

Feasibility of Tapping Coniferous Resources of Bhutan For Pulp Paper and Newsprint Industry

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Introduction

Bhutan has a rich, untapped potential of coniferous resources, which could make a substantial contribution to the attainment of self-sufficiency in pulp, paper and newsprint in the Indian Sub-Continent.

It is surprising that this intrinsic and latent wealth of Bhutan has not hitherto received the attention that it deserves. Perhaps, many eye-brows would be raised on hearing the assertion that the coniferous resources of Bhutan would be equal to, or even exceed the total coniferous resources of the northern Himalayan Belt in India.

Recently, the Government of India had sent a Preparatory Mission to Bhutan at the invitation of the Royal Government to study the forestry and forest development situation in that country and to advise on the question of carrying out a pre-investment survey of forest resources. The author had the privilege of leading this team. This paper is based on the observations made by the Mission during its tour in Bhutan. The views expressed in this paper are those of the author and they should, in no way, be taken as reflecting the

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Bhutan has a rich, untapped potential of coniferous resources, which could make a substantial contribution to the attainment of self-sufficiency in pulp, paper and newsprint in the Indian Sub-Continent. The growing stock in the coniferous forests, which are estimated to cover nearly 10,000 sq. Kms would be of the order of 300 million cu. mts., and the potential annual cut could be of the order of 6 to 8 million cu. mts. depending upon the rotation that is adopted. Natural reproduction of the main species is plentiful.

Bhutan is anxious to augment the annual cut from its forests and to make them contribute a much larger share to the country's economy. The local demand for wood within Bhutan is meagre, and therefore, the increased volume of wood following intensification of management will have to find its way to wood-deficit markets and industries in India and Bangla Desh.

There would be a good scope for the Governments of India and Bhutan to collaborate for appraising the extensive forest wealth of Bhutan and developing industries based on them. The coniferous resources of Bhutan are economically accessible for markets and industries located in Bengal and Bihar. Preliminary cost studies indicate that pulp-wood supply from Bhutan would compare favourably with bamboo supply from Assam etc.

The coniferous forests of Bhutan could sustain pulp, paper and newsprint industries of an annual capacity of 1.00 million tonnes. With so much resources available for being tapped, there seems to be no reason why India should import pulp, paper and newsprint from developed countries to the tune of Rs. 250 million annually.

opinions or policies of Government. The paper would have served its purpose if it could focus attention on the forest resources of Bhutan and lead to their harnessing for development purposes. It would, perhaps, not be too much to hope that it would lead to a fruitful collaboration between the Government of India and the Royal Bhutan Government for appraising the extensive forest wealth

and development of industries based on them.

The Background

Bhutan (Druk-yul or the Land of Dragons) is located between 26°-45' to 28°-20' N latitudes and 88°-45' to 92°-6' E longitudes. The country is situated along the southern slopes of the Great Himalayan Range. It is bounded by the table-

land of Tibet on the north, the plains of Jalpaiguri district of West Bengal and Gaolpara, Kamrup and Darrang district of Assam in the south, Chumbi valley (Tibet), Sikkim and Darjeeling district of West Bengal in the west, and the Kameng district of Arunachal Pradesh on the east.

The geographical area is 46,600 sq. kms. and the country is roughly rectangular in shape, extending about 304 kms. from east to west and about 150 kms. from north to south.

The population of Bhutan, according to the census of 1970 is 1.31 million, which gives a density of about 29 persons per sq. km. The densely populated areas are the Inner Himalayan Valleys and the low lands in the south. The Northern Region, which has extreme climatic conditions, has no permanent settlement at all.

State of Development : Inaccessibility is one of the characteristic features of Bhutan. Hidden in the mountainous fastness of the Himalayas, the country enjoyed a period of isolation for several centuries, till the sixties of the present century. Real development started in 1961 when the first five year Development Plan for Bhutan was launched. This Plan was wholly financed by the Government of India. Since 1962, Government of India has given aid to the extent of Rs. 300 million for construction of roads, in addition to Rs. 200 million for the second five year Plan. The Third five year Plan (1971-76) which has an outlay of Rs. 355.5 million will also be financed almost entirely by Government of India.

