

PRESIDENTIAL ADDRESS

Forests, People and Economics*

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I cannot adequately express my deep gratitude to the Members of the Indian Society of Agricultural Economics for so kindly electing me as the President for its Annual Conference this year. It is a tremendous honour for me. I have accepted it with humility and a prayer that I deserve the trust and confidence which you have so affectionately reposed in me.

Like all of you, I miss Professor V.M. Dandekar terribly, especially during this Conference. It is so sad that we shall no more have the benefit of his lively and lovable company and of his sage advice. He guided our Society with distinction and enhanced its stature.

ECONOMICS OF FORESTS VIS-A-VIS FORESTRY ECONOMICS

Forests in India may not be growing rapidly, but the literature on forests certainly is. Yet, the call of the forests proved irresistible to me in choosing the theme for my Address. I thought it was a good opportunity to take stock of the literature and see what sense I could make of it in understanding the forest problem as an economist. In what follows, I have posed the forest problem in terms of a broader study area of Economics of Forests, rather than in the narrow framework of conventional Forestry Economics. In doing this, I have also posed policy and research issues. Let me begin by describing how this Economics of Forests differs from Forestry Economics.

Forestry Economics assumes a single decision maker who would, in a top-down manner, plan and manage the forests. Economics of Forests, on the other hand, would have to recognise the fact that there are multiple users of forests, each with their own objectives and interests. To reconcile the conflict of interests, a participatory style of management rather than a top-down management would be needed. This means that while the assumed institutional framework of Forestry Economics was relatively simple, it is much more complex under Economics of Forests. Institutional issues would need more attention under the latter. Secondly, Forestry Economics originated in the Western countries where demand on the forests by local people was not an issue; Economics of Forests, on the other hand, has to address itself to issues relevant mainly in developing countries, particularly in the context of local pressures on the forests. Thirdly, Forestry Economics mostly dealt with a single product, viz., timber, but Economics of Forests has to contend with multiple products and services. Trade-offs and choice between them are its main concern. Fourthly, Forestry Economics is essentially concerned with marketed goods. Economics of Forests, in contrast, has also to reckon with non-market goods and services, as it encompasses environmental goods and services. Lastly, Forestry Economics assumed a fairly well defined single objective of Maximum Sustained Yield or Maximum Sustained Economic Yield. Economics

* Presidential Address delivered at the 55th Annual Conference of the Indian Society of Agricultural Economics held at Institute of Rural Management, Anand (Gujarat), on November 23, 1995.

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I am thankful to V.M. Rao, Sharachandra Lele and P.V. Shenoi for carefully going through an earlier draft and for their valuable comments. Weaknesses, if any, are mine.

of forests, alas, may not have such clarity and precision, as it has to deal with multiple objectives. Maximising social welfare could be its main objective, but it cannot be confined to the welfare of the present generation alone. Maximising the total economic value of all goods and services (including the environmental) could be another contender for being the main objective, with the valuation done from the point of both the present as well as future generations. This can be expected to be consistent with welfare maximisation too.

Under *Economics of Forests*, the forest problem can be taken to consist of mainly three aspects. The first is the problem of choice between alternative uses of forests in a context where each type of use is valued differently by different sets of interest groups. As such, it is not a purely economic problem but a political one too (Nadkarni, 1989, pp. 19-20). The second is a temporal one of increasing and maintaining the usefulness and productivity of forests over the long run, and of seeing that the present generation does not deprive the future generations of the same access to forest-based goods and services that the present generation has enjoyed. The third aspect is one of evolving a proper institutional framework to arrive at and carry out decisions made regarding the first two aspects. The three aspects are separated only for the convenience of analysis. In practice, all the three are closely intertwined. Whether and how far deforestation can be reversed depends ultimately on how these three aspects of the forest problem are resolved.

THE PROBLEM OF CHOICE

It is well known that forests have multiple functions that provide benefits at multiple levels. At the global level, it has the function of carbon uptake and sequestration, and of maintaining biodiversity. The latter is not a question of merely preserving wilderness for purely aesthetic or academic reasons, though sometimes it may be presented that way. If biodiversity is not conserved today, it may irreversibly foreclose future gain in welfare, including economic gain. For instance, the US National Cancer Institute is reported to have identified 3,000 plants that are active against cancer cells, 70 per cent of which come from rain forests (Munasinghe and McNeely, 1994, p. 5). It follows that conservation of biodiversity is not confined to conservation of some large mammals like tigers but "conservation of the entire spectrum of biodiversity, [including] apparently insignificant organisms, be they small herbs or wood rotting fungi" (Gadgil and Rao, 1994, p.2103). India is one of the few countries with a fantastic biodiversity, a rich heritage that needs protection. Forest ecosystems have certain unique non-substitutable functions in this respect, which man-made technologies cannot take over or take over only at an unaffordable cost. There are, for example, serious limits to *ex situ* conservation. In serving these functions, the forest ecosystems act as complementary to other ecosystems, and if the former are damaged the latter too suffer a loss. As such these 'unique' and non-substitutable benefits of forests are regarded as having the highest values among all their benefits by environmentalists (Damodaran, 1992, p. 7). The environmental role of forests is so important that the very survival - not to speak of welfare - of mankind may depend on it. This service of forests does not presently enter the market and is not valued in conventional economic terms. It tends, therefore, to be ignored.

At the national or regional levels, production of wood becomes a significant function of forests, and it is valued in conventional economic terms. To this may also be added minor forest produce collected in the forests and sold outside. Both major and minor market produce

enter the national income accounts, though a significant part of them - particularly minor forest produce - may escape reckoning. The larger economy of a country and its agents - pulp and paper mills, saw mills, timber merchants and so on - are primarily interested in the commercial use of forests. The larger economy also makes use of forest land for the exploitation of mineral ore often found under forests, thus causing deforestation; or for construction of dams involving submergence of forests; or even for resettlement of refugees requiring conversion of forests into agricultural lands or into urban settlements. It is pertinent to recall here Rao's apt remark: "These processes of the larger economy operate with little concern about the twin problems of poor environment and poor people in the areas from which they take out these resources" (Rao, 1988, p. 74).

At the local level there are various kinds of people who are interested in the other functions of forests - firewood gatherers, hunters, graziers, collectors of minor forest produce, and farmers who look upon forests as a source of inputs needed in agriculture like small timber for implements, fencing material, green manure and dry leaves for composting. Farmers and the landless also look upon forests as a source of land needed for extending cultivation. While these services can be individually appropriated at local levels, there are also collective services rendered by forests at the local or sub-regional level - maintaining soil quality and water balance, which are mainly in the form of positive externalities of forests (see Lele, 1994, p. 42 for a tabular presentation of different functions of forests at different levels).

Now, the problem with these goods or services is that they are not all jointly provided. Forests have positive externalities and to that extent some of the services go together with direct forest goods like timber. There is some degree of complementarity, but also a lot of scope for trade-off and choice. The most obvious case is one of extending cultivation into forests, thereby directly reducing other functions of the forests. There are also other cases. Maintaining forests only to conserve biodiversity in a natural state could very well reduce its commercial potential, something that developing countries may not be able to afford. Developing commercial monospecies plantations, on the other hand, will reduce not only biodiversity but also the forest's usefulness for the local people. Though conflicts between different local uses also exist, they are perhaps not as difficult to reconcile as the triangular conflict of interests between global, national and local levels.

