

Available Raw Materials for Paper and Pulp Industry in Punjab and Scope for Extension

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I. Introduction

Punjab is an agricultural State and has over 80% of the total land area under cultivation. Its economy is chiefly based on agriculture though the Punjabis have also earned a name in the field of small scale industries. About 4% (2,11,526 hectares) of the total land area (50,340 Sq. Kms.) is under the control of Forest Department out of which only half is potentially productive forest and the rest is managed as protective forest. At present the State forest area is about 89,569 hectares and the rest 1,21,957 hectares have been closed under the provisions of Punjab Land Preservation Act for soil and water conservation purposes. There is no big forest-based industry existing in Punjab. The raw materials available for pulping in form of grasses like bhabbar or baggar (*Eulaliopsis binata*), Munj (*Erianthus munja*), Kahi (*Saccharum spontaneum*) etc. bamboo species (*Dendrocalamus strictus*) and chil wood (*Pinus roxburghii*) are mostly restricted to sub mountainous tract of districts Rupar, Hoshiarpur, Gurdaspur and beds of the Satlej, Beas and Ravi rivers met with in districts of Amritsar, Ferozepur, Gurdaspur, Hoshiarpur, Rupar, Jullundur and Kapurthala. *Erianthus munja* (munj) is found occurring along Road, Canal and Railway strips as well. Due to the extension of agriculture in

In this paper the quantities of raw materials for paper and pulp industry in form of bamboo, chil wood, grasses like kana, kahi, bhabbar/baggar and Eucalyptus wood that are available or will become available in a few years in Punjab State are estimated at 68,000 tons. There is a scope for extending forest areas under bamboos, chil and Eucalyptus plantations. Bhabbar grass is an important raw material for paper industry met with in Punjab. In order to increase the output of Bhabbar grass from State and private areas a programme for ten years is detailed. It is estimated that the existing annual yield of 18,000 tons of Bhabbar grass will rise to 78,000 tons when its intensive plantation is carried out on 20,000 hectares at a cost of about Rs. 2 crores. There will be adequate raw materials available for a paper mill in Punjab in few years if the extension programme discussed is undertaken.

the plains the area covered by kahi and kana (*Saccharum Spp.*) is very fast decreasing. At present most of these grasses are cut by the villagers from bela areas and transported to depots maintained by the agents of Shree Gopal Paper Mills at various Railway Stations. A huge quantity of wheat and rice straw is also available but only very small quantity is consumed for paper making at Yamuna Nagar due to bulkiness of the material and high cost of transportation. Bamboo forests were previously under lease with Shree Gopal Paper Mills and bamboos extracted were consumed at Yamuna Nagar for pulping. Similarly, chil wood which is not suitable for sawing is used for pulping.

II. Availability of various raw materials for pulping

As stated above, very small area bears grasses and trees which can constitute as raw material for paper and pulp industry. The various raw materials available are discussed below:

(i) Bamboos.

Two Reserve forests Karanpur and Bindrahan occurring close to Talwara Town in district Hoshiarpur bear bamboo growth. Bamboos occupy about 1748 hectares. These bamboo forests are accessible by road from Mukerian Railway Station on Jullundur-Pathankot Railway Line. These forest remained on lease with Shree Gopal Paper Mills up to March, 1971. They are now auctioned to the contractors for extracting bamboos of various classes required in the market. About 10,00,000 bamboos were annually extracted from these forests by the Paper Mills on triennial felling cycle. It is estimated that the paper Mills extracted about 5000 tons of dry bamboos annually. These forests can make available about 4000 tons of bamboos annually under the present conditions.

(ii) Chil Wood

Chil forests are met with in districts Hoshiarpur, and Gurdaspur. There are privately owned chil forests in

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district Hoshiarpur. These forests occupy an area of about 15,000 hectares. It is estimated that about 1,000 tons of chil wood is available from these forests annually for pulping.

