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**ENVIRONMENT, DEVELOPMENT AND POVERTY:  
A Report of the International Workshop on  
India's Forest Management and Ecological Revival**

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The Consultative Group on International Agricultural Research (CGIAR) is an informal association of 41 public and private sector donors that supports a network of sixteen international agricultural research centers, CIFOR being the newest of these centers. The Group was established in 1971. The CGIAR centers are part of a global agricultural research system which endeavor to apply international scientific capacity to solution of the problems of the world's disadvantaged people.

**CIFOR**

CIFOR was established under the CGIAR system in response to global concerns about the social, environmental and economic consequences of loss and degradation of forests. It operates through a series of highly decentralized partnerships with key institutions and/or individuals throughout the developing and industrialized worlds. The nature and duration of these partnerships are determined by the specific research problems being addressed. This research agenda is under constant review and is subject to change as the partners recognize new opportunities and problems.

## FOREWORD

CIFOR is very pleased that one of our first *Occasional Papers* is **India's Forest Management and Ecological revival**. It is one output of a very comprehensive and ambitious program which included a year of research, eighteen commissioned papers, and a workshop in New Delhi. The scale of the undertaking, and the breadth of coverage - analysis of supply and demand trends; gender equity in Joint Forest Management programs; and Research, Education and Investment needs, for example might have deterred other researchers from even attempting such a task.

The forests, and the forest management issues in a country as vast and diverse as India, are very different from the tropical lowland rainforests that monopolize so much media attention. When the general public think about tropical deforestation, they think mainly of the Amazon, Borneo, and the Congo basin; tall pristine rainforests, teeming with rare wildlife, being turned to barren wastelands by either large-scale industrial logging, or by shifting cultivation. But the quest for ecologically and socially sustainable forest management systems crosses many boundaries. India presents a microcosm of many international issues.

The diverse forests of India have been subjected to very great pressures, from a variety of directions. In response to revelations about the current status of much of India's forest lands, within the past decade, there have been vigorous new policy initiatives, including an almost complete reversal of national forest policy. New initiatives, pursued in slightly different ways by State forestry agencies and numerous national and international NGOs, explore mechanisms for local participation in forest management - "Joint Forest Management". This parallels "Resource Sharing" in southern Africa, and "User Group management" in Nepal.

CIFOR undertakes generalisable, international, strategic research; CIFOR expressly does not undertake adaptive research to solve specific, localized forestry problems - there are National research institutions and development agencies which can do this better than CIFOR. In many parts of the world, in many very different forest ecosystems, the processes leading to deforestation, degradation and fragmentation continue, not because of malevolence or neglect but primarily due to inappropriate policies which discourage conservation management of forests, or encourage other land uses at the expense of forests. CIFOR is anxious to assist in the dissemination of research findings and methodologies throughout the tropics, and to establish collaborative arrangements to support such research of regional or global significance.

CIFOR offers this Occasional Paper not only as a direct contribution to improved social, economic and institutional outcomes through sustainable forest management in India, but as an indirect contribution to those objectives throughout the tropical world, wherever similar policy issues arise. CIFOR would welcome comments from researchers throughout the world, who recognize similar processes in their region, or who can contribute contrasting evidence and insights.

Jeffrey Sayer  
Director General, CIFOR

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# ENVIRONMENT, DEVELOPMENT AND POVERTY

## A Report of the International Workshop on India's Forest Management and Ecological Revival<sup>1</sup>

Uma Lele, Kinsuk Mitra and O.N. Kaul<sup>2</sup>

### Summary

*India is vast, diverse and complex, in its environments and in environment-society relations. These relationships, and government policies which influence or control them, are the subject of very significant reforms currently occurring in India. At the most fundamental level, this report asks "Who is to protect, manage and regenerate India's forests, where and for what, and what resources or support does each agent need to fulfil the mandate efficiently and equitably?" The conventional forestry systems have been under scrutiny. "Forestry" no longer means just industrial timber production by the Government, on government-owned lands. Other priority objectives (e.g. ecological and social sustainability) and other participants (farmers, communities, NGOs and industries) have emerged, and new modes of organisation are being explored and tested, such as Joint Forest Management. Is there a contradiction between "new goals and directions, such as JFM", but the old rules, structures and personnel? Is it possible to achieve the opposite goal with virtually the same apparatus as the 1950s? Or has it really been reformed? What further reforms and support (e.g. education, research, extension and investment funds) are required?*

### Introduction

Growing environmental concerns have resulted in a variety of responses to the issues of conservation, management and enhancement of the natural resource base throughout the world. An important response has been a focus on the conservation and restoration of tropical forests. The current high profile of the tropical forests is the result of greater understanding and awareness of the substantial environmental consequences of their disappearance, extending from the local to the global level.

Developing countries contain virtually all of the world's tropical forests. In addition to being important carbon sinks, tropical forests are the major source of the world's supply of hardwoods and contain the bulk of global biodiversity. However, the task of expanding and enhancing the tropical forest cover is made highly complex by the competing subsistence and developmental needs of the rapidly growing populations that derive their living from these forests, and the already heavy incidence of poverty. Indeed, in many developing countries forests provide a livelihood to some of the

poorest segments of the populations, at extremely low levels of factor productivity.

Reducing population growth and poverty through a combination of active population policies and rapid and broad-based economic growth are obvious solutions to contain the pressures on forests, to the extent that these originate from the subsistence needs of the poor. On the other hand, the processes of urbanisation and industrialisation also increase demand for forest products leading to deforestation. With growing population pressure on the land, subsistence and industrial needs often tend to be in conflict, and often result in increased imports of forest products, increased domestic production, or substitution, of non-forest products in consumption. Both the increased import capacity and increased domestic production in turn call for increasing domestic factor productivity as a way of relieving pressure on the existing forest land. Some of these challenges in the forestry sector are similar to those faced by the agricultural sector in combating poverty and hunger. There are marked differences, however, between the two sectors. First, much of the land on which rural households depend for their fuelwood and fodder needs, tend to be

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<sup>1</sup> A workshop funded by the Center for International Forestry Research (CIFOR), The Ford Foundation, the Swedish International Development Authority and the International Development Research Centre.

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public rather than private lands. The growing, and eventual, unlimited access to these resources often leads to a "tragedy of the commons". Secondly, markets forest products other than timber tend either to be non-existent or less-developed than those for food crops. Thirdly, improved technologies tend to be more limited in the forestry sector than in agriculture. Fourthly, the longer growing period of forests relative to crops poses a problem, particularly in relation to the rate of demand growth. Thus the supply of forest products tends to be more inelastic than for agricultural products. On the other hand, growth in demand for forest products can be more easily shifted to other products because of the existence of substitutes. In contrast, the subsistence needs of the human body make the demand for food much more inelastic with respect to population and income growth.

India provides an excellent laboratory to study these various phenomena. The country is experiencing rapid population growth and also has immense poverty and land pressure. Moreover, its continental size encompasses considerable physical and socio-economic diversity. India also has an above average human and institutional capacity among developing countries to devise and implement effective policies. Indeed, in 1988 India adopted a new National Forest Policy which aims to increase the country's forest cover to one-third of the total land area compared to the presently reported 19% while simultaneously meeting the growing local needs of a burgeoning population for fuelwood, fodder, minor forest products and small timber. The Government of India circular of June 1, 1990 encouraged all states to design participatory Joint Forest Management (JFM) systems with active involvement of forest communities in the protection of public forests. The policy emphasises the need to achieve environmental stability and ecological balance, while shifting the needs of the private industry to the private lands by encouraging the establishment of direct links between the industry and small producers.

However, a forest policy, and particularly its implementation can only be as effective as the quality of the information and analysis pertaining to it, and the extent to which implementation is linked to information and analysis through continuous monitoring. In this age of information technology and high-speed micro-computers it is possible to fine-tune policy and achieve a relatively high degree of precision in the implementation of that policy. For example, it may be possible to respond to the diverse location-specific technological, institutional and socio-political constraints faced by the

traditional rural communities that comprise of over half a billion people. Effective implementation of policy in diverse ecological and socio-political conditions is of particular importance, but such locally responsive forest management interventions call for systematic data collection and analysis and its input into planning and implementation to address the fundamental questions which affect development outcomes, namely:

1. What are the key policy and management questions facing the Indian forestry sector?
2. To what extent does the current policy address them?
3. Where and to what extent is the policy being implemented?
4. Are the available data and analysis adequate to assist in policy formulation, and ensure its effective implementation?
5. What additional information, research, human and institutional capital bases are needed to improve the content of policy, its implementation, routine monitoring and functioning?
6. What impact is the policy having?

