

GOVERNMENT OF HARYANA

TECHNICAL NOTE NO. 5

SOWING AND PLANTING



Issued by  
CHIEF CONSERVATOR OF FORESTS, HARYANA

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### Sowing And Planting

#### Introduction

5.1 Man made forests are raised through sowing and planting. These operations are carried out to raise plantations of tree species of economic value in graded waste lands and to replace the scrub growth. The technique of sowing and planting may vary in different forest areas, but the broad principles are similar which are discussed below :—

#### Organisation of Work

5.2 The success of plantations largely depends on proper organisation of work. An estimate of the seed and plants required should be made well in advance for the areas to be gone over. The Range Officer should draw up the sowing and planting programme by 15th May each year and get it approved by the Divisional Forest Officer. No sowing and planting works should be carried out unless the plantation programme has been approved. The plantation programme shall be submitted in the following proforma :—

Plantation programme \_\_\_\_\_ Forest Division, \_\_\_\_\_ Range for the year \_\_\_\_\_.

Location	Area in Hectares/RKM	Soil Conditions	Species to be raised.
1	2	3	4
Method of raising.	Irrigation facilities.	Name of nursery from where plants will be obtained.	
5	6	7	
Details of Soil Working	Time of sowing or planting	Approximate Cost. (Rs.)	Remarks
8	9	10	11

Efforts should be made to concentrate the work as far as possible. Experienced staff should be posted to carry out the job.

The Range Officer will take steps in good time to raise nursery stock and ensure that adequate supply of quality plants is available near the prospective planting sites to guarantee success with minimum cost.

#### Selection of Species

5.3 It is necessary to emphasize that the species for raising plantations are suited to the local soil and climatic conditions. Species of greater economic value such as *shisham* should not be planted on unsuitable sites.

Eucalyptus hybrid should not be planted in arid tract as part of programme for raising fast growing species. It should be confined to the areas where the average annual rainfall is more than 60 cm and adequate irrigation facilities are available. *Acacia nilotica* should not be sown on sites subject to floods because sowing in the initial stage is likely to be damaged by floods.

Eucalyptus hybrid should generally be planted in deep soils where conditions are favourable for optimum growth. In strips, Eucalyptus should be confined to the areas where more than two rows of trees can be raised on each side. The sites, where pressure of grazing is heavy, should not be taken up for raising Eucalyptus hybrid unless effective protection against grazing can be ensured. Stony soils in the hills should not be planted with Eucalyptus.

*Acacia nilotica* should be raised along distributories, minors, bunds and drains where protection against biotic factors is a problem and irrigation is uneconomical. It should not be grown in compact blocks of forests subject to severe frost.

*Dalbergia sissoo* should be planted in strips where adequate irrigation facilities are available and annual rainfall is not less than 60 cm. Heavy clay soils should be avoided.

*Prosopis cineraria* will be the main tree species for desert areas. *Albizia lebbek* and *Azadirachta indica* should be restricted to the avenues in sandy arid localities.

*Acacia catechu* should have an important place in the afforestation programme in the Siwaliks. *Pinus roxburghii* will be extended in the Morni tract. *Dendrocalamus strictus* shall be planted in suitable areas in Pinjore and Morni hills. In the Aravali hills *Acacia senegal* and *prosopis juliflora* will be the principal species for afforestation.

### Policy Directive

5.4 The important tree species to be raised in different forest divisions are listed below :—

Name of forest Division.	Tree species
Ambala	<i>Acacia catechu</i> , <i>Dendrocalamus strictus</i> , <i>Eucalyptus hybrid</i> , <i>Dalbergia sissoo</i> , <i>Acacia nilotica</i> , <i>shorea robusta</i> , <i>Terminalias</i> , <i>Lannea coromandelica</i> .
Morni-Pinjore	<i>Acacia catechu</i> , <i>Dendrocalamus strictus</i> , <i>Eucalyptus hybrid</i> , <i>Dalbergia sissoo</i> , <i>Acacia nilotica</i> , <i>Pinus roxburghii</i> , <i>Terminalias</i> , <i>Lannea coromandelica</i> .
Karnal, Jind Hissar, Kurukshetra and Sonapat Rohtak	<i>Dalbergia sissoo</i> , <i>Eucalyptus hybrid</i> , <i>Acacia nilotica</i> , <i>Dalbergia sissoo</i> , <i>Eucalyptus Hybrid</i> , <i>Acacia nilotica</i> , <i>Prosopis cineraria</i> , <i>Acacia tortilis</i> .
Bhiwani & Mohindergarh	<i>Acacia nilotica</i> , <i>Prosopis cineraria</i> , <i>Prosopis juliflora</i> , <i>Acacia senegal</i> , <i>Acacia torilis</i> .
Gurgaon	<i>Dalbergia sissoo</i> , <i>Eucalyptus hybrid</i> , <i>Acacia nilotica</i> , <i>Acacia senegal</i> , <i>Prosopis juliflora</i> .



