at nursery.
- Work for the seed collection in respect of the remaining species in under progress.
- Underground pipeline network and construction of mist chamber is in progress.

Project 4 : Survey and silvicultural management practices for commercially exploitable medicinal plants of arid and semi-arid areas of Rajasthan [AFRI 35/Silvi 8/MPB/2002-05]

Principal Investigator - Shri K.K. Chaudhuri

Status: 301 units/traders of 15 districts associated with medicinal plants have been surveyed and information received from them have been entered and analysed.

- The annual requirement of medicinal plants of Jaipur was highest followed by Jodhpur and Ajmer and Banswara has lowest requirement.
- *Emblica officinalis* Gaertn. followed by *Cassia angustifolia* Vahl. and *Mangifera indica* Linn. were highly traded. Senna seed procured from Jodhpur, Bikaner and Coimbatore was intercompared for seed weight, number of seeds per kg and presence of green and yellow seeds. Silvicultural trial is in progress.
- Germplasm bank has been established with 150 medicinal plants and field trials on guggal are being executed.

Project 5 : Study of characteristic features pertaining to bio-drainage potential of some selected tree species

Principal Investigator - Dr N. Bala

Status: The Ministry of Water Resources, Govt. of India, has sanctioned the project for Rs. 45.36 lakhs. Administrative approval and intimation regarding release of Rs. 19.19 lakhs has been received vide letter no. 21/73/2004-R&D/445-457 dated 4th March 2004. Funds are awaited.

PROJECTS INITIATED DURING THE YEAR 2003-2004

(Externally Aided)

NIL.

RESEARCH ACHIEVEMENTS

Name of State	No. of projects completed in 2003-04	No. of ongoing projects in 2003-04	No. of projects initiated in 2003-04
Rajasthan	3	19	3
Gujarat	-	1	1

TECHNOLOGY ASSESSED AND TRANSFERRED

- Preparation of AFRI paste and its application to the affected Khejri trees was demonstrated through training programmes of the farmers and agricultural officers.
- Indigenous and exotic species *Atriplex lentiformis* and *Acacia amliceps* screen out with afforestation technology on salt affected lands. Seeds of these species with afforestation technology were supplied to State Forest Department of Gujarat and Rajasthan.
- VAM production facility was developed at TRC, Gandhinagar, Gujarat. Demonstration for preparation of VAM inoculum containing five different combinations of species of VAM fungi viz., *Glomus fasiculatum*, *G. microcarpum* and *G. aggregatum* including Consortium inoculum was given to the field officers.

EDUCATION AND TRAINING

Education

Ph. D. Thesis Awarded by FRI, Deemed University on "Seed Source Variation and Reproductive Biology of *Azadirachta indica* A. Juss." to Shri. Somendra Sharma under the supervision of Sh. C.J.S.K. Emmanuel, Head, FGTB Division, AFRI, Jodhpur.

Training Attended

International

Sh. K.K. Chaudhuri, IFS attended two months shortterm study and research visit (from 15th August to 14th October, 2003) under DAAD fellowship at the Institute of Forestry, University of Goettingen (Germany) and worked on "Nursery Technology".

National

Dr Sunil Kumar attended an advance course on "Criteria and Indicators for sustainable forest management" from 13th to 17th October, 2003 at Bhopal organized by Indian Institute of Forest Management.

Trainings imparted by Institute

- Organised 5 days and 3 days training programme on Integrated Watershed Management to the cluster members, SHGs and farmers from Sangod and Kherabad Panchayat samities (Kota), Phalodi (Jodhpur) and Indergarh (Bundi).
- As a multidisciplinary approach of watershed management, inputs on Nursery and plantation techniques, biofertilzers, agroforestry models, moisture and soil conservation techniques, horticulture, animal husbandry pasture management were also given by the resource persons from the institute and outside both.

Demonstration on Vermicompost at AFRI Model Nursery

Participants during technical session

CEO Zila Prishad, Jodhpur addressing the participants

Educational Visits

1. Students of B.Sc. (Forestry) from Dr Y.S. Parmar University of Forestry and Horticulture, Solan on their study tour on 2nd April, 2003.
2. Study tour of IFS Probationers on 19th July, 2003.

IFS Probationer on their study tour

3. Study tour of Forester and Beat Guard class of Haryana State on 29th August, 2003.
4. Range officer Trainees of SFRC Coimbatore on study tour to the institute from 8th to 10th October, 2003 .

LINKAGES AND COLLABORATION

National

1. National Bureau of Plant Genetic Resources, New Delhi.
2. Tata Energy Research Institute, New Delhi.
3. Indian Institute of Technology, New Delhi.
4. Central Arid Zone Research Institute, Jodhpur.