To address these issues and broader problems applicable both in India and other developing countries, a workshop on India's Forest Management and Ecological Revival was held in New Delhi from February 10 to 12 1994. It explored a variety of issues including:

1. The nature and extent of markets for forest products, and the types and variety of non-market mechanisms deployed in the production and mobilisation of forest products by India's households.
2. Management of forest lands under different forms of control, e.g. public forests including those under JFM, forests set aside for special protection, common property lands, and private lands.
3. Research, extension, education, training and the supply of planting material.

Deliberations of the workshop were based on eighteen papers authored by Indian analysts and managers of forest research and policy at the forefront of Indian forestry (see Appendix I for the list of papers). The workshop was attended by 96 participants including Indian and international researchers, policy makers, donor representatives, forestry practitioners and members of the non-

governmental organisations (NGOs) (see [Appendix II](#) for the list of participants).

The workshop was inaugurated by India's finance minister, Dr. Manmohan Singh. Following discussion of the papers in plenary sessions, participants formed five groups to identify implications of the prevailing state of knowledge for policy, investments, monitoring of resources, information systems, research, technology and training. Many aspects of the forestry sector remained highly contentious. Thus, only a few commonly shared recommendations could be arrived at. This summary, prepared by the organisers of the workshop:

- (a) provides their perspective on the key issues facing Indian forestry, based on the workshop papers and discussions;
- (b) outlines its implications; and
- (c) summarises the recommendations agreed by the workshop participants.

### **India's forest management in an international context**

#### **The Finance Minister's call**

In his opening remarks, Dr. Manmohan Singh challenged the participants to:

1. Give meaning to the concept of sustainable development of which the forestry sector is an essential component.
2. Take action to evolve energy efficient technologies, reverse the process of soil erosion and desertification, and restore a viable ecosystem.
3. Resolve the demand-supply gap following the rapidly growing demand for forest products.

Finance Minister Singh stressed that meeting this triple challenge will tax all resources — financial, intellectual and organisational at both the domestic and international levels. It will require a new and innovative approach at the national and local levels based on energy-efficient and eco-friendly technologies for sustainable use of forest resources. He recognised that this will be a major departure from the past policy of treating forests as a source of Government revenue. Dr. Singh also stressed the need to view India's situation in a global context, calling for the transfer of environmentally sound technologies to meet the needs of the poor in third world countries. He expressed a concern that the

growing privatisation of science and technology and intellectual property rights at the global level may make the cost of such technology transfer prohibitive, unless resources are allocated to the generation of such technologies as international public goods.

### **Trends in Indian forestry**

The immense pressure on India's forests was summarised in the overview paper by AK. Mukerji.

India's population has risen from 370 million in 1947 to 880 million in 1994, constituting 18% of the world's population. India also has 15% of the world's livestock, but only 2% of the geographical area, 1% of forest area, and 0.5% of pasture lands (Figure 1). In her paper, Madhu Sarin stressed that nearly 50-60 million people, mostly tribal households and particularly their women rely on forests for a living. A large majority of the consumption of forest products takes place through non-market mechanisms to meet the subsistence needs of the rural populations, mainly from the lands under state or community control. Reliable estimates of the removals and the factors that determine their growth over time are, however, not available. According to Mukerji, a conservative estimate of the annual removals from the forest comprise 220 million tonnes of fuelwood, 250 million tonnes of green grass and fodder, 12 million cu.m. of timber and thousands of tonnes of non-timber forest products (NTFP) with a total value of about Rupees 300 billion (US \$10 billion) per year.

On the supply side, Mukerji reported the growing stock of wood in India to be about 4.2 billion cu.m., with a net annual increment of 52 million cu.m. or 1.24% of the growing stock. This is equivalent to a sustainable production of wood of 0.7 cu.m. per hectare. However, in a separate paper, Dwivedi reported the Mean Annual Increment (MAI) of Indian forests to be 0.53 cu.m. per hectare.

The extent to which the problem of Indian forestry is one of rapidly increasing demand, as distinct from slow growth in supply, remained an unresolved issue. Comparing the actual to the sustainable removals, Mukerji presented the difference between the Government of India's estimates of incremental production and extraction.

In the case of fuelwood, he reported an annual withdrawal of 220 million tonnes compared to the production of only 28 million tonnes. Dwivedi reinforced this concern about excessive removals, although the numbers he presented were not

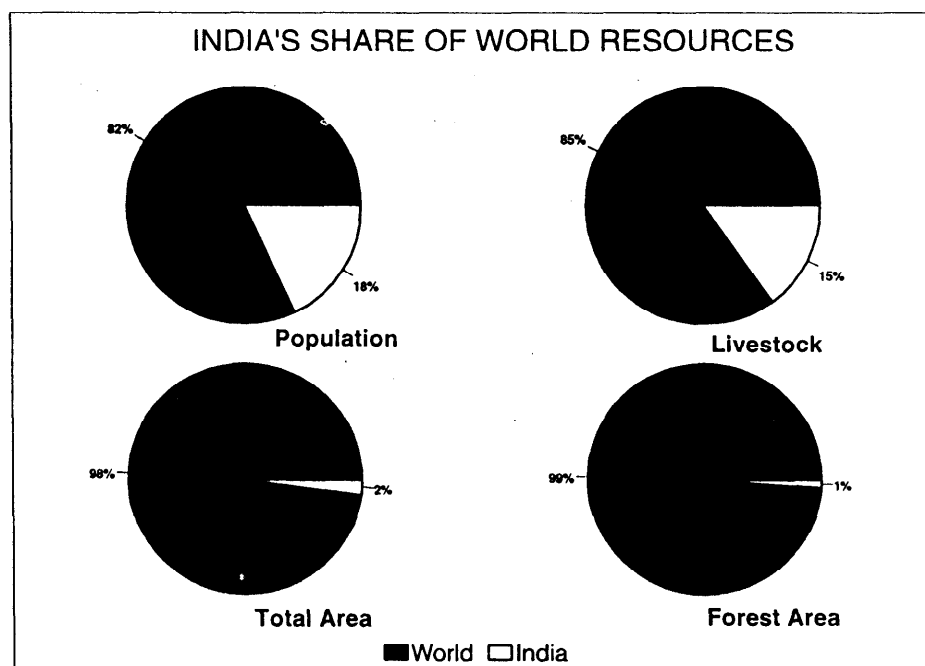


Figure 1. India's Share of World Resources in a Global Context (Source: Mukerji, 1994).

comparable to those presented by Mukerji. According to Dwivedi, between 1953-1987, 3.24 billion cu.m. of wood was removed, well above permissible silvicultural limits, of which 1.35 billion cu.m. came from clearfelling and conversion to other uses, 1.65 billion cu.m. from destruction of an estimated 3 million hectares of forests and reduction of growing stock in perhaps 27 million hectares. Clearly, reliable estimates of removals are not available.

The area under agriculture is four times the area under closed<sup>3</sup> forests. To improve India's forest cover calls for an approach much wider than the forestry sector policies and programs alone. Simultaneous action is needed to arrest the rate of growth of population, promote agricultural intensification, and adopt growth-oriented policies for rapid employment and income generation so as to relieve the growing pressures on forest lands. However these relationships remained implicit in the papers.

<sup>3</sup> Closed forest refers to forests that are not significantly degraded and generally have more than 60% crown density.

### Forestry and agriculture

Forestry and agriculture together occupy 222 million hectares or two-thirds of the geographical area of India. Net area sown to agricultural crops has increased from 118 million hectares (41.8% of the geographical area) in 1950-51 to 142 million hectares (46.5%) in 1989-90. On the assumption that the proportion of the population living in poverty has declined from 50% to 30% during the same period, as estimated by the Government of India, the absolute number of the poor has increased from 175 million to 253 million. The decline in poverty is in part a result of the increase in income and employment created by the Green Revolution. Annual rate of growth of India's food grain production increased from 2.3% (between 1950 and 1966), to 2.7% after the Green Revolution (between 1967 and 1990). Had there not been such a dramatic advance in productivity, some 45 million additional hectares of land would have been needed to achieve the same level of food grain production (Lele and Bumb, 1994); the area roughly equivalent to India's remaining closed forests. Moreover, without the Green Revolution, a larger proportion of the Indian population would have depended on forests for a living. Even with these productivity improvements in agriculture, per capita forest area



has declined from 0.20 in 1951 to 0.09 in 1991, according to Mukerji. Without the Green Revolution, India would have had little effective forest land left, a fact often overlooked by its critics.