The problem of choice or prioritisation between multiple functions of forests with different groups having different priorities for these functions could be viewed as a more generalised or extended version of the externality problem. Forests are characterised as having particularly conspicuous externalities (Dasgupta, 1982, pp. 6, 178). Deforestation causing floods and siltation of reservoirs is a typical instance of this forest externality. Externality involves a given decision-maker whose decisions affect others, and the costs or benefits from the point of the other party have to be evaluated. The concept of externality helps in the choice of specific projects each with its own identifiable externalities, and can be extended theoretically to the general problem of allocation of a resource among different alternative uses. In practice, it is easier to take project by project, and move to an overall optimal solution. Policy makers, however, have always felt the need to take an overall look and arrive at the broad principles of allocation and prioritisation.

The problem of prioritisation has baffled many experts on forestry and forests. They have changed their stand as their perception changed. An eminent example is that of Jack Westoby. He looked upon forestry and forest industries as a major plank for the attack on

under-development. He believed that they significantly contributed to national income, foreign exchange earnings and employment generation (Westoby, 1962). The National Commission on Agriculture in India 1976 (Government of India, 1976) was influenced by such a view and emphasised the role of forests in meeting the requirements of the national economy and the need for stepping up production from forests for commercial use.

A major assumption in the optimism regarding the role of forest industries in economic development was that forests would be exploited strictly on the basis of the sustained yield principle. This proved wrong in practice. Forests were devastated on account of government concessions to forest industries in the zeal for industrialisation, which had made forest raw material available to industries at much below the cost of regeneration. As such there was not much incentive for industries to invest in regeneration. The unsustainable exploitation of forest raw material dried up the sources of supply much sooner than expected by the forest industries themselves. This made the forest industries run below capacity, forcing them to hunt for raw material even from places thousands of kilometres away (Gadgil, 1989, pp. 15-18).

Furthermore, this exploitation (unsustainable or not) occurred at the cost of local needs and broader conservation functions of the forests. To raise new plantations, natural forests were clear-felled even in ecologically sensitive regions, such as on steep slopes. Such clear felling and lack of proper regeneration led to landslides, soil erosion, and siltation of rivers, reservoirs and tanks downstream. Local people were deprived of their biomass supply, and were also hit by reduction in employment in the informal sector that depended on minor forest produce.

This experience led to a more sober view regarding the role of forest industries and of commercial or industrial use of forests in the larger national economy. Completely retreating from his earlier stand, Westoby later observed: *"Just because the principal pre-occupation of the forest services in the underdeveloped world has been to help promote this miscalled forest and forest industry development, the much more important role which forestry could play in supporting agriculture and raising rural welfare has been either badly neglected or completely ignored. In precious few countries have the energies of the foresters been bent upon helping the peasant to develop the kind of forestry that would serve his material welfare"* (Westoby, 1978, reproduced in Westoby, 1987, p. 249).

But just how far should a government or a country go in using forest land to meet local needs? If the local communities are poor, their priorities should naturally get weightage from any government sensitive to distributional considerations. Even granting that the role of forests in meeting local needs is more crucial than meeting industrial needs, industries should also be able to meet their requirements. Moreover, what about conservation of biodiversity and of the environmental role of forests? Granting again that meeting local needs is environmentally far less destructive than commercial exploitation of forests, there could still be problems. The conflicts between locals and the Forest Department in the conservation of wild life sanctuaries is only one example. Another example is firewood. So long as the local use of firewood is for subsistence or 'for bonafide use' (as the Forest Department puts it), it may be within sustainable limits. Once the local people begin to extract firewood for sale to the outside market, it could cross these limits. Free grazing of livestock by local people is another contentious issue, as it may hinder the regeneration of trees. While local use may be quite consistent with conservation within limits particularly

when it is for meeting subsistence needs, demographic pressures and commercialisation may push local use beyond sustainable limits. How then do we resolve the problem of choice?

Policy Responses and Demarcation

Unlike the air and oceans, forests have one advantage in that it is possible to partition land under various uses to provide multiple goals and services. The traditional approach to the choice problem was demarcating areas for different purposes. This was the approach adopted by the British, and it continues to be the most practical.¹ The first Forest Policy Statement made in 1894, for example, classed the forest area under the following headings:

- (a) Forests, the preservation of which is essential on climatic or physical grounds;
- (b) Forests which afford a supply of valuable timbers for commercial purposes;
- (c) Minor forests and
- (d) Pasture Lands.

The first class of forests were to be on hill slopes and such other ecologically sensitive areas, whose protection would impart significant benefits to others through positive externalities. Though the second class of forests were meant largely for meeting commercial needs and raising revenues for the State, 'every reasonable facility' was to be afforded to local people to meet their needs of fuelwood, grass, manure, etc., from these forests. While extension of cultivation could be allowed where there is an 'effective demand for cultivable land', the Forest Policy of 1894 also asserted clearly that "*cultivation must not be allowed to so extend as to encroach upon the minimum area of forest which is needed in order to supply the general forest needs of the country, and the reasonable requirements, present and prospective of the neighbourhood in which it is situated. In many tracts cultivation is practically impossible without the assistance of forests, and it must not be allowed to destroy that upon which its existence depends*" (Lok Sabha Secretariat, 1985, para 7, p.49).

The minor forests and pasture lands were meant essentially for meeting local needs. All considerations of revenue from forests were to be subordinated to this objective. In making these forests meet local needs, the Policy stated, in a tone which sounds quite topical today, that "due regard must be had to the habits and wishes of local people". On the whole, the 1894 Forest Policy placed much greater emphasis on the fulfilment of the needs of the people than of other interests. Its approach continues to have relevance even today.

The two subsequent Forest Policy Statements of 1952 and 1988, made after Independence, have somewhat differed in their points of emphasis and priority. The 1952 Policy, for example, conceded that "village communities in the neighbourhood for forest will naturally make greater use of its products" but also warned that "such use, however, should in no event be permitted at the cost of national interests". It added: "The accident of a village being situated close to a forest does not prejudice the right of the country as a whole to receive the benefits of a national asset" (Lok Sabha Secretariat, 1985, para 7, p. 57). Consistent with this stand, independent India subordinated other uses of forests to the needs of the national economy even more than the earlier colonial Government. Both the local needs and conservation interests seemed to be pushed to the background, till this was sought to

be corrected by the 1988 Forest Policy. The new Policy of 1988 revised the priorities. It declared: "*The principal aim of Forest Policy must be to ensure environmental stability and maintenance of ecological balance including atmospheric equilibrium which are vital for sustenance of all life forms, human, animal and plant. The derivation of direct economic benefits must be subordinated to this principal aim*" (para 2.2).

It has also notably added that 'meeting the requirements of fuelwood, fodder, minor forest produce and small timber of the rural and tribal populations' is one of the basic objectives that should govern the National Forest Policy (para 2.1).

But commercial requirements could not be ignored either. The National Forest Policy of 1988 does recognise that 'wood is in short supply' (paras 4.3-4.5). It indicates three solutions to this problem. The first is a long-term solution in terms of increasing the productivity of forests. But such lands where sustainable commercial production can occur without reducing environmental benefits or depriving local communities may not be available on a large scale. Thus the National Forest Policy of 1988 suggests a second solution, viz., the 'establishment of a direct relationship between the factory and the individual who can grow the raw material by supporting individuals with inputs including credit, constant technical advice and finally harvesting and transport services' (para 4.9). This actually means dependence on forestry on farm lands or farm forestry for raising commercial wood, including pulpwood.

