

# Forestry raw material for paper and pulp industries in India problems and prospects

AGRAWAL S. C.\*

---

## SUMMARY

Forests are shrinking day by day both in respect of area as well as in stocking due to growth in population, increasing demand and various other biotic factors. Contrary to this the demand on forest for meeting the required raw material is increasing tremendously. Under the present circumstances and due to pressure on land it would not be possible to increase the forest area significantly and in future the forest will remain confined mostly to such areas which are inaccessible. The growing demand of raw material by the paper industries cannot be met with from the existing forest. The National Commission on Agriculture has estimated that the requirement of paper by 1983-84 and 1988-89 would be in the proximity of 2.8 million tonnes and 4 million tonnes respectively for which we would be requiring raw material to the extent of 5.7 million tonnes and 7.7 million tonnes (or 8 million tonnes) respectively. This demand can only be met with by bringing SECOND GREEN REVOLUTION in the country by raising man-made forests. Well integrated efforts would be required for tackling this problem by the Govt., State Forest Departments and the Paper Mills. There is a need for laying out a well defined industrial policy for the forest based industries which should assure the supply of raw material to the paper industries at reasonable royalty. The other important items to be decided will be lease period, frequency of revision of the royalty and the extent to which the royalty should be increased at each revision, concessions to be given to the industry during its gestation period and afterwards, concessions for using hardwoods and other unconventional raw material. The Govt. of M.P. has taken a lead in formulating a well defined industrial policy for forest based industries which could be adopted with minor changes by the other States and the Central Govt. as well.

There is a need that massive plantations should be carried out both by Forest Deptt. and the industries independently. These plantations primarily should be taken on productive areas with in the economical lead from the existing industries. As far as possible these plantations should be irrigated ones and heavy inputs in the shape of tilling operations, fertilizers, insecticides, irrigation, better seeds, fencing should be put in. Only fast growing species which are suitable for pulping should be grown. The higher cost on plantations will be well compensated by less expenditure on transportation of the pulpwood besides other advantages in having uniform, homogenous crop of younger age which would be easier in pulping and bleaching. The Govt. should transfer sufficient productive areas to the industries for raising their own captive plantations. Industry should create extension wing and encourage local farmers to grow suitable fast growing pulpable species for the Mills.

It would be worthwhile for the Govt. that the plantations can be taken up in joint sector by the Mills in collaboration with the State Forest Deptt. or with the Forest Development Corporation. This will facilitate the transfer of land and procurement of funds from the various financial institutions. Nepamills has already taken up such project in collaboration with M.P. State Forest Development Corporation. The scheme has already been implemented since 1982. The paper industry should increase use of hardwoods and search for other new species should also be made. Other raw materials like Bagasse, reeds, Jute, wild grasses and agricultural residue consisting of straw cotton sticks etc. should also be tried as an alternate source of raw material. Intensive research work is needed to develop better type of chippers and crushers for compressing the material which otherwise cannot be transported economically. The mills should develop technique of using small branch woods, bamboo twigs, small material from bamboo re-growth and crooked and malformed billets etc. This alone would increase the availability of the raw material by 10 to 15%. Intensive research is needed for utilising effluent water for irrigation purposes.

In the near future the requirement of raw material would be very heavy and it may be difficult for the Forest Deptt. to handle these problems. It would, therefore, be worthwhile establishing autonomous bodies which can be called as Raw Material Corporation of Cellulose Corporation or Forest Industries Corporation which could look after the various problems of the industries such as location of the industries, allocation of the raw material, pricing and supply etc.

---

\*I.F.S. Controller of Forest Works Nepa Mills, NEPANAGAR (M.P.)

Paper as we know has gradually become an essential requirement of every day life and has become an indispensable commodity. It has, therefore, become obligatory for us to look into the trends of its demand, the present situation and ways and means to meet the raw material requirement to produce it.

The paper industry in India has made phenomenal progress during last 30 years. There are about 100 paper mills in operation today and many more are on the way. Together they provide about a third of India's paper and board output of 1.2 million tonnes. The installed capacity has grown from about 1.1 million tonnes in 1976 to roughly 1.7 million tonnes today and should rise to perhaps 2.6 million tonnes by 1985, and 4.25 million tonnes by 2000 A.D. according to the plans announced by the industry. Today India contributes to the extent of 0.68% of the world's paper production and ranks 22nd in the world. However, in terms of per capita consumption, India is down the list, standing 106 with approximate 2 kg. person.

#### REASONS FOR SLOW GROWTH

The reasons for the slow growth of the paper industry during five years plan could be attributed to the following reasons :—

(i) The paper industry requires heavy investment and this cost is escalating day by day.

(ii) The cost of new capacity varies considerably from one unit to another and moderate figure could be Rs. 20,000 per annual tonne for a mill to be built today. The interest and deterioration charges for such huge investment alone becomes nearly 70%.