(iii) *Kana and Kahi*

Vast areas of waste lands in the foothills of the Shiwaliks in districts Rupar and Hoshiarpur, the beds of the rivers Ravi, Sutlej and Beas in plain districts are covered by thick growth of kana and kahi. The major centres are Rupar and Ghansuli in district Rupar, Hoshiarpur and Jaijon in district Hoshiarpur, Dera Baba Nanak in district Gurdaspur, Ramdas in district Amritsar, Malsian and Lohian Khas in district Jullundur. At present the villagers either cut these grasses from their areas and transport them on carts to the nearest Rail Head or they sell the standing grasses to the contractors who arrange their cutting and transportation. In case of State forest areas these grasses are sold standing and are worked by the contractors. Most of the grasses cut are baled and transported to Yamuna Nagar for pulping. A small quantity of munj grass is used for stringmaking locally. It is estimated that at least 10,000 tons of these grasses are extracted annually from the State and private areas.

(iv) *Bhabbar/Baggar (Sabai) grass*

This grass is mostly met with in the Shiwaliks of districts Rupar and Hoshiarpur. Most of the State forests in these districts bearing this grass are leased out to Shree Gopal Paper Mills at a royalty of 67 paise per quintal. They extract from 2000 to 3000 tons of this grass from the areas leased out to them. There are a few small forests which are auctioned annually

for grass cutting. They also bear Bhabbar. It is estimated that State forest areas yield over 3000 tons of Bhabbar annually in addition to a large quantity of other grasses.

There are large areas in districts Rupar and Hoshiarpur which had been closed under the provisions of sections 4 and 5 of Punjab Land Preservation (Chos) Act, 1900. In section 4 areas grazing by browsers is restricted but these areas are open to cattle grazing. These areas are owned by individuals as well as by Panchayats. They cover about 76150 hectares. At present they do not yield any raw material except grazing ground though they are mostly suitable for Bhabbar growth.

Cattle grazing is prohibited in areas closed under section 5 of the Chos Act. These areas cover about 34551 hectares in districts Hoshiarpur and Rupar. They bear scattered growth of trees, shrubs etc. but are covered by dense growth of grasses. On the well drained areas situated distantly from habitations Bhabbar grass is the dominant species. It was first time observed in 1935 that Bhabbar grass is a very useful species growing over there. Later on its growth was extended under soil conservation programme particularly during forties of this century. Due to the demand of Bhabbar grass for paper making, string making, packing of mangoes etc. the villagers provided it a proper protection and helped its multiplication. The Forest Department undertook planting of Bhabbar tufts on rainy days on the berms of contour trenches alongwith sowing of khair seed or planting of shisham stumps. The result of closure and planting of Bhabbar was that the

bhabbar production from these areas increased tremendously. Most of the privately owned areas which were not giving any income to the owners earlier started yielding a handsome income from the sale of Bhabbar grass. In district Hoshiarpur, some of the Panchayats earn from Rs. 30,000 to Rs. 70,000 annually from sale of Bhabbar. At present the owners either harvest Bhabbar from their areas themselves or auction them. From most of the areas Bhabbar is got extracted by Shree Gopal Paper Mills directly or indirectly. Some of Bhabbar grass is exported to Saharanpur or other places in Uttar Pradesh for use in paper making or string making. It is estimated that private areas yield over 15,000 tons of Bhabbar annually. M/S. Shree Gopal Paper Mills have got their Bramah Presses installed at their depots for pressing grass in to bales to facilitate transportation.

(v) *Eucalyptus and other hard woods*

Due to deficit forest area in the State most of the hard wood extracted from the State forests or private areas is used as firewood or for other purposes. At present hard wood is not used for pulping because it has a great demand and fetches an attractive price locally. Over 2000 tons of hard wood can be available for pulping from State forests if such a demand arises and reasonable price is offered.

Since 1961 planting of Eucalyptus had been going on in the State forests. It is estimated that by end of the current year (1972-73) about 15,000 hectares would have been planted with Eucalyptus. Up to 1965-66 very small areas were planted with Eucalyptus but since 1966-67,

1500 to 2000 hectares are annually planted. Eucalyptus wood will become available for paper making regularly after three years when it is estimated that 1000 hectares Eucalyptus plantation will be available for felling and yield about 50,000 tons green or 25,000 tons air-dry Eucalyptus wood annually for pulping.

