TECHNICAL NOTE NO. 12

TENDING OPERATIONS

FOREST DEPARTMENT, HARYANA,
CHANDIGARH.

TECHNICAL NOTE No. 12

TENDING OPERATIONS

12.1 All operations carried out from seedling stage to the stage of maturity of a tree are called tending operations. These operations are carried out to improve the forest growth in the best possible way so as to get maximum yield of desired quality in terms of timber and fuel wood etc., from a unit area in a defined period.

The followings are included under Tending Operations :

I. Weeding

II. Hoeing

III. Cleaning

IV. Thinning

V. Improvement Felling

VI. Selection Thinning

VII. Light increment Felling

VIII. Cultural Operations

IX. Pruning

X. Climber Cutting

XI. Coppice Thinning.

12.2 I. WEEDING

It consists of removing all unwanted growth which competes with the development of the principal species to reduce root competition. Certain spp. like Eucalyptus require intensive weeding as these are comparatively more sensitive to root competition.

The most practical method of carrying out weedings in the plantations, is to do scraping of weeds in 50 cm wide circular strips all around the plants. Where the plantations are done at closer spacing *e.g.* in Saraswati irrigated plantations, where thick growth of high grass develops, a 50 cm wide strip should be clear cut so as to allow free circulation of air.

Weeding being a costly operation, it will be desirable to reduce the number of weedings, without adverse effect to the plants. The following steps may be taken so that the weed growth is reduced :

(i) The area may be ploughed, if possible, before it is taken up for planting.

(ii) The area may be given a hot burn before planting.

(iii) Initial spacing in plantations should be kept closer.

(iv) Fast growth in the initial stages should be aimed at. This can be obtained by planting early during the growth season *i.e.* spring planting, wherever irrigation facilities are available.

The number of weedings required in most of our species, will be :—

First year; three weedings during August, October, and February-March.

Second year; two weedings during September-October and February-March.

Third year; only one weeding during September-October if necessary.

12.3 II. HOEING

This operation aims at loosening the soil all around the plant and it is done with two objects of Conservation of moisture by way of breaking capillary tubes, and loosening of soil so as to allow aeration of root system of the plant. In addition to this, the root system of grasses and weeds is also damaged resulting in lesser growth of weeds.

After irrigation or rains when the soil is just dry so as to allow easy working, the soil is hoed with a scraper. Hoeing should not be done when the soil is either very wet or very dry *i.e.* it should be done when the soil is in a state of *wattar*

Weeding should be followed by hoeing. Hoeing is very useful especially in areas where the soil is heavy or badly trampled. This operation should be given top priority in plantations having medium to heavy soils and desert areas.

Number of hoeings required will be as under:-

Firest year: two hoeings in September- October and February- March.

Second year; two hoeings in September-October and February-March.

Third year; only one hoeing will be sufficient if carried out during September-October

12.4 III. CLEANING

This is an operation carried out in crop not past the sapling stage. In this the number of stems is considerably reduced by removal of unwanted stems or species. The main object of this operation is the reduction of root and light competition. Cleanings are concerned more with the regulation of light conditions than with minimising root competition. It is done both in plantations as well as in natural crops. Cleanings are more suited for mixed crops where the composition of crop has to be controlled. Sometimes early thinnings are combined with cleanings and the whole operation is termed as cleanings. In Haryana this operation is needed mostly in kikar sowings where the number of stems is generally very large. In this case when the plants reach 1 to 1.50 m height these are spaced out at about 1.5 m spacing. The thumb rule is that the spacing should equal the average height. In fact this also saves kikar sowing from frost damage which is generally due to radiation frost in Haryana State.

A stick of desired length is taken and pas ed through the line of sowings. Two plants on either end of the stick are retained and the rest removed. There is a tendency amongst the subordinate staff not to do this operation with an idea that good germination look may be spoiled but this is an absolutely wrong notion and this fear should be discarded. There is hardly any need of cleanings in the plantations.

12.5 IV THINNINGS

This is an operation carried out in a crop beyond the sapling stage and upto the beginning of regeneration period with an object of diminishing root and light competition for the ultimate benefit of the future stems. Thinnings, strictly speaking, are carried out in pure, even-aged or relatively even-aged crops. In a mixed crop the operation will be termed as improvement fellings.

12.6 The objects of thinnings are :

(a) To regulate the hygiene of the crop by getting rid of dead, dying and diseased trees.

(b) To provide best physical conditions for growth. When a dense stand is opened by the thinnings, the remaining stems grow faster and the increase of growth in diameter is considerable and not infrequently annual rings 3 or 4 times as wide as before thinnings can be seen. If a tree has a fairly well developed crown and is growing in a close stand, the opening of the stand admits more light to the lower part of the crown and reduces root competition for soil moisture and nutrients. There is not only a stimulated diameter growth through this increased intensity of assimilation, but also the crown increases in size. At the same time the root system is enlarged proportionately and there is a sustained growth greater than before the new conditions were established.