(iii) The return on investment in paper is also inadequate. This discourages new investors.

(iv) The pay back period is very long which may vary from 15 to 20 years which is totally unacceptable to investors.

(v) The basic problem before the paper industry is to ensure the sustained availability of the required quantity of paper making raw materials at an economic cost. The depletion of forest has enhanced this problem and unless the raw material is guaranteed by the concerned State Govt., industrialist hesitate to invest huge amount in paper industries.

(vi) The supply of coal is also erratic and the quality is much inferior with an ash content varying from 20-30%. There is lack of co-ordination between the mines and the railways.

(vii) In case of newsprint the prices are controlled by the Govt. and usually a price paid for is

below the production cost. The present cost of production of newsprint per tonne is nearly Rs. 5,200/- whereas the present ceiling price is Rs. 4,700/- per tonne. In view of this no private entrepreneur even thinks of putting up a new industry.

#### NEWSPRINT

Until recently, the country's only newsprint producer was National Newsprint and Paper Mills Ltd., Govt. of India Undertaking. This mill was started in 1956 and is producing 55,000-60,000 tonnes of newsprint yearly based on bamboo and salai (*Boswellia serrata*) only. It further plans to expand its production in the next 5 years at a cost of Rs. 400 million approximately.

India has, therefore, been very heavily dependent on imports of newsprint and will no doubt continue to be so for some time to come. However, things are now changing with the coming of new mills. These are all in trial stage of production. Hindustan Paper Corporation has put up a newsprint machine at New Velloor in Kerala at a cost of Rs. 1,500 million approximately which will make 80,000 tonnes year of newsprint on a 6.8 M Voith machine. This paper machine will be a fully integrated, with a chemi-mechanical pulp line, which will run on local Eucalyptus plantations. Another newsprint mill has been set up at Bhadravati in Karnataka. This is a 70,000 tonnes/year unit based on a mix of mechanical and chemical pulp.

During the year 1982-83, the demand of newsprint has been estimated at 3.60 lakhs tonne, of which nearly 1.86 lakhs tonnes would be imported and the rest would be met with indigenous production and releases from the buffer stock.

#### FORESTS—THE MAIN SOURCE OF RAW MATERIAL

The principle raw material for paper making is wood, bamboo and other fibre producing material obtained mainly from the forest—whether natural or man made. For meeting the needs of the industry we have to consider the production of wood and other fibre producing material from forest on a progressively increasing basis.

Forestry represents a significant role in the world economy. However, in our country the forest area is already low. The total area of forest is 75 million ha. which represents 23% of the geographical area. The area under forestry is nearly 50% of the area under Agriculture. According to national forest policy, the area under forest should be 33% of the total geographical area. This has been considered

necessary to maintain proper environmental conditions, to have proper ecological balance, and to meet the economic and industrial needs of the people. Out of the above the exploitable forest area, is only 45 million ha. (60%). The areas of commercial forest is only 25 million ha. The total growing stock of productive managed forest till 1980, has been estimated as 2,000 million Cu.Mt. The annual cut from this forest is extremely low being 30 Million Cu.Mt. which comes to 0.5 Cu.Mt. per ha. per annum against 2.6 Cu.Mt. per ha annum for Asia and 2.1 Cu.Mt. for the world as a whole.

The forest area in Madhya Pradesh is 166, 161 Sq. km. which is nearly 37% of the total area of the State and 22% of the forest area of the country.

The forests are shrinking day by day both in areas as well as in its growing stock due to increase in population, more demand for agriculture, disforestation on account of development activities, heavy illicit fellings, fibres and uncontrolled grazing. After independence 22% of the forest area has already been disforested. During last 25 years the country has lost 4.134 million ha. of forest. The average rate of disforestation per year is 0.14 million ha. M.P. alone is responsible for 33% disforestation of the entire country. This is just to indicate the magnitude of disforestation going on in the country which is an alarming situation.

## RAW MATERIAL

The raw material obtained for the paper industry from the forest are mainly bamboo, hardwood and softwood, besides to some extent the grasses.

### (i) BAMBOO

Till 1911 there was no use of bamboo and it was considered a weed. Sir William Raott of the Forest Research Institute, Dehradun developed the process of utilising bamboo as a cellulosic material for production of paper. This paved the way for the rapid extension of the paper industry and bamboo (*Dendrocalamus strictus*) became the Chief source of cellulosic fibres for paper making being a long fibre material.

Most of the bamboo areas are now fully committed to the paper industries except in certain areas which are not easily accessible and where infrastructural facilities do not exist. Such areas constitute nearly 60% and are most confined in North-Eastern region.

