Proceedings of the Workshop on Afforestation Models (in Forest Land) under West Bengal Forest and Biodiversity Conservation Project (South West Bengal)

Kolkata, 22 January, 2015

Organised by:
Project Management Unit
&
Project Management Consultants
West Bengal Forest and Biodiversity Conservation Project

PROLOGUE

Since the JICA assisted West Bengal Forest and Biodiversity Conservation (WBFBC) Project was launched, it has been the endeavour of the Project Management Unit (PMU) to usher in dialogues with the Heads of DMUs and their staff to standardize the field works like plantation models, nursery works and tending works. It is needless to state that standardization of such field practices would lead to the development of the schedule of estimates that could be adopted in similar works either under this or any other project or scheme.

We, in the PMU, were of the firm view that the standardization of the plantation and allied works would require lot of reflection and inputs from experienced officers at various levels specially for analysing the items of works and work output of each type of estimate. The whole idea of standardization of works culminated in organizing workshops for South Bengal followed by North Bengal units, since the field situation and model prescribed in the two areas are completely different.

The workshop organized on 22nd January, 2015 for South Bengal was the first of the two workshops, where the PMU invited the senior most officers of the Forest Department and also the officers at Circle and Division levels to share their views on the models prescribed under the WBFBC Project. To facilitate and focus the discussion in the common forum towards a meaningful conclusion, we gave some lead suggestions for discussion against each of the models of South Bengal, viz: Technical parameters and Cost estimates of A2, A3 and of Quality Planting Material (QPM), which is central to the fundamental concept of WBFBC Project.

Five working groups were constituted from amongst the participants, each group comprising officers of a spectrum of experience and seniority. The topics of the working groups were as follows:

Group 1: Technical parameters of A2 model.
Group 2: Technical parameters of A3 model.
Group 3: Cost Estimate of A2 model.
Group 4: Cost Estimate of A3 model.
Group 5: Technical parameters and cost estimate of QPM production.

During the deliberations it was also felt that two models of afforestation – A1 and A4, which were formally not introduced for discussion in the workshop, should be delved into and the technical parameters and the cost estimates modified as per actual requirement. Such an exercise has also been carried out with technical inputs from the concerned divisions.

It is our pleasure therefore, to present the proceedings of the workshop covering the key issues and lead suggestions, recommendations of the group, acceptance of the recommendations by the bevy of officers, and the Resulting Technical parameters and Estimates of each of the models including A1 and A4. The whole hearted participation of every officer at all level was wonderfully cohesive.

Project Management Unit
W.B Forest and Biodiversity Conservation Project

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1. Introduction

The Project Management Unit (PMU) of the West Bengal Forest and Biodiversity Conservation Project (WBFBC Project) was receiving numerous technical queries in respect of planting pattern, species composition and estimated cost for the various models of plantations in forest land of South West Bengal, as included in the Minutes of the Discussion (MOD) under Afforestation Component of the WBFBC Project.

The issues were discussed in detail with the concerned Circle- in -Charges and the Heads of the DMUs concerned. In order to revisit the prescriptions and estimates of various models, as included in the MOD, it was felt necessary to organise Technical Workshops on the Plantation Models and Estimates of the West Bengal Forest & Biodiversity Conservation Project. The Project Management Consultants (PMC) working with PMU, therefore, took the initiative of organising the workshops on "Afforestation Models (in Forest Land) under West Bengal Forest and Biodiversity Conservation Project" to discuss the issues and draft recommendations for modifications, if any, in the Models and estimates. The first such Workshop was organised for South West Bengal at Sonnet Hotel, Salt Lake, Kolkata on the 22nd of January 2015.

The Workshop provided an opportunity to formulate specific and implementable recommendations on the issues under debate to the appropriate authority for reconsideration of any modifications in the models or estimates.

All the Senior Officials of the West Bengal Forest Department, including Heads of Divisional Management Units (DMUs) and Divisional Forest Officers from different districts of South West Bengal and PMC members, including the Team Leader & Afforestation Specialist were invited for participation in the workshop. The list of participants is as follows:

SI	Name Participants	Designation	SI	Name Participants	Designation
1	Sri U.K.Bhattacharya	Principal Chief Conservator of Forests, Wildlife & Chief Wildlife Warden, W.B.	2	Sri A.Zaidi	Principal Chief Conservator of Forests, General, W.B.
3	Sri P.Shukla	Principal Chief Conservator of Forests, Research, Monitoring & Development, W.B.	4	Sri R.R.Pandey	Addl. Principal Chief Conservator of Forests, Research, W.B.
5	Sri N.K.Pandey	Addl. Principal Chief Conservator of Forests, Finance, W.B.	6	Sri S.Dhaundyal	Chief Project Director, WBFBC Project
7	Dr. P.Vyas	Addl. Principal Chief Conservator of Forests & Director Sundarban Biosphere Reserve, W.B.	8	Sri S.Sen	Addl. Principal Chief Conservator of Forests, CAMPA, W.B.

9	Dr. B.R.Sharma	Addl. Principal Chief Conservator of Forests, Wildlife	10	Sri R.R.P.Singh	Spl Addl. Principal Chief Conservator of Forests, & CCF Research
11	Sri S.Barari	Project Director Finance, WBFBCP	12	Sri NV.Rajashekhar	Spl Addl. Principal Chief Conservator of Forests, & CCF Monitoring
13	Sri V.K.Yadav	Spl. APCCF & CCF Central	14	Sri D.Ray	CCF South West
15	Sri R.Kumar	CCF South East	16	Sri N.S.Murli	CCF Western
17	Sri S.Chaudhuri	Project Director, M&E, WBFBCP	18	Sri P.K.Pandit	Addl PD, Impl., WBFBCP
19	Sri S.Chanda	Joint Director SBR	20	Dr. Anupama	CF Working Plan & GIS
21	Sri A.K.Samanta	Addl PD,P&R, WBFBCP	22	Sri D.Mallick	Head Bankura (S) DMU
23	Sri S.Das	Head Bankura (N) DMU	24	Sri V.Salimath	Head Medinipur DMU
25	Sri R.N.Saha	Head Silviculture (S) DMU & Head Rupnarayan DMU	26	Sri S.Bandopadhyay	Addl PD Co-ord., WBFBCP
27	Sri Anjan Guha	Head , Kharagpur DMU	28	Sri A.Das	Head Burdwan DMU
29	Dr. Smt. S.Das	Head Kangsabati (N) DMU	30	Dr. S.Kulandaivel	Head Wildlife (HQ) DMU
31	Sri V.Santosha	Head Birbhum DMU	32	Sri B.K.Haldar	Head Durgapur DMU
33	Sri Manoj Saha	DFO Working Plan-II	34	Sri U.Nag	Head Kangsabati (S) DMU
35	Sri B.R. Chakravorty	DFO Working Plan – I	36	Sri G.Chatterjee	Joint PD Co-ord, WBFBCP
37	Sri Sarajit Mukherjee	Head Monitoring (S) DMU	38	Mr. J.P.van Kooijk	TL & Afforestation Specialist, PMC-WBFBCP
39	Sri Ayan Ghosh	ADFO, South 24 Pgs Dvn	40	Sri Sakti Sankar Dey	CCF & CF Development
41	Dr. Visvarup Chakravarti	TPOFA Expert, PMC-WBFBCP	42	Dr. Nupoor Prasad	GIS & MIS Expert, PMC-WBFBCP
43	Sri Subhasis Ghosh	ADFO, Panchet Division	44	Sri Ranjan Mohapatra	Capicity Building Expert, PMC-WBFBCP

1.1 Objective of the Workshop

Review and where felt necessary adopt rectifications in the prescriptions and estimates of Afforestation Models as prescribed in the MOD pertaining to South Bengal through discussions with higher officials of the WB Forest Department.

1.2 Setting the Context

Shri U.K. Bhattacharya, Principal Chief Conservator of Forests, Wildlife & Chief Wildlife Warden, in his opening remarks observed that the efficacy of potting mixture being used – Burnt Rice husk:sand:compost for better development of the seedlings at present as compared to earlier method should be assessed. The out planting patterns including choice of species should be well defined.

Shri A. Zaidi, Principal Chief Conservator of Forests, General said that it was heartening to see participants of all levels for Technical Sessions in the Workshop. He stressed that the Workshop should be able to formulate prescriptions for different afforestation models to be adopted by the Directorate in future afforestation programmes. He advised that it will be useful to have a review of Working Plan for Rotation, Thinning and Species composition.

Shri P. Shukla, Principal Chief Conservator of Forests, Research, Monitoring and Development, appreciated the effort of going back to basics of forestry, with this workshop. He stressed the importance of review of earlier models before finalising the recommendations. He expressed that future harvesting operation should be kept in mind in design of models and advocated that growing stock must be reviewed and growth data should be considered before finalising recommendations. He favoured the idea of plantation in blocks with liberty to some extent to the field officers in adopting/modifying a pattern.

Shri S. Dhaundyal, Chief Project Director, West Bengal Forest and Biodiversity Conservation Project, stated that the need for modifications was being felt for a long time based on feedback received from field. New technical suggestions, if any, may be put to experimentation by Research Wing before finalising recommendations.

1.3 Technical Sessions

Participants were assigned to different Work Groups for deliberations and drafting of recommendations on specific issues. The main issue discussed were:

1. Technical prescriptions for Plantation of Sal and Associates species, Model A-2
2. Technical prescriptions for Quick growing Small Timber, Fuel and Fodder Plantation, Model A-3
3. Cost Estimates for A2 model of Afforestation
4. Cost Estimates for A3 model
5. Technical prescriptions and Estimates for production of Quality Planting Material

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The Work Groups for each issue discussed during Workshop on Afforestation Models (in Forest land) under WBFBC Project on 22.1.2015 were as follows::

Group 1	**Group 2**	**Group 3**	**Group 4**	**Group 5**
A2 Model-Technical	**A3 Model-Technical**	**A2 Model-Estimate**	**A3 Model-Estimate**	**QPM – Technical & Estimate**
A.Zaidi	P.Shukla	B.R.Sharma	Sri D.Ray	S.Sen
N.K.Pandey	P.Vyas	R.Kumar	N.S.Murli	NV.Rajashekha
R.R.Pandey	V.K.Yadav	S.Das	S. Kulandaivel	S.S. Dey
D.Mallick	R.R.P.Singh	V.Salimath	G.R.Santosha	A.Das
S.Bandopadhya	S. Chanda	A.K.Samanta	S. Kulandaivel	B.K.Haldar
A. Ghosh	Dr. Anupama	R.N.Saha	U.Nag	G.Chatterjee
	P.K.Pandit	B.R. Chakravorty	A.Guha	
	S. Mukhopadhyay		S.Ghosh	
	M. Saha			

In the first session, the Groups deliberated on issues assigned to them and drafted recommendations. The recommendations were presented by each group to the house in the second session and each recommendation was debated. In the final plenary session, the accepted recommendations were presented.

2. Background information and key points

2.1 Model A2 : Plantation of Sal and Associates Species (As described in the MOD of WBFBC Project)

Objective: Production of mining timber like Poles, Posts, Cogging sleepers and production of timber, small timber, firewood and NTFPs like Myrobalans, Nuts, and other edibles.

General Description: This is an eco-friendly (mixed plantation by various indigenous species), habitat restoring model, which is likely to provide livelihood support to the JFMC members in the long run from the wealth of NTFPs available from regenerated tree species as well as from ground flora that will eventually come up.

Minimum Target Management Area per JFMC: 20 ha

Maximum Target number of JFMC: 170

Area: This plantation model will be raised in 12 Forest Division covered by 4 Districts.

Table 1 : Target Area of A2 Plantation of Sal and Associate Species

Afforestation Model	Area Proposed (ha)	Minimum viable area (ha)	Maximum number of JFMC	District to be covered	Division
A2. Plantation of Sal & Associate Species in South Bengal	3,430	20	170	Paschhim Medinipore	Medinipore
					Rupnarayan
					Kharagpore
					Jhargram
				Bankura	Panchet
					Bankura N.
					Bankura S.
				Burdwan	Burdwan
					Durgapur
				Purulia	Purulia
					Kangsabati North
					Kangsabati South

Soil & Climate: Red lateritic soil- deep reddish-yellow loamy to clayey soil together with alluvium of Damodar, Kangsabati, Ajoy, Rupnarain rivers. Well drained, low in organic matter and also in K and P. Hot dry summer, moderate winter, rainfall- 900 to 1500 mm spread over 150 to 180 days.

