

### Arid Forest Research Institute Jodhpur

Arid Forest Research Institute, Jodhpur (Rajasthan), is one of the eight Institutes under the Indian Council of Forestry Research and Education (ICFRE). The mandate of the Institute is to carry out scientific research in forestry and allied fields, to enhance the productivity and vegetative cover; conserve the biodiversity and develop the technologies for the end-users, especially in the hot arid and semi-arid regions of Rajasthan, Gujarat and Dadra and Nagar Haveli.

The main thrust areas of the Institute are soil, water and nutrient management technologies for afforestation of stress sites, management of plantations, growth and yield modeling, planting stock improvement, bio-fertilizers and bio-pesticides, agroforestry, JFM and extension, phytochemistry and non-timber forest products, integrated pest and disease management and forestry education.

#### PROJECTS COMPLETED DURING THE YEAR 2006-2007

##### **Project 1: Stand dynamics of some important tree species of Gujarat [AFRI-57/Silvi/2001-2006]**

**Findings:** Total wood and variable bole-length volume equations have been derived and validated for *Eucalyptus* hybrid and *Acacia nilotica* species that assume importance in projecting the total and commercial volume at different stages (thinnings and final harvest) as the plantations mature. Volume equations proposed may be applied on any population/sample of these species available in the study area as these equations have been validated for independent data set.

The site index equations developed may be used for assessing productive capacity of site and to select sites suitable for a particular species. These are also useful in estimating site index at base age as well as estimating height at some desired age at given site index.

The relationship between the average tree size and the number of surviving trees per unit area has been described by means of a limiting line. This relationship is helpful in generating information about the maximum number of trees ha<sup>-1</sup> to be kept in the stands given the mean diameter of the trees in the stands.

Path invariant algebraic difference form basal area prediction models have been developed and these can be used to analyze the relationship between stand density and tree growth. In combination with the stand density model, the proposed basal area projection models may also be used to define the type and weight of thinnings in the stands. Thus the models are crucial in evaluating silvicultural treatment options.

##### **Project 2: Studies on seed quality improvement in respect of various tree species of arid and semi-arid areas [AFRI-59/Silvi/2002-2006]**

**Findings:** Neem seeds collected either from morphologically superior or inferior stands for immediate sowing. Superiors gave better results during storage.

The best period for collection neem seeds is 11 WAA (weeks after anthesis). Fresh neem seeds of all mother tree age showed higher oil content than stored seeds. However, age classes I and II



exhibited higher oil content as compared to age classes III and IV. Reduction in oil content was minimum in age class IV during storage and it was best for oil production.

The neem seed stored under airtight containers at low moisture content showed  $P_{50}$  for 85 days. However, seeds can be stored best at low moisture ( $M_4$ , 5.5%) and low temperature ( $T_3$ ,  $5\pm 1^\circ\text{C}$ ) for longer period ( $P_{50}$ , 326 days) in airtight container. Open container seeds showed  $P_{50}$  for 233 days at ambient room temperature.

Hydration pre-treatment enhanced viability upto 3-6 times of stored neem seeds. Fresh neem seeds do not require any type of pre-treatment. However, stored seeds may need pre-treatment with Urea (1%) for better germination and seedlings attributes. Fresh neem seeds should be sown either in horizontal or in downward orientation and upto 3 cm depth whereas, stored seeds should be sown only in horizontal orientation.

### **Project 3: Micropropagation of an important medicinal plant of the arid and semi arid *Commiphora wightii* (Arn.) Bhandari [AFRI-42/FGTB/2002-2007]**

**Findings:** Method for identification of the right stage immature embryo containing unripened seeds for initiation of the embryogenic callus cultures has been developed. Medium for somatic embryo multiplication and maturation has been optimized. Complete regeneration protocol utilizing the two pathways involving callus phase (somatic embryogenesis) and bypassing the callus phase (micropropagation) has been established.

A systematic two phase hardening protocol has been developed and used successfully:

? Phase I: *In-vitro* hardening (done in tissue culture lab itself).

? Phase II: *Ex-vitro* hardening: The successfully *in-vitro* hardened plantlets (after passing through phase I) are subjected to *ex-vitro* hardening in mist chamber.

A total of 15 hardened plants were planted in the field and their performance evaluation has been carried out. The plants have shown 100% survival in 2 months.

### **Project 4: Litter dynamics and soil changes during stand development in plantation forest [AFRI-35/FED/2002-2006]**

**Findings:** The experiment was initiated in the year 2002 to study litter dynamics and soil changes at various stages of plantation in Indira Gandhi Nahar Pariyojna (IGNP). Four age groups and six species were selected for the study. A total of 76 litter plots of  $10 \times 10 \text{ m}^2$  area were laid in plantations of *Eucalyptus camaldulensis*, *Acacia nilotica*, *Acacia tortilis*, *Tecomella undulata*, *Prosopis cineraria* and *Dalbergia sissoo* at Nachna, Sada and Ramgarh area along IGNP.

Litter production varied greatly among species as well as age classes. *E. camaldulensis* was found to produce highest quantity of litter. Though leaf litter production was high in *D. sissoo* compared to *A. tortilis* and *A. nilotica*, total litter production was low. Bimodal pattern of litter-fall was observed in the species and it was observed to be highest in summer. Decomposition rate (weight loss) was rapid in case of *A. nilotica* litter with half decay in 0.66 years. Litter in *E. camaldulensis* plantation showed a slow rate of decomposition. There was an increase in soil organic carbon (SOC),  $\text{NH}_4\text{-N}$ ,  $\text{NO}_3\text{-N}$  and  $\text{PO}_4\text{-P}$  in the plantation area with increase in age. Lowest availability of all these nutrients was observed in *T. undulata* and *E. camaldulensis* plantations. Litter nutrients were high in old stands.





Litter plot in *E. camaldulensis* plantation in IGNP area

Carbon stock in top 25 cm soil layer has been worked out to be high in *P. cineraria* and *A. nilotica* ( $7.87 \text{ Mg ha}^{-1}$ ), followed by *A. tortilis* ( $7.75 \text{ Mg ha}^{-1}$ ), *E. camaldulensis* ( $6.75 \text{ Mg ha}^{-1}$ ), *D. sissoo* ( $6.37 \text{ Mg ha}^{-1}$ ) and *T. undulata* ( $5.25 \text{ Mg ha}^{-1}$ ). The study reveals that the plantations of different species and stand age modify the nutrient compositions in varied degree and in general improve soil condition and increase carbon stock in biomass, litter and soil.

#### **Project 5: Development of suitable models for urban aesthetic forestry suitable for arid and semi arid region of Rajasthan [AFRI-63/Silvi/UIT/ 2001-06]**

**Findings:** About 6000 plants were planted at road sides at seven important locations within the Jodhpur city during 2002 to 2005. Growth and survival data of plants raised under the experimental plantations on various road sites have been recorded. Average height and diameter of various tree species raised under the experimental plantations have been recorded in the order of *Dalbergia sissoo* > *Azadirachta indica* > *Cassia siamiae* > *Tecomela undulata* > *Pongamia pinnata* > *Alstonia scholaris* > *Cassia fistula* > *Delonix regia*.

