

Industrial forestry programmes of Mysore paper mills, Bhadravati

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Forest based industries play an important role in meeting some of the very basic needs of the country. Paper is just but one of the diverse range of products that forest based industries make available to the country. India's per capita consumption of paper is only 3 Kg. at present as against the Asian average of 18 Kg. and around 150-200 Kg. in developed countries. The paper mills in India can be classified on the basis of raw-materials used-forest based raw-material, waste paper and agricultural residues. At present, the operational capacity of paper industry in India stands at 2.52 million tonnes as against the installed capacity of 3.28 million tonnes with only 59.8% capacity utilization. (source: Kelker committee Report).

The paper industry in India mainly utilises bamboos and mixed tropical hardwoods. Of the raw-material consumed by the paper industry, the share of forest based raw-material is 66%. There is an increasing reliance of Eucalyptus and other hard woods in the wake of bamboo scarcity. In the last four decades, forest utilization policies have under gone a radical change. Coupled with a general reduction in total forest cover in the country, these policy changes have drastically curtailed the rawmaterial availability to the forest based industries. Unlike older days when industry enjoyed the facility of having long term leases in reserve forests at concessional rates, today needs of the people have the first charge of forests. This leaves forest based industries to largely fend for themselves so far as their raw-material requirements are concerned. The dependence on forest based raw-material poses serious problems as today environmental protection has transcended natural boundaries and has become a global issue. Every body agrees that these industries can not be wished away, however might one value the environment. Further, non-conventional raw-material for paper, paper board and news-print production do not offer a permanent solution because of their seasonal availability and alternative uses. To increase the production of paper, paper board and newsprint to meet the ever increasing demand, the main thrust will have to be for large scale integrated plants using forest based raw-material.

Requirement of Forest Raw-material

India's demand for paper and paper board is estimated

to be 3.4 million tonnes and that for news print 1.03 million tonnes at the turn of the century. Under assumption that 30% of the total paper demand would be met by production based on waste paper and non-conventional raw-materials, nearly 2.38 million tonnes of paper and paper board and 0.7 million tonnes of news-print would be dependent on forest based raw-materials. The availability of wood and bamboo is anticipated to be 1.3 million tonnes and 1.9 million tonnes respectively. This is sufficient to manufacture about 1 million tonnes, of paper and paper board and 0.18 million tonnes of news-print. This implies a huge short fall of over 4 million tonnes in forest based raw-materials. (Source : Development Council for Paper, pulp and Allied Industries - Report of the Raw-material Committee).

Though the industry has been facing the problem of raw-material for many years now, adequate efforts have not been made to resolve this problem. Paradoxically, the problem of raw-material could aggravate if the country succeeds in improving the literacy rate which is still low.

Industrial forestry

The raw-material situation in the years to come is likely to be very precarious even for the existing production levels, if something is not done immediately on a war-footing. India can afford to be oblivious to the needs of the Industrial/commercial forestry only at the cost of ecological security and hence it should not be ignored on account of emotional considerations. Suggestion regarding the import of timber, fire-wood and pulp-wood can only help to avert the most critical situation but does not offer a permanent solution. Plantations of fast-growing species undertaken by the Forest Departments and Forest Development corporations in various states on large scale are perhaps not sufficient to cater to the need of the forest based industries.

It is therefore, imperative to give very high priority to industrial forestry to augment and balance the raw-material supply to the forest based industry, to save our forest

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wealth and to meet the needs of the people on sustained basis, keeping our national forestry Policy in view.

Forestry programme of Mysore Paper Mills Limited, Bhadravati

The Mysore Paper Mills Ltd., Bhadravati, a public undertaking of the Govt. of Karnataka was established in 1936. It expanded from time to time and at present it has a installed capacity of 75,000 tonnes of news-print and 37,000 tonnes of writing and printing paper and 45,000 tonnes of sugar. The requirement of forest raw-material has increased many fold (2,50,000 ADT. annum) to meet the increased installed capacity of the Mills.

