

Bamboo for Paper

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Story of paper is the story of civilization. Paper originated from China where it was being used two centuries before Christ. But preservation of knowledge in time and its spread in space was known to India much earlier than that. Instead of on paper we wrote our scriptures on Bhoorj patra and palm leaves. Paper in Europe came into use only after 1000 A. D. when Arabs introduced it. Once the paper became plentiful the knowledge disseminated. Books were printed and they became carriers of civilization because of them ideas live and spread.

The credit of bringing bamboo as one of the raw materials for manufacture of paper belongs to an Englishman, Thomas Routledge. He published two pamphlets (i) Bamboo considered as paper making material in 1875 and (ii) Bamboo and its treatment in 1879. Mr. Routledge established the suitability of young bamboo culms of 4-6 months' growth in paper making. But later it was Mr. Raith who laid the foundation for modern paper making technique from bamboos - dead or alive, in 1912. Utilization of bamboo in India for large scale manufacture of paper by modern machinery is comparatively a recent development - hardly 50 years.

Hundred and fifty one species of bamboos have been described in his monumental work 'Bambuseae of British India' published in 1896 by Mr. Gamble. But even today our knowledge about the habits and requirements of different species is still lacking. Hardly one species has been studied in detail and a dozen are known intimately and the rest are still obscure even to a forester.

Distribution of various bamboos in India follows the distribution of the rainfall. Temperature

is also an important factor in determining the distribution in zones of altitude. Some grow in the moist areas along the banks of nallas and rivers; others in dry localities. Some thrive on fertile soils and some others on lateritic pans. Some tolerate overhead cover and others require open canopy. Some are giants growing to a height of 100' and some few are dwarfs reaching a height of 10' to 12'. Some are runners and some others are clump forming. So varied are their habits and requirements.

Indian common bamboo is *Dendrocalamus strictus*. It grows in almost every part of India and is much used in paper industry. Next in order is *Dambusa arundinacea*. The other important species available at economic cost in commercial quantities are - *Dendrocalamus hamiltonii*, *Dendrocalamus longipathus*, *Melocana bambusoides*, *Bambusa polymorpha*, *Bambusa tulda* and *Ochlandra travancorea*.

At present bamboo forms 70% of our raw material used for paper because it is available in large quantities at reasonable cost, yields good cellulose, has longer fibre, cooks well and bleaches fine. So to say, it is in the first rank as a raw material and its paper making qualities are in no way less than any other raw material in the world.

Abundance of bamboo and its use as a stable raw material has led to the rapid growth of paper industry in India. In 1925 hardly 5,000 tons of bamboo were consumed while today there is very little forest area which is not covered either by the existing paper factories or the factories that are in the offing.

Our total sustained yield of bamboos is reckoned at 20 lakhs tons per year and the average annual increment per acre at 0.5 ton. But this yield falls far below our present day requirements, leaves alone the future targets for the increased demands. Potentialities of our bamboo forests are very much higher, but they are to be conserved and judiciously managed for higher yields. The oft repeated old forest saying that bamboo is a menace in our forest shall have to be completely wiped out from our minds when we think of bamboo as a paper so vital for our enlightenment and progress.

Bamboos once considered inexhaustible in our forests are fast dwindling. The reasons are not far to seek. Indiscriminate fellings, irregular and unsystematic working, fires, grazing and reduction of forest areas are a few amongst many. Let us see how these affect our bamboo crop.

Indiscriminate fellings and irregular and unsystematic working :

Bamboo areas in many States are sold out or opened on permit system annually for extraction of Bamboos. The purchasers or the permit holders remove only tender bamboos growing on the periphery of the clumps, that are in great demand in the market for domestic use. This sort of extracting one or two year old culms retard the development of clumps and drops the yield. For proper growth over-mature and dead culms are to be felled and the congestion in the clump eased by spacing the culms to be retained. Again the clumps extracted will have to be given rest at least for 3 to 4 years to recoupe their vigour. There are also other important felling rules, such as height of cutting culms, number of culms to be retained, season of cutting etc. But these rules though incorporated in the agreements are observed more in breach. Bamboo is considered a minor forest produce and as such not much attention is paid to exercise strict supervision over fellings. This sort of haphazard working ruinous

to the crop does not usually happen in the bamboo forests leased out to the paper factories on long terms or rather it may be said that the factories cannot afford to treat their bamboo forests in this fashion, as ultimately it will be their own doom.