### (ii) HARDWOODS

The hardwood forest currently consists of number of species in intimate mixture and many of

these species are not very suitable for pulping. Since bamboo is not available in sufficient quantities there is no other go but to utilise existing hardwoods for which there is always a resistance from most of the paper mills. It is high time that suitable technologies are developed to use this material. There are some mills like Ballarpur Paper Mill, who are using hardwood in more than 40% quantity.

Total annual cut from hardwood forest for meeting various needs has been estimated at approximately 190 lakhs Cu.Mt. or 115 lakhs metric tonnes which also includes the present requirement of hardwoods for paper making at about 10 lakh Cu.Mt. or 6.9 lakh tonnes. The National Commission on Agriculture has estimated the requirement of Hardwoods for paper industry during 1988-89 at 76.8 lakh tonnes and by 2000 at 82.00 lakh tonnes. Thus much of quantity can only be met with by raising plantations.

### (iii) SOFT WOOD

Coniferous wood, commonly known as soft wood, considered most suitable for production of pulp are confined to high terrain, mostly in the Himalaya regions and constitute only 6.3% of the total forest area. The exploitation from these areas is difficult. The fellings are also restricted from conservation point of view.

## PROJECTED DEMAND FOR PAPER AND PAPER PRODUCTS

By now a very large number of studies have been carried out by organisations and individuals on demand projections for paper and paper products as well as for raw materials.

The National Commission on Agriculture in 1975 has made the following demand projections :—

	In thousand tonnes	
	1983-84	1988-89
i) Paper & Paper Boards	1,950	2,600
ii) Newsprint	500	700
iii) Paper grade pulp	150	215
iv) Rayon grade pulp	275	300
	<u>2,875</u>	<u>3,815</u>

The total demand projection for the year 1988-89 comes 3.8 million tonnes or 4 million tonnes.

## DEMAND PROJECTIONS FOR RAW MATERIAL

Paper industry has made a beginning in India as far back as 1832, when first paper machine was set

up at Serampur in West Bengal. Paper production in the country gradually rose to 26.8 thousand tonnes by 1911. Between 1954 and 1969, the paper production increased by about five times. Thereafter the growth became stagnant.

The present requirement on sustained basis for the existing paper mills and those which are coming up is of the order of 27 lakh tonnes per annum of bamboo and 10 lakh tonnes per annum of wood.

The present level of capacity utilisation in the paper industry is only 70%. When the production goes to its full capacity, the requirement of raw material will be enormous.

The N.C.A. has estimated the demand projections for raw material as under :—

In thousand tonnes				
	1983-84		1988-89	
	Long fibre material	Hard Woods	Long fibre material	Hard woods
i) Paper & Paper Board	2,250	1,490	3,100	2,070
ii) Pulp (Rayon) grade	272	635	297	693
iii) Newsprint	418	484	578	672
iv) Pulp (Paper Grade)	193	—	275	—
<b>TOTAL :</b>	<b>3,133</b>	<b>2,609</b>	<b>4,250</b>	<b>3,435</b>
<b>Total raw material required</b>	<b>5,742</b>		<b>7,685</b>	

The total raw material requirement in the year 1978-79 was estimated to be 4.14 million tonnes and corresponding figure now in 1983-84 and 1988-89 are 5.7 million tonnes and 7.6 million tonnes respectively.

Thus there appears to be a big gap in between the requirements of raw material and its available potential though some additional quantity may be available from certain catchments not yet committed, and also from certain areas not exploited due to in-accessibility.

To meet this requirement efficiently the planning should be for an annual production target of 10 million tonnes.

#### PLANTATION FORESTRY

With the growth of population and recent development of industries the demand of forest raw materials is increasing rapidly and these are acquiring

distinct economic values. The chances of getting more wood fibres are not very bright. The existing resources will have to be managed more carefully and judiciously and will also have to be supplemented from man made forests and switch over to PLANTATION FORESTRY.

#### PLANTATION PROGRAMME

Upto 1979-80, man made forests were created in India over an area of about 3.68 million hectares. The target of creation of such forests during the VIth five year plan is 2.32 million hectares as follows:—

	Upto end of 1979-80	During VIth Plan	Total
IN LAKH HECTARES			
1. Social Forestry programme	14.8	15.2	30.00
2. Industrial Plantations	22.0	8.0	30.00
	36.8	23.2	60.00

#### FUTURE PLANNING

The pulp and paper industry is the biggest ally of the Forestry Sector and the establishment of strong and cordial links between these two sectors could make an effective contribution towards national welfare. The problem which the industry is facing today requires immediate attention by adopting *Multi pronged strategy* and this is the time to bring **SECOND GREEN REVOLUTION**.

