

Social And Farm Forestry Plantation Initiatives By JK Paper, Unit: CPM

Agarwal N.K., Shukla O.P., Narkhede S.L.

ABSTRACT

JK Paper Ltd, unit: CPM is promoting social & farm forestry plantation in mill's surrounding area mainly through seeds, Hybrid seedlings & high yielding, disease resistant clones of Eucalyptus, Subabul & Casurina. JK paper Ltd has installed poly house Clonal hedge technology for Clonal multiplication of Eucalyptus & Subabul in 2008. Number of cuttings obtained & survival percentage inside the mist chamber is measured for 2 years in poly house & mist chamber. Rooting percentage of cuttings obtained from mini cutting technology/ Poly house & from field is recorded every month. Similarly the growth and establishment of Clonal plants has also recorded from farmer's fields. We are taking progeny trials of Subabul & Eucalyptus from hybrid seeds brought from different research organizations in India & abroad.

Introduction

JK Organization was established over 100 years ago and diversified into areas such as Paper, Cement, Tyre & Tubes, Pharmaceuticals, Hybrid seeds, Cosmetics, Audio-magnetic tapes, Automotive belts, Sugar, Dairy products etc. JK PAPER LIMITED, a member of JK Organization has two units JK Paper Ltd, Unit-CPM, located at Fort Songadh, Dist- Tapi, Gujarat, JK Paper Mills located at Rayagada, Orissa and the other, JK Paper Mills was the first paper mill to be accredited with ISO 9001, ISO 14001:2004 and OHSAS 18001:2007 certification. The current capacity of the JKPM (Raygada) is 1.25 lacs tones per annum of Pulp and Paper production and will also expand up to 2.4 lacs tones per annum after 18 months. Unit CPM (Fort Songadh) has a capacity of 1.15 lacs tones and is also accredited with

ISO 9001, ISO 14001:2004 and OHSAS 18001:2007 certification. JK Paper Ltd, Unit: CPM is largest integrated pulp, paper & paperboard industry of Gujarat state. Annual production capacity of Unit: CPM is 115000 MT per annum.

Annual Bamboo & Wood requirement of unit: CPM is 200000 MT. For sustainable wood supply CPM is promoting social & farm forestry plantations mainly in Tapi, Surat, Valsad, Navsari, Bharuch, Vadodara, Panchmahal, Anand, Kheda, Narmada & Ahmadabad district of Gujarat & Nandurbar, Dhule, & Jalgaon district of Maharashtra state.

We are promoting social and farm forestry plantations of Eucalyptus, Subabul and Casuarina species. Every year we are producing 85 Lacs seed route plants and distributing it to nearby farmers at subsidized rate. We are providing technical guidance to the farmers for raising pulpwood

Social forestry programme:

Every year we are raising 14-15 decentralized nurseries in our catchment area and producing 85-90 Lacs polybag saplings though hybrid Seeds of **Subabul hybrid (K-636 K-8, Kranti,)** *Eucalyptus camaldulensis*, *E. pellita*, *E. urophylla*, *E. grandis* and **Casurina** and distributing to nearby farmers at subsidized rate.

Till date we have promoted about 14500 Ha areas under social forestry plantation in Gujarat & Maharashtra state covering about 50000 farmers.

The year wise seedlings, clonal plants distributed & Area covered under seedlings, clonal plantation under social forestry programme is mentioned hereunder:

MASSIVE SUBABUL PLANTATION PROGRAM:



**Eucalyptus polybag nursery
at Malav, Gujarat**



**Casurina polybag nursery
at Navsari, Gujarat**



**Subabul polybag nursery
at Navsari, Gujarat**

JK Paper Ltd., Unit: CPM

Fort Songadh, Dist: Tapi, Gujarat

plantations. We also provide buy back guaranty to the farmers for their matured pulpwood.

Subabul is very fast growing, multipurpose species and useful for paper making, fuel wood & fodder

purpose etc. Subabul is leguminous crop and fix atmospheric nitrogen in the soil and helps in improving soil health. In order to improve the magnitude of social forestry program, we have introduced massive Subabul plantation scheme in Gujarat and Maharashtra area through direct seed sowing of hybrid seeds. We are providing quality seeds to the farmers, and appropriate seed treatment in order to speed up the germination.