Farmers have no doubt shown an inclination towards growing commercial species like eucalyptus and casuarina which can be harvested in about eight years, but this experience has not been uniformly happy. Saxena has shown how farmers growing eucalyptus burnt their fingers due to a price crash and other uncertainties (Saxena, 1994 a). Farmers seem to have lost more in agriculturally fertile areas, where the opportunity cost of growing eucalyptus is high. In the semi-arid tracts where productivity of annual crops is low, tree growing can be more attractive as opportunity costs are low. Aziz's study, for example, showed that farmers in Karnataka's semi-arid tracts grew eucalyptus quite profitably (Aziz, 1995). However, it would be necessary to estimate how much farm land of low crop productivity is available and whether it would be enough to meet the requirements of forest based industries and also firewood. It is important to realise that most of the firewood raised is not for meeting local needs outside the market framework, but to meet fuelwood needs of the larger economy, very much within the market framework. Lops and tops may be collected for subsistence, but firewood is essentially sold - some legally and some through what the forest officers call 'smuggling'. If the needs of the larger economy are not met legally and sustainably in a planned manner, they are tried to be met illegally, unsustainably and in unplanned ways. Hence, the urgent research and policy issue is how and where to find land for raising this wood, and to see if marginal private farm lands would suffice for the purpose without having to devote some forest areas as well.

The National Forest Policy of 1988 also suggested a third solution to the problem of meeting wood demand in the larger economy, viz., by the substitution of wood (paras 4.3-4.5). This is already taking place in the case of railway sleepers, construction industry, furniture and panelling, etc. The Policy wants this trend to be strengthened not only in such areas but also in encouraging alternative sources of energy like biogas, liquefied petroleum gas and solar energy. The Policy also suggests the propagation of fuel-saving devices like fuel-efficient *chulhas* in villages and towns that use substantial amount of firewood. While

every effort should be made to economise on the use of wood, we should also be careful in choosing substitutes for it. I am not at all sure if, for example, it is environmentally more benign to use furniture made of aluminium or steel than wood. If the environmental costs of mining the ores and the high energy costs of making iron and steel and aluminium are taken into account, it may appear far more sustainable to use timber, which uses free solar energy and is also a renewable resource, unlike metals.

Limits of Conventional Economics

The broad policy statements indicated priorities no doubt, but do not seem to have quite succeeded in the task of reconciling conflicting interests. Is it possible to think in terms of an optimal allocation of land between agriculture and forests and between different uses of forests, reconciling the above interests? On the consumption side, neoclassical economics suggests a solution in terms of equating the ratios of marginal utilities from alternative uses over the prices of these uses so that the marginal utility from each rupee spent is equal in different uses. On the production side, marginal value product from each hectare of land in different uses will have to be equal. Then, according to neoclassical economics, under perfect competition and perfect information, the demand and supply prices for different goods and services will be equal to each other and the quantity of goods and services produced also will be equal to those demanded, with price acting as the equilibrator. If these principles were fair and workable, we could determine on the area to be kept under forests vis-a-vis agriculture, instead of relying on a rule-of-thumb criterion like allocating one-third of the geographical area to forests. We could also decide how much forest land can be allocated for meeting purely environmental services like conservation of biodiversity, how much for commercial needs like timber, how much for non-timber forest produce, and how much for meeting local needs of fuelwood, fodder and manure.

Where there is a clear market, the competition between different interest groups takes place through demand exerted on the commodity backed up by purchasing power. This allocation, however, may not be socially ideal on three counts: absence of perfect competition, unequal distribution of purchasing power, and missing markets in some socially valuable goods and services. The last is particularly relevant in the case of forests; what markets exist in the forest case cover only some users or beneficiaries but not all. The reconciliation between demands and scarce forest land takes place through a hybrid process of lobbying and purchasing.

In a situation where there is market demand for some of the forest goods and not for others, and if the allocation is left entirely to market forces, the outcome is predictable. Forest land in such a case would be allocated to produce only market goods and services; if not, at least highest priority would be given to such goods and services. The other goods and services will be treated as if having no value and ignored, unless there is a strong countervailing political pressure in favour of forests continuing to provide them.

Solution through Political Struggles?

When a market orientation has deprived local people of the benefits from forests, social protests have resulted, as happened in the case of the famous Chipko movement in the

Garhwal Himalayas. Growing monoculture plantations of pine or eucalyptus for the sake of profits has generally led to widespread resentment and even struggles. These struggles by local people on forest issues have been fairly well documented (Agarwal *et al.*, 1987; Guha, 1989; Nadkarni, 1989). They have been at times prolonged, at times sporadic, but have left their impact on forest policy. Local people's struggles have often been a corrective to market forces, even when they have not been under the banner of environmentalism but more as a defence of their own rights on the forests.

Is it then desirable to leave the allocation problem to active political struggles alone? These struggles no doubt have an important role to play in so far as they compensate for the missing markets in socially valuable goods and services. A group disadvantaged in the larger economy can improve its relative position through these struggles and the economy as a whole may attain a higher level of welfare. The struggles also give a signal to the policy maker to intervene. But a democracy should minimise rather than maximise the necessity for political struggles through institutionalising a balance of forces and achieving a reconciliation between conflicting interests. Too much of political strife is not conducive either to economic development or to social welfare in a democracy. Besides, it is misleading to take for granted that political struggles are always fought by the most deprived or fought in their interest alone. Political forces can act in the interests of the rich as much as market forces. The forest struggles in Uttara Kannada (North Kanara) district in Karnataka, for example, had a clear class base of the relatively richer arecanut garden owners, rather than that of the landless (Nadkarni, 1989). The new farmers' movements on price and related issues (in contrast to the earlier Peasant Movements) also have a class base among the middle and rich farmers, rather than among the landless and marginal farmers (Nadkarni, 1987). The struggles of tribals asserting their rights on the forests may not of course fall in this category. Nevertheless, a conscious policy and planning in favour of a reconciliation of conflicts with higher weightage for the preferences of the poor, is preferable to necessitating active political strife. This would need institutionalising political and economic processes which achieve a balance between opposing claims.

Relevance of Environmental Economics

The outcome of our discussion so far is that though in general both the market and political struggles may be unavoidable necessities, neither of them by themselves guarantees an efficient and fair allocation of forests that provide multiple benefits to multiple users. Can environmental economics help at least to some extent by giving an economic valuation of different uses, so that a more informed political judgement and perhaps even a consensus can be arrived at? It will have to remove all the three deficiencies of conventional economics named above, by correcting prices of natural resources depressed by the presence of monopsony, by giving more weightage to the valuation by poorer sections, and by bringing social values into reckoning where markets are missing. It may often be desirable for an environmental economist to come out with a range of values, based on alternative shadow prices, alternative choices in possible trade-offs, and alternative discount rates. Though final decision-making is in the realm of politics, the chances of achieving greater efficiency and justice are higher with such a help from economics. Needless to add that solutions of economics should be subject to scrutiny and debate.

In the last one decade or two, significant progress has been made in developing techniques of economic valuation of non-market environmental goods and services. This has enabled an economic appraisal of alternatives, which could be applied to forests as well. A detailed review of methods and concepts used in the valuation of natural resources is available from Markandya (1992, pp. 142-166), Kuik *et al.* (1992), Smith (1993), Murty and Menkhaus (1994), Munasinghe (1994, pp. 15-49) and others. The total economic value of a resource has two components - *use value* and *non-use value*. Use values consist of direct use value, the indirect use value and the option value or potential use value. The *direct use values* of the forests cover firewood, fodder, timber, non-timber forest produce, and recreation value. The indirect use values cover the ecological functions of forests such as soil conservation, flood control, helping recharge of groundwater and carbon sequestration. However, use value at present alone does not do justice to use value in future. For the latter, we need to take into account option value which is the present willingness to pay for the opportunity in future to choose among alternative uses. In the case of the forests, biodiversity has such an option value. Finally, considering use value alone - whether present or future - amounts to ignoring the satisfaction people derive from the feeling that a natural resource continues to exist irrespective of whether they derive even recreation value out of it. For this, we need to estimate the existence value, which is a non-use value. Wildlife sanctuaries, natural habitats, wilderness, endangered species have existence values for a person who has no intention of making use of them in any way. Being components of total economic value, these values are additive but the economic analyst should be cautious about the possibility of substitution between uses and of double inclusion.

