

GOVERNMENT OF HARYANA

TECHNICAL NOTE NO. 3

NURSERY TECHNIQUES



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TECHNICAL NOTE NO. 3

NURSERY TECHNIQUES

3. Introduction.—Plantations of valuable tree species are being and will be raised artificially on an extensive scale in this State. For raising any artificial plantation successfully adequate and timely supply of quality plants is essential. Forest nurseries have to be raised to provide the desired planting stock. It is, therefore, the primary duty of all the Forest staff engaged on plantation work to ensure adequate production of quality plants from the nurseries well in time.

3.1 Planning.—The nurseries must be planned and established at least one year ahead of the planting season and as such the range officer will get his tentative planting Programme approved well in advance so that the nurseries are planned accordingly. Along with the planting Programme the Range Officer will submit the following details of the nurseries to be raised :—

- (i) Area/length to be planned.
- (ii) No. of plants required, size and species.
- (iii) Location of Nursery.
- (iv) Area of nursery.
- (v) Soil.
- (vi) Irrigation.
- (vii) Estimated Production species wise on 1st February and 1st July.
- (viii) Site plan and layout of nursery.
- (ix) Nature—permanent/Temporary.

3.2 Types.—Permanent nurseries are maintained for supply of plants for a long time. These are located at a Central place from where the plants can be easily distributed and transported to the plantation areas.

To avoid unnecessary cost on transport of plants and the damage to the Plants in transit, temporary nurseries are raised adjacent to the planting sites to meet the demand of planting stock particularly for the strip plantations. In such nurseries usually tall plants or plants in containers are raised.

3.3 Sizes.—The size of the nursery will depend upon the number of the plants to be raised. The following norms shall form practical guide in calculating the number of Plants required.

(i) **Spacing.**—The number of plants needed for planting in new areas at different spacing will be :—

Unit Area	Spacing	Number of Plants
Per Hectare	4 × 4m	625
	3 × 3 m	1,100
	3.5 × 2m	1,420
	3 × 2 m	1,650
Per Kilometre	7.5m	130
	4m	250
	3m	330

(ii) **Replacement.**—The number of plants calculated on the above basis will be increased by 30 to 40 per cent for replacement of casualties failure in the nursery, rejection of sub-standard plants and damage to the plants during transit, etc.

(iii) The area under sowing that will be needed to produce the requisite number of plants will be as under :—

0.4 Hectares for one lac shisham stumps or 10,000 tall plants or 2 lacs container Plants.

The total area of a permanent nursery for raising shisham plants will be double the area noted above in order to provide for sowing to obtain plants for the next year. This additional area will be used for raising green manuring crop in alternate years to maintain soil fertility.

3.4 Site Selection.—The following guide lines will be kept in view while selecting the area of a permanent nursery:—

1. Locate in a central place.
2. Select site preferably with medium textured soils. Where it is not possible to get the desired soil amendments will be made through addition of sand, silt and farm yard manure as needed.
3. Avoid sites which have been trampled excessively for example camping grounds.
4. Ensure adequate water supply.
5. Avoid saline-alkali and badly drained soils.

3.5 Fencing.—Permanent nurseries should be fenced with four strand barbed wire using angle iron posts. In case used.

The permanent nursery will be provided with a suitable gate to admit vehicles.

3.6. Soil Management.—In permanent nurseries soil management has to be done on the lines of agricultural crops to maintain soil fertility and to ensure adequate production of quality plants.

The entire nursery area is divided into parts and one-half is left fallow every year. The fallow portion is irrigated in April so that all weeds and grasses germinate. The area is tractor ploughed using a disc plough and is followed by harrowing. These operations are done twice, once in early May and repeated in early June. A green manuring crop of sunhemp/Jantar is sown during early July using a seed rate of 90 kg. per hectare. As soon as the plants reach flowering stage, they are buried by using mould-board plough. At this stage the soil must be moist so as to ensure proper decomposition. Before sowing sunhemp a phosphatic fertilizer (Super Phosphate) at the rate of 75 kg. per Hectare is added. The fertilizer can be broadcast along with the seed. At the time of burying the crop a nitrogenous fertilizer (calcium Ammonium or Ammonium Nitrate at the rate of 120—150 kg./Hectare, respectively) is added to hasten decomposition and to maintain adequate level of Nitrogen in the soil. The area is again ploughed and harrowed in October.

Alternately when a green manuring crop is not raised soil fertility is maintained by summer ploughing and addition of farm yard manure at the rate of 10—22 tons/Hectare. Chemical fertilizers at the rate of 20—25 kg Nitrogen per acre should be applied at the time of sowing. Soil analysis will be desirable to determine correct dose of fertilizers.

