

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), an autonomous body of the Ministry of Environment and Forests, Govt. of India. The objectives of the Institute are to carry out scientific research in forestry and allied fields to enhance the productivity and vegetative cover, to conserve the biodiversity and to develop the technologies for the end-users, especially in the hot arid and semi-arid region 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. During 2007-08, thirty three projects were executed including thirteen externally funded projects from Rajasthan Forest Department, Gujarat Forest Department, Department of Bio-technology, Government of India, New Delhi; National Medicinal Plant Board, New Delhi and CSIR, New Delhi.

An abstract of projects run by the Institute is as follows:

	No. of projects completed in 2007-08	No. of ongoing projects in 2007-08	No. of projects initiated in 2007-08
Plan Projects	—	13	7
Externally Aided Projects	4	11	2
Total	4	24	9

PROJECTS COMPLETED DURING THE YEAR 2007-2008

EXTERNALLY AIDED PROJECTS

Project 1: Integrated management for qualitative improvement and increased production of Rohida (*Tecomella undulata*) in Rajasthan [AFRI-65/FP/2005-08]

Component 1: Insect pests and disease studies

Findings: The entire IGNP area in Jaisalmer and Bikaner districts was surveyed and 21 sites were evaluated for the insect pests and disease studies. Subsequently, on the basis of infestation intensity,



six sites viz., were selected in IGNP area covering Jaisalmer and Bikaner districts. Three species of fungi belonging to the family imperfecti (*Phoma* sp., *Fomes* sp. and *Botryodiplodia theobromae*) are primarily responsible for canker-rots in *T. undulata* in IGNP area at Mohangarh. It was observed that no significant hollowness problem was encountered in the Rohida plantations raised in the IGNP area except in a few trees, which exhibited the initiation of canker formation in the main trunk.

Component II: Rohida Macro-propagation

Findings: Technology developed on macro-propagation of important tree of arid region known as Marwar Teak and locally called Rohida (*Tecomella undulata*). Studies carried out in last two years indicate that rooting response of Rohida stem cuttings is not only difficult influence by several factors such as donor trees health, physiological status of cuttings and the external environmental conditions. However, tree has the potential to root relative high frequency if tree is managed well before collecting the stem cuttings. Selection of cuttings from well managed selected tree and established in mist chamber at proper time period after treating proper fungicide, insecticide and antibiotic treatments can be rooted successfully.

Component III: Growth and Yield Studies on Rohida Plantations

Findings: Total wood volume equations have been constructed and validated which assume importance in projecting the total volume at different stages (thinning 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 equation has been developed that may be used for assessing productive capacity of site and to select sites suitable for the particular species. These are also useful in estimating site index at a base age given height at some other age as well as estimating height at some desired age given site index. Generalized diameter height models have been developed which are useful tools for forest inventory purposes.

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

Findings: Significant quantities of NTFPs are gathered in three forest divisions of the Aravalli region and the annual estimated values of NTFPs realized per household are Rs. 2765.00, Rs.1794.00 and Rs. 478.00 in Udaipur (central), Pratapgarh and Banswara forest divisions respectively, ignoring fuel wood and fodder grasses collection. Taking removal of fuel wood and fodder grasses from the nearby forests into account, estimated annual financial values realized per household are Rs. 5965, Rs. 4994 and Rs. 3678 in Udaipur (central), Pratapgarh and Banswara forest divisions respectively. The financial value realized per ha or NTFP income generated from a hectare area of tropical dry deciduous forest of Aravali region was estimated as Rs.1442.00 in Udaipur (central) forest division followed by the Pratapgarh and Banswara forest divisions, yielding Rs.1006.00/ha and Rs. 392.00/ha. Such species include important commercial and medicinal plant species like *Acacia catechu* (Khair), *Boswellia serrata* (Salar or Salai), *Lannea coromandelica* (Godal), *Sapindus trifolatus* (Aritha), *Anogeissus latifolia* (Dhavra), *Madhuca latifolia* (Mahua), *Chlorophytum borivillianum* (Safed Musli), *Dendrocalamus strictus* (Bamboo) and *Embelica officinalis* (Aonla) etc.

Project 3: Efficacy and economics of water harvesting devices in controlling run-off losses and enhancing biomass productivity in Aravalli ranges [AFRI-39/FED/2002-08] (Note: Concluded from State Forest Department, Rajasthan but got extension of one year in ICFRE Plan fund in 2008-09)

Findings: Experiment was started in July 2005 with the financial assistance from Rajasthan Forest Department. Seventy five plots of about 700 m² area were laid in 0-10, 10-20% and >20% slope 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 and December 2007. Run-off was measured from July to September (8 times) and water samples were collected (2 times) for soil and nutrient loss. Vegetation and shrub/ tree diversity was monitored and diversity indices calculated. Vegetation productivity was also estimated.