### **PROJECTS CONTINUED DURING THE YEAR 2006-2007**

#### **Project 1: Market survey on timber, bamboo and fuelwood [AFRI-58/Silvi/Continue]**

**Status:** The data regarding prices of various forest produces viz., timber, fuel-wood, bamboo collected from the markets of Jaipur and Ahmedabad on quarterly basis were compiled and submitted to the ADG (Stat.), ICFRE, Dehradun for further publication in Timber and Bamboo Trade Bulletin.

#### **Project 2: Screening of exotic and indigenous plant species for their performance on salt affected soil with different management project [AFRI-49/NWFP/1997-2008]**

**Status:** An experimental trial was laid out in August 2003 with two fodder species namely *Zizyphus mauritiana* (ber) and *Colophospermum mopane*. The trial was treated with two levels of gypsum (0 and 100 % soil G.R.) and three doses of nitrogen (0, 9 and 18 g of N in the form of urea) on two modes of planting (control and circular dished mound). *C. mopane* registered 95 % survival on CDM and 89 % in control after three years of planting, while it was 53 % and 64 % for *Z. mauritiana*. Mopane recorded better mean height (77.8 cm) and crown diameter (114.4 cm) on CDM as compared to control (71.5 and 106.4) while for Ber, crown was more on control 60.2 to 57 cm. Over all mopane recorded 100 % and 76.9 % more crown on CDM and control than Ber. Positive influence of nitrogen application was observed for height and Crown diameter for mopane only. In third year of growth ber showed better growth under control conditions compared to CDM.



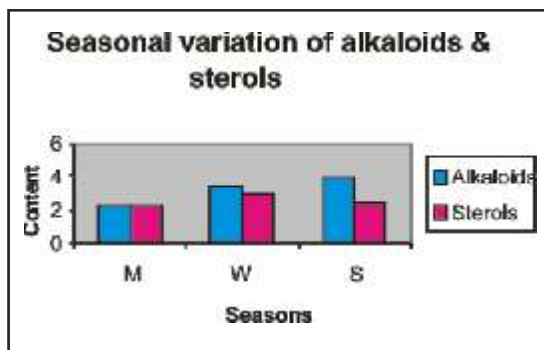
There is no appreciable difference in soil pH values in pre and post monsoon seasons for Ber and Mopane. Soil pH is ranging from 8.1 to 9.0 and 8.2 to 9.1 in 0-25 and 25-50 cm soil layer from plant pit in summer (May 05). Trench (0-25 cm soil layer) recorded pH from 8.1 to 8.6. No change was observed on soil pH of post monsoon season collected in November 2005.

Soil Organic Carbon from 0.13 to 0.25 % in post monsoon season registered 50% increase over initial values in plant pit and inter- row spaces.

*Sueada nudiflora* after 72 months recorded 79.2 and 66.7 per cent survival on CDM and DRM as compared to 55 % under control conditions. The average growth (height and crown diameter) on structures was also recorded higher. The total dry biomass was also 98 and 106 % more on DRM ( $2.16 \text{ tha}^{-1}$ ) and CDM ( $2.25 \text{ tha}^{-1}$ ) than on control ( $1.09 \text{ tha}^{-1}$ ). High percent ash content in leaves is balanced by high percent protein content (27.5 and 16.4 in CDM; 34 and 13.9 in DRM and 28.5 and 14.0 in control). The total soluble sugar content was higher in control (6.01%) as compared to CDM (4.55 %) and DRM (3.30 %). Thus *S. nudiflora* has the potential to be introduced as fodder species on arid sandy soils.

### Project 3: Quantitative estimation of biologically active secondary metabolites in some of the arid zone medicinal plants to ascertain correct harvesting time [AFRI-50/NWFP/2002-2007]

**Status:** The project aims at determining the optimum harvesting time for flowers of *Calotropis procera* so that the medicinally active principles can be exploited to the maximum. *Calotropis procera* flowers were collected for different seasons for two years and active principles extracted over soxhlet with various solvents. Total extractives determined show maximum extraction during monsoon. Investigations on sterol and alkaloid content of these flowers showed that the total alkaloid content was maximum in summer season and minimum in monsoon season. Yield of total sterols was maximum during winters and lowest in monsoon. The mean alkaloid content was found 2.27 %, 3.33 % and 3.89 % and sterol content was 2.30 %, 2.86 % and 2.35 % in monsoon, winter and summer seasons respectively.



### Project 4: Genetic improvement of *Tecomella undulata* [AFRI- 44/FGTB/2002-06]

**Status:** Rohida (*Tecomella undulata*) has multifarious uses and is well grown in arid regions. It is well distributed in Rajasthan and Gujarat. The species has been overexploited from its natural habitat for obtaining good quality timber. To bring improvement in the productivity of this tree, candidate plus trees (CPTs) in different areas have been 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. The data has been recorded for the total height, clear bole d.b.h., and the colour of the flower. The clear bole percentage was calculated over the total height of the CPTs selected, the maximum clear bole over the total height was recorded 46.5 per cent and minimum 17.9 per cent.



Photographs of the CPTs selected

## Project 5: Screening of high oil and azadirachtin in Neem [AFRI-45/FGTB/ 2002-06]

**Status:** Twelve hectares of progeny trials of summer and winter flowering CPTs at AFRI, Jodhpur and high azadirachtin and high oil CPTs at Govindpura Jaipur are being maintained periodically. Phenological observations are recorded on the trial.

## Project 6: Multilocal trial of *Eucalyptus camaldulensis* and *D. sissoo* clones [AFRI-41/FGTB/2002-2006]

**Status:** Multilocal clonal trial of *Eucalyptus camaldulensis* and *Dalbergia sissoo* was established in August 2003 at four different locations namely Deesa, Kheralu, Gandhinagar, Rajpipala in Gujarat state. These clones are superior from germplasm selected under WB project and other sources. Best four clones identified for both the species after 3½ years of growth and listed along with site within brackets for *E. camaldulensis* 99(D,K,G,R)4; 128(D,K,G)3; 115(D,G,R)3 and 105(D,K,R)3; and for *D. sissoo* G5(D,G,R)3; 89(D,K,R)3; 6(D,K,G)3 and 3(D,R)2.