It is necessary to recall here that valuation can differ depending upon the parties involved. Whose values do we take for valuation? This problem can be overcome by valuing a forest product or service as per the maximum value that it gets among the different parties, much as in the case of the market where pricing is decided through competitive bidding. Assuming, for example, that non-use value of a forest merely for its existence is zero for the industrialist and local people, it can still be assigned a value from the national and global viewpoint. Taking the maximum value is relevant also from the point of view of its potential for compensating another party whose value is sacrificed. Such a compensation is possible only if the sacrificed value is smaller than the value which is selected for use. This should be clear from some case studies which I shall describe a little later. These values can be estimated using any of the following methods depending on their suitability, based on (a) direct market prices and other market information; (b) opportunity costs; (c) cost of travel involved in availing of the good or service; (d) the estimation of the externality involved through valuation of the resulting increase in output in positive externality; or, as in the case of negative externality, valuation of loss of output or estimation of preventive or corrective expenditure; and (e) stated preferences in hypothetical markets, through what is known as the contingent valuation method.

An explanation and appraisal of the valuation methods need not detain us, as it has been done in the review papers cited above. I would only like to state here that the government's objective in respect of forests is to obtain allocation of land in such a way that its total economic value is maximised, and not its commercial value. I proceed now to take certain illustrative studies and see how they help in the solution of the choice problem of the forests.

A pioneering attempt is by Jodha who estimated the dependence of local people on

common property resources (CPRs) in India and showed how critically important these resources are, particularly for the poor people (Jodha, 1986, 1990). Though he took into account mainly the direct use values, and not indirect use values like soil conservation and recharge of groundwater, the value of income from CPRs was found to be significant. Jodha's studies on CPRs immediately brought into limelight a natural resource neglected only because people depended on it in a non-market framework. Resources regarded as wastelands and subjected to encroachments and conversion to cultivated land, came to be seen in a new light, and acquired an extra weightage vis-a-vis agricultural lands. It is not that the problem of CPRs is solved now, but Jodha turned the attention of academics and policy makers to it as never before.

We know that extension of cultivation has taken place in India at the expense of CPRs and the forests, which accounts for the bulk of the area lost to forests. As per the data in the *FAO Production Year Book* for 1992, India ranks second in the world in the extent of cultivated land as a proportion of geographical area, which was 57.1 per cent, including the area under permanent crops. The first rank goes to Bangladesh with 69.5 per cent of the area under cultivation, while the world average is only 11 per cent. Even a country with a comparably high density of population like Japan has 67 per cent of its area under forests, as against India's 23 per cent and the world's figure of 29.7 per cent as per the same source. This is by way of comparison with other countries. But it should also be possible to show that the extension of cultivation in India has gone beyond the socially desirable optimum point in terms of its own internal economics. Is economic value of direct goods and indirect services performed by forests at the margin higher or lower than that of agriculture?

Lal's work should be of use in this regard. He made an ambitious attempt to estimate the total economic value of the annual flow of goods and environmental services from India's forests (Lal, 1992), or 'annual rental value' as he calls it. He puts it at Rs. 79,550 crores or Rs. 12,391 per hectare of area under forests, presumably at 1987-88 prices. Incidentally, the contribution of forest produce - timber and minor forest produce - amounted to only 1.2 per cent of gross domestic product (GDP). The difference is because of the valuation of environmental services and option value of biodiversity. Thus the composition of the annual rental value from forests, as estimated by Lal, is as follows: timber and firewood 16.2 per cent, minor forest produce 1.4 per cent, grazing 2.8 per cent, environmental services other than recreation and harbouring biodiversity 71.2 per cent, biodiversity 8.3 per cent, and recreation 0.1 per cent.

There is a certain amount of arbitrariness in all such attempts, and Lal may not be free from it. He has not made use of the Contingent Valuation Method to estimate option value and existence value. Instead, he uses some plausible parameters. For example, he assumes that the country is willing to pay 10 per cent of its savings as a risk premium for conserving biodiversity to avoid the risk of not having something which we may want in future. Using earlier estimates of Kaul (1973) for organic productivity of forests and assuming a price of Rs. 1,063 per ton for this production, he has valued environmental services.

A subsequent attempt by Kaichan Chopra also comes close to Lal's estimate. She has estimated the value of non-timber goods and services from tropical deciduous forests, which includes fuelwood, fodder, minor forest produce, services like soil conservation and nutrient recycling and recreation, option value and existence value. Their annual flow at 10 per cent would be Rs. 12,106 at the minimum and Rs. 19,987 at the maximum (Chopra, 1993, p.

256). Lal's estimate of Rs. 12,391 per hectare falls within this range.

What I find interesting about such estimates of the value of annual flow of goods and services from forests per hectare is that it is possible to compare them with the annual productivity and value added per hectare in agriculture. Taking the average for three years centered around 1987-88 (so as to correct for fluctuations), the value of output per hectare from agriculture and livestock turned out to be Rs. 8,117 and the net domestic product (NDP) from this sector per hectare was Rs. 5,871 at current prices for the country as a whole. Both these figures are much lower than Lal's estimate of annual rental value from forests at Rs. 12,391 per hectare. This would clearly show that the proportion of area under agriculture has extended much beyond optimum, and that there are many areas in the country which ought to have been under forests but are under cultivation such as steep hill slopes.

I should clarify that agriculture and livestock come out unfavourably in comparison with forests only in terms of the total value of forests including environmental services. The output of timber and minor forest produce from forests which goes into national income accounting, on the other hand, was only Rs. 1,039 per hectare of area under forests, and NDP from forests was still lower at Rs. 917 per hectare during the same three years at current prices, both of which are much lower than the corresponding figures for agriculture and livestock. These figures are at a highly aggregated level, of course, but nevertheless indicate the situation on the whole, as well as the dilemmas and problems facing us.

If the contribution of the commercial forestry sector to GDP is insignificant, the picture is not any better in terms of employment generated. The Appendix Table presents proportions of workers engaged in the forestry sector as their main economic activity to total main workers in the country as a whole and also in some of the districts of the country where forests are dominant. The data are presented for three Census years - 1961, 1971 and 1981. It is quite likely that those engaged in illicit logging and trade do not report employment in the sector, and to that extent the figures are under-estimated. Workers engaged in the forestry sector as their marginal activity are not included here as the concerned data were not available, though probably forests generate mainly marginal rather than main employment. But their importance consists in supporting employment in agriculture by complementing it, and not in direct employment within the forestry sector itself. This is so even in the forest dominant districts. In a district like Nainital, the importance of forests as a source of direct main employment has declined sharply over the years.

The important fact that comes out of this is that a higher proportion of area under forests than at present is justified mainly on account of total value including especially environmental services, and not so much in terms of financial returns from timber or employment generated in the commercial forestry sector. When there is a divergence between private economic returns and social value, the problem has to be tackled from both angles - creating new economic incentives in the form of an economic stake in non-timber goods and services as well as through regulation. The attempt till recent years has been through legislation and regulation. The most important legislation in this regard is the Forest Conservation Act, 1980, which prohibits the conversion of forest lands for non-forestry purposes unless it is specifically approved by the Central Government. The Act is said to have been instrumental in reducing the diversion of forest lands from the earlier rate of 0.15 million hectares annually

to only 16,000 hectares in the post-1980 period (Government of India, 1991). While regulation would continue to be essential, it is not adequate by itself and needs to be supplemented by economic incentives and proper institution building.