5. National Botanical Research Institute, Lucknow.
6. Chaudhary Charan Singh Haryana Agricultural University, Hissar.
7. Neem Foundation, Mumbai.

International

1. DANIDA Forest Seed Centre, Humlebaek, Denmark.
2. International Neem Network, FAO, Rome.
3. CSIRO, Australia.

PUBLICATIONS

Chapters in Books

1. Ahmed, S.I. and Kumar, Shivesh (2002). Role of Environmentally Acceptable Entomopathogens in Forest Insect Pest Management. In Modern Trends in Environmental Biology, CBS Publishers, New Delhi.
2. Tripathi, Y.C.; Tiwari, V.K.; Srivastava, K.K. and Ahmed, S.I. (2002). Biopesticides as an effective tool for integrated pest management. In Forest conservation and management-challenges of the millennium (Ed. P. Rethy, P.P. Dabral, Vinay Singh and K.K. Sood), 113.
3. Srivastava, K.K. and Tripathi, Y.C. (2004). Potential of phytochemical in controlling pathogenic mycobionts. Chapter submitted in book on "Forest conservation and Management in challenges of the millennium (eds. D. Reddy, B.P. Dabral, Vinai Singh and K.K. Sood), pp: 594-612.

Research papers published in scientific journals

International

1. Bhati, M. and Singh, G. (2003). Growth and mineral accumulation in *Eucalyptus camaldulensis* seedlings irrigated with mixed industrial effluents. Bio Resource Technology, 88(3): 221-228.
2. Singh, Bilas and Singh, G. (2003). Biomass partitioning and gas exchange in *Dalbergia sissoo* seedlings under water stress. Photosynthetica, 41(3): 407-414.
3. Singh, G. and Bhati, M. (2003). Mineral element composition, growth and physiological functions in *Dalbergia sissoo* seedlings irrigated with different effluents. J. Environ. Sci. Health Part -A, 38: 2679-2695.
4. Singh, G. and Bhati, M. (2003). Growth, biomass production and nutrient composition of *Eucalyptus camaldulensis* seedlings irrigated with municipal effluent in loamy sand soil of Indian desert. J. Plant Nutrition, 26: 2469-2488.
5. Singh, G.; Bala, N.; Rathod, T. R. and Chouhan, S. (2003). Effect of adult neighbours on regeneration and performance of surface vegetation in shifting dune of Indian desert for the control of sand drift. Environmental Conservation, 30(4): 353-363.
6. Singh, G. (2004). Influence of soil moisture and nutrient gradient on growth and biomass production of *Calligonum polygonoides* in Indian desert affected by surface vegetation. J. Arid Environment, 56(3): 541-558.

National

1. Singh, G.; Bala, N.; Kuppusamy, V. and Rathod, T.R. (2003). Adaptability and productivity of *Cassia angustifolia* in sandy soil of Indian Desert. *Indian Forester*, 129(2): 213-223.
2. Bala, N.; Singh, G.; Kumar, P. and Sinha, A.K. (2003). Role of forest in carbon sequestration. *Indian Forester*, 129: 799-806.

3. Singh, G.; Bala, N.; Chaudhuri, K.K. and Meena, R.L. (2003). Carbon sequestration potential of common access resources in arid and semi-arid regions of north-western India, *Indian Forester*, 129: 859-864.

4. Kumar, P.; Singh, G. and Bohra, N.K. (2003). Socio-economic status-A tool to assess the impact of forestry programmes. Wasteland News, 18(4): 31-33.

5. Singh, G. (2003). Sowing seeds: Seed germination and growth of *Colophospermum mopane* during drought. Wasteland News, 19 (1): 48-50.

6. Kumar, P.; Singh, G.; Bala, N. and Bohra, N.K. (2003). Ethnobaotanical studies of forest of Banaskantha and Sabarkantha districts of Gujarat: A case study of some tribal villages. *Indian J. Ecoplanning*, 7(2): 303-306.

7. Bala, N.; Singh, G. and Bohra, N.K. (2003). Effect of irrigation on growth and performance of three different tree species in Indian arid zone. *Annals of Arid Zone*, 42: 61-67.

8. Singh, G. (2003). Windblown wonders: bio-productivity and economic returns from sand dune stabilization. Wasteland News, 19(2): 32-35.

9. Singh, B. and Singh, G. (2003). Effect of water availability and phosphorus application on biomass accumulation and micronutrients concentration in *Dalbergia sissoo* seedlings. *J. Indian Soc. Soil Science*, 51(3): 316-319.