Before the advent of planned development in Bhutan the country's economy was characterised by an extreme degree of isolation. Infrastructural facilities were conspicuous by their absence. Modern means of communication were completely lacking. During a period of little more than a decade of planned development significant achievements have been made, and a sound base has been laid for accelerated progress. An idea of the pace of development can be had from the fact that the first Technical team of the Planning Commission which went to Bhutan in 1961 to formulate the first five year Plan took five days to reach Thimphu from the border, whereas now it takes just five hours for the same journey.

The Development Plans of Bhutan aim at creating the basic facilities like roads, power communication system, suitable administrative set up, besides developing agriculture, forestry and animal husbandry. Over 1000 kms. of roads have been constructed linking eastern and western Bhutan. The Hydel Projects at Thimphu, Paro and Wangdu Phodrang have been completed. Foot hill towns of Sarbhang, Bhur, Gaylegphug, Samdrup zhonkhar and Deothang have been linked with the Assam Electricity Grid. Detailed investigations are being conducted for the proposed 250 M. W. Chukha Hydel Project. There are also proposals for setting up joint industries with the participation of both Governments. As an example, mention may be made of a proposal for the setting up of a large cement manufacturing plant.

Annual Revenue and Expenditure : Figures of revenue and expenditure

are available for the year 1969 which are Rs. 18.94 million and Rs. 18.13 million respectively. The Royal Bhutan Government are anxious to augment the annual revenue by harnessing the natural resources and to contribute an increasing share to the developmental expenditure. It is in this context that important role of forests and forestry is being recognised.

Forest Resources Outlook and Management Opportunities :

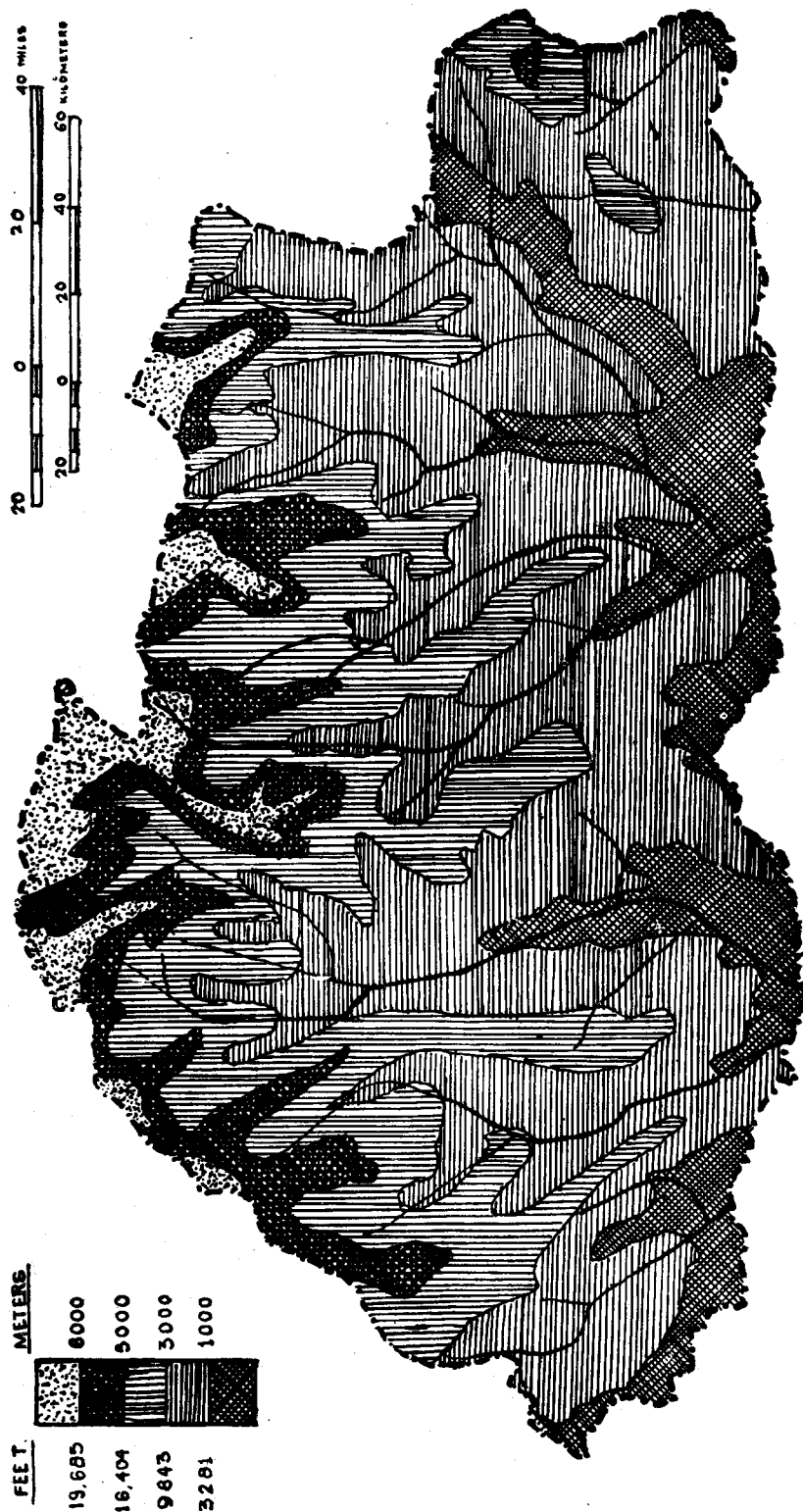
The area under forests is estimated to be 32,600 sq. kms., giving a percentage of 70 of the geographical area. The coniferous forests are found mainly in the Middle Tract, which is a belt of about 60 kms. width running east to west. The elevation ranges from about 1000 metres to 3000 metres. North of this tract lie the lofty snowy peaks and south of this tract lies a belt of dense evergreen and semi-evergreen hardwood forests.

