Promoting Raw Material Upgradation Techniques-APPM Experience

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ABSTRACT

Technological advancements are the need of the hour in Indian Pulp and Paper Industry. Modernization and up-gradation activities in process areas are doing away with obsolete technologies. The prelude for this is demand for high quality cellulosic raw material for meeting end uses. Availability of adequate raw material in order to meet increased production capacities is a major challenge for the industrial segment. On the other hand, quality raw material is a pre- requisite for higher-grade pulp and finished product. For wood based industries, industrial plantations are the only answer to overcome constraints.

In order to address these needs APPM has adopted Farm Forestry activities since 1989. The scheme ensures development and distribution of quality seedlings to farmers thereby increasing raw material availability and sustained supply of fibrous raw material to mills. In tune with the ongoing APPM Mill Development Plan and in order to meet the projected demand of hardwoods, structured Farm Forestry activities have been put into practice. A step ahead the mill has introduced techniques for raw material up-gradation by introducing high yielding, genetically superior site specific clones with short rotation cycle.

Clonal field trials with species of Casuarina hybrid showed uniform growth, higher yield per unit area and the pulpwood was found to be better during pulping trials.

INTRODUCTION

Indian Pulp and Paper Industry uses diverse raw materials from forest resources, agriculture residues and waste paper. During initial days, forest products included bamboo and hardwoods from forest sources. Over the years environmental concerns and concept of sustainability and self sufficiency have made industry to rely upon farm forestry. On the other hand there is a trend towards increased use of heterogeneous mix of hardwood species due to less availability of a single raw material species have demanded alteration of process parameters in order to get quality finished product.

Raw material up-gradation relies on quality of wood and its substantial quantum availability. Industrial expectations in recent times have also gone up in order to meet the demand of quality raw material. Industries are now required to play multifarious roles to deal with variety of externalities besides coping with traditional forestry and emerging sustainable forestry demand.

Forestry research needs to re-orient itself to fit into priorities like, poverty alleviation, dealing with social , environmental, economic and development issues. This would mean focus on farmers and communities to enable them to produce more from their land holdings and consequently get better economic returns. It can also integrate planting trees with traditional agricultural crops with overall aim of increasing biomass production.

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The fact is that that plantation grown wood will be the major source of industrial raw material, aiming at fast growing plantation with short rotation cycle. Majority of farmers are marginal land holders and even small farmers can be benefited if they are linked with industry for markets. Whether an activity would be economically viable for small and medium holdings or not depends on two factors; divisibility of inputs and scale of economies. Tree planting requires divisible inputs of quality seeds, proper management practices , fertilizers, water and labour.

Secondly, economies of scale favour small scale production, as it requires family labour in off-season (for harvesting at least), uses land with little opportunity cost and can be taken up along with agriculture in appropriate agro forestry models. Besides this, in order to increase industrial plantations, marginal and wastelands which are available may be utilized as they are more suitable for growing trees, but less for agriculture. Offering the farmers proven technology and extension sevices, will help to promote farm forestry and in meeting the raw material requirements of the industry.

APPM Farm Forestry envisages the following for raw material up-gradation techniques by means of treated bare rooted and clonal Casuarina seedlings.

- Better Productivity
- Better Income generating technologies
- Better Management practices
- Value addition and other sustaining activities
- Demonstration and Dissemination of technological advancements

Better Productivity:

To adopt novel technology of clonal planting stock, with uniformity of planting material and giving higher yield within a short rotation period.

Income generating technologies :

Helping farming communities to generate income from nursery to post harvest stage by their active participation and ensure early and continuous inflow of financial benefits.

Better Management practices :

Management practices to be adopted under rainfed and irrigated conditions and creating room for inter cropping.

Value addition and other sustaining activities :

Sustaining the local communities in order to meet their needs like fuel and

fodder. Contributing to shelter belts and Clean Development Mechanism for augmenting carbon sequestration.

Demonstration and Dissemination of technological advancements

Timely dissemination of information and demonstration of advancements by means of Farmers meet and literature.

METHODOLOGY

Casuarina equisetifolia is the most widely planted and domesticated species of Casuarina in coastal India. It was introduced as a fuel wood species. Over a period of time it has become a multipurpose species finding use in construction, pulpwood and for eco-restoration. It has also found place in agroforestry and grown both under irrigated and rainfed conditions. Almost the entire Casuarina planting is carried out with seeds collected from unimproved sources, any seed collected from such sources to raise seedlings will result in highly variable and less productive plantations (ICFRE,1994).

The farm forestry activities of Andhra Pradesh Paper Mills Ltd. have created self sufficiency of resources and sustaining raw material requirement. Under the scheme quality seedlings of Casuarina , Eucalyptus and Subabul stumps were developed and distributed. From 1989 to 2006 through farm forestry 413 million quality seedlings were distributed to 30,000 beneficiaries covering an area of 59,000 hectares. As a part of raw material up-gradation, the mills farm forestry scheme developed quality seedlings of Casuarina equisetifolia and treated bare rooted Casuarina seedlings were distributed to farmers of the coastal districts of Andhra Pradesh. Most areas taken up for plantation by the farmers are marginal / wastelands. The agrarian community could readily accept the seedlings given at subsidized rate. The average yield under rainfed conditions after four years for Casuarina equisetifolia bag seedling origin plantation was observed to be 50 MT per hectare, bare rooted treated Casuarina equisetifolia plantation was 75 MT per hectare and for Casuarina hybrid clonal plantation average yield was 165 MT per hectare. The yield of pulp : wood ratio is 1:4 (Figure -1).This could ensure quality raw material to mill and on the other hand lops and tops could sustain farmers to meet their fuel needs.