10. Sharma, Meeta and Ahmed, S.I. (2003). Relative toxicity of different insecticides against marwar teak defoliator, *Patialus tecomella* Pajni, Kumar and Rose (Coleoptera: Curculionidae). *Ann. For*, 11 (1): 127-132.

11. Mishra, D.K. and Singh, Ved Pal (2003): Standardization of seed weight replications of tree species growing in arid and semi-arid zone. *My Forest,* 39: 287-289.

12. Preliminary growth models for *Prosopis cineraria* (L.) Druce plantations in the hot arid region of India, V.P. Tewari and K.V. Gadow, Forests, Trees and Livelihoods, 13(4), 2003, 361-373.

13. Spacing effect on the growth of irrigated plantations in hot desert, V.P. Tewari and V.S. Kishan Kumar, *Indian Forester*, 129(3), 2003, pp 349-356.

Scientific Reports prepared

- Ahmed, S.I. and Srivastava, K.K. (2003). A report on the scientific approach to study the causes of mortality of *Prosopis cineraria* (L) Druce (Khejri) in Western Rajasthan. Report published in Paryavaran (2003).

Proceeding of Workshops

- "Development of suitable strategy for rehabilitation of Orans and Gauchars in Rajasthan" sponsored by UNICEF, Jaipur.
- "Data Analysis of the International Neem Network" sponsored by the FAO, Rome.

Research papers presented in Seminars / Symposiums / Workshops

1. Tewari, V.P. "Some important wild plants yielding alternative foods for nutritional security in arid region of Rajasthan" for the National Symposium on "Food and Nutritional Security: Technological innovations and Genetical options" held at CSKHP Krishi Vishvavidyalaya, Palampur on 18th and 19th September, 2003.

2. Thangamani, D.; Verma, Neelam and Srivastava, K.K. (2003). Purification of antifungal proteins from *Trigonella foenum* graceum against charcoal rot causing organisms *Macrophomina phaseolina* Paper presented and abstract published in 25th Annual conference and Symposium conducted in Indian society of mycology and Plant Pathology at Rajasthan college of Agriculture, Jaipur from 8th to 10th October.
3. Thangamani, D.; Srivastava, K.K. and Verma, Neelam (2003). Charcoal Root Rot - a serious Disease of Neem. Paper presented and abstract published in 25th Annual conference and Symposium conducted in Indian society of mycology and Plant Pathology at Rajasthan college of Agriculture, Jaipur from 8th to 10th October.
4. Thangamani, D.; Srivastava, K. K. and Verma, Neelam (2004). Noval antifungal protein from Staphylococcus aureus against *Macrophomina phaseolina*. Paper presented and abstract published in National conference on "Microbes for Mankind' conducted by Dept. of Microbiology, Karpagam Arts and Science college, Coimbatore on 9th and 10th January.
5. Thangamani, D.; Srivastava, K. K. and Verma, Neelam (2004). Identification and Purification of antifungal proteins from Trigonella foenum graceum against the charcoal rot causing organism *Macrophomina phaseolina*. Paper presented and abstract published in National conference on "Microbes for Mankind' conducted by Dept. of Microbiology, Karpagam Arts and Science college, Coimbatore on 9th and 10th January.
6. Srivastava, K.K.; Thangamani, D. and Verma, Neelam (2004). Antagonistic activity of AM-fungi against fusarium wilt disease of Rhoida (*Tecomella undulata* Sm. Seem.) Paper presented and abstract published in National conference on "Microbes for Mankind' conducted by Dept. of Microbiology, Karpagam Arts and Science college, Coimbatore on 9th and 10th January.
7. Jain, S.H., Arya, Ranjana and Chaudhuri, K.K., "Wood craft industry in Rajasthan" in workshop of " wood preservation in India : Challenges, opportunities and strategies" at Banglore on 20th and 21st October, 2003.
8. Tiwari, V.P. Desertification and its control through afforestation activities for increasing productivity" in Seventh International conference on "Desert Technology" from 9th to 14th November, 2003 at Jodhpur.
9. Meena, R.L. and Singh, G., " Integrated ecosystem approach for management of degraded arid and semi-arid areas of north-western India" in Seventh International conference on " Desert Technology" from 9th to14th November, 2003 at Jodhpur.
10. Jain, S.H., Kumar, Hemant; Arya, Ranjana and Chaudhuri, K.K.(2003) Woodcraft industry in Rajasthan - A challenging opportunity for Wood Preservation presented at National workshop on" Wood preservation in India: Challenges, opportunities and Strategies" on 20th and 21st October, 2003 at IWST, Bangalore

