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The social forestry programme should be taken as the people's programme and the people should be invited to participate with zeal and zest in the programme. Industrial units should also participate in this programme and they should adopt at least one village each for implementing the social forestry programme.

DEMAND-SUPPLY MANAGEMENT AND PRICING POLICY OF FOREST BASED RAW MATERIALS FOR THE PAPER INDUSTRY IN INDIA: SOME ISSUES

Tirath Gupta*

The significance of an activity in a nation's economy can be assessed through its backward and forward linkages. Numerical values of input and output coefficients are generally used to measure the relative importance of an activity but they cannot bring out its real or potential worth in a dynamic situation. This is more true for land based activities where the potential for technological improvements at primary production and product processing stages could be visible, and policy interventions can be used to enhance efficiency of the natural resource system.

This paper is an attempt to deal with the problems and prospects of demand for and supplies of forest based raw materials for the paper industry. The choice was made for a number of reasons. First, per capita consumption of paper is considered as one of the indices of the level of economic development of a country. Availability of paper in India (including imports) is around 2 kg. per person per annum as against 289 kg. in U.S.A. and 13 kg. for Asia. It can be argued that to plan for a very high level of paper consumption would not be desirable and the principles of 'demand management' must be invoked for a number of reasons including the necessity to (i) meet the demand for forest produce from other industries and sectors, and (ii) control environmental pollution caused not only by the production process but also by garbage disposal. At the same time, it can be argued that the nation must plan for enhancing paper consumption at least to match with the annual growth in per capita income at constant prices.¹ This is an enormous task.

Second, the paper-making units are currently competing for too little raw materials (10, p. 20).[†] This means that serious thought must be given on the sources and methods to meet the requirements for additional production capacity. Third, not only must the raw materials be available but their price must be such that the industry and society can afford. This encompasses

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1. Engel's Law of consumption states that proportionate expenditure on certain goods and services of social and cultural significance would normally rise faster than the rise in family income.

† The figure in brackets refers to the study in the list of references cited at the end.

a number of issues such as price elasticity of demand for, sources of, and opportunity cost of various raw materials. This paper will raise some issues pertaining to (i) assessment of raw materials required by the paper industry at present and in the foreseeable future, and their sources and opportunity cost; and (ii) finding a financially, economically, socially, and administratively feasible basis for pricing the raw materials. The issues are largely interrelated, and they may best be discussed simultaneously.

I

CURRENT PRODUCTION AND FUTURE REQUIREMENTS FOR
PAPER AND RAW MATERIALS

The industry can be classified into two groups: paper and paper board, and newsprint. The installed capacity for paper and paper boards has been presented in Table I. Units in the first category primarily use forest raw materials, while some in the second category and all those in the remaining three categories use agricultural residues. Thus, at least 30 per cent of the installed capacity was fed by agricultural residues. In spite of this, capacity utilization has been only around 70 per cent in the recent past. The situation is no better for large units (category one in Table I) which depend primarily on forest based raw materials.

TABLE I—INSTALLED CAPACITY OF PAPER AND PAPER BOARD UNITS IN INDIA
BY SIZE CLASSES, 1981-82

Sr. No.	Size class ('000 tonnes)	Number of units	Annual installed capacity ('000 tonnes)
I.	20 and above	22	1,128 (62.1)*
II.	10 to 20	10	148 (8.1)
III.	5 to 10	40	326 (18.0)
IV.	2 to 5	41	148 (8.1)
V.	1 to 2	44	66 (3.6)
VI.	Total	157**	1,816 (100.0)

Source: Ministry of Agriculture, Government of India.

* Figures in parentheses are percentages to total installed capacity.

** Five units managed by two business houses have been counted as three. The total may thus be reckoned at 159.

Additional capacity to the tune of 965,700 tonnes was expected to be created between 1981-82 and 1984-85. Further, letters of intent for 1.382

million tonnes have been issued. This would mean an installed capacity at nearly 4.165 million tonnes by the turn of the century. This may appear dismal if the country's population in A. D. 2000 is assumed at 1,000 million, and the objective was to raise the per capita paper production at a cumulative rate of 3 per cent per annum. Is it feasible on account of required development of the forestry sector to meet the raw material demand, and capital investment needed to enhance the production capacity?

Besides, there is only one newsprint making unit with a rated capacity of 75,000 tonnes of which 66 per cent was utilized in 1981-82. The shortfall, once again, appears to be owing to scarcity of raw materials (salai wood and bamboo). It is learnt that managerial and financial feasibilities for utilizing agricultural residues, particularly cotton stalk, on a substantial scale, are being assessed. Two other newsprint units with installed capacity at 155,000 tonnes were expected to commence production during 1982-83. A letter of intent for a 100,000 tonnes bagasse based newsprint making unit has also been issued. These facts may appear encouraging. Current average of newspaper circulation is 13 copies per 1,000 persons against UNESCO's recommendation of 100 copies per 1000 persons (7, p. 4). But would the new units be able to produce to full capacity? If not, what steps can be taken to meet raw material supply?

