



GOVERNMENT OF HARYANA

TECHNICAL NOTE No. 10

(30)

IRRIGATED PLANTATIONS

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10.1 Introduction

Raising of Economic Plantations on the waste lands, in the plains presents a challenging problem to the Forester. The economics of these plantations depends not only on the percentage of success but also on their rate of growth. The success and rate of growth of these plantations largely depend upon the available moisture. In the semi-arid zone where these plantations are being raised, irrigation is an essential feature to augment the success and growth of these plantations. This phase of Forestry is unique in nature because the Forester has not only to deal with the Forest management but has to be conversant with the system of irrigation and judicious application of water. Demand for firewood and timber in the plains cannot be met from the degraded scrub forests carrying a sparse growth of inferior species. Irrigated plantations are, therefore, being raised in several compact blocks to achieve high wood production per unit area to meet the growing demands for firewood and timber in the state.

10.2 Lay-out

Experience shows that an area of about 4000 hectares situated in compact block and conveniently located is considered adequate for raising an economic unit of such plantations. The area is surveyed, demarcated and a detailed map is prepared. The entire area is divided into rectangles of 10 hectares each.

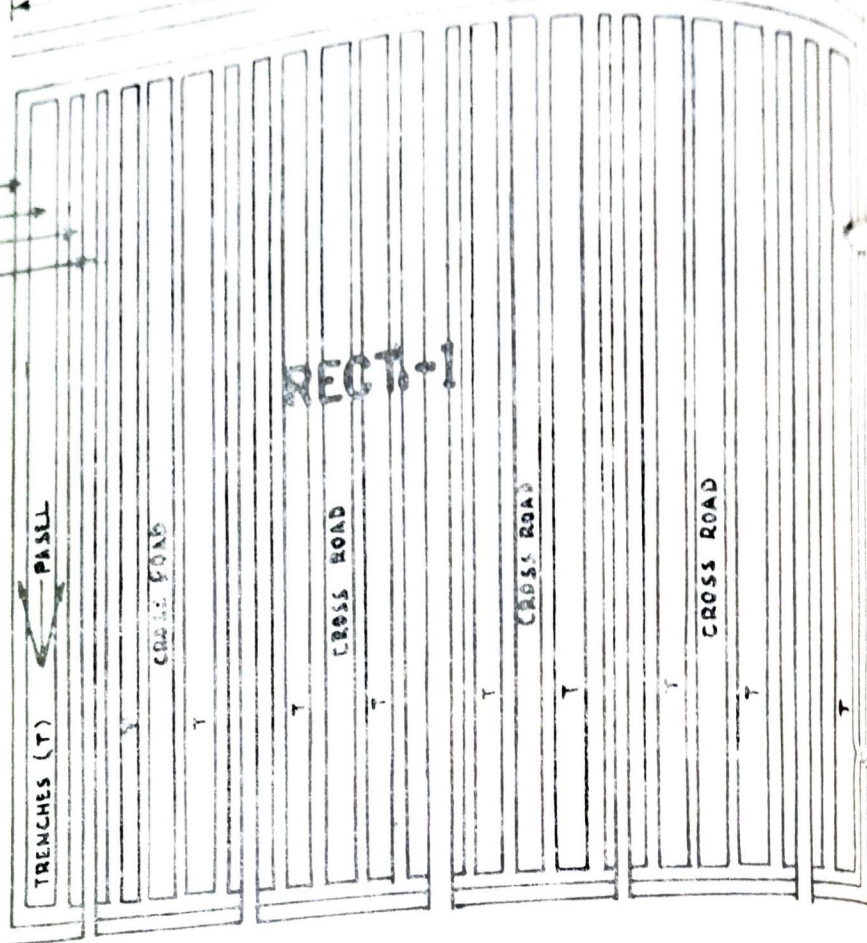
Each rectangle is now recognised as an independent compartment. The area being plain, with minor undulations, there is hardly any problem in confining the boundaries of a compartment, with those of a rectangle. Each compartment is provided with 6 metre wide road all around.

10.3 Irrigation System

The entire success of the plantation depends upon the irrigation system which is designed to achieve a high degree of irrigation efficiency. The area is divided into irrigation Chaks of about 200 hectares each. Each Chak is generally served by one outlet which feeds the main irrigation channel provided exclusively for the plantation and is called the main Khal. The main Khal generally runs along the upper boundary of the compartment and across the land slope. The main Khal branches into several branch Khals which feed a system of Pasels. The Pasels run parallel to the Khals and irrigation system of trenches aligned at right angle to the Khals. One Pasel feeds a unit of 90-100 trenches called the irrigation centre.

The Khals are designed according to the standard engineering principles. The pasels are 45 cm, wide at the top, 30 cm, at the bottom

45 CMs
28 MS
2 MS
70 CMs



DISTRIBUTION OF LENGTHS

DIVISION OF 335.28 METRES SIDE

1/2	COMPARTMENT ROAD	4.50	METRES
20	PASELS OF 45 CMs EACH.	9.00	-do-
10	PATRIES OF 2.25 MS EACH.	22.50	-do-
5	BRANCH KHALS OF 70 CMs EACH	3.50	-do-
4	CROSS ROADS OF 4.5 MS. EACH	18.00	-do-
9	TRENCHES OF 27.73 OR 28 MS EACH	251.00	-do-
1	TRENCH OF 25.78 MS	25.78	-do-
TOTAL		335.28	METRES.

DIVISION OF 301.75 METRES SIDE.