Presence of coarse fragment in most of the plots of >20% slope facilitated the infiltration and subsurface drainage reducing surface loss and enhanced duration of soil water availability for vegetation. Preparation of RWH structures further enhanced water availability increasing vegetation production and soil organic carbon, a benefit of carbon sequestration. Highest run-off (11.43%) was from the Control and lowest was from V-ditch plots (9.33%). The losses in other treatments were 11.28% from Box trench, 10.89% from Gradonie and 10.82% from Contour trench plots. Thus adoption of rainwater harvesting devices reduced run-off losses as the water loss in V-ditch plots was reduced by 2.1% of the total rainfall when compared with the control.

Report prepared and submitted to funding agency i.e., State Forest Department, Rajasthan.

Project 4: Baseline survey study on biological diversity in Mangala, Sarswati and Rageswari areas of Rajasthan Hydrocarbon Project [AFRI-75/FED/2006-08] (Funded by CAIRNS Energy India Pvt. Ltd.)

Findings: An extensive survey was conducted in the Mangala, Sarswati and Rageswari areas of Rajasthan Hydrocarbon Project in Barmer district to study the biological diversity in the area. Sensitive areas like community lands (Oran and Gauchar) and forest areas were also studied in detail. Site wise map has been prepared. Final report submitted to the funding agency.

PROJECTS ONGOING DURING THE YEAR 2007-2008

PLAN PROJECTS

Project 1: Market survey on selected species in selected markets [AFRI-58/Silvi/ Continue]

Status: The data regarding prices of various forest produces viz., timber, fuelwood, bamboo were collected from the markets of Jaipur and Ahmedabad on quarterly basis. Data collected were compiled and submitted to the ADG (Stat.), ICFRE, Dehradun on prescribed format for publication of 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/1997-08]

Status: Experiment 8: For *C. mopane* 88% survival was observed in control compared to 94% on CDM after 48 months. However, for ber survival decreased by 6% (58.20%) on control and 13% on CDM (40.20%). Plants of *C. mopane* became leafless during summer; it gained growth after rain and micronutrient application. Flowering and seed setting was observed in 64.7 % plants of mopane compared to 56.8% plants in control.

Experiment 6: Field trial was laid in 2000 with three planting treatments (DRM, CDM and Control) and three halophytic plant species (*S. nudiflora*, *A. lentiformis* and *A. stocksii*). Effect of structures continued and after 84 months mean survival was CDM (59.7%), DRM (63.9%) and Control (21.1%). *S. nudiflora* was found as best species with 63, 80 and 55 % survival in DRM, CDM and Control. Total (above and below ground) biomass studies were done in *S. nudiflora* plantation at the age of seven years.

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/2002-07]

Status: The total mean alkaloid content in *Calotropis* flowers was maximum in summer season (4.0%) and minimum in monsoon season (2.54 %), total mean sterol content was maximum during winters (2.97%) and lowest in monsoon (2.38%). The mean flavonoid content was found maximum in winter season (75.8 mg CE/100g) and minimum during monsoon season (61.2 mg CE/100g). Flowers collected from all the nine agro-climatic zones of Rajasthan analysed for studying variation in secondary metabolites showed maximum sterol and alkaloid content from Jaisalmer region (ACZIA).

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

Status: Tree improvement work on Rohida (*Tecomella undulata*) was started on the request of the Rajasthan Forest Department. Thirty CPTs in unirrigated and thirty five CPTs in irrigated regions were selected. Seeds of these CPTs were collected for raising of progeny trial-cum-seedling seed orchard in Rajasthan and Gujarat. Seeds were given to the Gujarat Forest Department for raising the trial in Gujarat and for Rajasthan. An area has been selected in Beechiwal Range of Bikaner and AFRI experimental field at Jodhpur. Seedlings have been transferred to the Beechiwal Range for acclimatization and establishment in the nursery.

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

Status: To assess the heritability pattern of Neem CPTs, twelve hectares of progeny trials of summer and winter flowering CPTs at AFRI, Jodhpur and high Azadirachtin and high oil CPTs at Govindpura Jaipur were laid out. These trials are being maintained periodically and phenological observations are recorded on the trial. The trials should have started flowering by now but due to frost and consistent drought conditions, flowering has not started so far.



Progeny trial at Jaipur



Flower buds at initiating stage

Project 6: Multilocal trial of *Eucalyptus camaldulensis* and *D. sissoo* clones [AFRI-41/FGTB/2002-06]

Status: Multilocal trials of *E. camaldulensis* and *D. sissoo* clones established in 2003 at four locations namely Deesa, Kheralu, Gandhinagar and Rajpipla of Gujarat State are being maintained. Preliminary data compilation and analysis reveals that there is a significant variation amongst clones of both species. Further analysis and estimation of genetic parameters is being done.

