ಬೆಂಗಳೂರು ಮೆಟ್ರೋ ರೈಲ್ ನಿಗಮ ನಿಯಮಿತ
(ಸಹಭಾಗಿತ್ವದ – ಕರ್ನಾಟಕ ಸರ್ಕಾರ ಹಾಗೂ ಕೇಂದ್ರ ಸರ್ಕಾರ ಉದ್ಯಮ)
ನೊಂದಾಯಿತ ಕಚೇರಿ : ಬಿ.ಎಂ.ಟಿ.ಸಿ. ಕಾಂಪ್ಲೆಕ್ಸ್, 3ನೇ ಮಹಡಿ, ಕೆಂಗಲ್ ಹನುಮಂತಯ್ಯ ರಸ್ತೆ, ಶಾಂತಿನಗರ
ಬೆಂಗಳೂರು – 560 027, ಭಾರತ

Bangalore Metro Rail Corporation Ltd.
(A Joint Venture of Government of Karnataka & Government of India)
Regd. Office : B.M.T.C. Complex, 3rd Floor, K.H. Road, Shanthinagar,
Bangalore - 560 027. INDIA

BMRCL/CE/SEMU/CP/2020-21/ಕ೩೩೬ **Date: 06.09.2021**

To,

The Deputy Conservator of Forests (Tree Officer),
Urban Division, Aranya Bhavan,
Bangalore- 560003

Dear Sir,

Sub: Proposed Compensatory Plantation Plan in lieu of felling of trees standing in work areas of Vijjinapura village Sy No.79 and Benniganahalli Village No.80 &83 (Reach 1A) Phase -2 of Bangalore Metro Rail Project reg.

Ref:1. Official Memorandum No. A9 /Tree Cutting /BMRCL / CR—480 / 2020-21 dated 26.08.2021.

2. Commissioner of The Department of Youth Empowerment & Sports, Bengaluru letter dated 19.08.2021 and Head master, Govt. High School, Vidyanagara letter dtd. 03.09.2021

As per the Official Memorandum No. dated issued by DCF, Bangalore Urban Division. Tree Officer has permitted BMRCL for removal of 32 trees (24 for felling and 08 trees for transplantation) and also directed BMRCL in his OM vide 5B (i and ii) to submit a plan for raising compensatory plantation in 1:10 ratio., 320 number of plants against 32 number of trees removal (Felling + Tranlslocation) Accordingly to take up the work BMRCL has identified the location Youth Training Center (Sri Jayaprakash Narayana Training Centre) and Govt. High School Vidyanagara, Bengaluru which is coming under the Jurisdiction of Bangalore urban area.

In this regard, BMRCL has approached The Department of Youth Empowerment & Sports, Bengaluru and Head master of Govt. High School, Vidyanagara (Sy.No.76, 25, 16 & 21) for allotment of open space for compensatory plantation. Accordingly, Commissioner of The Department of Youth Empowerment & Sports, Bengaluru and Head master of Govt. High School, Vidyanagara (Sy.No.76, 25, 16 & 21) has given approval vide letter dated 19.08.2021 and 03.09.2021 respectively for taking up Compensatory. The total boundary area of Youth Training Center (Sri Jayaprakash Narayana Training Centre) and Govt. High School Vidyanagara, (Sy.No.76, 25, 16 & 21) Bengaluru is 31 Hectares. Hence, to take up compensatory plantation of 320 no. tree saplings, approx. area required is 0.5 ha and 1.73 km of internal road said area were demarcated and accordingly compensatory plantation plan, Boundary coordinates and the area showing the extent of Land at Youth Training Center (Sri Jayaprakash Narayana Training Centre) and Govt. High School Vidyanagara, Bengaluru are prepared and submitted for approval.

863

Thanking you,

ಉಪ ಅರಣ್ಯ ಸಂರಕ್ಷಣಾಧಿಕಾರಿಗಳ ಕಛೇರಿ
ಬೆಂಗಳೂರು ನಗರ ವಿಭಾಗ,
7 SEP 2021
ಶಾಖೆ :
ಉ.ಅ.ಸಂ

Yours faithfully

B.C Nataraja

(B.C Nataraja)
Chief Engineer, SEMU

Encl: 1. Compensatory Plantation Plans :
Copy to: 1. Managing Director, BMRCL
2. Member secretary, TEC

BANGALORE METRO RAIL CORPORATION LTD.

PROPOSED COMPENSATORY PLANTATION PLAN FOR RAISING 320 NUMBER OF SAPLINGS BY BMRCL IN LIEU OF REMOVAL OF 32 NUMBER OF TREES NEAR VIJINAPURA SY NO.79 AND BENNIGANAHALLI VILLAGE SY NO. 80 & 83.

(Ref: Official Memorandum No. A9/Tree Cutting/BMRCL/CR-480/2020-21 Dated: 26.08.2021)

CONTENTS

PROPOSED COMPENSATORY PLANTATION PLAN FOR RAISING 320 NUMBER OF SAPLINGS BY BMRCL IN LIEU OF REMOVAL OF NEAR VIJINAPURA SY NO.79 AND BENNIGANAHALLI VILLAGE SY NO. 80 & 83.

I. Introduction

Bangalore Metro Rail Corporation Ltd is carrying out elevated construction works from Baiyapanahalli Metro Station to White Field Metro Station of 15.23 Kms also proposed to take up road widening works and Bus Hub near Vijinapura Survey No.79 and Bennigahalli Village Survey No. 80 & 83 and Station Entry/Exit structures for Jyothipura Metro Station.

There are total 47 numbers of Trees standing in work area at Vijinapura Sy no.79 and Benniganahalli Village Sy no. 80 & 83. Total 47 No. of standing trees proposed to be removed which are infringing construction works in order to implement the project. These Trees are coming under jurisdiction of Deputy Conservator of Forest, Urban Division, Bangalore

As per Official Memorandum No. A9/Tree Cutting/BMRCL/CR-480/2020-21 Dated: 26.08.2021 **(Annexure – I)** issued by DCF, Bengaluru Urban Division. Tree Officer has permitted BMRCL for removal of 32 trees (24 for felling, and 08 trees for transplantation) and also directed BMRCL in his OM vide para 5B (i and ii) to submit a plan for raising compensatory plantation in 1:10 ratio i.e., 320 number of plants against 320 number of trees removal (Felling + Translocation).

In view of above, BMRCL has identified the location Youth Training Center (Sri Jayaprakash Narayana Training Centre) and Govt. High School Vidyanagara, (Sy.No.76, 25, 16 & 21) Bengaluru, coming under the jurisdiction of Bengaluru Urban area here by propose to raise compensatory plantation as per technique/scheme described here in this plan.

II. Location plan & Approval of land owner

Officials from BMRCL has approached The Department of Youth Empowerment & Sports, Bengaluru and Head master of Govt. High School, Vidyanagara (Sy.No.76, 25, 16 & 21)for allotment of open space for compensatory plantation, accordingly Commissioners of The Department of Youth Empowerment & Sports, Bengaluru and Head master of Govt. High School, Vidyanagara has given their approval in letter dated 19.08.2021 and dtd. 03.09.2021 respectively (**Annexure-II**) for taking up Compensatory Plantation in Youth Training Center (Sri Jayaprakash Narayana Training Centre) and Govt. High School Vidyanagara, Bengaluru.

The total boundary area of Youth Training Center (Sri Jayaprakash Narayana Training Centre) and Govt. High School Vidyanagara, (Sy.No.76, 25, 16 & 21) Bengaluru is 31 Hectares, Commissioners and Head master has approved approximate 0.5 Hectares and 1.73 km of internal road side area for plantation,

accordingly BMRCL has planned compensatory plantation of total 320 number of saplings of various species as per Forest Department Guidelines and Compensatory plantation plan is also submitted to Tree Officer(**Annexure-III).**

Compensatory Plantation Plan in lieu of removal of trees in R1A- Vijinapura			
1	Total Land Available for Compensatory Plantation	Hectares	0.5 ha
2.	Total internal road said area for compensatory plantation	Km	1.73 km
3	Total Sampling Planned by BMRCL	Nos	320

III. Agency for compensatory plantation

Bangalore Metro Rail Corporation will engage & take service of plantation experienced agencies/contractors for implementing the proposed compensatory plantation including three years comprehensive maintenance. An agreement will be entered with the approved agency for raising the plantation as per the plan ensuring good survival rate.

IV.Scheme of Plantation/Technique:

BMRCL has taken the responsibility of raising compensatory plantation at the location suggested above as per standard practice & techniques through a plantation experienced agencies/contractors.
Forest Department, Government of Karnataka has issued "General Guidelines for Species and Plantation Technique Models" (**Annexure VI).**
BMRCL has finalized a Scheme / Technique for plantation considering these guidelines relevant for Bangalore Urban Transitional Zone and institutional /Office premises plantation model. The scheme is summarized as follows:

1. Plantation work will be taken up within Youth Training Center (Sri Jayaprakash Narayana Training Centre) and Govt. High School Vidyanagara, (Sy.No.76, 25, 16 & 21) Bengaluru, Bengaluru well protected with boundary /fencing all round the proposed area as institutional/office planting model during the current year.
2. Cleaning of site, weeding & alignment before pitting should be carried out.
3. Plantation work will be taken up through a licensed Forest Contractor/Forest Department.
4. Water required during rainy season i.e. from May-June to Oct-Nov in Bangalore Urban area would be minimal/nil. During dry season from November to April watering will be regularly done as per the standard practice specified in above guidelines and as per requirement of plantation species.
5. Aligning, marking of pits of size lm x lm x lm shall be done at the identified location.
6. Excavation of pits of size lm x lm x lm at 5m x 5m or 7m X 7m grid interval/espacement will be taken up as per the general guidelines given for City and Town Planting Model by the Karnataka Forest Department. (refer Annexure-V of Page No.25)

7. The pit will be vertically cut and straight in shape. All loose materials will be removed from pit.
8. Supply of saplings of min 12 months old of 7-8 feet height of species suitable for the zone as specified in the guidelines.
9. Supply of 10% Red earth required for refilling the pits after saplings.
10. Refilling of pit to 75% of the pit with excavated soil after breaking the clods and formation of saucer shaped mound.
11. Conveyance of polythene bag seedlings to the planting location including watering polythene bagged seedlings at site.
12. Supply of 2.5 to 3m length wooden sticks for supporting saplings.
13. Planting seedlings including scooping the soil to required depth pressing the soil gently around the seedlings after planting.
14. Carrying out de-weeding around the plants for a radius of 0.6m.
15. Hoeing and soil working with pickaxe around the plant to a depth of 15cm and to a radius of 60cm.
16. Application of chemical fertilizers around the plant about 15 cm away in furrow duly covering with soil as and when required.
17. Scraping of grass and weeds to radius of 0.5m around the plants.
18. Application of FYM (Farm Yard Manure), watering the plants using water tanker with available water inside the premises/ water from outside as required.

V. Up keep of plantation& Maintenance

The agency entrusted with the compensatory plantation will be responsible for comprehensive maintenance also. The plantation being done will be maintained for 3 years from date of plantation. During the maintenance period of 3 years following activities will be carried out by the agency and shall be monitored by the BMRCL.

1. Maintenance activities for 1st year, 2nd year and 3rd year to be carried out by agency responsible for plantation in order to ensure good success rate. In case of failure of any plant, immediate replacement will be done by agency.
2. In summer season i.e. from December to May watering will be done at regular intervals once in a week. During Monsoon season i.e., from June to November watering required may be minimal/nil. However, watering need to be done for any dry spell as and when required. During monsoon season whenever there is a scanty rainfall, agency shall do watering to make shortfall.
3. Removing weeds/grass surrounding plantation area as and when required.
4. Preparing reports on growth of plants with photographs/videographer and submission to authorities on quarterly basis.
5. The entire compensatory plantation and maintenance to be done under supervision of BMRCL Environmental Officer and under the direction of Tree Officer.
6. Replacement of causality plants for maintaining good survival rate.

VI. Supervision:

After raising the plantation, Environmental Officer/ SEMU, BMRCL will submit quarterly reports periodically to the Tree Officer and DCF Bangalore Urban who in turn visit the plantation and submit report to the Hon'ble High Court.

VII Conclusion:

BMRCL has accepted to take over compensatory plantation for 320 saplings at Sri Youth Training Center (Sri Jayaprakash Narayana Training Centre) and Govt. High School Vidyanagara, (Sy.No.76, 25, 16 & 21) Bengaluru attached area as per the guidelines of Forest Department, GOK through an expert horticultural agency with aim to ensure good survival rate of plantation with regular maintenance and adequate supervision.