We are providing technical knowhow and by back guaranty to the farmers. As an extension and motivational efforts, we have arranged local farmers visit to Andhra Pradesh area where thousands of hectare is planted under Subabul plantation.

Till date we have covered about 1500 hectare area under Subabul plantation and plan to covered 2000 hectare area in 2011-12.

This program will give new dimension for increasing income source of BPL farmers through low cost plantation activities along with soil in water conservation. (Economics of Subabul Plantation with agricultural crop is enclosed in Taable-4)

Extension and Motivational efforts:

We have established strong extension network in association of local influential person including NGO and Government agencies. Farmer's meets are being organized at different villages to develop awareness among the farmer regarding the economic benefit available through pulpwood plantation. As a part of extension program, farmer exposure visits are being organized to Andhra Pradesh, Maharashtra, Gujarat successful plantations. We are also organizing farmer exposure visits to our mill and R & D centre to develop confidence in the farmers by observing our activities in the area of Clonal development and seedling plantation in a scientific way to increase productivity.

We are organizing exhibition stall at different agriculture exhibition held in Gujarat & Maharashtra and giving demonstration to the farmers regarding the economic and environmental benefits of our plantations (Details of farmers/extension meetings enclosed in Table No. 5).

Eucalyptus Clonal propagation at Unit CPM

Average productivity in natural seed derived plantations is low due to high genetic variability. 80 % of productivity

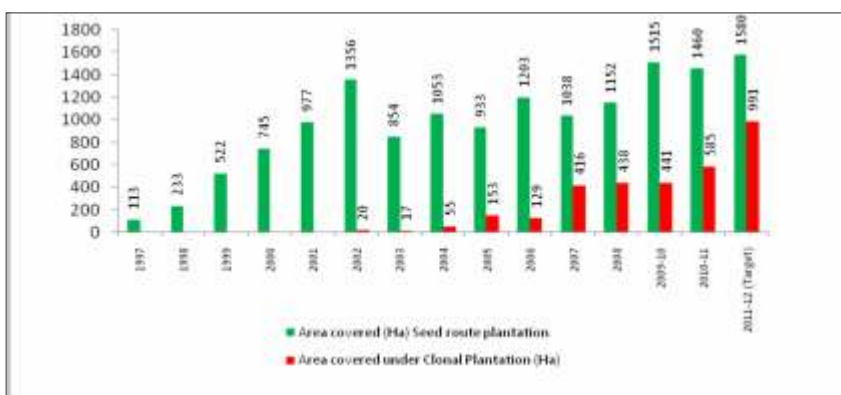
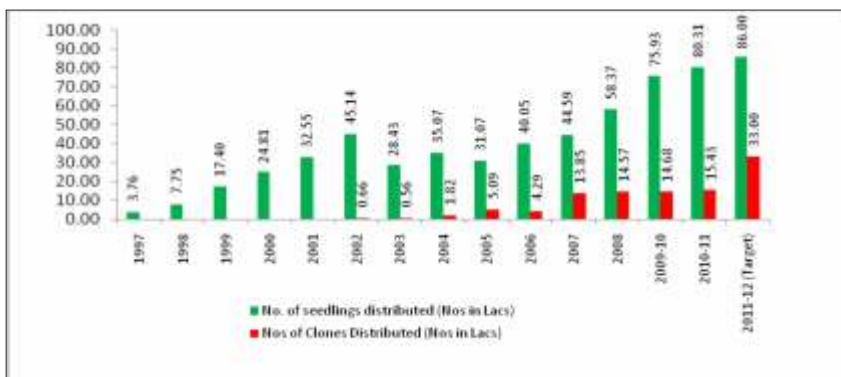


TABLE- 1
Statement showing month wise survival % in mist chamber by using mini cutting/ nodal cutting technology.

Sr. No.	Month	Nos of cutting Charged in Mist Chambers	Nos of Rooted cuttings	Rooting %
1	Apr-10	356200	271962	76
2	May-10	261320	239086	91
3	Jun-10	339755	304822	90
4	Jul-10	91495	81910	90
5	Aug-10	344830	314948	91
6	Sep-10	260210	231806	89
7	Oct-10	198960	176602	89
8	Nov-10	319280	272333	85
9	Dec-10	224240	202684	90
10	Jan-11	297480	255540	86
11	Feb-11	272065	244934	90
12	Mar-11	274390	239816	87
	Total	3240225	2836443	88

TABLE- 2
Statement showing month wise survival % in mist chamber by using Coppice cutting from Open Field area CMA.