Various estimates of future demand and/or requirement for paper have been made. In 1965, when the availability of paper and paper products was 1.4 kg. per capita, a Committee on Natural Resources appointed by the Planning Commission observed that this level was far below what was 'considered reasonable.' It was observed that, at that stage of development of the country, per capita consumption should be at a barest minimum of 4 kg. For 1980-81, it was estimated at 6 kg. per capita (3, p. 5). On that basis, the availability of paper and paper products should have been over 4 million tonnes in 1980-81.

The National Commission on Agriculture (NCA) estimated two levels, low and high, of likely domestic demand for paper and paper products for 1985 and 2000. For estimates on the low side, some kind of demand management and restrictions on imports were stipulated. In the second case, it was assumed that past trends in consumption and significant imports could be allowed to continue along with planning for enhanced production at home.² The estimates thus arrived range from 2.42 million to 3.090 million tonnes for 1985 and 4.43 million to 9.37 million tonnes for 2000 (5, p. 195). Comparable estimates for raw material requirements were 4.715 million to 6.055 million cubic metres, and 9.68 million to 17.695 million cubic metres (4, p. 26).

More or less in line with the lower of the two estimates of future requirements prepared by the NCA is the estimate by the Technology Group of the Development Council for Paper, Pulp and Allied Industries. Working on the assumption of India's population at 945 million in A. D. 2000, and a

2. For a description of the methodology used, see (4), pp. 32-46 and (5), pp. 194-196.

target at 4.5 kg. paper per person, the installed capacity by 2000 should be 4.25 million tonnes. Some relevant data in this context are presented in Table II.

TABLE II—INSTALLED AND PROJECTED TOTAL AND PER CAPITA CAPACITY FOR PAPER AND PAPER BOARD PRODUCTION IN INDIA : 1981 TO 2000

Year	Population (million)	Total capacity ('000 tonnes)	Per capita capacity (kg.)	Compound growth rate for each five-year period (percentage)	
				Total	Per capita
1976	605	1,130	2.0	—	—
1981	668	1,680	2.5	8.0	4.5
1986	734	2,200	3.0	5.5	4.0
1991	801	2,800	3.5	5.0	3.0
1996	882	3,500	4.0	4.5	3.0
2000	945	4,250	4.5	4.0	2.0

Source: (7), p. 3.

It can be observed that the population estimates for 1976 and 1981 have already been proved wrong. A more important issue is whether the future requirements (not demand) for paper can be estimated with a fair degree of confidence. In other words, do we have the necessary data on (i) the degree of sincerity with which the policy objective of compulsory education up to primary level by 1990 would be pursued, (ii) the proportion of population which may be in schools and colleges at different points of time in the future, (iii) extent of expansion in the administrative machinery of government and business organizations, (iv) changes in tastes and habits for reading by housewives and other adults which would determine the growth rate of the publishing industry, (v) technological advancements in a footloose industry like computers and the extent to which cello tapes may replace files for storing data, (vi) changes in pedagogy to impart education,³ and a whole lot of such variables which must enter the forecasting models? If not, should a body of professionals declare that issues pertaining to estimates of future requirements for goods and services of economic, social, cultural, and administrative significance be better handled through experience based on judgments free of individual or group values? For a product such as paper where a glut is not feared, can the nation adopt a simple principle that prospective entrepreneurs must first identify adequate supplies of specific types of raw materials to utilize the proposed rated capacity for a reasonably long period of time? This period

3. Paper used per student would be significantly more with the case method of teaching compared with the lecture method.

must be greater than or equal to the period required to recover the capital investment. Similarly, should the nation have a norm for services such as newspapers? If yes, what objective considerations should determine the norm? Alternatively, should there also be some kind of demand management through placing a definite limit on the size of the newspaper in general and commercial advertisements in particular?

Bamboo is the most important of the forest based raw material and accounts for three-fourths of the total in this category. But its supply has been dwindling while the cost, particularly on account of labour for harvesting and transportation, has been rising. Mechanisms for enhanced role of other raw materials are being thought of. These include industrial and agricultural by-products. For instance, the quantity of bagasse varies from 30-35 per cent of sugarcane crushed. It is estimated that a medium-sized sugar mill with cane crushing capacity at 2,400 metric tonnes (mt) per day would require 1,200-1,250 mt of steam which can be generated with 550-570 mt of bagasse. On the other hand, the total quantity of bagasse generated would be 800 mt per day. The surplus, thus, would be some 3,000 mt per year. On the other hand, a small pulp and paper plant with annual capacity at 7,000 mt would require 25,000 tonnes of bagasse and 6,000 mt of cotton waste/rags (2, pp. 13-14). Thus, a small paper mill would have to tie up with ten medium sized sugar mills. Have the financial, economic, managerial and administrative feasibilities of vertical integration between sugar and paper production been assessed?