## Project 7: Identification and screening of some suitable nitrogen fixing species of dry region for their utilization in improvement of soil fertility and biomass [AFRI-36/FED/2002-2006]

**Status:** Thirty beds of the size 5 x 5 m were prepared. Seeds of *Rhynchosia minima*, *Clitoria ternatea*, *Mucuna pruriense*, *Crotalaria burhia* and *Mimosa hamata* have been sown in the prepared beds. Soil samples were collected from the beds and analyzed for soil nutrients and soil







enzymes. Acid phosphatase activity increased from August to November and lowest activity was observed in December (greater than control). Nearly same trend was also observed for alkaline phosphatase activity. Acid and alkaline phosphates activity was 2.23 and 2.18 fold, respectively, greater than control. An increasing trend was observed in dehydrogenase activity also from August to October. Dehydrogenase activity was always higher (2 to 3 fold) in the soil collected from the rhizosphere of the plants as compared to the control plot.

## **Project 8: Transfer of forestry technology through demonstration and training for increasing productivity and sustainable management of natural resources (Establishment of Interpretation centre) [AFRI-54/AFE/2002-2006]**

**Status:** Rajasthan, Gujarat and Dadra and Nagar Haveli research results and other activities of the institute have been displayed through charts, exhibits, photograph and models.

## **Project 9: Develop strategies and methodologies for extension of forestry research technologies in semi-arid and arid areas [AFRI-71/AFE/2005-2009]**

**Status:** Extension through handouts/paper articles insertions, multimedia applications and mobile exhibit displays periodically. Organized Quiz and Painting Competition, published 5000 leaflets and 3 banner slogans. "World Environment Day 2006" was celebrated; and 10,000 leaflets, 10 banner slogans, sticker, article and poems were distributed.

## **Project 10: Relative resistance of neem provenances to insect pests and mites and their biomangement in arid areas [AFRI-73/FP/2006-09]**

**Status:** Three species of termites, *Odontotermes obesus* (Rambur), *O. redemanni* (Wasmann) and *O. gurdaspurensis* Holmgren (Termitidae) are among the common insect pests in neem provenance at AFRI. Termite workers feed on the roots and stem portions irrespective of age and ecological parameters of neem plants. The damage occurs by hollowing out or by partly removing the bark of the roots and stem. The oriental yellow scale, *Aonidiella orientalis* Newstead (Diaspididae), neem scale, *Pulvinaria maxima*, *P. azadirachtae* Green, Indian wax scale, *Ceroplastes ceriferus* Anderson, Wax scale, *Ceroplastes pseudoceriferus* Green, The shield scale, *Lecanium* sp. (Coccidae) and *Pseudococcus* sp. (Psedococcidae) are amongst the insect pests collected and identified during the last three months. Four species of sap sucking insects have been identified to cause minor damage to the robust trees of neem in the provenance trials.

## **Project 11: Management of potential insect pests and diseases of important medicinal plants grown in arid and semi-arid regions [AFRI-72/FP/2006-2009]**

**Status:** Severe infestation of a noctuid caterpillar species has been noticed on all mehndi (*Lawsonia inermis*) growing areas at Sojat road (Pali). Heavy termite infestation was recorded in the Guggal (*Commiphora wightii*) plantation at Kailana (Jodhpur). About 1.50 cm thick stem of Guggal were found infected by stem rot as well as termite infestation resulting drying of the stem and shoots. Guggal plants at AFRI model nursery were noticed infested severely by a lepidopteron pest and white fly. Foliar spray of 0.02 % of Monocrotophos in combination with Bavistin 0.1 % is recommended as remedial measure. Severe infestation of termites has also been noticed in the root system of mature Guggal plants at Herbal Guggal Farm, Mangaliavas near Ajmer. Ashwagandha (*Withania somnifera*) were found attacked by aphids and leaf blotcher. Two species of predatory beetles (Coccinelidae) were recorded to feed on these sap sucking insects from adjoining areas of Jodhpur. Sporadic incidence of black leaf

spot, brown leaf spot and blight disease was commonly found in all mehndi (*Lawsonia inermis*) growing areas at Sojat road (Pali). The pathogen was identified as *Alternaria* sp. causing black leaf spot disease. Some mehndi fruits were found attacked by fruit-rot disease. Stem dry rot in Guggal (*Commiphora wightii*) was noticed in young plantations of Guggal from AFRI nursery, adjoining Guggal growing areas at Jodhpur and Vasani nursery, Gandhinagar. Two pathogens namely, *Rhizoctonia bataticola* causing charcoal root rot and *Rhizoctonia solani* were isolated and identified from Guggal collected from Vasani Nursery, Gandhinagar. Leaf blight disease was recorded from Ashwagandha (*Withania somnifera*) at AFRI model nursery. The fungus was isolated and identified as *Alternaria* sp. Isabgol (*Plantago ovata*) crop was found severely attacked by downy mildew disease at Sojat (Pali). The fungus was identified as *Peronospora* sp. Farmers were advised to foliar spray (0.02%) of Monocrotophos in combination with Dithane M-45 at 0.2 % after fifteen days interval as remedial measures.

## NEW PROJECTS INITIATED DURING THE YEAR 2006-2007

### Project 1: Assessment of Neem International Provenance Trial

**Status:** The project was started in July 2006. Observations were taken for growth parameters of the different provenances and flowering time in the provenances. During the initial observation, i.e. in the month of August few fruits were found in some international provenances, giving an indication that the flowering either started late or it could be late flowering. No flowering has been observed in the trial until last observation was made.

### Project 2: Demonstration trial of male and female *Ailanthus excelsa* plants raised through grafting and tissue culture

**Status:** *A. excelsa* trees (50 males and 50 females) have been identified and marked for two ha site at AFRI (VMG field) for demonstration. Seedlings have been raised as root stock for grafting. Grafting work of male, female scion on the root stock is in progress. Similarly establishment of in vitro cultures of male, female *A. excelsa* trees is also in progress.

## PROJECTS CONTINUED DURING THE YEAR 2006-2007 (Externally aided)

### Project 1: Genetic improvement of *Jatropha curcas* for adaptability and oil yield [AFRI-66/Silvi/CSIR/2005-2010]

**Status:** Collected 23 elite and 180 native accessions of *Jatropha* and planted these in AFRI experimental field. Elite accessions planted in September 2005 and 2006 showed variation in percent survival, total mean height, collar diameter, crown diameter, number of branches, and female to male ratio. The survival percentage ranged from 18.75 to 100 %. Accession number SKNJ-1 (Sardar Krushi Nagar) has died and was unable to survive here. The major threat in arid region is termite infestation and cost of termite treatment is very high in arid areas. The maximum (100%) survival was obtained in accession numbers 12 and 13 from CRIDA; 20 from FRI, Dehradun and 21 from PAPL Bangalore. Other accessions showed 18.75 to 93.75% survival.

After 18-months of planting in the field, accession numbers CSMCRI-GJ-PCM-C<sub>3</sub>, CRIDA, Raipur and JPH009, PAPL, Bangalore performed better. Production of fruits per plant varied from 175 g in CSMCRI-GJ-PCM-C<sub>3</sub> to 3.67 g in SKNJ-, Urli Kanchan.



