

Greening of the earth-necessity & role of paper & pulp industry

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Introduction

According to neoclassical theory of economic growth, development of an economy depends on the amount of capital & labour employed and technological progress ultimately is the engine of growth. But this theory assumed technological progress to take place by chance from heaven as random scientific breakthroughs. Recently in 1983, Paul Romer has put forward a new theory of economic growth by adding a new factor "knowledge" to the two factors of production, i.e., capital & labour. Economics have to invest in knowledge as they invest in machines. More recent works have added one more factor, i.e., human capital, measured by years of education. This approach is likely to form the basis of mainstream thinking on growth during coming years. Further inventions do not pour down from heaven, as the neoclassical theory may propose. Knowledge is distinct from investment. This can explain why decades of heavy investment yielded so little in India and so much in South Korea, Taiwan. Empirical studies based on new growth theory has given striking results. Lack of human capital (i.e., education) and not lack of investment in physical capital is what prevents poor countries from catching up with rich ones. Therefore, Government will have to think in harder terms about education and investment in research and development.

No wonder paper consumption is being considered a barometer of education levels and knowledge of people of any country and this fact is borne out of consumption rates of paper in developed countries like USA, Canada, European countries, Japan, Australia etc which are many times higher than the consumption rate of paper per capita in developing countries. This is because paper is the major medium through which education and knowledge is disseminated. Although with large scale use of computers & accessories in data storage and analysis, paper need was supposed to be

eliminated. However, this is not going to take place in near future and paper is going to be the most important medium for providing education in the next century in the developing countries. Thus for the development of the country, it is important to increase investment in education and knowledge of people in which paper and pulp industry has a big role to play by providing increasing quantities of paper at low costs which the poor people can afford.

Present Paper & Pulp Industry status & raw materials situation :

The per capita consumption of paper in India was estimated at 2.00 kg. per annum in 1983 which is expected to grow to 4.25 kg per capita per annum by 2000 A.D. Thus the total requirement of paper by 2000 A.D. will be of the order of 4 MT. At present we are producing about 1.9 MT of paper (1989) and present installed capacity of 45 major and 225 small scale units is 3.00 MT. However, newsprint is being imported on a large scale. Consumption of paper will be rising in the next decades and to meet this growth in production, supplies of raw materials will have to be ensured.

Wood fibers have since long been a traditional raw material for the manufacture of paper and pulp. Coniferous softwoods and bamboos are most appropriate and form the basis of raw material for pulp manufacturing. Coniferous forests cover only about 4% to 6% of the forests and that too in the fragile Himalayas from where supplies are non-existent now. Bamboo has also become relatively more scarce. Use of non-conventional raw materials such as straw, bagasse,

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jute waste etc. has been encouraged but increased use of these materials is not without problems (straw is used for fodder, baggasse for fuel) and many units based on these are either working below their rated capacities or have become financially unviable. Therefore, agricultural and agro-industrial residues are going to make a marginal contribution to the total cellulosic raw material supply. Similarly grasses and reeds viz: *Eulaliopsis binata* (Bhabar grass) are also going to contribute to only a small portion. Pressed by the raw material crunch the industry has started using hardwoods too. Thus a major portion (60–70%) of raw material required for paper & pulp will be of conventional origin, i.e., bamboos and woods.

Presently about 235 million cu. m of wood is required for firewood as against its production of 40 million cu. m and about 27.5 million cu. m of industrial wood against the production of 12 million cu. m. Thus there is a big gap between demand and supply position. By 2000 AD the pulpwood is likely to constitute about 60% of the wood requirements. The raw material supply position will be further worsened due to escalation in population pressure as also the poor productivity of our forests which is about 0.7 cu. m/ha/year and is far below with the world average of 2.1 cu. m.

The expected shortfall in raw materials for paper and board by 2000 AD will be about 0.30 MT of air dry bamboo and 3.55 MT of air dry debarked wood (Table—1).

According to the latest estimates of Forest Survey of India the actual forest cover is only 64.01 million ha, 37.84 million ha is of adequate density which is only 11.51% of the total geographical area. The estimated growing stock of wood in the country is 4196 million cu. m. The net annual increment is 52 million cu. m. or 1.24% of the growing stock. The total growing area under bamboo is above 10 M hectares with an annual potential of 50 lakh tones mainly growing in Madhya Pradesh, Orissa, A.P., Karnataka and the North-eastern States. The supply of bamboo material is decreasing continuously due to ex-ploitation.