The total recorded forest area of approximately 77 million hectares in 1994 was only one-half the area under agriculture, and included all the degraded forests, which constituted between 35-40 million hectares of the reported area under forests. Moreover, although the recorded forest area was 23.4% of the geographical area, the actual forest cover, according to the latest estimate of the Forest Survey of India (FSI), was only of the order of 64.20 million hectares, 64.10 million hectares and 64.07 million hectares respectively for the periods 1981-83, 1985-87 and 1987-89. An increase of 560 sq. km. is reported in the forest cover between the second and the third assessments (1985-87 and 1987-89), but this must be monitored over several more years to derive any confidence in the trend.

### Estimating the growth in demand for forest products and determining policy responses

The workshop also demonstrated the complexity of estimating demand growth and determining policy responses to meet that demand. The absence of reliable estimates calls for better empirical research into the market for forest products. To illustrate, Dr. Manmohan Singh hypothesised that income

elasticity of demand for forest products would be more than one in a country such as India and demand for forest products would rise rapidly. Imports would relieve the pressure on the domestic forests but place a growing pressure on the balance of payments stressing the need for increased internal production through sustainable new technologies. But demand growth remained an unresolved and highly debated issue. Also the crucial role of prices in the markets for forest products remained unaddressed with the exception of a paper by Saxena.

### Industrial wood

According to Government of India estimates, annual demand for industrial wood is currently 28 million cu.m. against a production capacity of 12 million cu.m. Kumar provided various estimates of demand for all types of industrial wood, using five different functional forms, with income, wealth availability, and trends as explanatory variables.

Kumar's range of estimates, presented in Table 1, emphasise the wide variation in the estimates depending on the choice of demand specification. Notwithstanding these differences, it is clear that for most categories, increase in "requirements" in the next 20-30 years will be at least 34 times the current level. Kumar argues that to meet these 'requirements' a substantial increase in area and productivity of forests or tree farms will be needed. For example, meeting the demand for aggregate industrial roundwood in 2025 will require

Table 1. Alternative estimates of Demand Projections for Industrial Wood (in '000 cu.m. round)

	1980	1985	1990	2000	2015	2025
FAO	19,669	23,960	25,254			
Chandrakant et.al.(high values)	14,818	18,179	22,316			
Chandrakant et.al.(low values)	13,987	16,661	19,651			
NCA (high values)	26,895	35,180		64,450		
NCA (low values)	25,005	30,030		47,180		
Kumar (high values)			43,775	68,857	125,622	181,270
Kumar (low values)			30,241	45,093	78,151	110,170

Source: Kumar (1994)

a total increase of 17.58 million hectares in productive sawlog and plywood plantations during the next 35 years, assuming a MAI of 7.14 cu.m./hectare/year. This is a rather formidable target.

Saxena argues, on the other hand, that demand projections tend to be overestimated because they do not take into account the role of prices or income distribution.<sup>4</sup> Rather, demand tends to be confused with 'requirements', based on aggregate estimates of population and income growth. Thus, according to Saxena, demand for pulpwood of 6.4 million tonnes annually estimated by the Government, is an overestimation, as evidenced by the falling real prices of wood and bamboo. Saxena also mentions that imports of Rs18 billion (US\$ 580 million) of wood and wood products overstate demand, as imports have been encouraged even in the face of internal surpluses in

the case of certain products. The liberal imports of logs explain the fall in real prices of timber from 1982-88, after an increase by about 5.8% during 1970-80 (Saxena). The Ministry of Environment and Forests, however, points out that Saxena's evidence of declining prices is confined to Eucalyptus alone and does not include prices for other species such as Teak.

### Fuelwood

The lack of consensus on the current or the likely future growth in the demand for industrial raw materials is also mirrored in the case of fuelwood. Figure 2 shows alternative estimates of the current fuelwood consumption varying by a factor of 100%, i.e. from 146 to 305 million tonnes. Estimation of fuelwood supply and demand is problematic, both in terms of current levels, rural-urban shares and

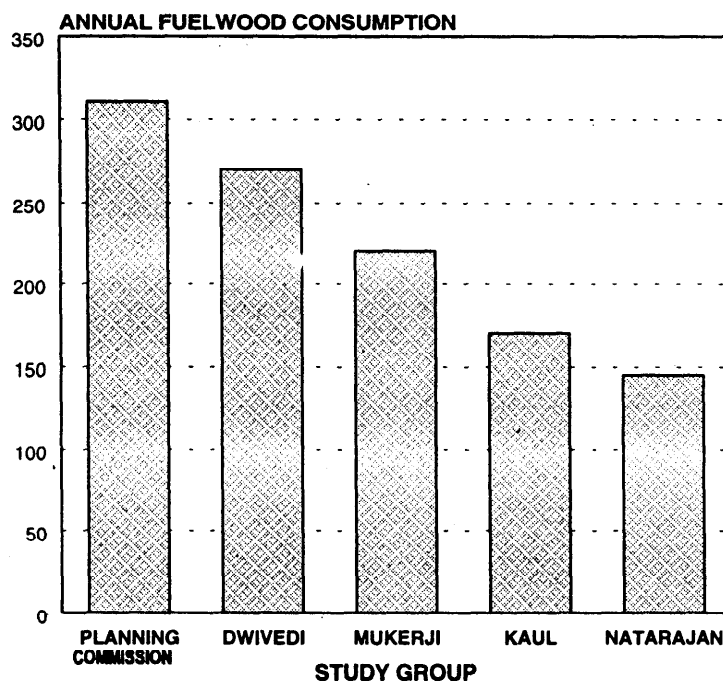


Figure 2. Alternative estimates of Annual Fuelwood Consumption in India (Million tonnes) (source: Planning Commission: 1991; NCAER, 1994; Mukerji, 1994; Kaul, 1990; Natarajan, 1989. All cited in Dwivedi, 1994).

<sup>4</sup> Saxena also points out that markets for forest products are imperfect and therefore a poor guide for estimating demand. Some of the reasons are: the monopolistic power of the middlemen, the large role of the government in supplying forest products, and often the non market factors in government decisions to offer supplies, poor information and infrastructure, and thus local and fragmented markets.

changes over time. There are no estimates of income or price elasticities for the use of energy. Thus it is not known at what level households switch to other more expensive forms of energy. Dwivedi observes that the percentage of fuelwood purchased to total consumption does not vary significantly with household income until the average household income rises substantially, prompting a drop in consumption.

According to him, doubling of income will lead to only a 10% decline in consumption of wood. On the other hand, fuelwood purchases also suggest a lack of availability due to extreme degradation of forests, rather than prosperity of the households.

Moreover, it is the net increment in energy use as a result of the increase in the incomes of some households and decline in those of others, that is of interest for macro and sectoral planning. Saxena argues that increase in the usage of modern forms of energy for production, e.g. irrigation, pumping, and household activities, such as cooking and lighting by some households tends to be accompanied by others moving **down** the ladder from the use of fuelwood to more inferior fuels such as straws, leaves and twigs. He attributes the discrepancies in demand estimations to: (a) the role of substitutes, i.e., crop residues, grasses, dung, and shrubs such as *Prosopis juliflora*, which constitute a major source of domestic energy, particularly among the poor, and, (b) non-market collection and disposal of fuel products, particularly by the poor.

In the urban areas, fuelwood consumption, is small (i.e. only about 40 million tonnes) and is inversely related to the size of the city (80% of the energy needs in towns of less than 20,000 inhabitants are provided by fuelwood, compared to only 10% in the metropolis). Moreover it appears to have gone down by 40% between 1978-79 and 1983-84 due to the substitution of kerosene and liquefied petroleum gas (LPG), the consumption of which rose by 57% and 98% respectively during the same period. The continuation of this trend is dependent on the supply and pricing of kerosene and LPG, and the rate of urbanisation. The recent reduction in the subsidy for kerosene and LPG, while necessary for budgetary reasons, could increase the rate of deforestation depending on the consumer response to prices. A lack of reliable estimates of price elasticity of demand for energy products prevents meaningful analysis of the impact of pricing and subsidy policies from the environmental or equity perspectives.