Out of 180 accessions planted, 30 accessions have died and remaining accessions showed 33 to 100 percent survival. Maximum mortality was observed in accessions supplied by CRIDA (12 accessions), followed by NBPGR (8) and FRI (6). Accessions received from CSMCRI, Bhav Nagar and AFRI showed no mortality and 2 accessions each from NBRI and PAPL died after transplantation in the field.

For developing agro-technology, seeds from a single tree having more than 40% oil have been collected and seedlings have been raised. Plantations have been done in July 2006 in split plot design. Initial observations have been recorded on above ground height, number of branches and crown diameter after 6-months of planting.

## **Project 2: Locational trials on Bamboos (NMBA) [AFRI-43/GTB/2005 2008]**

**Status:** All the three trials were established in July 2006. Initial and after one month growth data has been recorded as per guidelines of NMBA. Soil samples have been collected from all the three experimental plots and analysis for pH, EC, NPK and carbon stock have completed.

## **Project 3: Multiplication and field trial of Bamboos through tissue culture in Rajasthan and Gujarat [AFRI-68/GTB/2005-2008]**

**Status:** Superior Planting stocks of *Bambusa bambos* TC plants (8000) were procured from TERI New Delhi and *Dendrocalamus strictus* (4000 plants) were procured from I.H.B.T., Palampur. Remaining planting material of *D. strictus* was raised at TC lab of AFRI Jodhpur from seed source of TFRI, Jabalpur. The achievements of the project so far are given below:

1. Demonstrations and experimental plantations of *Bambusa bambos* and *Dendrocalamus strictus* plants were raised through tissue culture in July 2006 (25 ha Dahod Gujarat, 20 ha Kushalgarh and 5 ha Saira in Rajasthan).
2. Survival percentage of both species after four months was above 95 % at Kushalgarh (Rajasthan) and Dahod (Gujarat) locations. However survival percent was about 70 % at Saira, Udaipur in Rajasthan.
3. Data and soil samples (75 No.) were collected from all three sites and analysis for pH, EC, NPK and carbon stock has been completed.

## **Project 4: Efficacy and economics of water harvesting devices in controlling run-off losses and enhancing biomass productivity in Aravalli ranges [AFRI-39/FED/2002-2006]**

**Status:** Seventy five plots of about 700 m<sup>2</sup> area were laid in 0-10 %, 10-20 % and >20% with five treatments (control, contour trench, gradonie, Box trench and V. ditch rainwater harvesting structure) in five replicates. Growth and seedling survival were recorded in June 2006 and January 2007. Casuality was replaced in July 2006. Runoff measured from July to October 2006 (12 times) and water samples were collected (2 times) for nutrient analysis. Vegetation diversity monitored and community biomass determined.

Highest run-off losses were recorded from 10-20 % slope plots. Water loss was highest in control plots, whereas the lowest run-off loss was from Contour trench plots.





Growth of planted seedlings and vegetation at Banswara site

Nutrient loss ( $\text{NH}_4\text{-N}$  and  $\text{NO}_3\text{-N}$ ) along with run-off water was highest in control plots. Loss of dissolved solids and  $\text{PO}_4\text{-P}$  was lowest from Contour trench plots. Soil water content (SWC) determined in May, August, September, November 2006 and January 2007 indicated highest SWC in  $>30\%$  slope plots except in September and January. Lowest SWC was in  $10\text{-}20\%$  slope in all the observations. The SWC in May 2006 was in order of Contour trench  $>$  Box trench  $>$  Gradonie  $>$  V-ditch  $>$  Control.

Seedling survival was highest in *Emblica officinalis* (91.1 %) and lowest in *Dendrocalamus strictus* (79.5 %) in May 2006. The survival was highest in  $0\text{-}10\%$  slope area (86.1 %) and lowest in  $>20\%$  slope area (70.7 %) with an average survival of 79.1 %. Considering the rainwater harvesting structures, the survival was lowest (76.0 %) in the control plot and highest in Contour trench plot (83.4 %). Seedlings of *D. strictus* were tallest whereas the seedlings of *Holoptelia integrifolia* were smallest.

Seventy five herbs and grass species were recorded in October 2006. Highest numbers of herbs/grass species and their population were in  $0\text{-}10\%$  slope area. Vegetation production was highest in  $10\text{-}20\%$  slope. Both fresh and dry masses of the grasses were lowest in the plots of  $>20\%$  slope area. Average vegetation production was  $273.9\text{ g m}^{-2}$  ( $84.8\text{ g m}^{-2}$  in upside of the plots,  $393.6\text{ g m}^{-2}$  within the treated plots and  $342.3\text{ g m}^{-2}$  down side of the treated plots) in the protected (experimental) area as compared to  $105.4\text{ g m}^{-2}$  in the unprotected area (i.e., outside of the experimental area).

### **Project 5: Study of characteristic features pertaining to bio-drainage potential of some selected tree species [AFRI-38/FED/2004-2008]**

**Status:** Growth parameters have been recorded quarterly from sample plots at Anupgarh branch and 1357 RD, IGNP in the plantation raised by State Forest Department, Rajasthan and AFRI. At 1357 RD, crown spread and girth at breast (GBH) height of the plants was high in *Eucalyptus rudis*. Though plant height was more in *E. camaldulensis* but crown spread and GBH were less than *E. rudis* plants. Two and half year old *E. camaldulensis* plants at Anupgarh attained average height of 1472 cm. Crown diameter and collar girth was 294 cm and 35 cm respectively. Height, crown diameter and collar girth in three and half- year-old plants was 1808 cm, 378 cm and 48 cm, respectively.

High transpiration ( $3.11\text{ mmol H}_2\text{O m}^{-2}\text{ s}^{-1}$ ) and photosynthesis rate ( $10.14\text{ }\mu\text{mol CO}_2\text{ m}^{-2}\text{ s}^{-1}$ ) were recorded in *E. rudis*. Soil samples collected and analyzed for pH, EC and organic carbon. Soil pH ranged between 9.3 and 10.3 at different sites. Soil organic carbon was more in surface than the sub-surface. Soil EC, recorded in August 2006 was low at 1357 RD, IGNP in comparison to the observations recorded in December 2005. This may be attributed to leaching effect due to rain.

In another experiment out of the four species planted (viz. *Eucalyptus camaldulensis*, *Acacia nilotica*, *Tamarix aphylla* and *Casuarina junghuhniana*) *Tamarix* and *E. camaldulensis* recorded better survival and growth. One year old *Tamarix aphylla* attained height and crown growth of 207 cm and 172 cm at 1357 RD experimental plot out performing *E. camaldulensis* (130 cm, 80 cm and 6.5 cm of height, crown diameter and collar girth respectively).