The relief map in Fig. 1 will indicate roughly the Middle Tract in parts of which coniferous forests are located. The two profiles in Fig. 2 indicate the altitudinal distribution of the different forest types. On the basis of the relief map and observations made in the field, the area under coniferous forests has been estimated to be about 10,000 sq. kms.

Rough Estimate of Growing Stock of Conifers :

The coniferous forests particularly the Fir forests have a very high volume density. 700-900 cu. mts./ha. has been recorded by the author. Blue pine forests have about 250-350 cu. mts./ha. volume. The Chir pine forests have about 150-200 cu. mts./ha. volume. The

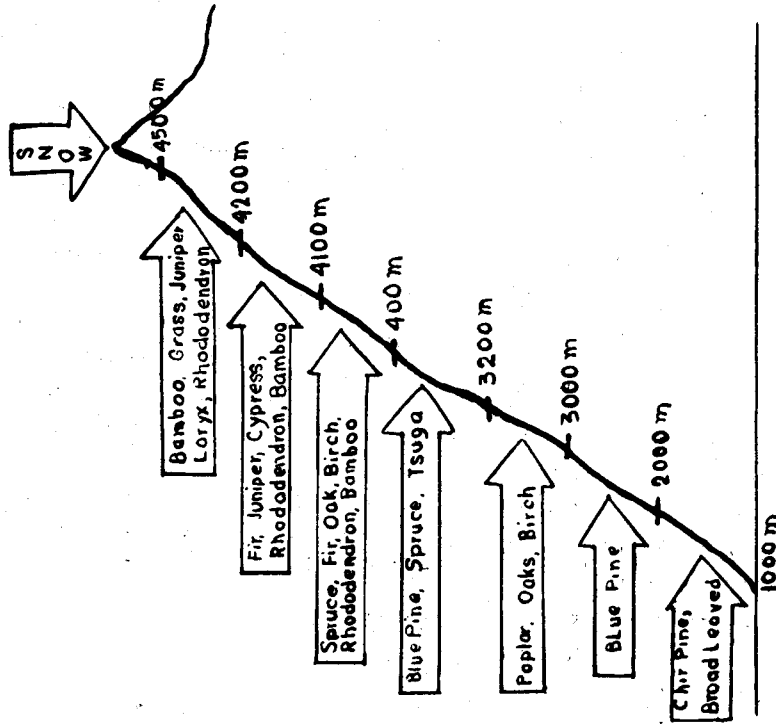
RELIEF AND DRAINAGE MAP OF BHUTAN



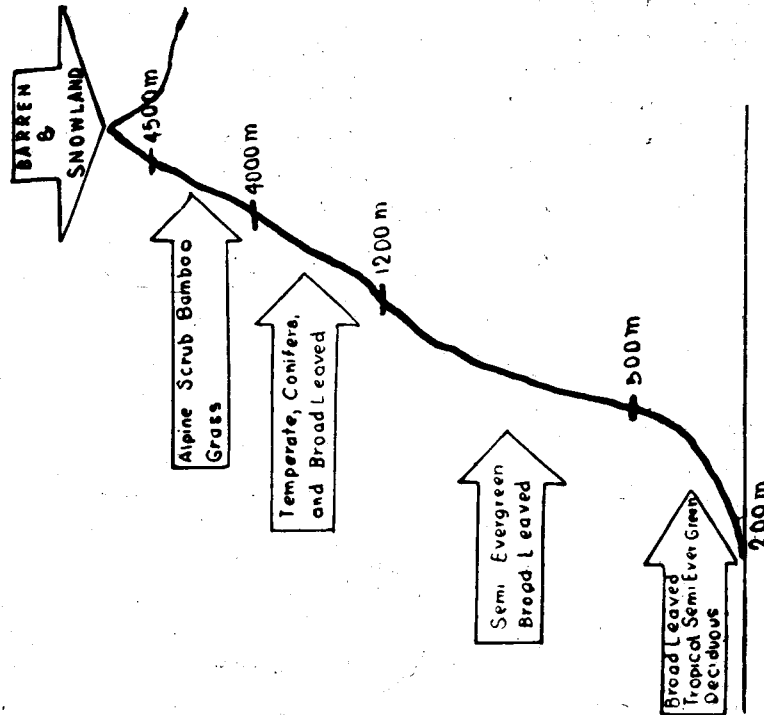
highest proportion of area would lie under Blue pine. The average volume of the coniferous forests could be safely assumed to be 300 cu. mts./ha. This would give the total growing stock in the coniferous forests as 300 million cu. mts. The annual increment of these forests could be safely taken as. 1.5 per cent. On this basis itself, the coniferous forests could give a sustained potential yield of 4.5 million cu. mts. annually. If the growing stock and increment are considered, the potential annual yield could be 6 million cu. mts. if a rotation of 100 years is considered or 8 million cu. mts. for a rotation of 60 years. These figures of volume would be for underbark measurements.

Coniferous Forests in the Country's Economy : The coniferous forests of Bhutan by virtue of their extent, and luxuriance form the most important renewable resource. The thin population at present consumes only a minute fraction of the potential annual cut, with the result that a large number of trees get decayed and rot in the forests. The little removal of wood is from the areas surrounding the habitations. The forests are at present used for fuelwood, and construction timber needs of the local population. Due to a limited demand and absence of suitable markets, the wood resources have little economic value. Sound trees of Blue pine over 60 cm. in diameter at breast height are supplied at Rs. 2 per tree for bonafide constructional purposes and at Rs. 30 per tree for commercial purposes. It may be of interest to mention here that for construction

GENERAL PROFILE OF BHUTAN SHOWING CONIFEROUS ZONES.



GENERAL PROFILE OF BHUTAN SHOWING VEGETATION ZONES.



of *Dzongs* anything from 50,000 to 100,000 Blue pine trees are cut.

