First Plan. The progress of the various schemes referred to above was fairly good. In the light of the success of the programmes implemented so far, there will be no difficulty in achieving the modest targets laid down in the Fourth Plan.

Summary

A review of forestry development in India in the planning era reveals that the success of the programmes implemented hitherto was inspiring. In the light of the success of the measures undertaken so far, the achievement of the targets in the Fourth Plan is by all means within the realm of the possibility of the country.

2. A new revenue of 48 paise per sq. k.m. at an expense of 35 paise per sq. k.m. was raised in 1960-61 against a net revenue of 21 paise at an expense of 14 paise in 1951-52.

3. The share of expenditure incurred over the maintenance of the forest and forest industry to the net revenue from the forest and forest industries has registered an increasing trend.

4. The increase in the forest area under protection to the total forest area of the states in 1960-61 over 1950-51 was 34 per cent or 92,000 sq. k.m.

5. The cost of regeneration operations per sq. k.m. had gone up from Rs. 417 in 1950-51 to Rs. 1,749 in 1960-61.

6. The employment opportunity per day in the forest and forest industries increased by more than 12 times during the same period.

NEEDED RESEARCH IN ECONOMICS OF INDIAN FORESTRY

JOHN C. REDMAN*

Professor of Agricultural Economics
University of Kentucky, Kentucky, U.S.A.

AND

G. S. CHANDRAS†

Divisional Forest Officer
Maharashtra Forest Service, Maharashtra

Forest represents a greater value to society than most people are aware. However, only a cursory examination of the available statistics and a casual observation at the forest resources of India are sufficient to convince oneself that the resources have been allowed to waste away through over-use, misuse or under-utilization and consequently the present overall output is low. This leaves many domestic needs of the country unfilled as well as eliminates the possibility of acquiring more foreign exchange through export.

* Serving as Visiting Professor at Gokhale Institute of Politics and Economics, Poona-4, Summer 1967.
† Now on deputation to Gokhale Institute of Politics and Economics, Poona-4.
FORESTRY DEVELOPMENT IN INDIA

PURPOSE OF PAPER

Since it is an accepted fact that forests and forest products contribute to the economy in many important ways, the purpose here is to seek an explanation why the Indian forests are degenerating and why their output is now so low and to offer some suggestions for areas of initial research. Improvement in the skills of making decisions pertaining to alternative plans or possibilities in resource management can come about only through increased knowledge, hence the need for research. Forest economics, although utilizing the same economic principles, is distinguishable from other branches of applied economics. Timber and other forest products require a long time to grow, often extending over 120 years in the case of some teak. Much of the timber is both capital and finished or nearly finished product at the same time and salable anytime and anywhere. Many values of forests are not measured by existing markets and others are almost beyond measurement. Forestry covers a very wide variety of ecological conditions and depends much more on natural influences than agriculture. The practice of forestry is almost a state enterprise and involves public interest. Although forestry brings in state revenue, the basic value of forestry rests in what it contributes in protective and productive roles to society.

BASIS OF THE PROBLEM

One of the main difficulties seems to be the extremely wide divergence of the individual interest from that of the society. The planning span of society is essentially perpetuity while that of an individual is only a few years at most or only a few days in case of dire need. The immediate needs for small timber, firewood and grazing have removed tree growth recklessly and have deprived the soil of its valuable vegetative cover. As a result, India now has thousands of square miles of barren, understocked and poorly stocked land which yields little or nothing of value, but on the contrary constitutes a social liability in the form of floods, drought, silting of streams, reservoirs and harbours, destruction of wild life, and impoverishing the naturally suited agricultural land. Obviously, there must be an optimum between the time preferences of the individual and of the society.¹

Another difficulty stems from the frailty of the deliberate devices for determining, planning and pursuing social goals, and in some cases the reluctance of society to accept and use the best available planning techniques. Limitations of human knowledge, wisdom and foresight due in large part to lack of research contribute to this difficulty, to say nothing about the scanty information available to the politicians and the institutional structure in which they perform their functions. C. R. Ranganathan, former Inspector General of Forests, mentioned that forestry was “in a state of retreat” and attributed it to “public apathy, ignorance of our legislators, the readiness with which our Government sequestrate forest land for other uses, etc.”² While suggesting the need for research in forest economics, Ranganathan further says, “Forestry has not established its title to continued use of the land in economic terms.....Orthodox forest

² Quoted by K. P. Sagreinya in Forests and Forestry, National Book Trust, Delhi, 1967, p. 125.
management is based on biogeocoenotic ecological approach.... The time has come to enquire whether we should not give more serious attention to the economics of forestry." On top of everything, the science of forestry in India is entirely government-sponsored and has received very little independent attention. It may have been rigidly influenced by a hierarchy, masked by in-service discipline.