This situation is further compounded by the increasing population of the country. There are more than 50 million tribal people in the country, living with in the forest belt. For centuries tribal people have utilized these forests for their livelihood. Exploitation of these forests have led to political discontent among tribal communities. Therefore, the productive & sustainable use of the country's natural resources are essential for enhancing human welfare and national development. At the current rate of over exploitation of forest vegetation it is estimated that 1.3 to 1.5 million ha. of forest land is denuded annually. The demands for fire wood & fodder is going to multiply rapidly. This will require elimination of current tensions amongst forestry system, administration, tribal people & industry requiring raw material from forests.

Government Policy :

Taking into consideration the situation, the rele-

Table - 1 : Demand and supply position of raw material for paper and board.

Year	Production dependent on forest raw material (MT)	Forest raw material required (M air dry T)			Forest raw material available (M air dry T)			Shortfall in forest raw material (M air dry T)		
		Bamboo	Wood	Total	Bamboo	Wood	Total	Bamboo	Wood	Total
1991	1,568	2.20	2.20	4.40	1.70	1.15	2.85	0.50	1.05	1.55
1996	1,960	2.20	3.30	5.50	1.70	1.15	2.85	0.50	2.15	2.65
2000	2,380	2.00	4.70	6.70	1.70	1.15	2.85	0.30	3.55	3.85

vant objectives of National Forest Policy were modified in 1988 and these aim at :

(i) maintenance and conserving the natural heritage of the country by preserving the remaining natural forests with the vast variety of flora and fauna which represent the remarkable biological diversity & genetic resources of the country;

(ii) increasing substantially the forest/tree cover in the country through massive afforestation and social forestry programmes; and

(iii) meeting the requirements of fuel wood, fodder, minor forest produce & small timber of rural & tribal populations.

Management policy forbids clear felling of adequately stocked natural forests and introduction of exotic species without long term scientific trials. It lays down following considerations governing establishment of forest based industries and supply of raw material them.

“As far as possible, a forest based industry should raise the raw material needed for meeting its own requirements, preferably by establishment of a direct relationship between factory and individuals who can grow the raw material by supporting the individuals with inputs including credit constant technical advice and finally harvesting and transport services”.

Role of Social Forestry :

The 1988 National Forest Policy suggestion with regards to industries may seem a major policy shift. But it is more of a statement of factual position. The industry has had a long period of support in the form of subsidised availability of raw material. The present level of demand can in no case be sustained on forest. Also if health of forests is to be maintained, which is necessary for many other reasons, alternative sources will have to be developed not only to meet additional requirements but also to shift the present responsibility.

Thus, industry is expected to meet its demands of raw material from farmers. Industries have initiated some programmes but progress has not been able to match the required pace. The difficulties in getting renewals of leases and securing fulfillment of contracts for supply of forest produce have recently made some industries to step up efforts.

In the back drop of this situation, the success of social forestry programme has held out new hopes in extending forest cover to ensure ecological, economic & social security to the people particular to rural masses and provide supply of raw material to wood based industries.

Social forestry programme has a large potential in wood production, particularly as this approach provides a greater safeguard in many environmentally critical areas than do most of the other practices, besides immediate benefits of afforestation are substantial in terms of generating employment. There is enormous potential of renewable plantations for paper industry. This can be achieved by afforestation of marginal lands, ravines, wastelands and through agroforestry.

This role of social forestry plantations can be further enhanced by developing compatible models of agroforestry with trees & agricultural crops having symbiotic relationships instead of competing models based on comparative financial results only. This will stop diversion of good agricultural lands to tree raising as provided in the policy. This will results in improving overall productivity of land, protection of environment, lessen the use of chemical fertilizer etc. The form forestry programme propagated under the social forestry programme has been a major success. It has been through the initial phase and is ready to provide major inputs of raw material in the market. Fast growing species form the major part of trees planted by people. The programme has suffered in the recent past mainly on account of market variations. Need has also been felt of enhanced research inputs.

