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Introduction

But for the rapid development of Pulp and Paper Industry in India bamboo had been a forest produce of minor importance, because its availability in nature was very much in excess of the demand. One of the forestry problems in those days was, how to dispose off bamboo from the forest than to grow them. Accordingly, the management prescriptions were so framed as to discourage its growth in the forest. In the present context of acute shortage of this vital industrial raw material it appears necessary to have a fresh look towards the aspect of management of bamboo forests.

Although of late there is some awareness about the importance of bamboo the past prejudices towards it still persist. This is obvious from the fact that as far as general management prescriptions are concerned there are hardly any changes in favour of bamboo. Moreover, the best of the bamboo areas continue to be lot for want of proper protection and care or are being sacrificed in favour of raising plantations of Timber species. Thus whereas on one side the industrial demand for bamboo is increasing its availability on the in nature is definitely decline.

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Need for on Industrial Outlook on Management of Bamboo Forests

The technological developments are bringing into use alternative rawmaterials for paper making which can supplement the bamboo to some extent. But bamboo being the only long fibred rawmaterial in India in bulk its guaranteed supply in required quantities would greatly determine the feasibility or otherwise of achieving multifold increase in production of paper evisaged.

Net Requirements of bamboo

If we are to meet even 50% of the total requirement of rawmaterial in terms of bamboo for the projected demand of 4 million tonnes of paper in 1985, the net requirement of bamboo alone would be 5 million tonnes.

Assuming that about 2.5 million tonnes of bamboo will be available from the natural forests for industrial consumption there is bound to be a short fall of additional 2.5 million tonnes to meet the demands. One way of making good this short fall would be by raising large scale bamboo plantations.

Bamboo Plantations

Bamboo plantations are being raised at present in various States to supplement the availability of natural bamboos. But the anticipated contribution from the plantations so far raised would be insignificant as compared with the overall requirement of the industry. If the expected shortfall of 2.5 million tonnes of bamboo is to be met by plantations alone about 2 million acres will have to be brought under effective bamboo plantations which would mean an investment to the tune of Rs. 600 millions. Besides the requirement of such huge capital outlay, it would be also difficult to find large areas in suitable localities for planting bamboo.

There indeed is a need to step up bamboo plantation targets to the maximum extent possible, but at the same time it is necessary to employ all possible means at our disposal for the improvement of natural bamboo crop in the forest so as to achieve more yield per unit area.

Improvement of bamboo in Natural Forests

1. Management aspect

At the outset it may be said that in view of the increasing importance and decreasing availability of bamboo the subordinate status given to it in the management of forest is no longer justifiable. It is high time atleast a part of the bamboo bearing forest is managed with the primary object of improvement of natural bamboo crop.

Before any suggestions could be made in this direction it may be necessary to have a little insight into the natural bamboo forests. In nature bamboo occupies the second

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Viewed from this angle storey. bamboo is often classified as a shade bearer. But a closer examination would exhibit better growth of bamboo where strong over-head light is available from the openings in the top canopy and the clumps situated under dense shade of tree species show decidely retarded growth. This view could be confirmed from the fact that growth rate of bamboo had been always better when plantations are raised as pure crop in the open as against under-plantings done in the natural forest where it often has to struggle for a number of years to achieve proper clump status, not to mention majority of them failing to make any head-way at all.

Again, even in the best of bamboo forests, where nearly 100 clumps per acre are reported the number of clumps that potentially contribute towards the yield may be as few as 30 to 50. Nearly 60% of the clumps, due to unfavourable conditions, especially, for want of light and growing space, will be found in an underdeveloped condition with smaller clump size and thinner and shorter clumps which are practically unworkable. In addition it is not uncommon to find many small and totally suppressed bamboo growth in the ground cover which can never attain clump status for the same reasons.

Thus basically when a forest is to be managed for the improvement of bamboo it will be essential that the canopy will have to be so manipulated as to provide sufficient light and growing space for the bamboo to develop fully. By so doing not only the unproductive smaller clumps including the suppressed growth get the existing developed clumps would further improve by putting on more increment. This contention would need no further proof if some good bamboo forests are observed wherein the tree growth being clearfelled, bamboo covers the ground so completely that it does not allow practically any other species to come up. Even in nature where favourable conditions for bamboo prevail existence of almost pure patches of bamboo containing over 200 clumps per acre, which are referred to by H.G. Champion as "Bamboo brakes" occur, wherein it will be invariably found that the tree growth at best will be represented by existence of only a few occasional stardards, here and there.