3.7 Compost.—The compost is prepared from grasses, weeds and leaves obtained locally. The material is placed in a pit 3×3m and 30 cm deep. This material is spread in a layer of 15 cm thickness. Fresh cowdung to a depth of 3cm is laid over the vegetative material. A layer of top soil 3 cm deep is spread over the cowdung. This arrangement is repeated till one meter high heap is built up above ground level. A covering of surface soil 3 cm thick is provided around

Care is taken to ensure that the various layers are loosely placed to provide enough aeration needed to develop bacteria which hasten the decomposition. Each layer of the material is moistened as it is spread. The manure will be ready after 3-4 months.

3.8 Soil Working.—A thorough and deep soil working is necessary for optimum plant production from the nurseries, the area is tractor ploughed by using a disc plough. All stones and roots, etc. are picked and removed. Then the area is twice harrowed. The area should be levelled before the layout of the beds. This is an essential operation to ensure proper use of irrigation water, pullock drawn ploughs should preferably be used if the area of the nursery is small. Manual digging of soil is adopted only when the area of the nursery is less than 0.25 hectare. In case of larger areas tractor ploughing must be arranged. After ploughing the area must be left as such for a fortnight for soil and for roots of weeds and grasses to dry. Planting is essential to obtain a good seed bed.

3.9. Soil Improvement.—As far as possible, medium textured soils are selected for nurseries, in case of clayey soils, and should be added to improve the soil texture, about 25 to 30 tonnes of farm yard manure hectare is added before laying out the beds.

3.10. Lay-out.—Before preparation of the beds a map of the nursery should be made to a scale of 1 cm—100 metres. The entire layout of the beds should be shown on this map. The whole nursery should be divided into blocks of 0.5 hectare and each block is served by a four metre wide road. Each block is further sub-divided into plots of 1000 square metres by 60 cm wide paths.

Proper drainage has to be planned to discharge the storm water.

Manure pits are made in one corner of the nursery so that the required compost is prepared in the nursery itself. A hut for storing tools, implements and seeds, etc., is necessary in a permanent nursery. In case of nurseries where Eucalyptus is raised a masonry water storage tank of size $2\frac{1}{2} \times 2 \times 2$ m will be needed for constant supply of irrigation water to be used with rose cans.

3.11 Irrigation.—Irrigation is essential for proper plant growth. But the general tendency is to over irrigate, which is decidedly harmful. The officer should frequently check the irrigation control its frequency and should ensure that irrigation is judiciously applied.

SHISHAM NURSERY

3.12. Preparation of beds.—Before the beds are actually laid out in the nursery, they should be marked on the plan by the Range Officer himself. Normal size of a bed is 10 cm long, 40 cm wide at the base and 30 cm wide at the top and 25 cm high. Beds and trenches alternate. The width of the trench is 25 cm at the base and 35 cm at the top. The top of the bed should have a slight camber towards the sides.

3.13. Sowings.—It is always preferable to use fresh seed to get good results. The pods are broken into segments so that each segment contains one or two seeds. The broken pods are soaked in water for 24—48 hours before sowing. The sowing is done in two parallel lines along the outer edges of the bed leaving 3 cm from the edge. The seed is lightly covered with soil. The sowing should be completed by the end of February. In case adequate irrigation supply is not available, sowing can be done in the first week of July but this is to be avoided as a practice.

3.14. Irrigation—Irrigation is done in the trenches. The beds should not be flooded. In the initial stage two irrigations a week are given till the germination is complete. After germination, one irrigation per week is generally applied fortnightly irrigation is adequate when the seedlings are more than 10 cm high. Irrigation frequency is reduced during the monsoons.

3.15. Maintenance of Irrigation Channels.—It will be necessary to reopen all the irrigation channels as well as trenches so that proper flow of water is maintained.

3.16. **Spacing.**—When the seedlings have attained a height of 6–9 cm they should be spaced 5 cm apart in lines. This practice should not be ignored in the interest of proper growth of the plants.

3.17 **Weeding.**—It is an important operation to promote good growth of the seedling. The nursery should be kept clean of the weeds. The removal of weeds is done with the roots as far as possible cutting of weeds with sickle is of no use. The number of weedings depends upon the incidence of weeds. Some of the obnoxious weeds like *Cyperus* species need special treatment. The details of the treatment are given in appendix I. First weeding is carried out when the seedlings are about 5 cm high. In all 5–7 weedings are considered adequate during the first year. Hoeing will be done along with weeding.