Opportunity costs of some other raw materials in this category such as cotton stalk and wheat and paddy straw must also be assessed. One relevant fact is that India accounts for one-fifth of the world's cattle population. Similarly, the oil equivalent of some 88 million tonnes of paddy straw and 30 million tonnes of cotton stalk produced annually have been estimated, respectively, at over 30 million tonnes and 12 million tonnes (8, p. 4). Emphasis is also being placed on enhanced use of hard and soft woods, but fuelwood is an important source of energy for the household sector and its price has been rising at an alarming pace.

II

PRICING OF FOREST BASED RAW MATERIALS

Pricing of forest produce was not an important issue till the recent past. The supply appeared almost inexhaustible. Bamboo which has been the most important raw material was looked upon as a wildgrass till the beginning of the present century. Since the produce from natural growth was to be harvested and taken out of forest areas, cost of production was not relevant. The basic problem faced by the policy maker and the forester at that time was to invite the user. The attitude was that whatever could be received was a 'net gain'. It is in this context that the term 'royalty' which means a share

payable to a proprietor can be understood. The royalty was not intended to be and cannot be the economic price for forest produce. It must also be noted that till the late 1910s the raw materials in common use were sabai grass (*Eulopsis binata*), hemp, rags, jute, and imported spruce and wood pulp. The first paper mill to use bamboo was started in 1918 and the whole of additional capacity starting from 1924 was bamboo based. The use of bamboo was encouraged by policy interventions including import duties on some types of paper levied in 1925, and the Bamboo Paper Industry (Protection) Act of 1932 (1, p. 36).

The most common practice has been long-term (20 to 50 years) agreements between the processing unit(s) and the State Government(s). These specified the quantity of materials to be made available to and the royalty payable by the former. Initially the contracts did not provide for periodic upward revisions of royalty but such provisions for marginal revisions every 5-10 years were later made. The royalty rates were fixed on purely ad hoc basis. Forest areas for extracting agreed quantity of materials were identified and marked every year. Besides harvesting, the processor was also expected to provide serviceable roads to transport the materials.

Recently a strong feeling has arisen that forest produce is being supplied to industrial units at very low prices. This has been further strengthened by cost consciousness on the part of the foresters which, in turn, has been induced by establishment of forest development corporations to undertake man-made plantations. A state has been reached where every State would like to dispense with the concept of royalty and sell the products on the basis of cost of production. In the meantime, there have been at least a few cases of upward revision of royalty beyond provisions of the contract agreements, or termination of agreements prior to the expiry date. On the other hand, some industrial units have gone to the courts with an intention to hold raw material price and supplies for as long as possible. Finding a rational basis for assured supply and a logical and feasible price is, therefore, of utmost importance. A positive aspect, however, is that both the supplier and the processor appreciate their mutual dependence in the long run.

Some considerations in pricing a renewable natural resource could be (i) relative bargaining power of the seller and the buyer, (ii) payment of land rent, (iii) need to meet at least replacement cost of the resource and to generate investible funds to harness the growth potential, (iv) price payable by competing users, and (v) need to manage demand derived from demand for outputs of user industries/sectors.

All these and related aspects cannot be appropriately tackled in a paper of this nature. A few issues which appeared relevant for tackling the problem will be briefly discussed. Bargaining power of the concerned parties cannot be relied upon in a mixed economy. This is most likely to activate some external forces whose short-term interests do not match the requirements of efficient management of a natural resource system. Similarly, if the price of the produce has to be fixed on the basis of land rent, the problem could be

the determination of rent. One important variable for that purpose must be the price of the produce which is to be determined. One can argue that market price in competing uses be considered. This aspect will be discussed a little later. Other relevant variables would be inherent capacities of the soil, species raised, competing uses of land, intensity and efficiency of management, etc. Are the data available, and can the relative weights to be placed on the variables be scientifically determined?

Grade specifications of seemingly competitive uses of a good may be significantly different. For instance, bamboo species and grades vary not only amongst uses but also within a use in the household and cottage industries while even disease infested produce can be used by the paper industry. Moreover, a bulk buyer cannot be usually compared with numerous small ones. Value added in specific uses could be another consideration in pricing the input. Once again, there are many questions. Has a satisfactory basis to compare the weight or numbers of bamboo termed as *kachra* and 'marketable' been found? Should value added in various uses be weighted equally? If not, how should one proceed for assigning such weights?