Sr. No.	Month	Nos of cutting charged in Mist Chambers	Nos of Rooted cuttings	Rooting %
1	May-10	91495	62216	68
2	Aug-10	90400	62376	69
3	Oct-10	91300	54780	60
4	Nov-10	94120	58354	62
5	Feb-11	93360	65352	70
6	Mar-11	84740	50844	60
	Total	545415	353922	65

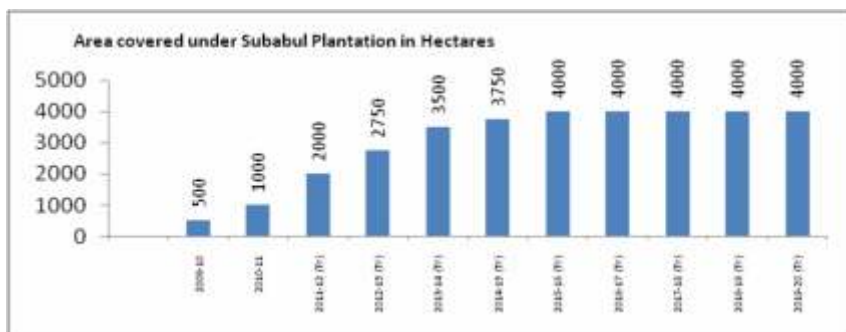
TABLE- 3
The Economics of Clonal Eucalyptus plantation is mentioned hereunder (Per Ha)

Sl.No.	Particulars	Unit	Clonal Plantation
1.0	FIRST ROTATION (After 5 Years)		
1.1	Cost of raising & maintenance	Rs.	30,000
1.2	Cost of Plant Material @ Rs.5/-/plant	Rs.	15,000
1.3	Total Cost	Rs.	45,000
1.4	Estimated Yield/Hectare	Tonne	150
1.5	Minimum Rate/tonne at Farm Gate (2011)	Rs.	2,250
1.6	Total returns	Rs.	337,500
1.7	Net returns in First rotation	Rs.	292,500
2.0	SECOND ROTATION (After 10 years)		
2.1	Cost of raising & maintenance	Rs.	20,000
2.2	Cost of Plant Material	Rs.	-
2.3	Total Cost	Rs.	20,000
2.4	Estimated Yield/Hectare	Tonne	150
2.5	Minimum Rate/tonne at Farm Gate (2011)	Rs.	2,250
2.6	Total returns	Rs.	337,500
2.7	Net returns in Second rotation	Rs.	317,500

TABLE- 4
Statement showing Economics of Subabul Plantation Vs Agricultural crops in Gujarat & Maharashtra Area under irrigated condition (Per Acre)

Particulars	Subabul (Rotation 3 Years)	Rice	Wheat	Ground Nut	Cotton	Green gram	Castor	Black Gram
Total Investment	8540	10650	8500	9690	15000	4900	6600	3960
Total Yield	40	2000	1500	700	1200	400	800	500
	MT	Kg	Kg	Kg	Kg	Kg	Kg	Kg
Sale Price	2250	10	12	26.25	30	40	28	30
Revenue	90000	20000	18000	18375	36000	16000	22400	15000
Firewood/ Lops tops/ Straw etc	4000	4000	2000	1125	0	0	0	0
Total Revenue	94000	24000	20000	19500	36000	16000	22400	15000
Expenditure	8540	10650	8500	9690	15000	4900	6600	3960
Net Income	85460	13350	11500	9810	21000	11100	15800	11040
Net Income/Acre/year	28487	13350	11500	9810	21000	11100	15800	11040

Year wise area covered under Subabul Plantation in Hectares



Year wise Expected Yield from Subabul Plantation in ADMT



is contributed by just about 20 % of the plants. Hence it is very important to have only the highly productive member of the plantation to improve the productivity per unit area.

In order to improve per unit area productivity of the farmer we have introduced Clonal propagation of Eucalyptus in Gujarat area. Clonal propagation technique is used for mass production of true to type planting stock in which all the genetic superiority of the parent tree is retained. The mean annual increment of Eucalyptus grandis plantations in Brazil before attempting genetic improvement and Clonal forestry in



Farmer visit to our Mills



Farmer visit to our Mist Chamber



Exhibition stall in Agriculture fair at Anand



Exhibition stall in Agriculture fair at Kadodara

TABLE-5
Nos of Farmers/ Extension meeting conducted for Subabul plantation.