Role of Compensatory Payments

Before we go into economic incentives within a country for local communities, it is necessary to realise that developing countries like India need such incentives from the world at large particularly from the richer countries, to conserve forests rich in biodiversity. Conserving biodiversity has significant opportunity costs especially in a land-hungry country where the pressure on forests for cultivating them for agriculture continues. In spite of this, countries like India have taken steps to restrain conversion of forests, hardly a popular measure. These countries and the affected local people have to be compensated adequately. This is particularly so because there is no reward in the market for conserving biodiversity, while there are rich rewards for developing new patented products based on the biodiversity conserved. One of the tasks of research in countries like India is to calculate what cost, including opportunity costs, we have to bear in maintaining protected areas such as the Biosphere Reserves, and what compensatory payments have to be made to the people.

An attempt by Ruitenbeek to estimate a 'rainforest supply price' (RSP) of Korup National Park in Cameroon, Africa, is interesting here (Ruitenbeek, 1992). This is to decide whether and what sum of international resources should be transferred to the host country having the forest to give it an incentive to protect it. The estimation is done in terms of social cost-benefit analysis of the conservation project to protect Korup from increased land use pressure. The basis of RSP is the principle that the net present value (NPV) of the compensation to the host country must be adequate to offset the NPV of any net losses associated with the conservation project. Korup is the oldest remaining rainforest in Africa, having survived some 60 million years. Without conservation, it is feared that normal exploitation of forest resources would result eventually in the elimination of the primary forest. The National Park envisages protection to both trees and animals.

The social costs of the project cover capital costs, operational costs of protecting, lost timber value due to prevention of logging and other forest uses lost. The NPV of total costs amounted to 5,051 million Cameroon francs. The project generated local benefits too, which totalled 3,199 million Cameroon francs. The major benefits are in terms of fisheries protection, flood control, soil fertility maintenance and tourism. The value of fish protected by conservation accounted for as much as 55 per cent of the total benefits. The NPV of social cost exceeded NPV of social benefits by 1,852 million Cameroon francs. The supply price was estimated at 3,605 Cameroon francs per hectare per year, which amounted to 1,060 European Currency Units per sq.km per year. Though in principle, the supply price has to be a one time lumpsum transfer, it was expressed as an annual rental payment per hectare. The transfer, in practice, could be a combination of both capital transfer and ongoing transfer. The author observes that his estimate of supply price is within a range that international conservation interests are willing to mobilise. This is an instance of divergence between global valuation of a resource and its national valuation being bridged through an economic incentive.

Such compensatory payments to local people may be necessary within countries both in

the case of conservation and in commercial plantations if they have to forego the benefits of forest use as a result of these projects. Such compensation may be in the form of cash transfers or extra benefits, and in appropriate cases resettlement and rehabilitation of local people. It is needless to emphasise that the compensatory measures have to be effective and have to reach the targets intended. It is no use merely spending the money meant for compensation in a way that breeds pilferage and leakages into wrong hands. If, however, the country can effectively handle this job and local people are no worse off, or, more desirably, are better off, as a result of the project including its compensatory measures, the project can be instrumental in raising the general well being of the society. This is possible if a project is viable in terms of a social benefit-cost analysis after taking into account compensatory payments to local people.

In this context, an economic analysis of Keoladeo National Park, Bharatpur, by Murty and Menkhaus (1994) should be interesting. This is a case of wildlife protection for which there is both domestic and international willingness to pay. There are also recreation benefits to tourists. Though some of the benefits of tourism development accrue to locals in terms of employment and income generated thereby, there are substantial income losses to them in terms of the benefits foregone. While the tourists belong to higher income groups, the locals who suffer a loss in income are quite poor. There is thus an equity consideration requiring differential weightage to incomes accruing to different income categories. The authors found that the project has positive net present benefits if equity considerations are ignored, but negative net present social benefits when adverse effects on income distribution are taken into account. If, however, willingness to pay for recreation and non-use values is encashed and even if 50 per cent of net values are transferred to local communities, then the project has significant positive net social benefit. The authors suggest increased user charges and gate fees for visitors, a wildlife protection tax on domestic nationals, and fund-raising through non-governmental organisations (NGOs). It is important to note that it is not enough if a project is justified in terms of a hypothetical willingness to pay; it should also be possible to encash this willingness to compensate the losers.

ROLE OF COMPLEMENTARITIES

The choice problem can be considerably eased, if not completely avoided or solved, by increasing the scope for complementarities between different uses of forests. This could even raise the total value of a forest, and generate important social and economic gains too because complementarities create economic stakes in more than one use. Competing interest groups need not be totally excluded from each other, and the costs of exclusion need not be incurred. For example, taking a forest to be conserved mainly for biodiversity and wildlife, tribals living in such a forest need not be ousted from them if their needs can be met without reducing the environmental value of the forest, and if their services can be used in protecting the forests. Conservation and peoples' needs can both be accommodated in a forest where greater attention is given to wild fruits, nuts, grasses, leaves and other minor forest products (MFPs) than to timber alone. Gupta and Guleria emphasised the importance of MFPs both in conservation and generation of employment long back (Gupta and Guleria, 1982). Chambers *et al.* have pleaded with great force that 'scientific forestry' should henceforth mean that such MFPs became the main intended products from government forest lands and

timber a by-product from large trees like tamarind, jack and sal. Apart from helping conservation, such a policy could step up income and employment generation to the poor and so reduce poverty (Chambers *et al.*, 1989, p. 207). This raises the economic stake of the people in conservation, making them friends rather than enemies of forests.

Similar complementarities could be sought and strengthened between commercial plantations and local needs, by increasing the output that could go to the local people meeting their fuel requirements. This needs proper selection of trees which can accommodate both needs in consultation with the local people. In the course of my field work in Karnataka, I found tremendous bitterness among local people about captive plantations of paper mills which had grown pine trees. People felt totally deprived because they were using these lands earlier for grazing and fuelwood collection. Productivity in terms of timber value may be optimised by growing pine, but the value of social benefits is significantly reduced. There is no scope for compensating the losers in such an arrangement. At least government lands, including those leased out to paper and pulp mills, should aim at optimising net social benefit rather than net commercial return and include a provision for compensation in the form of biomass supply needed by the locals.

One of the most conspicuous cases of complementarity is between forests and agriculture. If it is strengthened, the local community develops a stake in the preservation of forests, which can deter individual attempts at encroachments. Traditional agroforestry patterns are a reflection of farmers' own perception of complementarity between trees and crops. Vishwa Ballabh and Saxena have shown how these agroforestry patterns have strong linkages between trees and crops (Ballabh and Saxena, 1991, 1992; Deshpande and Nikumbh, 1991). The issue of complementarity between forests and agriculture is wider than that between trees and crops. To enrich this complementarity, forests should have more of such produce as are useful to farmers, such as trees producing fodder, green manure and wood for agricultural implements and fuel. I will not elaborate on the significance of this complementarity further, as I have done it earlier (Nadkarni *et al.*, 1989, Part II; Nadkarni and Pasha, 1992).