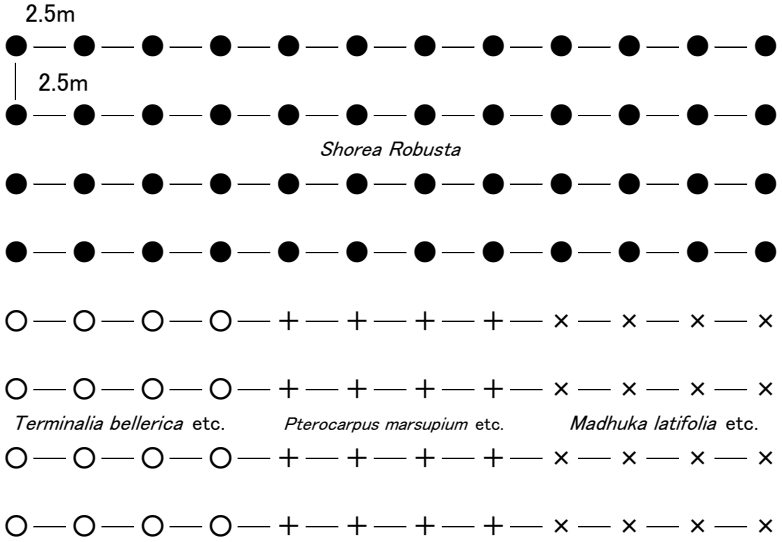
Proposed Species: Sal with associates like *Pterocarpus marsupium, Ougeinia oojeinensis Dalbergia latifolia, Symplocos racemosa, Madhuka latifolia, Terminalia bellerica Terminalia chebula, Anogeissus latifolia, Schleichera oleosa, Buchanania lanzan Semecarpus anacardium, Soymida febrifuga* etc. Choice of species, however, will be guided by the community preference, subject to the fulfilment of silvicultural requirements.

These are endemic species having community preference fulfilling much of their livelihood needs. Sizable numbers of JFMCs are functioning in the area in manageable clusters and as a result older plantations in the area are growing remarkably well. Such forest areas are allocated to Sal Working Circle of the Working Plan prescription.

Extent: 3,430 ha of degraded forest land has been proposed under this model

Technique: This will be a mixed plantation, *Shorea robusta* being the main constituent (50%), with other natural associates. Planting interval is 2.5 x 2.5 m (1,600 plants /ha)

Seedlings will be planted at a spacing of 2.5 m x 2.5 m and the species mixture will be in strips of Sal and misc. hardwood alternating In miscellaneous strips blocks of 100 sq, m. having 16 plants of the same species in each block will be planted. Each strip will comprise 4 lines. Pit size is (0.75 + 0.6) / 2 x 0.6 x 0.6 m^3 (refer to Figure below)



NB. Planting species will be determined through discussion with JFMC
Example of A2 Sal and Associate Species Plantation

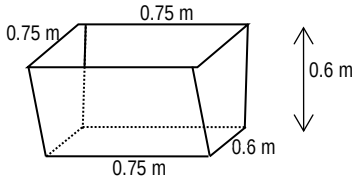


Figure Plantation Pit

Management: Silvicultural operations and final felling will be done as per Working Plan prescription. Revenue will be shared as per the extant rules.

Survival Rate (target): The survival rate for this model may be fixed as follows -

1st year: 90% 3rd year: 85% 5th year: 75%

2.1.1 Key Points for discussion on A2 Model:

1. The proportion of Sal & associates: The MoD prescribes 50:50; Sal 4 lines alternating with Miscellaneous 4 lines.

2. Planting pattern of Sal and Miscellaneous: MoD suggests 4 lines Sal alternating with 4 lines Miscellaneous species

3. Ex-situ conservation of rare & endangered species : A point has arisen during informal discussions in various fora that A2 Sal plantation area is the place where rare and endangered spp. should be planted for biodiversity conservation.

4. Pit dimensions : Pit dimensions prescribed in MoD is 75 cm x 75 cm top, 60 cm x 60 cm bottom and 60 cm depth

5. Shade providing plants : Cost for shade plants "Arhar" is provided in the estimate. However there is no mention about the planting pattern of Arhar in MoD.

6. Contour Trench (C.T) : In the estimate given in the MoD against this model, contour trenches of dimension 60 cm top, 45 cm bottom, 45 cm depth and 5 m length has been prescribed. Regarding proportion of the C.T over the whole plantation area it has been mentioned as "appropriate running meter".

2.2 Model A3: Quick Growing Small Timber, Fuel and Fodder Plantation (As described in the MOD of WBFBC Project)

Objective: Production of pulpwood, small wood, firewood and some NTFPs.

General Description: This plantation model is supposed to cater to the needs of the people, particularly the JFMC members. Species chosen for this model are fast growing and will fetch early return to the JFMC members from mechanical thinning out and thinning operations. Besides, the plantation will improve the potential of NTFP production in the long run, providing livelihood support to the JFMC/EDC members.

Minimum Target Management Area per JFMC: 20 ha

Maximum Target number of JFMC: 300

Area: This plantation model will be raised in 13 Forest Divisions covered by 5 Districts.

Table 2 Target Area of A3: Quick Growing Small timber, Fuel & Fodder Plantation

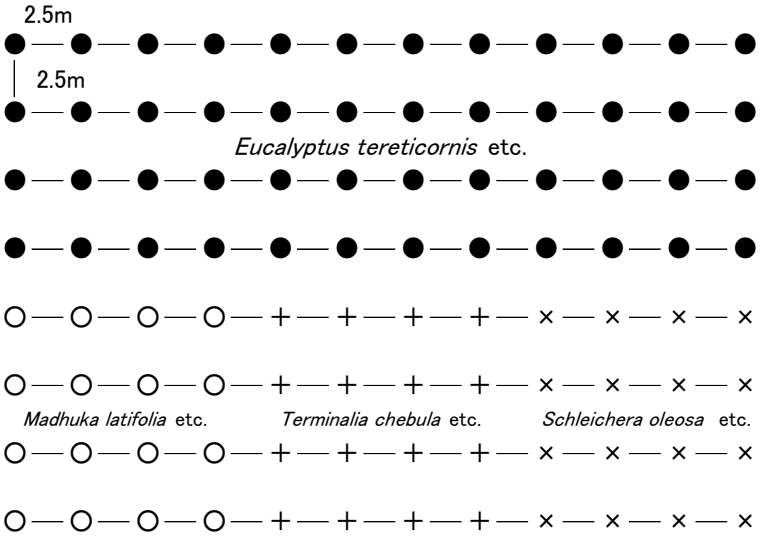
Afforestation Model	Area Proposed (ha)	Minimum viable area (ha)	Maximum number of JFMC	District to be covered	Division
A3. Quick growing & small timber spp. plantation in South Bengal	6,000	20	300	Paschhim Medinipore	Medninipore Rupnarayan Kharagpore Jhargram
				Bankura	Panchet Bankura N. Bankura S.
				Burdwan	Burdwan Durgapur
				Purulia	Purulia Kangsawati N. Kangsawati S.
				Birbhum	Birbhum

Soil & Climate: Red lateritic soil- deep reddish-yellow loamy to clayey soil together with Gneiss gravely soil- undulating topography with low soil depth, poor capacity for rain water retention, prone to severe soil erosion. Hot dry summer, moderate winter, rainfall-900 to 1500 mm spread over 150 to 180 days.
Species proposed: Miscellaneous species of economic importance like *Madhuka latifolia, Schleichera oleosa, Terminelia bellerica, Terminala chebula Pterocarpus marsupium etc and others with fast growing species producing fuel, fodder and small wood such as Acacia auriculiformis, Eucalyptus tereticornis, Terminalia arjuna, Anogeissus latifolia, Sapindus laurifolius, Schleichera oleosa, Buchanania lanzan, Azadirachta indica, Phyllanthus emblica, Haldina cordifolia,* etc.

This component has a strong social basis as well as a silvicultural basis. The species chosen can survive on fairly dry soil and will also fulfil the demand of fuel fodder and small wood of the society. Most of JFMC will derive benefit and therefore will be instrumental in protection of the plantations. Such areas are allocated to Miscellaneous Working Circle of the Working Plan prescription.

Extent: 6,000 ha of degraded forest land will be planted up under this model.

Technique: Seedlings will be planted in pits of size (0.60 m + 0.45 m) /2 x 0.45 m x 0.45 m (refer to Figure 6-5) at a spacing of 2.5 m x 2.5 m (1,600 plants / ha). The species mixture will be in alternating strips of Eucalyptus and miscellaneous hardwood species. In miscellaneous strips, blocks of 100 m2 having 16 plants of the same species in each block will be planted. Each strip will comprise of 4 lines.



NB. Planting species will be determined through discussion with JFMC
Example of Quick Growing Small timber, Fuel & Fodder Plantation

Management: The area treated through this model will fall under the category of Miscellaneous Working Circle of the Working Plan. Mechanical thinning, Silvicultural thinning and final felling shall be carried out as prescribed in relevant Working Plan. Harvested produce shall be disposed of as per the extant benefit sharing mechanism.

Survival Rate (target) - The survival rate for this model may be fixed as follows
1st year: 85% 3rd year: 80% 5th year: 75%

2.2.1 Key Points for discussion on A3 Model:

1. Main Species : As per MoD *Eucalyptus* sp. has been prescribed as the main Quick Growing Species (QGS). MoD states 50% *Eucalyptus* & 50% local miscellaneous species.

2. Proportion of Main QGS and other miscelleaneous spp: As per MoD 4 lines of Eucalyptus alternating with 4 lines of other QGS has been prescribed.

3. Planting age of main Species : MoD mentions 1 year old seedlings (Quality Planting Material) should be planted.

4. Planting pattern of miscellaneous species other than the main species: The MoD prescribes that these should be planted in blocks of 16 plants each

5. Ex-situ conservation of rare & endangered species : A point has arisen during informal discussions in various fora that the A3 plantation area is the place where rare and endangered spp. should be planted for biodiversity conservation

6. Contour Trench (C.T) : In the estimate given in the MoD against this model contour trenches of dimension 60 cm top, 45 cm bottom, 45 cm depth and 5m length has been prescribed.

2.3 Estimate Model A2: Plantation of Sal and Associates Species

The estimates provided in the MoD has considered some standards of pit size, spacing, labour and material, which are either not always attainable, or requires review based on the field conditions and output of labour. Therefore threadbare discussions on these aspects were long due. Apart from this, it was felt that some changes are required so far as the prescriptions of spp. proportion, ex-situ conservation, planting pattern, contour trenching etc. are concerned. These are also technical dimensions which would require discussion for proposing any modification. In fact the changes in technical parameters would have a direct bearing on the estimates. Thus revising the estimates has assumed much importance.

2.4 Estimate Model A3: Quick Growing Small Timber, Fuel and Fodder Plantation

It has been long felt that the prescription given against model A3(QGS) like spp. composition, proportion of main QGS and other miscellaneous spp., planting pattern and also plantable age of seedlings of main spp. need review, since many of them did not match with existing practice or are not practicable. Also the rates given in the detailed estimates and work output would require review for making it perfectly implementable. Threadbare technical discussion was therefore necessary to frame recommendations suggesting modification of estimates.

2.5 Production of Quality Planting Material (As described in the MOD of WBFBC Project)

General Description

Plantation creation programs, now-a-days, are largely dependent on seedlings raised in Central Nurseries where seedlings are better looked after and healthier than those raised in Field Nurseries. Besides, in Central Nurseries older seedlings may be available for planting and this essential requirement for slow growing species. *Shorea robusta* (Sal), *Madhuca indica* (Mohua), (*Schleichera triiuga*) Kusum etc. It has been seen that extra investments made for Central Nurseries are more than compensated by the performance of saplings in the plantation, in respect of survival, growth and health.

Seedling quality is primarily controlled by collection of seeds from seed trees /seed stands and from clonal orchards maintained for a variety of clones for Eucalyptus hybrid. Use of agro-sheds and production of seedlings in root trainers (Hycopots) in mist chambers have greatly improved the quality of seedling.

With this understanding, it has been proposed that all the afforestation models in South West & North Bengal except Enrichment of Sal Degraded Forest (A4) will be provided with Quality Planting Materials (QPM).

In this component, four activities are proposed such as 1) Capital cost of setting up hi-tech 20 modern central nurseries, 2) Capacity expansion of existing 20 hi-tech Nurseries, 3) Production of 1 year old quality Eucalyptus clone: 900,000 seedlings, 4) Production of 1 year old quality seedlings: 22,040,000 plants, 22,940,000 seedlings in total.

2.5.1 Key Points for discussion on Production of Quality Planting Material

1. Review of Estimate for raising QPM : Estimate for raising 1 yr old seedlings (QPM) and its cost of maintenance for 12 months has been prescribed in MoD as lump-sum as Rs 4.00 and Rs. 2.00 respectively at the base rate of May, 2011. The same for Eucalyptus clones is provided as Rs. 4.00 and Rs. 1.00 respectively. No detailed estimates have been provided.
2. Plantable age of QPM under A1, A2 and A3 models : MoD mentions that 1 year old seedlings/ramets (Quality Planting Material) should be planted.
3. Cost of making compost for potting mixture : Cost of production of compost for raising QPMs to be used in a particular year has to be provided in preceding year for raising QPM.

