

Farm Forestry Plantations And Advancements - APPM Experience

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ABSTRACT

Key Words : Farm forestry, wastelands, Genetic improvement

Farm forestry is the strategic integration of commercial trees into existing farming enterprises to provide direct and indirect, economic, environmental and social benefits. Over the years it is evident that the potential financial returns from farm forestry are considerable. However, with the increasing trend of raw material requirement by wood based industries it is essential to plan, design and develop plantations with genetically improved pulp wood species. This is necessary to derive higher productivity from farm forestry plantations.

Research and Development plays a key role for introduction of good planting stock there by ensuring quality raw material for industry. For wood based industries, industrial plantations are the only answer to overcome constraints This demands availability of wastelands for taking up farm forestry plantations Research programmes should also address long term wasteland development programmes.

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. Availability of different pulp wood species suitable to different agro-climatic zones ensuring higher yield per unit area are very much essential. Biologically there needs to be development of genotypes which have benefits of high productivity and desirable end uses

The Andhra Pradesh Paper Mills has envisaged an integrated pulpwood based farm forestry project for more than two decades. Targeting marginal and wastelands, the mill has introduced low cost planting technique, particularly development of high quality seedlings and clonal Casuarina at the minimum affordable cost. It has proven to be a revolutionary step in introducing quality material in the field. Simultaneously steps were taken by tree improvement programme for producing genetically improved seeds in adequate quantities through development of Clonal Seed Orchards (CSO) involving highly productive clones. Thus, the farm forestry has offered initial minimal investment and higher yield within short rotation cycle, ensuring quality raw material to mills. It has improved farmers socio-economic conditions by diversifying farm income by an array of products.

Introduction

Sustainability is a concept in which the environmental, economic and social dimensions of interactions between people and resources are of equal importance. It requires meeting current and future needs thus it implies intergenerational equity (WCED, 1987). It seeks balance amongst environmental protection, economic development and the perpetuation of vibrant human communities. It is an idea that is now shaping perspectives on forest management in most of the nations (FAO, 2002).

Farm Forestry plays a key role in developing pathways for management of resources in a sustainable manner. It has been receiving an increasing attention as an important objective. In order to meet the fibrous raw material requirement. Most of the world's industrial wood will eventually come from forests planted especially for

wood production (Sedjo and Botkin 1997). There is also an urgent need to address and ensure that fiber resources are obtained mostly from forests planted for and dedicated to producing high yields. It is inevitable that smaller forested area will have to serve more people in the future.

There is also much scope and potential for application of biotechnology and genetically modified organisms in wood production in forestry. Forests planted and managed for higher yields of wood will help in meeting more than 80% of the industrial wood requirements by 2050 (Sedjo and Botkin 1997 ; Victor and Ausubel, 2000).

The availability of fibrous raw material has been a major bottleneck in the progress of the Indian pulp and paper industry. Under the circumstances, the arrangement of fibrous raw material had been a challenging activity for the industry.

Indian Pulp and Paper Industry uses diverse raw material ranging from forest resources to agriculture residues and waste paper. During initial days, forest produce for pulp and paper

industry included bamboo and hardwoods. Over the years environmental concerns and concept of sustainability and self sufficiency have made industry to rely upon farm forestry.

Farm Forestry has paved the way for pulp and paper industry to become self-sustained in the generation of the much needed pulpwood resources while simultaneously ensuring the sustainable livelihood for farmers and thereby raising socio-economic status of the local populace and more importantly, improving the environment and maintaining the ecological balance.

In India Casuarina and Leucaena (Subabul) are largely grown (Pinyopusarerk and Williams, 2000 ; Nicodemus, 2009). Among different species of Casuarina, Casuarina equisetifolia L is the most widely planted species in India. Its nitrogen fixing ability, desirable stem form, fast growth and light crown characteristics make it ideal tree for agroforestry systems (Viswanath et.al, 2001) Leucaena leucocephala (Lam.) de wit is also well known for its fodder and

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pulp wood value (Brewbaker and Sorensson,1990).Variation is the basic resource to be explored for Genetic improvement of tree species and plays a key role in tree improvement programmes(Hedegart,1976;Zobel and Talbert,1984,Bagchi,1995,Warrier,2009).