Captive Plantation Programme

Govt. of the Karnataka have conceded 30,000 hectares of degraded state forest reserves and other Govt. waste lands in Shimoga and Chickmangalore dists. on long lease initially for a period of 40 years to MPM to raise Captive plantations to meet it's raw-material requirement on sustained basis. MPM raised it's first plantation in 1981. Captive plantations of Eucalyptus, Acacia, Casuarina and Pine have been raised over an extent of 23,000 hectares till-date.

The areas made available to MPM for plantation development fall into two main categories. They are:

i) Wet zone areas along the eastern flank of Westernghats with a mean annual rainfall of 1,000 mm and above (1,000 to 3,000 mm)- Zone A.

ii) Dry zone areas further east where mean annual rainfall is less than 900 mm-Zone B.

The species selection is dependent on raw-material requirement of the mills, characteristics of the available land and Govt. policy. Tropical Pine viz *Pinus caribaea* var. *hondurensis*, *Pinus tecumumanii* and Bamboo for long fibre and *Acacia auriculiformis* *Casuarina equisetifolia* for short fibre requirement have been planted in wet-zone. Eucalyptus hybrid (Mysore gum) was planted initially on plantation scale in dry-zone but later on switched over to more promising eucalyptus *camaldulensis*, Petford provenance from Queensland, Australia.

MPM raised plantations over 16,666 hectares in the I Phase between 1981 and 1989 with the financial and technical assistance from M/s Overseas Development Administration, London. The details are as below.

Table -1 Summary of Captive plantations.

(in Ha.)

Year	Dry-zone		Wet-zone			Total
	E.Hybrid	E.Camaldulensis	Acacia	Tropical Pine	Casuarina	
1981	118	-	32	-	-	150
1982	553	-	362	-	-	915
1983	699	-	481	20	151	1351
1984	833	-	1037	9	76	1955
1985	1277	-	1151	23	220	2671
1986	1566	-	1223	70	568	3427
1987	827	34	1352	16	372	2601
1988	222	287	568	679	-	1756
1989	454	200	1186	-	-	1840
Total	6549	521	7392	817	1387	16666

In Phase II (1990-1996), careful planning has been done as to how much extent is to be planted under each species so that MPM will be self-sufficient in it's raw-material requirement on sustained basis. An extent of 6,300 hectares have been covered with plantations of Eucalyptus, Acacia, Pine and Bamboo between 1990 and 1992. Further, it has been programmed to afforest an extent of 2,000 hectares annually to cover the remaining area of 7,034 hectares. The

Captive plantation development has been undertaken by the Mills in the II Phase from it's self-generated funds.

Excellent silvicultural and managerial techniques have been adopted to raise captive plantations on operational scale successfully based on edaphic and climatic factors. Soil preparation is done by using bulldozers of capacity 120 HP, 200 HP in wet-zone where the soil profile is

comparatively less hard. In dry-zone, heavy duty bulldozers of capacity 350 HP are used for soil preparation in order to break the hard pan underneath to enable increased infiltration of rain water. Line ripping is done by bulldozers all along the contours to conserve soil moisture and for easy and quick establishment. Following planting density is adopted for different species.

Eucalyptus	2,500 plants/Ha. (2.5 m x 1.5 m)
Acacia and Casuarina	2,600 plants/Ha. (2.7 m x 1.5 m)
Pine	1,800 plants/Ha. (2.7 m x 2.0 m)

Planting is done during the month of June with the onset of south-west monsoon. Efforts are made to complete the planting in the main field as early as possible so that planted seedlings get well established before the onset of summer. Planted areas are well protected by digging cattle proof trench around the plantations. After-care operations viz.

application of fertilizer, weeding, digging of soil all along the ripped line and fire tracing operations are carried-out annually upto end of 3rd year. After 3rd year, only, watch and ward is provided at the rate of 1 watcher per 40 ha. to protect the plantations against biotic interference till harvest.

Returns from Captive Plantations

A rotation of 8 years for Eucalyptus, Acacia and Casuarina and 12 years for Tropical Pine has been fixed. Series of Temporary Sample Plots, Permanent Sample Plots and Destructive Sample Plots have been laid-out in Captive Plantations to derive growth models and to predict the productivity. The Forest Research Wing with the technical and financial assistance from M/s O DA derived local volume tables for Eucalyptus hybrid, Eucalyptus camaldulensis, Acacia auriculiformis, casuarina equisetifolia and tropical Pine. The productivity of the Captive plantations of different species is indicated in Table 5.