(c) To ensure uniform distribution of trees all over the area.

(d) To choose the right type of trees of right species as future crop.

(e) To minimise the climber damage and reduce the fire hazard, by getting rid of the suppressed stems.

(f) To get timber of desired quality and mechanical strength. Uniformly grown timber can be produced by manipulating the thinning degree and thinning cycle.

12.7 The basic principles involved in all types of thinnings are as under:

(a) Reduction in the number of stems per unit area to minimise the root and light competition for the ultimate benefit of the growth of the future stems & at the same time keeping sufficient stocking in the crop for the development of better form and for maintaining the soil fertility.

(b) Whatever be the degrees of thinning, the total volume production per unit area for a given site and for a given age is the same. With a heavier degree of thinning the final yield decreases, but it is compensated with quality of timber of large sized trees.

(c) While carrying out thinnings the density of leaf canopy must be maintained and no lasting gaps should be created, otherwise there is every likelihood of reduced volume resulting from reduced soil fertility and lesser amount of photosynthesis.

12.8 Depending upon the classes of trees removed or retained, and the manner in which the number of trees per unit area is reduced, thinnings may be classified as :

(a) Ordinary thinning

(b) Crown thinning

(c) Hecks free thinning

(d) Craib's advance thinning

(e) Thinning to a formula

(f) Maximum thinning

(g) Mechanical thinning

(h) Selection thinning

In this state thinnings given at a, e and g are applicable

12.9 (a) *Ordinary Thinning*

This is the thinning ordinarily practised and is, therefore, known as ordinary thinning. This is also called low thinning or German thinning. In this the removal of trees is affected starting from the lowest class *i.e.* the suppressed class and gradually working upward through the dominated and dominant classes. The maximum number of stems are removed from the suppressed class and least from dominant class. The under lying principle of this thinning is that trees which have been left behind in the struggle for existence completely or partially, do not perform any useful purpose and there is no use retaining them. On the contrary these are likely to harm the healthier trees by way of accelerating the root competition as well as spreading many diseases through insects, fungi, climbers and fire etc. This thinning follows nature in which the reduction in the number of stems takes place through the elimination of suppressed, dominated and a few dominant trees.

(8) 12.10 *Grades of Ordinary Thinnings*

There are five recognised grades of ordinary thinning *i.e.* A to E. Out of these grades A, D and E are not applicable in Haryana and need not be explained. The remaining grades *i.e.* B and C are as under :

In B grade thinning, dead, dying, diseased trees from all canopy classes and suppressed trees, dominated trees with defective stems or crowns, whippy and dominant trees with very defective stems and crown form are removed.

In C grade thinnings, in addition to the trees prescribed for removal in B grade, all the dominated trees plus the less promising trees in the dominant class are also removed. In gaps likely to be created by removal of dominant trees some suppressed trees may be retained to maintain soil fertility.

It has been observed in Haryana that best results are obtained if the first thinning carried out is between B and C grades, whereas the subsequent thinnings are of C grade. It is, in the interest of forest plantations if these grades of thinnings are adopted in true spirit.

12.11 In the forests of this State ordinary thinnings are suited because of the followings :

1. Most of the species, except Mulbery, are light demanders and so it is no use retaining the trees left behind in struggle for existence.

2. There is a ready market for the sale of small sized stuff.

3. Most of our species are fire tender and our locations are liable to repeated and frequent fires. The removal of weaker stems shall reduce the fire hazard.

4. Most of our areas, except Shiwaliks, are least prone to water erosion. Therefore, the removal of lower canopy shall not expose the areas to such type of erosion.

12.12 (e) *Thinning to a formula.*

Certain thumb rules have been worked out and standardized to facilitate the carrying out of the thinnings by subordinate field staff. This is not actually thinning but a simple check on thinning so that the subordinates may not commit mistakes while carrying out thinning. The thumb rules are based on the relationship between D *i.e.* average diameter and d average spacing in cms.

Some of the formulae of thinning applicable in Forestry.

1. (i) For irregular sal crops of more than 20 cm dia
d=18 D (Kalesar Sal Forest)

(ii) For irregular sal crops of below 20 cm dia.
d= 24 D (Warran's formula)

2. (i) for shisham crops of more than 20 cm dia.
d= 24 D

(ii) For shisham crops of below 20 cm dia.
d= 30 D (Howard's formula)

Formulae applicable to Sal crops can be applied to kikar crops as well.

These thinnings are carried out in certain species in young stage without any silvicultural considerations, whatsoever, in order to provide uniform spacement to all plants. In early stage all growing saplings are, more or less of the same vigour and thus the removal of trees is done just mechanically. Generally if rows of plantations are existing then the trees are removed alternately either in rows or diagonally. In sowings of Acacia nilotica a spacing of 150 cm is generally given with a stick of 120 cm length. The stick is passed through line sowings and all plants coming in front of the stick are removed and one on either side of stick is retained.