Most lands can be used for a variety of purposes. In the absence of definite criteria laid down for overall land use planning followed by rigid methods of implementation, wide differences in the individual choices concerning land use have resulted. Owners tend to use land for the purpose which promises them the highest return in satisfying their present needs. Any return which can be expected in the distant future will be discounted at a very high rate in order to satisfy the present needs of individuals. Social needs will not require such high discount rates because one of the main functions of any society is to make provisions for continued existence and growth.

The fact that the economic supply of land for agriculture is very inelastic in India with a rapid increase in the already overgrown population, assuming other demand shifting factors are constant, will place an increasing pressure for bringing more land into cultivation for food production. To the extent that the income level increases and the educational level rises, the pressure will increase even more. A part of this pressure will be met by increased intensity of present land use by applying irrigation, improved varieties of seed, fertilizer, better managerial practices, etc., but in many areas a large part will be met from lands suitable only for forestry and/or currently under forestry. Such a gradual encroachment upon forest resources will in most cases satisfy the food needs only partly and temporarily, but eventually can reduce food output by flooding, lack of fertility, and moisture conservation, erosion, and arid conditions.

FUNCTIONS OF FORESTS

The growth and vigour of India depend to a large extent on how the natural resources are used. The present condition of forests reflects the relative value society has placed on the use of the forest resources over time. One can easily conclude that society has placed little or no value on conservation of these resources. It appears that even in forests entirely managed by the Government, conservation practices have not been truly achieved. Perhaps, this is due to the failure to realize in adequate terms the functions these resources perform for society.

Indian forests as elsewhere provide two major functions, one for protective purposes and another for production of products and services. Under the category of protection, forests perform functions of most supreme and paramount importance to the nation. They retard run-off and allow ground water to accumulate to feed springs and wells, prevent or greatly reduce the danger of floods, distribute the water supply over a longer time period and prevent the loss of soil which is carried by rapid flow of water to streams causing silting of streams and clogging of harbours. Forests also have a beneficial effect on the surrounding climate. A denuded forest land has meant a desert in many areas of India.

3. ibid., p. 125.
In addition to the protective functions which are of inestimable value for the tropical characteristics of India, forests can be very productive in providing marketable products badly needed by the economy in a developing agri-industrial base. Fuel wood badly needed by homes for cooking purposes is presently the most important product in most areas. The time preference for fuel wood is very high and because forests have not been able to supply enough, people use cow dung, a very valuable organic fertilizer. Teak, rosewood, sandalwood and walnut and a few others provide some of the finest wood in the world, but these too will not meet even the domestic needs on a sustained basis. Home construction, agricultural implements, communication, national defence, furniture, etc., are all dependent on the continuous output of the forests. Many other products of the forests, such as bamboo, gum, resin, tanning material, medicinal herbs, grass, bidi leaves, etc., are produced in India's forests and provide an important base for industrial development and employment.

All of these functions form a complex of resources which will help safeguard the future allround development of India and at the same time provide increased opportunities for recreation and tourism which will earn valuable foreign exchange.

As valuable as the forest resources are to the economy, India is currently realizing only a fraction of what the potential could have been if good conservation practices had been practiced during the past half century. The past experience indicates that these resources have been exploited without much consideration of the effects of these activities on limiting the future flow and growth of the products from these resources. Now, it will be increasingly more costly to execute afforestations and other soil conservation programmes, etc. Pigou comments that "it is the duty of Government, which is the trustee for unborn generations as well as for the present citizens, to watch over and if need be, by legislative enactment, to defend the exhaustible natural resources of the country from rash and reckless exploitation." Every society is the custodian of its own future. The question remains, what kind of future does India want?

A Case for Conservation

In India, the case for social action takes on considerable meaning, particularly with an increasing population which is the main variable in creating a rising demand for forest functions as well as products and services from forests. Whether or not social controls should be used to guide, direct and even limit individuals in their decisions depends on both the extent of the difference between public and individual interests and the prevailing philosophy regarding the desirability of social intervention.