Encl:

1) **Annexure I:** Official Memorandum No. A9/Tree Cutting/BMRCL/CR-480/2020-21 Dated: 26.08.2021.
2) **Annexure II:** Commissioner of The Department of Youth Empowerment & Sports, Bengaluru letter dated 19.08.2021 and Head master, Govt. High School, Vidyanagara letter dtd. 03.09.2021
3) **Annexure III:** Location plan for compensatory plantation in Sri Jayaprakash Narayana Training Centre, Vidyanagara, Bengaluru
4) **Annexure- IV:** Soil report of Sri Jayaprakash Narayana Training Centre, Vidyanagara, Bengaluru.
5) **Annexure-V:** List of tree species and quantity for 320 No. saplings.
6) **Annexure-VI:** Forest Department - GOK Guidelines on "Species and Plantation Schemes/Technique Models.

Annexure - 01

ದೂರವಾಣಿ /ಫ್ಯಾಕ್ಸ್ - 080-23343464
Email ID -dcfurban82@yahoo.co.in

ಕರ್ನಾಟಕಅರಣ್ಯ ಇಲಾಖೆ
ಉಪ ಅರಣ್ಯ ಸಂರಕ್ಷಣಾಧಿಕಾರಿಯವರಕಛೇರಿ
ಬೆಂಗಳೂರು ನಗರ ವಿಭಾಗ, ಅರಣ್ಯ ಭವನ ಸಂಕೀರ್ಣ, 18ನೇ ಅಡ್ಡರಸ್ತೆ, ಮಲ್ಲೇಶ್ವರಂ, ಬೆಂಗಳೂರು - 560 003

Office of the Deputy Conservator of Forests
Bangalore Urban Division, AranyaBhavanCompus. 18th cross, Malleshwaram, Bangaloe-560003

No: A9/Tree Cutting /BMRCL/CR-480/2020-21 Date:26/08/2021.

Official Memorandum

Sub: Permission for felling of trees infringing the Metro Rail Construction work at Vijinapura Sy No. 79 & Benniganahalli Village sy No.80 & 83 and Jyothipura Metro Station Entry Exit Structure Reach -1A.

Ref:1. Hon'ble High Court Order dated: 18.11.2020 in WP 17841/2018

2. Letter No: BMRCL/Dy.CE/R1A/Ph2/Trees/2021/4527 Dated 20.01.2021.
3. This Office Public Notice vide letter No: A9 /Tree Cutting /BMRCL/CR- 480/2020-21 Dated: 10-02-2021.
4. Letter No: RFO/KRPuram/tree cutting/CR-6/2020-21/Dtd. 16.03.2021 O/o of The Range Forest Officer, K.R.Puram Range, K.R.Puram
5. Members Secretary and ACF BBMP, Bengaluru Letter No.ACF/PR.43/2021-22 Dtd.25-08-2021 along with report and proceeding of Tree Expert Committee.

--*

Preamble:-

BMRCL submitted a fresh application dated 20.01.2021 read at ref (2) above seeking permission for removal of 42 trees infringing the Metro Rail Construction work at Vijinapura Sy No. 79 & Benniganahalli Village sy No.80 & 83 and Jyothipura Metro Station Entry Exit Structure Reach -1A, as per the directions issued by the Hon'ble High Court of Karnataka vide Order dated:18.11.2020 in WP No. 17841/2018 read at ref (1) above.

The processing and consideration of the application was taken up as per provisions of the Karnataka Preservation of Trees Act, 1976 (hereinafter mentioned as "the Act") and the Memorandum of Procedure (hereinafter mentioned as "the MOP") formulated by the Tree Expert Committee

(hereinafter mentioned as "the TEC"). As stipulated under Section 8(3)(vii) of the Act, a public notice in Template No. 1 of the MOP was issued duly inviting the objections from the public, as the total number of trees proposed to be removed are more than 50, though the number at this location is 42 only. The public notice appeared Vijaya karnataka newspaper and The Hindu news paper on 11.02.2021. The details of the project area, Number of trees to be removed, GPS Co-ordinates and physical details of those trees were uploaded in the website of BBMP, as per the MOP.

In response to the public notice, no objections/suggestions were received from the general public. The proceedings of that consideration along with a tabular statement showing the objections from the public, and remarks and findings of the undersigned for each specific objection and comment were prepared on 20.03.2021, besides recording summary of the findings in Template No. 3 of the MOP.

As per BMRCL's application, there are 47 trees in the project area out of which 42 trees are sought to be removed. Detailed enumeration of each of those 47 trees in terms of location, physical parameters, health and defects, etc. was organized from the forest officers in Part-I of Template No. 2 of the MOP. Thereafter, the same was verified by the undersigned and a preliminary assessment in terms of possibility of onsite retention or translocation or felling along with justification was carried out through inspection of those 47 trees on 19.03.2021 and recorded in Part-II of Template No. 2.

The proceedings regarding consideration of the objections, tabular statement of the findings along with summary, detailed enumeration and preliminary assessment along with justification for each of the 42 trees, and information in Template No 2 and 3 were submitted vide letter dated 26.03.2021 for consideration by the TEC.

The TEC has submitted a detailed report dated 25.08.2021 giving their recommendations for onsite retention of 15 trees, translocation of 8 trees and felling of 24 trees with justification for each of them along with an abstract of the report in Template No. 4. It is noted from the report that the TEC carried out their activities in 4 stages, namely, (i) review of the application, objections received from the public and findings by the undersigned, (ii) review of preliminary assessment by the undersigned, (iii) their field inspection, and (iv) post inspection review and report preparation.

The TEC has concluded that out of total 47 trees proposed for removal by BMRCL, the project activities can be carried out without removal of following 15 trees.

Trees recommended by TEC for Onsite Retention	
Tree Numbers	8A & B, 9A &B, 10, 11, 12, 13,16, 18, 27, 31,42, 43, 44, 46, and 47A,B,C Total = 15 nos

The TEC concluded that the balance 32 trees need to be removed as they are falling within the following physical features of Metro Project.

Physical Features	Tree Numbers
Metro station Entry and Exit	01, 02,03,04,05,06,07 **Total – 07 Nos.**
Pile Cap BP-47	14 and 15 **Total – 02 Nos.**
Consruction of Bus Hub	17,19,20,21,22,23,24,25,26,28,29,30,32,33 34, 35, 36,37, 38, 39, 40, 41 and 45 **Total – 23 Nos.**

The TEC has further concluded that 08 trees out of these 32 trees are healthy and suitable for translocation. The TEC has accordingly recommended translocation of those 08 trees to save them. Based on the inspection and soil test reports of the proposed receptor sites, the TEC has confirmed suitability of those sites for the translocation.

The TEC has also concluded that 24 trees out of these 32 trees are not suitable for the translocation as they have major defects or extraction of the root ball of adequate size is not practical. The TEC has accordingly recommended felling of those 24 trees.

The report of the TEC has been examined. The TEC has provided detailed specific justification for removal of each of the 47 trees, besides giving justification for translocation or felling of the trees in Part-III of Template 2 as well as in Appendix to its report. The undersigned concurs with the recommendations and justification of the TEC.

The final assessment of the undersigned has been recorded in Part-IV of Template No. 2. The translocation of 08 trees and felling of 24 trees are essential for implementation of the metro project, which seeks to build a sustainable public transport system. The adverse impact of the felling of trees

will have to be mitigated by directing BMRCL to take up compensatory plantation in adequate number.

Hence, the following order.

Order

1. Permission is refused for removal of Fifteen(15) trees listed in **Appendix 1** appended to this Official Memorandum. They should be retained at site only.
2. Based on the consideration detailed above, permission is hereby granted for removal of Eight (8) trees by way of translocation as listed with justification in Template No. 5 appended to this Official Memorandum as **Appendix-2.**
3. Permission is hereby also granted for removal of Twenty Four(24) trees by way of felling as listed with justification in Template No. 6 appended to this Official Memorandum as **Appendix-3.**
4. This order will come into effect fifteen (15) days from the date of uploading of the order on the websites of BBMP and Karnataka Forest Department and serving by email on the petitioners in WP 17841/2018.
5. The order is subject to following directions to BMRCL.

A. Translocation of trees:

i. The translocation should be carried out only at following location.

1) Along the boundary wall of the K.R.Puram Metro Station adjacent to Lowry School compound wall. K.R.Puram Bangalore-560048

The translocation should be organized by competent agencies, at the cost of BMRCL as mentioned in Template 5.

The translocation should follow the methodology suggested by UAS, GKVK.

B. Compensatory Plantation:

i. The BMRCL to arrange compensatory Afforestation of 320 tall and healthy saplings, i.e., @ 10 saplings for each tree removed within Six(6) months from the date of the removal.

ii. BMRCL to submit a plan for the compensatory plantation within Two(2) months from the date of this order.

C. Care & Maintenance of translocated trees and compensatory plantation, and their Reporting:

i. BMRCL should ensure proper and effective care and maintenance of the translocated trees and compensatory plantation for a period of Three(3) years.

ii. BMRCL should also submit reports regarding condition of the translocated trees and the compensatory plantation every quarter for a period of Three(3) years to the undersigned and follow the appropriate recommendation of the Tree officer.

D. Storage & disposal of felled trees:

i. The extracted wood from 24 trees to be felled should be deposited at Jarakbande Kaval Tenkey Depot with the Bangalore Range Forest Officer, through the Range Forest Officer, K.R.Puram for disposal.

Sd/-

Tree Officer &
Deputy Conservator of Forests
Bengaluru Urban Division.

Copy to:

1. Chairman, Tree Authority and Chief Conservator of Forests(Territorial),Bangalore for kind information.
2. Managing Director, BMRCL, 3rd Floor, BMTC Complex, Shanthinagara, Bengaluru - 560027.
3. General Manager, Social and Environment Management Unit, BMRCL, 5th Floor, BMTC Complex, Shanthinagara, Bengaluru - 560027.
4. Sri Dattatraya T Devare, A-102 Natasha Golf View Apartments, Domlur Bengaluru– 560071, Petitioner in WP 17841/2018.
5. Bangalore Environment Trust, 10, Sirur Park B Street Seshadripuram Bengaluru – 560020, Petitioner in WP 17841/2018.
6. Deputy Chief Engineer , Engineer/R1A/BMRCL, 3rd Floor, BMTC Complex, Shanthinagara, Bengaluru - 560027
7. Assistant Conservator of Forests, BBMP & Member Secretary, Tree Expert Committee appointed by Hon'ble High Court in WP 17841/2018.

8. Assistant Conservator of Forests, South Sub Division, Bangalore for kind information and necessary action.
9. Range Forest Officer, K.R.Puram Range, K.R.Puram for kind information and necessary action.
10. Office Copy.

Tree Officer &
Deputy Conservator of Forests,
Bengaluru Urban Division.

Tree Officer and
Deputy Conservator of Forests
Bangalore Urban Division,
BANGALORE

Annexure-02

ಕರ್ನಾಟಕ ಸರ್ಕಾರ

ಸಂಖ್ಯೆ: ಕಕ್ರೀಪ್ರಾ:ಸಿ5:65/2021-22

ಆಯುಕ್ತರ ಕಾರ್ಯಾಲಯ
ಯುವ ಸಬಲೀಕರಣ ಮತ್ತು ಕ್ರೀಡಾ ಇಲಾಖೆ
ಹಾಗೂ ಮಹಾ ನಿರ್ದೇಶಕರು
ಕರ್ನಾಟಕ ಕ್ರೀಡಾ ಪ್ರಾಧಿಕಾರ
ರಾಜ್ಯ ಯುವ ಕೇಂದ್ರ, ನೃಪತುಂಗ ರಸ್ತೆ
ಬೆಂಗಳೂರು – 560001
ದಿನಾಂಕ : 19-08-2021

ಗೆ

ವ್ಯವಸ್ಥಾಪಕ ನಿರ್ದೇಶಕರು
ಬಿಎಂಆರ್‌ಸಿಎಲ್ (ಮೆಟ್ರೋ)
ಬೆಂಗಳೂರು

ಮಾನ್ಯರೇ,

ವಿಷಯ:- ಕುಂಬಳಗೋಡು ಮತ್ತು ವಿದ್ಯಾನಗರ ತರಬೇತಿ ಕೇಂದ್ರದಲ್ಲಿ ಗಿಡ/ಸಸಿಗಳನ್ನು ನೆಡುವ ಕುರಿತು:-

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ಯುವ ಸಬಲೀಕರಣ ಮತ್ತು ಕ್ರೀಡಾ ಇಲಾಖೆಯ ಅಧೀನದಲ್ಲಿರುವ ಕುಂಬಳಗೋಡು ತರಬೇತಿ ಕೇಂದ್ರವು ಸುಮಾರು 7 ಎಕರೆ ವಿಸೀರ್ಣವನ್ನು ಮತ್ತು ವಿದ್ಯಾನಗರ ತರಬೇತಿ ಕೇಂದ್ರವು ಸುಮಾರು 62 ಎಕರೆ ವಿಸ್ತೀರ್ಣವನ್ನು ಹೊಂದಿರುತ್ತದೆ.