3.18 **Extraction of Stumps.**—When the plants have reached the desired size these are extracted from the nursery beds and made into stumps. The diameter of the plants should be 1–2 cm at the collar level. All undersize and over size plants should be rejected and not converted into stumps. For extraction of plants the nursery is flooded and the plants are pulled out when the soil is still wet. In case of difficulty in pulling the plants, a trench is made along with the beds. The side roots are trimmed with a sharp knife. The stump is made keeping 7 cm shoot and 22 cm root by using a sharp "drat". The cutting should be done by placing the seedling on a dry hard wooden piece well fixed in the ground. About 2 cm each of the root and the shoot is cut off before planting in the field and the size of the stumps thus left will be 5 cm shoot and 20 cm root. This operation is called refreshing. While preparing the stumps care should be taken to prevent any damage to the bark.

100 stumps are bundled together and transported to the planting site as soon as possible. The stumps should be covered with moist green grass, leaves or even wet earth. If it is not possible to transport and plant the stumps immediately, these should be placed in moist soil till transported or planted to prevent drying out.

The bundled stumps are placed in gunny bags and tied properly for transport. Each bag will contain about 1,000 stumps.

EUCALYPTUS.

3.19. **Germination beds.**—The germination bed is prepared by using mixture of loam, sand and well decomposed farm yard manure in equal parts. The bed is 10 m long, 1 m wide and 15 cm high. The three ingredients are sieved through a 16 mesh sieve. The sieved material is mixed together to form a homogeneous mass.

It has been observed that a good soil free from salts is essential for germination and establishment of the seedlings in the containers. The sample of the soil to be used should be got tested in the laboratory to ensure that PH does not exceed 7.5 and soluble salt content is not more than 0.1 per cent. If the nursery soil does not confirm to these specifications, it will be necessary to transport soil from outside.

3.20. **Sowing.**—Sowing of Eucalyptus seed is done in lines 5 cm apart running along the width of the bed. 120 grams of seed on a standard bed will give about 15,000 seedlings. Sowing is done in September/October for the plants required in July next. In case of irrigated plantation spring planting is possible sowing is done in February. The seed is very minute and is mixed with a faller line sand or ash for uniform distribution. Where termite attack is anticipated 10 per cent B.H.C. dust is mixed with the soil before sowing. After sowing a light covering of straw is spread over the bed to protect the seed from being washed down with irrigation water. Irrigation is done with fine rose can twice a day during germination period. Germination is generally completed within a fortnight and after that straw cover is removed. One irrigation a day is continued for about a month after which it is needed on alternate days.

3.21 **Pricking.**—When the seedlings are about 3 cm high in the germination beds, these are pricked out into polythene bags. Polythene bags are 15 × 22 in size and made out of 150 gauge transparent polythene sheet. The bags are usually perforated. They are filled

with the same soil mixture as has been used in preparing the germination beds by using a metallic scoop. The bags are arranged tight in sunken beds 10m long, 1m wide and 25cm deep. Germination bed is irrigated before removing the seedlings. A group of seedlings is removed along with the soil with the help of a transplanting trowel. The seedlings are separated carefully and each placed in the soil in polythene bag. The pricking out should not be delayed beyond the stage of about 3 cm height otherwise mortality may occur. The pricking of plants in bags should be done quickly so that tender roots do not suffer exposure. The bags should be watered a couple of hours before transplanting and also immediately after transplanting. After placing the plant in the bag the soil around is pressed so that the roots get an intimate contact with the soil.

3.22. Irrigation :—Plants are irrigated with a rose can immediately after pricking and daily irrigation is continued till the seedlings have attained a height of 15cm. Subsequently flood irrigation is applied twice a week. The tendency to over irrigate must be discouraged.

2.23. Weeding :—Any grass or weeds appearing in the bags should be removed. Ordinarily the operation is required 3-4 times till the plants are transported out.

3.24. Shifting of Polythene bags:—The polythene bags are shifted from their original place about a couple of months after pricking of the seedlings. A second shifting will be done 4 months after pricking. Any bags in which the plants have failed are taken out. The third shifting is done about a fortnight before planting. At this stage any root that has come out of the bag will be pruned and the plants irrigated soon after pruning.

At the time of shifting the sub-standard plants will be removed from the bed.



OTHER SPECIES

3.25. Siris :—Clean seed will be used. The technique for raising siris will be the same as for shisham.

3.26. Mulberry :—the technique for raising mulberry plants is the same as for shisham. At the time of sowing the Mulberry seed will be rubbed with kerosene oil to avoid damage to the seed by insects.

3.27. Kikar :—Kikar plants are raised by direct of kikar seeds in polythene bags filled with good nursery soil. Kikar seed be sown in the bag by the middle of May. Irrigation will be done with rose can once a day till germination and subsequently on alternate days till seedlings are 10 cm high. Later on flow irrigation will be applied once a week. First shifting will be done after a fortnight of germination and then once a fortnight till plants are transported for planting out. The plants will be ready for planting by middle of July.