Conservation is concerned with the optimum rate of using resources over time and it calls for deliberate choices between the present and some future use of the forest resources. In this process, the benefits expected from holding the resource in forest during some given planning period must be balanced against costs associated with the holding. For example, the holding costs are tending to rise rapidly

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in Maharashtra (as elsewhere in the country) on account of the fact that "there has been increasing incidence of illicit cutting, unauthorised clearance for cultivation, indiscriminate grazing and other wanton violations of the forest regulations." Exorbitant cost of protection and preservation of forests must become a matter of serious concern to all administrators, legislators and technicians who cannot afford to remain silent spectators of such a situation or to take it lightly. A strong case can be made for conservation only when the expected future values and benefits, i.e., the value of the resource at the end of the planning period plus the value of any flow of returns or satisfactions, exceed the present value and holding costs. As pointed out above, urgent and persistent measures are warranted to minimize the cost on holding by apprising the people and their representatives in the parliament and legislature. The balancing of benefits and costs depends also on the discount rate used which in turn is dependent on the time preference system and the degree of uncertainty envisioned. Generally, the poorer the individual, the greater is the emphasis placed in actual practice on the early and rapid exploitation of resources.

Conservation decisions must be ex ante or forward looking and economically sound. They should precede actions and uses that are expected to take place in time periods which may range for a few years for firewood or pulpwood production to several decades for, say, teak production. A certain amount of flexibility may, of course, be incorporated in plans so that adjustments can be made when required for changing economic and technological conditions.

Some of the most important economic and social planning needs involve forests. In the past, individuals have taken much freedom to decide how they might use or abuse their resources. The result is obvious. Society still has a strong vested interest in the manner how the forest resources continue to be used and maintained. Thus, group action is urgently needed to discourage, control or prohibit unwise and wasteful practices which in time prove injurious not only to the individual but also to the society.

Some Obstacles to Conservation

There are several obstacles to developing an effective forest conservation programme. Economic instability of the economy will encourage short planning periods and high discount rates because of the inability to predict future cost, price and market conditions. These risks caused by society can logically be shared or assumed by society.

For the individual, a group of individuals or even a local body, the lack of capital constitutes a major obstacle to the development or conservation of forest resources. The time period involved generally will not encourage them to make such investments. The fact that their need for capital is immediate will cause the individuals to disinvest their resources or use a high time preference rate because of the need to increase the current income available for living and operating expenses.

5. Shri Y. B. Chavan in his message to the Maharashtra Forest Department on the occasion of its centenary celebration. See the Souvenir issued in 1961.

6. This points to one of the reasons why several of the past appeals for conservation have failed to evoke a requisite response from the people.
Lack of recognition and fulfilment of local needs constitutes one of the more important problems in forestry. This aspect was given due importance in the 1894 Policy (see subsequent paragraph on forest policy) but it was overlooked in the revised policy of 1952, with the result that forests suffered seriously thereafter. Under the existing circumstances, forest conservation (and development) cannot be achieved without a motivated participation by the local villagers.

Perhaps, the major obstacle to conservation of forest resources is the lack of knowledge and foresight. Individuals as well as society often do not realize what needs to be done. Before a large educational programme can be effective in making people conservation-conscious, considerable knowledge must be acquired concerning many salient aspects of the forest resource base, past and current policy, expectations regarding costs and benefits and alternative courses of action. This most important field (of forest economics) has, however, remained sadly overlooked, though a century has passed since forestry was organized, with the obvious result that 'forestry is in a state of retreat in India.' It is therefore proposed here to suggest a few areas of studies or research which need a priori attention.

SOME SUGGESTED AREAS FOR INITIAL RESEARCH

Research in economics of forest resource use must be given a more important role to play if a high order of judgment by planners is expected. In India, little or no research has been systematically done in this phase, and consequently, the amount of available economic information is relatively small. Society has a very large stake in the nature of expectations thus formed about the future and the decisions made thereupon. Research in forestry and its economics provides an objective basis for improving the formation of expectations and decision making, and when devoid of political influence it can avoid wasted effort, wrong priorities, mis-allocation of resources and embarrassing inconsistencies.

**Inventory of Forest Resources**

Good statistical data provide the basis for a useful and valuable analysis. Most of the present data on forestry presents a tangible scope for improvement. The National Planning Commission observes that some of the data were "based on guesses."