ಸದರಿ ತರಬೇತಿ ಕೇಂದ್ರದ ಪರಿಸರವನ್ನು ಉತ್ತಮ ರೀತಿಯಲ್ಲಿ ನಿರ್ವಹಣೆ ಮಾಡುವ ದೃಷ್ಟಿಯಿಂದ ಈ ಎರಡು ತರಬೇತಿ ಕೇಂದ್ರದಲ್ಲಿ ಖಾಲಿ ಇರುವ ಸೂಕ್ತ ಸ್ಥಳಗಳಲ್ಲಿ ಗಿಡಗಳನ್ನು / ಸಸಿಗಳನ್ನು ನೆಡಲು ಉದ್ದೇಶಿಸಲಾಗಿದೆ. ಆದ್ದರಿಂದ ಈ ಎರಡು ತರಬೇತಿ ಕೇಂದ್ರದಲ್ಲಿ ತಮ್ಮ ಸಂಸ್ಥೆಯವತಿಯಿಂದ ಗಿಡಗಳನ್ನು / ಸಸಿಗಳನ್ನು ಉಚಿತವಾಗಿ ನೆಡುವಂತೆ ಮತ್ತು ಈ ಗಿಡಗಳನ್ನು / ಸಸಿಗಳನ್ನು ಎರಡು ವರ್ಷಗಳ ಅವಧಿಯವರೆಗೆ ಉಚಿತವಾಗಿ ನಿರ್ವಹಣೆ ಮಾಡುವಂತೆ ಕೋರಿದೆ.

ತಮ್ಮ ವಿಶ್ವಾಸಿ

ಆಯುಕ್ತರು
ಯುವ ಸಬಲೀಕರಣ ಮತ್ತು ಕ್ರೀಡಾ ಇಲಾಖೆ
ಹಾಗೂ ಮಹಾ ನಿರ್ದೇಶಕರು
ಕರ್ನಾಟಕ ಕ್ರೀಡಾ ಪ್ರಾಧಿಕಾರ

ಸ್ವೀಕೃತಿ ಪೃಷ್ಠ ಸಂಖ್ಯೆ: 4596
31 AUG 2021
ಬೆಂಗಳೂರು - 560 001

356

ಸರ್ಕಾರಿ ಪ್ರೌಢಶಾಲೆ, ವಿದ್ಯಾನಗರ ಕ್ರ.ಸಂ.09/21-22 Dt. 03/09/21 ಬೆಂಗಳೂರು ಉತ್ತರ ವಲಯ-4 ಬೆಂಗಳೂರು-562157

ಮುಖ್ಯಶಿಕ್ಷಕರ ಕಾರ್ಯಾಲಯ, ಸರ್ಕಾರಿ ಪ್ರೌಢಶಾಲೆ, ವಿದ್ಯಾನಗರ, ಯಲಹಂಕ ತಾಲೂಕು,ಉತ್ತರ ವಲಯ -4. ಬೆಂಗಳೂರು -562157.

ರವರಿಗೆ,

ದಿನಾಂಕ : 03-09-2021.

ವ್ಯವಸ್ಥಾಪಕ ನಿರ್ದೇಶಕರು,
ಬಿ.ಎಂ.ಆರ್.ಸಿ.ಎಲ್ (ನಮ್ಮ ಮೆಟ್ರೋ)
ಬೆಂಗಳೂರು.

ಮಾನ್ಯರೇ,

ವಿಷಯ : ಶಾಲಾ ಕಾಂಪೌಡಿನಲ್ಲಿ ಹಣ್ಣು ಹಾಗೂ ಹೂ ಗಿಡಗಳನ್ನು ನೆಡಲು ಜಾಗ ಲಭ್ಯವಿರುವ ಬಗ್ಗೆ.

ಉಲ್ಲೇಖ :ತಮ್ಮ ಕ.ಪ.ಸಂ..BMRCL/SEMO/GM 2021-22/4916. ದಿನಾಂಕ :03-09-2021.

****

ಮೇಲ್ಕಂಡ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖದನ್ವಯ ಗೌರವಾನ್ವಿತ ಉಚ್ಚ ನ್ಯಾಯಾಲಯದ ಆದೇಶದಂತೆ METRO ದಿಂದ ತೆರವಾದ ಮರಗಳ ಬದಲಿಗೆ ಗಿಡನೆಡುವಂತೆ ಸೂಚಿಸಿರುವುದರಿಂದ, ತಮ್ಮ ಕಛೇರಿ ಪತ್ರದಲ್ಲಿ ಲಭ್ಯವಿರುವ ಸ್ಥಳದಲ್ಲಿ ಗಿಡ ನೆಡಲು ಸ್ಥಳಾವಕಾಶ ಕೋರಿದ್ದು ಅದರಂತೆ ನಮ್ಮ ಶಾಲಾ ಕಾಂಪೌಂಡಿನಲ್ಲಿ ಸುಮಾರು 16 ಎಕರೆ ಖಾಲಿ ಜಾಗವಿದ್ದು, ಈ ಜಾಗದಲ್ಲಿ ಗಿಡಗಳನ್ನು ನೆಡಬಹುದಾಗಿರುತ್ತದೆ.

ಗೌರವ ವಂದನೆಗಳೊಂದಿಗೆ

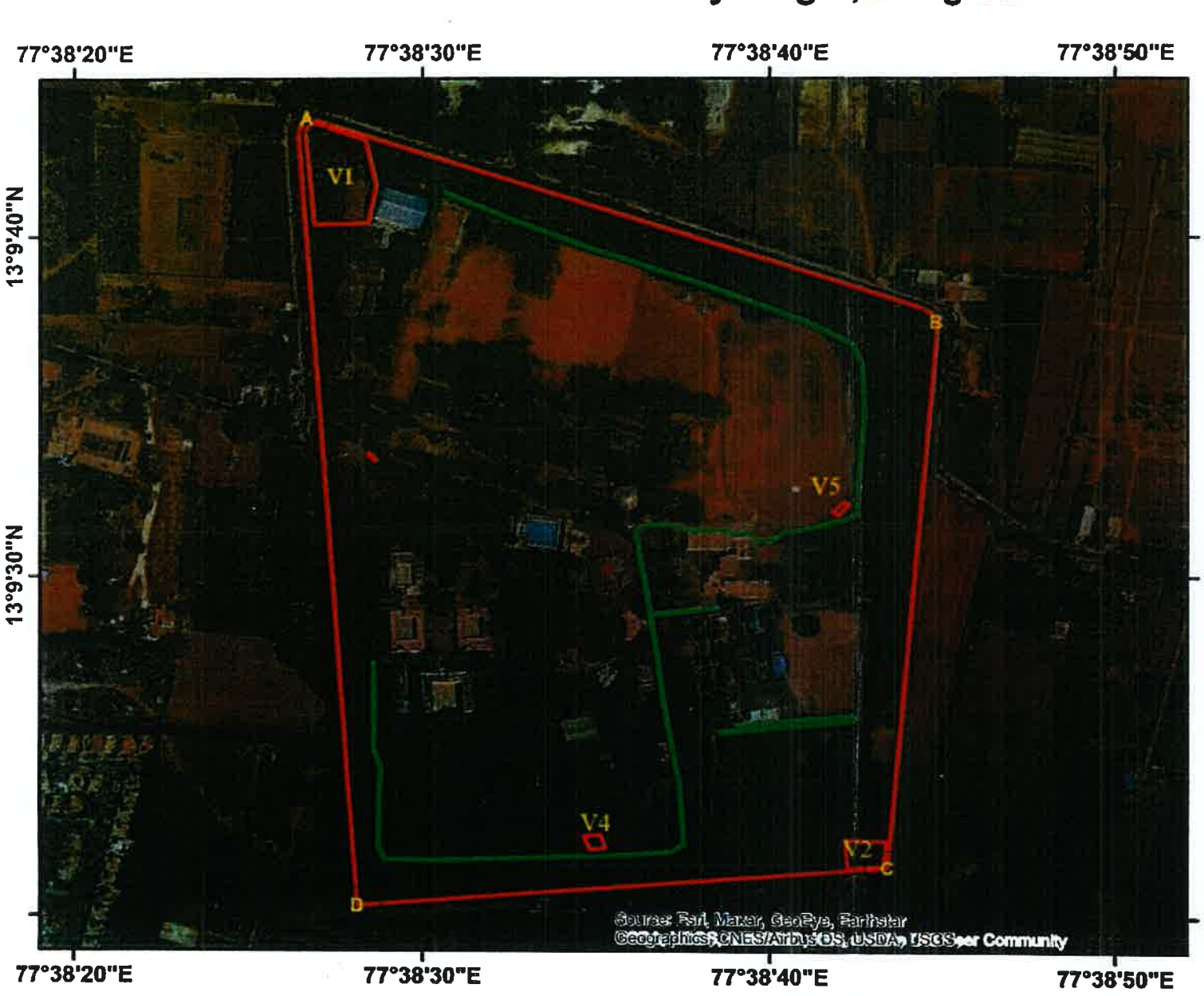
ತಮ್ಮ ನಂಬುಗೆಯ

HEAD MASTER
Government High School
Vidyanagara, Bangalore North
Bangalore-562157

ಸ್ಥಳ : ವಿದ್ಯಾನಗರ.

Annexure - 03

Proposed Compensatory Plantation in Youth Training Centre (DYSS) and Govt. High School, Vidyanagar, Bangaluru



N

Boundary Area coordinates for Compensatory Plantation

Id	Latitude	Longtide
A	13° 9'43.46"N	77°38'26.70"E
B	13° 9'37.48"N	77°38'44.81"E
C	13° 9'21.44"N	77°38'43.40"E
D	13° 9'20.30"N	77°38'28.11"E

Legend

Road (1.73 km)

Compensatory Plantation Site (0.529 ha)

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Shanthinagar, Bengaluru - 560 027

Compensatory Plantation Plan pertaining to reach R1A Vijinapur - 320 Saplings

Boundary Coordinates

V1	
13° 9' 43.344" N	77° 38' 26.808" E
13° 9' 42.804" N	77° 38' 28.32" E
13° 9' 40.356" N	77° 38' 28.392" E
13° 9' 40.32" N	77° 38' 26.88" E

V2	
13° 9' 22.212" N	77° 38' 42.144" E
13° 9' 22.212" N	77° 38' 43.368" E
13° 9' 21.456" N	77° 38' 43.26" E
13° 9' 21.384" N	77° 38' 42.216" E

V4	
13° 9' 22.32" N	77° 38' 34.584" E
13° 9' 22.392" N	77° 38' 35.088" E
13° 9' 21.996" N	77° 38' 35.196" E
13° 9' 21.924" N	77° 38' 34.764" E

V5	
13° 9' 31.896" N	77° 38' 41.784" E
13° 9' 31.788" N	77° 38' 41.928" E
13° 9' 32.112" N	77° 38' 42.252" E
13° 9' 32.148" N	77° 38' 42.036" E