Project 7: Developing strategies and methodologies for extension of forestry research technologies in semi-arid and arid areas [AFRI-71/AFE/2005-09]

Status: AFRI brochures, pamphlets, achievements and expertise booklet being revised. Published 5000 leaflets and 3 banner slogans, coordinated the Ceremonial Planting and Shramdaan on "World Environment Day 2007" publicized 10,000 leaflets, 10 banner slogans, sticker, article and poem, participated in plantation programme on "International Day to Combat Desert and Desertification" and publicized 10,000 leaflets, 10 banner slogans, and participated in plantation programme on "Van Mahotsav, 2007 for mass awareness. Documentation of regional workshop on "Challenges in Forestry Research Extension" (18th and 19th October 2005) finalized for printing. Dissemination of forestry extension services rendered to the stakeholders by participating in State Level Independence Day Celebration held at Jodhpur from 12th to 16th August 2007. Mela/Exhibition held at Polo Ground, Jodhpur from 31st October to 6th November 2007 and Western Rajasthan Hastshilp Mela 2008 held at Rawan Ka Chabutra, Jodhpur from 5th to 14th January 2008.

Project 8: Relative resistance of Neem provenances to insect pests and mites and their bio management in arid areas [AFRI-73/FP/2006-09]

Status: Relative resistance of neem provenances to neem weevil, *Myllocerus tenuicornis*: An experiment has been conducted to study the resistance of 39 neem provenances to neem weevil, *M. tenuicornis*. The provenance from Palanpur and Jhansi exhibited the least preference for the larvae (0.65 and 0.69 cm sq.). The provenance from Mulag was found to be the most favoured or susceptible host as the leaf area consumed by larvae was 3.11 cm sq.

Microbial control agent of neem weevil: Infection of an entomopathogenic fungus, *Beauveria bassiana* has been observed in the adult population of neem weevil, *M. tenuicornis*. Efforts are being made to isolate and propagate the fungus for further lab study.



The fungus quickly spread on the body of the weevil and choked the respiratory system resulting death of the weevil. Efficacy of this entomopathogenic fungus has been studied. The weevil have been exposed with entomofungus in the outdoor cages of insectary.

Bioecology of neem defoliator: A complete life cycle under different generations took an average period of 39.75 which ranges from 29 to 47 days under different conditions of temperature and relative humidity.

Project 9: Management of potential insect pests and diseases of important medicinal plants grown in arid and semi-arid regions [AFRI- 72/FPD/2006-09]

Status: Severe infestation of a noctuid caterpillar species has been noticed on all mehndi, (*Lawsonia inermis*), growing areas at Sojat road (Pali). The caterpillars are the semiloopers brown to black in colour depending on the number of instars. The larvae are voracious feeders of foliage. Heavy termite infestation was recorded in the Guggal (*Commiphora wightii*) plantation at Kailana (Jodhpur) wherein 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. Severe infestation of termites has also been noticed in the root system of mature Guggal plants at Herbal Guggal Farm, Mangaliavas near Ajmer.

Project 10: Assessment of Neem International Provenance Trial [AFRI-78/ FG TB/ 2006-09]

Status: Phenological observation in the selected trees was made from February 2007 to July 2007 in 20 trees of each provenances. All the trees of the introduced provenances and national provenances started flowering in the 1st week of March except in the Thai provenances which came to flowering at the end of November. Large amount of flowers and immature fruits were fallen due to heat wave which occurred during the month of June. Fruits were collected in the month of July and August. Only five provenances produced fruits, though all of them showed high intensity of flowering. One Tanzanian Provenance and 4 Indian provenances produced the fruits. The quantity of the fruit yield was also very minimum in 4 provenances (10g -40 g) and the maximum amount of seed (467 g) was only obtained from the Indian Provenance (Ghati Subramaniya).



Neem International Provenance Trial

Project 11: Demonstration trial of male and female *Ailanthus excelsa* plants raised through grafting and tissue culture [AFRI-79/FGTB/2006-09]

Status: Method of grafting was further refined to improve grafting success. Stocks for raising demonstration plantation with male, female grafted plants and controlled seedlings are ready for plantations in July 2008. One hectare site has been identified at AFRI experimental area for establishing demonstration trail of this fodder species.

