

ARTIFICIAL REGENERATION OF SAL IN EAST PAKISTAN.

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Prior to the partition of Indo-Pakistan sub-continent, the sal forests of this sub-continent were managed under both high forest systems and coppice systems. Of the high forest systems-clear felling system and selection system and of the coppice systems-the simple coppice system and the coppice with standard system were mostly in practice. Selection system was the main silvicultural system for sal in the outer hills of the United Provinces. Selection system was never in practice for sal in the portion now fallen in East Pakistan and the only system for sal of this portion was coppice system. As a result of working under coppice system, the sal forests of this part have become deteriorated to a great extent.

With the partition of Indo-Pakistan sub-continent, the best sal growing areas have fallen under the Indian Dominion and with the closure of the commerce and trade between these two countries, Pakistan was deprived of the supplies of good sal timber. To meet the growing demand of the new nation, not enough sal timber were available in the sal forests of East Pakistan which necessitated the creation of sal forests artificially by raising plantations, thus the age of sal plantations in East Pakistan is of very recent origin and dates back only to 1952.

There are many bars in raising sal artificially. The first bar lies in selection of suitable site. Sal grows well in well drained soil preferably of the old sal removed area.

It does not grow well in grassy, wet or semi wet, or dry areas. It grows well in well drained plains and foot hills upto 2000 feet to 3000 feet. Due to mistake in proper selection of site many sal plantations were failed in the past. Sal must not be tried to raise in areas which are not suitable for it.

The second bar lies in the preparation of site. In the early stages sal does not grow well in non-aerated soil, hence deep soil working in lines is most important for raising of successful sal plantations. The soil working must be completed after proper burning and reburning the debris etc. before the start of moonsoon or just with the early moonsoon for better aeration of the soil. The lines must be 6' apart and 18" wide hoed upto 9" depth. The general level of the lines must be 2"-3" above the ground level. In East Pakistan the lines must be in the North-South direction if the land is plain and along the contour if the land is too much undulated.

The third important bar lies in the collection and sowing of seeds. For raising successful sal plantation, the seeds must be collected from selected mother trees. The age of the mother trees should not be less than 25 years and preferably of seed origin. The progeny of the seed origin are definitely better than the progeny of the coppice origin. The other qualities of the mother tree should be straight holed and good crowned. Sal seeds ripen at the end of May and the beginning of June. The site for sowing must be ready well in time. Sal seeds usually lose their vitality comparatively in a shorter period. The seeds can be kept viable for 3 to 4 days by keeping them in cool and shady places. Ripe seeds after fallen on the moist ground germinate quickly hence the seeds must be sown in the lines immediately after collection from the mother trees without storing them for a longer period.

The fourth important bar lies in the time of sowing and sowing technique. Sal seeds require sufficient moisture for their germination and it is customary to sow sal seeds on the moist ground just after rains and on cloudy days. The age old procedure of raising sal in 6 feet apart lines of 15"-18" wide in 3 rows keeping 6" distance between the seeds along the row is still in practice in East Pakistan with the modification that a distance of 3" is kept between the seeds along the rows for the safe-guard of poor germination and mortality due to desiccation in the dry season. The general rule of sowing sal seeds in one row first and then in the second and third rows at the interval of 4 to 5 days is not found in practice in East Pakistan though it is prescribed in the working plans. The idea behind this principle is to safe guard the plantation from the total failure and that one or two of such occasions might be in favour of germination of sal seeds. It is observed that the taungya villagers have the tendency of sowing sal seeds in 6' apart lines of 6" wide in 3 rows keeping a distance of 3" between the seeds both along the rows and between the rows as a result the seedlings begin to die even in the rainy season due to root competition. It is advisable to check this tendency of the taungya villagers by strict supervision of the forest staff and enforcing standing orders. In my opinion 6" distance between the seeds both along the rows and between the rows in 18" wide lines will be the best distance. A prolonged drought at the time of sowing season is a serious cause for the failure of sal plantations and to guard against this unfavourable circumstances a well stocked nursesey must be maintained well in advance for filling up the vacancies at the end of June or early July of the same calander year.

The fifth important barties in the protection of the young sal seedlings from dry weather. East Pakistan is not an ideal home for the artificial propagation of sal. In the early stages it is very slow growing here and its average height

usually does not exceed 10", 25" and 40" at the end of first, second and third year respectively. In the early stages it is a very thin leaved species and can not stand in the drought which results them dying. To guard against this, special devices have been adopted in East Pakistan and the main one is raising them with other shade crops or cover crops either in the form of agricultural crop or of any other field crops. Under taungya systems, agricultural crops like - paddy, jute, chillies, cotton etc. are usually grown in between the lines by the taungya villagers. Boga medulla (*Tephrosia candida*) and arhor (*cajanus indicus*) are usually grown in between the lines when the plantations are raised departmentally by engaging paid labourers. In practice it is seen in East Pakistan that the agricultural crops are usually raised by the taungya labourers by broadcasting the aus paddy or dibbling them in the entire area after staking the area in May. At the time of sowing of sal seeds, the paddy plants attain a height of 6"-9" and the taungya laborers sow the sal seeds in the minimum possible space along the lines and the paddy plants found to engulf the sal seedling soon after their germination. Thus the sal seedlings in their first growing season are found to remain suppressed by the field crops for which proper development of the root system can not take place in them which is most essential for their survival in the next immediate dry season. In case of departmentally raised sal plantations, seeds of cover crop are found to sow in a narrow line of 3" wide in between the sal lines, much before the sowing of sal seeds and with the advent of rains the cover crop attains a good height at the time of sowing of the sal seeds. The so raised cover crop comes to use only if the sal seeds get a favourable weather for their germination which is often rare. Thus for the definite utility of the cover crop it is advisable to raise the cover crop after the proper germination of the sal seeds towards the end of June or last week of July. This operation at this particular time will also help in controlling the weeds.