Discrepancies on some of the fundamental aspects are inescapable and demand an urgent or serious attention. For example, the extent of forest areas in India is still a matter of uncertainty. No planning in forestry can be sound unless one has an accurate information on the area available for forestry. Like the information on forest area, other fields of forestry also are very inadequately and inaccurately known. The fact that all forestry information is available in Government records has had its own advantages and disadvantages. Thus, the highest priority should be given to a well designed statistical gathering programme, which over time will provide many insights on the use and productivity of India’s

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7. The fact that the social planning horizon should be long run does not mean necessarily that it is. Often a national emergency, such as war, will prompt a sudden change in policy to allow the needs to be met. In addition, the policy makers who are elected by the people often respond quickly to the wishes of their constituents. Consequently, the social planning horizon which is entrusted to the policy makers often becomes short term in effect.

8. Report of the Committee on Natural Resources, Planning Commission, Government of India, 1962, p. 14. It states "A total survey of forest resources is urgently required... New forms for reporting on the availability of forest resources and production should be adopted... Though India has plenty of jungles, there are few forests."
forest resources in satisfying the needs of her economy. With an appropriate analysis, data will provide much of the information needed for critical decisions on resource use, policy as well as decisions dealing with many micro aspects.

Statistical data are also essential to appraise the contribution of forest resources to the economy and to consider the ways and means of maximizing this contribution. Obviously, for all problems, data are not readily available in the forms desired. It is essential to make an effort to improve the present aspects and to evolve pro-formae, histograms, graphs, maps, etc., in which information should be compiled and presented. In other words, statistics of Indian forestry present a wide scope for improvement in its contents and utility. Different types of records are available for handling in such an undertaking. Indian forest statistics, State forest statistics, administration reports of State forest departments, various control forms and such other returns are prepared on annual basis. Working plans, working schemes, afforestation schemes, felling schemes, etc., are prepared for local areas on a periodical basis, say, with a lapse of about 10-25 years for a particular forest area. Much valuable data collected by utilization and silvicultural branches can also be utilized. Extensive enumerations have been carried out in forest areas considered for industrial plans or evaluation purposes, or affected by agricultural cultigations, irrigation projects, rehabilitation plans and similar other purposes. Above mentioned compilations contain acreage of forests, location, species, ownership, legal status, volume, quality, rate of growth and harvest, industrial and consumer uses of forests, forest products and services and illustrate the type of additional general purpose data needed. Utility of such compilations must be maximized with efficient use of the electronic computer.

So far, some information has been collected in India. The initiation of a desirable statistical programme may entail some field work probably on a sample basis, but the possibility of using aerial photographs should not be overlooked to provide information on land use, location, size and volume data, accessibility, etc., on a broader basis.

Historical Evaluation of Forest Policy

The Government plays a major role in influencing rational use of forest resources, particularly when the people at large are not sufficiently enlightened on the role of forests. As aptly described in the 1894 statement (by the Government of India on forest policy) though “the first object to be aimed at is to preserve wood and grass from destruction . . . . the people must be protected against their own improvidence.” Indian forestry can be proud of having made pioneering attempts to lay down principles underlying forest policies:

1855—Lord Dalhousie’s “Charter of Indian Forests” based on Dr. McCleland’s (Superintendent of Forests, Pegu) report to Government of India.

1894—Government of India’s declaration on forest policy. This is based on the relevant portion of the report submitted to the Government of India on “Improvement of Indian Agriculture” by Dr. J. A. Voelcker, a German expert, specially invited to India.

1952—For the first time after Independence, a national forest policy was formulated in consultation with the States and the Central Board of Forestry.
The responsibility of the Government in framing and implementing a healthy forest policy has risen especially when the ownership of many ex-private forests has been acquired through the abolition of Princely States, inams and jagirs, etc. The influence may be direct—through programmes and legislation, encouraging or restricting activities—, or indirect—through activities which will eventually affect the use of the forest resources. Thus, forest resource management is carried on in India in an environment almost exclusively under institutional influences.