Sr. No.	Particulars	Nos of meeting organized	Nos of Farmers attended.
1	Andhra Pradesh Educational Tour for Gujarat & Maharashtra farmers	7	169
2	Farmers Educational Tour at CPM	110	2813
3	Farmers meeting at Villages	205	4350
	Total	322	7332

1967 was 15 M³ / hectare / year, but when selected clones were introduced, the yield increased to 70 M³ / hectare / year. Such clones under intensive management have yielded even up to 100 M³/hectare/year (Zobel, 1993).

Selection of candidate plus trees:

We have selected 200 no's of CPTs of Eucalyptus. We have conducted multi locational trials in randomized block design of above CPTs in our agro climatic conditions to assess their suitability. We have measured period increment of above CPTs in terms of height, girth and yield. We have started the mass multiplication of about 50 superior individual. We have 6 Nos of mist chamber, 2 Nos of hardening chamber & producing about 35 Lacs clonal plants annually.

Cutting preparation:

The juvenile coppice cuttings/ Mini cutting harvested from Clonal hedge garden then washed thoroughly then severed with secateurs in to two noded cuttings with pair of leaves. The leaf area is reduced to less than half the original leaf size to minimize evapotranspiration. The cuttings then treated with contact and systemic fungicide (diathane M45, Bavistin). The lower portion of cutting then treated with indol-butyric acid at 5000 ppm concentration in talcum powder. Cuttings are placed in root trainer trays filled with vermiculite.

Media for propagation:

We are using vermiculite for Clonal propagation. Vermiculite is a micaceous mineral, which can expand when heated. When expanded it is very light in weight. It is neutral in reaction with good buffering properties and is soluble in water, can observe large

quantity of water. It contains enough magnesium and potassium to supply the plants.

a) Mist Chamber operation:

State of art Mist Chamber covered with UV rays stabilized polythene of 200 micron size. Mist Chambers are provided with temperature, humidity controllers and forced circulation systems. The root trainer blocks with two noded treated cuttings placed in to Mist Chamber for 40 to 45 days for root initiation. 35 to 40° C temperature and 85 to 90 % humidity is maintained inside the Mist Chambers.

b) Hardening Chamber:

After successful rooting of juvenile cuttings inside the Mist Chamber i.e. after 40 to 45 days, rooted cuttings are then shifted to Hardening Chamber covered with

75 % agro shade net for 15 days for acclimatization with local climate.

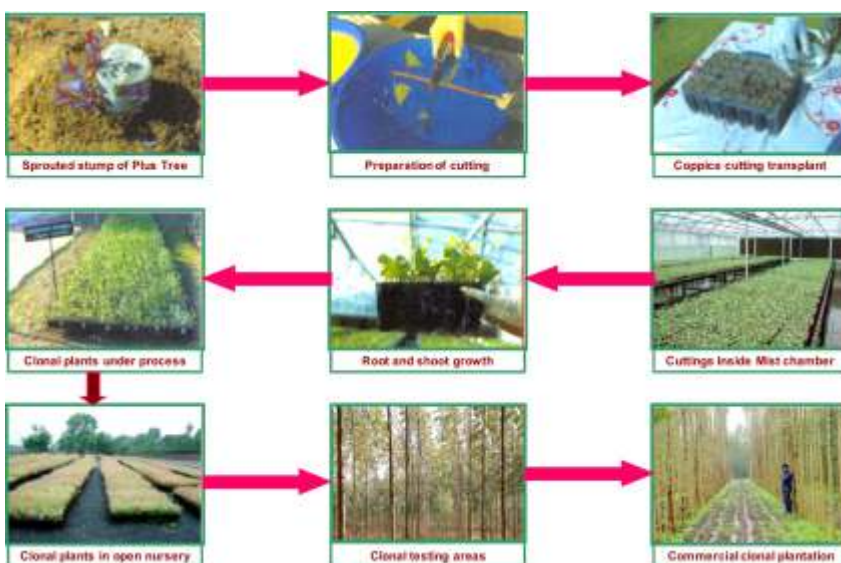
c) Open Nursery:

The rooted cuttings are then placed in open nursery for 2 to 3 months till they attain palatable height of about 1 to 1.5 feet. The required macro and micro nutrient are provided to these cuttings regularly through spray pump.