The area of forests exploited so far would be less than 10 per cent of total forest area. This shows that a bulk of the forest area has remained untapped, and has, therefore, been preserved in its pristine glory.

The total annual revenue from the forests of Bhutan is Rs. 1.7 million, which amounts to nearly 9 per cent of the total annual revenue of the country. There is not the least doubt that, with intensive management, export of wood and the establishment of wood-based industries, this figure of revenue could be raised many times. The contribution of the coniferous forests to the total annual revenue could be Rs. 100 million.

At present no systematic or scientific working is done in these forests. For removals by the local people, permits are issued by the Royal Bhutan Government and Forest Officers from specific areas only.

Previous Surveys by Technical Teams: In the past the following surveys by different technical teams have been carried out :-

- i) Report on "The Utilization of the Coniferous Forests of Bhutan"-1961-62 by Swedish Experts, Tore H. Nevrell and Karl Olivecrona. This report deals with coniferous forests of approximately 15 mile radius around Paro-Wongchu Confluence. On an estimated area of about 87,000 ha. based on air-mosaics and field excursions, the report estimates a total growing stock of about 30 mill. cu. mts., with annual growth of one mill cu. mts. On a conservative estimate this report

estimates that in this area there is enough raw material for sustaining a 100,000 tonnes per year capacity newsprint mill or a 50,000 tonnes per year Kraft paper mill.

- ii) "Report on Basic Survey of Paper, Pulp and Power Development In Bhutan", Dec. 1963, by Japan Consulting Institute, Japan. This report also deals with very rich and dense forests in Western Bhutan in Paro and Ha valleys. An area of 16,000 ha. of coniferous forests was estimated to have a growing stock of 7.8 million cu. mts. which could give a potential annual cut 0.13 million cu. mts. Annual increment has been estimated at 8 cu. mts./ha.

The above study was commissioned by the Royal Bhutan Government for advising on the establishment of a paper mill in the western region and a rayon pulp plant in the eastern region. The Japanese Team came up with a recommendation that a groundwood pulp plant based on conifers could be set up at Thimphu and a Kraft pulp and paper mill could be set up in the vicinity of the border.

- iii) Report on "An Appraisal of Forest Resources in Bhutan" by the National Council of Applied Economic Research-1968.
- iv) "Feasibility Report on Three Wood-Based Industries In the Manas Drainage of Bhutan"-by WOODTECH (An Indian Consultancy Organization), New Delhi, 1970. Industries suggested are :
 - 1) Paper industry based on conifers and an integrated hardboard

and particle board plant based on hardwoods, 2) a Distillation Industry based on tapping and distilling resin from Chir pine trees, and 3) an Essential Oil (Citronella oil) Plant based on Lemon grass. All these industries have been proposed for the Manas Valley of Eastern Bhutan. Some suggestions on logging and extraction by floating have also been given in this report.

Management opportunities and scope of developing forest-based industries
Tremendous opportunities exist in Bhutan for intensifying forest management and augmenting the potential annual cut. Natural reproduction of the coniferous species and also of the important broad-leaved species is profuse and, therefore, intensive methods of silvicultural treatment could be applied to the forest crops.

It must be appreciated that for translating the above ideas into concrete action would call for heavy investments on infrastructural development and forestry operations. As for road construction, it would cost anything from Rs. 300,000 to Rs. 400,000 per km. for all-weather black-topped roads (as per estimates of the Border Roads Organization) and from Rs. 50,000 to Rs. 70,000 per Km. for forest roads and extraction routes.

The Royal Bhutan Government are anxious to set up forest-based industries, including saw-milling, plywood, turpentine and rosin industry based on Chir pine and match industry. Taking the coniferous resources of Bhutan alone into consideration, it could be possible to set up large

pulp, paper and newsprint units, apart from the possibilities of marketing large quantities of timber in the round or in sawn form in India and Bangla Desh.