For sustained yield and continuance of regular supplies, a system of rotational felling is quite essential. It is true that bamboos are annually self-productive but their vigour and productive capacity will have to be maintained by proper treatment and silviculture felling. Right from seeding period to the age of exploitation, the bamboo crop needs to be protected from fires and grazing. When the crop reaches exploitable age regular exploitation starts with periodic fellings and the yield will be sustained throughout its life, unless treated adversely. In a crop worked out systematically at regular intervals, the production of culms varies from 25 to 30% of the whole standing crop according to site quality. It is for this reason that a felling cycle is fixed either at 3 or 4 years.

Fires :

Bamboo though a hardy species suffers very badly when fires are severe. Particular care is necessary during the flowering period as the bamboos after seeding die wholesale and become combustible mass all over the forests if not extracted immediately after seed fall. After extraction of dead bamboos there will be good quantity of debris left behind and it is here that the exploiting agency will have to be careful to take all possible precautions against fires as otherwise the seeds and seedlings will be wiped out for ever.

Grazing :

Grazing is another menace in the bamboo forests. Necessity of closure to grazing in the seeded areas for successful regeneration cannot be overlooked. In the areas where professional graziers are numerous their cattle render untold miseries to the natural regeneration and their constant grazing not only hamper the development

of clumps but also lay bare the extensive newly regenerated areas. Even young shoots and succulent branches are lopped by these graziers for stall feeding their milch cattle and calves.

Reduction in bamboo-bearing areas :

For grow more food campaign extensive forest areas are being disafforested and cleared right in the interior of rich wooded lands creating new habitation of both men and cattle. Here there appears to be no co-ordination between the Revenue and the Forest Departments. It is always the Revenue Department which has an upper hand, may be due to the pressure from local populace, but the result is decrease in the valuable forests and severe damage to the forest crop in the vicinity of new clearings.

Flowering of bamboos :

Bamboo is a perennial grass and its flowering at regular intervals is a natural phenomena. Different species flower at different periods. Some flower sporadically and some gregariously. The life cycle of various species vary from 30 to 60 years. After periodic flowering, seeding and death of bamboo, there will be an interruption of supplies for a period of 8-12 years. This is a very critical period for the paper mills, particularly, when the flowering is of gregarious type as in the case of *Bambusa arundinacea*. Gregarious flowering spreads like a wave and covers hundreds of square miles in a year. It is, therefore, always advisable to have a bamboo crop of different species flowering at different periods. In allocation of areas to different mills, the flowering aspect of the crop will have to be clearly born in mind and adequate areas having the flowering spread of 8-12 years set aside. Otherwise, the mills having concentrated flowering areas may have a sorry plight of temporary dislocation. Seeding period is the best period for re-stocking and enriching the bamboo areas. Unlike other species succession of vegetation takes place at the seeding period. After seeding there will be millions of seedlings

under the mother clumps. These seedlings when they are 3 to 4 years old, may be thinned out and removed to reboise the blanks and poorly stocked areas. The cost of such planting will be very much less as nothing is to be spent on collection of seed and raising of nurseries. Fencing against grazing and protection from fire are quite essential in the case of plantations.

Recently much attention is paid in the use of chemical fertilizers for rapid development of seedlings and to push them for early exploitable size and better yield. Experiments carried out by Prof. Ueda in Japan is an eye opener in this direction.

Economics of Bamboo planting :

Bamboo may be planted either in open or as an under storey in the existing tree crop. But successful plantations can only be raised under favourable soil and climatic conditions. In the open, the crop may reach exploitable age early, while under the shade it may take longer time. The exploitable age of bamboo may be taken as 8 to 12 years. It is at this age the clumps are in a fit condition for harvest at regular intervals of 3 to 4 years. In a spacing of 15' to 25' planting, the maximum number of culms at any one time in a clump may not be more than 15 to 25 according to species. This density of culms in a clump should not hamper the natural regeneration of other tree species. There are no pure bamboo forests in nature. Bamboo occurs always as a mixed crop. On the Western Ghats rich bamboo areas are also the excellent teak forests. Bamboo as an under-storey helps to preserve the composition of the forests by conservation of soil and moisture. Bamboo being shallow rooted does not in any way hamper the uptake levels of the nutrients by the deep rooted tree species that have more spread in the soil. Bamboo can thus co-exist with other tree species without any interference. Then, why not introduce and encourage the growth of bamboo for more revenue and increased production of paper ?