3. Recommendations

3.1 Group 1: Model A2 : Plantation of Sal and Associates Species

1. Sal may be planted in a block comprising 60% area and miscellaneous spp. may be planted in a block comprising 40% area.
2. Within the block of miscellaneous spp., pure sub-blocks of each species comprising 160 to 400 individual plants may be planted.
3. For ease of management, not more than 6 to10 miscellaneous spp. may be planted.
4. For ex-situ conservation of rare and endangered species a small sub-block (not more than 10% of the area of miscellaneous block) may be planted within the miscellaneous block containing at least 160 plants with intensive post plantation management.
5. Pit dimensions may be modified as 60 cm x 60 cm top, 45 cm x 45 cm bottom and 45 cm depth, from the prescribed dimensions of 75 cm x 75 cm top, 75cm x 60 cm bottom and 60 cm depth.
6. As shade providing plants, Arhar and other local legumes may be sown on the dug up soil of the contour trenches.
7. Contour Trenches (C.T) may be dug throughout the area of plantation @ 100 m3 /ha.
8. The C.T. expenditure may be booked under the component 1C: Soil and Moisture Conservation in Treatment areas.
9. Core manuring with compost should be done depending on availability of funds. This is applicable in case of both Sal & misc. spp.
10. As the current working plan does not prescribe any tending operation for Sal plantations an exercise should be undertaken by Research and Working Plan wings to ascertain the requirements for tending operation and better management to conserve biodiversity.
11. Boundary demarcation, by planting some spp. of local bamboo, palm, khejur etc. and even sowing of Akashmoni or Babla in thick lines, may be considered.
12. The present prescription of Sal & Associates plantations is under the Sal Coppice Working Circle. A2 plantations may also be taken up in other Working Circles where good soil depth is available.

3.2 Group 2: Model A3: Quick Growing Small Timber, Fuel and Fodder Plantation

1. *Acacia auriculiformis* (Akashmoni) may be considered as main QGS instead of Eucalyptus, since pure Eucalyptus is being taken up under A1 plantation (clonal). Moreover, there is higher demand for *Acacia auriculiformis* in the FPCs.
2. Considering this, there may be two sub-models depending on the site quality/soil condition of the planting area:
   a) A3(a) 50% Acacia and 50% of Miscellaneous species which should comprise of NTFP species to an extent of at least 10%.
   b) A3(b) 70% Acacia and 30% of Miscellaneous species which should comprise of NTFP species to an extent of at least 10%.
3. The variation from 30-50% for miscellaneous species (considering both the sub-models suggested) should be guided by the soil condition of the plantation area and site quality. Sufficient cost for execution of this model for fencing, watch and ward and Cattle Proof trenches should be made available.
4. Mixture of *Acacia auriculiformis* (50% - 70%) by area in pure block & local quick growing miscellaneous species (50**%** - 30%) by area should be followed. There may be 50 - 70 lines of Akashmoni, alternating with 50 - 30 lines of other local/endemic miscellaneous species.

5. Not less than 6 months old QPM of *Acacia auriculiformis*, grown from known and proven seed source should be grown in Central nursery (seed sown in December/January) in compost based potting media in 150 CC Root-trainers.
6. With *Acacia Auriculiformis* as main spp., Miscellaneous species, not less than one years old and raised in appropriate sized hycopots/ Root-trainers (300-500 cc, depending upon the species), should be planted.
7. For Miscellaneous species, the following planting pattern is suggested:
    a. Within the block of Miscellaneous spp. (comprising 30%-50% area), pure sub-blocks of each species comprising 160 to 400 individual plants may be planted. Selection of misc. species may be made on the basis of the predominant species in the area.
    b. Up to 6 quick growing & hardy local species can be tried in a particular plantation site.
8. A small sub-block (not more than 5% area) may be planted within the miscellaneous block. It should be decided by the Silvicuturist and also the seeds/QPM would be from trees/sources certified/supplied from Silviculturist in the area.
9. Soil conservation measures should be done as per the need and appropriate investment made as required as per standard estimate approved.
10. Regarding the core manuring, mulching etc., and other pre-plantation preparations the Silviculture protocols have to be followed which would be specific for the area.

3.3 Group 3: Estimate Model A2 : Plantation of Sal and Associates Species

The estimate of Model A2 provided in the MOD was reviewed by the group based on practical experience with regard to output of labour, cost of materials etc. of field level officers and the proposed changes in the prescriptions. The draft estimate is placed below:

Review of Estimate of A2 model of afforestation

Estimate of A2 model			Unit	Labour	Materiai
I.	**Advance Soil Works**				
	1	Survey and demarcation of the plantation area including GPS Survey by Technical person	L.S		500
	2	Alignment of planting lines and staking the pit positions	md	2	
	3	Advance Soil works by digging planting pits of size (0.90+0.60)/2 x 0.60 x0.60 m3 at 2.5.x 2.5 m spacing (1600 nos)	md	52	
	4	Cleaning & Burning of the pltn site	md	20	
	Sub Total of I			**74**	
II.	**Creation Works**				
	5	Filling up of planting pits with dug up pulverized soil	md	16	
	6	Staking the seedlings for plantation	md	2	
	7	Transplanting of potted seedlings in pits, including carriage	md		
	8	From field nursery to planting site	md	25	
	9	Vacancy infilling including application of insecticide, fertilizer etc	md	4	

	10	Sowing Arhar seeds for raising nurse crop	md	4	
	11	1st mulching, weeding, cleaning and application of fertilizer	md	18	
	12	Cleaning the plantation	md	15	
	13	2nd mulching, weeding, cleaning and application of fertilizer	md	16	
	14	3rd mulching, cleaning, weeding	md	14	
	15	Making 3m wide inspection path and cutting firelines	md	5	
	16	Erection of barbed wire fencing including carriage of fencing posts	md	8	
	17	Making trenches across the contour of size 2.0m x (0.60+0.45)/2 x 0.45 m of appropriate running metre			
	18	Watering the seedlings in the field during dry spell with 15 days interval, as and when required	md	30	
	19	Cost of fencing post	L.S		2000
	20	Cost of barbed wire along with plain wire all complete with appropriate running metre with brushwood	L.S		7000
	21	Cost of Arhar seeds	L.S		200
	22	Digging dug well/shallow tube well including labour	L.S		13000
	23	Cost of carriage of manure, insecticide, post, fencing materials and other contingencies	L.S		1200
	24	Cost of manure/fertilizer and insecticides			4000
	Sub Total of II			**157**	**27900**
	Sub Total of I+II			**231**	

Total without trench (per ha)

Mandays Rs. 49,836.00 (231 @Rs.216)
Material Rs. 27,900.00
Total Rs. 77,736.00

Alternative of Item No.3:

3a. 60% Trench (0.45mX0.45mX2400mtr) = 100 mandays @ 216 = Rs. 21,600.00
3b. 40% pits (640/ha.) = 21 mandays @216 = Rs. 4,536.00
3a+3b = Rs. 26,136.00

Total per ha. Rs. 92,640.00

3.4 Group 4: Estimate Model A3: Quick Growing Small Timber, Fuel and Fodder Plantation

The estimate of Model A3 provided in the MOD was reviewed by the group based on practical experience with regard to output of labour, cost of materials etc. of field level officers and the proposed changes in the prescriptions. The draft estimate is presented below:

Review of Estimate of A3 model of afforestation

			Unit		Amount	
				Labour	Labour	Material
I.	**Creation**					
	1	Survey and demarcation of the plantation area	md	1	216	
	2	cleaning	md	5	1080	
	3	Digging of pits of size (0.6+0.45)/2 x 0.45 x 0.45	md	45	9720	
	4	Filling up of planting pits with dug up pulverized soil	md	15	3240	
	5	Cleaning the plantation area before planting	md	4	864	
	6	Local carriage of seedling by			0	1500
	7	Transplanting of potted seedlings	md	10	2160	
	8	Infilling of vacancy created due to field mortality including carriage	md	4	864	
	9	1st mulching by digging earth around pits and cleaning, weeding and application of fertilizer	md	26	5616	
	10	2nd mulching, cleaning, weeding including application of 2nd dose of fertilizer	md	12	2592	
	11	Cutting firelines 3 m wide to prevent accidental fire	md	6	1296	
	12	watch and ward	md	6	1296	
	13	Making livehedge fencing	md	3	648	
	14	Cost of insecticide, fertilizer including carriage	LS		0	5000
	15	Cost of materials like Ipomoea sp for live hedge fence	LS		0	
	16	Cost of Bamboo for live hedge fencing - 3 nos	nos		0	
	Sub-Total			**137**	**29592**	**6500**
	17	Contingencies Rope/tin/watering can/thatch & carriage of seedling etc (5 %)	LS		1479.6	520
					31072	7020
	TOTAL					38092

3.5 Group 5: Production of Quality Planting Material

1. It has been suggested by the technical **Group 2** that *Acacia auriculiformis* may be planted as main species under A3. As the spps. grows very fast in nursery as well in plantation, the plantable age of *Acacia auriculiformis* seedlings in A3 plantation should be about 6 months. The QPMs of this spps. should be grown in Central Nurseries for one

season only during which it would attain proper plantable height & collar diameter. If the seedlings are retained for more than one growing season, the seedlings will be lanky.

2. Plantable age of Sal seedlings: The MoD prescribes that 1 year old nursery grown Sal seedlings should be planted under A2 model. A suggestion for planting the Sal seedlings of less than one year age was discussed. The technicality of using current year Sal seedlings in A2 Plantation vis-à-vis 1-year old QPM raised in 300 cc root-trainers rests on the fact that Sal seeds are obtained towards the end of May and planting done in July, i.e barely two months growth is attainable prior to planting out. The 2-3 months old seedlings will stand a poor chance of survival in the harsh conditions of the field. It is therefore recommended that age of QPMs of Sal raised in Central Nurseries should be of two growing seasons i.e. 1-year old.
3. The plantable age of Eucalyptus clones in A1 plantation: As the spps. grows very fast in nursery as well as in plantations, the plantable age of *Eucalyptus* ramets in A1 plantation should not be more than 6 months. 3-6 month old ramets have been found to give good result in the field. Therefore we may do away with growing 1 year old *Eucalyptus* ramets in nursery.
4. For planting about 6 months old *Acacia auriculiformis* seedlings, estimate of Production of 1 yr old seedling has been reviewed. The details of cost calculations are given below. Also the cost of maintenance of these QPMs has been reviewed. The cost calculations have been done on the basis of current rates.
5. The age of QPM of different miscellaneous spp. may however be continued to be kept as 1 year (2 growing Seasons).
6. Few slow growing spp. may be considered to be grown for 4 growing seasons.
7. Cost of production of compost for raising QPMs to be used in a particular year has to be provided in preceding year for raising QPM. Cost of production of compost has been calculated as Rs. 4000.00 per m3, details of which are given below. This cost will form the part of the cost of production of QPM. The cost calculations have been done on the basis of current rates.
8. The estimates for raising seedlings for one, two and three seasons have been prepared. The cost calculations have been done on the basis of current rates. Accordingly the cost of raising and maintenance should be as follows :

Sl. No.	**Item**	**Unit**	**Unit Cost**	**150 cc**		**300 cc**		**500cc**	
	Rate for 2000 nos. Seedlings			m/d	Amt	md	amt	md	amt
1	Preparation of potting mixture	md	216	2	432	4	864	6	1296
2	Supply of coarse sand	cu.m.	1000	0.1	100	0.2	200	0.33	330
3	Supply of compost	cu.m.	2000	0.1	200	0.2	400	0.33	660
4	Supply of burnt rice husk	cu.m.	600	0.1	60	0.2	120	0.33	198
5	Filling of hycopot	md	216	8	1728	12	2592	14	3024
6	Collection of seeds				1000		1000		1000
7	Treatment of seeds				150		150		150
8	Sowing of seeds in mother bed	md	216	1	216	1	216	1	216
9	Pricking out and transplanting of seedlings	md	216	3	648	3	648	3	648
10	Supply of insecticides				500		750		750
11	Spraying of insecticides	md	216	1	216	2	432	2	432

12	Watering	md	216	12	2592	18	3888	25	5400
13	Weeding and cleaning	md	216	4	864	6	1296	10	2160
14	Sorting and shifting	md	216	3	648	6	1296	8	1728
15	Contingencies for supply of spraying machine etc.				1000		1000		1000
	Total				10354		14852		18992
	Rate /seedling				5.177		7.426		9.496

Thus the rates are recommended as follows:

One season – Rs. 5.20 in 150 cc root trainer (including maintenance)
Two seasons – Rs. 7.50 in 300 cc root trainer (including maintenance)
Three seasons – Rs. 9.50 in 500 cc root trainer (including maintenance)

4. Acceptance of Recommendations

4.1 Acceptance of the Recommendations: Group 1

1. Sal should be planted in blocks comprising of 60% area and miscellaneous spp. should be planted in blocks comprising of 40% area.
2. 1600 plants per ha at spacing 2.5 m x 2.5 m should be followed.
3. Within the block of miscellaneous spp., pure sub-blocks of each species comprising 160 to 400 individual plants should be planted. These blocks may also be developed as future Seed Production Areas (SPAs), for which the planting material should be supplied by the Silviculture Divisions.
4. For ease of management, no. of miscellaneous spp. in a particular plantation area should be restricted between 6 to10.
5. For ex-situ conservation of rare and endangered species a small sub-block (not more than 10% of the area of the miscellaneous block) should be planted within the miscellaneous block containing at least 160 plants with intensive post plantation management. The seedlings for this purpose should be supplied by the Silviculture Divisions.
6. Pit dimensions should be modified as (60+45)/2 cm x 45 cm x 45 cm.
7. For providing shade to Sal plants, Arhar or any local legume species should be sown on the dug up soil of the contour trenches.
8. Discontinuous Contour Trenches of 5.0 m length and 0.45 m width and 0.45 m depth should be dug all over the plantation area @ 100 m3 /ha. in a staggered manner, the lines being at 10.0 m interval. This is done to check run off, arrest soil and conserve moisture.
9. The of planting Sal seedlings in trenches, as suggested during plenary session, should be considered only after the trial are carried out by the Research Wing and the model is assessed on the parameters of cost and growth etc.
10. Core manuring with compost should be considered only after the recommendations of the Research Wing on the basis of experiments to be carried out by it and also depending on availability of funds.
11. As the current working plan does not prescribe any tending operation for Sal plantations, an exercise should be undertaken by Research and Working Plan Wings to ascertain the requirements for tending operations.
12. Boundary demarcation, by planting some spp. of local bamboo, palm, khejur etc. and even sowing of Akashmoni or Babla in thick lines, should be carried out.
13. The present prescription of Sal & Associates plantations is under the Sal Coppice Working Circle. A2 plantations should also be taken up in other working circles where good soil depth is available.