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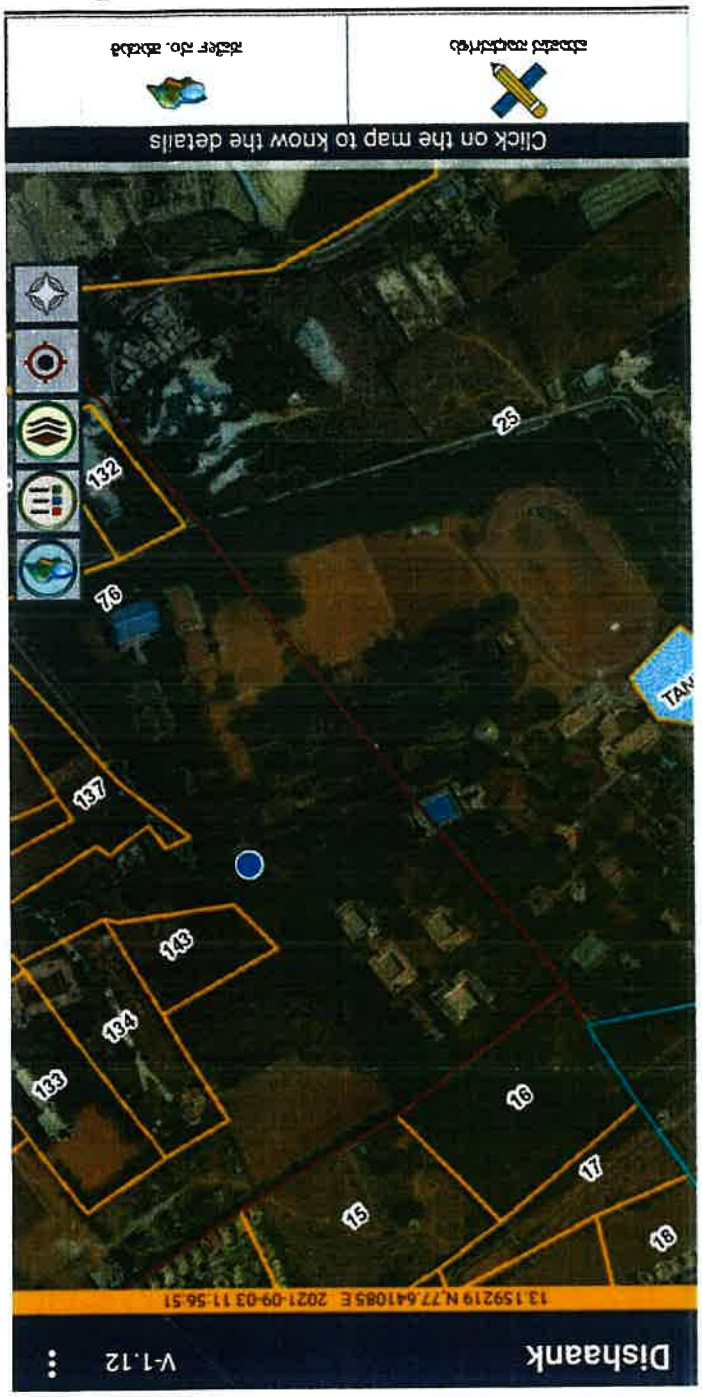
Map showing the survey number of Compensatory plantation site



Annexure-04

UNIVERSITY OF AGRICULTURAL SCIENCES GKVK, BANGALORE
DEPARTMENT OF SOIL SCIENCE AND AGRICULTURAL CHEMISTRY

SS&AC/775 /2021-22 25-08-2021

To,
CHIEF ENGINEER,
SEMU, BMRCL,BMTC COMPLEX, 3rd FLOOR,
K.H. ROAD, SHANTINAGAR, BANGALORE- 560 027
PH: 9481235157

Sir,

Sub: Analytical result of three soil samples ....reg
Ref: DR/ STA/TT- 123 / 2021-22 dt: 23-08-2021

Please find here with the analytical results of three soil samples provided by you for analysis in the Dept. of Soil Science and Agricultural Chemistry, College of Agriculture, GKVK, Bangalore-65

Soil samples

Parameters	Jayaprakash Narayan Youth Training Centre, Vidyanagara, Bengaluru	Singapura Lake, Bengaluru	Doddajala Lake, Bengaluru
pH (1:2.5)	6.62	6.28	6.43
Electrical conductivity (dS/m)(1: 2.5)	0.19	0.10	0.15
Organic carbon (%)	0.52	0.55	0.47
Nitrogen (kg ha^{-1})	284.17	298.92	218.69
Phosphorus (kg ha^{-1})	27.20	21.64	29.43
Potassium (kg ha^{-1})	219.48	223.16	182.92
Calcium (meq/100 g)	8.10	6.40	5.50
Magnesium (meq/100 g)	3.00	2.90	2.60
Sulphur (ppm)	15.92	12.74	11.68
Iron (ppm)	7.14	6.83	6.56
Manganese (ppm)	3.11	2.49	4.17
Zinc (ppm)	0.76	0.64	0.70
Copper (ppm)	0.35	0.22	0.28
Boron (ppm)	0.41	0.38	0.33

Inference: The three soil samples provided for analysis are acidic to neutral in nature, low to medium in organic carbon content and contains low to medium quantities of major nutrients (N, P, K as per standards) and all other parameters vary from medium to high ranges as per standards. Therefore with proper amendment application soil is suitable for translocation/ compensatory plantation.

The result should not be utilized for legal / commercial purposes without prior consent of the Director of Research.

Yours faithfully

Forwarded to
Director of Research

NO. DR/STA/TT-123/2021-22
dtd. 26/8/2021

Professor and Head
Professor and Head
Dept. of Soil Science & Agril. Chemistry
College of Agriculture, GKVK
Bangalore-560 065

COUNTERSIGNED

Director of Research
University Of Agricultural Sciences
G.K.V.K Bengaluru-560 065

UNIVERSITY OF AGRICULTURAL SCIENCES, BANGLORE
DEPARTMENT OF SOIL SCIENCE AND AGRICULTURAL CHEMISTRY
COLLEGE OF AGRICULTURE, GKVK CAMPUS

Soil and Irrigation Water Parameters Interpretation

Limits of Nutrients in Soil /ಮಣ್ಣಿನಲ್ಲಿನ ಪೋಷಕಾಂಶಗಳ ಮಿತಿಗಳು

Parameters				
pH	ರಪಹಾರ	<6.5 ಹುಳಿ	6.5-8.5 ತಟಸ್ಥ	>8.5 ಕ್ಷಾರ
EC (dS/m)	ವಿದ್ಯುತ್ ವಾಹಕತ್ವ,ಡೆಸಿ,ಸ್ಪೆಮನ/ಮೀ	<0.8 ಸಹಜ ಸ್ಥಿತಿ	0.8-1.6	>1.6-2.5 ಹಾನಿಕಾರಕ

Parameters		Low/ಕಡಿಮೆ	Medium/ಮಧ್ಯಮ	High/ಹೆಚ್ಚು
OC (Organic Carbon%)	ಸಾವಯನ ಇಂಗಾಲ (%)	<0.50	0.5 - 0.75	>0.75
Nitrogen (Kg ha^{-1})	ಸಾರಜನಕ (N) ಕೆ.ಜಿ./ಹೆ.	<280	280-560	>560
Phosphorus (Kg ha^{-1})	ರಂಜಕ (P2O5) ಕೆ.ಜಿ./ಹೆ.	<22.9	22.9-56.33	>56.33
Potassium (Kg ha^{-1})	ಪೊಟ್ಯಾಶ್ (K2O) ಕೆ.ಜಿ./ಹೆ.	<141	141-336	>336
Sulphur (ppm)/mg kg^{-1}	ಗಂಧಕ(S) ಪಿ.ಪಿ.ಎಂ	<10	10-20	>20
Iron (ppm)/mg kg^{-1}	ಕಬ್ಬಿಣ (Fe) ಪಿ.ಪಿ.ಎಂ	<2.50	2.50-4.50	>4.50
Manganese (ppm)/mg kg^{-1}	ಮ್ಯಾಂಗನೀಸ್(Mn) ಪಿ.ಪಿ.ಎಂ	<1.00	1.00-2.00	>2.00
Copper (ppm)/mg kg^{-1}	ತಾಮ್ರ(Cu) ಪಿ.ಪಿ.ಎಂ	<0.10	0.10-0.20	>0.20
Zinc (ppm)/mg kg^{-1}	ಸತು (Zn) ಪಿ.ಪಿ.ಎಂ	<0.60	0.60-1.00	>1.00
Boron (ppm)/mg kg^{-1}	ಬೋರಾನ್ (B) ಪಿ.ಪಿ.ಎಂ	<0.25	0.25-0.50	>0.50

Irrigation Water Quality Parameters/ ನೀರಾವರಿ ನೀರಿನ ಗುಣಮಟ್ಟ ನಿಯತಾಂಕ

Parameter	Low/ಕಡಿಮೆ	Medium/ಮಧ್ಯಮ	High/ಹೆಚ್ಚು
pH/ಪಹಾರ	<6.5	6.5-7.5	>7.5

Salinity Classes

Parameter	Low/ಕಡಿಮೆ (C_1)	Medium/ಮಧ್ಯಮ (C_2)	High/ಹೆಚ್ಚು (C_3)	Very High/ಅತಿ ಹೆಚ್ಚು (C_4)
EC (dS/M) ವಿದ್ಯುತ್ ವಾಹಕತ್ವ	<0.25	0.25-0.75	0.75-2.25	>2.25
Chlorides(Cl)(ppm)/ಕ್ಲೋರೈಡ್	<2-5	5-12	12-20	>20

Sodicity Classes

Parameter	Low/ ಕಡಿಮೆ (S_1)	Medium/ಮಧ್ಯಮ (S_2)	High/ಹೆಚ್ಚು (S_3)	Very High/ ಅತಿ ಹೆಚ್ಚು (S_4)
SAR (Sodium adsorption ratio) ಸೋಡಿಯಂ ಹೀರುವಿಕೆ ಅನುಪಾತ	<10	10-18	18-26	>26

Bicarbonate (HCO3) Classes

Parameter	Low (RSC_1) / ಕಡಿಮೆ	Medium (RSC_2) /ಮಧ್ಯಮ	High (RSC_3) /ಹೆಚ್ಚು
RSC (Residual Sodium carbonate) ಉಳಿಕೆ ಸೋಡಿಯಂ ಕಾರ್ಬೋನೇಟ್	<1.25	1.25-2.50	>2.50

Professor and Head
Soil Science & Agril. Chemistry
U.A.S., G.K.V.K

Annexure-05

List of Tree species for Compensatory Plantation of 320 saplings			
SI NO	**Tree Species Name**	**Category**	**No Of Saplings Proposed for Plantation**
1	Tamarind *(Tamarindus indica)*	Fruit	10
2	Jackfruit *(Artocarpus heterophyllus)*	Fruit	25
3	Indian Almond *(Terminalia catappa)*	Fruit	25
4	Indian Fig Tree *(Ficus racemosa)*	Fruit	10
5	Basavana pada *(Bauhinia purpurea)*	Flower	10
6	Goosseberry Tree *(Phyllanthus acidus)*	Fruit	10
7	Monkey Jackfruit *(Artocarpus hirsutus)*	Fruit	20
8	Mahuwa Tree *(Madhuca longifolia)*	Fruit & Flower	5
9	Hole dasavala *(Lagerstroemia speciosa)*	Flower	10
10	Hole matti *(Terminalia arjuna)*	Wood	20
11	Hoorasi *(Thespesia Populnea)*	Flower & Wood	5
12	Nagalingpuspha *(Couroupita guianensis)*	Flower	10
13	Bili booraga *(Ceiba pentandra)*	Flower	20
14	Kadamba mara *(Neolamarckia cadamba)*	Flower & Wood	10
15	Mahogany *(Swietenia mahogany)*	Wood	10
16	champaka mara *(Michalea champaca)*	Flower	20
17	Ala *(Ficus benghalensis)*	Wood & Fruit	10
18	Arali mara *(Ficus religiosa)*	Wood & Fruit	10
19	Atti mara *(Ficus glomerata)*	Wood & Fruit	10
20	Basari mara *(Ficus virens)*	Wood	10

SI NO	Tree Species Name	Category	No Of Saplings Proposed for Plantation
21	Narale mara *(Syzygium cumini)*	Fruit	10
22	Neem *(Azadirachta indica)*	Wood	10
23	Tapasi *(Holoptelea integrifolia)*	Wood	10
24	Honge *(Millettia pinnata)*	Wood	10
25	Ailanthus *(Ailanthus altissima)*	Wood	5
26	Tare *(Terminalia bellirica)*	Wood	10
27	Antawala *(Sapindus emarginatus)*	Flower	5
Total			**320**

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Annexure-06

SPECIES AND PLANTING TECHNIQUE MODELS
General Guidelines

A. INTRODUCTION:

1) Karnataka Forest Department is afforesting around 80000 to 100000 ha. annually under various plan and non-plan programmes. Afforestation is also taken up under various models of planting. Assisted Natural Regeneration (ANR) and Artificial Regeneration (AR) accounts for large share of hectare being afforested. The department has gained lot of experience by way of feed back and evaluation of the planting programmes. Many successful planting techniques have been established and followed in the field. However there is no compilation of such successful planting techniques evolved and of collective experience of the department. Afforestation and Reforestation is one of the core activities of the department and there is an urgent need to codify successful practices, so that it serves as manual for all the field officers who are engaged in the task of afforestation. In addition uniform cost norms and model estimates for various types of afforestation works help in standardizing planting techniques across various schemes.

2) An effort in this regard began in a meeting of few field officers and senior officers on 3-11-2010. A concept paper was prepared and sent to all circles with a request to submit circle wise write up on important best practices. Based on the circle wise reports "A species and Planting Technique models for Karnataka" was prepared by a Core Committee comprising of Addl. Principal Chief Conservator of Forests (Development), Addl. Principal Chief Conservator of Forests (Projects), Conservator of Forests (Development) and Conservator of Forests (Projects).