Chaturvedi M.D. (1928) the former Inspector General of Forests and a well known authority on Indian Forestry had suggested that in a forest to be managed for bamboo it is not desirable to maintain more than 30 trees per acre in the top canopy. When about 30 trees of economic importance are retained per acre it should be possible to bring up and maintain in a good bamboo area about 150 well developed clumps arising out of existing natural root stock which can give an annual increment of over a tonne of bamboo per acre per year as against the present yield of only 0.3 tonnes or even less. Thus by judicious management of bamboo forests it is possible to increase the yield of natural bamboo by 3 to 4 times.

Initially therefore potentially good bamboo bearing forests could be taken up under this treatment and by co-ordinating the local demands to be met as regards fuel and timber from these areas, forests could be suitably opened up in favour of bamboo.

2. Cultural operations in bamboo forest

Especially when the bamboo crop in a forest is young it has to compete with many other vegetation in the forest and in the process considerable number of developing clumps receive permanent set-back. A timely cultural operation like cutting down climbers and other rank growth including the tree species having no economic value can provide better room for the bamboos to develop and also assure good stocking. It has been found that by deep soil working and heaping up the soil around the young growth of bamboo, clump development can be speeded up. Addition of fersiltzers could be of added advantage in establishing a vigorous and fully stocked bamboo forest.

3. Management of flowered areas

Gregarious flowered of bamboo and cosequent dying of clump bringing down steeply the sustained yield of raw material for the following decade or more does create serious problems for the industry. But at the time this offers a good opportunity for the creation of new and better stocked bamboo forest provided some immediate protective measures are undertaken. Generally natural regeneration of bamboo after flowering does not present any problems. In a flowered area after the seedfall it is usual to find millions of seedlings coming up and covering the ground like a carpet

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with the onset of monsoons. But if this regneration is not protected from forest fire and grazing it is bound to recede year after year and the final crop of bamboo is more likely to present poorer density than the original one. In extreme cases there had been instances of complete eradication of bamboo after flowering for want of protective measures against the above hazards.

Thus the primary need for proper management of flowered are is protection from forest fires and complete closure of the area from grazing atleast for a period of five years after flowering. Plentiful availability of bamboo seed after flowering makes it possible to collect the same in large quantities which can be either broadcast or dibbled at intervals in the adjoining areas to enable uniform stocking of bamboo or to extend the stretch of existing bamboo forest.

4. Spacing out Natural Regeneration

Under proper protection the natural bamboo seedlings would attain a height of about-6 feet in a period of 3-4 years flowering and they will be found so crowded together that it will be beneficial to carry out spacing out operations so that the most promising seedlings are retained at an espacement of 10 to 15 feet from each other. This would eliminate unhealthy competition and the growing space provided will encourage quick clump formation. It will be of added advantage to carry out the cultural operations as proposed earlier.

The flowered areas can thus be converted into one of the fines bamboo forests to ensure multifold increase in yield within a period of 10 to 12 years after flowering.

5. Silvicultural rules of Extraction

It is a common knowledge that to maintain the productive vigour of bamboo clumboo clumps its basic physiological and physical needs have to be met. The silvicultural rules extraction have been framed taking into consideration these basic obligations. The injurious effect of removal of younger culms, over exploitation of clums and cutting the clums too high or too low are so well understood that they need not be elaborated here.

But at the same time it is an admitted fact that on large scale operations strict adherence to these rules has practical limitations. The bamboo in nature are widely scattered and as a result the large labour for the industrial scale exploitation is bound to spread out over the extensive forest which often has very rugged terrain. Proper control under the circumstances becomes impossible whosoever may be the agency of extraction.

There is therefore a necessity to simplify the rules to the extent possible, by conducting proper experiments, because the present rules however good intentioned they might be would lose significance if their practical application is known to be not feasible.

Bamboo extraction is a labour

intensive job and on unit weight basis its relative cost of extraction is much higher as compared with extraction of other woods. The labour cost is not only increasing year after year but also the availability of labour is decreasing with the improvement in agricultural economy and other rural developments. In this context mechanization of bamboo extraction will have to be considered seriously which would also call for suitable modifications in the present silvicultural rules of extraction to suit mechanized operations.

Conclusions

To meet the shortfall of long fibred cellulosic raw material there is a need for stepping up artificial regeneration of bamboo, but at the same time the possibilities of improvement of natural stand of bamboo in the forests especially in the industrial catchments deserves special attention. By adopting suitable management prescriptions such as opening up the canopy to provide adequate light and growing space in potentially good bamboo bearing areas, protection from grazing and fire particularly after gregarious flowering, timely spacing-out of natural regeneration followed by cultural operations and application of fertilizers, it is possible to achieve substantial increase in the yield of bamboo from the natural forests. More research in this respect as well as towards evolution of more practical rules of extraction to suit. mechanization of bamboo operations will be of topical importance.

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