

Industry promoted Agroforestry Systems for Pulpwood Production Under Rainfed Conditions in India

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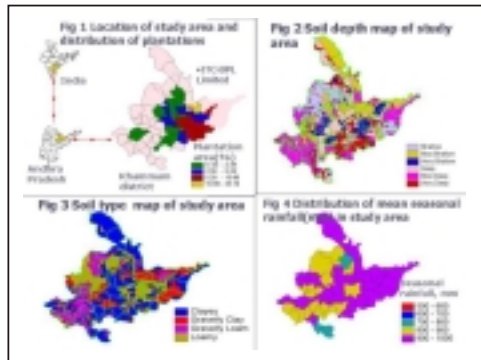
Introduction

- 1) In India, the chief raw material for the pulp and paper industries is Eucalyptus, Leucaena and Bamboo
- 2) India is in short supply of raw pulp used for making various kinds of paper, packaging material etc. The imports are to the tune of Rs. 28,900 million (1998-99:1US\$=Rs. 49)
- 3) The paper demand is increasing rapidly and the shortfall is expected to double by 2010
- 4) Paper and pulp industry is encouraging farmers to grow Eucalyptus and Leucaena to meet its raw material requirements
- 5) Minimum support price is announced for Leucaena and Eucalyptus wood by the Government to encourage cultivation in Andhra Pradesh
- 6) Eucalyptus based systems are distributed widely in the states of Andhra Pradesh, Orissa, Karnataka, Maharashtra and Haryana
- 7) In Andhra Pradesh Eucalyptus is planted in about 50,000 ha. and the area is increasing rapidly
- 8) To study the geographical spread, adoption pattern among different groups of farmers and the general method of cultivation, the present investigation was carried out.



The study area

- Khammam district of Andhra Pradesh with an area of 16,029 sq. km is located in India and is distributed between 16.630E-18.730E, 79.510N- 82.010N.(Fig: 1).
- The annual rainfall varies from 500 to 1000 mm. and the distribution is uni modal. About 70% of the rainfall is received during 4 months (June-September) (Fig:4).
- The predominant soil groups are black and alluvial soils having depth ranging from shallow to very deep (Fig 2&3).
- Agricultural crops are the main source, contributing to nearly 60% of the household income.



Materials & Methods

- Khammam district, having considerable acreage under Eucalyptus is selected for the present study.
- Information was collected from farmers regarding acreage, clones planted and various methods adopted in Eucalyptus cultivation since 1992 to 2001 through questionnaires and analyzed.
- For agricultural crops data of 1994 is used.
- Spatial information of soils (depth and type) was derived from soil resource maps (NBSSLUP, India, 1994).
- Long term seasonal average rainfall for different mandals was collected.

Results

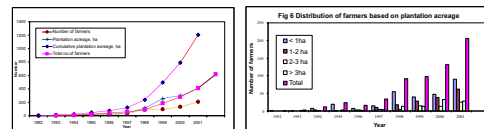
1. Acreage and Distribution

* Of the 45 mandals of Khammam district, 33% of the acreage is concentrated in the Bhadrachalam mandal alone and 68% of the acreage is concentrated in 5 mandals (Fig:1).

* The acreage under Eucalyptus has increased manifold from 0.87 ha. in 1992 to 1203.5 ha. during 2002. (Fig:5)

* The number of farmers adopted Eucalyptus based systems increased from 2 in 1992 to 615 till 2001.

* Of the total number of farmers who adopted the Eucalyptus based systems, the majority belongs to a small category (73%) with the acreage under plantations is < 2 ha. (Fig:6)



2. Clones and Spacing

* About 40 clones were developed by the company, ITC-Bhadrachalam Paper Boards Division. Of these 5 clones are planted in half of the total area (Fig:7).

* The most widely used spacing for Eucalyptus is 3x2 m. A few farmers adopted 2.5x2.5m. spacing to take up inter cultivations in both the directions (Fig:8).