3) The report was again circulated among field officers through circle Conservators of Forests / Chief Conservator of Forests during April 2011.

4) A series of workshops were held at Davanagere (Bellary circle), Shimoga (Shimoga, Chikmagalur and Mangalore circles), Dharwad (Dharwad, Belgaum and Kanara circles), Bangalore (Bangalore and Chamarajanagar circles), Mysore (Mysore, Kodagu and Hassan circles) and Gulbarga (Gulbarga circle) during May-June 2012. In these workshops all Chief Conservators of Forests, Deputy Conservators of Forests (Territorial) and (Social Forest), Assistant Conservators of Forests (Territorial) and (Social Forest) and selected Range Forest Officers participated. The report was also discussed in the meeting of Chief Conservators of Forests and senior officers of the department on 20-06-2012 and 17-12-2012. Based on the deliberations and inputs of senior officers and field officers the final report is prepared.

B. METHODOLOGY

1) The Approach: The state is divided in to 4 Silvi (Agro) climatic zones for the purpose of report. The Talukas / Districts in each zone are as per the agro-

climatic zones recognized by the State Agriculture Department. The details of areas falling in various agro-climatic zones is provided in Annexure-I. Karnataka state land use board has classified state in to 10 zones. These zones are further regrouped as follows for the purpose of this report.

1.	Dry Zone	:	North Eastern Dry Zone, Northern Dry Zone, Central Dry Zone, Eastern dry zone, Southern dry zone.
2.	Transitional zone	:	Southern transition zone, Northern transition zone, North Eastern transition zone.
3.	Malnad & Western Ghat zone	:	Corresponding to Hilly zone of Karnataka land use board classification.
4.	Coastal zone	:	Coastal zone.

2) Within Silvi (Agro) climatic zones and specially for the purpose of Artificial Regeneration Model two site qualities have been distinguished.

1. Poor site quality : Sites of low fertility having little (<30cm) or no top soil. Rocky in nature.
2. Moderate to High fertility site quality : Sites with >30 cm. soil depth. Can sustain growth of native species and production forestry.

3) Three canopy densities are also distinguished for deciding allotment of areas under ANR or AR model and working out specific treatments.

1. Open areas and areas with less than 10% canopy.
2. Areas with 10 to 25% canopy.
3. Areas with 25 to 40% canopy.

4) Following various models and topics have been considered for detailing out planting techniques and best practices.

1. Assisted Natural Regeneration (ANR)
2. Artificial Regeneration (AR)
3. NTFP plantation
4. Sandal Regeneration
5. Road side plantations.
6. School and Institutional planting.
7. City and Urban areas planting.
8. Canal Bank plantations.
9. Farm Forestry.
10. Nursery Practices.

5) The species and planting technique models for the states provide the following details.

(1) **Brief description** of the area relevant to the Model. For actual geographical applicability and Taluks, districts in each zone Annexure-1 may be referred.

(2) **List of core species**: The species which constitute core of nursery and planting for the given zone and model are listed based on the past experience.

(3) **Planting Technique**: The details like site preparation, planting density per ha, size of polythene bags for raising seedlings, land preparation (pitting, T.M, Ripping etc.,) type of protection to be provided, watering, number of years a plantation to be maintained are indicated.

However to avoid repetition only the specific and important details of each model are only noted. Rest of the specifications are detailed out in Model Estimates relevant for each model of planting.

(4) It is strongly recommended that the afforestation areas are delineated on water shed basis. A land scape of about 5-10 thousand ha. in each range including the areas outside forests may be taken as a unit of treatment of both arable and non-arable land. Such land scapes may be prioritised based on a composite index with proper weightage for extent of forest degradation, availability of waste lands, scope for Farm Forestry and Socio-economic backwardness of the areas etc.,

6) All resources available for afforestation including promotion of farm forestry may be allotted to such delineated land scapes based on its prioratisation so that the limited resources at the disposal of the department are spent on most needy areas.

7) The report also recommends the following common prescriptions.

1. All block plantation sites are provided protection with Cattle Proof Trenches or Barbed Wire Fencing.

2. SMC in terms of Gully checks and **SMC Trenches of 5X1X1 M dimension with outlets / spill ways and one or two nala bunds depending upon site requirement are provided in all block plantation.** A sum equal to 20% (a sum equal to 15% of the total cost of planting up to full maintenance is provided for SMC works in plain and gentle sloppy lands and 25% of the total cost of planting upto to full maintenance is provided in SMC works in sloppy and steep sloppy areas. This has to be certified by the officers at the rank of ACF / DCF after site visit.

3. CPT is excavated to cover entire Micro Water Shed and plantings raised within the area for 5 years.

4. Sowing of seeds, planting of cuttings and Agave shall be taken up on CPT mounds and SMC trenches.

5. Ripping is recommended as preferred in mode of site preparation in Dry and Transitional zones under AR Model.

6. Planting will be done in ripped furrows and mound formation taken up later. So no sowing of seeds on mounds is normally recommended. But in case where two seedlings are planted per trench, sowing of seeds of local species like Muttuga, Honge, Hale, Ode, Kamara etc. can be done in the trenches.

7. Watering of seedling is provided 5 times in the 1st year 3 times in 2nd year under Greening Urban Areas. Road side, NTFP, Canal Bank and Sandal Estate Models. However in Institutional Planting model watering will be done by individual institutions.

8. F.Y.M application @1CM/40 plants is recommended under Greening Urban Areas / Road side / NTFP models.

9. a) 500 T.M. of 4M length and 1500 plants/Ha is recommended for the area which do not have root stocks and do not likely to get root suckers after ripping / pitting.

   b) However, in the locations where good number of root stocks are found and root suckers are likely to come up after ripping 1000 plants per hectare is recommended. Then the number of seedlings in each trench will be two per trench.

10. Plantation maintenance is kept at planting plus 2 year for Artificial Regeneration models which are planted with fast going species and 4 years for the models which are planted with slow going species. ANR Model, Greening Urban Areas, Road side, NTFP models where the plantations will be maintained up to 5 years.

11. Any major deviation based on site specific requirement shall be done only with the written approval of Deputy Conservator of Forests detailing out the reasons.

12. Detailed model estimates are provided for each model of planting.

C. SPECIES AND PLANTING TECHNIQUES MODELS

I. Assisted Natural Regeneration (ANR) Model is further sub divided in to

IA. Eco-Restoration Model
IB. Supplemental Planting Model

I(A) ECO- RESTORATION MODEL:

1. **Area Description**: Sites in all 4 zones which contain canopy density between 25 – 40% and are under various stages of degradation but can rejuvenate given proper protection and soil moisture conservation treatment are treated under this model, so that the already present root stock and regeneration is helped to establish and grow.

2. **Core Species**: No planting is proposed in this model. Only dibbling of seeds of native species will be taken up.

3. **Planting Technique**:

1) Protection through excavation of cattle proof trenches @ 72 RMT/ 90 CMT per ha.

2) Sowing of seeds of Glyrecidia, Planting of Agave suckers on the CPT mounds in open area and Duranta cuttings on the CPT mounds in partially shaded area in high forest locations.

3) Watch and Ward for every 50 ha.

4) Dibbling of seeds of Sandal, Neem, Seetaphal, Honge and other native species.

5) Clearing unwanted growth, Climber cutting, Tending, cutting back of half cut stumps / stools to get good coppice growth and singling of coppice growth @ 400 plants/ha. The training of local community/ VFC members and sharing of biomass and its documentation shall be made in this operation.

6) Other details as per model estimate Model -01

I(B) SUPPLIMENTAL PLANTING MODEL:

1. Area Description: Sites in all 4 zones which have a canopy density between 10 – 25% which are deficient in regeneration and are under higher degree of degradation and with large open gaps are selected under this model. The presence of appreciable root stock of native species which can be nursed / nurtured to better health and supplemental planting with high value native species is main objective of this model.

Species Proposed:

Dry Deciduous Forests:

1.	Bevu	Azadiracta indica
2.	Tapasi	Holoptelia integrifolia
3.	Seetaphal	Annona Squamosa
4.	Honge	Pongamia pinnata
5.	Kamara	Hardwikia binata
6.	Bage	Albezzia lebbek
7.	Ficus	Ficus bengalensis
8.	Sisso	Dalbargia Sisso
9.	Ailanthus	Ailanthus excelsa
10.	Hale	Writia tinctoria
11.	Ude	Steriospermum chelanoides
12.	Dhupa	Boswella Serrata
13.	Nelli	Emblica officinalis
14.	Honne	Pterocarpus marsupium

Moist Decidious Forests

1.	Teak	Tectona grandis
2.	Nandi	Legarstroemia lanceolata
3.	Honne	Pterocarpus marsupium
4.	Mathi	Terminalia alata
5.	Shivane	Gmelina arboria
6.	Kindal	T.paniculata
7.	Beete	Dalbargia latifolia
8.	Tare	T.belerica
9.	Bamboo	Bambusa arundinasia
10.	Muthuga	Butea monosperma
11.	Hippe	Madhuca latifolia
12.	Sandal	Santalum album
13.	Nelli	Emblica officinalis
14.	Neral	Sizyzium cumini
15.	Dhaman	Grevia tilifolia
16.	Kaval	Careya arborea
17.	Harada	Terminatia chebula

Semi Evergreen and Evergreen Forests:

1.	Honne	Pterocarpus marsupium
2.	Beete	Dalbargia latifolia
3.	Dhoopa	Vateria indica
4.	Tare	T.belerica
5.	Hole mathi	T.arjuna
6.	Kindal	T.paniculata
7.	Bamboo	a) B.arundinasia b) D. Strictus
8.	Bharanigi	Vitex ultissima
9.	Bobbi	Lophopetalum whitianum
10.	Canes	Calamus species
11.	Gulmavu	Machilus macranta
12.	Saldhoopa	Veteria indica
13	Nerale	Sizyzium Cumini
14	Hebbalasu	Artocarpus heterophyllus
15	Halmaddi	Ailanthus malabaricum
16	Mango	Mangifera indica
17	Murugal	Garcinia indica
18	Uppage	Garcinia gummigatta
19	White cedar	Dysoxylon Malabaricum

3. Planting Technique:

1. Identified area is demarcated and surveyed and area will be closed with CPT / barbed wire fence.

2. The SMC works are taken up from ridge to valley concept. SMC trenches of 5X1X1 mts. across rills with spill ways and nala bunds are created.

3. The young regeneration is protected, the coppice growth is promoted by cutting back of stumps, singling of multiple shoots. Training of local community / VFC members for singling, pruning, cutting back, sharing of biomass and its documentation is done. This to be done by watch and ward persons.

4. Advance work is done by digging upto 200 pits of $75cm^3$ in dry zones, upto 400 pits of $60cm^3$ in other zones avoiding pitting near the existing root stock / regeneration.

5. Sowing of seeds of Prosopis, Glyrecidia in dry areas only. Planting of Agave suckers on the CPT mounds in open area and Duranta cuttings on the CPT mounds in partially shaded area in high forest locations.

6. At least 12 month old seedling in 10" X 16" polythene bags in dry zones and 10 months old 8" X 12" / 6" X 9" (for teak) polythene bags in other zones are used for planting.

7. Planting with Agave, Suckers/ bulbils and sowing of seeds of Bamboo, Sandal, Glyrecedia, Cassia, honge etc., on Mounds of SMC trenches and on Cattle Proof Trenches is done.

8. If necessary, further tending of root suckers, cutting back stumps, singling of coppice growth and soil working up to 400 plants/ha. is done during 3rd year involving local community / VFC members with documentation.

9. Engaging watch and ward for every 25 ha.

10. Other operations as per Model estimate Model- 02 and 03.

II. ARTIFICIAL REGENERATION MODELS (AR)

1. Artificial regeneration is taken up on barren, open areas, waste lands, blanks and laterate patches and forest areas where the canopy density or root stock is less than 10%. The site preparation is normally done by ripping by D-80 / D-120 dozers in dry and transitional zones and pitting is also done in the patches where ripping can not be taken up in rocky patches, rugged nalas up to 100 pits per hectare with pit size 75 cm^3.

2. Pitting is done in Malnad and coastal zones. The model by far constitutes very high extent of afforestation works in the state. Considering this fact the species choice and planting pattern is prescribed for all zones and two site qualities separately.

II(A) AR MODEL FOR LOW FERTILITY, ERODED AND ROCKY AREAS IN DRY ZONES.

1. **Area Description**: These are rocky eroded areas with very little or no top soil (less than 30 cm). The rainfall is scanty and ill distributed with high mean annual temperatures. The strategy for such areas is primarily to check the further degradation of sites and create a green cover using pioneer, colonizing species like Glyrecedia, C.Siamia, Agave etc., with a suitable mixture of hardy local species. The fast growing species like Glyrecedia cover up the site in 2-3 years and it is seen to compliment and facilitate the growth of inter planted local hardy species in course of time.