For achieving the objects, the following steps need immediate attention:—

- To formulate industrial policy for forest based industries.
- To increase production by bringing more area under tree species, bamboos and other fibre producing plants.
- Use of efficient harvesting methods to avoid wastage.
- To exercise greater economy in the use of available raw material.
- To investigate and adopt alternative sources of raw material.
- To improve technology to obtain better higher pulp yield.

For carrying out and implementing the above programme effectively, the following agencies are mainly concerned who shall carry out their functions

in a more co-ordinated way-

- a) Central and State Government.
- b) Paper Industry.
- c) Forest Department

### INDUSTRIAL POLICY

Till a few decades ago, the forests were considered as surplus and in-exhaustible. But now the conditions have changed fast. With the increase in population, not only the extent of forests is shrinking, but the demands on forest resources are also increasing tremendously. Due to rise of literacy and standard of living, there is more demand of pulp, paper and other forest-based articles. The raw materials which hitherto were considered as a waste are now acquiring a definite economic value. These resources would have to be managed wisely and judiciously and may have to be augmented through heavy inputs and resorting to the concept of man-made forests. The policies for raw material allocation to forest-based industries which were considered suitable earlier, when raw material did not have much value, could not be expected to be valid now. It is high time that a planned and scientific approach is made to assess the present situation and potential for the future, so as to identify the raw materials and ensure their sustained availability to the paper industry at an economic cost. The Central Govt. and all the State Govt. should review the entire problem and evolve certain parameters and norms for matters like supply of raw material to industries pricing, lease period, mode of supply, revision of royalty etc.

The M.P. Govt. has taken a lead in forming a well defined industrial policy for forest based industries. This policy was drafted by the author in 1977 under the chairmanship of Shri V.K. Seth, now Principal C.C.F., M.P. Bhopal and this policy has been accepted by the Govt. and brought in force and this with certain modifications could be adopted by other States also.

The salient features of the industrial policy accepted by the Government are as under:-

- i) Assured and sustained supply of raw material over a longer period of time and formation of rational catchment. These catchments would be as close as possible to the industry.
- ii) Use of Bamboo as a raw material in a decreasing proportion.

Use of bamboo as a raw material in a decreasing proportion. No bamboo will be given for making Rayon grade pulp whereas only 20% bamboos will be given to corrugated media and 30% to newsprint in the raw material furnish. The percentage of bamboo for writing and printing will be only 60%. These percentages will go on decreasing gradually and raw material furnish will be reviewed after every five years.

- (iii) The concept of delivered or landed cost of the materials.

The present concept of royalty needs to be replaced by the delivered cost of the raw material which will include the royalty/or replacement cost or the market price as the case may be, plus all the cost involved in the supply process viz; exploitation, handling and transportation etc. This may be relaxed from those items where there is a ceiling on its sale price as for example newsprint. Royalty of hardwoods from the existing forests should not be more than 50% of the replacement cost of bamboos. This is necessary to encourage the use of hardwoods in the initial stages.

- iv) Concessions during gestation period

Industries such as pulp, paper, newsprint and board require investments and large supplies of raw materials. For such units a concessional price for raw material should be fixed for the first 5-10 years in order to enable the industry to get over gestation problems and also to compete with the existing units. These concessions should also be considered in respect of central excise, Sales Tax, Octroi duty, Electric duty, Water cess and interests on loans, etc

- (v) Royalty of the raw material—Concept of Replacement cost

The requirement of raw materials are growing rapidly and now their economic value is being realised more keenly. The forest produce is no longer available in abundance. The raw material resources are finite and in the near future the growth of population and the industry would be placing a heavy demand on the existing resources. The future requirements particularly of such industries which consume bulk of the raw material can be met only from the man-made forests.

The concept of the replacement cost i.e. the actual cost should be applied to such industries. Unless the industry pays an adequate price for the raw materials to cover the cost of formation, maintenance and harvesting etc., as well as a reasonable margin of profit on the capital invested, there would be no incentive for raising large scale plantations of man-made forests.

- (vi) Concessions in Royalty

The concessions in the supply of raw material may be given to the following types of industries :-

- (a) Industries utilising unconventional or abundant unutilised material e.g. hardwoods for pulping.
- b) Industries utilising secondary species as a substitute of timber species for constructional purposes e.g. seasoning and preservation units.

- (c) Industries utilising waste material or less known material which otherwise has no value e.g. parquet floorings (wood mosaic) and hard board etc
- (d) Industries exploring new fields of manufacture e.g. manufacture of oxalic acid from barks of Saja and Kahu, wood alcohol, acetic acid and activated carbon by destructive distillation of wood, sugar by saccharification of wood, single cell protein from cellulosic material oils from seeds of tree origin, essential oils and medicines etc.
- (e) Industries producing material which has less added value and is less in demand and for which market has to be created e.g. particle board, chip board, cora board, fiber board, bamboo board.