Since 1966-67 to make up the deficiency of forest area planting has been encouraged on private areas under 'Farm Forestry Scheme'. This programme has started well from 1969-70 since when about 20,00,000 plants are being got planted annually on private areas mostly along the boundaries of cultivated fields, village approach roads, phirnies, irrigation channels etc. It is estimated that about half of these plants are of Eucalyptus as this tree has been liked by the farmers for its quick growth, ornamental nature, thin crown and deep root system. Taking that fifty per cent will succeed, it is estimated that 20,000 tons green or 10,000 tons air-dry Eucalyptus wood will become available annually after five years from these plantations for pulping.

From the above it will be clear that the following quantities of various raw materials for pulping are available or would become available in few years to come under the existing conditions:—

1. Bamboos.	4,000 tons.
2. Kana/Kahi (from State & private areas).	10,000 tons.
3. Chil wood.	1,000 tons.
4. Eucalyptus wood (air-dry) after 3/5 years from State forests and private areas.	35,000 tons.

5. Bhabbar grass (from State and private areas).

18,000 tons.

Total : 68,000 tons.

III. Proposals to extend resources of raw materials for pulp and paper.

There is a wide scope to develop the existing resources of raw materials in Punjab as discussed above considered suitable for paper and pulp industry with a purpose of establishing a paper and pulping plant. In recent years some attempts have been made to undertake planting of Eucalyptus, bhabbar grass, bamboo and chil seedlings in State forests. In order to utilise fully the productive potential of the areas which are under the control and management of Forest Department the following proposals are made in respect of various raw materials :—

(i) Bamboos

At present only 1748 hectares forest area is under bamboos out of a total area of 2513 hectares of Reserve Forests Karanpur and Bindraban. There are many other areas particularly along the Nallahs which are considered suitable for Bamboo planting. Recently bamboo planting has been undertaken to fill up the blank areas in bamboo forests. 20 hectares was planted in last July with bamboo seedlings raised in polythene bags. It is estimated that 500 hectares more can be gradually brought under bamboo plantation at a rate of 50 hectares per annum in districts Hoshiarpur and Rupar. Bamboo seedlings will be planted on berms of trenches 1M × 30 cm × 50 cm refilled with dug up earth and spaced at 5 M × 5M. The

cost of planting will be Rs. 1000/- per hectare. It will include cost of plants, jungle clearance, earth work, planting, tending etc. In ten years a sum of Rupees 5 lakh is estimated to be spent for raising 500 hectares of bamboo plantation. It was observed by Deogan during studies of bamboo culms in Punjab forests that average age of culm was 6 years hence 4/5 year old culms can be exploited. At a longer age the culm starts showing signs of deterioration. In addition to 4000 tons of bamboos available from the existing bamboo areas it is estimated that another 1000 tons would become available after a period of ten years.

(ii) Chil wood

At present only 1000 tons of chil wood is available from 15,000 hectares of State and private chil forests. Most of the areas bear open chil crop hence there is a scope to extend chil stocking over these forests gradually. At present about 100 hectares are being planted with chil in Hoshiarpur and Gurdaspur Forest Divisions. With the object of intensive management it is estimated that 5000 hectares of area is available for extending chil plantations in Punjab State. Chil gives good revenue from resin tapping. At the existing rate of 100 hectares planting every year the area available can be covered in 50 years at a cost of Rs. 50,00,000. The technique of raising chil plantation adopted is planting of chil seedlings raised in polythene bags (25 Cm × 10 Cm). Chil seed is sown in September or late February and the seedlings attain a height about 20 cm. by the middle of July when monsoon rains commence. Chil seedlings have been observed to respond well to nitrogenous fertilizer both in the

nursery and in the field. They are planted 3 metre apart in trenches/pits one metre long 30 cm deep. The soil in district Hoshiarpur is mostly derived from sandstone hence it is suitable for this species. When these plantations get established the output of chil wood would almost get doubled.

(iii) Eucalyptus wood

For the last 6/7 years about 2000 hectares of State forests are being covered by Eucalyptus plantations annually. There is a scope of raising 5000 hectares of Eucalyptus plantation more in next three years. These plantations when harvested will yield about 25,000 tons of air dry Eucalyptus wood annually. It is estimated to cost Rs. 50,00,000 at Rs. 1000/- per hectare

As stated earlier villagers have taken fancy of Eucalyptus plantation under 'Farm Forestry Scheme'. 1000 hectares can be conveniently brought under Eucalyptus plantation under this project annually. The area will gradually go on increasing. Forest Department is to meet the requirement of Eucalyptus seedlings from their nurseries. The growth of Eucalyptus on agricultural farms is very encouraging as they are raised in single rows. When these trees are exploited to supply Eucalyptus wood after 4/5 years it is estimated that they would yield over 10,000 tons of air dry wood annually for pulping.