In irrigated plantations of Dalbergia sissoo the original spacement is of 3mX2m where the alternate lines are removed diagonally, thus giving a spacement of 3.5X3.5 meters.

12.13 The following thinning cycles for important species of this State are prescribed :—

1. **Acacia nilotica**

Ist thinning	4th year
2nd thinning	9th year
Subsequent thinning	at 10 years cycle.

2. **Dalbergia sissoo and Accacia catechu**

Ist thinning	4th year
2nd thinning	10th year
Subsequent thinning	at 10 years cycle.

3. **Shorea robusta**

Thinnings at 10 years cycle.

4. **Eucalyptus spp :—**

No thinnings required in plantations if the spacing is 2X2m. or more.

12.14 **V. IMPROVEMENT FELLINGS**

It is an operation carried out in a mixed forest of even or uneven age after the sapling stage for improving the composition and character of the crop by removing trees of undesirable form and spp. in the interest of better stems and of more valuable spp. It regulates the composition and layout of the crop. It is also called an interim silvicultural system for those forests which have been maltreated in the past. Most of the fellings in natural forests of our state are of this type. The following classes of trees should be marked in improvement fellings :—

1. All dead, dying and diseased trees.
2. All silviculturally available unsound and over mature trees.
3. All malformed trees if their removal helps trees of better form and species.
4. Thinning in congested groups of advance growth (*e.g.* Sal Forests of Kalesar).
5. Cutting back badly shaped young trees to get better coppice trees.
6. Removal of inferior species if this helps the better spp.

12.15 **VI. SELECTION THINNING**

This is a thinning in an irregular forest and it is one of the most difficult tending operations. It requires the highest technical skill as all age classes are present on every unit area and there is nothing like crown differentiation which is present in an even-aged forest and where the struggle for existence is quite evident. A tree in the lower most canopy of an irregular forest may be as much or even

more vigorous than a tree in the middle or the topmost canopy. Personal bias is, therefore, likely to play a considerable role in selection thinnings. This thinning can be applicable in Sal irregular forests of Kalesar. As a matter of fact this is an improvement felling as well as regeneration felling and the following classes of trees are removed under this operation.

1. Trees which hamper the growth of their neighbouring trees from all sides.

2. Removal of inferior stems in favour of superior stems of the same species.

3. Removal of less valuable spp. in favour of more valuable ones.

4. Groups of advance growth, wherever they exist, will be thinned and freed from over head suppression.

12.16 VII. LIGHT INCREMENT FELLINGS

This operation is carried out after the culmination of height growth and before the area is taken up for regeneration fellings. The object is to get rapid increment in terms of diameter and price for the remaining trees by creating permanent gap in the canopy. A few trees per unit area are marked for retention and the rest of trees are removed. The trees are retained at uniform spacing. Light increment fellings should not be carried out in areas where soil erosion or invasion by weeds is feared.

12.1 VIII. CULTURAL OPERATIONS

It is carried out in the year following the main fellings with the primary object of retrieving the damage sustained by the crop retained at the time of felling. At the same time the condition of the crop is also improved by way of carrying out other operations alongwith. This operation includes :

1. Felling of trees which were marked for felling but were not felled.

2. Cutting back of damaged sapling and poles to get better shoots.

3. Climber cutting.

4. Removal of inferior species in favour of more valuable ones.

5. Thinnings, in the crop retained if necessary, and prescribed.

6. Any other operation for the betterment of the crop.

12.18 IX. PRUNING

It is an operation by which the lower branches of plants are removed from the stems. The object is to produce straight and knotless timber. Even the height growth of trees is effected by pruning. In our plantations where planting is done at wider spacings, pruning is very essential but unfortunately this operation is being ignored mostly due to high cost. In order to keep down the cost this method may be confined to future stems only. The lower branches of the plants should be cut flush with the stem with pruning saws or knives. These instruments should be very sharp so as to give a clear cut. The pruning should be upto

three-fifth of the total height of the trees. Coaltar should be applied on the cut ends to prevent rot etc. If coaltar i not available even cattle dungplaster will be useful. In our State pruning is needed in crops of Dalbergia sissoo, Morus alba and Salix species when the object is to produce sports and furniture wood.

12.19. X CLIMBER CONTROL

There is not much climber problem in Haryana forests. However, it should be attended to simultaneously alongwith other operations.

12.17 XI COPPICF THINNINGS

The forests which are being worked on coppice system for fuel/pulp wood production need not be thinned as volume production is the sole aim in these forests which is not effected by thinning. If poles are to be produced, then thinning may be carried out. The operation consists in reducing the number of shoots per stool. One or two good shoots may be retained in the second or final thinning.