In northern India about 80% of plantation growing during early years of farm forestry were of *Eucalyptus* alone. In recent years there has been a steep decline in the price of *Eucalyptus* wood. The other reason is high density plantings. The Spacing between plants adopted in such plantings varies from 50 cm to 1.00 m which has adversely affected the annual increments and also resulted adverse affects on agriculture crops. The type of stock supplied and used for raising plantations proved inferior in the long run which has frustrated the farmer after few years of planting. These reasons have forced various farmers to discontinue the planting of *Eucalyptus*. However, many farmers have

now realized the mistake and have adopted wider spacings of more than 2 m which goes upto 4 m depending on the geometry of plantation and site conditions.

It has been observed that the productivity of plantations could be raised substantially with proper inputs and management. Under favourable conditions recorded production for various species could be as high as shown in table—2 below.

Table—2

Species	Age	MAI cu,m/ha
<i>Pinus roxburghii</i>	38	12.25
<i>Alnus nepalensis</i>	15	16.34
<i>Toona ciliata</i>	14	16.80
	9	15.47
<i>Cryptomaria japonica</i>	32	42.92
<i>Eucalyptus tereticornis</i>	8	22.00
<i>E. globulus</i>	10	50.00
<i>E. grandis</i>	10	40.00
<i>Gmelina arborea</i>	13	14.81
<i>Michelia champaca</i>	8	18.25
<i>Casuarina equisetifolia</i>	5	15.06
<i>Bischofia javanica</i>	7	13.22
<i>Broussonetia papyrifera</i>	10	21 to 30

The rate of growth of trees under farm forestry is much faster due to the advantage of various inputs provided by farmers for agriculture crops. Devedi & Sharma (1990) reported that in case of field boundary plantation growing stock of 1.5 cu. m/ha/year to 3.5 cu. m/ha/year can easily be obtained which is much more than average productivity of our forests (0.7 cu. m/ha/year). In case of block plantations, the productivity has been many times more and ranged from 20-28 cu. m/ha/year for *Pupulus* species. *Eucalyptus* hybrid raised on field boundary on one side of the field recorded a mean bole biomass (dryt/ha) of 3.42 and 4.42 at the age of 5 and 6 years. *Eucalyptus* produced total above ground biomass of the order of 41 tons/ha (9 years) recorded in 158 tons/ha (12 years) plantations grown (under rainfed conditions) in Bijnor, Tarai Bhabar, Pilibhit and Eastern Dehradun forest Divisions of U. P. (George, 1978). Next to *Eucalyptus* various tropical pines grown in India viz *Pinus patula*, *P. caribaea* var. *hordurensis*, *P. caribaea* var. *bahamensis*, *P. oocarpa* and *P. elliotii* have shown encouraging results and considered

suitable raw material for pulp and paper industry. Studies carried out on biomass production of *P. patula* at Kodaikanal and Ootacamund ranges from about 145.4 T/ha to 146.8 T/ha at 12 years of age consisting about 60% wood. (George et al, 1982; Malhotra et. al, 1985). Kaul et al, (1982) reported total biomass of *P. elliotii* plantation at the age of 40 years ranged from 169 tons/ha (10 years) to 529 tonnes (40) years per ha with 81 to 85 percent contributed by above ground Parts. The percentage contribution by wood biomass increases from 43.7 (10 years) to 65 (20 years). *P. roxburghii* plantation (20 years) produced total above ground biomass of 68.5 tonnes/ha (Seth et al, 1963). Pande, (1989) reported total above ground biomass for *P. kesiya* which ranges from 9.26 t/ha (12 years) to 7.96 t/ha (14 years). Maximum contribution is made by the wood which contributed 68%. From the foregoing discussion it is clear that the tropical pines are capable of solving the supply of raw material for forest based industries particularly paper & pulp.

It is amply clear from the forgoing discussion that the present scenario offers opportunities to the industry to not only attain self sustainability but also contribute to the economic development and environmental improvement of the country. While on one hand the National Forest Policy makes it obligatory on the part of the industry to search for raw material outside forests, the encouragement to social forestry programme facilitates the process.

While the options are clear the path is beset with hurdles. Let us convert the challenges into opportunities. The hardships of the present day are only the harbingers of a brighter future. The major issues which need to be addressed can be listed as below:

Lack of traditional market :

The history of growing trees for cash crop is recent only. It is only enterprising farmers who are willing to take chances to raise trees in substantial number by putting in major inputs. In absence of traditional markets most of the farmers need to be assured of salability of wood produced from trees. The experience of farmers has shown their vulnerability to middle men in the absence of developed market. It is encouraging that some industries and forest cooperation are coming forward to address this issue. However, the zone of

operation and level of operation needs to be expanded many fold.