2. **Core Species and Planting Pattern**:

a) In the locations where there is no chance of getting roots sucker and regeneration after ripping, the planting density is as follows:

1.	Glyrecedia, C.Siamia, Agave	1400 plants / ha.
2.	Honge, Seetaphal, Tapasi, Ficus	100 plants / ha.

b) In the locations where there are chances of sufficient roots sucker and natural regeneration after ripping, the following core species planting pattern shall be followed.

c)

1.	Glyrecedia, C.Siamia, Agave	800 plants / ha.
2.	Honge, Seetaphal, Tapasi, Ficus	200 plants / ha.

II(B) AR MODEL FOR MODERATE TO HIGH FERTILITY AREAS IN DRY ZONE.

Planting Pattern – I

1. **Area Description**: Two distinct areas can be identified for the purpose of species selection. The taluks falling in Northern and North eastern dry zones (Annexure-I) especially districts like Bijapur, Gokak division of Belgaum district, Yadgir, Raichur, Gulbarga, Koppal and Gadag districts the following planting pattern is recommended.

2. **Core Species**:

1.	Glyrecedia, C.Siamia, Sisso	1300 plants / ha.
2.	Seetaphal, Honge, Ficus, Tapasi, Nelli, Bevu, Nerale	200 plants / ha.

b) In the locations where there are chances of sufficient roots sucker and natural regeneration after ripping, the following core species planting pattern shall be followed.

1.	Glyrecedia, C.Siamia, Agave	800 plants / ha.
2.	Honge, Seetaphal, Tapasi, Ficus	200 plants / ha.

3. Planting Pattern – II :

Area Description : The second distinct area comprises of Central, Eastern and Southern dry zones (Annexure-I) comprising of districts of Bagalkot, Bellary, Davanagere, Chitradurga, Tumkur, Kolar, Chikkaballapur, Bangalore Rural, Ramanagara etc.,

4. Core Species:

1.	Kamara, C.Siamia, Sisso, Stereospermum chelenoides, Soymida, Boswella serrata	1300 plants / ha.
2.	Seetaphal, Honge, Tapasi, Ficus, Nelli, Cashew, Seemaruba, Bevu, Nerale, Mango	200 plants / ha.

b) In the locations where there are chances of sufficient roots sucker and natural regeneration after ripping, the following core species planting pattern shall be followed.

1.	Kamara, C.Siamia, Sisso, Stereospermum Chelenoides, Soymida, Boswella serrata	800 plants / ha.
2.	Seetaphal, Honge, Tapasi, Ficus, Nelli, Cashew, Seemaruba, Bevu, Nerale, Mango	200 plants / ha.

II(C) AR MODEL FOR POORER SITES IN TRANSITIONAL ZONE:

1. **Area Description:** These areas also have little or no top soil, eroded, rocky and of low fertility. However the sites are located in better rainfall and moderate temperature and weather conditions.

2. **Core Species:**

1.	Auriculiformis in >1000 mm rainfall areas and in JFPM areas	1500 plants / ha.
2a.	C.Siamia, Sisso, Sterospermum, Seemaruba, Kamara	1300 plants / ha.
	Honge, Tapasi, Ficus, Nelli, Cashew, Bevu.	200 plants / ha.
2b.	In the locations where there are chances of sufficient roots sucker and regeneration after ripping the following core species planting pattern shall be followed.	
	C.Siamia, Sisso, Sterospermum, Seemaruba, Kamara	800 plants / ha
	Honge, Tapasi, Ficus, Nelli, Cashew, Bevu	200 plants / ha.

II(D) AR MODEL FOR MODERATE TO HIGH FERTILE AREAS IN TRANSITIONAL ZONE.

1. **Area Description**: The sites are having better soil depth (30-60 cms) and are situated in better rainfall and moderate weather conditions, conducive for raising productive plantations of fuel and small timber. Very fertile areas in this zone are put under NTFP / Fruit Orchard Model.

2. **Core Species:**

1.	A.auriculiformis in better rainfall areas and JFPM areas.	1500 plants / ha.
2a	C.Siamia, Sisso, Sterospermum, Seemaruba, Kamara	1100 plants / ha.
	Bamboo, Shivani, Nelli, Mango, Nerale, Cashew, Bage, Honge, Tapasi, Ficus	400 plants / ha.
2b.	In the locations where there are chances of sufficient roots suckers and regeneration after ripping the following core species planting pattern shall be followed.	
	C.Siamia, Sisso, Sterospermum, Seemaruba, Kamara	800 plants / ha
	Bamboo, Shivani, Nelli, Mango, Nerale, Cashew, Bage, Honge, Tapasi, Ficus	200 plants / ha.

3. Planting Pattern : Fast growing species like Kamara, C.Siamia, Sisso etc., in single species rows and species like Mango, Nerale, Nelli, Cashew at 10M spacing but in the ripped line only, without resorting to excavation of separate pits.

II(E) PLANTING OF EUCALYPTUS IN TRANSITIONAL ZONES

1. Moderate to high fertile areas in transitional zone as well as areas under JFPM in transitional zone are also suitable for raising Clonal and seed origin of better provinces Eucalyptus plantations. These plantations can yield appreciable biomass at the end of rotation period of 8 years. This will also improve supply of fuel wood, poles, small timber to meet local needs. It can also generate income to Village Forest Committees. In this model Eucalyptus preferably clonal planting material is planted 100% @ 1500 plants per hectare without mixing with any other species.

   However adopting this planting model is subject to overall policy of growing of eucalyptus by Government.

II(F) AR MODEL FOR FORESHORE AREAS IN DRY AND TRANSITIONAL ZONE.

1. **Area Description** : These areas are situated in foreshores of Tanks and Reservoirs in dry and transitional zones. The sites are fertile due to accumulation of salt, but have high degree of salinity and water logging.

2. **Core Species**:

1.	A.Nilotica / A.auriculiformis	550 plants / ha.
2.	Honge, T.arjuna, Nerale, Sisso and Bamboo	550 plants / ha.

3. **Planting Technique**: Only pitting is done for foreshore planting. A.nilotica is raised in 5"X8" polythene bags and miscellaneous species raised in 8"X12" polythene bags. While planting care should be taken to scrape the salt entrusted surface soil away. While doing soil working, raised mounds are formed so that the salt is leached down during rains. The planting should be done beyond HFL of Tank.

Planting Technique for AR model for Dry and Transitional Zone:

1) Site preparation is done by using D-80 / D-120 dozers in dry zones and by D-8 dozers in transitional zones.

2) 500 Trenches of 4M length are formed per ha. Pitting is also done in patches where ripping can not be taken up in rocky patches, rugged nalas etc up to 100 trenches of 4X11M or 100 pits per hectare with pit size $75cm^3$.

3) No refilling and formation of mounds is done before planting. This operation will be done after planting.

4) Fast growing species like Glyrecedia, C.Siamia, Kamara etc., are raised in 5"X8" polythene bags and miscellaneous species like Honge, Bevu, Ficus, Seetaphal etc., raised in 8"X12" polythene bags.

5) The planting proportion of fast growing species and miscellaneous shall be as indicated.

6) No separate pitting will be excavated for planting miscellaneous species, but are planted in the ripped line only.

7) Fast growing species like C.Siamia, Glyrecedia, Kamara etc., are planted. Single species in a row and the miscellaneous species mixed in each line at appropriate spacing.

8) SMC works are carried out by Gully checks and SMC trenches of size 5X1X1m across the rills with spill way and nala bunding wherever required only.

9) Other details as per Model estimate – Model 04, 05, 06 and 07.

II(G) AR MODEL FOR MALNAD AND WESTERN GHAT ZONE AND COASTAL ZONE.

1. Core species and Planting Pattern:

Planting Pattern-I

Open degraded areas with <10% canopy cover. Areas assigned to JFPM, Harvested areas, Encroachment evicted areas in Malnad and Coastal zones including the area having lateritic stones and outcrops. In all types of forest areas viz., Moist deciduous, SEG or EG areas.	Acacia auriculiformis 1500 plants / ha.

Planting Pattern-II

Moist deciduous forest types areas with bigger gaps and deficient regeneration. Moderate to high fertile areas.	Teak: 550 plants / ha.
	Honne, Matti, Kindal or Hunal, Heddi, Kalam, Nandi, Bamboo, Cashew, Mango, Nerale, Antawala, Shivani, Albezia 550 plants / ha.

Planting Pattern-III

Semi Evergreen, Evergreen areas with gaps and difficient regeneration. Moderate to high fertility in Malnad and Coastal zones	Acacia auriculiformis
	Hopea Whitiana 550 plants / ha.
	Hopea Parviflora, T.arjuna, Mango, Nerale, Cashew, Lophopetalumwhitianum, Hebbalasu, Saldhupa, Kaidhupa (Canarium strictum), Murugal, Uppage. 550 plants / ha.

Planting Technique :

1) Acacia auriculiformis is planted in pits of $45cm^3$ and planted 100% without mixing with any other species.

2) Teak in planting pattern II and Hopea whitiania is planting pattern-III are planted at 3X3M spacing (1100/ha) in $45cm^3$ pits in open areas.

3) Miscellaneous species are planted @400/ha in 5X5 M spacing.

4) Acacia is raised in 5"X8" polythene bags. Teak and Hopea are raised in 6"X9" polythene bags. Other miscellaneous species raised in 8"X12" polythene bags.

5) Protection is provided by Cattle Proof Trenches.

6) Sowing of seeds of Prosopis, Glyrecidia, Planting of Agave suckers on the CPT mounds in open area and Duranta cuttings on the CPT mounds in partially shaded area in high forest locations. SMC works provided by Gully checks are SMC trenches of 5X1X1 Mts size across the rills with spill ways and nala bunding wherever required only.

7) Other details as per Model estimate No.06 and 07.

NOTE ON PLANTING ACACIA IN AR MODEL:

1. Acacia is a gregarious, highly productive species which can attain high productivity in 8 years. It also gives highly valued timber after 20 years.

2. It is suitable for barren lateritic areas.

3. It can be planted in degraded forests, open areas with<10% canopy in Malnad and Coastal zones.

4. It can be grown as a pioneer species in Western ghats to build up fertility of the area and make it suitable for planting native species later.

5. It can be planted on Encroachment prone / evicted sites for quick site recovery and coverage.

6. It can be planted on Degraded forests and JFPM areas identified in JFPM management plan in Transitional, Malnad and Coastal zones.

7. Replanting after harvesting of JFPM areas as per VFC management plan.

8. Acacia should not be planted in ANR model as under planting.

9. Acacia should not be planted in dry zones.

II(H) AR MODEL SPECIAL AREAS IN COASTAL ZONES

1. **Area Description**: The sites in coastal area fall in 3 categories.

    1. Lateritic soils.
    2. Mangrooves.
    3. Sand dune stabilization

DEGRADED / LATERITIC SOILS:

Open degraded lateritic soils	Acacia auriculiformis 550 plants / ha. A.catachu 550 plants / ha.
Very hard lateritic patches	Ficus, A.catachu, T.belerica, Callophyllum oenophyllam, Cashew, Jummanakai (Fagara budrunga) planted 100 plants / ha.

Planting Technique:

1. Acacia auriculiform is raised in 5"X8" polythene bags and Acacia catachu in 8"X12" polythene bags planted in pits of $45cm^3$ and $60cm^3$ respectively.
2. Protection is provided by Cattle Proof Trenches / Barbed wire fence/ Laterite block rubble wall.
3. Standard SMC works with Gully checks and SMC trenches across the rills with spill ways and nala bunding wherever required only provided.
4. Other planting details as per Model estimate No.07.

MANGROVE PLANTING MODEL

1. **Area description**: Mangroove are typical areas in estuaries. They are both viviparous and saline tolerant in nature.

2. Core species : Avicennia marina, A.officinalis, Kandelia candel, Rhizophora apiculata, R.mucronata, Sonnaratia alba, S.Caseolaris, Exocaria agallocha, Aegiceras Corniculatum.

3. Planting Pattern : Seedlings of the species are collected and planted in estuaries in low sites at 1X1M spacing. Nursery seedlings can also be raised by wildling and planting can be done.

COASTAL SAND DUNE PLANTING:

Coastal sand dune belts are planted in Shelter belt fashion. Vegetative barrier created by shelter belt can be very effective in halting erosion of sand dumes.

Species : Spinifix littorate (Ravanana meese), Ipomea species, Pandanus species, Morinda citrifolia,
Callophyllum inophyllum, Anacardium occedentale,
Cauarina equisitifolia

Planting Technique : These species listed above are planted from sea shore towards inlands in the listed order. Smaller plants can be planted at 2X2M spacing with callophylhum, Cashew can be planted at 4X4 M spacing.