From this perspective programs developed to reduce fuelwood consumption by promotion of substitutes and increased efficiency of combustion

are of interest, but have had limited success. According to Dwivedi, the national program on biogas, begun in 1982 by the Department of Non-Conventional Energy Sources, installed over 1.67 million biogas plants in a decade. These plants were expected to save 5.27 million tonnes of fuelwood but the savings did not materialise due to technical, organisational and operational problems of the program. Under the national program on improved chulhas (stoves), more than 12 million chulhas have been installed to date. Their thermal efficiency ranges from 20-50% compared to 8-12% in the case of traditional chulhas. Difficulties in designing appropriate models to suit the users' needs, and the lack of availability of fuels, raise doubts about the likely future savings in energy. Dwivedi predicts that further degradation and shortages of fuelwood may force people to move to inferior and more polluting fuels, and add to the drudgery, as well as ill health, of women and children.

Notwithstanding the problems with the estimates of fuelwood consumption, the importance of improved forest productivity to increasing supply cannot be overemphasised. Mukerji asserts that the estimated annual **production capacity** of fuelwood is a mere 28 million tonnes. Using Government of India estimates of excess demand for fuelwood of 211 million tonnes per year, Khoshoo calculates that at 0.7 cu.m. per hectare per year and a 10-year rotation, it will take 300 million hectares or more than 90% of India's geographical area to provide for all the required fuelwood! Despite the many limitations of the farm forestry program pointed out by Saxena, Mukerji argues that their by-products did serve an important role in relieving pressure on public forests for fuelwood consumption. But these claims and counterclaims now remain the domain of conjecture due to the lack of reliable quantitative estimates.

### Livestock and fodder

Livestock rearing is potentially an important source of agricultural intensification with possibilities for more productive employment than currently seems to exist. It is evident that livestock development policy is weak in India, with the notable exception of milch animals, where intensification has led to considerable increases in production and productivity.

The papers and discussions suggested a strong adverse impact of grazing on forest lands. Mukerji, for instance, reported that India's livestock population has increased from 292 million in 1951

to 369 million in 1977, to an estimated 450 million today. The 46% increase in livestock populations between 1951 and 1991 is significantly less than the 134% increase in human population in the same period, signalling the growing competition for land between the human and livestock populations.

Notwithstanding the important role of livestock in farming in India there are no current estimates of aggregate fodder requirements. R.V. Singh highlighted that only 56% of dry fodder and 27% of the green fodder requirements of livestock, based on the estimates made by the National Commission on Agriculture, were being met in 1985, leaving a shortfall of 339 and 682 million tonnes respectively. The estimated shortfall in requirements in the year 2000, compared to availability, is 504 and 844 million tonnes respectively. This large gap in the fodder needs and its availability explains the poor health of Indian livestock. Chaturvedi estimates that the carrying capacity of land to support grazing of livestock is only about 50 million head, or one-ninth of the current livestock population. Whereas the increase in livestock population indicates increased demand for fodder, the low carrying capacity and fodder productivity explain the magnitude of the fodder supply problem. Net sown area increased by a mere 6% between 1960-61 and 1988-89, but total food grain production increased by 110% reflecting the increase in total factor productivity in agriculture. In contrast, fodder production has not increased to keep pace with the increase in livestock population.

The reasons for this phenomenon could be the divergence of "requirements" and "effective demand" for fodder arising out of (i) low productivity of cattle, (ii) poverty of cattle owners, on the demand side, and (iii) the absence of a policy thrust to achieve more efficient fodder production, on the supply side. Discussions between the authors of this report and Indian Council of Agricultural Research (ICAR) officials suggest that research results are available to improve fodder crops but their application at the farm level is poor.

The 1988 Forest Policy supports controlled grazing in forest areas through the active involvement of communities and Joint Forest Management provides a major vehicle for achieving that objective. The observed results of some of the activities are related below. R.V. Singh emphasises the importance of stall feeding and asserts that besides arresting land degradation, stall feeding will lead to higher livestock productivity. Furthermore, the forage requirement of the livestock is lowered by saving the animal energy expended in foraging. Production of dung, used extensively in India as

fuel, could increase by 30-50% with stall feeding and meet the energy requirements through biogas or dung cakes and provide additional manure. R.V. Singh sees the obstacles to stall feeding lying in:

- 1) Low economic returns from livestock;
- 2) Unproductive livestock leading to disinterest in investment by the owners;
- 3) Low productivity of pasture lands and their distance from stalls leading to high harvest costs;
- 4) The farmer's inability to provide the extra labour (6-10 times more) required for stall feeding; and
- 5) Difficulties of equitable distribution of the available fodder from common property resources.

It is clear that the intensification of animal production through improved forage production and animal husbandry would be an important way of increasing productive employment and incomes for households that now eke out marginal subsistence from forests, while relieving pressure on the rapidly dwindling forest lands. Some JFM programs are effectively addressing this problem, for example in the Shivaliks in Haryana, which is discussed later in the section on JFM. At a more general level, these problems call for much stronger policy research, its inter-sectoral coordination and particularly its implementation at the grassroots level, than currently exists among the departments of Environment and Forests, Agriculture and Animal Husbandry. The National Commission of Agriculture (1976), an influential body in setting the direction of India's *agricultural* policy for nearly two decades, appears to have underestimated the implications for policy of the growth in demand for forage crops in the *livestock* sector. The Ministry of Environment and Forests, and particularly the state forest departments and their district and local counterparts, seem to be overlooking the need for strong coordination of their efforts to increase forage production with functional activities and responsibilities of the departments of Agriculture and Animal Husbandry.

### **Non-timber forest products**

Non-timber forest products (NTFPs) are important for both subsistence of forest communities as well as from a commercial perspective. However, the problem of reliable data is even more acute in this case. Chaturvedi states that income from NTFPs to the state exchequer was about Rupees 6.5 billion

(US\$ 208 million), as against the revenue from timber and fuelwood of Rs. 1.11 billion (US\$ 356 million). Shiva, on the other hand, estimates the revenue from NTFPs to be Rs. 20 billion (US\$ 645 million). Thus the revenue contributions of NTFPs remained uncertain. Shiva also quotes export figures for NTFPs of Rs. 41.98 billion for 1990-91 (US\$ 1.3 billion), or 70% of total earnings from forest product exports and 13% of total exports, with export earnings from NTFPs ranging from 56% to 75% of the total value obtained by exports of forest products during 1959-91. These figures, however, involve processed (including medicinal) products whose raw materials come from the forestry and agricultural sectors, and may overstate the contribution of forestry. The important point is that data on contributions of the forestry sector to India's economy are unreliable or deficient in spite of a generally strong statistical base, stressing the importance for urgent empirical research.

Data on the role of NTFPs in local income-generating activities are equally sparse. Shiva cites an example from West Bengal where 17% of the annual income of village communities comes from NTFPs with an average of Rs. 2,720 (US\$ 88) per hectare per year. He compares it to the income from 25% of timber revenue under JFM which comes to about Rs. 16,000 (US\$ 516) per hectare every ten years or Rs 1,600 (US\$ 52) per year. Shiva asserts that studies in Orissa, Madhya Pradesh, Himachal Pradesh and Bihar show that 80% of forest dwellers depend on NTFPs for 20-25% of their food requirements. In Orissa, about 13% of them depend entirely on NTFPs, 17% landless depend on daily wage from NTFP collection and 39% are involved in NTFP collection as subsidiary occupation. On a national basis, Shiva argues that 50% of the revenue and 55% of the employment in the forestry sector is attributable to NTFPs. They provide 50% of income to 30% of the rural population. Saxena also cites a study by Gupta which claims that 70% of the total wage employment in the forestry sector comes from NTFPs. There are additional opportunities for self employment of forest dwellers and he estimates that organised collection of NTFPs could increase employment from 0.8 million person years to 3.3 million person years.

Growth of revenue from NTFPs has been faster than from timber; compound growth rates between 1968-69 and 1976-77 being 15.1% compared to 10.8% for timber (Shiva). The reasons for this growth are, however, unclear. Shiva argues that this growth has occurred notwithstanding the absence of policy on their production, marketing and trade suggesting that reliance on NTFPs may

have increased due to the reduction in opportunity cost of labour, as the population and incidence of absolute poverty has increased.

Although JFM puts much emphasis on NTFPs, Shiva argues that there are many impediments to sustainable development of NTFP production, including:

- Inadequate organisational structures to facilitate procurement of NTFPs, given the extreme seasonality in their availability.
- Lack of development of small-scale industries based on NTFPs.
- Inadequacy of processing and storage technology and transport facilities for perishable NTFPs.
- Problems of quality control due to poor technologies for drying, grading and processing at the village level.
- Exploitation of producers -due to imperfect markets and middlemen.
- Lack of information on the economic potential of NTFPs.
- A price structure for NTFPs fixed to meet the needs of industries.