Project 12: Development of economically viable and integrated agroforestry models for arid region [AFRI-55/Silvi/2004-09]

Status: Agroforestry model being maintained at farmer's field at village Harsh, Bilara. *Cordia mixa* plants obtained average maximum height 86 cm and followed by *Prosopis cineraria* (78 cm), *Colophospermum mopane* (75 cm) and *Ailanthus excelsa* (75 cm) respectively. The plant height was found higher in agroforestry plots as compared to the control (without crop). Similarly, collar diameter was found highest in *Ailanthus excelsa* (3.12 cm) and followed by *Cordia mixa* (2.89 cm), *Prosopis cineraria* (1.69 cm). The highest survival was observed in *Prosopis cineraria* (99%) followed by *Zyzyphus mauritiana* (97%), *Colophospermum mopane* (92%) and *Cordia mixa* (90%) species.

Project 13: Development of suitable models for Eco-restoration of degraded lands in Thar desert [AFRI-74/Silvi/2006-10]

Status: Project was initiated at village Ostra, district Jodhpur over community land in 2007 but due to resistance of local people, work was stopped. Efforts were made to locate alternate site at village Salawas, Jodhpur district and Gram Panchayat was requested for granting no objection.

EXTERNALLY AIDED PROJECTS

Project 1: Genetic improvement of *Jatropha curcas* for adaptability and oil yield [AFRI-66/Silvi/CSIR/2005-10]

Status: (i) Collection of *Jatropha* Elite and Native Accessions and field trials : Twenty three elite accessions and 160 native accessions were collected. The survival percentage ranged from 12.50% to 100%. Native accessions collected and exchanged with various partner institutes have been planted in July/August 2006 in RBD design with three replications having single plant per replication at 2.5 x 2.5m spacing. (ii) Agro-technology Trials: Various trials on spacing, pollarding, irrigation and fertilizer have been initiated as per the design agreed upon during meeting held on February 2007 at New Delhi. (iii) Spacing trial: Trial was initiated from the seedlings raised from seeds received from Bhav Nagar. Plants were planted in RBD design with 16 plants per treatment and in five replications in July 2007.

Project 2: Locational trials on Bamboos (NMBA) [AFRI-43/GTB/2005-08]

Status: The initial results in the six bamboo species trial at Banswara, Rajasthan indicated that *D. strictus* and *B. vulgaris* are performing well followed by *B. bambos*, *B. nutans* and *B. tulda*. *Dendrocalamus asper* is not suitable for the selected site as survival percentage of this species is almost nil (<2%). In another experiment on water management of *B. bambos* tissue culture plants did not show any significant difference. However this experiment is only one and half year old.

Project 3: Multiplication and field trial of Bamboos through tissue culture in Rajasthan and Gujarat [AFRI-68/GTB/2005-08]

Status: Initial data collected from all the trails after one month indicates that survival percentage was 100 in *Dendrocalamus strictus* and 99% in *Bambusa bambos* at Jhalod site in Gujarat, whereas survival percentage was relatively less in both the species (95% in *Dendrocalamus strictus* and 96% in *Bambusa bambos*) at Kushal Garh site in Rajasthan. Survival percentage further decreased after



one year and it was ranging from 97.2% to 100.0% for both the species in Gujarat and 67.6 % to 96.8% at Kushal Garh site in Rajasthan. Initial data also indicate the enhancement of growth of *B. bambos* tissue culture plants.

Project 4: Study of Characteristic features pertaining to Bio-drainage potential of some selected tree species [AFRI-38/FED/2004-08]

Status: This is an externally funded project that has been funded by the Ministry of Water Resources (MoWR), New Delhi. It was initiated in 2004 with two field experiments in Indira Gandhi Nahar Pariyojana (IGNP) and one in in-filled non weighing type of Lysimeters ($2 \times 2 \times 2 \text{ m}^3$) at Jodhpur. *Eucalyptus rudis* accumulated high biomass under waterlogged condition in IGNP area followed by *Corymbia tessellaris*, *Eucalyptus camaldulensis* and *Eucalyptus fastigata*. In all these species, root spread was mostly concentrated along the bunds. Rooting depth was restricted up to the ground water level which receded to a maximum level of 125 cm in *E. rudis* plantation within a period of four year. *E. rudis* and *C. tessellaris* maintained steady rate of transpiration and photosynthesis throughout the year. In the lysimeter experiment, high rate of transpiration was observed in *Acacia nilotica* plants compared to *E. camaldulensis* plants. Peak rate of transpiration was recorded at 12.00 hour during the month of January 2008 for both the species.