4.2 Acceptance of the Recommendations: Group 2

1. *Acacia auriculiformis* (Akashmoni) should be considered as main QGS instead of Eucalyptus, since pure Eucalyptus is being taken up under A1 plantation (clonal) and moreover, there is higher demand for Acacia in the FPCs.
2. Model A3 should have 70% *Acacia auriculiformis* and 30% of quick growing local miscellaneous species in separate blocks. The blocks (Acacia and Miscellaneous spp) should, however, be contiguous and should not be at a different location.
3. QPM of *Acacia auriculiformis* about 6 months old should be planted for this model. The QPM should be grown in central nursery (seed sown in December/January) in compost

based potting media in 150 CC root-trainers. with seeds collected from known and proven seed source.

4. Miscellaneous species, 6-12 months old and raised in appropriate sized root-trainers (150-300 cc, depending upon the species), should be planted.
5. Prescription of planting 1600 seedlings per ha at a spacing of 2.5 m x 2.5 m should be followed.
6. Within the block of miscellaneous spp., pure sub-blocks of each species comprising 160 to 400 individual plants should be planted.
7. The miscellaneous block should be properly fenced and provision of watering should also be included for this block.
8. For ease of management, no. of miscellaneous spp. in a particular plantation area should be restricted up to a maximum of 6. Such species should be included/decided by DFO as per the working plan prescription and based on the preference of the community and on the basis of the predominance of the species in the area.
9. For ex-situ conservation of rare and endangered species, including NTFP spp., a small sub-block (not more than 5% of the area of the miscellaneous block) should be planted within the miscellaneous block containing at least 160 plants of each spps. The seedlings for this purpose should be supplied by the Silviculture Divisions.
10. Pit dimensions should be modified as (60+45)/2 cm x 45 cm x 45 cm.
11. Discontinuous Contour Trenches of 5.0 m length and 0.45 m width and 0.45 m depth should be dug all over the plantation area @ 100 m3 /ha. in a staggered manner, the lines being at 10.0 m interval. This is done to check run off, arrest soil and conserve moisture.
12. Core manuring with compost should be considered only after the recommendations of the Research Wing on the basis of experiments to be carried out by it and also depending on availability of funds.
13. As the current working plan does not prescribe any tending operation for miscellaneous spp., an exercise should be undertaken by Research and Working Plan Wings to ascertain the requirements for tending operations.
14. Boundary demarcation, by planting some spp. of local bamboo, palm, khejur etc. and even sowing of Akashmoni or Babla in thick lines, should be carried out.

4.3 Acceptance of the Recommendations: Group 3

The technical prescriptions for model A2 (Sal Plantation) were accepted by the members on the basis of the recommendations of Group 1. PMU and PMC were requested to refine the details of activities and work out the cost per ha within a reasonable amount by modifying the estimate in the light of accepted technical prescriptions.

The PMU and PMC were also requested to revisit the estimates for maintenance in Year 1, Year 2 and Year 3 on the basis of the accepted prescription of the model.

The modified estimates have been furnished in Chapter 6.

4.4 Acceptance of the Recommendations: Group 4

The technical prescriptions for model A3 were accepted by the members on the basis of the recommendations of Group 2. PMU and PMC were requested to refine the details of activities and work out the cost per ha within a reasonable amount by modifying the estimate in the light of accepted technical prescriptions.

It was also recommended by the house that apart from the estimates of the models A2 and A3, the PMC and PMU should refine the estimates for the models A4- Enrichment of degraded Sal coppice forest in South West Bengal through Coppice Regeneration and A1- High yielding Eucalyptus hybrid clones plantation in South West Bengal.

The PMU and PMC were also requested to revisit the estimates for maintenance in Year 1, Year 2 and Year 3 on the basis of the accepted prescription of the model.

The modified estimates have been furnished in Chapter 6.

4.5 Acceptance of the Recommendations: Group 5

1. *Acacia auriculiformis* should be planted as main species under model A3. As the spps. grows very fast in nursery as well in plantation, the plantable age of *Acacia auriculiformis* seedlings in A3 plantation should be about 6 months. The QPMs of this spps. should be grown in Central Nurseries for one season only (December/January to June/July) during which it would attain proper plantable height & collar diameter.
2. The age of QPMs of Sal raised in Central Nurseries should be of two growing seasons i.e. 1-year old.
3. The plantable age of *Eucalyptus* ramets in A1 plantation should not be more than 6 months. The planting of 1 year old *Eucalyptus* ramets is not required.
4. The age of QPM of different misc. spps. should however be continued to be kept as 6 months (one growing season) to 1 year (2 growing seasons) depending on the growth rate of the species.
5. Slow growing spp. especially for high hill regions should be considered to be grown for 2 years (4 growing seasons).
6. Cost of production of compost for raising QPMs to be used in a particular year has to be provided in preceding year for raising QPM. Cost of production of compost will form the part of the cost of production of QPM. PMC and PMU should refine the details of cost of compost making.
7. The estimates for raising seedlings for one, two and four growing seasons should be refined by PMU and PMC giving the details of activities and work out the cost per seedling.

   The modified estimates have been furnished in Chapter 6.

5. Resulting technical prescriptions

5.1 Technical prescription for Plantation of Sal and Associates Species: A2 Model

Soil & Climate: Red lateritic soil- deep reddish-yellow loamy to clayey soil together with alluvium of Damodar, Kangsabati, Ajoy, Rupnarain rivers; well drained, low in organic matter and also in K and P. Hot dry summer, moderate winter, rainfall- 900 to 1500 mm spread over 150 to 180 days.

Proposed Species: Sal with associates like *Pterocarpus marsupium, Ougeinia oojeinensis Dalbergia latifolia, Madhuka latifolia, Terminalia bellerica Terminalia chebula, Anogeissus latifolia, Schleichera oleosa, Buchanania lanzan, Semecarpus anacardium, Soymida febrifuga* etc. The above list is illustrative only. Choice of species, however, will be guided by the community preference, subject to the fulfilment of silvicultural requirements, never to exceed the maximum allowable 10 miscellaneous species in any given plantation area.

These are endemic species having community preference fulfilling much of their livelihood needs. Sizable numbers of JFMCs are functioning in the area in manageable clusters and as a result older plantations in the area are growing remarkably well. Such forest areas are allocated to Sal Working Circle of the Working Plan prescription. A2 plantations should also be taken up in other working circles where good soil depth is available.

Extent: 3,430 ha of degraded forest land has been proposed under this model

Technique: This will be a mixed plantation, *Shorea robusta* being the main constituent with other natural associates. Sal to be planted in blocks comprising 60% area and miscellaneous spp. to be planted in blocks comprising 40% area. 1600 plants per ha at spacing 2.5 m x 2.5 m to be followed. The species mixture will be in strips of 6 lines of Sal alternating with strips of 4 lines of miscellaneous hardwood spp. Associates to be planted in groups (preferably 160 – 400 plants per spp. in each block of 4 lines). For ease of management, no. of miscellaneous spp. in a particular plantation area to be restricted between 6 to10. For ex-situ conservation of rare and endangered species a small sub-block (not more than 10% of the area of miscellaneous species) may be planted within the miscellaneous block containing at least 160 plants. The seedlings for this purpose should be supplied by the Silviculture Divisions. The pit dimensions should be modified as (60+45)/2 cm x 45 cm x 45 cm.

For providing shade to Sal plants, Arhar or any local legume species should be sown on the dug up soil of the contour trenches.

Boundary demarcation, by planting some spp. of local bamboo, palm, khejur etc. and even sowing of Akashmoni or Babla in thick lines, should be carried out.

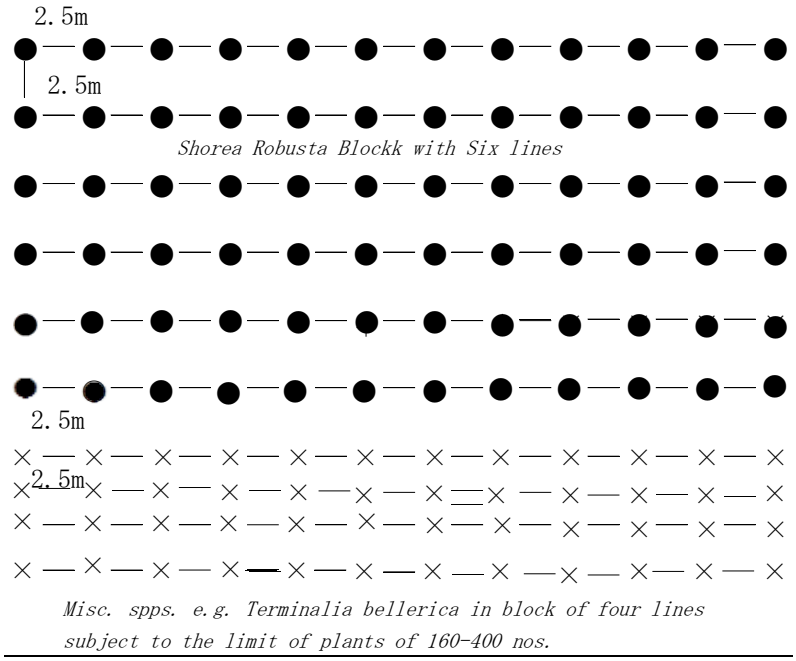


Figure Plantation Pattern A2

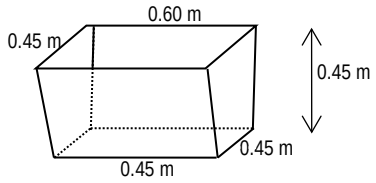
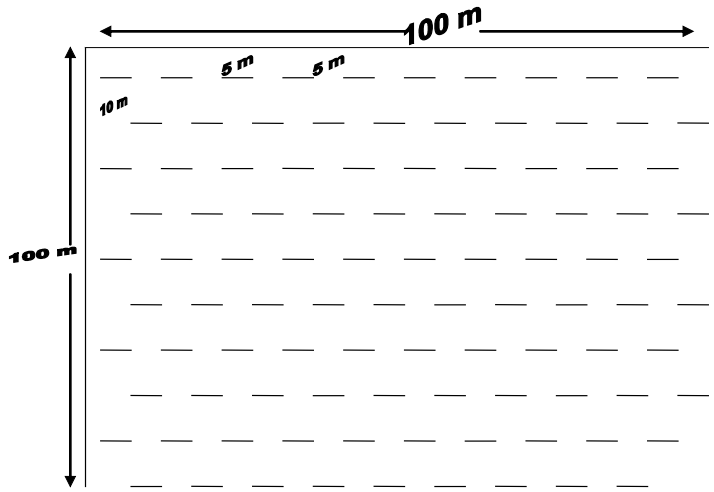


Figure Plantation Pit

Afforestation and reforestation activities will be confined to degraded forest areas with signs of sheet erosion and rill erosion of different intensities. There is a need therefore to adopt simple soil and moisture conservation measures in the form of Contour trenches.

For the A2 Plantation of Sal and Associate Species in South West Bengal, the component of soil conservation activities has been provided with above soil and moisture conservation measures in the form of contour trenches.

Contour trench: Discontinuous Contour Trenches of 5.0 m length and 0.45 m x 0.45 m size are dug all over the plantation area @ 100 m3 /ha. in a staggered manner, the lines being at 10.0 m interval. This is done to check run off, arrest soil and conserve moisture as shown in figure below:



Survival Rate (target): The survival rate for this model may be fixed as follows -

1st year: 90% 3rd year: 85% 5th year: 75%

Management: Silvicultural operations and final felling will be done as per Working Plan prescription. As the current working plan does not prescribe any tending operation for Sal plantations, an exercise should be undertaken by Research and Working Plan Wings to ascertain the requirements for tending operations. Revenue will be shared as per the extant rules.

5.2 Technical prescription for Quick Growing Small Timber, Fuel and Fodder Plantation: A3 Model

Soil & Climate: Red lateritic soil - deep reddish-yellow loamy to clayey - together with Gneiss gravely soil; undulating topography with low soil depth, poor capacity for rain water retention, prone to severe soil erosion. Hot dry summer, moderate winter, rainfall-900 to 1500 mm spread over 150 to 180 days.