Table 2: Productivity of Captive plantations.

Sl. No.	Species	Rotation in years	MAI Ha. in M3	Total Productivity in M3 per Ha.	Total air-dried tonnes per hectare	Wood Density
1.	E.hybrid	8	4.8	38.4	26	.67
2.	E.Camaldulensis	8	8.0	72.0	42	.66
3.	C.equisetifolia	8	11.3	90.4	63	.70
4.	Tropical Pine	12	13.7	164.4	94	.572
5.	A.auriculiformis	8	16.0	128.0	82	.64

It is found that the pulping characteristics of Acacia auriculiformis are better than that of Eucalyptus. Acacia auriculiformis gives 2-4% higher pulp yield and better strength properties and requirement of bleach is also low compared to Eucalyptus. Further, plant scale analysis of pine-wood for it's pulping characteristics has indicated that higher quality pulp could be extracted from Pine-wood compared to Bamboo. Pine-wood has higher wood density (0.572) and higher average fibre length (3.2 mm) compared to Bamboo.

Further, plantations of Acacia and Casuarina raised during 1981, 1982 and 1983 were harvested on rotation and these areas were replanted either with Acacia or Pine depending on the land suitability. Eucalyptus plantations raised in dry-zone were harvested on rotation and coppice growth is being maintained. Standard costing method has been evolved and a production cost has been worked out to Rs. 330 per tonne from Captive plantations as against the

market rate of Rs. 700.

Besides, in dry-zone operational planting of E.camaldulensis has been done carefully and it's planting is restricted to better site conditions to enhance productivity. Plantation development with Acacia and Pine in wet-zone has been given high priority in the I Phase due to higher productivity and better quality pulp.

Additional Benefits

1. Captive plantation programme of MPM has generated employment to about 2,500 local people continuously which helps in improving the socio-economic condition in rural areas significantly.

2. 12.5% of the produce is made available to the Karnataka Forest Department (KFD) towards lease-rent. This material is sold to Public at concessional rate which reduces the pressure on reserve forests considerably. During

1991, 10,500 tonnes of air dried wood have been made available to the forest Department as lease-rent. Further, local people are permitted collect lops and tops (less than 3 cm diameter), leaves and bark available in the extracted areas free of cost. It is roughly estimated that 17,808.629 tonnes of bark and 5,904.344 tonnes of lops and tops have been collected by the local villagers as fire-wood from the extracted areas of MPM in 1991.

3. The barren-lands become green with plantations as a consequence of which environment is protected from air pollution. In addition, soil erosion has been reduced to a great extent and consequently siltation in dams (Chakra, Linganamakki, Talakalale and Savehaklu) is brought down resulting in increasing the life-span of the dams. Plantations played a vital role in restoration of ecology of degraded forest and non forest lands and prevented encroachment of these lands.

4. Plantations have become habitates for wild life. At least, 19 species of mammals, 115 species of birds and many amphibians, reptiles and invertebrates are reported. Deer, Black buck, leopard and bears have re-appeared in breeding populations. (Source: Mr. Harrison's Report-June 1990).

5. The production of news-print from MPM to an extent of 82,000 tonnes per annum meets 14.09% of 5,82,000 tonnes per annum required by the country today and saves foreign-exchange substantially.

Farm-Forestry Programme

In accordance with the National Forest Policy 1988, Mysore Paper Mills Ltd., Bhadravati launched Farm-Forestry Project in Shimoga dist. and in Tarikere taluka of Chickmangalore dist. to motivate and encourage the farmers to take-up the tree-planting in their lands without affecting the normal production of agricultural crop. The Farm-Forestry areas are as nearer to the factory as possible and they are not more than 70-80 Kms. away from the factory. It has been indented to cover an extent of 5,000 hectares under Farm-Forestry over a period of 5 years. MPM distributes seedlings to a tune of 1,22,00,000 at subsidised rate (20, Paise per seedling) and extends technical know-how free of cost to farmers to plant Eucalyptus, Acacia and Bamboo in their fields under various Farm-Forestry models. Further, MPM has been assisting the individual farmers who take-up tree-planting to obtain loan from the financial institutions and farmers are assured that the material will be purchased by the MPM at the market rate existed at the time of harvest.