## **Project 6: Baseline survey study on biological diversity in Mangala, Sarswati and Rageshwari Areas of Rajasthan Hydro Carbon Project [AFRI-75/FED/2006-2008]**

**Status:** The present proposal was formulated with a view of survey of existing bio-diversity in the eco-sensitive areas and compile inventory i.e., Ecosystems/areas (terrestrial and aquatic if available), Floral and faunal community/ species assemblages, Eco-sensitive areas like sanctuaries, wildlife habitats, breeding grounds, migratory routes and flocking areas if available. Winter season vegetation survey of 372 plot (319 agriculture land, 14 forest land, 23 gauchar land and 16 orans /Nadi) covering an area of about 1700 km<sup>2</sup> in Barmer district was completed. Data entries, analysis and interim report is in progress. Socio-economic and vegetations in schools, temples and other community lands data have also been collected. About 122 (12 trees, 15 shrubs, 68 herbs and 27 grasses/ sedges) have been recorded. One new variety has been recorded.



Three year-old *E. rudis*

## **Project 7: Productive propagation of remunerative medicinal plants for establishment of Silva-Ayurveda demonstrative models in the arid and semi arid areas, their preservation for further improvement, research, extension, development and diversification [AFRI-70/AFE/2006-2009]**

**Status:** Literature survey was done. Thirteen plots in 10 hectares of targeted area involving eight stakeholders for medi-culture were selected. Analysis of soil and water samples collected from the selected areas was completed. MoUs signed with the farmers were completed. Nursery site was selected and choice of species worked out. Sowing of *Moringa oleifera* in 580 polybags, Ber in 620 polybags, Tulsi, sown in 2 beds of 12x12 feet and Guggal cuttings sown in 2300 polybags was carried out. Brahmi plantlets (2500) were also planted in 2 beds of 12x12 feet.

## **Project 8: Integrated management for qualitative improvement and increased production of rohida ( *Tecomella undulata*) in Rajasthan [AFRI-65/FP/2005-2007]**

### **Component 1: Insect pests and disease studies**

**Status:** The observations revealed that the tree deformity pertaining to hollowness might initiate the formation of cankers in the main trunks of the trees. Canker formation was found in trees having girth range from 80 cm onwards irrespective of age and girth class. The maximum percentage (18.65 %) of cankers has been noticed in the trees with girth range above 121 cm.

Thirty rohida trees exhibiting symptoms of hollowness in IGNP area as well as in the farmers' fields were identified. Regular examination was made and studied marked trees pertaining to causal agents responsible for the hollowness problem.

Thirty five insect species belonging to 5 insect orders viz., Coleoptera, Hemiptera, Isoptera, Lepidoptera and Orthoptera, have been recorded feeding on *T. undulata*. Majority of the insects are polyphagous and infest *T. undulata* in a moderate pattern but some are potential pests and have been found to cause epidemics in plantations in the selected localities around Bikaner and Jaisalmer. Of them, 12 species of Coleopterous beetles and weevils are found causing economic damage to the shoot and root system of *T. undulata*. *Aeolesthes holosericea* and *Celosterna scabrator* are the most damaging species and can be termed as the key pests of *T. undulata*. Eggs of these 2 species are laid on the bark and stem. Yet another species of Cerambycidae, *Derolus volvulus* is a polyphagous in nature and its damage has been recorded in IGNP areas. Minor infestation of *D. volvulus* was noticed in the old plantation of *T. undulata*. Larvae excavate small tunnel of about 3-5 cm in the sapwood. The tunnels are filled with frass. Three species of termites are observed to be associated with the infestation in *T. undulata*. They cause considerable damage to the dead wood as well as living trees. *Odontotermes wallonensis*, *O. obesus* and *Microtermes obesi* (Termitidae) are recorded to be injurious in the Rohida plantations. *Inderbela quadrinotata* is the only lepidopterous insect causing damage as the insect borer of living rohida trees in IGNP area.

Heavy termite infestation in rohida trees at 1438 RD, Mohangarh and 1252 RD and 1265 RD at Nachna was also observed. Species responsible for the damage of bark and canker were identified as *Microcerotermes* sp. *Botryodiplodia theobromae* and *Phoma* sp. The infection occurs in the form of splitting of bark on the bole, which spreads in upward and downward direction.

## Component II: Rohida Macropropagation

**Status:** An experiment has been conducted with following four variables:

1. Conditions: In side polyhouse/out side polyhouse.
2. Container: Poly bags/ root trainers.
3. Treatment: Wax coating/without wax coating.
4. Stem thickness: ( $1.0 \pm 0.4$  cm and  $2.0 \pm 0.4$  cm).

Therefore, a total of 16 combinations of treatments were given to Rohida stem cuttings and 60 cuttings were raised with each treatment. Data were recorded after three months on sprouting, root primordia formation, root induction as well as number of cuttings attached by pathogens. Surviving ( $1.0 \pm 0.4$  cm diameter thick) stem cuttings exhibited high percentage of sprouting 100 %, root primordial formation (72.7 %) and rooting (27.0 %) if raised in polybags, treated with wax coating and raised in polyhouse at intermittent misting interval (99 minutes off, 99 seconds on).

## Component-III: Growth and yield studies on Rohida plantations

**Status:** Annual measurements were carried out in 22 sample plots of *T. undulata* laid out in IGNP Stage-II of Rajasthan state.

The data collected were compiled and plot computations were completed. The summary results indicated that depending upon age, site and density, average height in the stands varied from 3.45 to 6.24 m, mean quadratic diameter from 6.30 to 12.28 cm, dominant height from 4.56 to 8.54 m, basal area from 1.94 to 14.21 m<sup>2</sup>/ha, volume yield from 4.20 to 44.10 m<sup>3</sup>/ha, height increment from 0.19 to 0.37 m/yr, dbh increment 0.36 to 0.64 cm/yr and MAI from 0.22 to 2.47 m<sup>3</sup>/ha/yr.





## NEW PROJECTS INITIATED DURING THE YEAR 2006-2007 (Externally aided)

### Project 1: Source variation, extraction and cultivation practices for *Commiphora wightii* Arn. Bhandari [NMPB]

#### Component 1:

**Status:** Various clonal accessions (seed sources) of guggal from 13 different regions of Rajasthan were collected and their performance trial tested.

As a common practice, in general, half mature fruits were collected for seeds, this results into low germination. Depulping these half ripe-fruits gave black and white coloured seeds. Black coloured seeds were viable and gave 75-90 % germination.

Material collected from various places was kept in 12x22 cm size polythene bags with good soil and FYM in the ratio of 2:1. All bags were kept in polyhouse having misting facility.

#### Component 2:

**Status:** Field visits were undertaken to Mangaliawas Guggal Herbal Farm, Ajmer Forest area in Jaisalmer and Kumatia encloser in Kailana, Jodhpur.

#### Component 3:

**Status:** Fresh callus cultures have been established from juvenile explants on MS medium. Experiments on applicability of Guar gum, sago granules and powder and isabgoal as viable gelling agents have been initiated and are underway. The results are encouraging and it has been observed that each of these can be used as an alternative gelling agent. Older somatic embryogenic cultures have been revived and cultures are being maintained. Here isabgoal has shown promising results compared to two others tested so far.