Forests in India are presently under the administration mostly of the respective State Governments and only a few under Central agencies. This often involves the risk of unco-ordinated or loosely co-ordinated planning of the programmes. Possibility should be explored to improve the soundness and effectiveness of forestry programmes on a national or on a regional level because forest resources do not conform strictly to State boundaries. The national goal of an overall 35\(\frac{1}{2}\) per cent of land area under forests with 60 per cent in Himalayas and Deccan and 20 per cent in the plains is still not clear in its practical applications. The details of principles underlying the optimum percentage of distribution in small territories, viz., States, districts and even lower need to be enunciated in clearer terms.

Valuable insights into the kind of a future forest resource use policy needed can be gained by making a historical evaluation of the forest policy implemented over the past several decades. The policy would need to be evaluated on the basis of the needs at the time and the subsequent impact on the resource base. The stated long range policy often turns out to be very short range because of the usual pressures caused by unforeseen emergencies. But the fact remains that the condition of the present forest resource base is a reflection of the policy and its implementation in the past. The extent to which this resource base will be improved or allowed to deteriorate further will depend in large part on the policy of today. Thus, research into the relevant aspects of forestry can be very helpful to the policy makers.

**Demand Studies**

Before a realistic programme in forest resource utilization can be established, some estimate of the future needs of society must be made. Every production process involving time and production plans requires an estimate of what is desired. Thus, estimates of the future demand become a momentous part of the plans involved in the production process. Obviously, future demand can never be forecast with certainty because many demand shifters, such as changes in population, income, tastes, substitutes due to technological changes, exports, etc., cannot be predicted accurately. However, reasonable projections can be made, assuming varying conditions, which will provide an idea of what the future demand may be over the next several decades.

In addition to the quantity estimates at a given price, planners need to know something about elasticity of demand with respect to price and income, i.e., how the users of forest products and services will respond to changes in prices and income. Such demand studies would provide a desirable goal for forestry to provide a continuing adequate supply of forest products and services to meet the changing needs of the economy over time at a reasonable price. Demand estimates would
be essential not only in planning the use of forest resources, but also for providing a base for public policy for forestry.9

Production and Supply Studies

Knowledge about the productivity of forests in terms of products and services rendered over time is required in effective planning of resource use. The first need is to re-classify land as to optimum use, considering the social needs, so that all land use programmes—agriculture, pasture, forestry, etc.—would have a common set of land use capabilities within which to operate. Aerial photographs plus on-site inspection offer a good approach to a land classification programme. Forestry as a long term enterprise cannot be sound and successful unless it is free from constant threats of encroachments.

Research should be directed towards finding an economical way of increasing the effective supply of land, particularly for agriculture so as to ensure more permanence of land under forestry or to reduce the constant pressure of converting forest land to agricultural uses. The cost of social investment into creating new supply of agricultural land as compared to the cost of social waste of converting forest resources into marginal and sub-marginal agricultural lands needs constant study and evaluation. It is the contention here in this paper that an increase in agricultural output can be realized with less social cost by utilizing the available technology and knowledge than by a transfer of land from forestry to agriculture. An economic study towards diverting extensive non-arable lands under sound practices of pasture and forestry has been actually overdue.

Production and supply studies are also needed to find ways to provide needed forestry products as cheaply as possible. Similarly, studies of a specific nature on problems immediately facing society are of utmost importance and are urgently needed. For instance, it is essential to know the productivity of eucalyptus trees as compared to teak, over time, under varying conditions, such as site quality, planning horizon, etc., in order to evaluate and advise on planting with each. The equilibrium of enterprise in time, using compounding and discounting techniques, offers a possible model for such analysis of past management, plantations and afforestation.

A knowledge of the economics of the sustained yield principle in harvesting techniques as compared to rotation cutting requires a knowledge of the growth characteristics of the species involved, as well as the possible economics of size in harvesting, processing, etc., under each situation. Since there is a rising trend in the creation and development of the Forest Labourers' Co-operative Societies, e.g., over 60 per cent of the annual harvest of Government forests in Maharashtra is carried out through such co-operatives, it would be desirable to examine the