If the potential annual availability of coniferous pulpwood is taken as 4 million cu. mts., the capacities of newsprint, kraft and writing and printing paper mills could be as shown below :

Newsprint	—1000 tonnes per day (340,000 tonnes annually). Eighty per cent component is taken as ground-wood pulp (yield 80%) and 20% as chemical pulp (yield 50%).
Kraft paper and writing and printing paper.	—2200 tonnes per day (748,000 tonnes annually).

The likely investment on the setting up of mills of the above capacities would be of the order of Rs. 7300 million. And for developing an intensive network of roads for working the forest areas intensively, an investment of the order of Rs. 1000 million would be required.

The above indications of capacities (of the order of 1.09 million tonnes) are quite impressive and should enable Governments, planners and industrialists to give a serious consideration to the coniferous resources of Bhutan. These figures could be fitted into planning goals, and a phased, and concerted programme for their attainment could be drawn up.

There is already a proposal for a pre-investment survey of these resources, and if this survey is carried out, authentic data on the coniferous resources would become available by the end of 1976. In the meantime, however, nothing should come in the way of preliminary investigations and planning for the setting up of these industries. It would be advisable to delineate distinct catchments for integrated pulp and paper mills of annual capacities ranging from 100,000 to 150,000 tonnes and to formulate a concrete plan for the development of resources and industries.

The two major constraints for the intensification of management in the coniferous forests of Bhutan could be the lack of capital for investment and the market situation for raw materials or finished products. For both of these Indian industries and markets could provide a ready answer. The required capital could be raised either by Government of India or by private industrialists, and the adjoining wood-deficit areas in Bengal (and as for that in Bangla Desh) and wood-based industries located in them and in Bihar could provide a ready market for timber and raw material from Bhutan. Unless Bhutan has an assured market for its material, it would be futile for it to launch an ambitious programme of forestry development.

What ought to be the shape of financial assistance or participation between the two countries is not for this paper to suggest. These matters would lie in the realm of trade and policy planning by the two Governments. All that could be stressed here is that there would be an excel-

lent scope for launching big forestry and industrial development programmes in Bhutan which would be in the interest of both the countries. Such a collaboration, apart from enriching the economy of Bhutan and making for self-sufficiency in pulp, paper and newsprint in India, would enable sizable exports of these products to countries in Asia and Africa (more especially to Japan). The likelihood of an understanding between India and Bangla Desh on the use of rivers in the latter country for navigation purposes could open up rich possibilities and provide a cheap means of transporting paper meant for export to the sea coast for loading into ships.

The pulp and paper industry in India is facing an acute problem of raw material supply, and this would be further accentuated in the coming years. As it is, pulp and paper units in Bengal, Bihar and Uttar Pradesh are obtaining their raw material supplies from far-off forest areas. The cost calculations done in the following part of this paper will show that a supply of coniferous pulpwood from Bhutan to paper mills in Bengal and Bihar would be more economical than the present costs incurred by some paper units (e.g. Bengal Paper Mills) on obtaining bamboo supplies from Assam and Madhya Pradesh.

It would require little imagination to picture the tremendous boost that the pulp and paper industry could get if about 4 million cubic metres of coniferous pulpwood (after excluding timber) could become available. This could bring about a revolution in the industry with regard to quality of finished products and cap-

activities of pulp and paper mills, and in the long run, enable India to prevent an annual drain of nearly Rs. 250 million on import of chemical pulp, newspaper etc. from Scandinavian countries, U. S. S. R., U.S.A. and Canada.

The raw material requirements in the year 1988-89 for the Pulp, paper, board and newsprint industry have been estimated to be 8 million tonnes. In this context coniferous forests of Bhutan could play a significant role in helping India solve its raw material problem.

Considerations of Costs : The mere existence of a resource cannot be a guarantee for a country's welfare or prosperity. What is more important is that it should be economically accessible from markets and centres of demand. The preliminary cost studies carried out by the author indicate that coniferous resources of Bhutan would be economically accessible for the pulp, paper and newsprint industry, be it located within Bhutan or as far away as Calcutta. More detailed and precise cost studies could be carried out when elaborate feasibility studies for the establishment of industries are carried out. The cost figures given in this paper should only be taken as indicating a broad picture of how the resources are situated with respect to their possible utilization for industrial development.