### Project 2: Studies on prediction of NTFP availability and potential for extraction in Aravali region of Rajasthan

**Status:** A total of 42 villages from three forest divisions i.e. Pratapgarh, Udaipur (C) and Banswara were selected for detailed study. Initial as well as post monsoon observations for natural regeneration in 84 plots of 42 villages have been taken. Socio-economic survey of these villages has been done.

### Project 3: Enhancing productivity of saline wastelands in Kutchch through improved tree planting techniques and silvipastoral study

#### Sub Project A:

**Status:** The experimental area is located in Kordha, Sami Range in Patan (23.83° N latitude 72.12° E longitude) of Gujarat, India. The area is on the fringe of little Rann of Kutchch.

It is a highly saline silty clay textured black soil (medium) having soil depth 75-100 cm. *Salvadora persica* and *Tamarix dioca* did not survive the experimental conditions after three months. The percent survival of *Sueada nudiflora* after six months was 66.6, 78.6, 58.3, 70.3 and 51.5 for T<sub>1</sub>- T<sub>5</sub> treatments respectively. In case of *A. ampliceps* it was 29.6, 33.3, 33.3 and 81.4 and height and crown diameter was 31.7 and 20; 36.1 and 30.7; 33.6 and 33.6 and 40.5 and 56.1 cm for T<sub>1</sub> to T<sub>4</sub> treatments indicating that application of wheat husk with FYM is the most suitable treatment. There was no change

in pH but EC values decreased to 3.29 to 6.21 and 4.29 to 8.4  $\text{dsm}^{-1}$  in upper and lower soil layers due to various treatment applications. Weed evaluation is done, mostly halophytes dominated by *S. nudiflora* appeared.

### Sub Project B:

**Status:** The experimental site was located at Mochirai forest range in Bhuj district (23.15° N latitude, 69.49° E longitude) of Gujarat, India. The area was undulating, and soils were loamy sand textured. Soil pH and EC was 7.3 to 7.5 and 0.49 to 0.89  $\text{dsm}^{-1}$  for 0-25, 25-50 and 50-75 cm soil layers. Organic carbon in 0-25 cm, 25-50 and 50-75 cm soil layer was 0.34, 39 and .36 % respectively. Soil depth to an impermeable underlying calcium carbonate layer was 25-75 cm at different places. Trials with four tree species namely *Cordia gharaf*, *Prosopis cineraria*, *Ziziphus mauritiana* and *Colophospermum mopane* and three grass species, namely, *Cenchrus ciliaris*, *C. setigerus* and *Dicanthium annulatum* were laid in RBD in three replication at Mochirai, Bhuj in July 2006. The six-month old seedlings of tree species in polybags were planted in pits of size 30 x 30 x 30 cm at a spacing of 6 x 4 m. Among the tree species the percent survival was *P. cineraria* (98.76 %), *Z. mauritiana* (100 %), *C. gharaf* (100 %), and *C. mopane* (92.59 %) for tree control and *P. cineraria* (100 %), *Z. mauritiana* (95.67 %), *C. gharaf* (100 %), and *C. mopane* (91.35 %) with grass species after six months. Growth wise *C. gharaf* recorded maximum growth (height and crown diameter) while minimum growth was for *C. mopane* after six months of planting. After fortnightly irrigation with saline water ( $\text{pH}_2$  7.4,  $\text{EC}_2$  5.6  $\text{dsm}^{-1}$ ) from October 2006 there is an increase in EC in plant furrows. Now it ranges from 0.5-1.8  $\text{dsm}^{-1}$  for 0-25 cm soil layer and 0.33 to 2.1  $\text{dsm}^{-1}$  for 25-50 cm soil layer while EC in inter row spaces is 0.1 to 0.26 and 0.12 to 0.22  $\text{dsm}^{-1}$  in upper and lower soil layer.

Green (dry) grass yield was estimated in September 2006 and an average yield of 1.21 (0.33), 0.67 (0.18), 1.02 (0.28), 0.78 (0.21), and 1.08 (0.29)  $\text{Kgm}^{-2}$  was recorded for *Z. mauritiana*, *C. gharaf*, *P. cineraria*, *C. mopane* and grass control respectively for *C. ciliaris*. In case of *C. setigerus* these values are 0.59 (0.21), 0.80 (0.29), 0.83 (0.30), 0.69 (0.25) and 0.60 (0.22)  $\text{Kgm}^{-2}$  respectively. Germination of *D. annulatum* was poor and only 0.37  $\text{kgm}^{-1}$  yield was recorded in scattered pockets. However 0.89  $\text{kgm}^{-2}$  yield of local vegetation, 60-80 % of which was palatable was recorded.

### Abstract: No. of Projects

	No. of projects completed in 2006-2007	No. of ongoing projects in 2006-2007	No. of projects initiated in 2006-2007
Plan Projects	5	11	2
External Projects	1	8	3
<b>Total</b>	<b>6</b>	<b>19</b>	<b>5</b>

### TECHNOLOGY ASSESSED AND TRANSFERRED

Growth and yield functions (volume equations, site index equations, potential density and Basal area projection models) were developed for *Acacia nilotica* and *Eucalyptus* hybrid plantations in Gujarat State. The detailed report incorporating these models and results was sent to the PCCF, Gujarat and other concerned officials for being used in sustainable management of the plantations of the two species in the state.



## EDUCATION AND TRAINING

### Education

1. Mr. Pradeep Chaudhry was awarded Ph.D degree from FRI University, Dehradun in Forest management i.e. "Valuing recreational benefits of Urban Forestry-A case study of Chandigarh City" under the supervision of Dr. V.P. Tewari, Scientist E, Silviculture Division, AFRI, Jodhpur.
2. Ms. Neelam Verma was awarded Ph.D degree from FRI University, Dehradun in Forest Pathology i.e. "Dependency, evaluation and selection of efficient strains of a mycorrhizal fungi for *Prosopis cineraria* (L) Druce. In Western Rajasthan" under the supervision of Dr. K.K. Srivastava, Scientist E, Forest Protection Division, AFRI, Jodhpur.
3. Mr. Sandeep Kaushish was awarded Ph.D degree from FRI University, Dehradun in Forest Genetics i.e. "Assessing variability of seed, seedling and sapling on some morphological and chemical traits of superior germplasm of *Azadirachta indica* A. Juss. in hot arid environment" under the supervision of Mr. C.J.S.K. Emmanuel, Scientist-F, Head, Forest Genetics and Tree Breeding Division, AFRI, Jodhpur.
4. Mr. Devender Kumar was awarded Ph.D degree from FRI University, Dehradun on "Studies on viability and performance potential of neem (*Azadirachta indica* A. Juss)" under the supervision of Dr. D.K. Mishra, Scientist E, Silviculture Division, AFRI, Jodhpur.