SUMMARY OF SPECIES, PLANTING PATTERN AND TECHNIQUE UNDER ARTIFICIAL REGENERATION MODELS

Sl. No.	Site specification	No. of plants / Ha	Core species	Planting Pattern			Model Code
				No. of Plants	Bag size	Site Preparation	
1.	Poorer sites in Dry zones all over state.	1500	Glyrecedia, C.Siamia, Agave Honge, Tapasi, Sitaphal, Ficus	1400 100	5"X8" 8"X12"	Ripping / pitting (upto 100) in area where ripping can not be done	IIA
2.	Moderate-High Fertile areas in Northern and North Eastern dry zone	1500	Glyrecedia, C.Siamia, Sisso Seetaphal, Honge, Ficus, Tapasi, Nelli, Bevu, Nerale	1300 200	5"X8" 8"X12"	Ripping / pitting (upto 100) in area where ripping can not be done	IIB
3.	Moderate - High fertile areas in Central, Eastern and Southern Dry zone.	1500	Kamara, C.Siamia, Sisso, Sterospermum, Seemaruba. Seetaphal, Honge, Saymeda, Tapasi, Ficus, Nelli, C;ashew, Bevu, Nerale.	1300 200	5"X8" 8"X12"	Ripping / pitting (upto 100) in area where ripping can not be done	IIB
4.	Poorer sites in Transitional zone	1500	Acacia auriculiformis in JFPM areas and areas receiving >1000 mm C.Siamia, Sisso, Stereospermum, Seemaruba, Kamara, Honge, Tapasi, Ficus, Nelli, Cashew, Bevu	1500 1300 200	5"X8" 5"X8" 8"X12"	Ripping / pitting (upto 100) in area where ripping can not be done	IIC

Sl. No.	Site specification	No. of plants / Ha	Core species	Planting Pattern			Model Code
				No. of Plants	Bag size	Site Preparation	
5.	Moderate to fertile sits in Transitional zones	1500	Acacia auriculiformis in JFPM areas and areas receiving >1000 mm rainfall	1500	5"X8"	Ripping / pitting (upto 100) in area where ripping can not be done	II D
			C.Siamia, Sisso, Stereosperum, Seemaruba, Kamara	1100	5"X8"		
			Bamboo, Shivani, Nelli, Mango, Nerale, Cashew, Bage, Honge, Tapasi, Ficus.	400	8"X12"		
			Eucalyptus	1500	5"X8"		II E
6.	Dry zone, Transitional zone where there are chances of sufficient root suckers and natural regeneration after Ripping.	1000	As recommended for respective sites.	800	5"X8"	Ripping	IIA/IIB/ IIC / IID
				200	8"X12"		
7.	Foreshore areas of Tanks and Reservoirs.	1500	A.Nilotica	750	5"X8"	$45cm^3$	II F
			Honge, T.arjuna, Nerale, Sisso	750	8"X12"	$60cm^3$	

Sl. No.	Site specification	No. of plants / Ha	Core species	Planting Pattern			Model Code
				No. of Plants	Bag size	Site Preparation	
8.	Degraded, Open areas, JFPM areas, Harvested areas, Encroachment evicted areas in Transition, Malnad, Coastal zones.	1500	Acacia auriculiformis	1500	5"X8"	Ripping or 45cm^3 pits	II G
9.	Open areas in Moist deciduous areas, Moderate to high fertility areas	1500	Teak Honne, Matti, Nandi, Bamboo, Cashew, Mango, Nerale, Antawala, Shivani, Alberia	550 550	6"X9" 8"X12"	45cm^3 pits 60cm^3 pits	II G
10.	Semi evergreen and evergreen forest types in Malnad, Coastal zones. Deficient in regeneration, Moderate to high fertility		Hopea Whitiana Hopea Parriflones, T.arjuna, Mango, Nerale, Cashew, Lophopetalum Whitannum, Hebbalasu.	550 550	6"X9" 8"X12"	45cm^3 pits 60cm^3 pits	II G
11.	Degraded Lateritic sites	1500	Acacia auriculiforms A.Catachu	750 750	5"X8" 8"X12"	45cm^3 60cm^{3}pits	II H
12.	Very Hard Lateritic Patches	100	Ficus, A.Catachu, T.Belerica, Callophyllan inofillum	100	10"X16"	1M^3 pits	

III. N.T.F.P. PLANTING MODEL

Area Description : Non Timber Forest produce plantations may be raised in sites of high fertility. Even while taking up ANR or AR Model, NTFP plantations may be raised on small portion of the plantation areas, which has high fertility.

2. Core Species:

Dry zone	:	Hunse, Mango, Neral, Nelli, Hippe, Bevu, Honge, Seetaphal, Kadgeru, Bucnania, Cashew, Feronia, Seemaruba and other local NTFP Species. Halsu may also be taken up in better sites in Districts like Kolar, Tumkur, Bangalore.
Transitional zone	:	Sandal, Bamboo, Antwala, Nelli, Hippe, Mango, Nerale, Muttuga, Kadgeru, Bucnania, Harada, Cashew, Hunse, Halasu, Seege and other local NTFP Species.
Malnad & Western Ghats	:	Antawala, Murugal, Uppage, Dalchinni, Wate, Cashew, Halmaddi, Kaidhoopa, Harada, Nelli, Mango, Halsu, Sandal, Xanthoxylum ritsa, Bamboo, Canes and other local NTFP Species.
Coastal zone	:	Murugal, Vate, Jummanakai, Myristica, Uppage, Cashew, Suragi, Urhonne, Antawala, Halsu, Mango and other local NTFP Species.

3. Planting Technique:

1. Atleast 12 months old, 7-8 feet tall seedlings raised in 10"X16" polythene bags to be planted.
2. $0.75m^3$ pits excavated for planting. 275 plants per ha. planted at spacing of 6X6 mts and 1m3 pits excavated for planting Hunse, Mango, Halsu at 10x10m spacing raised in 14"X20" bags.
3. Protection to be provided by Barbed wire fencing.
4. Sowing of seeds of Prosopis, Glyrecidia, Planting of Agave suckers on the CPT mounds in open area and Duranta cuttings on the CPT mounds in partially shaded area in high forest locations.
5. F.Y.M. application 1 cm / 40 plants for first 2 years. D.A.P. fertilizer applied for 2 years.
6. Watering to be provided 5 times during 1^{st} year and 3 times during 2^{nd} year.
7. Maintenance up to 5 years. S.M.C. works from ridge to valley provided wherever necessary by standard SMC works with Gully checks and SMC trenches across the rills with spill ways and nala bunding wherever required only provided.
8. Other details as per Model estimate Model-08.

IV. MODEL FOR CREATION OF SANDAL ESTATES:

1. **Area Description**: Sandal was once very widely distributed in the Malnad and transition zone of the state. There is need to protect sandal regeneration areas as well as to create sandal on an estate management basis. Sandal can be planted in Malnad and transition zone extensively. The sites selected must be prepared by uprooting stumps and dozing with a dozer prepare like farm land for establishing estates.

2. **Species** : Sandal with planting of Teak / Bamboo along the boundaries.

3. **Planting Technique:**

A. **Protection of Sandal Regeneration Model**

1) A minimum of 200 ha area where the sandal regenerate profusely identified and the seedlings have attained 5-10 cms girth has to be selected with 200 plants/ha. minimum density.

2) The area is fenced with chain link mesh which is embedded in concrete foundation. For each such unit, 6 number of watch and ward are employed on 24/7 basis.

3) Requisite ration is provided to the watchers.

4) A temporary residential accommodation is constructed within the area.

5) Dibbling of sandal seeds and planting in open areas taken up.

6) Other details as per Model estimate. Model-09.

B. **Creation of Sandal Estates with chain link mesh**

1) The site selected shall be moderate to high fertility area in Transition and Malnad zone.

2) Preferably an old harvested Acacia / Eucalyptus plantation or encroachment evicted area is suitable.

3) Site preparation is done by uprooting the stumps and dozing the area, ripping done 5M apart.

4) Standard SMC works with Gully checks and SMC trenches across the rills with spill ways and nala bunding wherever required only provided.

5) Well grown sandal seedlings raised in 8"X12" polythene bags planted at 5X5M spacing.

6) The treated sandal seed should be shown on mounds of SMC, in the trenches.

7) For sustainable management of sandal estate, people participation should be encouraged by forming VFC or strengthening existing VFC. Sufficient seed money and corpus fund shall be made available to VFC.

8) In order to ensure sustainable financial resources for maintenance of the chain link mess, providing watch and ward and protection of sandalwood trees beyond 5th year fast growing species like Teak, Marihal bamboo, Burma bamboo, Shivane, Hebbevu, Hale, Acacia auriculiformis, Eucalyptus species including clones shall be planted all along the boundary inside the outer inspection path and also all along internal inspection paths and fire lines @ 200 plants per hectare. The revenue out of thinned material from fast growing species and also from sale of sandal seeds would be made available by VFC for keeping watch and ward and also to maintain a dog squad of local breeds.

9) Area is fenced by chain link mess fixed on steel anglers and maintained regularly.

10) Watering and FYM application cultural operations as per Model estimate. Model-10.

11) Where sufficient funds are available, construction of compound wall as protection measure can be taken up.

V. INSTITUTION AND SCHOOL PLANTING MODEL.

1. Area description : Vacant lands and the boundaries of Institutions, Government offices, Schools and Colleges.

2. Core Species :

Dry zone	:	Bevu, Honge, Kadbadam, Nerale, Mango, Seethaphal, Ala, Nelli, Mellingtonia, Seehunse, Singapur Cherry, Chakra Nelli, Arali, Bela and other suitable fruit & ornamental plants.
Transitional zone	:	Mango, Halsu, Nelli, Hunse, Nerale, Singapur Cherry, Chakra Nelli, Kadbadam, Sampige, Mahagony, Tabubia, Spathodia, Bela, Antuwala, Ala, Arali and other local native species.
Malnad and Western Ghats	:	Sampige, Mavu, Halsu, Nelli, Nerale, Ranjal, Kadbadam, Cashew, Murugal, Saldhoopa, Uruhonne Saludhupa and other local species.

3. Planting Technique.

(1) At least 12 months old 7-8 feet tall plants raised in 10"X16" bags to be planted.
(2) Block planting or Boundary planting at 5X5 m or 7X7m spacing, as the case may be. On an average 200 pits/ha.
(3) If the area is not fenced or does not have a compound wall, staking and thorn fencing to be done, as provided for Road side planting.
(4) Application of F.Y.M., watering, watch and ward as provided in Model Estimate-11.
(5) Protection of such plantations shall also be the responsibility of concerned institutions.

VI. CITY AND TOWN PLANTING MODEL.

1. Area Description: Planting can be taken up along the roads within the city. Vacant lands meant for parks can also be taken up for planting. Care has to be taken to avoid electricity lines and telephone lines during alignment.

2. Core Species :

Dry zone	:	Bevu, Kadbadam, Arli, Bahaunia, Honge, Mellingtonia, Nelli, Thespesia, Peltophorum, Sissoo.
Transitional zone	:	Bevu, Arli, Sisso, Bahaunia, Kadbadam, Sampige, Tabubia, Mango, Halsu, Nerale, Spathodia, Peltophorum, Holedasawal, Mahagony, Honge.
Malnad & Western Ghat zone	:	Sampige, Mavu, Halsu, Nelli, Mango, Nerale, Saldhoopa, Mahagony, Kadamba Ranjal and other ornamental species.
Coastal zone	:	Sampige, Mango, Mahagony, Bahaunia, Uruhonne, Halsu, Spathodia, Ranjal, Tabubia.

Suitable ornamental species which provide flowers round the year may also be planted.

3. Planting Technique:

1. At least 12 months old 7 to 8 feet tall seedlings raised in 10" X 16" bags to be planted.
2. 75 cm^3 pits excavated at a spacing of 10 mts along roads and 5X5 m or 7X7 mts for block planting.
3. Staking, Protection, application of F.Y.M. watering provided as per Model estimate. Model-12
4. Pretreated stakes are used for enhancing life of stakes.

VII. ROADSIDE PLANTING MODEL:

1. Area description : The Road margins available along NH, SH, MDR's and Village roads throughout the state. These margins are often encroached. The species along roadsides are required to be planted with species which should be compatible with agricultural crops, to avoid hostility from adjoining cultivators.