**(vii) Revision of price of raw material**

The question of revision of prices would arise mostly in those cases, where the valuation of the raw material has been done on the basis of "Replacement cost" or where the price charged is even less than this. If the material is being supplied on annual basis at prevalent market rates, then the question of revision of royalties would not arise.

The interval of the period, when the revision of royalties should be taken, needs to be a practical one, both in the interest of the State Government and the industry. Too short intervals may not be desirable since it may not even be possible for the Forest Department to work out the revised prices and communicate these in time and this would also disturb the economic and effective planning of the industry, particularly in matter of costing. This revision period should be based more on the duration of the lease period.

Keeping in view the above considerations, the intervals of periodic revision of prices for units having different lease periods have been accepted as under : -

Lease period	Period of revision
i) For units having lease period upto 12 years.	Every third year.
ii) For units having lease period more than 12 years but less than 25 years.	Every fifth year.
iii) For units having lease period more than 25 years.	(a) First revision will be carried out in 10th year. (b) Subsequent revisions would be carried out every fifth year.

**(viii) EXTENT OF REVISION**

At the time of every revision, the royalty should be fixed after studying the market trend. It should

be fixed at the future market rate, which could be expected at the middle point of the next revision period. For example, if the periodic interval for revision of the royalty is four years, then the future expected market rate of the raw material after two years will be worked out and will be operative for the entire period of four years.

**(ix) LEASE PERIOD**

It would be logical to provide for a longer agreement period for capital intensive units than for other units. In the case of former there would be a longer period of repayment of loans borrowed from financial institutions, and as such the standing of a company getting a longer agreement period would be better and more satisfactory before term lending institutions and shareholders than if the agreement periods are short. The longer lease periods are also necessary in areas which are devoid of infrastructure and other facilities.

The following lease periods have been accepted for different kinds of units.

Sr. No.	Different categories	Lease period
(i)	Units having an investment upto Rs. 50 million.	12 years
(ii)	Industries which are capital intensive and having total investment of more than Rs. 500 million.	25 years
(iii)	Capital intensive industries having investment of more than Rs. 50 million and located in such backward areas which are devoid of infrastructure and other facilities.	35 years

**(x) PLANTATIONS**

Large scale plantations of fast growing species suitable for industries should be raised annually in close proximity to the existing mills.

**(xi) RELATIONSHIP BETWEEN THE INDUSTRIES AND THE CONCERNED DEPARTMENTS.**

The industries are the focal point of development, the source of additional revenue and the creators of the employment opportunities. These also reflect the role of partners in the development of State activities. In view of this, it has been decided that the conditions in the agreement to be executed between the Govt. and the industry should be reasonable, feasible, workable and bilateral.

There should be standard agreements for different industries. The conditions in the agreement for all the units with similar type of industry should be uniform and alive.

The conditions in respect of advance payments for supply of raw material should be such which could be practicable and bankable.

#### **(xii) CREATION OF AN INDEPENDANT ORGANISATION FOR SUPPLY OF RAW MATERIAL.**

There is an immediate need of creating an autonomous body which may be called as "Forest Raw Material Corporation" for organising massive supply of raw materials to the existing and incoming industries. The Forest Department alone, in view of its pre-occupation with other silvicultural and managerial problems, may not be in a position to handle such big commercial activities. The main job of this corporation would be to look after the various problems of the industries such as supply of raw materials and their pricing etc.

#### **ACTION TO BE TAKEN BY STATE FOREST DEPARTMENT**

Besides industrial policy there are many fields where Forest Department being a subject could play an important role. The protection of the existing forest is the most important function which needs immediate attention. Unless we are able to protect our existing forests, it will not be of any use to raise plantations. Forest Department should also try to tap new areas where working has not been started due to lack of infrastructure. Nearly 60% of bamboo area is confined to the North Eastern region which have not been exploited fully due to infrastructural deficiencies. Similar areas also exist in Bastar region of Madhya Pradesh. Improvements in felling and logging methods and with improvised tools would also reduce the wastage and increase the availability of raw material. Great difficulty is often felt in procuring proper and viable seeds particularly in case of bamboos. All States have got their silvicultural and research wing which should take the responsibility of collecting and supplying seeds at reasonable prices. The State Forest Department should act as seed bank.

For raising industrial plantations, areas should be identified close to the mills and only productive areas with better soil and growing conditions need to be selected. Planting of fast growing species with shorter rotations of suitable provenances with better inputs in the shape of fertilizers, irrigation and soil operations will result in much better yields. It can increase from 4 to 8 times depending upon

the efforts made. Intercropping of various leguminous species, which may benefit the plants, would also be possible and add to the yield. The bamboo can yield 3 to 5 tons and hardwoods 7 to 12 CMT per hectare per year. The crop obtained would be young, uniform, homogenous. The younger wood has lower wall thickness/lumen diameter ratio than older woods. Pulping of the wood, bleaching of the pulp would be more economical and easier. Yield would also be more.