Project 5: 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/2006-09]

Status: Silva-Ayurveda demonstrative models were planted in farmers' fields at Tibna and Jadan villages in Jodhpur and Pali districts of Rajasthan respectively. Fifteen field beneficiaries were selected at Tibna - two of one hectare and thirteen of one bigha area. Total area planted is 5.75 ha. at village Tibna. The species of Gunda, Karonda, Guggal, Ber, Khejeri, Rohida Sahjan, *Aloe vera* and Ashwagandha were planted after the advance works. At Jadan, species of Rohida, Khejeri, Gunda, Ber, Aonla, Guggal and Nimbu were planted over 2 ha. with 384 no. of plants. Field nursery has been established and maintained at Tibna. It contains about 40,000 seedlings of *Aloe vera*. Neem khali, Tabacoo dust, Vermicompost and Gomutra were distributed to the farmers for application in plants. Survival and growth observations were recorded (84%) in February 2008.

Project 6: Source variation, extraction and cultivation Practices for *Commiphora wightii* Arn. Bhandari

Status: Establishment of Performance Trial: Clonal Material collected from 25 Districts of Rajasthan was raised in the polyhouse and planted in RBD design with 4 replications and each replication has 8 plants per accession in September 2007. Clonal material collected from Baran, Bundi, Chittorgarh and Jhalawad districts have shown distinct characteristics and showed higher sprouting and rooting than other accessions.

Establishment of Agri-trial: For assessing proper growth requirement of Guggal plants under arid conditions, an agri-trial has been initiated with three level of irrigation frequency (Survival, 30 and 45 days) and seven levels of fertilizer.

Component –II: Forty eight Guggul trees were selected with the objective to enhance gum

production by non-destructive means. All trees were multi-branched having number of branches (> 2 cm dia.) from 2-12 per tree. Organic manure was applied in September 2007 as per the treatments prescribed. Irrigation at the interval of 20 and 30 days was given November 2007 to January 2008. Tapping experiments, with different doses of gum enhancer (ethephone- 0, 150, 300 and 450 mg / plant), were initiated in February 2008. Three semi-circular cuts/plant were made. First gum collection was done after fifteen days, however, gum exudation was not observed in all the trees. Thereafter, gum was collected every ten days and gum yield (4.20 g to 59.22 g), was recorded till March end from all the trees, though the yield was minimal under control conditions. All the trees were healthy up to 31st March 2008, even those branches did not dry where cuts were given.

Component –III: Tissue culture

- A. **Characterization of immature seeds for use as right explant:** Fruit length, weight and volume was measured for selecting appropriate size for getting immature seeds as explant. Seed size of 1cm , weight of 300 mg and volume of 0.23 cc was best.
- B. **Hormonal treatment:** Green embryos were supplemented with varying concentration of 2,4-D for 30 to 90 days and was observed that 0.5 mg/ml concentration of for incubation of 60 days were best for callus biomass and embryogenic potential.
- C. **Maturation of somatic embryoids:** Experiment was carried out by culturing somatic embryos clumps on modified MS media supplemented with 5 g/l Activated charcoal + 0.1 mg/l IBA + 0.25 mg/l BAP + 0.8 % Agar + 3 % Sucrose + pH-5.8.
- D. **Maintenance of somatic embryoids:** Somatic embryoids were maintained with or without hormonal supplementation.

Project 7: Enhancing productivity of saline wastelands in Kachchh through improved tree planting techniques and silvipastoral study

Status: In plantation trials at Kordha (Patan), only 33% plants of *A. ampliceps* (with wheat husk) survived from previous year trials, hence, new trials were laid in July 2007 on highly saline EC₂(dSm⁻¹) 7.8 to 20.7 black silty clay soil (medium), Soil depth: 40-75 cm. Plant species were *Acacia ampliceps* and *A. bivenosa*, *S. persica* and *Atriplex* spp. with control, WH (1/2 kg), FYM (5kg), WH + FYM, Bajara Husk (250g) and FYM + BH treatments in RBD with 3 replication for all the trials. Spacing adopted was 4 m x 4 m for *A. bivenosa* and *S. persica* and 3m x 3m for *A. ampliceps* and *Atriplex* spp. All the three tree species recorded appreciably high mean survival, *S. persica* (95%), *A. bivenosa* (88.8%) and *A. ampliceps* (82.9%), after eight months. Survival of *Atriplex* spp. was not good (max *A. amnicola* 18%). In silvipastoral trial (Bhuj), maximum overall plant survival was 99.3% in *D. annulatum* followed by *C. setigerus* 93.3% and *C. ciliaris* 91.6% after 19 months. However, species-wise maximum survival was in *P. cineraria* (99.4%) followed by *C. gharaf* (99.7%), *Z. mauritiana* (96.5%) and *C. mopane* (81.7%). While all other species nearly maintained the survival there is slight decrease in survival for *C. mopane*. After 14 months, effect of grass on tree growth was very pronounced in *C. setigerus* where control trees recorded 36.6 % and 38.9 % more height and crown diameter, respectively. Overall maximum mean tree height and crown diameter was



recorded with *D. annulatum*, followed by *C. ciliaris* and minimum with *C. setigerus*. Species-wise growth was in the order of *C. gharaf* > *Z. mauritiana* > *P. cineraria* > *C. mopane*.