Species proposed: In addition to *Acacia auriculiformis* as main spps., miscellaneous fast growing species producing fuel, fodder and small wood such as *Terminalia bellerica, Pterocarpus marsupium, Terminalia arjuna, Azadirachta indica, Casia siamea, Holoptelia integrefolia* etc. will be planted. The above list is illustrative only. Choice of species, however, will be guided by the community preference, subject to the fulfilment of silvicultural requirements, never to exceed the maximum allowable 6 misc. in any given plantation area.

This component has a strong social basis as well as a silvicultural basis. The species chosen can survive on fairly dry soil and will also fulfill the demand of fuel fodder and small wood of the society. Most of the JFMC will derive benefit and therefore will be instrumental in protection of the plantations. Such areas are generally allocated to Development Working Circle of the Working Plan prescription. However the choice of the model will depend on the soil condition of the area.

Extent: 6,000 ha of degraded forest land will be planted up under this model.

Technique: This will be a mixed plantation, *Acacia auriculiformis* being the main spps., with miscellaneous fast growing species, to be planted in distinct blocks. Akashmoni to be planted in blocks comprising 70% area and miscellaneous spp. to be planted in distinct blocks comprising 30% area. The blocks (Acacia and Miscellaneous spp) should, however, be contiguous and should not be at a different location. 1600 plants per ha at spacing 2.5 m x 2.5 m to be followed. Within the block of miscellaneous spp., pure sub-blocks of each species comprising 160 to 400 individual plants to be planted. For ease of management, no. of miscellaneous spp. in a particular plantation area should be restricted to 6. For ex-situ conservation of rare and endangered species a small sub-block (not more than 5% of the area of the miscellaneous block) may be planted within the miscellaneous block containing at least 160 plants of a spps. The seedlings for this purpose should be supplied by the Silviculture Divisions. Boundary demarcation, by planting some spp. of local bamboo, palm, khejur etc. and even sowing of Akashmoni or Babla in thick lines, should be carried out. Pit dimensions should be (60+45)/2 cm x 45 cm x 45 cm.

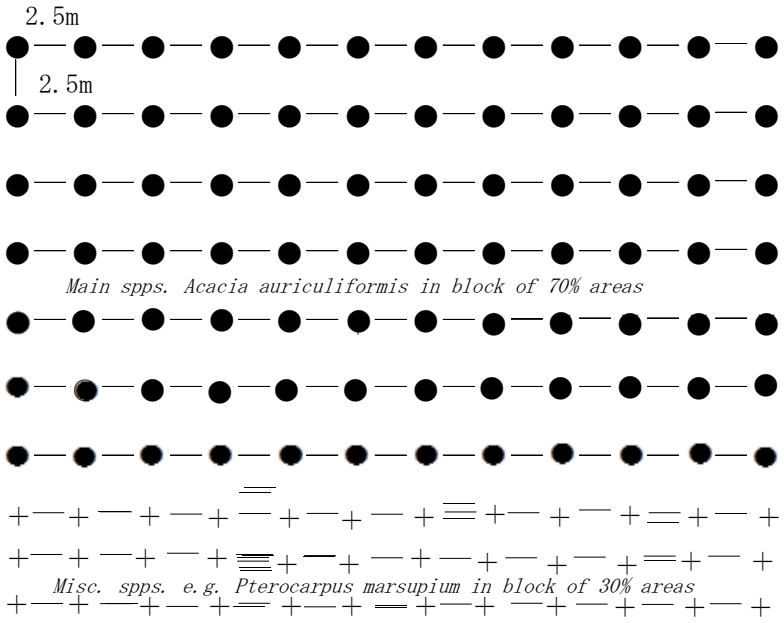


Figure Plantation Pattern A3

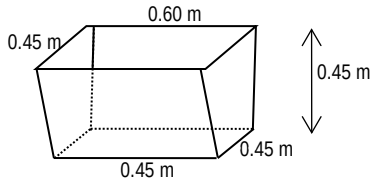
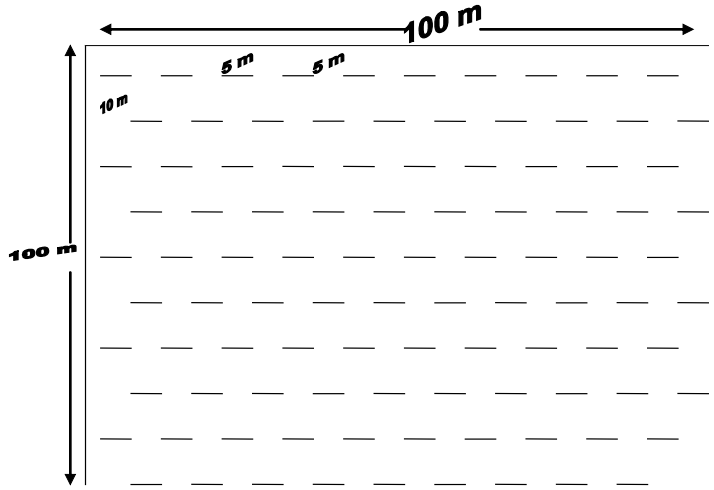


Figure Plantation Pit

Afforestation and reforestation activities will be confined to degraded forest areas with signs of sheet erosion and rill erosion of different intensities. There is a need therefore to adopt simple soil and moisture conservation measures in the form of Contour Trenches.

For the A3 Plantation of Quick Growing Small Timber, Fuel and Fodder Plantation in South West Bengal, the component of soil conservation activities has been provided with above soil and moisture conservation measures in the form of contour trenches.

Contour trench: Discontinuous Contour Trenches of 5.0 m length and 0.45 m x 0.45 m size are dug all over the plantation area @ 100 m3 /ha. in a staggered manner, the lines being at 10.0 m interval. This is done to check run off, arrest soil and conserve moisture as shown in figure below:



Survival Rate (target) - The survival rate for this model may be fixed as follows -

1st year: 90% 3rd year: 85% 5th year: 75%

Management: Silvicultural operations and final felling will be done as per Working Plan prescription. As the current working plan does not prescribe any tending operation for miscellaneous spp. in A3 plantations, an exercise should be undertaken by Research and Working Plan Wings to ascertain the requirements for tending operations. Revenue will be shared as per the extant rules.

5.3 Technical prescription for Production of Quality Planting Material

General Description
Plantation creation programs, now-a-days, are largely dependent on seedlings raised in Central Nurseries where seedlings are better looked after and healthier than those raised in Field Nurseries. Besides, in Central Nurseries older seedlings may be available for planting and this essential requirement for slow growing species. *Shorea robusta* (Sal), *Madhuca indica* (Mohua), *Schleichera trijuga* (Kusum) etc. It has been seen that extra investments made for Central Nurseries are more than compensated by the performance of saplings in the plantation, in respect of survival, growth and health.

Seedling quality is primarily controlled by collection seeds from seed trees /seed stands and from clonal orchards maintained for a variety of clones for Eucalyptus hybrid. Use of agro-sheds and production of seedlings in root trainers (Hycopots) have greatly improved the quality of seedling.

With this understanding, it has been proposed that all the afforestation models in South West & North Bengal except Enrichment of Sal Degraded Forest (A4) will be provided with Quality Planting Materials (QPM).

In this component, four activities are proposed such as

1) Capital cost of setting up 20 Central Nurseries,
2) Capacity expansion of existing 20 Central Nurseries,

3) Production of 1 year old quality Eucalyptus clone: 900,000 ramets,
4) Production of 1 growing season / two growing seasons / four growing seasons old quality seedlings: 22,040,000 seedlings.

6. Resulting estimates

The estimates for Creation and Maintenances of Year1, Year 2 and Year 3 for Models A1, A2, A3 and A4 as well as for Production of QPM for 1 growing season and 2 growing seasons were revisited by the PMU in consultation with Team Leader and Forestry Expert, PMC and the respective group members. The final estimates are attached in following pages.

6.1 Estimate for High Yielding Eucalyptus Hybrid Clones Plantation: A1 Model

6.1.1 Estimate for High Yielding Eucalyptus Hybrid Clones Plantation:A1 Model - Creation

Category	Sl. No.	Item	Quantity	Unit	Type	Output per manday	Required Mandays	Rate	Amount (Rs.)
Advance	1	Survey and demarcation of the plantation area including GPS Survey by Technical person	1.00	ha	Labour	1.00	1.00	216.00	216.00
Advance	2	Alignment of planting lines and staking the pit positions	1,600.00	nos	Labour	1,600.00	1.00	216.00	216.00
Advance	3	Advance Soil works by digging planting pits of size (0.60+0.45)/2 x 0.45 x0.45 m3 at 2.5.x 2.5 m spacing (1600 nos)	1,600.00	nos	Labour	35.00	46.00	216.00	9,936.00
Advance	4	Cleaning of the pltn site and making inspection path	1.00	ha	Labour	0.17	6.00	216.00	1,296.00
Creation	5	Filling up of planting pits with dug up pulverized soil	1,600.00	nos	Labour	100.00	16.00	216.00	3,456.00
Creation	6	Transplanting of potted seedlings in pits, including carriage of Root Trainers to planting site and collection and recarriage of Root Trainers to local store site	1,600.00	nos	Labour	80.00	20.00	216.00	4,320.00
Creation	7	Carriage of Seedlings from Central Nursery to Planting site including loading and unloading and return of Stand and Root Trainers to Central Nursery	1,600.00	nos	Material			LS	1,200.00
Creation	8	Vacancy infilling	110.00	nos	Labour	55.00	2.00	216.00	432.00
Creation	9	1st mulching, weeding, cleaning and application of fertilizer	1,600.00	nos	Labour	100.00	16.00	216.00	3,456.00
Creation	10	2nd mulching, weeding, cleaning and application of fertilizer	1,600.00	nos	Labour	133.00	12.00	216.00	2,592.00
Creation	11	Cutting firelines 3.0 m wide	250.00	rmt	Labour	125.00	2.00	216.00	432.00
Creation	12	Carriage of fertiliser, insecticide etc.	LS		Material			LS	250.00
Creation	13	Cost of fertilizer, insecticides etc.	LS		Material			LS	2,000.00
Creation	14	Watch & Ward (1 md per 10 ha) for 6 months	LS		Labour		18.00	216.00	3,888.00
Creation	15	Sowing Khijure/ Akashmoni/Babla on boundary including supply and carriage of all materials	LS		Labour		1.00	216.00	216.00
Advance	16	Contingencies - Labour	LS		Labour			LS	136.00
Advance	17	Contingencies - Material	LS		Material			LS	200.00
Creation	18	Contingencies - Labour	LS		Labour			LS	108.00
Creation	19	Contingencies - Material	LS		Material			LS	150.00
		Total							**34,500.00**

ABSTRACT					
		Labour (No.)	**Labour (Amount Rs.)**	**Material (Amount Rs.)**	**Total (Rs.)**
Advance		54.00	11,664.00	0.00	11,664.00
Contingency		0.00	136.00	200.00	336.00
Total Advance		**54.00**	**11,800.00**	**200.00**	**12,000.00**
Creation		87.00	18,792.00	3,450.00	22,242.00
Contingency		0.00	108.00	150.00	258.00
Total Creation		**87.00**	**18,900.00**	**3,600.00**	**22,500.00**
Grand Total		**141.00**	**30,700.00**	**3,800.00**	**34,500.00**

6.1.2 Estimate for High Yielding Eucalyptus Hybrid Clones Plantation:A1 Model- Maint. Year 1

Estimate of A1 1st Year Maintenance									
Category	**Sl. No.**	**Item**	**Quantity**	**Unit**	**Type**	**Output per manday**	**Required Mandays**	**Rate**	**Amount (Rs.)**
Maint. Y1	1	Vacancy infilling	80.00	nos	Labour	80.00	1.00	216.00	216.00
Maint. Y1	2	1st weeding, cleaning, mulching, with application of fertilizer	1,600.00	nos	Labour	100.00	16.00	216.00	3,456.00
Maint. Y1	3	2nd weeding, cleaning	1,600.00	nos	Labour	133.00	12.00	216.00	2,592.00
Maint. Y1	4	Cutting of firelines 3.0 m wide	500.00	rmt	Labour	250.00	2.00	216.00	432.00
Maint. Y1	5	Cost of fertilizer and insecticide etc. including carriage	LS		Material			LS	250.00
	6	Contingency							54.00
		Total							**7,000.00**

		ABSTRACT							
				Labour (No.)	**Labour (Amount Rs.)**	**Material (Amount Rs.)**	**Total (Rs.)**		
		Maint. Y1		31.00	6,696.00	250.00	6,946.00		
		Contingency				54.00	54.00		
						304.00	**7,000.00**		

6.1.3 Estimate for High Yielding Eucalyptus Hybrid Clones Plantation:A1 Model- Maint. Year 2

Estimate of A1 2nd Year Maintenance									
Category	**Sl. No.**	**Item**	**Quantity**	**Unit**	**Type**	**Output per manday**	**Required Mandays**	**Rate**	**Amount (Rs.)**
Maint. Y2	1	Vacancy infilling	80.00	nos	Labour	80	1.00	216.00	216.00
Maint. Y2	2	1st weeding, cleaning, mulching	1,600.00	nos	Labour	100	16.00	216.00	3,456.00
Maint. Y2	4	Cutting of firelines 3.0 m wide	1,000.00	rmt	Labour	250	4.00	216.00	864.00
	5	Contingency							64.00
		Total							**4,600.00**