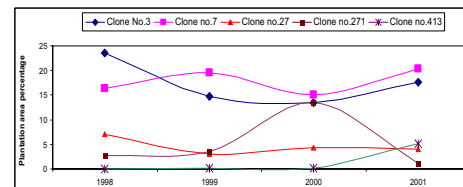


Fig 7: Percent distribution of different clones in India
Clonal selections: Clone No.3 & 7 – Eucalyptus tereticornis blackmont provenance
Clone No. 27- Eucalyptus hybrid local
Clone No. 271& 413- Eucalyptus camaldulensis

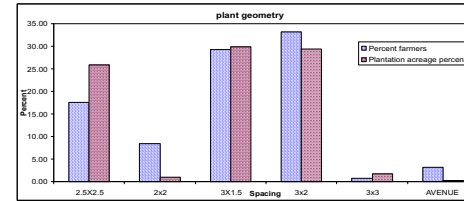


Fig 8: Percent farmers and plantation acreage under different tree geometry

3. Intercropping

* Cotton, chillies, blackgram, greengram, rice and groundnut are taken up as intercrops during the first year of plantation cycle. Intercrops are also taken up during the second and third year of plantation, but the yield reduction observed is up to 70%.



4. Fertilizers and yield

* On an average 58 kg of N, 40 kg of P and 75 kg of K are applied to the trees annually. Fertilizers are generally broadcasted during the rainy season.

* Eucalyptus trees are harvested at the end of fourth year. A minimum of three coppices are taken up. Intercrops are taken up during the second and third coppice also.

* The productivity of the plantations ranges from 20-40 Mg of wood/ha/year.

* Higher productivity is observed in small size plantations with area < 1 ha. and in red soils.

5. Contribution of Eucalyptus based Agro-forestry systems to the improvement of rural livelihoods vis a vis agricultural crops

* Net returns from agricultural crops ranges from 3,980 to Rs. 16,443/ha/year (Table 1), whereas net returns from Eucalyptus plantations ranges from Rs. 20,000 – 40,000 (1 US \$= Rs. 49).

* The returns from Eucalyptus plantations are significantly higher compared to majority of the annual agricultural crops grown in the district.

6. Existing institutional structure

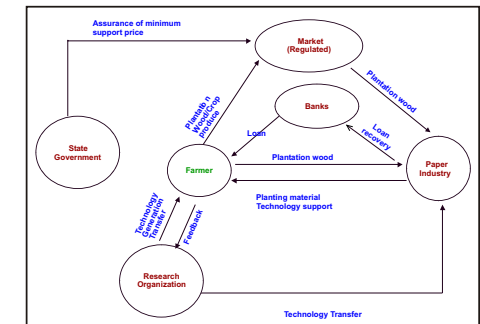
* Plantations are popular with farmers because of assured high returns, government support (Fig.9), low and variable returns from agricultural crops due to erratic rainfall and market fluctuations.

Table. 1 Returns from predominant agricultural crops of Khammam district

Crop	%Cultivated area*	Productivity (kg/ha)	Net returns (Rs./ ha)**
Rice	36.8	2643	11,140
Cotton	12.1	337	16,443
Green gram	11.8	327	6,442
Pigeon pea	5.8	516	3,980
Groundnut	5.6	1230	14,146
Sunflower	2.4	727	4,368

* % Cultivated area = Area under a crop in district/ Total cultivated area of the district.
** Values are based on the current market prices

Fig. 9 Farmer-Industry-Government-Research Organisation Linkage



Conclusions

- Quality planting material, assured market and higher and assured returns and well established industry-farmer-government linkage are the prime reasons for the rapid increase in area under Eucalyptus in Khammam district of Andhra Pradesh.
- Even though the rate of adoption is more with the small farmers, the total acreage is more with large farmers.
- There is need for research to increase the system (trees and crops) productivity through low cost interventions and better targeting of inputs