### Training attended

Dr. S.I. Ahmed attended a training programme on "Intellectual Property Rights and World Trade Organization Related Issues" sponsored by Department of Science and Technology, Government of India from 31<sup>st</sup> July to 4<sup>th</sup> August 2006 at Administrative Staff College of India, Hyderabad.

### Training organized

1. A training programme was organized from 12<sup>th</sup> to 16<sup>th</sup> September 2006 for Watershed Development Team consisting of 42 participants, including 9 Technical members, 11 Agricultural Experts, 6 Animal Husbandry experts and 16 Social Workers; on "Watershed Development" sponsored by Zila Parishad, Jodhpur under Hariyali-2003 programme of Ministry of Rural Development, Govt. of India.
2. A training programme was organized at AFRI from 17<sup>th</sup> to 22<sup>nd</sup> December 2006 for Watershed Development team members consisting of 60 participants, which included Agricultural experts, Animal husbandry experts, Social workers and Junior engineers; sponsored by Zila Parishad, Jalore, Rajasthan under Hariyali-2003 programme of Ministry of Rural Development, Govt. of India.
3. One week IFS officers' refresher training course was organized at AFRI, Jodhpur from 21<sup>st</sup> to 25<sup>th</sup> August 2006 on "Integrated approach for sustainable development of fragile desert ecosystem". Ministry of Environment and Forests, Government of India, New Delhi, sponsored the training. Eighteen IFS officers from different states participated in the refresher course.
4. A training programme was organized on "Pure multiplication of VAM inoculum and isolation techniques of Rhizobium" to the freshly recruited JRFs under Biofertilizer project of SFD, Gujarat at Training and Research Centre, Gandhinagar on 11<sup>th</sup> and 12<sup>th</sup> August 2006.
5. A training programme was organized on VAM technology, conducted for 35 members (ACFs, Rangers, Foresters, Progressive farmers and JRFs) under the consultancy project entitled "Identification of mycorrhizal and rhizobial association, establishing gene bank and technology transfer to farmers in field" funded by Gujarat State Biotechnology Mission at Training and



Research Centre, Gandhinagar.

6. Desert Learning Programme was organized for 45 students from Ambala, Haryana, from 12<sup>th</sup> to 14<sup>th</sup> December 2006 at AFRI in collaboration with Ashoka Trust for Research in Ecology and the Environment (ATREE), New Delhi.

## LINKAGES AND COLLABORATION

1. Tata Energy Research Institute, New Delhi.
2. Central Arid Zone Research Institute, Jodhpur.
3. Jai Narayan Vyas University, Jodhpur.
4. Council of Scientific and Industrial Research, New Delhi.
5. National Medicinal Plants Board, New Delhi.
6. Department of Biotechnology, Govt. of India, New Delhi.
7. National Mission on Bamboo Application, New Delhi.
8. Ministry of Water Resources, New Delhi.
9. Rajasthan Forest Department.
10. Gujarat Forest Department.

## PUBLICATIONS

Brochures/pamphlets

1. Brochure on 'Food from forests' published and released during National Workshop on "Forestry for Food Security in dry zones" held at AFRI, Jodhpur on 6<sup>th</sup> and 7<sup>th</sup> October 2006.
2. A bilingual brochure on '*Desertification: its significance, challenges and solutions*' published and released on 17<sup>th</sup> June 2006, the World day to combat desertification.

## CONSULTANCY

Consultancy on "Identification of mycorrhizal and rhizobial association, establishing gene bank and technology transfer to farmers in field" was funded by SFD, Gujarat. Under this consultancy, training was imparted to SFD officials, seven different species of AM fungi and Rhizobial strains were isolated and mass multiplied, and AM inoculation experiments on six different tree species were laid out in nursery at Gandhinagar.



Training programme on biofertilizer organized at TRC, Gandhinagar



Preparation of inoculum



AM inoculation in nursery

## CONFERENCES/MEETINGS/WORKSHOPS/SEMINARS/SYMPOSIA/EXHIBITIONS

### Organized

1. A day long brain storming session on “Floods in Thar and Challenges of Natural Disaster: Prevention, Relief and Rehabilitation” was organized jointly by Arid Forest Research Institute (AFRI), Jodhpur and The School of Desert Sciences (SDS), Jodhpur at AFRI, Seminar Hall on 19<sup>th</sup> November 2006.
2. A consultative meeting on *Commiphora wightii* (Guggul)-an endangered medicinal plant, was held at AFRI on 20/02/07, which was chaired by Shri B.S. Sajwan, Chief Executive Officer, National Medicinal Plants Board, New Delhi.
3. A National workshop on “Forestry for food security in dry zone” was organized on 6<sup>th</sup> and 7<sup>th</sup> October 2006, to commemorate International Year of Deserts and Desertification.

### Attended

1. Shri CJSK Emmanuel, Scientist-F participated as resource person for UGC refresher course on “Plants and Microbes as Natural Resources” organized by Department of Botany, JNV University, Jodhpur.
2. Dr. R.L. Srivastava, Director and Dr. G. Singh, Scientist-E, attended a meeting to finalize 3<sup>rd</sup> National report on implementation of provisions and processes of United Nations Convention to Combat Desertification (UNCCD) in India at India International Centre, Lodhi Estate, New Delhi 110003 on 13<sup>th</sup> July 2006.
3. Dr. R.L. Srivastava, Director attended Agri Conclave 2006, organized by Confederation of Indian Industry at Kota, Rajasthan on 14<sup>th</sup> and 15<sup>th</sup> July 2006 and



Agri Conclave at Kota, Rajasthan

chaired the plenary session on “Soil Mapping and Quality Inputs” during the conference-cum-showcase on Agriculture and Food Products.