NEW PROJECTS INITIATED DURING THE YEAR 2007-2008

PLAN PROJECTS

Project 1: Survey selection, performance trial and estimation of yield potential of *Jatropha curcas* in Rajasthan and Gujarat [AFRI-88/Silvi/2007-12]

Status: *Jatropha* population in Banswara and Saira, Rajasthan was surveyed. Fifteen CPPs in Banswara and 5 CPPs in Saira were marked. Similarly, 5 CPPs in Gandhinagar and 15 in SFD trials at Rajpipla were selected. Total height, girth and crown width of the CPPs have been measured. The variations for these traits were 3.5-4.0 m, 0.28-0.30 m and 3.1-3.3 m, respectively. Seeds collected from the CPPs selected at Gandhinagar and Rajpipla. Seeds were also obtained from DCF (Res.), Gandhinagar for the 16 CPPs identified by them. Seed yield variation in the CPPs at Gandhinagar was from 474 gm to 730 gm. Oil yield was estimated and it varied from 12.7% to 36.0% on seed basis. A total of 46 CPTs were tested for seed weight, kernel weight, seed and kernel ratio and estimation of oil.

Project 2: Studies on seed traits of seeds collected from seed stands / SPAs / SSOs / CSOs of important species of Gujarat state [AFRI-80/Silvi/2007-12]

Status: Collection of seeds: Seeds from 8 seed stands of *Acacia nilotica*, four stands of *Acacia catechu*, 2 stand of *Terminalia chebula* and 18 stands of *Tectona grandis* have been collected.

Seed Testing: Hundred seeds weight of *Acacia nilotica*, *A. catechu* and 100 fruit weight of *T. grandis* and *Terminalia chebula* has been worked out. Hundred seeds weight of *Acacia nilotica* varied from 13.24g to 16.70g and *A. catechu* from 5.40 to g. 100 fruits weight of *Tectona grandis* and *Terminalia chebula* varied from 37.94g to 43.99g and respectively.

Seed Testing: Various seed lots of *Acacia nilotica* (8) and two seedlots of *Acacia catechu* were tested for germinability. Seed germination in various seed lots of *A. nilotica* varied from 80.5% in seedlot no. 2429 and 96% in seedlot no. 2432. Seed germination in *A. catechu* varied from 73% to 82.25%. Fruit weight of 100 fruits of *Terminalia chebula* varied from 382.63g to 438g and in *Tectona grandis* it varied from 37.94g to 43.99g. The number of seeds in 100 fruits varied from 84-200 and seed viability from 30-70%. 100 seed weight of *T. chebula* also varied from 123.25 to 153.38g.

Project 3: Characterization and classification of forest soils of Rajasthan [AFRI-85/FED/2007-12]

Status: The project has been initiated in September 2007 with the objective to characterize and classify the forest soils of Rajasthan following the USDA classification system. Soil profiles have been studied at 14 places in Jodhpur, Banswara and Pratapgarh districts covering three subgroup types of forests under Tropical Dry Deciduous Forests and Tropical Thorn Forests.

Project 4: *In vitro* mass propagation of *Jatropha curcas* L. and optimization of low cost options for economizing the technology [AFRI-83/FGTB/2007-2012]

Status: Surveyed nearby *Jatropha* plantations including AFRI nursery. Plants for explant collection identified. Germplasm brought from Barmer and Saira being used. *In vitro* seed germination and sterilization protocol optimized. Cultures from seedling explants initiated on MS medium. Explants used: (A) Mature tree and shrub – Nodal segments, apical buds, leaf discs and petiole. Hormones tried: alpha-Naphthaleneacetic Acid (NAA), 6 Benzyl aminopurine (BAP), Indole Butyric acid (IBA), Indole Acetic Acid (IAA) and 2,4-Dichlorophenoxy acetic acid (2,4-D). Bud break and micro-shoot multiplication has been achieved through nodal segment on MS media supplemented with different combination of BAP. Best response was observed on MS + 0.2 mg/l BAP and MS + 0.5 mg/l BAP. Apical buds when cultured on different combination of BAP and NAA supplemented MS medium gave 100% callus induction.