		ABSTRACT							
				Labour (No.)	**Labour (Amount Rs.)**	**Material (Amount Rs.)**	**Total (Rs.)**		
		Maint. Y2		21.00	4,536.00	0.00	4,536.00		
		Contingency				64.00	64.00		
						64.00	**4,600.00**		

6.2 Estimate for Plantation of Sal and Associates:A2 Model

6.2.1 Estimate for Plantation of Sal and Associates:A2 Model- Creation

Category	Sl. No.	Item	Quantity	Unit	Type	Output per manday	Required Mandays	Rate	Amount (Rs.)
Advance	1	Survey and demarcation of the plantation area including GPS Survey by Technical person	1.00	ha	Labour	1.00	1.00	216.00	216.00
Advance	2	Alignment of planting lines and staking the pit positions	1,600.00	nos	Labour	1,600.00	1.00	216.00	216.00
Advance	3	Advance Soil works by digging planting pits of size (0.60+0.45)/2 x 0.45 x0.45 m3 at 2.5.x 2.5 m spacing (1600 nos)	1,600.00	nos	Labour	40.00	40.00	216.00	8,640.00
Advance	4	Cleaning of the pltn site and making inspection path	1.00	ha	Labour	0.13	8.00	216.00	1,728.00
Creation	5	Filling up of planting pits with dug up pulverized soil	1,600.00	nos	Labour	100.00	16.00	216.00	3,456.00
Creation	6	Transplanting of potted seedlings in pits, including carriage of Root Trainers to planting site and collection and recarriage of Root Trainers to local store site	1,600.00	nos	Labour	80.00	20.00	216.00	4,320.00
Creation	7	Carriage of Seedlings from Central Nursery to Planting site including loading and unloading and return of Stand and Root Trainers to Central Nursery	1,600.00	nos	Material			LS	1,600.00
Creation	8	Vacancy infilling	165.00	nos	Labour	55.00	3.00	216.00	648.00
Creation	9	Sowing Arhar seeds for raising nurse crop	500.00	rmt	Labour	250.00	2.00	216.00	432.00
Creation	10	Supply of Arhar seeds	5.00	kg	Material			LS	500.00
Creation	11	1st mulching, weeding, cleaning and application of fertilizer	1,600.00	nos	Labour	80.00	20.00	216.00	4,320.00
Creation	13	2nd mulching, weeding, cleaning and application of fertilizer	1,600.00	nos	Labour	100.00	16.00	216.00	3,456.00
Creation	14	3rd mulching, cleaning, weeding	1,600.00	nos	Labour	115.00	14.00	216.00	3,024.00
Creation	15	Cutting firelines 3.0 m wide	500.00	rmt	Labour	125.00	4.00	216.00	864.00
Creation	16	Erection of live hedge (ipomea, vitex, thorny spps.) fencing with bamboo/bamboo posts including local carriage of all material	400.00	rmt	Labour	100.00	4.00	216.00	864.00
Creation	17	Material for live fencing including carriage upto site	LS		Material			LS	2,000.00
Creation	18	Watering the seedlings in the field during dry spell with 15 days interval, for 3 months i.e. for about 6 days	1,600.00	nos	Labour	400.00	24.00	216.00	5,184.00
Creation	19	Digging dug well/shallow tube well - Labour	LS		Labour		30.00	216.00	6,480.00
Creation	20	Digging dug well/shallow tube well - Material			Material			LS	3,520.00
Creation	21	Carriage of manure, including cowdung manure, insecticide etc.	LS		Material			LS	500.00
Creation	22	Cost of manure including cowdung manure, fertilizer and insecticides etc.	LS		Material			LS	4,000.00
Creation	23	Watch & Ward (1 md per 10 ha) for 6 months	LS		Labour		18.00	216.00	3,888.00
Creation	24	Planting/sowing Bamboo/ Khijure/Akashmoni/Babla on boundary including supply and carriage of all materials	LS		Labour		4.00	216.00	864.00
Advance	25	Contingencies - Labour	LS		Labour			LS	100.00
Advance	26	Contingencies - Material	LS		Material			LS	100.00
Creation	27	Contingencies - Labour	LS		Labour			LS	30.00
Creation	28	Contingencies - Material	LS		Material			LS	50.00
		Total							**61,000.00**

ABSTRACT					
		Labour (No.)	**Labour (Amount Rs.)**	**Material (Amount Rs.)**	**Total (Rs.)**
Advance		50.00	10,800.00	0.00	10,800.00
Contingency		0.00	100.00	100.00	200.00
Total Advance		**50.00**	**10,900.00**	**100.00**	**11,000.00**
Creation		175.00	37,800.00	12,120.00	49,920.00
Contingency		0.00	30.00	50.00	80.00
Total Creation		**175.00**	**37,830.00**	**12,170.00**	**50,000.00**
Grand Total		**225.00**	**48,730.00**	**12,270.00**	**61,000.00**

6.2.2 Estimate for Plantation of Sal and Associates:A2 Model- Maint. Year 1

Estimate of A2 1st Year Maintenance									
Category	**Sl. No.**	**Item**	**Quantity**	**Unit**	**Type**	**Output per manday**	**Required Mandays**	**Rate**	**Amount (Rs.)**
Maint. Y1	1	Vacancy infilling	160.00	nos	Labour	80.00	2.00	216.00	432.00
Maint. Y1	2	1st weeding, cleaning, mulching, with application of fertilizer	1,600.00	nos	Labour	90.00	18.00	216.00	3,888.00
Maint. Y1	3	2nd weeding, cleaning, mulching	1,600.00	nos	Labour	115.00	14.00	216.00	3,024.00
Maint. Y1	4	Cutting of firelines 3.0 m wide	500.00	rmt	Labour	250.00	2.00	216.00	432.00
Maint. Y1	5	Repair of live hedge (ipomea, vitex, thorny spps.) fencing with bamboo/bamboo posts including local carriage of all material	400.00	rmt	Labour	200.00	2.00	216.00	432.00
Maint. Y1	6	Material for live fencing including carriage upto site	LS		Material			LS	100.00
Maint. Y1	7	Watering the seedlings in the field during dry spell with 30 days interval, for 3 months i.e. for about 3 days	1,600.00	nos	Labour	400.00	12.00	216.00	2,592.00
Maint. Y1	8	Watch & Ward for 12 months	1.00	ha	Labour		25.00	216.00	5,400.00
Maint. Y1	9	Cost of fertilizer and insecticide including carriage	LS		Material			LS	1,000.00
	10	Contingency							100.00
		Total							**17,400.00**

ABSTRACT								
			Labour (No.)	**Labour (Amount Rs.)**	**Material (Amount Rs.)**	**Total (Rs.)**		
		Maint. Y1	75.00	16,200.00	1,100.00	17,300.00		
		Contingency			100.00	100.00		
					1,200.00	**17,400.00**		

6.2.3 Estimate for Plantation of Sal and Associates:A2 Model- Maint. Year 2

Estimate of A2 2nd Yr Maintenance									
Category	**Sl. No.**	**Item**	**Quantity**	**Unit**	**Type**	**Output per manday**	**Required Mandays**	**Rate**	**Amount (Rs.)**
Maint. Y2	1	Vacancy infilling	80.00	nos	Labour	80.00	1.00	216.00	216.00
Maint. Y2	2	1st weeding, cleaning, mulching	1,600.00	nos	Labour	115.00	14.00	216.00	3,024.00
Maint. Y2	3	2nd weeding, cleaning	1,600.00	nos	Labour	133.00	12.00	216.00	2,592.00
Maint. Y2	3	3rd weeding, cleaning	1,600	nos	Labour	160.00	10.00	216.00	2,160.00
Maint. Y2	4	Cutting of firelines 3.0 m wide	500.00	rmt	Labour	250.00	2.00	216.00	432.00
Maint. Y2	5	Watch & Ward for 12 months	1.00	ha	Labour		25.00	216.00	5,400.00
Maint. Y2	6	Contingency							176.00
		Total					64.00		**14,000.00**

		ABSTRACT							
				Labour (No.)	**Labour (Amount Rs.)**	**Material (Amount Rs.)**	**Total (Rs.)**		
		Maint. Y2		64.00	13,824.00	0.00	13,824.00		
		Contingency				176.00	176.00		
						176.00	**14,000.00**		

6.2.4 Estimate for Plantation of Sal and Associates:A2 Model- Maint. Year 3

Estimate of A2 3rd Yr Maintenance									
Category	**Sl. No.**	**Item**	**Quantity**	**Unit**	**Type**	**Output per manday**	**Required Mandays**	**Rate**	**Amount (Rs.)**
Maint. Y3	1	1st weeding, cleaning	1600.00	nos	Labour	115.00	14.00	216.00	3024.00
Maint. Y3	2	2nd weeding, cleaning,	1600.00	nos	Labour	160.00	10.00	216.00	2160.00
Maint. Y3	3	Cutting of firelines 3.0 m wide	750.00	Rmt	Labour	250.00	3.00	216.00	648.00
Maint. Y3	4	Contingency							68.00
		Total							**5900.00**
		ABSTRACT							
				Labour (No.)	**Labour (Amount Rs.)**	**Material (Amount Rs.)**	**Total (Rs.)**		
		Maint. Y3		27.00	5,832.00	0.00	5,832.00		
		Contingency				68.00	68.00		
						68.00	**5,900.00**		

6.3 Estimate for Quick Growing Small Timber, Fuel and Fodder Plantation:A3 Model

6.3.1 Estimate for Quick Growing Small Timber, Fuel and Fodder Plantation:A3 Model: 70% - Creation

Category	Sl. No.	Item	Quantity	Unit	Type	Output per manday	Required Mandays	Rate	Amount (Rs.)
Advance	1	Survey and demarcation of the plantation area including GPS Survey by Technical person	1.00	ha	Labour	1.00	1.00	216.00	216.00
Advance	2	Alignment of planting lines and staking the pit positions	1,600.00	nos	Labour	1,600.00	1.00	216.00	216.00
Advance	3	Advance Soil works by digging planting pits of size (0.60+0.45)/2 x 0.45 x0.45 m3 at 2.5.x 2.5 m spacing (1600 nos)	1,600.00	nos	Labour	35.00	46.00	216.00	9,936.00
Advance	4	Cleaning of the pltn site and making inspection path	1.00	ha	Labour	0.17	6.00	216.00	1,296.00
Creation	5	Filling up of planting pits with dug up pulverized soil	1,600.00	nos	Labour	100.00	16.00	216.00	3,456.00
Creation	6	Transplanting of potted seedlings in pits, including carriage of Root Trainers to planting site and collection and recarriage of Root Trainers to local store site	1,600.00	nos	Labour	80.00	20.00	216.00	4,320.00
Creation	7	Carriage of Seedlings from Central Nursery to Planting site including loading and unloading and return of Stand and Root Trainers to Central Nursery	1,600.00	nos	Material			LS	1,200.00
Creation	8	Vacancy infilling	110.00	nos	Labour	55.00	2.00	216.00	432.00
Creation	9	1st mulching, weeding, cleaning and application of fertilizer	1,600.00	nos	Labour	100.00	16.00	216.00	3,456.00
Creation	10	2nd mulching, weeding, cleaning and application of fertilizer	1,600.00	nos	Labour	133.00	12.00	216.00	2,592.00
Creation	11	Cutting firelines 3.0 m wide	250.00	rmt	Labour	125.00	2.00	216.00	432.00
Creation	12	Carriage of fertiliser, insecticide etc.	LS		Material			LS	250.00
Creation	13	Cost of fertilizer, insecticides etc.	LS		Material			LS	2,000.00
Creation	14	Watch & Ward (1 md per 10 ha) for 6 months	LS		Labour		18.00	216.00	3,888.00
Creation	15	Sowing Khijure/ Akashmoni/Babla on boundary including supply and carriage of all materials	LS		Labour		1.00	216.00	216.00
Advance	16	Contingencies - Labour	LS		Labour			LS	136.00
Advance	17	Contingencies - Material	LS		Material			LS	200.00
Creation	18	Contingencies - Labour	LS		Labour			LS	108.00
Creation	19	Contingencies - Material	LS		Material			LS	150.00
		Total							**34,500.00**

ABSTRACT					
		Labour (No.)	**Labour (Amount Rs.)**	**Material (Amount Rs.)**	**Total (Rs.)**
Advance		54.00	11,664.00	0.00	11,664.00
Contingency		0.00	136.00	200.00	336.00
Total Advance		**54.00**	**11,800.00**	**200.00**	**12,000.00**
Creation		87.00	18,792.00	3,450.00	22,242.00
Contingency		0.00	108.00	150.00	258.00
Total Creation		**87.00**	**18,900.00**	**3,600.00**	**22,500.00**
Grand Total		**141.00**	**30,700.00**	**3,800.00**	**34,500.00**

6.3.2 Estimate for Quick Growing Small Timber, Fuel and Fodder Plantation: A3 Model: 30% Area - Creation (Including 5% Area for Rare & Endangered Spps.)