3.28. Jand.—Jand plants can be raised in polythene bags just as kikar. The soil mixture prescribed for Eucalyptus will be used. Sowing of seed will be done by April.

3.29. Mesquite.—The seed of Mesquite has to be extracted from pods by soaking in boiling water and then keeping it in water for 24 hours before sowing. Other procedure will be the same as that for kikar.

3.30. Nim.—Seed has to be sown soon after collection as it is destroyed in storage. The seed should be depulped before sowing. The sowing can be done by dibbling in lines on beds similar to Shisham nursery, seed being placed 10 cm apart in the lines.

3.31. Tall Plants.—A temporary nursery for the tall plants is raised on suitable sites adjacent to the planting area of the rail, road and canal strips. The soil working and management area done like a permanent nursery. The entire area is levelled and divided into plots by raising wats around. The size of the plots depends upon the availability of the extent of the area.

3.32. Planting.—Shisham stumps with 15 cm root and 5cm shoot are planted in February at a spacing of 45 × 45 cm. The stumps are planted in a hole made with the help of planting rod. The soil is firmly pressed all round the stumps ensuring that the collar is at ground level.

3.33. Irrigation.—3 cm deep irrigation is applied immediately after the planting. Great care is necessary to ensure that the stumps do not get sub-merged. Irrigation is carried out once a week for first four weeks and then fortnightly irrigation is done till the break of monsoon. No irrigation is needed during the rains unless there is long dry spell. In the next summer three to four irrigations will be done till the plants are ready for taking out.

3.34. Singling of Shoots.—It is an important operation for the proper development of tall plants. Normally each stump will give a number of shoots. After a month of sprouting all the shoots should be pruned with the help of a pruning knife leaving only one vigorous shoot per stump. Some of the stumps redevelop the shoots. The operation is repeated when the height of the plants is about 45 cm.

3.35. Pruning.—To prevent formation of side branches pruning of shisham tall plants in the nursery is necessary. The pruning should be done with a sharp pruning knife. When the plants are 6 months old and again about a month before the plants are extracted for planting out. At each stage all side branches upto 1/2 of the plant height should be removed flush to the stem but without injuring the bark. Heavy and bad pruning results in malformation and should be avoided.

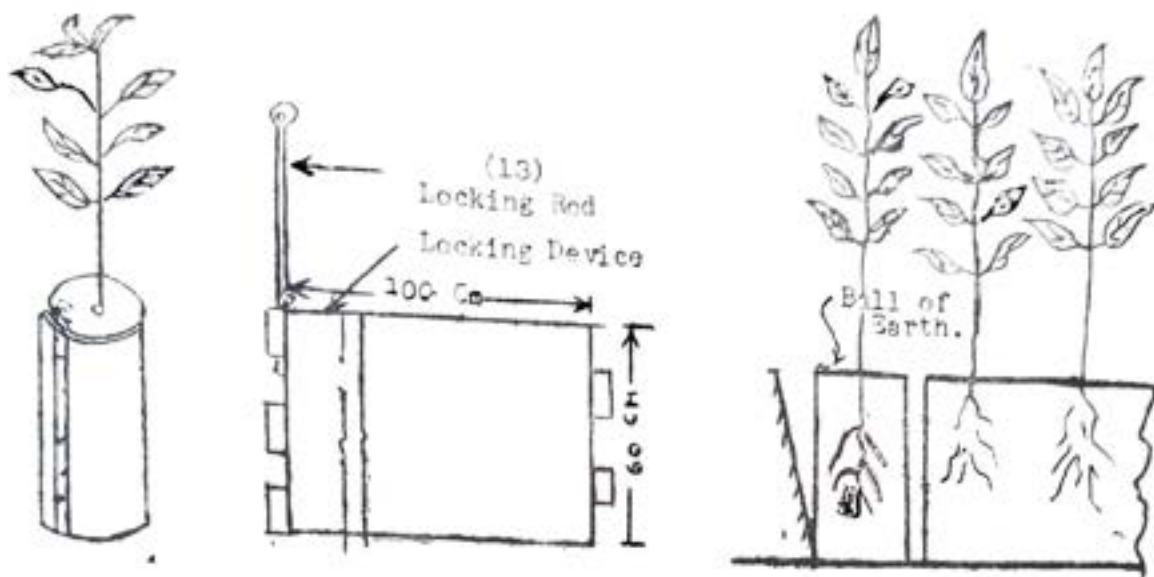
3.36. Extraction.—Tall plants are removed from the nursery with balls of earth. This operation needs great care to take out the plants without damage to the ball of earth and the roots. Before the plants are taken out, the leaves of Shisham plants are stripped off leaving only a few at the top of the leading shoots. In this operation branches are not to be pruned. The soil should neither be too wet nor too dry to facilitate extraction of balls of earth. Earth is removed carefully with a spade or trenching hoe upto the required depth all round the plant and the tap and the side roots, if any, coming out of the earth ball are cut with the spade. Final size of the ball of earth is 45cm long with diameter of 30 cm at the top and 15cm at the bottom. The ball of earth is tied with grass to prevent damage during transport.