9. The following reports can be cited as examples of initial attempts made in this direction: Integration of Forests and Forest Industries, Report to the Government of India by J.A. Von Monroy, F.A.O. Report No. 1298, 1960, and Timber Trends and Prospects in India by P. Venkatramany, Government of India, 1962. But these reports have not given the basis of the demand projections. The efforts seem to be directed mainly towards preparation of quantitative estimates based on population projections and changes in per capita income. Other factors, viz., exports and imports, price structure and general sociological development, etc., but which have a very important bearing on such projections must not go without proper weightage.
organization and functioning of these societies in order to appraise their role and efficiency in the removal of forest products from the land. In order to meet the social needs, several forests are proposed to be managed on an intensive basis and to follow the principle of "the highest tonnage of production of organic raw materials within the shortest possible period and at the lowest possible costs." The FAO expert, Eric Lundqvist, has prepared a report on "Expansion of Plantation Forestry" in India which envisaged large scale plantation programmes with species inadequately known for their suitability to varying site conditions. All these should be studied to determine the relative economics with that of the natural or traditional basis, considering varying lengths of run. Studies on the economics of harvesting and processing techniques such as felling and logging, saw milling, merchandising procedures, etc., are important to attain efficiency and to lower cost in these phases of operations. New technology common in Europe and U.S.A. is beginning to enter the wood industry in India also. Particle boards, pressed fibre boards, plastic laminates and plywood plants are all producing high quality products from a low quality raw material and in case of veneer, the process will make valuable teak logs more valuable. The economics of adopting this type of technology and production processes should be explored thoroughly. The economics of untapped sources of forest products should be critically examined. Building of access roads and logging with helicopters are expensive but for high quality products, it may be economical to do so in the near future.

Watershed Studies

As an approach towards planning for a complex of resources, it is suggested that a pilot watershed be established. Since it is desirable that every public expenditure provides a marginal economic and social return at least as high as if the funds were spent in some other way, it would be prudent that funds spent in watershed development be a sound investment. Thus, benefit-cost analysis12 of potential watershed projects should be made to indicate if the ratio of benefits to costs justifies their activation.

The benefit would include such primary benefits as value of crops, forest products, flood protection, erosion control, wild life, recreation, electrical energy, navigation, etc., and the value of the secondary benefits, such as industrial development and such others, if it can be shown that they are the direct result of the development. The costs would include such considerations as value of land, labour and materials used in construction and operation of the project. Accurate and realistic estimates must be made to realize a meaningful benefit-cost analysis. Prices and technical coefficients are critical in the analysis. Prices used may logically be some estimate of the future period during which the benefits are being realized. The costs involved could be based on current levels since the project would be expected to be underway, if found feasible, in the near future. Realistic interest and discount rates must be selected to adjust all future benefits and costs to a comparable value basis.

The expected life of such projects will vary widely, depending on the physical conditions present, but the 50-year period used in the U.S.A. has proved to be too short for those conditions. The feasibility study of a particular watershed must not only establish the unquestionable need but the optimum size of development in order to be efficient in addition to the least cost of construction.

While the benefit-cost type of analysis is open to several criticisms, it does permit an orderly approach towards guiding land use development. It brings to bear on the problem many disciplines—agronomy, forestry, engineering, economics, etc., in designing a multiple use project which over time can prove to be a valuable asset to the region and the country.

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SOME ASPECTS OF FORESTRY DEVELOPMENT AND POLICY IN INDIA

T. R. GUPTA AND J. L. KAUL*

Department of Economics and Sociology
Punjab Agricultural University, Ludhiana

Ever since its origin, mankind has been constantly making an endeavour to solve its economic problems through the transformation of the natural resources at its disposal into usable goods. The problem, however, arises when such natural resources are indiscriminately used by man because of divergent economic interests of an individual from those of society. This calls for a policy to regulate their use. Exploitation of the forests is a part of this geneal problem. There was no clear cut policy in India as late as 1864 to guide the use and development of its forest wealth and consequently the forests in this country were subjected to a good deal of indiscriminate and uneconomic use. There are, however, some instances available prior to 1864 which, at times, are mistaken for a forest policy. We know, for example, that some kings in ancient India had executed plans for planting trees on both sides of the public highways or a medieval ruler had ordered for such plantations on both sides of a canal. Similar efforts were made by the British Government around 1800. The Forest Committee of 1805 for Madras is one such example. On the recommendations of this Committee the royalty rights over "teak" trees in the South were proclaimed and the need for construction of more forest roads was realized to tap the distant areas. Such actions do not speak of any appreciation of the true value of the forests and cannot be given the status of any scientific effort aimed at strengthening the forest resources.

The establishment in 1864 of a separate Forest Department under the Government of India and the efforts that followed are considered as the first serious attempt to check the early practice of exploiting the forest merely for obtaining supplies

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