

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 ucalyptus 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⁻¹ 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 for 85 days. 50 However, seeds can be stored best at low moisture (M , 5.5%) and low temperature (T , 5◊1◊C) for 4 3 longer period (P , 326 days) in airtight container. Open container seeds showed P for 233 days at 50 50 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 x 10 m² 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), NH⁻-N, NO⁻-N and PO⁻-P in 4 3 4 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.



Carbon stock in top 25 cm soil layer has been worked out to be high in *P. cineraria* and *A. nilotica* (7.87 Mg ha⁻¹), followed by *A. tortilis* (7.75 Mg ha⁻¹), *E. camaldulensis* (6.75 Mg ha⁻¹), *D. sissoo* (6.37 Mg ha⁻¹) and *T. undulata* (5.25 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*.