The cost on raising these man made plantations will be well compensated by low transportation cost from longer leads. At present many of the mills including Nepa mills are transporting material from a lead of more than 700 km.

#### **Plantations along roads, canal banks, railway tracks, waste lands and marginal lands**

Extensive pulpwood plantations, can be raised on road sides, rail tracks, along canal banks in two to four rows, on each side. Other marginal lands and waste lands could also be planted with suitable pulpable species. The wood from such plantation after meeting local requirements can also be made available to paper mills.

The concept of joint sector approach for raising industrial plantations, particularly when the idea of leasing out land to mills for raising plantations has been opposed by the National Government and the Central Board of Forestry deserves consideration. This can be conveniently done in collaboration with Forest Development Corporations which have mainly been created for raising plantations. This joint Sector approach will facilitate the transfer of land for plantations and also to procure finance from the banks and various other financial institutions.

It may be of interest to point out that Nepamills in collaboration with Madhya Pradesh State Forest Development Corporation have already implemented this scheme since 1982 for raising bamboo and quick growing pulpwood. Further details are still being worked out, but the plantation work has been already started.

#### **ROLE TO BE PLAYED BY PAPER INDUSTRY**

##### **(i) Increasing use of hardwoods**

At present most of the paper industries are dependant on bamboo as the main raw material which is not available in plenty and almost all the existing areas are already committed to the Mills. It is high time that the industry, should think of using more of hardwoods and less of bamboo. There are hardly four paper factories like Ballarpur West Coast Paper

Mills and Bengal Paper Mills who are using it in a proportion of more than 40%.

## ii) Full utilisation of the available raw material

There is already a shortage of raw material which may increase many fold in times to come. It is, therefore, necessary that whatever raw materials available from the present resources should be utilised to its full extent. At present Mills are very choosy in having raw material of specific length and thickness with the result large quantities of small size bamboo and hardwoods are left behind the forest unutilised. The Mills must develop techniques of using small branch woods, bamboo twigs, small material from bamboo regrowth, rejects from the grinders and use of crooked malformed billets. For this intensive research work is needed to develop better type of chippers. The use of such material can alone increase the availability of the raw material by 10-15%.

The present inefficient and uneconomic machinery should be replaced by more modern and efficient machines. The mills should also develop either mini chippers or crushers for compressing such material which otherwise cannot be transported economically and easily. The industries should, therefore, aim towards the maximum utilisation of the harvested crop. The technology will have to be improved for this.

Likewise, debarking at present is done in the forest itself in the primitive manual way. The bark is thus wasted and left in the forest itself. A proper debarking equipment can be installed in the paper machines. This bark can be used as fuel for boilers at no cost.

There are many species which at present are not easily acceptable to the Mills, and these are considered unpulpable e.g. certain hardwoods like Saja, Mowha, Tendu, Dhoban, Dhawada. Technology must be developed to utilise such species, which are not being used till now. These alone constitute nearly 25 to 30% of total available hardwoods.

## iii) Commitment to research and development programme

The paper industry should take research and development programme. This could be taken by individual industries as well as by a Central Research organisation to be financed by paper industries.

The following fields need intensive research.

### a) High yielding process

Another way for meeting the demand of raw material is to develop high yielding process. The

Forest Research Institute, Dehradun has recently developed a process for improving high yield cold soda pulps, through chemical modification of lignins. Likewise Australian Newsprint mills have developed chemi-ground process and the yield of pulp is nearly 93%. Similar research programme could be taken by all the industries.

Some work in this direction has been done by Nepamills. Trials have been carried out to determine the suitability of various species for mechanical pulping and Cold Soda pulping. The results obtained are summarized in Appendix 'A'.

### (b) Search for new species

There are many species which are not being used as pulpable material. Till 1911, bamboo was considered a weed and its use as long fibred material was unknown. There should always be a search for new species, which could be pulpable as well as fast growing. At present there is a craze for ku habul (*Leucena lucocephala*) and certain species of Eucalyptus. Fast growing species like *Sesbania grandiflora*, Mesta, Koobabul, Gmelina, *Casia augustifolia* could yield much higher tonnage of raw material per unit area than most of the present conventional species. *Agave sisilana* could be another one species which has a long fibre and high yields. In Brazil there is a paper factory of 300 tonnes per day capacity based exclusively on *Agave sisilana*. This is the species which can be grown in most xerophytic conditions.