There is a special case of complementarity between agriculture and forestry in shifting cultivation or *jhum* or *podu* in hill areas. The general feeling is that shifting cultivation is environmentally unsustainable and is good neither for agriculture nor forestry. Much depends, however, on the nature of practices in shifting cultivation and particularly the length of *jhum* cycles. Scholars like Ramakrishnan have pointed out that cycles of ten years and longer are environmentally sustainable and economically viable, but not cycles of shorter duration (Ramakrishnan, 1992, pp. 33-36). Unfortunately, in actual fact, the cycles have come down now to an average of four to five years and in some extreme cases even zero years (Ramakrishnan, 1992, pp. 14, 366). Long cycles of ten years and above permitted proper nutrient recycling, cultivation of a wide diversity of crops, and also forest growth during fallow periods. On the contrary, short cycles bring down yields and also prevent forest growth, with only weeds like *cupatorium* growing in fallow periods. Some of the alternatives suggested for converting shifting into permanent cultivation like terrace cultivation are relatively quite costly and do not yield as much return as shifting cultivation (Ninan, 1992; Ramakrishnan, 1992).

The variation within the *jhum* system offers scope for identification of high yielding and sustainable practices and their transfer from one tribal community to another, provided a reasonable cycle length is ensured. An alternative in terms of home gardens that are already

found in north-eastern India, which have a mixture of annuals and perennials forming a multistoreyed structure and resembling a natural forest, seems attractive (Ramakrishnan, 1992, pp. 44, 56). Since a ten-year jhum cycle cannot be sustained due to continuing population pressure, it is necessary to find ways of redeveloping jhum and making it viable even with shorter cycles of four to five years. This seems to be possible with the adoption of agroforestry schemes. Introducing appropriate trees, which will be kept and not slashed and burnt, amidst seasonal or annual crops can improve sustainability of the system. Such trees should have narrow crowns, be useful to the farmers and implant nitrogen into the soil. Of the several species identified, Nepalese alder has been found acceptable to farmers in this regard (Ramakrishnan, 1992, p. 371). With the co-operation of local people and using their ingenuity, it should not be too difficult to resolve conflicts between cultivation and forests in hill areas.

Problem of Sustainability

The problem of choice also incorporates the temporal problem of sustainable use of forest, since the need for conservation is a part of the choice problem and conservation orientation in itself contributes to sustainable use. The sustainability issue arises specifically in the forests which are oriented to timber and to meeting local needs. Such forests meant for exploitation by man have to be consciously managed to ensure sustainable use. It is not surprising, therefore, that the concept of sustained yield got associated primarily with timber-oriented forests, but it can be extended to forests meant for local use as well. 'Sustained yield' is a forest management concept evolved to obtain sustainable use of forests exploited by man so that there is no reckless exploitation leading to the erosion of the capital stock of forest. An erosion of the capital stock would result in reducing the flow of yield from forests. To avoid this, management of forests had to ensure that the annual cut did not exceed the annual increment in forests and that the annual increment itself did not decline over the years. The concept was evolved first in Germany and was applied widely both in developed and developing countries. The official definition of the concept as adopted in the United States is quite useful, viz. "*Sustained yield of the several products and services means the achievement and maintenance in perpetuity of high level annual or regular periodic output of the various renewable resources without impairment of the productivity of the land*" (as quoted in Clawson and Sedjo, 1984, p. 3).

The system as evolved in Germany involved cutting trees which were mature, with the land there restored to forests. Equal areas were put in each age class, so that annual cutting was equal and continued in perpetuity. The age distribution of trees was so planned as to achieve this sustained yield. The concept is relevant to developing countries in so far as there is already some land allotted primarily for meeting the needs of timber, fuelwood and even minor forest produce. If it is interpreted to allow clear-felling of natural forests to raise forests to meet the above needs and then ensuring sustained yield from these forests, it would directly conflict with the needs of conservation and the function of forests in providing positive externalities.

The concept of sustained yield soon gave way to the concept of optimal rotation of forests. The first step in this direction was sharpening of the concept of sustained yield to mean maximum sustained yield per unit of time. The yield was taken either in terms of volume

of timber, or, more usually in value terms after deducting expected maintenance and harvesting costs. Maximum sustained yield is achieved when marginal yield equals average yield per unit of time, a point that is reached earlier than the top hill point of the production function. This is particularly so when yield is measured in value terms. After a few initial years, timber output in value terms increases at an increasing rate and also at a higher rate than in physical terms, but after some time increases at a rapidly diminishing rate and then stops increasing. For the same reason, maximum sustained yield in value terms indicates a little shorter rotation period than that in terms of physical volume.

Maximum sustained yield even in value terms is only a first approximation to economically optimal rotation. A further step towards this is by taking the rate of interest into account and comparing it with the rate of growth in stumpage value. The optimum rotation is reached when the two are just equal, with the rate of growth in stumpage value becoming lower than the interest rate thereafter. This point is usually, if not necessarily, reached earlier than the optimum rotation in terms of maximum sustained yield per unit of time. A further refinement is to determine optimum rotation with successive crops, by taking into account the opportunity cost of land. This point is reached earlier than the optimum in terms of a single crop.³

This economics of sustained yield and optimal rotation, however, need not necessarily ensure sustainable use of land. This is particularly so if the optimal rotations are so shortened for each succession of crops that the soils get exhausted and productivity is reduced. But successive crops are taken in agriculture too, and with prudent practices, nutrition supplement and with some rotational fallowing, sustainability can be ensured in forests as much as in agriculture. Probably mixed species of trees would be more congenial to sustainability than monoculture plantations.

Attention could be given to positive externalities generated by timber plantations which could be valued and incorporated into the estimation of net yields. I am not sure about the direction of environmental implications of shortened rotation periods following economic considerations, apart from the impact on soil productivity. For example, does shortened rotation have an adverse effect on wildlife, such as birds? On water flow in the neighbourhood areas? If sustained yield is to refer to total economic yield including environmental benefits, these questions also have to be addressed at least in the case of government forests.

It is interesting that the question of sustainability of forest use cannot be separated from the choice problem. The benefits whose flow is sought to be maintained undiminished or possibly maximised, accrue to different users who have different choices of what needs to be sustained (Lele, 1994, p. 42). Focusing on sustained yield of timber may benefit one user, but not necessarily others, and may be appropriate in private lands. In the case of public lands, it is the total benefits to the society which need to be sustained at the maximum possible level. The government need not be bound by commercial profitability alone even in lands allotted to timber production.

INSTITUTIONAL ISSUES

This takes us to the third aspect of the forest problem, namely, the institutional aspect. The major issue here, regarding the ownership of forest lands, is fortunately settled in India. Historically, the forests have been owned by the state. Even during the days of Kautilya's *Arthashastra*, (end of 4th Century BC), the state was responsible for the proper upkeep and

development of forests, of which it was the sole owner (Dasgupta, 1993, p.30). Local communities may have used them, since the kings allowed it with certain reservations. If someone wanted to clear forest land for cultivation, it had to be with the king's permission.⁴ This is as it ought to be. *If the main function of forests is recognised as the provider of environmental goods and services*, as in the National Forest Policy of 1988, then the forests acquire the characteristics of a public good. Their main services, namely environmental, are indivisible, non-rival and non-excludable. And since they are also of utmost importance for the survival of mankind, the ownership of such a good cannot be left to the caprice of a private individual or corporation or even a local community. No doubt, the forests also provide private goods but this capacity can be accommodated within the framework of public ownership, while the capacity to provide public good cannot be so easily accommodated within the framework of private ownership.

It could be argued that the state ownership and control over forests have not ensured their conservation in the past. The Forest Department in India was, for example, almost swept off its feet during the Second World War and thereafter by the unprecedented demand from industries as well as from the growing population both in the larger and the local economy. But the damage to the forests here was not due to state control; it was rather due to the fact that it was not allowed to be exercised. Romm has aptly observed: "Historically, the fate of forests has been determined by forces other than conscious decisions about how forests are or should be used.... The forests have fragmented when social pressures to evade or modify government authority exceeded government powers to control them; they have remained intact when government powers over forest lands were unambiguous" (Romm, 1986, p.85).