Clonal hedge garden/ Mini Cutting technology for multiplication of Eucalyptus & Subabul Clonal plants:

Initially we multiply the Clonal plants from coppice shoots derived from the mother plant of 2 to 3 yrs old. The process is cumbersome and involves huge land area for Clonal multiplication purpose. The development of micro cutting technology for Eucalyptus allowed the concept of super intensive management of producing vegetative propagules to be achieved at commercial scale. As for cloning methods, the advent of micro cutting systems for large scale production of vegetative propagules ex vitro. Originally the system was based on mini hedges established through rooted mini cuttings, grown in small containers. This system provided a series of technical and Economical benefits as well as good root quality. Despite representing great advance over coppice cutting in the field mini hedges in container faced some limitations. The outdoor mini hedges were hostages of climate, and the problem related to adequate

The Flow Diagram of clonal production system is mentioned hereunder:



maintenance of nutritional status and leaf diseases continued, especially during winter. The main problems were: reduced photosynthesis rate, reduced nutritional uptake and high level of nutrition loss by leaching during the periods of excessive rainfall, or even during irrigation. These limitations led to development of an indoor mini hedges system.

We have installed naturally ventilated poly house covered with UV rays stabilized 200 micron polythene provided with fertigation system, temperature and humidity controllers. We have planted superior mother plants in raised bed filled with pure sterilized sand at 15 cm x 15 cm spacing. We are providing the required fertilizer dosage through fertigation system to the plants. We are providing constant humidity and temperature to the plants. Every month we are getting about 10 to 15 juvenile coppice cuttings from 1 mother plant. The adequate fertilizer dosage and nutritional status in the plant will help in increasing rooting percentage in Mist Chamber.

Result & Discussions:

In the era of global markets, the development of social & farm forestry plantation for industrial purpose must aim for, among other objectives, increasing industrial competitiveness in the distinct market segments they interact with. In such a scenario, forestry based companies must consider the mode in which the forestry raw material can affect their competitive capacity. The modern concept of competitiveness includes producing products to meet the customer's requirements at low costs, in a sustainable manner and with minimum impact on the environment. Therefore, developing tree breeding programs to obtain quick gains, and also developing cloning systems to have a well established vegetative propagation method becomes important. The vegetative propagation methods should rapidly transform genetic gains obtained through breeding or genetic transformation, in to benefits for the industry.

One of the most efficient tools to acquire these objectives is the combination of inter-specific hybridization and establishment of Clonal forestry derived from superior hybrid individuals.

The traditional Eucalyptus Clonal technology using coppice cuttings from 1.5 to 2 years old plants is cumbersome also requires about 2 year to start

multiplication of Eucalyptus. The traditional Clonal technology is also liable for insect infestation like Gall insect, little leaf etc.

From 1008 Sq. Mtrs Naturally Ventilated Poly house, we are getting about 36 Lacs juvenile mini cuttings per annum (About 10 mini cutting/ plant & about 300000 mini cutting per



Clonal Hedge Garden/ Mini cutting technology

month). We need to maintain about 36000 mother plants in Clonal Multiplication Area in field covering an area of about 25 Acres. The survival of coppice cuttings will be about 65% which has increased to 88 % by using mini cutting technology (The Survival of Coppice cutting & mini cutting is enclosed in Table 1 & 2).

The mini cutting technology has also reduced time required for rooting from 45 days to 35 days which helps in increasing production capacity of Clonal plants. We can introduce/produce new clone within the period of 2 months by using mini cutting technology as it requires about 1.5 year in traditional technology.

The cost of Clonal production will reduce drastically by using mini cutting technology hence we can provide cheaper clones to the farmers to take up plantation by using genetically superior seedlings. This will increase yield by 2-3 times as compared to normal seedlings.

Conclusion:

The use of mini cutting technology has resulted in significant increase in Clonal plants productivity in same Nos of mist chamber area. Nos of days required for rooting of cutting inside the mist chamber is also reduced from 45 days to 35 days. Nos of days required to produce/ introduce new clones is also reduced from 1.5 years to 2 months. Rooting percentage inside the mist chamber is increased from 65 % to 88 %.

References:

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