Selection of species for each site should be personally made by the Range Officer. The Divisional Forest Officer shall inspect as many of these sites as possible. At the outset it will be better to leave out highly saline-alkali soils and water-logged areas.

### Plantation Technique

5.5 The following schedule will be adhered to :—

Species	Method of propagation	Age of plants	Minimum height of plants for planting	Season of planting/sowing	Remarks
1	2	3	4	5	6
(1) <i>Acacia nilotica</i> / <i>Acacia catechu</i> / <i>Acacia senegal</i> / <i>Prosopis juliflora</i>	(i) Direct sowing (ii) Plants raised in polythene bags	— 4 months	— 30 cm.	20th June to 15th July July	
(2) <i>Albizzia lebbek</i>	Tall plants with ball of earth	2½ years	2.5 m.	July	
(3) <i>Azadirachta indica</i>	Tall plants with ball of earth	One year	2 m.	July	
(4) <i>Dalbergia sissoo</i> / <i>Morus alba</i>	(i) Stumps 1 to 2 cm. diameter. (ii) Tall plants with ball of earth.	One year 2½ years	5 cm shoot & 20 cm root 2.5 m.	Feb./July July	
(5) <i>Eucalyptus</i> hybrid	Plants raised in polythene bags.	9 months	1 m.	July	
(6) <i>Prosopis cineraria</i> / <i>Acacia tortilis</i>	Plants raised in earthen bricks or polythene bags.	5 months	30 cm.	July	
(7) <i>Dendrocalamus strictus</i>	Plants raised in Polythene bags	1½ years	45 cm.	July	
(8) <i>Pinus roxburghii</i>	Plants raised in Polythene bags	1½ years	30 cm.	July	
(9) <i>Shorea robusta</i>	Direct sowings	—	—	15th June to 15th July	

5.6 The points enumerated below shall be rigidly observed at the time of planting.

1. 15 cm thick pad of the loose worked soil will be provided at the bottom of the planting pit.
2. 10 cm deep trough for irrigation will be kept unfilled after planting.
3. The polythene bag will be removed carefully from the ball of earth before placing it in the site.
4. Earth will be thoroughly packed all round the plant upto the collar level and no space for air will be left.
5. Earth balls will be kept in the site without disturbance.
6. The plants shall be graded in the nursery before transportation to the planting site. The under sized and unhealthy plants should be rejected and not carried to the planting site.
7. Both ends of stumps will be refreshed before planting.
8. Leaves of *Dalbergia sissoo* and *Albizia lebbek* tall plants must be stripped off prior to their extraction from the nursery beds but no branch should be pruned or clipped.
9. Leaves and branches of *Eucalyptus* plants should be kept intact at the time of planting.

The Range Officer shall ensure that all the operations connected with sowing and planting are got executed in time. Slight delay in execution may result in poor growth and low survival percentage.

### **Transport of Plants**

5.7 The planting stock will be raised as close to planting site as possible to minimize cost of transport, damage to plants in transit and delay in execution of the work. Carts may be hired for transport of plants over short distances and trucks for long distances where departmental tractor trolleys are not available. The plants with balls of earth should be properly packed in the nursery before transport. Great vigil should be exercised while loading and unloading the plants and arranging them securely in the body of the conveyance so that there should be no damage to the plants and their balls or containers in transit. At the time of loading, unloading and arranging the plants in the conveyance, these should be carefully handled and lifted from the bottom and not from the stem of the plants. For carriage of plants, raised in polythene bags, arrangements should be made to carry the plants in double tiers by providing suitable stands and trays for the purpose in departmental trolleys and also in the trucks as far as possible to make maximum use of the conveyance and to save time and cost.

### **Replacement of Casualties**

5.8 The failures should be replaced within the same planting season and for this purpose sufficient number of vigorous plants should be kept in reserve. Subsequent failures of the plants should be replaced with in the same year as far as possible.



### Irrigation

5.9 Plants should be immediately irrigated after planting, provided it is not raining. Initial irrigation to the tall plants should consist of 40 litres of water per plant.

Adequate irrigation during the first year is essential for proper establishment of plants and their growth. Normally 8-12 irrigations, depending upon the species and the locality factors, will be needed during the first year, whereas 3-4 irrigations shall suffice during the second year. 20 litres of water should be provided to each plant at each irrigation. Every alternate irrigation shall be followed by hoeing to conserve moisture.