(iv) Bhabbar/Baggar grass

(a) This is the chief raw material available in Punjab State and there is a big scope for its extension both in State Forests and private forests in districts Rupar, Hoshiarpur and Gurdaspur. At present the yield of bhabbar grass from State forests

is less than half ton per hectare. 6200 hectares of State forests leased out to Shree Gopal Paper Mills have been yielding from 2000 to 3000 tons of bhabbar grass annually. The output of bhabbar grass from some of the private areas in district Hoshiarpur varies from 8 quintals to 12 quintals per hectare and the average is about one ton per hectare where bhabbar growth is satisfactory. The yield of bhabbar is low in case of areas which are covered by dense growth of shrubs like mallah, Carissa, Dodonea, etc. Similarly, its growth is affected by tree shade. 34,550 hectares of private areas individual or Panchayat have been closed under section 5 of Punjab Land Preservation Act in districts Hoshiarpur and Rupar. Grazing is prohibited in these areas. These areas are mostly covered by grasses and shrubs and bear scattered tree growth except near Nallahs where tree growth is satisfactory. Most of them are suitable for bhabbar growth. It is estimated that out of the total area closed under section 5 of Punjab Land Preservation Act about 16,000 hectares can be available for intensive working. Similarly, about 4000 hectares of State forests in these districts can be brought under intensive bhabbar planting. This means that 20,000 hectares of private and State areas in districts Rupar and Hoshiarpur can be brought under intensive bhabbar growth.

The experience in other States in working of bhabbar (Sabai) grass plantations has shown that the yield had been ranging from 1.5 to 4 tons per hectare. At present the bhabbar areas are yielding only half ton per hectare. With intensive working the yield of bhabbar can be

raised by 3 to 6 times. It has also been observed that bhabbar grass gets deteriorated after 12th year. It has to be replenished either artificially or from seed falling from the existing plants. Bhabbar starts giving yield from 2nd year and output is maximum during 4th to 8th year when it may go up to 5 tons per hectare. It has been estimated that bhabbar yield from bhabbar plantations will be about 3.5 tonnes annually for 12 years. 20,000 hectares which at present yield hardly 10,000 tonnes would yield 70,000 tonnes when brought under regular bhabbar plantation.

(b) Technique of bhabbar planting

The area which is to be brought under bhabbar planting has to be cleared of shrubs. Tuft planting is carried out on rainy days which is done mostly from 15th July to 15th August. Wooden pegs of about 5 cm diameter and wooden hammers are used for making holes in the area. Sorted out roots of the tussocks are put straight in the 15 cm. vertical holes made by fixing the wooden peg and are firmly pressed and packed in the soil so that it is fully compacted around the roots. Rows for planting are marked 60 cm to 75 cm apart along the contour over the gentle slopes. Within a row the tussocks are planted approximately 30 cm to 45 cm. apart. The plants are generally staggered. The useless grasses are removed with spade before the planting operations are carried out. For conspicuous success, high rate of growth and increased yield, bhabbar is planted on berms of contour trenches dug out on convenient slopes. The trenches are from 1 to 3 metres long and 30 cm. deep and are spaced

at one metre apart in the line. The contour lines are one metre apart from each other. The trenches are dug to hold moisture for facilitating growth. For contouring level marker is generally used. Three tussocks are planted on one metre long trench whereas upto 8 tussocks in case of long trenches. Tussocks sprout within seven to ten days' time and those which fail to sprout are replaced. Tending is required during the first two years when useless grasses are removed. During second and third years replacement of failures is done alongwith weeding. The tending i.e. weeding, cutting of bushes and fencing of the area would be required almost every year. For vigorous growth manuring with nitrogenous fertilizer is called for. It is estimated that all the operations will cost about Rs. 1000 per hectare during 12 years as given below. 28000 tussocks will be planted per hectare to cover the area intensively with bhabbar grass.

Estimated cost of planting bhabbar grass per hectare.