### MESTA

Another unconventional pulping material is mesta (*Hibiscus cannabinus*), which can be raised as an inter crop in the plantations. The Forest Deptt. of Maharashtra Govt. made a beginning of this in raising mesta plantations which gave an yield of 1 A.D.M.T. per ha. With further trials of fertilizers and soil working, it is hoped that it could be possible to reach a production level of 2 to 3 A.D.M.T./ha. This will be an additional source of raw material from the same land.

### c) Use of improvised chipper

There is sufficient scope to suitable chippers for utilising small sized wood, crooked and malformed billets, branchwood, bamboo regrowth. At present most of the small size material remains unutilised. This alone could increase the availability of raw material to an extent upto 10%.

### Utilisation of treated effluent for irrigation

At present most of the treated effluent goes as a waste. This could be effectively utilised in raising plantations. Detailed experiments are needed to



determine its suitability for various pulpable species. An attempt on moderate scale was made to raise plantations at Nepanagar and the results are extremely encouraging. Several pulpable species like Gulmohar (*Poinciana regia*), *Acacia auriculiformis*, Bamboo Parkinsonia, *Cordia allamanda*, Kooba-bul (*Leucena leucocephala*), Karanj (*Pongamia glabra*), Siris (*Albizia procera* and *A. lebbek*), Shisam (*D. sisoo*), Semal (*Bumbox malbaricum*) were tried and these all have shown extremely good results.

#### **Alternative source of raw material**

Considering the limited wood and bamboo resources, non-wood fibrous raw materials have also to be considered. Such other raw material could include Bagasse, reeds, Jute, wild grasses and agricultural residue consisting of straw, fast growing legumes, cotton sticks, mesta as an intercrop and many other plant fibres.

The mills should create their own extension organisations, raise and distribute seeds and seedlings, provide technical know-how and guide farmers to grow the crops with an assurance that the wood will be purchased by them at remunerative rates. The people involvement and participation on a large scale in this massive programme would be of immense help.

In a farm forestry in agricultural land nearly 250 samplings can be planted along the main crop around the periphery of one hectare land. These trees roughly will give 500 tonnes of wood after 8 to 10 years. The gross income to the farmers would be nearly more than Rs. 3,000/- per hectare per year.

The author had an occasion to stay in Italy for a period of six months and it was observed that the entire "Po" Valley in Italy has been converted from Agricultural areas to Plantation forestry of poplar. The return on these plantations was much more than the agricultural crop. It reached to such an extent that the Govt. had to stop conversion of further agricultural areas to plantation forestry of poplars. In Southern part of Italy also some of the organisations are raising plantations of Eucalyptus trees with the help of agriculturists.

In India also plantation forestry has been taken up on large scale by farmers of Gujarat in particular. If proper well organised extension organisations for raising farm forestry crops are created, there is no reason that why we should not succeed in this venture.

#### **v) Industry must raise its own plantations to meet part of its requirement (captive plantations)**

The huge task of raising man-made forests should be tackled both by the forestry as well as by the

industry. The industry must grow part of its requirement of raw material. Even in foreign countries, most of the major mills are raising their own plantations to meet their requirements.

In India the industries had been pressing for raising captive plantations, for quite a long but progress has been very slow due to procedural wrangles. The state Govts. where the land ceiling act has come in force are hesitating to transfer a land to the industry for raising plantations. They consider each industry as an individual and the industry cannot be given more than 15-30 ha. of land. Even both the National Commission on Agriculture and Central Board of Forestry have opposed the idea of leasing out land to industry. Their main contention is that most of the forests are burdened with rights of local people and transfer of land to industry will create some problems. This is not a major problem. Optimum size of areas can be transferred to the mills for raising plantations leaving in between forest blocks from where people can meet their requirements. Considering the major difficulties in the industry, the Karnataka Govt. have accepted the proposal to make forest areas available to Mysore Paper Mills, West Coast Paper mills and M/s. Harihar Polifibres for raising their own plantations. The Maharashtra Govt. have also permitted Modi to take up extensive commercial afforestation programme in Konkan region for their modulus fibre plant.

It is time that this matter is examined at appropriate level to release sufficient land to the industries for raising their captive plantations on line with Rubber Tea and Coffee estates. It will also be necessary that the paper industries entrusted with the task of raising these captive plantations are properly delegated with necessary powers for the effective protection and efficient management of these plantations, if necessary by making suitable amendments to the Indian Forest Act.

The expenditure on plantation in the initial stages may be on higher side but this will ensure the availability of raw material to the industry and being close to the mill, there would be sufficient savings in transportation of material. At present transportation cost almost constitutes 50-60% of the total landed cost of the raw material.