It is, therefore, important to make proper constitutional or legislative provisions to ensure that the forests are safeguarded from both populist and market pressures. Since such pressures are typically exerted at the local and regional levels, it is only proper that a legislation like the Forest Conservation Act, 1980 was enacted giving the Central Government a decisive say in the issue of diverting forest lands to other uses. In the interest of the environment and the future, this power of the Central Government should not be diluted. The idea is not to undermine the authority of the State Governments, but to ensure that the forests are not diverted easily without a rigorous appraisal.

As the National Forest Policy of 1988 implies and as advocated by experts like Saxena (1994 b) and others, the commercial production of wood can be left mainly to private farmers. While private farmers should have the choice to produce, sell and transport wood, supplementing it with wood from government forests may be required to some extent. Since government forests should not be exploited on commercial lines and have to take note of externalities as argued earlier, farmers can in fact achieve higher productivity at lower cost. However, they should not face unfair competition from the government in the form of sale of wood to private industry at concessional or subsidised prices. The government also should not lease out its forests or forest land to private industries for commercial plantations, except where large tracts of ravine, saline or desert lands are available for development. Lands with sparse tree cover but used by people for grazing purposes should in no case be brought under such contractual arrangements with private industry. Such lands are best left to management by people themselves jointly with the Forest Department.

Though the state should have the ownership of forests for the reasons argued above, the

forests produce a lot of private goods which are appropriated by the local people. There has to be an institutional mechanism whereby these private goods are sustainably exploited by the people. People have traditionally enjoyed access to government forests including the reserve forests, but they were alienated from the management of forests. This resulted in a "Tragedy of the Commons" of the type described by Hardin (1968). Giving a stake to people in the sustainable use of forests and involving them in their management could avert this tragedy. This is now a widely acknowledged principle, and Joint Forest Management (JFM) is already in operation in most of the states in India.

JFM is not just one more scheme, but a new organising principle. The land still belongs to the Forest Department, as it should, but people share the forest produce - both major and minor - and participate in management. Giving people minor forest produce alone would confine JFM to areas where such produce is abundant; in general, people also need a share in the major produce. This would give them incentive to bring degraded lands under forest cover. It is crucial to the success of JFM to involve people from the planning stage itself and in the choice of the species and to give some scope for grazing land and not to trees alone. It is too early to judge the success of JFM, since the circular to launch it was released by the Central government to the states only in June 1990. Of course, JFM was initiated in West Bengal a few years earlier, and there are already many examples of success particularly in West Bengal and also elsewhere to some extent.

Management of forests by local people is not new in India. A study of Van Panchayats in Uttar Pradesh (U.P.) by Vishwa Ballabh and Katar Singh is interesting in this regard. Informal management by people may have prevailed in the distant past but it disappeared in the wake of the British take over. Van Panchayats which were constituted in U.P. since about 1930s can be considered as an attempt to revive people's management. By 1985, as many as 4,058 of them existed in the state (Ballabh and Singh, 1988, p. 6). Most of them could effectively prevent encroachment through informal measures, but encroachment did occur in a few cases. They have also been fairly effective in regulating resource use to prevent unsustainable exploitation. Their experience indicates that one can be at least cautiously optimistic about the success of JFM.

It would be sad if JFM ends up merely creating a few showpieces here and there instead of launching a widespread movement for sustainable use of forests. I have often noticed, in the course of my field work, examples of people's management where they have merely diverted grazing pressure and extraction of fuelwood to nearby reserve forests while land under their management is protected and scarcely used. The effort should rather be directed to sustainably meet the needs of the people within the limits of the forest area taken up for management. As a matter of general principle, all the areas expected to face peoples' pressure can be brought under JFM provided that the Village Forest Committee finds it feasible to manage it for sustainable use. Taking only parts of areas needed exposes other areas to unsustainable use.

Should all or any type of forest land be brought under JFM? Broadly, wherever local people are willing to form a Village Forest Committee to manage a given area of forests under JFM, they should be encouraged to do so. But there are problems in extending it to all areas. Forests meant mainly for environmental services cannot bear too much pressure of exploitation to meet local needs. Sustainable use in their case requires more stringent requirements of conservation than in forests meant mainly for meeting local needs. In the

latter, and in general, sustainability requires only that harvests do not exceed productivity, and that productivity is not impaired over time. Subject to this constraint, harvests can be tried to be maximised. In the case of national parks and reserved forests, however, a more stringent concept of sustainability is needed. It is not merely the productivity of goods needed for local needs but, more important, the production of all environmental services that needs to be conserved. Such a goal may need minimum necessary, and not maximum, exploitation of forests for meeting the local needs; harvesting here has to be quite below the level of annual increment. Village communities may hardly be inclined to accept such stringent requirements. Even if there are a few instances where village communities have protected and conserved such forests (such as the sacred groves), we can hardly generalise from this. Most of the earlier sacred groves are in a sad state today. It was necessary to dwell on this point, because the Draft Forest Bill has excluded Reserve Forests from the lands which could be brought under the management of village communities, and there have been protests against this proposal (see Hiremath *et al.*, 1995). While there need be no blanket ban on Reserved Forests being brought under village management, there is an obvious case for caution. Reserve forests that are not so critical for environmental conservation, have a good potential for production of private goods, and are in the vicinity of human settlements that require these goods, may be converted to village forests, subject to their sustainable use and management.

We cannot take for granted that once the forests are handed over to the people for management, they will be used sustainably. In the earlier days, this was easier for people because they did not have to cope with the pressures of commercialisation and population as much as now. Fears are expressed whether under the continuation of these pressures, JFM may break down and lapse into open access regimes. However, JFM is a better model than one of exclusive management by people, because the Forest Department can, as a partner with people, act as a watchdog on the sustainability of forest use under JFM. The Draft Forest Bill rightly provides for a mechanism to wind up the Village Forest Committee and enable the Forest Department to take over the concerned forest when there is unsustainable use of and encroachments into the forest. The concepts of 'Sustainable Use' and 'Carrying Capacity' mentioned in the Draft Bill may not be precise, and there are difficulties particularly with the latter. However, as a wag has put it, it is better to be imprecisely correct than be precisely wrong. Certain precautions can be taken to avoid arbitrary action, but there should certainly be a provision for mechanism to warn against and prevent misuse.

I must also add that the interaction of local people with the forests may not necessarily and always have a negative environmental impact. An activity like grazing cattle can limit growth of grass and add nutrients into the forest soil in the form of dung droppings. The tendency of some local people to cause fires in forests to stimulate growth of grass can also control weeds and open forest canopy for new growth of trees. But the beneficial effect is likely only when these activities are carried out in sustainable ways and with careful planning. This needs involvement of people, who should shoulder the responsibility of protecting the forests in their own long-term interests. Good relations with local people and their help are necessary also in checking smuggling and poaching. Prevention of these illegal activities is taking a heavy toll of forest personnel and resources. Enlisting people's co-operation for the purpose and rewarding them for help may be more economical. Even if JFM is confined to village forests, some institutional form for involving people in protecting other forests as

well is necessary along with a reward for their efforts and sacrifice.