	Rs.
(i) Clearance of inferior grasses and bushes from the area.	80.00
(ii) Contour trenching for water conservation	200.00
(iii) Planting 28000 tussocks at 60 cm x 60 cm including their preparation and carriage	250.00
(iv) Replacement of failures, weeding and tending during 1st, 2nd & 3rd years.	150.00
(v) Tending like cutting of bushes, removal of useless grasses, fencing etc. from 4th year to 12th year.	125.00

(vi) Manuring, construction of paths etc.	30.00
(vii) Miscellaneous like contingencies, staff, tools and plants during 12 years.	165.00

Total : 1000.00

(Labour wages are Rs. 4/- to Rs. 5/- per day, at present).

Estimated yield of bhabbar plantation per hectare.

1st year	Nil
2nd year	1.5
3rd year	3
4th to 8th year at 5 ton per hectare	25
9th year	4.5
10th year	3.5
11th year	2.5
12th year	1.5

Total : 41.5

Average : 3.5

Experimental planting of pre-sprouted bhabbar tufts raised in polythene tubes has given encouraging results. It is proposed to raise bhabbar planting stock from seed or tufts for planting out in the field. This has been necessitated as large areas are to be planted with bhabbar intensively and there are only a few and uncertain rainy days (10-20) during July-August when it may not be feasible to complete planting over large areas (2000 hectares annually) alongwith other planting and works. Pre-sprouted tufts or seedlings of bhabbar will be able to stand a dry spell of short duration. 20,000 hectares of State and private areas in districts Rupar and Hoshiarpur can be planted in a period of ten

years at a cost of rupees two crores. These plantations will yield about 70,000 tonnes of bhabbar annually when work has been completed. At present large scale bhabbar planting on State areas is not being undertaken because the royalty paid by Shree Gopal Paper Mills to Forest Department for areas leased to them is 67 paise per quintal, whereas the private owners are getting a royalty over Rs. 5/- per quintal or Rs. 50/- per tonne. When bhabbar plantation raised over 20,000 hectares is exploited, it is expected to give a royalty of at least Rupees 56 lakh at the rate of Rs. 80/- per ton envisaged by National Commission of Agriculture in their Interim Report on production Forestry every year and provide raw material to paper and pulp industry.

IV. Conclusion

The proposals made above for extending plantations of bamboos, chil, Eucalyptus and bhabbar can only materialise if there is a demand for these raw materials locally at a remunerative price suggested by National Commission of Agriculture at Rs. 80/- per tonne. Due to Indo-Pak war during December 1971 a large quantity of grasses stacked at Railway Yards by contractors could not be disposed of for want of Railway Wagons. There is a limited demand for bhabbar in Punjab State and a major portion of it is sent out to other States for use in Paper Mills or for string making where they have a big demand and fetch good price up to Rs. 20/- per quintal. The project of planting can be interlinked with industrial projects. The intensive plantations for producing raw materials for paper and pulp industry will not only

utilize the productive potential of the area to the maximum but provide employment to the extent of five lac mandays during the year to local people for planting and tending operations and in addition a large number of persons will be engaged on cutting and transport of material from forests. In addition, cost to be incurred on planting, the road system will have to be developed to link the forest areas with High Ways and Railway Stations. This work is already in hand under

Crash programme for village link roads and it is envisaged that all villages in Punjab will be linked with metalled roads during next few years. Some roads along the hills are being constructed under Crash Scheme for Rural Employment. The areas will become conveniently accessible by the time planting projects are completed. After incurring a cost of Rs. 3.05 crores during ten years, it is estimated that the total quantities of various raw materials to be available annually

after ten year from existing and developed resources in Punjab for paper and pulp industry to be located close to the hilly tract of districts Rupar, Hoshiarpur and Gurdaspur will be as Shown in Table I.

These raw materials will yield a revenue of about Rupees One Crore at the rate of Rs. 80/- per tonne. In addition to this kana and kahi will continue to be cut and transported from waste lands both private and State.

TABLE I

Name of raw material	Area to be planted	Cost of planting	Quantity to be available annually
	Hectares	Rs.	Tonnes
1. Bamboo	500	5,00,000	5000
2. Chil wood	5000	50,00,000	4000
3. Eucalyptus wood.	5000	50,00,000	35000
4. Bhabbar grass.	20000	2,00,00,000	78000
Total :	30500	3,05,00,000	122000