3.37. Growth.—In 18 months time the prescribed height of the tall plants that is about 2.4m is attained. Suitable dose of manure can be used to accelerate growth.

3.38. Other Species.—Siris tall plants are made in the same manner as in case of Shisham. Eucalyptus tall plants do not have each scope in practice. In case these are needed in special situations, the initial planting in the plot is done by using Eucalyptus seedlings 10 cm high. Pruning and defoliation are not done in case of Eucalyptus. All other operations are similar to Shisham.

3.39. Extraction of Tall plants in Desert areas.—In semi arid and desert areas the soil being sandy, the taking out of the balls of earth is a problem. The earth ball gets disintegrated during extraction and transport, if not supported by an effective cover. For this purpose a plant made of 26 gauge metal sheet is used. This metallic sheet is one metre long and 60 cm wide and is inserted all round the ball of earth so as to form a tube 60 cm long with 30 cm diameter when the plant is inside. A thin clay paste is pored over the ball of earth to fill all the interspaces and to improve the cohesion of the soil mass. The ball of earth is removed along with the metallic tube and transported to the planting

site. The tube is pulled out after placing the ball of earth in planting pit. A sketch of the special device is given below:—



Plant Extractor
Inserted Round
The Ball of Earth

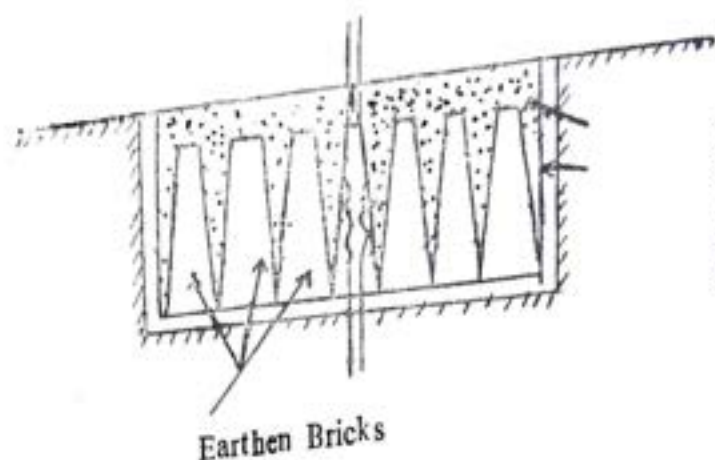
PLANT EXTRACTOR
(FLAT)

Ball of Earth Exposed
In Nursery

3.40. **Raising of Plants for desert areas.**—In desert areas raising of nursery stock has its own problems. Normally plants of 'Jand' 'Kikar' 'Acacia tortilis' and 'Mesquite' are raised in the nursery for planting in the desert areas or in other adverse site conditions. These species require transport of nursery plants with complete root system and earth balls. Clay bricks will be suitable to raise the plants.

3.41. **Clay Bricks.**—Sun dried clay bricks are prepared by using a mixture of clay sand (local soil) and farm yard manure in equal proportion. The bricks are 45 cm long with 18×18 cm base and 10×10 cm top. A hole of 2 cm diameter and 6 cm deep is left at the top in the centre of the brick to receive the seed. These bricks are some times also used for raising Shisham plants. The bricks are prepared by using a mould made of wood or metal.

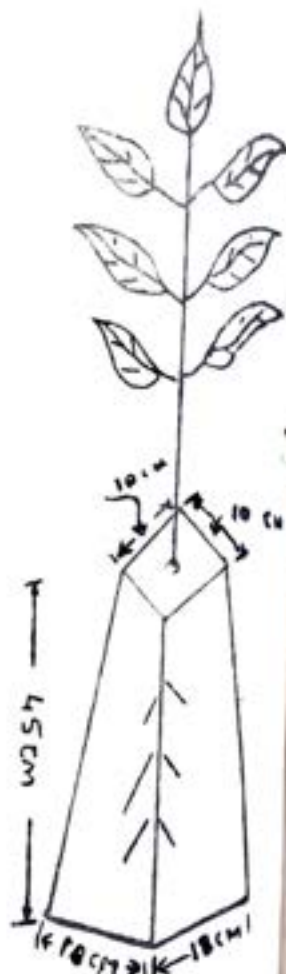
3.42. **Sowing.**—The bricks are arranged in sunken beds 50 cm deep with pacca floor, leaving a space of 1 cm between the bricks as shown in the sketch below. Sand is filled in the interspaces upto the top. Two seeds are sown in each hole after filling the hole with sand and farm yard manure. Sowings are done during the first week of March.