Project 5: Field efficacy of control measures for the management of khejri mortality in North-Western Districts of Rajasthan [AFRI-87/FPD/2007-10]

Status: A study site was selected at Triloki (Sikar) and design of the experiment was finalized. MOU has been signed. Infected Khejri trees were randomly marked for treatment as per the design. Data of the 'loong' production has been recorded from selected trees before treatment. Pre-treatment Observations were recorded on DBH, Root infection, Die-back, shoot borer attack and defoliation (%) etc. Root infection (60.90%) and shoot infection/borer attack (57.60%) was recorded before the treatment. The repeat treatment was conducted in the month of August 2007 and data has been recorded in the month of February 2008. After one year of the treatment, the root infection reduced from 60.9% to 57.4% whereas, borer attack reduced from 57.60 to 54.5%.

Project 6: Development of Web Portal for Forestry Research Extension [AFRI-82/IT CELL/2007-11]

Status: The process for the purchase of softwares was also started and the purchase orders have now been issued. The other activities were to decide the outline of the portal and to identify the fields of the database. Discussions were made with the Co-PI and the other scientists in order to decide the outline of the portal and to decide the fields of the database. The areas to be covered under the web portal have been decided and the fields of the database have also been noted down to a large extent. The format for the collection of the data is under progress. Process has been started to collect the information about the research being carried out by AFRI since its inception.

Project 7: Mycorrhizal Dependency and Productivity of Economic Important Medicinal Plants (Mehndi and Ashwagandha) of Arid Zones [AFRI/FPD/2007-10]

Status: Five genera were identified in the rhizosphere of these selected plant species. A high diversity of AMF was observed which varied between different host plant species. Among the five genera, *Glomus* occurred most frequently, with ten species, *Acaulospora* and *Scutellospora* were found with three species, respectively, while *Gigaspora* and *Paraglomus* were detected with one species each. *Glomus constrictum*, *Glomus fasciculatum*, *Glomus geosporum*, *Glomus intraradices*, *Glomus*



mosseae and *Glomus rubiforme* were the most dominant species. The spore density of AMF had a strong positive correlation with soil pH and organic carbon content and a negative correlation with Olsen's P content of the soil.

EXTERNALLY AIDED PROJECTS

Project 1: Establishment of a network to facilitate collection, processing and dissemination of statistics pertaining to tropical timber and other forestry parameters in India (ITTO sponsored ICFRE Coordinated project) [AFRI-86/Silvi/ITTO/2007-09]

Status: Field assistant engaged and formats for statistical data collection modified in view of the recommendations of the Stakeholder's meet organized at ICFRE during November 2006. Data regarding forestry statistics 2004-05 and 2005-06 collected from Rajasthan, Gujarat and Dadra and Nagar Haveli, compiled on various formats and sent to the ADG (Stat.), ICFRE. Regional workshop on Forestry Statistics organized at AFRI on 18th September 2007 and recommendations finalized.

Project 2: Establishment of multilocational clonal trial and seedling seed orchard of *Jatropha curcas* [AFRI-81/Silvi/DBT/2007-10]

Status: Site Selection and Soil Analysis: Site at Haldu Ki Ghati, Kewda Ki Naal in Udaipur has been selected. The mean minimum and mean maximum temperatures goes from 6° to 45°C and mean annual rainfall is 600mm. The soil analysis has been performed.

Establishment and Observations in Field Trial: PDKV, Akola, MSSRF, Chennai, Biotech Park, Lucknow, AFRI, Jodhpur, TERI, Guwhati, Garhwal University and Raipur University, Chhattisgarh will participate in network multilocational trial.

EDUCATION AND TRAINING

Imparted training on tissue culture to the students of different colleges and Universities in the Biotechnology laboratory of AFRI.

LINKAGES AND COLLABORATION

- Tata Energy Research Institute, New Delhi
- Central Arid Zone Research Institute, Jodhpur
- Jai Narayan Vyas University, Jodhpur
- Council of Scientific and Industrial Research, New Delhi.
- National Medicinal Plants Board, New Delhi.
- Department of Biotechnology, Govt. of India, New Delhi.
- National Mission on Bamboo Application, New Delhi
- Ministry of Water Resources, New Delhi.
- Rajasthan Forest Department
- Gujarat Forest Department.

PUBLICATIONS

Extension. Brochure/Pamphlets

1. Prepared Pamphlet on Programme at a Glance for UNESCO MAB International Workshop “Ensuring the future of Dry Lands: Towards Implementing the MAB Agenda for a Sustainable Future of Dry Lands.
2. AFRI Published a Brochure regarding the mandate, Research Highlights and Research Facilities of the Institute.

CONSULTANCY

The works were carried out 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. Imparted training on VAM technology to 35 participants (ACFs, RFOs, Foresters, JRFs and Progressive farmers at Training and Research Centre, Gandhinagar. Laboratory training was given time to time for identification to the JRFs working under the project at Basan nursery, Gandhinagar and AFRI, Jodhpur.