2. **Core Species :**

1.	Dry Zone	:	Bevu, Ala, Arali, Basri, Goni, Honge, Tapasi, Hunse, Sisso, Bage, Mango, Nerale, Seehunse and other suitable local species.
2.	Transition zone	:	Bevu, Ala, Arali, Basri, Hunse, Sisso, Bage, Honge, Mango, Nerale, Hippe, Tapsi and other suitable local species.
3.	Malnad and Western Ghats	:	Mango, Halsu, Nerale, Mahagony, Sampige, Veteria, Hippe Hole dasval and other suitable local species.
4.	Coastal Zone	:	Sampige, Holedasavala, Tare, Mahagony, Vateria, Mango, Halsu, Uruhonne and other suitable local species.

Other suitable local species shall be personally decided by concerned Deputy Conservator of Forests, after proper assessment with regard to the site, climatic and other local conditions.

3. **Planting Technique:**

1. At least 14-18 months old minimum 7-8 feet tall seedlings raised in 14"X20" bags to be planted.
2. Pits of 1X1X1 Mts at a spacing of 10 Mts on either side of the road, 200 plants/km
3. Application of F.Y.M. 1 cum / 40 plants during 1st year.
4. Protection with staking and tying of thorns every year for 3 years. Proper treatment of stakes for long life.
5. Watch & Ward for minimum of 5 years; the watcher will do replacements and maintain thorn fencing.
6. Watering in Dry zones and Transitional zones 5 times in first year and 3 times in the second year.
7. Other Cultural operations like weeding, Saucer Bharav, Fire tracing etc., as per model estimate. Model-13

XIII. CANAL BANK MODEL

1. **Area Description** : Planting can be taken up along canals of irrigation projects. Since water is available for part of the year these sites are suitable for raising fruit yielding and NTFP species. If the site along Canals is very poor due to dumped soil, the pits can be filled with imported soil.

2. **Core Species** :

Dry zone	:	Bevu, Honge, Mango, Nerale, Seemaruba, Sissoo, Bage, and other suitable local species. Cassia siamea and Glyricidia in poorer sites
Transitional zone	:	Bevu, Honge, Sissoo, Cashew, Seemaruba, Mango, Hippe, Hunse, Halasu, Nerale, Nelli and other suitable local species.

3. **Planting Technique** :

1. Atleast 12 months old 7-8 feet tall seedlings raised in 10" X 16" bags to be planted at 10 m apart in pits of 0.75 m^3.
2. C.siamea, Sissoo, Glyricidia are raised in 5"X8" Polythene Bags and planted in trenches of 4X0.5X0.5 mts in poorer sites.
3. Seed sowing is taken up on mounds with C.siamea and Glyricidia.
4. Miscellaneous plants provided with staking, protection, F.Y.M. application, watering on par with Road side plantations.
5. Barbed wire fencing may be taken up, if sufficient width strip is available.
6. Watch and ward provided for 5 years.
7. Other details as per Road side planting model estimate, Model-13.

FARM FORESTRY

Karnataka Forest Department has realized that the task of bringing 33% of geographical area cannot be achieved without facilitating voluntary tree planting by people outside the forest areas. Various schemes, especially the externally aided projects have tried to implement ambitious Farm Forestry components in the past.

The present status of farm forestry envisages that the seedlings raised for farm forestry in departmental nurseries and priced at subsidized rates will be purchased by interested farmers and they will take care of such assets.

However in view of the magnitude of the programme and the shortage of staff, lack of extension expertise, lack of mechanism to ascertain species preference of people, lack of proper distribution network, it is suggested that a comprehensive policy for farm forestry with following components be put in place.

1) The species preference of farmers is mandatorily assessed by a systematic demand survey, well in advance of nursery season.

2) The seedlings raised for farm forestry should be from known, superior seed source.

3) Wherever feasible clonal / grafted seedlings to be made available to farmers.

4) A stable policy on pricing of seedling supplied to farmers for planting, to be put in place after wider consultations. This is pertinent in view of pricing of seedling in plan schemes, where as the seedlings are not only given free but the planting costs are also paid under National Rural Employment Guarantee Scheme.

5) Krishi Aranya Protsaha Yojane, A scheme to incentivize for farmers @ Rs.10, 15, and 20 at the end of 1st, 2nd and 3rd year for each surviving seedling is a good initiative in encouraging Farm Forestry.

6) Well organized network of distribution centre using the existing infrastructure like the Forest Department offices, Panchayat Office premises, Temples, Schools etc., where the required number of seedlings are stocked and replenished as and when the seedlings are lifted by the public. Any person interested in buying seedling should be able to pay and carry the required number of seedlings from the centers. The cost involved in creating distribution centers should be budgeted and made available to field officers.

7) About 5000 Village Forest Committees and around 6000 self help groups, created under various programmes and NGOs may be involved in demand survey, raising of seedlings and establishing and running distribution centers. Suitable remuneration and incentives may be paid to those organizations and persons for this purpose.

8) Tree felling and transportation rules have to be made farmers friendly to facilitate farm forestry on large scale.

Species proposed: The species list is only indicative. The assessment may be done by a systematic demand survey.

Dry zone:	Teak, Silver oak, Sandal, Neem, Tamarind, Mango, Nelli, Bamboo, Feronia, Drumstick, Karibevu, Kadbadam, Honge, Seemaruba, Hebbevu, Ailanthes excelsa, Sissoo etc.
Transitional zone:	Teak, Silver oak, Hebbevu, Sandal, Cashew, Nelli, Mango, Halsu, Marihal, Bamboo, Neem, Tamarind, Drumstick, Karibevu, Red sanders, Honge, Seemaruba, Shivani, Sissoo etc.
Malnad, Western Ghats and Coastal zone:	Teak, Sandal, Beete, Silver oak, Hebbevu, Cashew, Mango, Halasu, Nelli, Acacia auriculiformis, Casurina equisitifolia, Murugal,Uppage, Wate, Antawala, Dalchinni, Shivani, Ber Halsu, Marihal Bamboo and Burma Bamboo etc.

Eucalyptus has been traditionally preferred species in southern dry and transitional zones of the state, because of its fast growing, high yielding, coppicing and non-browsing qualities. There is a perception about not encouraging the planting of Eucalyptus. There is no conclusive evidence substantiating labelling of Eucalyptus as an ecological disaster. Similarly Acacia auriculiformis and Casurina are also in high demand in Malnad and Coastal areas. At present Eucalyptus, Acacia, Casurina are not covered under Krishi Aranya Protsaha Yojane. However **Government may take a final view on promoting these species based on wider consultations.**

NURSERY PRACTICES

Raising of successful plantation has 3 critical components (1) Selection of right species for the site (2) Raising right planting material (3) Following right planting technique and practices.

Nursery practices should aim at raising right planting material. The seed for raising planting material should come from known superior quality source. The seedling should be of the right age, sturdiness, attain critical height, so that within the period of normal plantation maintenance (3-5 years), the plantation is established beyond damaging factors. This is all the more important when native, slow growing species form the core of our planting programme. These species not only need to be raised in bigger containers, they need to be nursed for sufficient period in nursery, so that they attain status of right planting material. This is the most important critical factor that has direct bearing on raising successful native species plantations.

The following points are very important to streamline the nursery practices:

1) A list of core species have to be prepared for various models at planting in the department and Farm Forestry to assess the species wise seedling targets, seed requirement etc.,

2) All the seed source for planting programme should come from identified seed source only, either from plus trees, seed stands, clonal orchards and facilities for seed processing and certification upgraded to achieve this target in next 3-5 years.

3) To begin with all seedlings for distribution to public should come from known sources. In case of fruit yielding species like Mango, Hunse, Nelli, Nerale, and Halsu etc grafted seedlings can also be supplied to public.

4) For raising quality and healthy seedlings, the seeds should not be directly shown in to the bags and they should be first shown in the mother seed beds. In order to ensure genetically superior quality of seedling , it is essential to sow the genuine quality seeds in the beds at least 3 times the number of required of seed beds. The seeds can be sown in staggered period of 3 days each – $1/3^{rd}$ number of seed beds are sown at the beginning, another $1/3^{rd}$ number of seed beds are sown after three days and remaining $1/3^{rd}$ number of seed beds are sown after six days. The sprouts of seeds as soon as they are germinated from first, $1/3^{rd}$ set of seed beds shall be transplanted to polythene bags at first stage ($1/3^{rd}$) , the sprouts of second 1/3rd set of seed beds shall be transplanted in to another set of polythene bags($1/3^{rd}$) and the sprouts of germinated seeds from third, $1/3^{rd}$ set of seed beds can be transplanted to 3^{rd} set of polythene bags ($1/3^{rd}$). Seedlings which sprout within 3 days of emergence of first sprouts only have to be transplanted and sprouts which emerge after 3 days should be discarded. To enhance further quality of seedlings, rigorous culling of weak seedlings in the polythene bags should be done within one month by pulling out such seedlings The empty

bags should be separated and shall be used for transplanting earliest germinated quality sprouts as explained above. This method shall be followed meticulously for most of the species which do not exhibit 'root shock' after transplanting of sprouts. For species which exhibit 'root shock', the seeds can be shown smaller polythene bags as in case of raising tall seedlings as explained below.

For raising tall seedlings, sufficient number of seedlings should be raised to take care of rigorous culling at early stage. For re-bagging, seedlings in 4"X6" should be raised in large number, at least thrice the number of required number of seedlings for the species which are difficult to survive after transplanting of spourt seedlings or which do not with stand root shock or which can not be transplanted due to unfavorable weather conditions like continuous rainy season. After germination in the 4"x6" polythene bags, the earliest germinated vigorous seedlings should be retained and late germinated weak seeding should be mercilessly pulled out from the polythene bags and the empty bags can be used subsequently for other species or for next round of sowing. The culling out shall be done within one month. The selected seedlings in polythene bags shall be maintained and they shall be transplanted to bigger bag within two to three months before root coiling. For bigger seed species like mango, vateria etc. 5"X8" polythene bags can be used by following above explained procedure.

The cost of raising such seedlings for transplanting has to be provided for. At the time of re-bagging the selected and retained seedlings should be at least 2 months old.

5) Good quality, vigorous seedlings of Teak, Bamboo and sandal can be raised by proper precautions detailed below:

I. For teak seeds from known source should be used for sowing. From standard seed bed, stumps of thumb thickness, maximum 400 per bed only should be used. Rest of the stumps which are thinner in size and come up later should not be used and they should be discarded.

II. **Bamboo** : Bamboo seeds must be sown in seed beds first. Then 4-6 week old bamboo seedlings should be transplanted in to ridges and forrows Transplant beds. The seedlings should be allowed to grow in transplant beds for about 10-12 months. The seedlings which have well developed rhizome only should be transplanted in to 10"X16" bags and maintained for about 6 months. Thus raising proper bamboo seedlings will have 3 stages and require about 18 months of planning prior to planting.

III. **Sandal** : Sandal seeds have large proportion of immature seeds, which produce weak seedlings and they die after transplanting in to Polythene Bags or remain yellowish and weak throughout. It is very important to segregate well matured seeds and select only vigorous / dormant seedlings from seed beds. Seedlings which sprout within 3 days of the emergence of first

sprouting only should be used. Seeds should be treated with G.A (Gibberilhic Acid) 500 PPM for 16 hours for better germination and periodic, regular plant protection should be done using DithaneM-45 (0.25%) and Ekalnx (0.02%) sprayed at monthly intervals.

6) The **nursery calendar** for raising right planting material is tabled below:

Sl. No.	Size of Polythene Bags/HDP E Bags.	Right age for planting	Month of sowing or Re-bagging	Month of raising 4"X6", 5"X8", seed beds for Re-bagging / transplanting
1.	5"X8"	Not less than 6 months	Before end of November	TPs from seed bed / Direct Sowing in the thrice the number of bags.
2.	6"X9"	Not less than 8 months	Before end of October	Direct sowing from teak beds.
3.	8"X12"	Not less than 10 months	Before end of July	Before end of April.
4.	10"X16"	Not less than 12 months	Before end of May	Before end of February
5.	14"X20"	Not less than 12 months	Before end of April	Before end of January

7) There should be a strict mechanism to monitor collection of seed and the timely raising of seedlings. The nursery infrastructure has to be suitably developed. This has to be personally monitored / ensured by Deputy Conservators of Forests / Chief Conservators of Forests of the circle.

8) Quality seeds should be procured from research and seed units of the department. Only if the requirement exceeds their capacity, that such seeds should be procured from elsewhere under proper certification about area of collection, viability, germination percentage and other relevant information.

9) The quality of ingredients viz., sand, good quality FYM and red earth should be ensured. Stringent action including disallowance of expenditure should be done for using poor quality ingredients.

10) All Nurseries should have proper records, Registers, display boards, name boards and proper layout, water tanks and pipelines for watering and sanitation to be maintained.