Arrangement in Nursery Bed

Earthen Brick

Sand
5 Cm.
Thick
Brick
Lining



3.43. **Irrigation.**—Flow irrigation is applied just after the sowing and repeated once a week till the seedlings are 15 cm high. Subsequently the irrigation is applied once in a fortnight, if the plants show a vigorous growth, the irrigation frequency should be gradually reduced to prevent roots coming out of the bricks.

3.44. **Extraction.**—When the plants are 30 cm high, the irrigation is stopped and bricks are separated just by removing the sand from the interspaces. The plants are transported during the rains for planting.

3.45. **Alternate containers.**—Polythene bags have been successfully used to raise plants in desert areas in place of clay bricks. The desired species are raised in the polythene bags using the same technique as for Eucalyptus. The only difference is that seeds of these species will be sown direct in the polythene bags just like clay bricks and not in a germination bed.

3.46. **Ornamental plants.**—A list of important ornamental plants that can be raised in this State is given in Appendix II. The seeds are raised in germination bed and the seedlings are pricked out in polythene bags just like Eucalyptus. The larger seeds are sown direct in the polythene bags to raise the planting stock.

3.47. **Maintenance of nursery records.**—It is necessary to maintain proper nursery records to find out the availability and production of the planting stock.

The following nursery record will be maintained :—

3.48. **Nursery Journal.**—It will be maintained in the Range Office on the form given in Appendix IIIA, IIIB, IIIC and IIID. Entries in the appendix III-B will be made monthly and abstract prepared at the end of the year. Under column 4 of this appendix only the whole time establishment like Mali exclusively engaged on the nursery

should be entered. The entries will be made in this statement at the end of the month without waiting for the booking of expenditure in the accounts. Under column 9 ploughing and seeding for green manuring will be given. Under column 10 water rates or any other charges connected with irrigation will be recorded.

Appendix III-C will be filled twice a year, i.e., in January and June. In January, the plants available for spring planting will be entered and similarly the plants available for monsoon planting will be listed in June. A fresh sheet will be used for each planting season.

3.49. **Nursery Register.**—The register will be maintained for each nursery by the official incharge of the nursery in appendix IV-A, IV-B, IV-C, IV-A will be similar to appendix III-B in the Range Office. In appendix IV-B the official incharge of the nursery maintains the irrigation record. The details of the plants supplied from the nursery will be maintained in form IV-C. An abstract of this form will be submitted to the Range office every month.

APPENDIX I

A NOTE ON CONTROL OF MOTHAS IN NURSERIES

One of the common weed pests found in the plains' nurseries is the Motha (*Cyperus rotundus*). It is a perennial sedge and reproduces primarily by means of tubers. The tubers are often 2 cm. in diameter and 2.5 cm. in length and are generally found deep in the soil. The tubers after sprouting send out feeding roots and also rhizomes which grow to the solid surface and produce the shoots. The basal bulk develops at the juncture of the shoot and rhizome, which can produce still more rhizomes. In this way the sedge multiplies vigorously and spreads quickly.

2. The control methods of this weed pest involve the eradication of the underground parts and checking the seed production and dissemination.

(i) **Control of seed production.**—All the weed growth is out from the belt surrounding the nursery, paths and roads inside the nursery, irrigation channel etc. just after the flowering is complete. All the beds should be given a hot burn before ploughing or soil working in order to destroy the seeds received in the beds by dissemination and the root stocks present near the surface of the soil.

(ii) **Eradication of underground parts.**—This can be done both by mechanical or chemical methods. Mechanical method is more effective. Deep ploughing is done over the entire area roots, rhizomes and tubers are removed and destroyed. Ploughing should be done during the hot season so that tubers and rhizomes are killed.

The following weedings have been recommended for controlling the Motha grass:—

(a) 2, 4-D 80 per cent sodium salt (Fernozone) 2.5 lbs. In 100 gallons of water per acre, Repeated application may be necessary. Spraying should be done after ploughing the area.

(b) 2,4-D Amino Salt-1 1/2 lbs. of acid equivalent per acre. No ploughing is necessary.