The concept of JFM represents a hybrid property rights regime. Ciriacy-Wantrup and Bishop (1975) distinguished between four basic regimes: State property, common property, private property and open access. JFM is a combination of the first two. While members have a right to exclude people from other villages and to a share of forest produce and its benefits, the government reserves the right of ownership and retains the authority to exclude certain land uses like cultivation and to control the disposal of certain products like timber. The bundle of property rights belongs exclusively neither to the government nor to members, but is distributed between the two. It is an interesting experiment in social engineering, and economists would find it exciting to study factors determining the success and failure of JFM, the relative advantages and weaknesses of this hybrid regime compared to pure state ownership and purely peoples' collective management; what objectives and incentives guide decision-making; how forests would be allocated among alternative uses; how the Village Forest Committees would ensure sustainable use; how they would determine the optimum size of forest to be managed and also the size of user-group; whether and under what incentives they would undertake regeneration of wastelands; how they would resolve possible tensions between the state and local needs, and so on. Economics of forests and institutional economics in India would get enriched in the process and can generate lessons to be learnt by other countries with similar problems.

I have not dealt with social forestry projects separately but they can be clubbed together with JFM for our purpose. While JFM is initiated in forest areas, social forestry projects were undertaken mostly in what were earlier revenue lands used for grazing livestock. In most of the cases, at least in Karnataka, social forestry projects have been managed by the Forest Department itself rather than by local people. Consistency requires that the principles followed in JFM are followed here too. Social forestry projects particularly need to give a proper priority to raising fodder as per the wish of the people, avoiding an obsession with trees.

To conclude this section, we are left mainly with three institutions for managing forests: (a) purely under government ownership and management, but with some participation of people wherever feasible, as in the case of national parks, wildlife sanctuaries and ecologically fragile but rich reserved forests maintained mainly for environmental considerations; (b) farm forestry in private agricultural lands or in government lands leased to private farmers to produce timber and fuelwood for sale to the larger economy; and (c) JFM and social forestry projects mainly under people's collective management. While the primary purpose of the last is to meet local biomass needs, wastelands regenerated with people's co-operation may also involve species of commercial value, with a provision to share the proceeds with people on their harvesting. These institutions will have to co-exist with each other. (A fourth type is where government land is leased to private industry for growing commercial species. This is not likely to be politically acceptable due to its high social costs.) A major policy issue in the future would be how to allocate forests under different institutions consistent with the multiple objectives which forests have to serve. The answer may depend partly on the success of JFM.

PROSPECTS IN THE COURSE OF ECONOMIC DEVELOPMENT

How do we envisage the nature and magnitude of interaction between local people and forests in the course of economic development? I think the picture is not very clear and needs more research. At a higher level of economic development, the demand for environmental and recreational services of forests is expected to increase, and the demand for meeting local biomass to decline. This is consistent with the hypothesis of environmental transition, in support of which there is some evidence now. The concern for forests (and in general for environment) is seen to decline with economic growth at low income levels, but increases as income grows (Shafik and Bandyopadhyay, 1992; Antle and Heidebrink, 1995). But there is nothing automatic about this transition. In any case, we seem to be as yet far behind that stage. This is particularly because economic development in nonagricultural sectors is not rapid enough to absorb the significant number of workers and reduce their dependence on land based activities. In the meanwhile, we cannot afford to irreversibly degrade our environment just because our per capita income is low by international standards.

The evidence on the income elasticity of demand for forest products in India does not seem to be conclusive. An early study by Chandrakanth *et al.* (1979) showed demand to be quite income elastic for most of the items, but a subsequent study by Rai *et al.* (1983) showed it to be much less than unity for most products except veneer sheets. Dilip Kumar's recent work showed high income elasticity of consumption but the elasticities declined with the increase in income (Dilip Kumar, 1994).

Economic development in the agricultural sector seems to have mixed effects, and the net outcome is uncertain and needs more probing. Hanumantha Rao feels that the Green Revolution in India, by increasing the yields per hectare, reduced the need for extra land to produce food, relieving the pressure on forests (Rao, 1991, p. 237). It must be, however, appreciated that a rise in the productivity of land for cultivation makes it more attractive vis-a-vis forests and CPRs, which could increase encroachments. In one of our studies of selected villages in semi-arid areas, it was found that this was indeed the case. The proportion of encroached lands was higher in more developed villages, and similarly the proportion of land under CPRs declined with higher levels of development (Nadkarni and Pasha, 1991, p. 547). Extension of cultivation into forests takes place not so much to increase food supply as to meet the needs of livelihood. Even if there is surplus food in the economy as a whole, pressure on forests for livelihood would continue as long as economic development does not create enough opportunities for better livelihood and reduce the pressure on land. This would also mean that the local pressure on forests would be one of the significant challenges to face policy makers. It would need all the ingenuity at their command to evolve the right institutional mechanisms and incentives, so that the issue can be resolved amicably, leaving both the people and forests flourishing. Also, mobilisation of local people to resist pressures of the larger economy on the forests and to protect their own access to their resource environment could lead to disciplining their own pressure on the forests.

APPENDIX TABLE

WORKERS ENGAGED IN FORESTRY SECTOR AS MAIN ACTIVITY AS A PROPORTION OF TOTAL MAIN WORKERS IN INDIA AND IN SOME OF ITS FOREST DOMINANT DISTRICTS

Year/ Forestry sector (1)	<i>(per cent)</i>					
	India (2)	Mokokchung (Nagaland) (3)	Uttara Kannada (Karnataka) (4)	Bastar (Mad- hya Pradesh) (5)	Nainital (Uttar Pradesh) (6)	Kottayam (Ker- ala) (7)
Proportion of area under forests						
1993	19.5	88.8	75.9	57.2	52.6	36.0
Workers engaged in forestry sector as per cent of main workers:						
Primary Forestry Sector (logging, etc.)						
1961	0.20	0.01	1.14	N.A.	7.48	0.31
1971	0.13	N.A.	1.48	0.44	1.83	0.19
1981	0.17	0.09	0.71	0.60	1.09	0.25
Secondary Forestry Sector (manufacturing wood and wood products)						
1961	1.15	0.19	1.86	N.A.	0.98	2.07
1971	1.03	N.A.	1.99	0.41	1.17	1.68
1981	1.08	0.33	2.02	0.43	0.98	1.96
Trade in Forestry Sector						
1961	0.11	-	0.12	N.A.	0.11	-
1971	1.03	N.A.	0.01	0.02	0.36	0.13
1981	0.14	-	0.29	0.05	0.18	0.12
Total Forestry Sector						
1961	1.46	0.20	3.12	N.A.	8.57	2.38
1971	1.28	N.A.	3.48	0.86	3.36	2.00
1981	1.38	0.42	3.03	1.07	2.25	2.33

Source: For area, Government of India, 1993; for workers, Census of India 1961, 1971 and 1981.

- Notes: 1. The proportion of area under forests is based on satellite imagery and excludes scrub forests with a crown density of less than 10 per cent.
 2. Percentages are to total workers for 1961.
 3. Workers engaged in forestry sector as a marginal activity are not included here, data on them not being available.
 4. Employees of the Forest Department are not included.
 5. Mokokchung district is inclusive of Wokha and Zumbhebot districts.
 6. Kottayam district is inclusive of Idukki district.
 7. N.A. = Not available.

NOTES

1. For debates about the choice problem during the British period, see Gadgil and Guha, 1992.
 2. It is only 19.5 per cent as per satellite imagery, see Government of India (1993).
 3. For more details on the economics of optimal rotation, see Pearce, 1990, Chapter 7; Tisdell, 1991, Chapter 8, pp. 143-148; Neher, 1990, Chapter 2.
 4. Buchanan gives an example of such a case in Dakshina Kannada, Karnataka, before the British came. See Buchanan, 1870, Vol. II, p. 262, also quoted in Nadkarni, 1989, p. 31.

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