Saxena adds:

- Many NTFPs grow in widely scattered and inaccessible areas making their economic exploitation difficult, and
- Trees which yield NTFPs have generally been ignored in afforestation programs.

### Forest productivity

The fundamental importance of increasing forest productivity, both in natural and managed forests, is evident from the preceding discussion. Dwivedi points out that by effective, protection and proper management techniques there is substantial scope to raise forest productivity, given the current Mean Annual Increment (MAI) of 0.53 cu.m. per hectare relative to the world average of 2.1 cu.m. per hectare. For instance, the potential productivity of India's forests of about 490 million cu.m. per year (as calculated by Seth et al.) compares well with the MAI of some of the species obtained in sample plots. Chaturvedi emphasises that protection of soil fertility is the key to good forest management, arguing that evidence of forest productivity decline in India points strongly to soil macroporosity and site organic matter as the principal causes. They in turn are affected directly by management related to

long-term productivity. Panwar stresses the importance of increasing forest productivity, such that not only will adequate quantities be available, but the range will be diverse enough to meet the different needs, both local and national. Several papers call for professionally sound and location-specific forest management strategies outside the protected areas with the active participation of people in caring and sharing (Panwar).

### **Large-scale vs. small-scale producers**

It is evident that the conflict between subsistence and commercial activities will grow unless strategies are developed rationally to achieve both the needs of the urban industrial sector and the employment and income needs of the poor households. The 1988 Forest Policy clearly states that, as far as possible, industry should establish links with producers and support them with credit, technical advice, transport facilities, etc. to facilitate tree production among small farmers. The policy rules out supply of timber at concessional rates to industries. However, the estimated current utilisation of wood and bamboo is about 3.2 million tonnes per year and participants from forest-based industries argue that without their access to degraded public lands to meet the demand of 6.4 million tonnes, imports will have to increase. New efficient pulp and paper mills, for instance, will need a greater throughput than the old antiquated mills that currently exist in India and without a guaranteed supply, modernisation of the industry will not be possible. There is no reason why arrangements cannot be worked out by which the industry acquires perhaps half or more of the needed raw material from large-scale plantations with a captive supply, while at the same time sharing a portion of the profit from the land with the households who would lose access to that land for meeting their subsistence needs. Supplies from the small producers would be needed to meet the remainder of industry requirements.

There was strong opposition to this proposition from some participants. Critics argued that at only 10% of the total, the industrial demand is relatively minor in the overall picture, as well as perhaps being overestimated. The strategy of meeting that demand is misguided because there is considerable untapped potential to increase wood production on the existing small-scale private farms instead of establishing large-scale plantations demanded by the industrial sector. Such an approach would not only increase the wood supply,

but create employment and income directly on farms as well as indirectly through the multiplier effects created by the increased employment and income on private lands. Saxena argued that even if the estimates are correct, and assuming an annual productivity of plantation forests of 3 tonnes per hectare, only 2 million hectares of forest land would be needed to satisfy the requirement.

Some participants (Saxena, Khare) criticised the policy of the forest departments to supply industries through long-term leases at subsidised prices, on the grounds that it does not address the objectives of productivity, equity or sustainability. The Ministry officials, however, maintain that the practice of such subsidised concessions has now ceased. Once again, there are no concrete data to support or refute these claims. Critics also argued that private producers should meet the needs of industry at market prices, leaving public lands to meet the needs of the poor, and further that small private farms rather than large industrial plantations should produce the wood. Saxena further argues that encouraging small-scale farmers to grow timber to meet the industrial needs is quite feasible, socially optimal and ecologically desirable, since costs of production tend to be low on small farms due to the use of family labour which has low opportunity cost. Turning over industrial wood production to small-scale private producers, will also leave the existing public lands available to meet the needs of the poor who have few resources to purchase fuelwood, or indeed any other form of energy in the market.

The National Commission on Agriculture (NCA) suggested in 1976 that public lands should meet the industrial demand for wood whereas private or common property lands should meet the subsistence needs of the poor. Critics of the NCA argued that the poor have few alternative means of employment and should not lose the rights to the products of public lands on which their livelihoods depend. There is also a concern that once public lands are made available to private industry to grow industrial wood, they will eventually be diverted to other more lucrative uses.

It was clear that alternative models of joint industry and community managed lands should be trialled as controlled experiments. They need to be accompanied by rigorous quantitative research to assess the merits of alternative arrangements of reconciling the apparent current conflicts in the interests of the industry and the poor,

Studies in agricultural economics have demonstrated why small farms tend to be more efficient than large farms under traditional technology, but with technical change there can be

scale economies in production which small farms may not necessarily enjoy. In addition, experience in the agricultural sector also shows that effective promotion of small-scale production calls for considerable investment in the related service sectors, such as the timely supply of high-quality planting material, extension, agricultural credit, development of markets, as well as information, transport, and communications. Experience of farm forestry, discussed later, suggests that many of these issues currently remain inadequately addressed in the forestry sector.

The sources of future increase in the supply of industrial products, i.e. whether from large plantations owned or operated by the industrial sector, or from the public sector, or through the encouragement of farm forestry, thus remained an unresolved issue.

### Forestry programs

According to Mukerji, the area planted under various forestry programs has increased substantially in recent years, from a mere 52,000 hectares in 1951-56, and 222,000 hectares in 1979-80, to 4.65 million hectares in 1980-85, and 8.87 million hectares in 1985-90. However, estimates of afforestation are often imprecise because they are based on the number of seedlings distributed rather than those actually planted and *survived*. Survival rates of seedlings have been variable due to the poor quality of the planting material and care and protection offered after planting. Monitorable information on the precise spread of forest management programs is needed.

Mukerji also observed that since the implementation of the Forest Conservation Act, 1980 and the Social Forestry Program, the average rate of annual "diversion" of forest lands to non-forest uses has declined from 150,000 hectares in 1980 to only 29,000 hectares annually, in some cases protecting the most luxuriant and valuable forests. Saxena argues, that although the reported diversions declined, actual diversions have remained much higher. Saxena justifies his argument by citing the steady increase in reported diversion, from 2672 ha in 1981 to 138551 ha in 1990<sup>5</sup>. This raises the issue of the extent to which implementation of the policies and acts by the state governments are monitored, to increase confidence in the official estimates

### Farm forestry

Farm Forestry programs were initiated in India in the late 1970s as a result of the recommendations of the NCA with a view to producing fuelwood and fodder on degraded and relatively infertile lands, for self-consumption by rural households and to relieve pressure on government forests. In reality, however, adoption of new technology mostly occurred on relatively large farms for the market, not on uncultivated lands used by the poorest households for their subsistence. Also, most trees were grown in surplus-producing agrarian regions. Less developed semi-arid regions planted few trees, but among the surplus-producing regions the response was widespread and seedling distribution targets were overshot by many times. In Gujarat in 1983-84 alone, farmers planted 195 million trees, four times the reported existing number of 49 million trees. During 1980-88, based on the number of seedlings distributed, farmers appear to have raised about 10,550 million trees on private lands. The factors behind this impressive response were: (i) the initial high and increasing market price of wood; (ii) expectations of high returns; (iii) a diversification strategy to address the risky nature of agriculture; and (iv) the low labour cost and supervision required in planting species like Eucalyptus.

However, overall disenchantment in the production of Eucalyptus led to drastic reduction in planting (Saxena). In most plantations, a high-density planting of over 4,000 seedlings per hectare led to a rapid increase in demand exceeding the available supply of quality seedlings. Low quality seedlings, a less than optimal genetic status and composition of Eucalyptus hybrids in India and farmers' neglect of the intensive weeding and soil management, resulted in tree production of short 5-7 year rotation and low girth, unusable as timber. Whereas the trees were suitable as raw material for paper mills, subsidised wood supply by the Government and organisational and locational difficulties of buying from scattered farmers posed problems in meeting industrial demand. Another alternative was to use the thin trees as poles but the demand for poles was limited. Even thicker Eucalyptus trees fetched a low price as timber because of inferior quality compared to other timber.

As a result, most had to be sold as fuelwood at low prices. Market imperfections also added to farmers' woes. Markets are not geared to receiving farm production, and imperfections are reinforced by restrictions on transport of wood to prevent illegal felling from public forests. Trees are also believed

<sup>5</sup> Figures from *Indian Express*, September 15, 1991

to have competed with crops for nutrients and water, resulting in up to 25% crop loss in some areas. This effect is however not statistically established.