(c) Planotox (Botoxyethyl) ester of 2,4-D containing 700 grams per liter of acid equivalent) about 3/4 pint mixed with 20 gallons of water per acre. It is oil based and resistant to washing off by rains. Top growth is readily killed. Repeated doses may be necessary to kill the roots. It should be applied as post emergence spray. Special fire protection measures should be taken after its use. It is more effective than the amino or sodium salt of 2, 4-D pound for pound acid equivalent (May and Baker).

(d) Dictox.—(Ethylester of 2, 4-D) at 1 1/2 lbs. of acid equivalent in 60 gallons of water per acre applied twice at an interval of a month. Dictox is self emulsifying (May and Baker).

(e) Dalanon (at 8 lbs. acid equivalent) per acre or 40 to 50 gallons liquid per acre may be sprayed. The doses will have to be repeated.

(f) Spraying with Cibberellic acid. (50 P.P.M.) allowed a week later with palacos (2.2 Dichloro propionic acid) at the rate of 1 lb in 15 gallons of water per acre.

4. The following preventive methods may also be followed in practice to keep the weeds away from the nurseries:—

(i) Ploughing and soil working should follow the hot burn of the area in order to kill all the grass seeds lying on the surface of the soil. This can be done by spreading a thick layer of dry grass/or twigs and then burn the same under control.

- (ii) Seeds sown in the nursery should be free from foreign seeds specially weeds.
- (iii) Leguminous crop should always be sown in the fallow beds to suppress the growth of weeds.

5. **Equipment required for spraying : the constant.**—Pressure knapsack Sprayer fitted with a plunger or a diaphragm pump is quite suitable for use in nurseries. Jets giving varying densities of spray and nozzles swivelling to spray in any direction should be used according to the need.

APPENDIX II

List of ornamental plants

Spp.	Local name if any	Method of raising	Colour of the flower
A—Flowering plants			
1. <i>Bauhinia variegata</i>	.. Kachnar	Seed sowing	White pink spotted
2. <i>Rutca monosperma</i>	.. Dhak	Ditto	Orange
3. <i>Callistemon lanceolatus</i>	.. Bottle Brush	Seed sowing and cuttings	Scarlet
4. <i>Cassia fistula</i>	.. Amaltas	Seed sowing	Bright yellow
5. <i>Cassia javanica</i>	Ditto	Deep pink
6. <i>Cassia nodosa</i>	Ditto	Bright Pink
7. <i>Celonix regia</i>	.. Gold Mohur	Ditto	Orange
8. <i>Dillenia indica</i>	.. Chalta	Ditto	White
9. <i>Lexthrina indica</i>	.. Dhol Dhak	Ditto	Red
10. <i>Jacaranda mimosaefolia</i>	Ditto	Dark purple
11. <i>Kigelia pinnata</i>	.. Jarul	Ditto	Maroon
12. <i>Lagerstroemia speciosa</i>	Seed and cutting	Mauve
13. <i>Magnolia grandiflora</i>	.. Champa	Seed and gootia	White
14. <i>Michelia Champaca</i>	.. Kadam	Ditto	Yellow
15. <i>Nauclea Cadamba</i>	.. Dwarf Gul Mohar	Seed	Cream
16. <i>Poinciana pulcherima</i>	.. Fupri	Do	Orange
17. <i>Pongamia glabra</i>	.. Simbal	Do	Mauve
18. <i>Salmalia malabarica</i>	.. Ashok	Do	Red
19. <i>Saraca indica</i>	.. Rohira	Do	Scarlet
20. <i>Tecomella undulata</i>	.. Pili Kaner	Do	Orange yellow
21. <i>Veetianecifolia</i>			Yellow
B—Foliage and shade only			
1. <i>Albizia procera</i>	.. Safed Siris	Seed	
2. <i>Cupressis sempervirens</i>	.. Saru	Do	
3. <i>Eucalytus citriodora</i>	.. Safeda	Do	
4. <i>Ficus religiosa</i>	.. Pipal	Seed and cutting	
5. <i>Grevillea robusta</i>	.. Silver oak	Seed	
6. <i>Millingtonia hortensis</i>	.. Akasnin	Do	
7. <i>Polyalthia longifolia</i>	.. Mastree	Do	
8. <i>Putranjiva roxburghii</i>	.. Jiapota	Do	
9. <i>Populus spp.</i>	.. Poplar	Cuttings	
10. <i>Terminalia arjuna</i>	.. Arjun	Seed	
11. <i>Thuja orientalis</i>	.. Morpankhi	Do	