Visualizing the problem in the early 1980s, the APPM had embarked upon the ambitious programme of generating requisite fibrous raw material by farm forestry in collaboration and cooperation with farmers by utilizing their marginal and degraded lands, The project focuses upon introduction of superior planting stock of Casuarina and Leucaena to the farming community with minimal initial expenditure and ensuring higher yield per unit area. and also for all round sustainable development, be it fiber resource availability or livelihood of local community, by integrating the local communities and the end user, strongly believing in the concept that “sustainable community can only ensure sustainable forests”.

Methodology :

The Farm Forestry scheme was formulated during the year 1989. Under this scheme, after careful study of the socio economic conditions of the farmers of the area, on marginal and wastelands

1. Project area
2. Choice of species and its compatibility with existing cropping pattern
3. Minimization of the initial investment on tree planting activity
4. Additional income generation
5. Productivity enhancement
6. Providing ready market to growers
7. Involvement of local community through motivation and extension
8. Plantation for poverty alleviation

1. Project area:

Farm Forestry Project was started in marginal, degraded and low productivity land of coastal districts of Andhra Pradesh which were prone to natural calamities.

2. Choice of species and its adaptation to existing cropping pattern:

Most of the areas taken up for plantation were rain fed and marginal/wastelands. Therefore, non-controversial, already existing, fast growing tree species like Casuarina and Leucaena (Subabul) appeared as a convenient option as these were

compatible with the existing cropping pattern wherein large chunks of wasteland were lying vacant. Reason for propagating these species were:

- a. Non controversial nature and already existence in the area.
- b. Compatibility with existing cropping pattern.
- c. Their ability to enrich the degraded and waste land soil.
- d. Their short gestation period, thereby providing early and continuous income to farmers.
- e. Availability of fuel and fodder

3.Minimization of initial investment on tree planting activity:

In initial stages of the programme, bare rooted planting stock of casuarinas was used for planting, in which seedlings directly uprooted from the seed bed were planted. But due to root coiling and poor development of roots, productivity of plantations was low with low survival percentage.. Therefore, polybag seedlings were propagated but it required high initial investment along with transportation problems on one hand and use of environmentally hazardous polythene bag on other hand. Thereafter, new low cost technique was developed, in which seedlings were transferred from primary bed to secondary bed for root shock and vigorous root growth. At the time of distribution of planting stock for planting, plant root were treated with mixture of local soil, some adhesive and growth hormones. This proved to be the least cost intensive and highly productive methodology, particularly for small and marginal farmers having financial constraints.

4. Additional income generation:

Inter cropping with ground nut, chili, sweet potato, beans, gram, vegetable etc were introduced during first year of plantation to provide additional income to the landholders. This additional income combined with low cost technology reduced initial plantation establishment cost.

5. Productivity enhancement:

TREE IMPROVEMENT PROGRAMME

During initiation of farm forestry, it was conventional bare rooted Casuarina seedlings giving way to polybag seedlings. Thereafter, concept of low cost, treated bare rooted seedlings was adopted for Casuarina and Subabul stumps were introduced..

Simultaneously, Research and Development was initiated in the direction of macro propagation of plus trees of Casuarina hybrid through plus tree selection from existing stands, establishment of Clonal testing areas, provenance trials etc. Tested clones with high yield and wide range of adaptability were multiplied and distributed to farmers for plantation on their farm land for enhancement of productivity of existing land within short rotation cycle.. Introduction of Casuarina hybrid clones was a step ahead in the farm forestry scheme as farmers sustained over the years in phased manner on farm forestry scheme, could now afford the hybrid Casuarina clones.

Clonal Seed Orchards And Demonstration Plots

Clonal seed orchard (CSO) is the right option for quality seed production with known origin. Employing seeds from proven seed sources and identified seed stands, have benefited in development of superior planting stock in the farm forestry programme for the benefit of farmers. The mill has taken up Casuarina tree improvement by means of Clonal Seed Orchard (CSO) for quality seed. The mill has also encouraged farmers by establishing demonstration plots and envisaging suitable technologies to create eco-friendly atmosphere. Thereby farmers can adopt methods suiting to local sites and needs.

6. Providing ready market to growers:

To fulfill the fibrous raw material requirement of the mills on sustained basis, programme was chalked out for development of plantation on farmer's field to the tune of 15000 ha per year beginning with the 166 ha. Presently, mills farm forestry is covering around 15000 ha every year. APPM is procuring the raw material from these farmers fulfilling its hardwood requirement (Approximately 7 lakh MT per year). APPM gives assurance of procurement but does not impose any binding on the farmers to supply the material back to the mills and they are free to get the ruling market prices at any point of time.