### Common property resources

Area under common property resources (CPRs) has declined significantly over the last few decades. Nadkarni argues that this decline is not merely a physical loss in the resource base but a social process of breakdown in community management with widespread conversion of CPRs to open access resources. In his view it is an end-result of the process of alienation of the local users from the management of their resources. Reasons include the take-over of community lands for commercial forestry, extension of cultivation and private transfers (Nadkarni).

In an insightful set of studies involving a large number of communities in developed and developing countries where CPRs have been managed successfully, Elinor Ostrom (1994) sets out 8 rules in use where management is successful, namely:

1. **clearly 'defined' boundaries:** Individuals or households with rights to withdraw resource units from the CPR and the boundaries of the CPR itself are clearly defined;
2. **Congruence between appropriations and provision rules and local conditions:** Appropriation rules restricting time, place, technology or quantity of resource units are related to the local conditions and to provision rules requiring labour, materials and/or money;
3. **Collective choice arrangements:** Most individuals affected by operational rules can participate in modifying operational rules;
4. **Monitoring:** Monitors who actively keep check on CPR conditions and acceptable behaviour, are accountable to the appropriators and may be appropriators themselves;
5. **Graduated sanctions:** Appropriators who violate operational rules are likely to receive graduated sanctions from other appropriators, from officials accountable to these appropriators, or from both;
6. **Conflict resolution mechanisms:** Appropriators and their officials have rapid access to low cost, local arenas to resolve conflict among appropriators or between appropriators and officials;
7. **Minimal recognition of rights to organise:** The rights of appropriators to devise their own

- institutions are not challenged by external governmental authorities; and
- 8. **Nested enterprises:** Appropriation, provision, monitoring, enforcement, conflict resolutions and governance activities are organised in multiple layers of nested enterprises.

Given the diversity of institutional and ecological circumstances, clearly rules such as these would have to be devised on a location-specific basis, but they must be devised and monitored systematically and refined based on the actual experience to make more effective use of CPRs. However, no such systematic comparative research currently exists in India to evaluate CPR management experiences. Most studies tend 'to be ad hoc and descriptive rather than analytical.

Thus, once again, inconsistencies in data and information are apparent. Contrary to the findings of the micro-level studies, the official land use statistics do not show a decline in the area under CPRs. Instead, they record an increase from 29.5% of India's geographical area in 1955-56 to 31.7% in 1989-90. Nadkarni argues that this discrepancy is due to the private encroachments on public lands which are yet to be regularised in official records.

Since poverty leads people to depend on CPRs, if development reduces the incidence of poverty, will the decline of CPRs be a less serious problem? Nadkarni cites studies by Kanbargi and Kanbargi which note that developed and prosperous villages witnessed an almost complete disappearance of CPRs, but also a similar disappearance of absolute poverty. A neighbouring village which did not so develop, faced neither a decline in CPR, nor in poverty. However, Nadkarni does not consider such an interpretation to be warranted. According to him, apart from the powerful state and commercial forces, local elites also contribute to the decline by using their power to privatise CPRs. In support of his case, Nadkarni borrows findings from Jodha to stress:

- The importance of the protection of the natural resource base
- The strong complementarities between the CPRs and-PPRs (Private Property Resources)<sup>6</sup>

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<sup>6</sup> *In the absence of healthy CPRs, the groundwater table drops affecting drinking water. Soils on private holdings can also deplete faster. The reduction of CPRs, according to Nadkarni, have led to declines in agricultural productivity and extension of cultivation to marginal lands more suitable for afforestation. However, he did not provide evidence to support these assertions.*



- Sustenance needs of the rural poor;
- The need for reconciliation of the conflicting interests of neighbouring villages; and
- Developing a communitarian ethos.

The ecological issues relate to soil erosion and productive land use. But Nadkarni contends that there is nothing automatic about the benefits from CPRs flowing to the poor. The benefits derived by the poor tend to be commensurate with their meagre incomes, and are small in absolute terms. Improved management of CPRs can also improve the bargaining position of the poor, but granting CPR lands to the poor poses problems. First, the lands are generally less fertile and need considerable investment to produce annual crops, which the poor are not able to finance. Eventually, the rich acquire control of such lands through mortgage, lease and sale. Secondly, there is just not enough land for distribution unless forest areas are brought under cultivation, which would be ecologically disastrous (Nadkarni). It is clear that scientifically designed, comparative studies of CPRs are urgently needed in the Indian context to develop conditions similar to those that Ostrom has derived in other contexts for operational policy.

### Joint forest management

Joint Forest Management (JFM) with its focus on meeting the subsistence needs of the poor is the centrepiece of the new Forest Policy and the Government of India circular of 1st June 1990 to all states, which has provided strong support for JFM in publicly owned natural forests. The Forest Policy and the circular, however, are not legal enactments and are not enforceable in a court of law.

JFM is intended to reverse the old top-down policy of managing India's public forests which has been in place for nearly a century. Interventions in farm forestry and common property resources tended to emphasise monoculture plantations by seedling distribution by forest departments. JFM, on the other hand, gives greater responsibility to the local communities for the management, protection and development of the public forest in partnership with the forest departments. In return it allows an increased share of benefits from the land to local groups, particularly by increasing their share of the NTFPs and timber revenue. In addition to the protection of forests against grazing and illicit fellings, JFM programs are also involved in the distribution of irrigation water, fixing of rates for water and grass, maintenance of a conveyance system, cooperation and interaction with the forest

departments, etc. JFM thus implies a different relationship between the government and the people at the local level, prompting a different dynamic among the people and their institutions, e.g., between the forest departments, village administrative units, the tribals and others, among households between the poor and the powerful, and within households between men and women.

JFM is geared to provide for the subsistence needs of the local communities while regenerating and maintaining the natural forests on a sustainable basis. The primary emphasis is on natural regeneration of degraded forests assisted by plantings as required. There are several underlying assumptions in the JFM approach: that the equity and ecological objectives are mutually reinforcing;

1. that there is a complementarity among the short- and long-term objectives;
2. that by involving people in the protection and the management of resources on which their livelihoods depend, they will help ensure sustainability of the forest resources; and
3. that interests of the "people" are sufficiently homogenous that they can be resolved peacefully.

According to Mukerji, by December 1993 14 states had issued orders/resolutions providing for JFM, involving about 10,000 Forest Protection Committees (FPCs). An area of 1.5 million hectares of degraded forest land was being regenerated naturally or with assisted planting programs. While these are large numbers, in an overall context of 77 million hectares under forests, JFM is still small, operating mostly in areas accessible to communities.

A number of useful insights for future research, planning, implementation and testing are already being generated by the JFM experience. First, the papers suggest that JFM holds considerable promise. They contend that, once protected, most lands experience abundant regeneration of biomass particularly in the wetter areas, but quantitative evidence to support these assertions is missing. There is also evidence that much cooperative action is stimulated by JFM within and between village communities. For instance, some communities have replaced contractors and purchased forest products like grasses, etc. for cooperative sale, leading to a greater retention of profits by the forest communities, as Kaul and Dhar observed in the Sukhomajri project in the outer Shivaliks. They

also assert that there was a quantum increase in the production of various grasses. Catchment runoff decreased from 40-80% to less than 3%, sales of fodder and fibre grasses leased by the Forest Department directly to the communities instead of contractors, reduced fodder cutting and collection costs to villagers from Rs. 450 to Rs. 150 per year and doubled profits from rope making.

While expressing optimism about JFM in opening new windows to equity and empowerment of the rural poor, Kamla Chowdhry stresses that sometimes the community elite may not have the well being of **all** community members in mind. For instance, the Mahila Mandals (women's groups) which emerged from the Chipko movement became very successful, taking the management of the common forest lands into their control and ensuring equitable distribution of grass and fuelwood through co-operation among all families in the village. However, Forest Panchayats opposed them. This example illustrates that whereas a shift to community participation is clearly evident in some areas where JFM is practised, a clear concept of the composition and characteristics of the "community" has remained elusive.

Sarin, Arora and Khare, and Kaul and Dhar, also raise additional issues regarding the impact of JFM:

- Closure leads to excessive exploitation of open access areas for grazing and fuelwood. Thus the "net" effect of these interventions and the distributive impact among the poor and relatively better off households are not known.
- There is no relationship between the amount of area set aside for protection and either the needs of the community or the regenerative capacity of the land. Additionally, little information is available on the carrying capacity of the land.  
The benefit sharing does not seem to have any apparent relationship to the benefits foregone by specific members of the community, and their labour input in protecting and managing the forests.
- Due to closure of forests for protection during the initial stages of JFM, pressure increases on the women to obtain fuelwood for subsistence. They usually have to travel much greater distances to carry headloads from yet unprotected forests. There is no provision for the mobilisation of resources lost to the communities in the short run.
- In 9 of the 14 states which have adopted JFM, there is no effective representation of women

either in the membership in FPCs or in the share of profits from timber sales.