#### **Plantations raised by forest department of Nepamills:**

Beginning for raising environmental plantations has already been made by the Forest Department of Nepamills during the year 1980-81. Nursery for this was established in October, 1980 and nearly 30,000 plants obtained from it were planted within the township & on barren hillocks during, 1981. During July-

August 1982 nearly 1,50,000 plants had been planted on various hillocks and in other areas of Nepanagar township. The main species planted are Gulmohar, Kachnar, Karanj, Siris, Jakarenda, Amaltas, Peltaforam, Neem, Pipal, Bud, Sisham, Prosopis, Ku babul, Bamboo and Agave sisiana etc. Bougainvillea and other ornamental plants have been planted in various gardens, office premises, rest houses, schools, temple hills, Ram Mandir, Hanuman Mandir, Hospital, market, factory, Mill yard, play ground and various other places.

At present the effluent plant at Nepanagar is discharging nearly 60,000 Cu.Mt. of water per day after treatment into Tapti River. This is an enormous quantity and could be properly utilised for irrigating plantations. During July, 1981, plantations based on effluent water were raised in Beed Colony, and the results obtained are wonderful. In one year the growth of Shisham, Albizzia, procera, gulmohar, Eucalyptus, Peltaforam and koo-babul etc. have attained the height of 2.5 Mtrs. to 3.5 Metres with girth varying from 5 cm. to 10 cm. This had encouraged us to take this scheme on a much larger scale during 1982.

Local residents are also being encouraged to take up plantations in their bungalows. Plants are being supplied to local people and farmers on subsidised rates.

### U.N.D.P. PROJECT

Efforts are being made to take-up research plantations under U.N.D.P. Project from Govt. of India. Assurances have already been made to give sanction to this scheme. Initially an amount of Rs. 15.20 lakhs is likely to be sanctioned. As soon as the sanction is obtained from the Govt. of India, this research programme will be taken up at Nepanagar. This will be under co-ordination with Fungus Investigation Unit of Hindustan Paper Corporation, Carmal Centre of Kerala State.

With all the efforts being made by Nepamills independently and in collaboration with M.P. Forest Development Corporation and by Govt. of India, we hope to restore the lost greenary of the past soon.

## I. P. T. NEWS

1. About 14 selection teams from various paper and allied industries visited the institute during March-May 1983 for on campus recruitment of our out going students.
2. The academic session ended on 30th May. The following out going students left the institute after successful completion of their academic programmes :
 

Bachelor of Engineering (Pulp & Paper)	—	11
University diploma (Pulp & Paper)	—	20
University diploma (Process Instrumentation)	—	8

These students will be entering the professional field shortly.
3. The new academic session started on 18th July 1983. Fresh students have been admitted to the institute as listed below—
 

B.E. (Pulp & Paper)	—	37
University diploma (Pulp & Paper)	—	21
University Dip. (Process Instrumentation)	—	13
4. As a part of the tree plantation fort-night about 1000 trees were planted on the institute campus on 6.8.83 with the active cooperation of the Divisional Forest Officer and N. S. S. Shri L. K. Gupta, District Magistrate presided over the function and Shri Surendra Kapil, Local M. L. A. was the Chief Guest on the occasion.

# APPENDIX—A. SUMMARY OF LABORATORY TRIALS ON DIFFERENT WOOD

Process	Stronger than salai, no bleaching	As good as salai no bleaching	Stronger than salai need bleaching	As good as salai need bleaching
Mechanical pulping	1 Ailanthus excelsa (Maharukh)	1 Anthocephalus kadamba	1 Melia azaderach (Bakain)	
	2 Albizzia procera (Safed Siris)	2 Butea monosperma (Palas)	2 Linea grandis	
	3 Broussonelia papyrifera (Paper Malburry)	3 Dalbergia paniculata	3 Diospyros melonoxylon (Tendu)	
	4 Cryptomeria javanica	4 Erythrena sabrosa (Gadha Palas)	4 Terminalia tomentosa (Saja)	
	5 Pithecolomium jaman (Rain Tree)	5 Ficus Religiosa	5 Xylia xylocarpa	
	6 Poinciana regia	6 Garuga Pinnata (Kakad or Kharpat)		
	7 Ricinus communis (Castor oil Plant)	7 Moringa pterigosperma		
	8 Terminalia arjuna			
	9 Eucalyptus grandis (Nilgiri)			
Cold Soda Pulping	1 Albizzia procera	Cassia siamia	Eucalyptus grandis (Nilgiri)	Acacia aur'culi- formis
	2 Pithecolomium saman (Rain Tree)	Diospyros melonoxylon (Tendu)	Melia azaderach (Bakain)	Terminalia Tomentosa (Saja)
	3 Poinciana regia	Lagerstroemia Parviflora (Lendia)	Eucalyptus hybrid (Nilgiri)	
	4 Terminalia arjuna	Pterocarpus Marsupium (Bija)		
	5 Hibiscus cannabinus	Tectona Grandis	(Teak lops and tops can be used with bark even)	
	6 Ipomea carnea (Besharam)			