11. Jain, S.H.; Arya, Ranjana; Kumar, Hemant and Chaudhuri, K.K. (2004) Rational utilization of plantation grown lesser known timber species in arid region. Sent to National workshop on "Conservation and Sustainable utilisation of lesser known tree species" from 8th to 10th March, 2004 at FRI, Dehradun.
12. Rathore, Mala; Arya, R.; Meena, Rajendra; Chaudhuri, K.K. (2004). Potential of some lesser known oilseed tree species from Indian Arid Zone, Sent to National workshop on "Conservation and Sustainable utilisation of lesser known tree species" from 8th to 10th March, 2004 at FRI, Dehradun.

CONSULTANCIES

Ministry of Rural Development, Department of Land Resources, Government of India and Department of Rural Development, Land development cell, Government of Rajasthan assigned the evaluation work of following projects:

1. Evaluation of 'Reclamation of wasteland of waterlogged area in Rawatsar, Hanumangarh District in Rajasthan.
2. Evaluation of Combating Desertification works under DDP sponsored by Department of Rural Development, Govt. of Rajasthan in Barmer, Jaisalmer, Sirohi, Jhunjhunu, Sikar, Pali and Nagaur districts.

CONFERENCES/MEETINGS/WORKSHOPS/ SEMINARS / SYMPOSIA / EXHIBITIONS

Organised

1. Liaison and RAG meetings on 23rd and 24th December, 2003.
2. Hindi Saptah from 11th to 17th September, 2003, "AFRI Darpan"- a quarterly newsletter of the Institute was released by Sh. Santokh Singh, Divisional Railways Manager, Jodhpur Division on concluding session of Hindi Saptah.

Institute's News Letter released by Sh. Santokh Singh

3. Maru Gaucher Task Force meeting at AFRI, Jodhpur on 18th July, 2003.

Maru Gaucher Task Force meeting

Participated

1. Workshop on "Conservation and Propagation of medicinal Plants" at Jaipur on 20th to 22nd April, 2003.
2. Workshop on Criteria and Indicator for Sustainable Forest Management organized by IIFM, Bhopal on 5th and 6th September at Jaipur.

3. Workshop on "Current Technologies for plant disease management and future strategies" from 8th to 10th October, 2003 at RAU, Jaipur.
4. Workshop on "Arravallis mining and forests" on 11th October, 2003 at JNV, University, Jodhpur.
5. Workshop on " wood preservation in India : challenges, opportunities and strategies" at Bangalore on 20th and 21st October, 2003.
6. Seventh International conference on "Desert Technology" from 9th to14th November, 2003 at Jodhpur.
7. Sh. Balbir Singh, I.F.S., Head, Agroforestry and Extension Division attended three days workshop on Devolution and Community based Forest Management NIRD, Hyderabad from 1st to 3rd March, 2004.
8. National Workshop on 'Conservation and Sustainable Utilization of Lesser-Known Tree Species", FRI Dehradun from 8th to10th March, 2004.
9. Institute participated and exhibited the research findings and transfer of technology in Swadeshi Mela in October, 2003 and Hasthsilp Mela in February, 2004.

DISTINGUISHED VISITORS

1. Hon'ble Minister of Forests and Environment, Rajasthan and the PCCF, Rajasthan on 28th August, 2003.
2. Prof. Kaus Seeland, Forest Politic and Forest Economic, Swiss Federal Institute of Technology, Zurich on 22nd October, 2003.
3. Shri Jogesh Ch. Barman, Hon'ble Minister-in-Charge, Department of Forest, Government of West Bengal on 10th December, 2003.

Tulesar Charan Silvipasture model being developed by AFRI

Inauguration of Medicinal Germplasm bank by the DG, ICFRE

4. Shri J. Hari Narayan, IAS, Addl. Secretary (Land Reforms), Ministry of Rural Development, Govt. of India visited the institute on 30th March, 2004. Director, AFRI gave a presentation on research activities of the Institute followed by visit to Medicinal Germplasm Bank.

Sh. J. Hari Narayan, IAS, Addl. Secretary, MoRD at Medicinal Germplasm Bank.

MISCELLANEOUS

1. Organized sports meet and cultural activities on 15th August, 2003.
2. Observed "Vigilance Awareness Week" from 31st October to 6th November, 2003 and "Kaumi Ekta Week" from 19th to 25th November, 2003.
3. National Science Day was celebrated on 28th February, 2004 at AFRI by way of organizing Elocution and Quiz competition on the environment, forestry and wildlife among the children of AFRI campus.