### Protection

5.10 Protection against grazing and browsing must be ensured because even a chance grazing can result in considerable damage. The wider strips and block plantations should be fenced either with barbed wire or with thorny bushes. In case of single row, individual plants will be fenced with thorny bushes. Protection from forest fires should get a great attention.

### Strip Plantations

Strip plantations are raised along roads, railways, canals, drains and bunds.

### Choice of Species

5.11 The following species shall be raised in strips:—

(a) *Roads*:—Eucalyptus hybrid will be planted where more than two rows of trees can be raised on each side of the strip.

Acacia nilotica will be grown where pressure of grazing is heavy or irrigation is uneconomical. Prosopis juliflora will be confined to saline-alkali soils and Aravali hills. In sandy soils Albizia lebbek, Azadirachta indica, Acacia tortilis and Prosopis cineraria should be grown.

Dalbergia sissoo will be planted in the road strips where adequate irrigation is available.

(b) *Canals*:—Dalbergia sissoo, Acacia nilotica, Eucalyptus hybrid and Morus alba will be the principal species along the canals, drains and bunds.

Dalbergia sissoo will be preferred for the avenue line and the multiple rows of the main canals. Acacia nilotica will be the main species for the 'rud' Patri of the canals and such strips of drains and bunds where irrigation is uneconomical.

(c) *Railways*:—Dalbergia sissoo and Eucalyptus hybrid will be planted where irrigation is available and site factors are favourable. Elsewhere Acacia nilotica and Prosopis cineraria will be grown.

### Location and Spacing

5.12 All the species will be raised in rows. The spacing between the rows and plants will be as follows:—

(a) *Roads*:—In wider strips the first row of trees *i.e.* the avenue line, shall be located at a distance of 9 metres from the centre of the road along the National Highways, and 7.5 metres along the other roads. The rest of the rows in the strips will be spaced 3 metres apart. The plants will be spaced 7.5 metres apart in the avenue line and 3 metres apart in the back rows.

(b) *Canals*:—Along the canals the trees should be planted sufficiently away from the water line so that the root system may not extend to the channel. The first row *i.e.* the avenue line shall be planted along the outer edge of the service road and the other rows 3 metres apart. The spacing of plants in the avenue line will be 7.5 metres and in other rows 3 metres. Along drains and bunds, planting espacement will be 3 metres. Where service roads exist avenue line will be planted and plants will be spaced 7.5 metres apart. No planting of trees will be carried out on the berms of the canals.

(c) *Railways*:—The first line of trees shall be 6 metres away from the centre of the track or the designed toe of the railway embankment whichever is longer. No trees should be planted on the inner side of the curves and close to the level crossings to maintain good visibility. In case of telegraph lines, the row of trees will not be located nearer than 4.5 metres on either side. The remaining rows shall be spaced 3 metres apart and the plants in the rows 3 metres apart.

### Block Plantations

5.13 These plantations are raised in compact blocks as part of rehabilitation of the degraded scrub forests or re-afforestation programme. The technique of raising such plantations under different ecological habitats is prescribed below :—

#### Selection of Species

##### (a) *The Siwalik Zone*

5.14 Eucalyptus hybrid will be the principal species on relatively easier slopes and plains carrying deep soil and capable of high production. Sites having excess of gravel in the soil profile should not be stocked with this species. Dalbergia sissoo should be restricted to riverain sites and depressions in the sub-mountainous tract. Relatively warmer slopes and gravelly soils should be stocked with Acacia catechu. Pinus roxburghii should be extended in the Morni Hills on comparatively cooler sites and Dendrocalamus strictus on well drained slopes of the outer Siwaliks.

##### (b) *The Aravali Zone*

5.15 The Aravali Hills are highly denuded. These hills present inhospitable conditions and great care is, therefore, needed to select suitable sites for afforestation. Such sites occur only in scattered pockets where soil depth is not less than 45 cm.

#### Selection of Species

5.16 In view of the inhospitable environments the choice of species is limited indeed. Acacia senegal and Prosopis juliflora should be artificially grown to afforest the outliers, the former in highly refractory areas and the latter in relatively better sites.



(c) *Arid Plains*

5.17 The raising of plantations in arid plains needs specialised techniques on account of highly inhospitable environments caused by low availability of moisture, severe frost and sandy impoverished soil. Favourable rainfall year occurs once in 5 years.

### **Selection of Species**

5.18 *Prosopis chineraria* and *Acacia tortilis* are the principal species for restoring these plains. These species withstand the prevalent adverse factors remarkably well and reliance can only be placed on such species for afforestation.

### **Irrigation**

5.19 If planting is carried out immediately after rainfall no irrigation will be needed. However, under extremely adverse conditions one irrigation after the planting should be provided, if feasible. Mulching should also be done to conserve moisture.