Spp.	Local name if any	Method of raising	Colour of the flower
C—Creepers			
1. <i>Alla manda cathartica</i>	Seed	Yellow
2. <i>Banistrea laurifolia</i>	Do	Do
3. <i>Bignonia purpurea</i>	Do	Deep purple
4. <i>Bougainvillea glabra</i>	Cuttings	Various Shades
5. <i>Clerodendron splendens</i>	Do	Scarlet
6. <i>Tecoma grandiflora</i>	Seed	Orange
7. <i>Thumbergia grandiflora</i>	Do	Purple
D—Hedge			
1. <i>Dedonaea viscosa</i>	.. Sanatha or Aliyar	Seed	
2. <i>Duranta plumieri</i>	Seed and cuttings	
3. <i>Hibiscus Rosa Chinensis</i>	.. China rose	Cuttings	Red
4. <i>Inga dulcis</i>	.. Jungle Jalebi	Seed	
E—Fruits			
1. <i>Carica Paney</i>	.. Papita	Seed	
2. <i>Citrus medica</i>	.. Nimboo	Do	
3. <i>Grewia asiatica</i>	.. Phalsa	Do	
4. <i>Mangifera indica</i>	.. Am	Do	
5. <i>Psidium Guvaya</i>	.. Amrood	Do	
6. <i>Syzygium Cumini</i>	Jaman	Do	

III B - COST STATEMENT (FOR EACH YEAR) FOR THE YEAR 19

Month	Tools	Rent.	Estt.	Soil preparation including filling of polythene] pags etc. and cost of soil ingredients	Polythene Bags		Sowing including pricking of Eucalyptus Plants in polythene bags and also including cost of seed	Manuring including cost of manure both chemical fertilizers and farm-yard manure and green manuring	Irrigation including hand watering	Cultural operations including weeding hoeing, spacing and shift ing of bags etc.	Extraction of stumps and tall plants	Miscellaneous
					No.	Cost						
1	2	3	4	5	6	7	8	9	10	11	12	13
April	..											
May	..											
June	..											
July	..											
August	..											
September	..											
October	..											
November	..											
December	..											
January	..											
February	..											
March	..											

APPENDIX III

Record to be maintained as nursery Journal in Range Office

A Genral Particulars of Nursery

1. Name of nursery
2. Location
3. Year in which started
4. Area in hectares
5. Soil
6. Means of irrigation
7. Type of fencing
8. Cost of initial fencing
9. Initial cost of clearance and layout etc.
10. Rent, if any
11. Map of the nursery showing layout and plot numbers etc.

APPENDIX A

Nursery record to be maintained by the official incharge of the nursery

Month	Tools	Rent	Estt.	Soil preparation including filling of Polythene bags etc. and cost and carriage of soil ingredients	Polythene Bags		Sowing including pricking of Eucalyptus Plants in polythene bags and also including cost of seed	Manuring including cost of manure both chemical fertilizers and farm-yard manure and green manuring	Irrigation including hand watering	Cultural operations including weeding, hoeing, spacing and shifting of bags etc.	Extraction of stumps and tall plants	Miscellaneous
					No.	Cost						
1	2	3	4	5	6	7	8	9	10	11	12	13
April	..											
May	..											
June	..											
July	..											
August	..											
September	..											
October	..											
November	..											
December	..											
January	..											
February	..											
March	..											

APPENDIX IV-B

Record of Irrigation from _____ nursery

Date	Mode of irrigation	Time				Area irrigated	Number of containers irrigated	Remarks
		From	To	Total	Hours			

APPENDIX IV-C

Record of Plants supplied from _____ nursery

This will include the details of plants supplied for departmental use.

Date	To whom supplied	Species	Details of plants supplied			
			Tall plants	Plants	Stumps	Total

MONTHLY ABSTRACT

Species to whom supplied	Details of plants supplied			
	Tall Plants	Plants	Stumps	Total

III-C—STATEMENT SHOWING THE NUMBER OF PLANTS AVAILABLE IN NURSERY

(Each species will be shown in a separate line)

Month	S. Number of beds	Area of beds	Number and age of beds or plants in polythene bags	Estimated number of plants that will be available			
				<i>Spring/Monsoon Planting</i>			
				Tall Plants	Plants	Stumps	Total

III-D—Record of Plants supplied from _____

(Monthly abstract to be maintained in Range Office)

(Plants issued or used for departmental planting in different beats will also be shown)

Month	To whom supplied	Species	<i>Details of plants supplied</i>				<i>Price Recovery</i>		
			Tall Plants	Plants	Stumps	Total	Amount	Cash No.	Vr. and Date

ANNUAL ABSTRACT

Species	<i>Details of plants supplied</i>			
	Tall Plants	Plants	Stumps	Total