Based on the prevailing wage rate in Bhutan, the cost figures for timber and pulpwood supplies from the forests of Bhutan would be as shown below :

For Timber	Per cu. mt. in Rs.
1) Felling, sectioning and rolling from 5-500 metres.	— 26
2) Loading and unloading in trucks	— 7
3) Miscellaneous charges	— 2
Total	35

The average transportation charge of timber by truck would be Rs. 0.50 per cu. mt. per km. Thus the total cost of delivery of timber at the border town of Phuntsholing (excluding royalty) with an average lead of 200 kms. would be Rs. 135/cu. mt. From the border of Bhutan the additional cost of transporting timber by rail to Calcutta (average lead 560 kms.) could be taken as Rs. 50/cu. mt. Thus the cost figure for coniferous timber in the round from Bhutan delivered at Calcutta would be Rs. 185/cu. mt. If the prevailing market rates for coniferous timber from Himachal Pradesh sold at Yamunanagar, which are—

Fir/Spruce	— Rs. 315/cu. mt.
Chir	— Rs. 350/cu. mt.
Blue pine	— Rs. 526/cu. mt.

are taken as applying to Calcutta, then it would be seen that it would be quite profitable to introduce coniferous timber of Bhutan into Indian markets as far away as Calcutta.

For Pulpwood :

- 1) Felling, billeting stacking, loading, unloading etc. — Rs. 30/tonne.
- 2) Transportation by truck — Rs 0.50/tonne/km.

Thus the cost of delivery of coniferous pulpwood from the forests of

Bhutan, delivered at the border town of Phuntsholing (average lead 200 kms.) would be Rs. 130/tonne. This town is situated quite close to Dalingpara and Hashimara railway stations. The freight charge for the transportation of pulpwood to Calcutta would be around Rs. 50/tonne. Thus coniferous pulpwood of Bhutan could be delivered at Rs. 180/tonne at Calcutta. This cost figure is excluding royalty. The cost of raw material per tonne of finished product (taking a factor of 2 tonnes of pulpwood for one tonne of paper) would work out to Rs. 360/—.

Some of the paper mills located in Bengal and Bihar are tapping bamboo resources from far off forest areas in Assam and Madhya Pradesh. The landed cost of raw material delivery at some of these mills (and especially Bengal Paper Mills, Raniganj) is as high as Rs. 450 per tonne of paper. (taking a conversion ratio of 2.5 tonnes of bamboo to one tonne of paper).

It would be seen from the above that coniferous pulpwood resources of Bhutan would be economically accessible for a pulp and paper mill either within Bhutan or as far away as at Calcutta. These resources would, in any case, be more favourably situated than the bamboo resources of far-off areas such as Assam and Madhya Pradesh.

Conclusion : The coniferous forests of Bhutan await stepped-up development. They have a rich potential (which could compare with the total coniferous resources of India) and they could be utilised for enriching the economy of Bhutan and for providing much-

needed raw material to the pulp and paper industry in India.

As compared with the coniferous forests of India, the Bhutan forests have some distinct advantages, i. e. —

- 1) They are more compact;
- 2) They are situated on more favourable terrain;
- 3) They are less subject to popula-

tion pressure and to grazing;

- 4) Natural reproduction is plentiful and poses no problems;
- 5) They are economically accessible to the wood-deficit areas in West Bengal and Bangla Desh.

The Indian markets and industries could provide the *raison d'être* for a scientific management of the forests of Bhutan. Forestry and forest-

based industrial development offers a promising field for joint country-level collaboration and investment of capital,

With the rich coniferous resources of Bhutan being economically accessible to Indian industry, there would be no justification for importing annually pulp, paper and newsprint from developed countries to the tune of Rs. 250 million.

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