4. Dr. R.L. Srivastava, G. Singh and Dr. D.K. Mishra participated in International conference on 'Biofuels Vision 2015' at engineering college, Bikaner, Rajasthan from 13<sup>th</sup> to 15<sup>th</sup> October 2006.
5. Dr. R. L. Srivastava, Director, AFRI attended 3<sup>rd</sup> meeting of DBT, at New Delhi on 11<sup>th</sup> and 12<sup>th</sup> October 2006.
6. Dr. R.L. Srivastava, Director AFRI, undertook evaluation tour of Raipur (Chattishgarh) under DBT network programme on “Production and demonstration of high quality planting Jatropha” from 30<sup>th</sup> October to 2<sup>nd</sup> November 2006 along with other DBT team members.
7. Dr. R.L. Srivastava, Director AFRI attended National symposium on “Tree improvement for sustainable forestry” at Jawahar Lal Nehru Krishi Vishwa Vidyalaya, Jabalpur from 4<sup>th</sup> to 6<sup>th</sup> November 2006.
8. Dr. R.L. Srivastava, Director, AFRI attended a DBT meeting at New Delhi on 14<sup>th</sup> December 2006 to discuss and workout modalities of “DBT bioresources and biotechnology awareness generation clubs for school children”.
9. Director, AFRI attended Second meeting of Scientific Advisory Committee on Biofuels and Bioenergy at Department of Biotechnology, New Delhi on 28<sup>th</sup> and 29<sup>th</sup> March 2006.
10. Dr. R.L. Srivastava, G. Singh and Dr. D.K. Mishra participated in International conference on 'Biofuels Vision 2015' at Engineering College, Bikaner, Rajasthan from 13<sup>th</sup> to 15<sup>th</sup> October 2006.
11. Dr. R.L. Srivastava, Director, AFRI attended the meeting of stakeholders on “Proposed policy reforms to remove the barriers to CDM Afforestation and Reforestation (A/R) Projects” at ICFRE, Dehradun on 14<sup>th</sup> and 15<sup>th</sup> September 2006.
12. Dr. R.L. Srivastava, Director, AFRI attended a workshop on Desert and Desertification on 21<sup>st</sup> September 2006 at Jaipur, organized by Ministry of Environment and Forests, Govt. of India, New Delhi.
13. Dr. R.L. Srivastava, Director, AFRI participated in two days Regional conference, organized by Gujarat Institute of Desert Ecology on “Natural Resource Conservation, use and sustainability in dry lands” at Bhuj, Gujarat on 18<sup>th</sup> and 19<sup>th</sup> December 2006.
14. Shri N. Bala, Scientist D attended Regional Conference on Scope of Production Forestry for Carbon Sequestration at IIFM Campus, Bhopal on 23<sup>rd</sup> and 24<sup>th</sup> November 2006.
15. Dr. R. L. Srivastava, Director AFRI presided over the inaugural session of one day seminar on “Recent Advances in Natural Resource Appraisal for Sustainable Management” on 15<sup>th</sup> March 2007 and held at State Remote Sensing Application Centre, Jodhpur.
16. Dr. R.L. Srivastava, Director AFRI was the chief guest in a crop consultative meeting on “Horticulture and medicinal plants” organized by IFFCO on 16<sup>th</sup> March 2007 at Govt. hospital, village Borunda, District Jodhpur.
17. Dr. R. L. Srivastava and Pradeep Chaudhry participated in two days National Seminar on “Trees outside Forests: Potential for socio-economic and ecological development” at Chandigarh, organized by Punjab Forest Department on 25<sup>th</sup> and 26<sup>th</sup> April 2006.





18. Dr. G. Singh, Scientist E participated in two days training programme on 'Concept and Approach to Combat Desertification' for Rajasthan Forest Department conducted by Indian Institute of Bio-Social research and Development (IBRAD) held at AFRI on 25<sup>th</sup> and 25<sup>th</sup> April 2006.
19. Dr. P. Chaudhry, GCR and Dr. V.P. Tewari, Scientist-E participated in the International Conference on "Planted Forests: Ecosystem Good and Services" organized at FRI, Dehradun from 13<sup>th</sup> to 15<sup>th</sup> December 2006.
20. Dr. R.L. Srivastava, Director, AFRI delivered a talk on the theme "Desert Bioresources" at Ashoka Trust for Research in Ecology and Environment (ATREE), New Delhi on 18<sup>th</sup> May 2006.
21. Dr. R.L. Srivastava, Director, AFRI made a presentation before screening committee of National Medicinal Plants Board, New Delhi on 19<sup>th</sup> May 2006.
22. Dr. R.L. Srivastava, Director, AFRI attended an International Conference on "Environment and Globalization" at City Palace, Udaipur on 5<sup>th</sup> and 6<sup>th</sup> January 2007 and chaired the valedictory session.

## EXHIBITION

AFRI participated in the 'Paschimi Rajasthan Udyog Hastshilp Utsav-2007' from 5<sup>th</sup> to 14<sup>th</sup> January 2007 through a stall with mobile display exhibits about A.F.R.I., Jodhpur facilities, activities and services attributes.

## AWARDS

Dr. Tarun Kant, Scientist D, FGTD Division was felicitated by the Botanical Society of India by awarding Dr. Y.S. Murthy Gold Medal for the year 2006.

## DISTINGUISHED VISITORS

1. Shri D.D. Verma, IAS, Joint Secretary, Ministry of Environment and Forests, New Delhi visited the institute on 13<sup>th</sup> August 2006 and discussed about the research work related to management and improvement of desert ecosystem being carried out at AFRI and CAZRI, Jodhpur and various other aspects related to the UNCCD.
2. Mr. N.P. Nawani, IAS (Retd.), former Secretary (Information and Broadcasting), Government of India and currently Secretary General, Indian Broadcasting Foundation, New Delhi visited AFRI, Jodhpur on 26<sup>th</sup> December 2006.
3. Dr. Prabhakar Dubey, AIGF (R&T) visited the institute on 16<sup>th</sup> and 17<sup>th</sup> January 2006 and attended Friday presentation in Seminar Hall regarding tours undertaken by different scientists to project sites.
4. Shri Jagdish Kishwan, DG, ICFRE visited AFRI on 8<sup>th</sup> and 9<sup>th</sup> February 2007. He inspected various experimental research fields, visited AFRI model village in Jodhpur district and addressed Scientists/ other staff of the institute during the visit.

5. Shri B.S. Sajwan, Chief Executive Officer, National Medicinal Plants Board, New Delhi visited AFRI, Jodhpur on 20<sup>th</sup> February 2007. He visited AFRI model nursery, Medicinal Plants Germ Plasm Bank and Guggul field trials. He also chaired a consultative meet on Guggul (an endangered medicinal plant) held in seminar hall of the institute on 20<sup>th</sup> February 2007.
6. Dr. (Mrs) Kiran Soni Gupta, IAS, and Divisional Commissioner, Jodhpur visited the institute on 4<sup>th</sup> March 2007, visited experimental fields and labs and interacted with the scientists about the research work being carried out at AFRI.

## MISCELLANEOUS

1. The year 2006-2007 was declared as International Year of Desert and Desertification (IYDD) by the United Nations Organization. In this connection the institute celebrated 'World day to Combat Desertification' on 17<sup>th</sup> June 2006. Prof. L.K. Shekhawat, Vice Chancellor, Jai Narayan Vyas University, Jodhpur was the Chief Guest in the function in which Director, CAZRI presided over. Logo, sticker and slogans were released on the occasion. A bilingual brochure containing information on deserts, their distribution, effects, significance of the day etc. was also released on this day. The pamphlets and brochures were sent to all government departments, universities, research institutions, NGOs, progressive farmers and public representatives up to village Panchayat level in Rajasthan state to generate public awareness and mobilize the masses for their active cooperation in combating desertification.
2. A Film on Khejri Mortality and its control measures was telecast on ETV, Rajasthan and Dr. S. I. Ahmed, Scientist-E, was interviewed as an Expert on the Khejri Mortality on 9<sup>th</sup> March 2007.
3. Dr. Pradeep Chaudhry, GCR, gave a Radio talk on "Cultivation of medicinal plants of arid region" at Radio Station, Jodhpur on 20<sup>th</sup> March 2007.