To ensure success of the project, the mills has planned publicity and extension services to motivate the farmers.

For this purpose, motivators are engaged who approach individual farmer and perambulate his land to find out suitable area for tree-planting, Motivators are guides to the farmers and are responsible for creating general awareness to ensure community and individual participation in tree-planting. Besides, demonstration plots under various Farm-Forestry models have been established in farmer's lands at Mill's cost to impart technical skills involved in tree-planting and to convince farmers about the benefits of tree-planting.

Forest-Research Programme

Intensive forest Research has been done on extensive scale by the MPM specially oriented towards enhancing plantation productivity answering social and environmental problems with the financial and technical assistance from M/s Overseas Development Administration, United Kingdom.

i. Species and Provenance Research

A large number of species and provenances have been established in the trials replicated at more than one location in respect of Eucalyptus, Acacia, Casuarina and Pine. These trails have already demonstrated that Eucalyptus camaldulensis in dryzone, Eucalyptus urophylla, Eucalyptus pellita and Eucalyptus cloeziana in wet-zone will yield significantly more than the Eucalyptus hybrid. Further, PNG provenances in Acacia auriculiformis, Acacia crassicaarpa and Acacia mangium have established their superiority in trials. Tropical Pines viz. Pinus caribaea var. hondurensis and Pinus tecunumanii have been found adaptable and promising.

ii Nursery Research

Suitable nursery techniques have been developed and they are in operation on the large scale. These techniques have reduced the nersery cost considerably. However, further refinement is necessary.

iii. Silvicultural and Managerial Research

Trials with regard to ground preperation technique, espacement, weeding and fertilizer requirement have been established in principle pulp-wood species to evolve package of practices to enhance plantation productivity.

iv. Clonal propagation

Clonal propagation of plus trees in Eucalyptus, Acacia and Pine has been done on a small scale. Natural hybridization supposedly between Acacia auriculiformis and Acacia mangium has been noticed in trial plots and the rate of growth of these hybrid trees is 3-4 times more than that of

parent trees depending on the degree of crossing. Vegetative propagation of these hybrid trees has been taken-up and rooted cuttings have been planted in the main field on the trial basis whose performance is highly encouraging. Techniques for mass propagation of cuttings in Eucalyptus are standardised.

Further, development of hybrids in Eucalyptus has been planned in order to increase the plantation productivity on the lines of Aracruz, Brazil.

v. Growth, Water-use and Nutrient-uptake Studies

In response wide spread criticism of fast-growing forest plantations on environmental grounds, trials with respect to water-use, growth and nutrient-uptake in Eucalyptus, Acacia and Pine have been taken up in comparison with indigenous forest vegetation. It has been found that Eucalyptus exercises tremendous control in water utilization during the period of stress. Analysis of measurements recorded for the past five years showed that the fears of excessive water-use by Eucalyptus are unfounded and there is no indication that Eucalyptus trees are transpiring at a rate indicative of

ground water exploitation. Identical soil moisture depletion pattern is observed both under Eucalyptus stand and degraded indigenous natural forest. Further, it has been observed that Eucalyptus does not deplete the soil nutrients, instead it improves the fertility and structure of the degraded soils. Besides, Eucalyptus does not suppress any vegetation underneath and growing agricultural crops under Eucalyptus stand could be taken-up economically upto third year.

Conclusion

Considering the direct and indirect benefits of forest based industries and their importance in national economy, it is imperative that country does some holistic planning to solve the raw-material problem faced by the forest based industries. Industrial forestry is a prime need of our country from the point of view of economics, productivity, generation of goods and services, avoidance of imports, greening of waste-lands and partial meeting of social obligations. Government should extend incentives in the form of subsidy to the forest based industry for plantation development. Forest based industry can very well be a catalyst in protecting whatever is left of our natural forests.