The sixth important bar lies in the weedings and clearings. For successful sal plantation weedings and clearings are most essential. In sal plantations with the germination of sal seeds, germination of the seeds of other weeds and the sprouting of the sal coppice from the old stumps also take place. Creepers from their old rhizomes found to have the maximum growth in the first month. It is advisable to weed the creepers from time to time before first weeding and clearing. Due to heavy rains during the later part of June and the month of July, weeds were found to grow luxuriantly in the plantation area. It is advisable to carry out the first weeding accompanied by cleaning in the early part of July. It is found in practice that weeding is only carried out along the lines without weeding in the strips in between the lines, as a result, soon after the weeding, the lines again become covered with weeds and creepers from the strips. Under the circumstances through first weeding is recommended for the betterment of sal plantation. In East Pakistan a second time weeding becomes due at the end of July or at the beginning of August, which should also be a through one. Along with the weedings, cleaning of the seedlings should also carry out depending on the necessity. Cleaning here is meant in the reduction of the sal seedlings. In taungya system weeding in the first year are carried out with the weeding of the agricultural crops by the taungya labourers. Under taungya system the weeds can be best controlled with the cultivation. The better the cultivation the better the result for the plantations. Taungya crop should also be raised during the second year. It is found in some sal plantations that neither taungya crops were raised nor weedings were carried out in the taungya plantations in the second year as a result the plantations suffered to a great extent in the 2nd year and in some cases resulted into failure. For successful sal plantations, the taungya villagers need to be handled property. There can not be any justification to maintain the

taungya villagers only for their own benefit at the cost of plantations. Weedings, creeper cuttings and cutting back of inferior species in sal plantation need be carried out till the establishment of the plantation. Most of our sal plantations failed due to lack of care and attention after second year. In case of departmentally raised plantation care must be taken to see that the cover crop does not over top the sal, if there is danger of this the top of the cover crop must be cut back. There are instances that sal plantations failed due to suppression of the sal seedlings by the cover crop specially of *Boga medulla*.

Growth and success of sal plantations :- Growth of sal in plantations of East Pakistan is comparatively slower than in those of Jalpiguri and this is due to biotic and edaphic factors. It is also found that even the growth of sal in plantation of charkai Range in Northern Forest Division is better than those in Mymensingh Division. This is due to the presence of better aerated soil in Charkai Range. The average rates of growth of sal in charkai Range, are :- One foot in 1st year, 2-3 feet in 2nd year, 3-4 feet in third year and three feet a year from 4th year on words.

In raising sal 6' apart 18" wide lines in 3 rows keeping 3" distance between in seeds along the rows, 23000 seeds are required to be sown per acres. If half of the seeds i.e. 41500 germinate uniformly all over the area then it may be considered as hundred percent success. In the second year if half of this i.e. 20750 seedlings survive uniformly all over the area then it can be considered for hundred percent success for the second year. In the 3rd and 4th year if two thirds of this i.e. 13832 seedlings survive then it can be considered as hundred percent success for these years. In the 5 year and just before 1st thinning if 10000 saplings are

found well distributed over the area then it can be considered for hundred percent success for that stage. Thinning in sal plantation is one of the most vital silvicultural operations. We have no sufficient research works on thinning in our sal plantations. It is observed that sal becomes ready for first thinning in the 5th year. The first thinning needs be carried out before the dominant stems declare themselves naturally. The 1st thinning should be a fairly heavy "C-D" grade and will consist of an equal spacing of selected straight stems, by the removal of wolf, forked, diseased and badly shaped stems, and in addition occasional good stems in order to give enough space for the crown development of the remaining stems. The average spacing between the stem may be 3' for our slow growing plantations. Approximately 2420 saplings will remain after 1st thinning at an interval of 3' along the line. Sal in plantations become ready for 2nd thinning in the tenth growing season. This thinning should also be a heavy "C-D" grade thinning keeping 806 dominant saplings at the spacing of 9' along the line. The third thinning should be a heavier "D" grade and should be done in the 15th year. The number of stems retained per acre should not exceed 403 at the spacing of 18' along the line and 11' between two trees in the two adjacent lines. The 4th thinning is to be carried out at the 25th year by reducing the stems to 200 per acre.

Due to lack of adequate research works on our sal plantations much more can not be said authentically for the present on this topic. In short the condition of our sal plantations is not upto our satisfaction. Time has come to investigate whether a better system can be discovered for the substitution of artificial regeneration of sal through natural regeneration under shelterwood system. Mr.H.G.Champion of the University of Oxford and veteran of Indo-Pak. forestry also

suggested for similar investigations during his last visit to the sal forests of East Pakistan. Therefore, we should start our experiments in this direction by selecting sample plots without further delay in Northern, Dacca and Mymensingh Divisions with the hope of seeing new positive out-comes in the field of our forestry.