7. Involvement of local communities through Motivation and Extension:

The company started motivation and extension work amongst the

community with a view to educate them about optimum utilization of site resources, benefits of low cost improved planting stock, innovative agro silvicultural techniques, high yielding Clonal plantation. For the purpose audio visual aids, field trips, demonstration plantations, training, regular farmers meet for exchange of ideas amongst farmers, forest staff and end users and wider publicity through media were adopted.

8. Plantation programme for poverty alleviation:

With a view to integrate the weakest section of the society and all round development of all stake holders, company started farm forestry development in collaboration with the government agencies like Integrated Tribal Development Agency, District Water Management Agency, CLDP etc. Main objective of this programme was poverty alleviation and providing sustainable livelihood to weakest section of the society. Plantation programmes were carried out by the beneficiaries under the aegis of self help groups, village organizations etc.

Results

Through farm forestry activity since 1989 to 2010, the mill has developed and distributed 798 million quality planting stock to 40,000 beneficiaries (families) with the coverage of around 1,15,000 hectares area. .

1. Minimization of initial investment on tree planting activity and additional income generation:

The introduction of the concept of treated bare rooted Casuarina seedlings and Subabul stumps has attracted tremendous response from the farmers as the technique has proved

cost effective with low initial investment and higher survival percentage. Transportation expenses are also bare minimum. (Table-1)

The table clearly shows that there is reduction of initial plantation establishment cost to the tune of 63%. Combined with this, additional income through inter cropping during first year have resulted in recovery of initial plantation establishment cost in the beginning itself.

2.Enhanced productivity:

Research and Development contributed to macro propagation of Casuarina hybrid with significant results in terms of wide range of

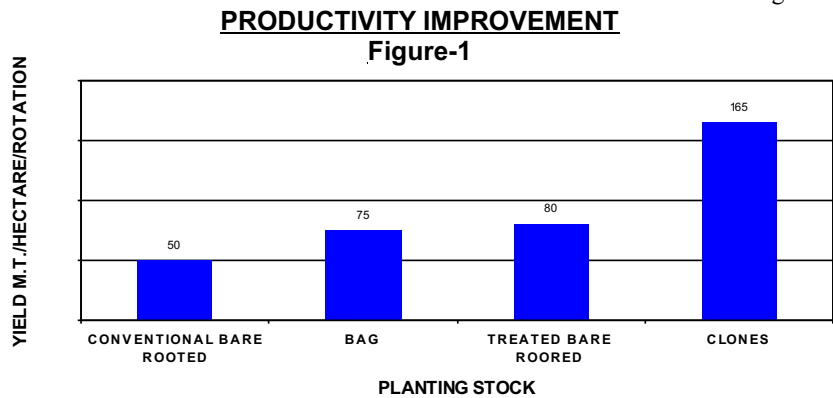


Table-1
Reduction In Per Hectare Establishment Cost Expenditure
Rs per Ha

ACTIVITY	BAG PLANTS CONVENTIONAL	TREATED BARE ROOTED SEEDLING/STUMP
Seedlings Cost	7500	200
Transportation cost	1000	100
Transportation damages	225	0
Planting	7500	5625
Total:	16225	5925

adaptability and higher yield per unit area within a short rotation cycle. During initiation of Farm forestry it was conventional bare rooted Casuarina seedlings with recorded yield of 50MT/ Ha/ rotation. The introduction of polybag seedlings recoded yield of 75 MT / Ha/ rotation. Thereafter, concept of low cost planting technique with the introduction of treated bare rooted

Table-2
FARM FORESTRY PROGRAMME AND EMPLOYMENT GENERATION 1989-2010

S.NO.	DISTRICT	No.OF NURSERIES	AREA HAC.	SEEDLINGS MILLIONS	BENEFICIARIES	MANDAYS MILLIONS
1	SRIKAKULAM	14	6335	43.15	1767	3.16
2	VIJAYANAGARM	3	1396	9.90	176	0.69
3	VIZAG	203	51993	379.23	19499	25.99
4	EAST GODAVARI	93	21506	156.58	12784	10.75
5	WEST GODAVARI	37	4780	40.72	2505	2.39
6	KRISHNA	26	7763	57.64	1323	3.04
7	PRAKASAM	62	21316	104.18	3367	10.65
8	NELLORE	3	847	6.30	47	0.42
		441	115936	797.7	41468	57.09