Input needs :

Major section of Indian farmers are poor and have little ability even to provide inputs for a long term venture like tree growing, what to talk of sustenance for few years. For a scientific effort with proper inputs they need to be provided with inputs on reasonable terms. The uncared trees with little inputs do not provide profitable outputs and discourage the farmers. The industry obviously has an important role to play in this regard.

Technological

There are possibilities of enhancing production substantially through tree improvement using quality planting stock, providing right inputs and using correct management techniques. The present research has mainly been at a macro-level where in some demonstration of potential has been made. The soil and climatic variations make it necessary to develop site specific models with not only carefully selected species but provenances also. Enhancement of specific traits crop to make best use of available opportunities by tree need to be ensured. Areas of the technological research may be as following.

RESEARCH NEEDS

(i) Selection of tree species suitable for various sites in different agro-climatic regions and capable of meeting the objective of planting. The ICFRE, Dehra Dun has identified 55 tree species which are suitable for the manufacture of paper and pulp.

(ii) Identifying proper seed source and developing suitable technology seed certification and storage.

(iii) Tree improvement by evolving suitable breeding methods and producing's desired strains, selections of suitable clones/natural hybrids.

(iv) Narrowing of the degree of variation in stands and stressing on economic yields, through tissue culture and other propagation techniques.

(v) Studies on raising healthy and standard nursery stock, transplanting techniques different soil

Working techniques, various plantations models, various Plantation densities, use of nutrients, VAM fungi etc. to evolve a package of planting and cultural practices.

(vi) Studies on economic facibility of growing indigenous and exotic tree species with different inputs.

(vii) Evaluating efficiency of wind-breaks and shelterbelts of different tree species and geometry of planting on soil and moisture conservation and their effect on the yield of associated crops.

(viii) Evolving methodology for management of multiple row planting in strip plantations.

(ix) Study of crop compatibility of agroforestry crops and their interrelation etc.

(x) Study of growth data of different species for presenting optimum rotation in relation to object of management.

(xi) Market research in the disposal of Produce is necessary the producer in the disposal of forest produce.

Thus, major research initiative from industry is expected to address these and many other research problems. Raw material production need to be stimulated on the basis of major technological break through. There can not be any argument that the society has been taken to a take off stage through social forestry effort. Need is that of inovations and development to take advantage.

Policy issues : The policy statement needs to be supported by structural adjustments to encourage its implementation. The legal hurdles to raising and harvesting of tree and tax incentives, subsidies, soft credit are the major tools in support of the policy. The financial institutions have shown willingness to provide for credit needs on easier terms. However, few have taken advantage of this. The forest departments seem to be in a fix over the implications of relaxing legal restrictions over felling and transport of trees. Industries may play an important role to facilitate smoother flow of credit facilities and mitigate legal hardships to farmers as a responsible agency on which the forest departments and governments could have greater faith in.

The research, credit and support price package developed by some leading industries are encouraging. Similar models with necessary modifications need be developed and implemented on a much larger scale.

Opportunity on Public lands : Industries have also been pleading for allowing them to raise captive plantations on waste lands with little vegetation. While arguments have been weighty and logical there have been lack of faith for various reasons. However, political and beuracritic leadership has shown inclination to involve cooperative agencies in the task of greening the country. This offers an opportunity to industries to support and encourage cooperatives and produce raw material.

Thus, the constraints to the availability raw material offer opportunities to entrepreneurs. It can be concluded that there is enormous potential for meeting the requirements of cellulosic raw material of paper and pulp industry through social forestry plantations. But it will require initiative on the part of Industry to start a programme of tree planting along-with provision of technical and financial aid to the farmers through research and extension organization. This can enhance the image of paper & pulp industry to be environmental friendly in the present times where the environmental issue are of primary importance and no industry can ignore these concerns. The natural forests should be left for development of environment, ecological and social stability. Industries should, therefore, develop its own raw material base by concentrating with individuals & cooperatives on growing trees on the available sites in close cooperation along-

with more emphasis on research & development of these inputs. This will go a long way in increasing the ecological, social and economic growth of the country.

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