There may be little disagreement that the price of a renewable resource must generate investible funds not only for its natural regeneration but also for enhanced output on a sustained basis. But can this be guaranteed where forest land is largely State owned and managed? There has been no relationship between revenue generated from forests and investments made in the system. In fact, the gap between revenue and investments has been rising over time (6, p. 789). Moreover, cost of production and regeneration can be realistically estimated for man-made forests but not for natural forests managed on the principle of coppice with reserve. Can a product from man-made and natural forests be priced differently?

The answer may be in the affirmative. The argument in the case of bamboo would be that, if silvicultural rules are followed, there can be a crop every 3-4 years without any investment or systematic management. Bamboo occupies nearly 10 million hectares or 13 per cent of the total forest land in India. The annual production is estimated at 9.5 million mt: an average of less than one mt per hectare per year (11, p. 466). Can this be considered satisfactory when the demand is insatiable and yield from plantations of certain bamboo species spaced at 5×5 metres has been estimated at 15 tonnes per hectare per annum with a scope for further increase through reduced spacing? Alternatively, are there data on the extent to which bamboo yields from natural forests can be enhanced through improved management including fertilizer use, and the extent to which the industry may be willing to share the incremental cost?

Let it be assumed for the present that the basis for pricing the produce from natural forests may be the cost of production from man-made forests. The buyers' reservation may be that the man-made plantations are not being raised in a cost effective manner, and they would also be paying for the inefficiencies of a public system. Moreover, forests have multiple values and

generate a number of intangible benefits. To a limited extent this is true even for a monoculture forest. The industry may, therefore, like to argue that it should not be expected to bear the entire plantation cost. This brings in the controversy whether any one section or sector can claim all or most of the external benefits of an activity utilizing public resources? Even if the answer is positive, negative externalities generated by the sector will also have to be weighed. Do we have the technology and the will to do that? The paper industry also contributes to the public exchequer by way of excise duties and other taxes. It invests in infrastructural development: roads, hospitals, schools, etc. Are there data on the extent to which the industry is an exception in these respects?

In the context of some of the facts presented earlier, the nation may not opt for demand management. More importantly, there is scope for significant enhancement in the supply of pulpable materials through better management of forest land, other common property land, and private land not capable of sustaining a dynamic system of seasonal crop production. Technological developments have made it possible to reduce the dependence on bamboo. Fast growing tree species with all the properties required for pulping are available, and some of these (*Accacia Spp*) are not very sensitive to agro-climatic conditions to be able to have an acceptable growth rate. Harnessing these opportunities would also lead to enhanced supply of fuel and fodder materials. The industry would of course prefer single species plantations for ease of management and economy. Though vast areas cannot be covered with single species plantations for ecological and other reasons, islands of monoculture close to the industrial units should be possible and acceptable.

Such islands need not necessarily be created on reserved forest land and by forest development corporations. Various approaches are being thought of. Forest land, community waste land, road and canal sides, and such other common property land may be leased out to paper mills on a one to one or group basis. The industrial unit(s) should be able to invest in raising and protecting the plantations. A 'social fence' may provide better protection. A portion of the area must be planted with tree species which can generate more of fuelwood and fodder to meet the local requirements. Once planted, this area can be protected by the people. Alternatively, forest development corporations and paper making units can jointly create captive plantations of fast growing pulpable materials including bamboo. The industry may be willing to contribute to equity capital needed for such ventures along with enhancing the corporations' ability to avail of institutional finance. Some of the objectives of such efforts could be (i) assured raw material supplies, (ii) growth of harmonious relationship between the industry and the forestry system and dispensation of a feeling that the former is nabbing the latter, (iii) better utilization of the land resources, (iv) breathing time for regeneration of the mixed natural forest areas, and (v) bridging the widening gap between the people, the forestry system, and the industry. How should it be ensured that there would be no conflicts of interests in meeting these objectives?

III

SOME GENERAL ISSUES

A few general issues which have a bearing on the issues raised in this paper may also be summarised. First, technology for paper production in India is outdated. Should the protection enjoyed by paper making machinery manufacturers be continued? Should more resources be earmarked for research and development? If yes, what should be the relative responsibility of the government, the paper industry, and the machinery manufacturers? Second, the proportion of small-scale paper making units in the total has been rising in the recent past but the industry is prone to economies of scale. One estimate is that a plant with capacity less than 50,000 tonnes per annum cannot afford to have a chemical recovery unit. Chemicals constitute at least 25 per cent of the cost of paper production in India. The materials recovered would not only enhance the industry's capacity to pay more for raw materials but also protect the environment.

Third, chemical pulp is used for almost all types of paper produced in India. Recovery of chemical pulp is 40-45 per cent of most of the raw materials used against 90-95 per cent for mechanical pulp (9, p. 7). It can be safely assumed that the maximum use life for at least 50 per cent of the paper produced is one year. Strength need not be an important consideration for this part of the output. Mechanical and other pulping processes can reduce the raw materials required per unit of output. Would the benefits of possible technological change be available to the consumer who stands at the end of the line?

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