Casuarina seedlings showed a desirable yield of 80 MT / Ha / rotation. Finally with the introduction of hybrid Casuarina clones, almost double yield have been recorded within the same rotation cycle, achieving 165 MT/ Ha/ rotation. (Figure- 1)

3. Income generation and sustainable livelihood:

The programme has been able to help farming communities in generation of continual financial benefits from nursery to post harvest stage by their active participation at all stages. Combined with above activities, utilization of wasteland and poverty alleviation schemes have created large scale employment. (Table-2)

Conclusion

Quality of the wood produced under farm forestry programme is one of the major concern besides uncertainty of availability. Farmers generally do not follow the scientific rotations and their felling cycle is based on their individual economic consideration, which, most of the time, results in to immature felling of wood giving lesser pulp yield with less desirable pulp qualities. Research needs should focus more on quality of wood and its availability in substantial quantum. Industrial expectations in recent times have also gone up for 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. The fact that the plantation grown wood will be the major source of industrial raw material, aiming at fast growing plantation with short rotation cycle should be the criteria for farm forestry plantations. Majority of farmers are marginal land holders and even small farmers can be benefited if they are

linked with industry for markets.

Tree improvement programme envisages to introduce coppicing varieties of Casuarina, as this would reduce the burden on farmers. In usual practice farmers have to go for felling and uprooting before replanting again. This laborious and expensive process can be avoided by coppicing variety which would regenerate, is introduced in farmers field.

The ever increasing demand for raw material needs to be met by augmenting superior planting material. It has been demonstrated that genetically superior seed material would contribute to increased productivity per unit area. .

As APPM is already involved in development of quality seed material from clonal seed orchards and macro propagation would further sustain genetic tree improvement and enhance yield of plantations on marginal and wastelands.

References

1. Bagachi, S.K.1995. Selection differential and predicted genetic gain in *Tectona grandis*. Indian For.121(6): 482-490
2. Brewbaker, J.L. and Sorensson, C.T. 1990. New crops from interspecific *Leucaena* hybrids, 283-289. In *Advances in New Crops*, Janick, J and Simon, J.E. (eds.) Timber Press Portland.
2. FAO 2002. (Food and Agricultural Organisation) of the United Nations, 2002. Global forest resources assessment 2000. FAO Forestry paper 140. Rome, Italy, FAO.
3. Hedegart, T. 1976. Breeding systems variation and genetic improvement of teak, 109-121 : In *Linnean Society Symposium Series No.2 . Tropical Trees variation Breeding and Conservation*, Burley, J. and Styles, B.T.(eds.)

Oxford Univ.

3. Nicodemus, A. 2009. *Casuarina_A Guide for Cultivation*. Institute of Forest Genetics and Tree Breeding (Indian Council of Forestry Research and Education) Coimbatore, India.
4. Pinyopusarek, K. and Williams, E.R. 2000 Range wide provenance variation in growth and morphological characteristics of *Casuarina equisetifolia* grown in Northern Australia. *For. Ecol. Manage.* 143:219-232.
5. Sedjo, R and Botkin, D. 1997. Using forest plantations to spare natural forests environment 39(10) :14-22.
6. Victor, D.G. and Ausubel, J.H. 2000 Restoring the Forests. *Foreign affairs:* 79(6) 239-256.
7. Viswanath, S., Manivahakam, P. and George, M. 2001. *Casuarina equisetifolia in agroforestry practices* 187-192. In : *Casuarina Improvement and Utilization* Gurumurthi K., Nicodemus, A. and Siddappa (eds.) Institute of Forest Genetics and Tree Breeding, Coimbatore, India.
8. Warriar, K.C.S. 2009. *Variability studies in Casuarina equisetifolia* . Ph.D. Thesis. Forest Research Institute University, Dehra Dun, Uttarakhand, India.
9. WCED.(World Commission on Environment and Development) 1987. *Our common future*, New York. Oxford University Press.
10. Zobel, B.J. and Talbert, J. 1984. *Applied Forest Tree Improvement*. John Wiley and Sons, New York. 505 p.