Category	Sl. No.	Item	Quantity	Unit	Type	Output per manday	Required Mandays	Rate	Amount (Rs.)
Advance	1	Survey and demarcation of the plantation area including GPS Survey by Technical person	1.00	ha	Labour	1.00	1.00	216.00	216.00
Advance	2	Alignment of planting lines and staking the pit positions	1,600.00	nos	Labour	1,600.00	1.00	216.00	216.00
Advance	3	Advance Soil works by digging planting pits of size (0.60+0.45)/2 x 0.45 x0.45 m3 at 2.5.x 2.5 m spacing (1600 nos)	1,600.00	nos	Labour	35.00	46.00	216.00	9,936.00
Advance	4	Cleaning of the pltn site and making inspection path	1.00	ha	Labour	0.17	6.00	216.00	1,296.00
Creation	5	Filling up of planting pits with dug up pulverized soil	1,600.00	nos	Labour	100.00	16.00	216.00	3,456.00
Creation	6	Transplanting of potted seedlings in pits, including carriage of Root Trainers to planting site and collection and recarriage of Root Trainers to local store site	1,600.00	nos	Labour	80.00	20.00	216.00	4,320.00
Creation	7	Carriage of Seedlings from Central Nursery to Planting site including loading and unloading and return of Stand and Root Trainers to Central Nursery	1,600.00	nos	Material			LS	1,600.00
Creation	8	Vacancy infilling	165.00	nos	Labour	55.00	3.00	216.00	648.00
Creation	9	1st mulching, weeding, cleaning and application of fertilizer	1,600.00	nos	Labour	100.00	16.00	216.00	3,456.00
Creation	10	2nd mulching, weeding, cleaning and application of fertilizer	1,600.00	nos	Labour	115.00	14.00	216.00	3,024.00
Creation	11	3rd mulching, cleaning, weeding	1,600.00	nos	Labour	160.00	10.00	216.00	2,160.00
Creation	12	Cutting firelines 3.0 m wide	500.00	rmt	Labour	125.00	4.00	216.00	864.00
Creation	13	Erection of live hedge (ipomea, vitex, thorny spps.) fencing with bamboo/bamboo posts including local carriage of all material	400.00	rmt	Labour	100.00	4.00	216.00	864.00
Creation	14	Material for live fencing including carriage upto site	LS		Material			LS	2,000.00
Creation	15	Watering the seedlings in the field during dry spell with 15 days interval, for 2 months i.e. for about 4 days	1,600.00	nos	Labour	400.00	16.00	216.00	3,456.00
Creation	16	Digging dug well - Labour	LS		Labour		20.00	216.00	4,320.00
Creation	17	Digging dug well - Material			Material			LS	680.00
Creation	18	Carriage of fertiliser, insecticide etc.			Material			LS	250.00
Creation	19	Cost of fertilizer, insecticides etc.			Material			LS	2,000.00
Creation	20	Watch & Ward (1 md per 10 ha) for 6 months			Labour		18.00	216.00	3,888.00
Creation	21	Sowing Khijure/ Akashmoni/Babla on boundary including supply and carriage of all materials	LS		Labour		1.00	216.00	216.00
Advance	22	Contingencies - Labour	LS		Labour			LS	136.00
Advance	23	Contingencies - Material	LS		Material			LS	200.00
Creation	24	Contingencies - Labour	LS		Labour			LS	128.00
Creation	25	Contingencies - Material	LS		Material			LS	170.00
		Total							**49,500.00**

ABSTRACT					
		Labour (No.)	**Labour (Amount Rs.)**	**Material (Amount Rs.)**	**Total (Rs.)**
Advance		54.00	11,664.00	0.00	11,664.00
Contingency		0.00	136.00	200.00	336.00
Total Advance		**54.00**	**11,800.00**	**200.00**	**12,000.00**
Creation		142.00	30,672.00	6,530.00	37,202.00
Contingency		0.00	128.00	170.00	298.00
Total Creation		**142.00**	**30,800.00**	**6,700.00**	**37,500.00**
Grand Total		**196.00**	**42,600.00**	**6,900.00**	**49,500.00**

6.3.3 Estimate for Quick Growing Small Timber, Fuel and Fodder Plantation:A3 Model-70% -Maint. Year 1

Estimate of A3 1st Year Maintenance (for 70% area)									
Category	**Sl. No.**	**Item**	**Quantity**	**Unit**	**Type**	**Output per manday**	**Required Mandays**	**Rate**	**Amount (Rs.)**
Maint. Y1	1	Vacancy infilling	80.00	nos	Labour	80.00	1.00	216.00	216.00
Maint. Y1	2	1st weeding, cleaning, mulching, with application of fertilizer	1,600.00	nos	Labour	100.00	16.00	216.00	3,456.00
Maint. Y1	3	2nd weeding, cleaning	1,600.00	nos	Labour	133.00	12.00	216.00	2,592.00
Maint. Y1	4	Cutting of firelines 3.0 m wide	500.00	rmt	Labour	250.00	2.00	216.00	432.00
Maint. Y1	5	Cost of fertilizer and insecticide etc. including carriage	LS		Material			LS	250.00
	6	Contingency							54.00
		Total							**7,000.00**
		ABSTRACT							
				Labour (No.)	**Labour (Amount Rs.)**	**Material (Amount Rs.)**	**Total (Rs.)**		
		Maint. Y1		31.00	6,696.00	250.00	6,946.00		
		Contingency				54.00	54.00		
						304.00	**7,000.00**		

6.3.4 Estimate for Quick Growing Small Timber, Fuel and Fodder Plantation:A3 Model -30% - Maint. Year 1

Estimate of A3 1st Year Maintenance (for 30% area)									
Category	**Sl. No.**	**Item**	**Quantity**	**Unit**	**Type**	**Output per manday**	**Required Mandays**	**Rate**	**Amount (Rs.)**
Maint. Y1	1	Vacancy infilling	160.00	nos	Labour	80.00	2.00	216.00	432.00
Maint. Y1	2	1st weeding, cleaning, mulching, with application of fertilizer	1600.00	nos	Labour	100.00	16.00	216.00	3456.00
Maint. Y1	3	2nd weeding, cleaning, mulching	1600.00	nos	Labour	133.00	12.00	216.00	2592.00
Maint. Y1	4	Cutting of firelines 3.0 m wide	500.00	rmt	Labour	250.00	2.00	216.00	432.00
Maint. Y1	5	Repair of live hedge (ipomea, vitex, thorny spps.) fencing with bamboo/bamboo posts including local carriage of all material	400.00	rmt	Labour	200.00	2.00	216.00	432.00
Maint. Y1	6	Material for live fencing including carriage upto site	LS		Material			LS	100.00
Maint. Y1	7	Watch & Ward for 12 months	1	Ha	Labour		25.00	216.00	5400.00
Maint. Y1	8	Cost of fertilizer and insecticide etc. including carriage	LS		Material			LS	600.00
	9	Contingency							56.00
		Total							**13500.00**
		ABSTRACT							
				Labour (No.)	**Labour (Amount Rs.)**	**Material (Amount Rs.)**	**Total (Rs.)**		
		Maint. Y2		59.00	12,744.00	700.00	13,444.00		
		Contingency				56.00	56.00		
						756.00	**13,500.00**		

6.3.5 Estimate for Quick Growing Small Timber, Fuel and Fodder Plantation:A3 Model-70% - Maint. Year 2

Estimate of A3 2nd Year Maintenance (for 70% area)									
Category	**Sl. No.**	**Item**	**Quantity**	**Unit**	**Type**	**Output per manday**	**Required Mandays**	**Rate**	**Amount (Rs.)**
Maint. Y2	1	Vacancy infilling	80.00	nos	Labour	80	1.00	216.00	216.00
Maint. Y2	2	1st weeding, cleaning, mulching	1,600.00	nos	Labour	100	16.00	216.00	3,456.00
Maint. Y2	4	Cutting of firelines 3.0 m wide	1,000.00	rmt	Labour	250	4.00	216.00	864.00
	5	Contingency							64.00
		Total							**4,600.00**
		ABSTRACT							
				Labour (No.)	**Labour (Amount Rs.)**	**Material (Amount Rs.)**	**Total (Rs.)**		
		Maint. Y2		21.00	4,536.00	0.00	4,536.00		
		Contingency				64.00	64.00		
						64.00	**4,600.00**		

6.3.6 Estimate for Quick Growing Small Timber, Fuel and Fodder Plantation:A3 Model -30%- Maint. Year 2

Estimate of A3 2nd Year Maintenance (for 30% area)									
Category	**Sl. No.**	**Item**	**Quantity**	**Unit**	**Type**	**Output per manday**	**Required Mandays**	**Rate**	**Amount (Rs.)**
Maint. Y2	1	Vacancy infilling	80.00	nos	Labour	80.00	1.00	216.00	216.00
Maint. Y2	2	1st weeding, cleaning, mulching	1,600.00	nos	Labour	115.00	14.00	216.00	3,024.00
Maint. Y2	3	2nd weeding, cleaning, mulching	1,600.00	nos	Labour	160.00	10.00	216.00	2,160.00
Maint. Y2	4	Cutting of firelines 3.0 m wide	500.00	rmt	Labour	250.00	2.00	216.00	432.00
Maint. Y2	5	Repair of live hedge (ipomea, vitex, thorny spps.) fencing with bamboo/bamboo posts including local carriage of all material	400.00	rmt	Labour	200.00	2.00	216.00	432.00
Maint. Y2	6	Material for live fencing including carriage upto site	LS		Material			LS	100.00
Maint. Y2	7	Watch & Ward for 10 months	1.00	Ha	Labour		25.00	216.00	5,400.00
	8	Contingency							36.00
		Total							**11,800.00**
		ABSTRACT							
				Labour (No.)	**Labour (Amount Rs.)**	**Material (Amount Rs.)**	**Total (Rs.)**		
		Maint. Y2		54.00	11,664.00	100.00	11,764.00		
		Contingency				36.00	36.00		
						136.00	**11,800.00**		

6.3.7 Estimate for Quick Growing Small Timber, Fuel and Fodder Plantation:A3 Model -70% - Maint. Year 3

Estimate of A3 3rd Year Maintenance (for 70% area)									
Category	**Sl. No.**	**Item**	**Quantity**	**Unit**	**Type**	**Output per manday**	**Required Mandays**	**Rate**	**Amount (Rs.)**
Maint. Y3	1	Cutting of firelines 3.0 m wide	1,250.00	rmt	Labour	250.00	5.00	216.00	1,080.00
	2	Contingency							20.00
		Total							**1,100.00**
		ABSTRACT							
				Labour (No.)	**Labour (Amount Rs.)**	**Material (Amount Rs.)**	**Total (Rs.)**		
		Maint. Y3		5.00	1,080.00	0.00	1,080.00		
		Contingency				20.00	20.00		
						20.00	**1,100.00**		

6.3.8 Estimate for Quick Growing Small Timber, Fuel and Fodder Plantation:A3 Model -30% - Maint. Year 3

Estimate of A3 3rd Year Maintenance (for 30% area)									
Category	**Sl. No.**	**Item**	**Quantity**	**Unit**	**Type**	**Output per manday**	**Required Mandays**	**Rate**	**Amount (Rs.)**
Maint. Y3	1	Vacancy infilling	80.00	nos	Labour	80.00	1.00	216.00	216.00
Maint. Y3	2	1st weeding, cleaning, mulching	1600.00	nos	Labour	160.00	10.00	216.00	2160.00
Maint. Y3	3	Cutting of firelines 3.0 m wide	1000.00	rmt	Labour	250.00	4.00	216.00	864.00
	4	Contingency							60.00
		Total							**3300.00**
		ABSTRACT							
				Labour (No.)	**Labour (Amount Rs.)**	**Material (Amount Rs.)**	**Total (Rs.)**		
		Maint. Y3		15.00	3,240.00	0.00	3,240.00		
		Contingency				60.00	60.00		
						60.00	**3,300.00**		

6.4 Estimate for Enrichment of Degraded Sal Coppice Forests through Coppice Regeneration: A4 Model

Category	Sl. No.	Item	Quantity	Unit	Type	Output per manday	Required Mandays	Rate	Amount (Rs.)
Creation	1	Survey and demarcation of the plantation area including GPS Survey by Technical person	1.00	ha	Labour	1.00	1.00	216.00	216.00
Creation	2	Cutting of dead, dying, moribund, bent, supressed coppice shoots of Sal flush to the ground	1.00	ha	Labour	0.10	10.00	216.00	2,160.00
Creation	3	Hoeing around basal portion of living stump, mulching, application of fertilizer and spraying of insecticides	1.00	ha	Labour	0.13	8.00	216.00	1,728.00
Creation	4	Erection of live hedge Ipomea, Vitex, thorny spp. fencing with bamboo/bamboo posts including local carriage of all material	400.00	rmt	Labour	100.00	4.00	216.00	864.00
Creation	5	Material for live fencing including carriage upto site	LS		Material			LS	1,000.00
Creation	6	Carriage of fertiliser, insecticide etc.	LS		Material			LS	150.00
Creation	7	Cost of fertilizer, insecticides etc.	LS		Material			LS	400.00
	8	Contingencies - Labour	LS		Labour			LS	32.00
	9	Contingencies - Material	LS		Material			LS	100.00
		Total							**6,650.00**