- The impact of protection on increasing land productivity is poorly understood. There is a need for research and policy analysis and hence for a cautious approach to JFM.
- The orientation and structure of the forest departments have been geared to address management objectives of the past. While policy prescriptions are eloquent about the changing role of the forest department, there are no similar prescriptions for a simultaneous change in the structure and orientation of the department staff. As a result, there seems to be less than adequate preparation for achieving such a massive transformation.
- The existing state of silvicultural knowledge is not adequate to simultaneously fulfil the multiple objectives of different strata of village communities and various user sectors of the nation.

### **Role of tribals and women**

Ensuring participation of tribal people and women in forest management is important. According to the 1981 census, there were 54 million tribal people making up to 8% of India's population. Over 90% of them lived near forests with 12% being engaged in shifting cultivation while 33% were agricultural labourers. The number of landless tribals has increased sharply. About 20% have been displaced due to development activities and have lost control over their traditional resources such as land, forest and water. According to Gin, forest nationalisation, combined with the curtailment of their traditional rights in forests, plus the transfer of tribal lands to non-tribals, have also led to displacement.

In the 14 states which have passed JFM resolutions, the tribal population is 36.2 million, constituting between 1% and 22% of the total population of the states concerned. Tribals and women are major actors in the forestry sector, and more so among the poorer families which, studies show, depend more on the earnings of female members. Women gather a diverse range of NTFPs for both subsistence and income generation through processing and sale, and also work as labourers in forestry operations. Because of the decline in the availability of NTFPs and the seasonal nature of their collection, combined with the lack of alternative employment or earning opportunities, women have started collecting fuelwood for sale. Headloading has become the most important source of

employment for women in the energy sector, with tribal women in the majority. Women are highly constrained due to the limited and declining resources and means at their command. These constraints stem from a combination of class and gender and include differences in the distribution of basic necessities, a disadvantaged position in the labour market, little access to land or technology, and the growing deterioration and privatisation of CPRs on which the poor and the women, in particular, depend for subsistence.

Sarin explains that JFM implies instituting a new regime of property rights, not to the forest land, but to its management and produce. Institutional arrangements will determine who gets empowered and disempowered between and within communities, and by gender and age within households. The position and roles of men and women vary in the household tasks performed, the way income is earned, allocation of time, traditional and legal rights and their accumulated knowledge. All these contribute to different priorities and goals. Thus development interventions will affect men and women in disparate ways. The unit of participation as the "household" at the community level leads to men's rather than "people's" participation. Grin argues that the continuing invisibility of women in state JFM resolutions is tantamount to a transfer of the policing role from the forest department to the male members of the community against the predominantly women gatherers. The almost 100% male staffing of the Forest Departments, and the greater ease with which village men can be assembled, result in men interacting with men to take decisions on behalf of the "community". Sarin suggests measures to empower and improve the position of women in the forest community, such as keeping membership in community institutions open for all adult men and women, increasing women's representation in the executive bodies of community institutions to at least one-third, and the quorum for meetings to include the presence 30-50% of women, and specifying independent entitlements of women members.

Apart from these socio-cultural issues that should influence the design, implementation and impact of JFM, the problem of the growing market demand for forest products remains unanswered in the present policy. Nor does the Forest Policy address the issue of the need for revenues for the forest departments, particularly if the revenues from NTFPs are shared with local populations. According to one estimate reported earlier, NTFPs contribute 40% of the total Forest Department revenues and 75% of forest-based export earnings,

but these are not reliable estimates. Kaul and Dhar, however, assert that the Haryana experience shows that revenue would not fall due to the higher productivity of forests under JFM. Concrete quantitative evidence on net productivity increase due to JFM is not available.

There are other reasons for sounding a cautious note on JFM. Panwar observes that the forests in the north-eastern states and scrub savannah lands in the western states should have been well conserved because the bulk of them remain under community ownership or retain the status of CPRs. In reality, those forests have either been privatised or become degraded (Panwar).

Chaturvedi's paper implies that the failure of the earlier Social Forestry program was due to bad silvicultural management. On the success of JFM schemes, he contends that to realise sustainability of a natural forest, only the incremental growth of wood can be removed. Under JFM, all NTFPs are routinely removed in most cases, which would lead to an ecological imbalance because natural forests can only survive as an interdependent system, and removing all biomass other than timber will not maintain the system. Chaturvedi contends that Sal forests are not being managed according to the silvicultural needs of the species. More than the removal of timber, the problems lie with the factors on which regeneration and growth depend. Heavy grazing, fires for inducing grasses, removal of ground litter and humus through floor sweeping, lopping of leaves for fodder and sale, excessive tapping and transfer of water from forest areas are some of the problems Chaturvedi outlines in his paper.

## **Research constraints**

Productivity increase is fundamental to achieving success in the forest sector, although the current emphasis of policy is more on natural regeneration than productivity growth. Research is fundamental to increasing forest productivity. Tewari of the Indian Council of Forest Research and Education (ICFRE), the agency responsible for coordinating forestry research, points out the constraints:

- Lack of a long-term forestry research plan and integration of research programs which leads to research being unresponsive to the needs of the users of research results.
- Lack of coordination between research conducted by the state Forest Departments, private sector and universities. Also, there is

little linkage between the research institutes and the staff of the state Forest Departments who are practising foresters.

- Appointments of research staff in government research institutes are not conducive to productive work because of the short tenure of postings and appointment of people lacking interest in research.
- Research funding is less than 1% of total expenditure in the forestry sector. During 1980-85, the allocation for forestry research was Rs. 41 million which was 0.6% of the forestry sector outlay. In 1985-90, the allocation, in nominal terms, was Rs. 159 million, which was 0.9% of the total forestry sector budget.

In addition, Chaturvedi observed that many findings from field research stations are not replicable, can not be interpreted by statistical inference and are not valid. Foresters cannot wait indefinitely for research results when they are faced with making decisions among alternative practices. The papers imply that the forest research system in India is in need of major reforms.

### Planting material

The yearly demand for seedlings during the Eighth Five Year Plan is estimated to be 5 billion plants. Nearly one-quarter of plantation expenditure is incurred on the production of seedlings. However, the quality of planting material used for afforestation leaves much scope for improvement. Moreover, the production of planting material by the private sector is negligible. In the few private Eucalyptus nurseries, the quality of seed is low and the supply is erratic, primarily due to lack of technical guidance and financial constraints.

Bahuguna stresses the need for decentralisation and incentives for fostering people's nurseries. In a study in Madhya Pradesh, the cost of production in people's nurseries was only between Rs. 0.28 to Rs. 0.44 per seedling compared to the buying rate of Rs. 0.70 per seedling. The labour cost of Rs 0.12 to Rs. 0.15 per seedling has been excluded because of free family labour.

Clearly the private sector will need to take the lead in the production of planting material with the public sector playing a strong regulatory role to ensure quality. A near-monopoly of the public sector has been a major constraint, not just to the rapid expansion of high-quality planting material, but to the creation of employment and income

permitted by greater emphasis on private (including community nurseries) production of planting material. Community nurseries have not been effective due to their poor design, inadequate supervision, extension and quality control.

According to Bahuguna, the public sector, private sector, research organisations, NGOs and the local communities will have to act co-operatively to develop the production of quality planting material, but he does not provide examples of such co-operation in operationally successful programs.

### Investment in the forestry sector

The workshop left a number of other important questions unanswered. To what extent is the 1988 Forest Policy being implement? Where? In what ways? How should implementation be measured and monitored? Have working plans and silvicultural practices, harvesting and marketing and support to small-scale village level industries changed noticeably? Have local demands for fuelwood, fodder, NTFPs and small-scale timber declined or been met? To what extent is this happening in those relatively few areas where JFM is being practised? Concrete answers to these questions are obviously crucial in making a case for increased investment in the forestry sector which seems to be urgently needed.