Figure - 1

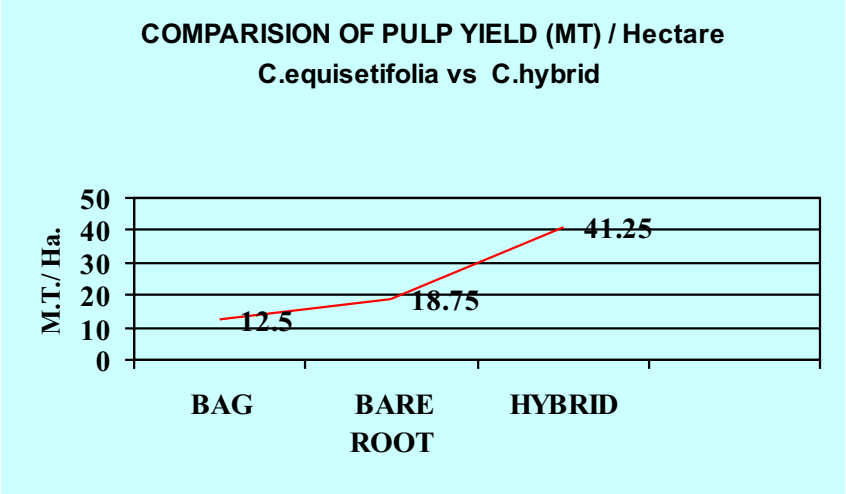

Table - 1

Species	Casuarina Hybrid Macro propagated		Casuarina equisetifolia Treated bare rooted		Casuarina equisetifolia Bag plant	
Parameters	Height* (Mtrs.)	GBH* (Cms.)	Height* (Mtrs.)	GBH* (Cms.)	Height* (Mtrs.)	GBH* (Cms.)
1 Year	4.71	-	4.16	-	3.84	-
2 Year	6.82	14.10	5.62	12.31	5.21	12.18
3 Year	8.77	17.91	7.46	15.12	7.00	14.76
4 Year	11.90	25.30	9.80	20.60	8.20	18.80

Casuarina junghuhniana is a native of the Indonesian islands of Java, Timor and Wetar. This species was introduced in India as rooted cuttings of a male clone from Thailand as a hybrid between Casuarina equisetifolia and Casuarina junghuhnian (Pinyopusarerk and Boland,1990A).Studies show that the hybrid has more photosynthetic efficiency ,drought and salinity tolerance than C.equisetifolia (Reddy and Desing,2001). In field trials of APPM, it was found to have coppicing ability.

Trials with seed origin and macro propagation

Inland trials in red soils were conducted at test plot located at Pendurti, Visakhapatnam district under rainfed conditions with Casuarina equisetifolia seed routed (bag plants and treated bare rooted seedlings) and Casuarina hybrid macro propagated clonal saplings. Observations were recorded for height and girth parameters for four years (Table-1).

Casuarina hybrid macro propagated clonal seedlings recorded significant results for height and girth parameters, over that of Casuarina equisetifolia treated bare rooted and bag plant seedlings.

PULPING TRIAL COMPARISON

Pulping trials under similar conditions were conducted at pilot plant scale with Casuarina hybrid and Casuarina equisetifolia. Comparative study was made of four year old material (Table 2).

It was observed that yield of Casuarina hybrid was on the higher side and other parameters like, burst factor, breaking length and tear factor were higher when compared with Casuarina equisetifolia. Future efforts are directed to improve pulp yield per unit area with employment of proper genetic material and resource management.

CONCLUSION

The Farm Forestry scheme of APPM developed the concept of raw material up gradation in a phased manner. During initiation it was bag culture which was replaced with, treated bare rooted seedlings of Casuarina equisetifolia. This helped in cost reduction incurred in bag plants and could develop healthy plants without root coiling, treated bare rooted seedlings were cost effective and readily accepted by farmers, thus ensuring well established plantations. This could help the mill in getting

Table - 2

S.No.	PARAMETERS	UNIT	Casuarina Hybrid	Casuarina equisetifolia
1.	Chip Packing Density (BD basis)	Kgs/Cu. M	256	306
2.	Cooking Chemical (White liquor)	%	17.25	17.75
3.	Sulphidity of W.L	%	17.9	18.3
4.	Anthraquinone	%	0.05	0.05
5.	Cooking temperature	Deg C	165	165
6.	Kappa Number		16.0	15.6
7.	Total yield	%	46.7	46.5
8.	Unbleached Pulp Evaluation (Valley Beater)			
a.	Burst factor		37.2	35.5
b.	Breaking Length	Meters	6315	6210
c.	Tear Factor		71	66

quality material and also generate good income to farmers.

Introduction of clonal seedlings was a step ahead in the scheme and farmers could afford clones after getting assured income over the years from seed routed seedlings. On the other hand farmers could adopt better management practices along with inputs for development of clonal plantations with Casuarina hybrid . The wide range of adaptability of clones suiting to local agro-climatic conditions and uniform growth habit was an encouragement to farmers. The yield was doubled within short rotation cycle.

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