CONFERENCE/MEETINGS/WORKSHOPS/SYMPOSIA/EXHIBITIONS

1. A one day regional workshop on Forestry Statistics was organized at AFRI on 18th September 2007 under the ICFRE-ITTO project with the aim to sensitize the agencies and review the formats designed to collect forestry statistics data to make them more meaningful and at the same time to get the feedback from the SFDs regarding problems faced in collecting, compiling and sending the required data on these formats.
2. AFRI organized the workshop on Guggal cultivation, production and collection on 24th September 2007. The PCCFs from many states participated in the meeting.
3. AFRI and CAZRI in coordination organized a workshop “UNESCO-MAB International Workshop” on ‘Ensuring the future of drylands: Towards implementing the MAB agenda for a sustainable future of drylands’ from 11th to 15th November 2007. This workshop was a follow up of Tunis declaration, 2006.
4. An introductory workshop on E-governance was organized in conference hall of AFRI. The discussions were made with Dr. Harish Sharma, Scientist D, Incharge IT Cell FRI, Dehradun on 16th November 2007.
5. A National Symposium on “Integrated Pest and Disease Management (IPDM) in Arid and Semi-arid Areas” was organized by Forest Protection Division on 12th and 13th March 2008 at Arid Forest Research Institute, Jodhpur. The organizing secretary of this seminar was Dr. S.I. Ahmed, Scientist-F and Head, Forest Protection. The total no. of 79 research papers were received on above themes. About 102 delegates participated in the symposium from 13 various states viz., (Orissa, Karnataka, Tamil Nadu, Maharashtra, M.P., U.P., Uttarakhand, Haryana, Gujarat, Rajasthan, H.P, Delhi and Kerala) etc. There were 10 technical sessions during which 36 multi-media presentations on various aspects of IPDM delivered by renowned delegates. A part from these 39 posters were presented during the symposium.



Inauguration of symposium



Group photo of the participants

6. An exhibition “Sanskriti- Sarokar and Sankalp” was organized in Gaushala maidan, by Jodhpur district administration on the occasion of 60th Independence day celebrations in Jodhpur, from 13th to 16th August 2007. The exhibition was inaugurated on 13th August by Smt. Vasundhara Raje, the Hon’ble Chief Minister of Rajasthan. In this exhibition various institutes of art/culture/science/development/agriculture/mineral/dairy and Railway of Jodhpur, Jaisalmer, Barmer and Pali participated and displayed their items. Our Institute exhibited various research findings/works in the exhibition. Important medicinal plants viz. Ashwagandha, Guarpatha, Ratanjot, Sonamukhi and Guggul, were displayed in the stall along with their useful parts and processed products. Two models depicting the natural sand drift conditions and bio-drainage were displayed in the stall. Brochures on medicinal plants, food from forests etc. were distributed in the exhibition. The exhibits were well praised by the visitors.
7. AFRI participated in Swadeshi Mela, organized by district administration, Jodhpur at polo ground of Jodhpur from 31st October to 6th November 2007.
8. AFRI participated in Hastshilp Mela, organized by Marudhar Industries Association and district administration, Jodhpur at Rawan Ka Chabutra of Jodhpur from 5th to 14th January 2008.

AWARD

Third prize awarded for poster presentation to Dr. Meeta Sharma, Research officer, AFRI on the paper entitled “Integrated Pest Management of Marwar Teak Defoliator in Arid and Semi Arid Region” in “National Symposium on Integrated Pest and Disease Management in Arid and Semi-arid Areas” held on 12th and 13th March 2008 at AFRI, Jodhpur.

DISTINGUISHED VISITORS

1. Dr. (Smt.) Kiran Soni Gupta, I.A.S., Divisional Commissioner, Jodhpur Division visited the Institute on 4th April 2007 and interacted with the Scientists/Officers. She visited Extension and Interpretation Centre, model nursery, arboretum and Germ-plasm of medicinal plants developed by the institute. She appreciated the work done by AFRI.
2. Shri Ram Bhuj, Scientist from UNESCO came and discussed about the international workshop on “Ensuring the Future of Drylands-Towards Implementing the MAB Agenda for sustainable Future of Dry lands.” Jodhpur, Rajasthan, India, to be held on 12th to 15th November 2007.
3. Sh. G.S. Kang, IAS, former Chief Secretary, Bihar and Mrs. Kiran Soni Gupta, IAS, Divisional Commissioner Jodhpur Division, visited AFRI on 14th January 2008. They were briefed about the institute and related research activities by the Director, AFRI and other officers/scientists.