ABSTRACT					
		Labour (No.)	**Labour (Amount Rs.)**	**Material (Amount Rs.)**	**Total (Rs.)**
Creation		23.00	4,968.00	1,550.00	6,518.00
Contingency		0.00	32.00	100.00	132.00
Total Creation		**23.00**	**5,000.00**	**1,650.00**	**6,650.00**

6.5 Estimate for Production of Quality Planting Material

6.5.1 Estimate for Production of Quality Planting Material: One Season

150 cc Root Trainers	1 Root Trainer	2,000 Root Trainers	10,000 Root Trainers
	(cc)	(m3)	(m3)
Requirement of Compost	50.00	0.10	0.50
Requirement of Coarse Sand	50.00	0.10	0.50
Requirement of Burnt Rice husk	50.00	0.10	0.50

For 10,000 Seedlings

Category	Sl.No.	Item	Quantity	Unit	Type	Output per manday	Required Mandays	Rate	Amount (Rs.)
Creation	1	Supply of Compost	0.50	m3	Material			LS	1,500.00
Creation	2	Preparation of potting mixture (Mixing through hand driven Mixture Machine)	1.50	m3	Labour	0.75	2.00	216.00	432.00
Creation	3	Supply of Coarse Sand including collection and carriage	0.50	m3	Material			LS	300.00
Creation	4	Drying and Seiving Sand	0.50		Labour	1.00	0.50	216.00	108.00
Creation	5	Supply of Burnt Rice Husk including collection and carriage	0.50	m3	Material			LS	300.00
Creation	6	Drying and seiving Burnt Rice husk	0.50	m3	Labour	2.00	0.25	216.00	54.00
Creation	7	Filling of Root Trainers and keeping filled Root Trainers on Stands	10,000.00	no.	Labour	800.00	12.50	216.00	2,700.00
Creation	8	Collection of Quality Seeds including collection and carriage	LS		Material			LS	500.00
Creation	9	Drying, Sorting and Pretreatment of Seeds and Sowing in Hygropits	5.00	kg	Labour	5.00	1.00	216.00	216.00
Creation	10	Pricking out and transplanting of seedlings in Root Trainers	10,000.00	no.	Labour	500.00	20.00	216.00	4,320.00
Creation	11	Supply of insecticides	LS		Material			LS	500.00
Creation	12	Watering for 90 days (January to March) including Watering in Hygropits and Spraying of insecticides	10,000.00	no.	Labour	20,000.00	45.00	216.00	9,720.00
Creation	13	Sorting and Weeding-2 times	20,000.00	no.	Labour	10,000.00	4.00	216.00	864.00
Maint	14	Watering for 120 days (April to July) including Spraying of insecticides	10,000.00	no.	Labour	15,000.00	80.00	216.00	17,280.00
Maint	15	Sorting and Weeding-2 times	20,000.00	no.	Labour	10,000.00	4.00	216.00	864.00
		Contingencies - Advance						LS	100.00
Creation	16	Contingencies - Creation	LS					LS	286.00
Maint	17	Contingencies - Maintenance	LS					LS	56.00
		Total							40,100.00

ABSTRACT					
		Labour (No.)	**Labour (Rs.)**	**Material (Rs.)**	**Total (Rs.)**
Advance		0.00	0.00	0.00	0.00
Contingency		0.00	0.00	0.00	0.00
Total Advance		**0.00**	**0.00**	**0.00**	**0.00**
Creation		85.25	18,414.00	3,100.00	21,514.00
Contingency		0.00		286.00	286.00
Total Creation		**85.25**	**18,414.00**	**3,386.00**	**21,800.00**
Maintenance		84.00	18,144.00		18,144.00
Contingency		0.00	56.00		56.00
Total Creation		**84.00**	**18,200.00**	**0.00**	**18,200.00**
Grand Total		**169.25**	**36,614.00**	**3,386.00**	**40,000.00**

Cost per Seedling Advance	0.00
Cost per Seedling Creation	2.18
Cost per Seedling Maintenance	1.82
Total	**4.00**

6.5.2 Estimate for Production of Quality Planting Material: Two Seasons

300 cc Root Trainers	1 Root Trainer	2,000 Root Trainers	10,000 Root Trainers
	(cc)	(m3)	(m3)
Requirement of Compost	100	0.2	1
Requirement of Coarse Sand	100	0.2	1
Requirement of Burnt Rice husk	100	0.2	1

For 10,000 Seedlings

Category	Sl.No.	Item	Quantity	Unit	Type	Output per manday	Required Mandays	Rate	Amount (Rs.)
Advance	1	Supply of Compost	1.00	m3	Material			LS	3,000.00
Creation	2	Preparation of potting mixture (Mixing through hand driven Mixture Machine)	1.00		Labour	0.75	4.00	216.00	864.00
Creation	3	Supply of Coarse Sand including collection and carriage	1.00		Material			LS	600.00
Creation	4	Drying and Sieving Sand	1.00	m3	Labour	1.00	1.00	216.00	216.00
Creation	5	Supply of Burnt Rice Husk including collection and carriage	1.00	m3	Material			LS	600.00
Creation	6	Drying and sieving Burnt Rice husk	1.00	m3	Labour	2.00	0.50	216.00	108.00
Creation	7	Filling of Root Trainers and keeping filled Root Trainers on Stands	10,000.00	no.	Labour	500.00	20.00	216.00	4,320.00
Creation	8	Collection of Quality Seeds including collection and carriage	LS		Material			LS	2,500.00
Creation	9	Drying, Sorting and Pre-treatment of Seeds, Sowing in Hygropits and Dibbling in Root Trainers	20.00	kg	Labour	5.00	4.00	216.00	864.00
Creation	10	Pricking out and transplanting of seedlings in Root Trainers	10,000.00	no.	Labour	500.00	20.00	216.00	4,320.00
Creation	11	Supply of insecticides	LS		Material			LS	500.00
Creation	12	Watering for 30 days (June) including Watering in Hygropits and Spraying of insecticides	10,000.00	no.	Labour	10,000.00	30.00	216.00	6,480.00
Creation	13	Watering for 90 days (July to September) including Watering in Hygropits and Spraying of insecticides	10,000.00	no.	Labour	30,000.00	30.00	216.00	6,480.00
Creation	14	Watering for 90 days (October to December) including Watering in Hygropits and Spraying of insecticides	10,000.00	no.	Labour	20,000.00	45.00	216.00	9,720.00
Creation	15	Watering for 90 days (January to March) including Watering in Hygropits and Spraying of insecticides	10,000.00	no.	Labour	20,000.00	45.00	216.00	9,720.00
Maint	16	Watering for 105 days (April to mid- July) including Watering in Hygropits and Spraying of insecticides	10,000.00	no.	Labour	15,000.00	70.00	216.00	15,120.00
Maint	17	Sorting and Weeding-2 times	20,000.00	no.	Labour	10,000.00	4.00	216.00	864.00
Creation	18	Contingencies - Creation	LS					LS	208.00
Maint	19	Contingencies - Maintenance	LS					LS	16.00
		Total							66,500.00

ABSTRACT					
		Labour (No.)	**Labour (Rs.)**	**Material (Rs.)**	**Total (Rs.)**
Advance		0.00	0.00	3,000.00	3,000.00
Contingency		0.00	0.00	0.00	0.00
Total Advance		**0.00**	**0.00**	**3,000.00**	**3,000.00**
Creation		199.50	43,092.00	4,200.00	47,292.00
Contingency		0.00		208.00	208.00
Total Creation		**199.50**	**43,092.00**	**4,408.00**	**47,500.00**
Maintenance		74.00	15,984.00	0.00	15,984.00
Contingency		0.00	16.00	0.00	16.00
Total Creation		**74.00**	**16,000.00**	**0.00**	**16,000.00**
Grand Total		**273.50**	**59,092.00**	**7,408.00**	**66,500.00**

Cost per Seedling Advance	0.30
Cost per Seedling Creation	4.75
Cost per Seedling Maintenance	1.60
Total	**6.65**

6.5.3 Estimate for Production of Quality Planting Material: Clones

Estimate - Preparation Eucalyptus Clones

	1.00	2,000.00	10,000.00
100 cc	(cc)	(m3)	(m3)
Requirement of Compost	70.00	0.14	0.70
Requirement of Coarse Sand	30.00	0.06	0.30

For 10,000 Ramet

A	**Preparation of Clones**								
Category	**Sl.No.**	**Item**	**Quantity**	**Unit**	**Type**	**Output per manday**	**Required Mandays**	**Rate**	**Amount (Rs.)**
Creation	1	Preparation of potting mixture (Mixing through hand driven Mixture Machine)	1.00	m3	Labour	0.75	1.50	216.00	324.00
Creation	2	Supply of Coarse Sand	0.30	m3	Material			LS	210.00
Creation	3	Drying and Seiving Sand	0.50		Labour	1.00	0.50	216.00	108.00
Creation	4	Supply of Compost	0.70	m3	Material			LS	2,100.00
Creation	5	Filling of Root Trainers and keeping filled Root Trainers on Stands	10,000.00	no.	Labour	1,000.00	10.00	216.00	2,160.00
Creation	6	Cutting effective shoots into pieces of proper size and placing them into buckets filled with water & fungicide solution. Carrying these cuttings to the shed & making nodal cuttings	10,000.00	no.	Labour	250.00	40.00	216.00	8,640.00
Creation	7	Application of Talc media root promoting hormone at the lower end, making hole & placing the cutting in the root-trainer	10,000.00	no.	Labour	2,000.00	5.00	216.00	1,080.00
Creation	8	Putting in Hygropits	10,000.00	no.	Labour	2,000.00	5.00	216.00	1,080.00
Creation	9	Watering in Hygropits	10.00	no.	Labour	10.00	1.00	216.00	216.00
Creation	10	Taking out Root Trainers and placing them in 70% / 50% agronet shed area	10,000.00	no.	Labour	2,000.00	5.00	216.00	1,080.00
Creation	11	Supply of hormones, fungicides, insecticides	LS		Material				2,500.00
Creation	12	Spraying of insecticides	10,000.00	no.	Labour	20,000.00	0.50	216.00	108.00
Creation	13	Watering for 90 days (January to March)	10,000.00	no.	Labour	25,000.00	36.00	216.00	7,776.00
Creation		Sorting and Weeding-2 times	20,000.00	no.	Labour	20,000.00	2.00	216.00	432.00
Maint	14	Watering for 120 days (April to July)	10,000.00	no.	Labour	20,000.00	60.00	216.00	12,960.00
Maint	15	Sorting and Weeding-1 times	20,000.00	no.	Labour	20,000.00	1.00	216.00	216.00
	16	Contingencies- Creation							486.00
	17	Contingencies-Maintenance							124.00
		Total							41,600.00

B	Maintenance of existing CMA		Considering about 300000 nos of ramets to be finally obtained from 0.4 ha						
		Spacing of CMA plants	1m x 1m						
		Total no. of CMA plants per ha	10,000						
Category	**Sl.No.**	**Item**	**Quantity**	**Unit**	**Type**	**Output per manday**	**Required Mandays**	**Rate**	**Amount (Rs.)**
Creation	1	Flush cutting of stumps of clonal plants in the CMA to allow coppice shoots to sprout [Flushing to be done 1/4 th area at a time] Stumps at 2m x 2 m, i.e; 2500 nos per ha. Cutting includes disposal of shoots including. carriage outside CMA	4,000.00	no.	Labour	200.00	20.00	216.00	4,320.00
Creation	2	1st hoeing of the soil around the stumps for aeration, mulching and application of fertilizer etc	4,000.00	no.	Labour	80.00	50.00	216.00	10,800.00
Creation	3	2nd hoeing of the soil around the stumps for aeration, mulching and application of fertilizer etc	4,000.00	no.	Labour	80.00	50.00	216.00	10,800.00
Creation	4	3rd hoeing of the soil around the stumps for aeration, mulching and application of fertilizer etc	4,000.00	no.	Labour	80.00	50.00	216.00	10,800.00
Creation	5	Channel irrigation in between lines, once in 10 days for 4 months	4,000.00	no.	Labour	1,000.00	48.00	216.00	10,368.00
Creation	6	Material including supply of fertilizer, pipes etc.	LS		Material			LS	3,300.00
	7	Contingencies							612.00
		TOTAL							**51,000.00**
		Cost per 10,000 ramets							
		Labour				**218.00**	**216.00**	**47,088.00**	**1,569.60**
		Material						**3,300.00**	**110.00**
		Contingency						**612.00**	**20.40**
		Total							**1,700.00**

ABSTRACT					
		Labour (No.)	**Labour (Rs.)**	**Material (Rs.)**	**Total (Rs.)**
Creation-Preparation of clones		106.50	23,004.00	4,810.00	27,814.00
Creation-Maintenance of existing CMA		7.27	1,569.60	110.00	1,679.60
Contingency		0.00		506.40	506.40
Total Creation		**113.77**	**24,573.60**	**5,426.40**	**30,000.00**
Maintenance		61.00	13,176.00	0.00	13,176.00
Contingency		0.00	124.00	0.00	124.00
Total Creation		**61.00**	**13,300.00**	**0.00**	**13,300.00**
Grand Total		**174.77**	**37,873.60**	**5,426.40**	**43,300.00**

Cost per Ramet Creation	3.00
Cost per Ramet Maintenance	1.33
Total	**4.33**