1/2	SUB MAIN KHALS	0.70	METRES.
1/2	COMPARTMENT ROAD	4.50	-do-
2	PASELS OF 45 CMs. EACH	0.90	-do-
2	PATRIES OF 2.25 MS. EACH	4.50	-do-
93	TRENCHES C.C. 0.4511 3.05 MS APPART	283.65	-do-
2	TRENCHES AT 3.75 MS FROM PASEL	7.50	-do-
TOTAL		301.75	METRES

LAY OUT PLAN OF IRRIGATED PLANTATION

and 30 cm, deep. Care is exercised to ensure that bed level of the Khal is never higher than the main, to prevent siltation in the main.

The irrigation is done in the trenches only. Night irrigation has been found to be relatively more efficient and effective. The irrigation proceeds from the bottom end of Khal upward. The irrigation generally irrigated at one time. The trenches are filled to the berm and are not allowed to overflow.

All channels and trenches are kept free of obstructions to ensure free flow of water. The khals and pasels are designed properly for efficient utilisation of water. A standard plan for layout of irrigation system is enclosed.

Although canal irrigation was largely depended upon in the past for raising plantations yet it had its own problems and limitations. Due to erratic supplies and occasional closures of canals, the plantations suffer. The local undulations and long lead of the water channels result in excessive seepage losses. In view of these difficulties the Forest Department has started installing shallow tubewells to irrigate largely in uncommanded areas. These tubewells are worked with diesel engines. The plantations are irrigated for 2 years with these tube-wells and after that the wells are shifted to new sites. Dependence on canal irrigation is totally stopped now. In case of tube-well irrigation size of Khal will be that of pasel.

10.4 Choice of Species

Dalbergia sissoo and *Eucalyptus* hybrid are important species for these plantations. Observations have proved that there is a good co-relation between the ground vegetation and the soil conditions and these relations have been made use of while selecting species for different sites. A dominance of *Vetiveria zizanioides* shows that site is suitable for *Dalbergia sissoo*. Abundance of *Desmostachya bipinnata* indicates moderate salt concentration and pH of about 8.00. Such areas are planted with *Eucalyptus* hybrid normally but *Dalbergia sissoo* can be planted on such sites if plentiful irrigation is available. An almost pure cover of *Sporobolus marginatus* is a definite indication that the site is impregnated with salts and unfit for tree planting directly unless reclaimed. Presence of *Typha elephantina* and *Urochloa* species indicates poor drainage and such sites are used for *Eucalyptus* hybrid.

It has been observed in the past few years that *Eucalyptus* hybrid has attained the best success in these areas and therefore it is now adopted as a principal species and about 90 per cent of the current plantations consist of *Eucalyptus* hybrid.

Acacia nilotica is raised where adequate water is not available. It is true that the species suffers in severe frost years but in the absence of irrigation this is the only species which can be relied upon. Moreover, irrigated plantations are being raised mainly to meet the fuel wood demands of the State, and *Acacia nilotica* is a good species for this purpose. It is quick growing in the initial stages. Sowings of *Acacia nilotica* in March with irrigation have been attempted successfully to

prevent damage by flood and frost. This species can be a better success if raised under shelter wood after ploughing.

10.5 Soil Working

Soil working plays vital role in the growth and success of irrigated plantations. The soils being heavy need thorough soil working. The area to be planted is ploughed with a heavy duty discplough drawn by a Chain type tractor. It is harrowed with a heavy duty discharrow drawn by a wheel type tractor. Several types of tractors have been used. D-4 Caterpillar has given best performance. Without ploughing and harrowing success of plantation is not satisfactory.

10.6 Cultivation of Agricultural Crops

The area is sold in open auction for raising agricultural crops, after ploughing and harrowing one year in advance for raising agricultural crops. Inter cultivation after planting is also allowed for about 2 years. Gram is the principal crop normally cultivated. No Kharif is allowed.

10.7 Planting Technique

Dalbergia sissoo is raised by using stumps which are planted in slots along the berm of trenches just after irrigation has been done. Season of planting depends upon availability of water, planting is done if assured water supply is available during summer, otherwise monsoon planting is done. *Eucalyptus* hybrid is propagated by using plants raised in polythene bags. The planting period for this species is relatively long, although efforts are made to complete the planting work during the rainy season. Slots are cut in the berms of trenches for planting the container plants. The plants are spaced 2 metres apart along the trenches and are placed below the berm level to maintain good soil moisture. Approximately 1500 plants are planted per Hectare.

The irrigation frequency depends upon the weather & soil conditions. Frequent irrigations during the summer are needed for the plantations raised in spring, whereas the water requirement is considerably reduced in case of monsoon planting. The plantations are generally irrigated for one to three years. The older crops are irrigated periodically if and when water is available. Ten to fifteen irrigations are needed during the first year and about half a dozen irrigations are required for the second and third years.

Acacia nilotica being frost tender is very severely damaged, if sowing is done during rains. Sowings during February and March, in irrigated areas have given better results and in future greater reliance will be placed on spring sowing.

10.8 Tending Operations

Tall grasses present a big problem in establishment and growth of the plantations. In addition they constitute a big fire hazard. Three weedings are done during the first year and two weedings are carried

out during the 2nd year. Grass cutting during the 3rd year is needed for Shisham plantations but this operation is often ignored on account of heavy cost. Experience shows that manual weeding is not very efficient besides being very costly. Singling of shoots in case of *Dalbergia sissoo* is done during September/October. Pruning is also needed in the 2nd year to prevent formation of side branches.

First thinning is carried out when the plantation is five years old and the second thinning is carried out when the plantation is 10 years old. In the 2nd and the 3rd year of plantation the area is harrowed twice a year. The first harrowing is done before the start of monsoons and the second after the end of monsoons. The operation is done to keep down the growth of weeds and to protect the plantation from suppression and fire damage.