The percentage of total planned outlay in the forestry sector has varied between 0.39 to 1. The current annual Plan and Non-Plan outlay in the forestry sector is Rs. 8,000 million and Rs. 7,000 million respectively. Mukerji argues that a total investment (Plan and Non-Plan) of Rs. 50,000 million per year would be needed to implement the entire set of forest sector initiatives.<sup>7</sup>

The substantial amount of resources for afforestation, channelled through the employment generation schemes of National Rural Employment

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<sup>7</sup> Assuming a nominal 0.5% *maintenance* cost of the 4,196 cu.m. of growing stock valued at Rs. 4 trillion, the amount works out to be Rs. 20,000 million annually. However, in order to pursue the target set forth in the National Forest Policy of 109 million hectares of forest cover (one-third of the geographical area) made up of 64 million hectares of existing forests and about 10 million hectares of other tree lands under private forests or Social Forestry programs, attention to afforesting an additional 35 million hectares would require substantially more investment. Further resources will be required to regenerate the 25 million hectares of degraded land.

Program (NREP) and Rural Landless Employment Guarantee Program (RLEGP) of the Ministry of Rural Development, has dropped since the two schemes merged, from an earlier 25% to 8.7% in 1989-90 and 4.9% in 1990-91. There was a strong demand at the workshop for increased investment in the forestry sector.

## **Education and training**

The role of the Forest Departments must change radically from one of control to one of catalyst. However, it is clear that the training of foresters is not adequate to meet these new challenges. Palit argues that the existing forest education, training and research set-up was designed to address traditional forest management. Policy revisions have changed the basic objectives drastically and the old institutions are unable to provide support for the new system. Some cosmetic changes are being made by periodic short-term, ad hoc courses while the primary training remains the same. Palit makes a convincing case that this is an unacceptable situation given the competence required in technical, managerial and extension areas. A major difference between traditional forestry practices and the new community management practices is in the design of working plans. Whereas traditional forestry practices have depended entirely on the prescriptions laid down by the working plans for a period of 10 or 20 years, in JFM the emphasis is on micro-plans, focusing on the linkages of the available resources and required investments in small areas with specific needs identified by community groups, including agreed formulae for sharing of the usufructs. The broader working plans become an aggregate of these microplans. This is an important concept and must appear in the curricula of training programs. Market research, information and sales promotion, gender issues, status of economically important tree species and their regeneration methods, ecological adaptability, need to be incorporated in existing training programs. The syllabuses and training schedules also need to be revised, but the backlog is quite heavy. Three groups identified as important in the government's policy statement, forest personnel, participating forest communities and the NGOs, require orientation and training.

All serving forest officers trained under the old syllabus need to be retrained and thereafter be

used as conduits for imparting training to the lower levels. Instead of a formal orientation course for senior foresters, in-house informal discussions on a broad range of topics may bring about the desired results. These include the planning process, investment needs, inputs available from other Government departments, tree improvement programs, wildlife and biodiversity, integrated watershed management, collection, processing and marketing of NTFPs, support activities like sericulture, orchid propagation, mushroom collection, basket making, lac cultivation and pisciculture. For others, regular training classes on specific topics are needed. At least one week of training of all officers annually was agreed upon at a workshop in West Bengal. A permanent Education Cell headed by a senior officer is required in each State Forest Department. They should be responsible for organising in-house training programs for senior officers and dissemination of technical information and research findings amongst the field staff. A one-time training process, however good it may be, will not be able to keep foresters informed on continuing developments.

The NGOs form an integral part of the new management system and have a key role to play. Therefore, they must be adequately oriented and trained. The participating communities also need to be trained in seed collection, nursery raising, plantation activities and non-forestry support activities like bee-keeping, sericulture, mushroom and lac cultivation, basket making, etc. Efficiency can be significantly increased by the transfer of new technologies to the rural communities.

According to Palit, constraints of funds do not appear to have been a problem for training, but that perhaps reflects the lack of sufficient training programs. Forestry education has been introduced in some universities, the Indian Institute of Forest Management (IIFM), Bhopal, has been running various courses for forestry professionals as well as NGOs, and the Government of India have been organising training of senior forest officers through various compulsory training courses in 55 management and training institutes, there is a dearth of resource persons with competence and experience to impart the required training. This calls for the recruitment of experienced forest officers and guest faculty as resource persons. The workshop participants recommended a major rationalisation of training including the reorientation of training institutes.

## Research implications of India's forest management and ecological revival

The workshop leads to three important conclusions:

1. the dearth of reliable data and rigorous quantitative analysis at all levels of forest policy and implementation;
2. the inadequate emphasis of policy on productivity growth relative to regeneration, leading to an unnecessarily apparent conflict between growth, equity and sustainability; and
3. the urgent need to link future policy formulation and implementation to data collection and analysis of a multi-sectoral and multi-level nature, and doing so by developing long-term policy and analytical capacity by tapping the most qualified individuals and institutions, including those outside the purview of the government institutions.

The grassroots orientation of the 1988 Forest Policy has tended to result in an understandable gap of research at the macro and sectoral levels. Even at the local level, research is often not rigorous. Research is a specialised task and must involve the necessary expertise in its conduct. Grassroots implementation does not necessarily imply that research should be conducted by those who participate in the implementation of programs. Many issues raised in this summary call for long-term research, whereas much of the currently ongoing analysis tends to be of a short term nature.

### Analysis of forest dynamics

Systematic data collection on a continuous long-term basis is an urgent necessity but, to be useful, data collection must be oriented to problem solving.

Very general reasons for the degradation of forest lands were offered in the papers, ranging from the growth of population, urban/industrial demand, revenue requirements of the forest departments, lack of grazing control, expansion of irrigation and other development projects, etc. Concrete information on the relative importance of these factors seems to be lacking, particularly in the way they vary among specific regions and over time; yet information is crucial for targeting interventions to effect reversal of the current trends.

Given the speed of the degradation of India's forest lands, it is clear that both the extent and causes of degradation need to be better understood through concrete data collection and analysis on an urgent basis.

## Monitoring the dynamics of land use in a multi-sectoral context

Estimates of land use and its dynamics, as well as its expert interpretation, are also urgently needed in greater detail than currently undertaken by the Forest Survey of India (FSI), to understand the dynamics of land-use changes and the factors underlying them. Furthermore, understanding the changing nature of forest cover calls for an analysis not simply of the 77 million hectares of recorded forest lands but also of the 150 million or more hectares of agricultural lands that offer a huge potential to increase the forest cover both through the intensification of agriculture as well as the integration of agriculture and forestry to meet the subsistence and market needs. Finally, such analysis needs to be done at the aggregate as well as at the micro levels. The current FSI work is confined to the forest lands alone. Steps to correct this deficiency need to be taken as soon as possible. The experience of the Social Forestry projects also illustrates the importance of obtaining such information in a multi-sectoral context. Social Forestry projects were intended to meet the subsistence needs of the poor households by planting trees on private lands and common property lands. The projects have had little success on common property lands, but they were successful on private farm lands, thereby increasing the marketed supply of timber and to some extent reducing the pressure on public lands.

### Research on research

Since productivity growth is of utmost importance if the objectives of growth/equity and sustainability are to be achieved simultaneously, there is an urgent need to assess the extent to which the current research, extension, seedling production and distribution are adequate responses to the critical situation. Are there new productive species of trees available through research and how effective is extension of the known technology? What are the determinants of forest productivity under plantations and natural forests, under different ecological conditions?

### Need for resources

To, increase the intensity of data collection for a Geographical Information System (GIS) calls for the allocation of additional resources to the Ministry of Environment and Forests or an appropriate agency, which will increase the interface between

changing sectoral land uses. There is also need for the concurrent allocation of resources for data collection and analysis at the farm, community and regional levels to improve interpretation of, and interface with, the GIS data. Such multi-level, interactive data collection will need active co-operation and collaboration between the central, state and local governments, between NGOs and expert research analysts with a demonstrated ability in conducting research. This new approach should be trialled in one or two states as soon as possible, to improve the operational utility of such data for the purposes of planning and implementation. A related objective should be to increase the capabilities of the institutions involved, to learn operational lessons, and to apply the methods and lessons learnt from the experiment on an all-India basis within a clear time limit, such as three to five years.

### **International co-operation**

The use of GIS for environmental monitoring has become a common instrument of research and policy in many developed countries. In accordance with Dr. Manmohan Singh's plea for international cooperation, universities and other bodies (e.g. CIFOR, FAO, the World Bank) can be invited to play a useful role in helping FSI and Indian agencies to improve the planning and implementation of their broadened work through the establishment of long-term collaborative arrangements, technical assistance, training and research. Planning and implementation of projects at the state levels and below also need to reflect these concerns. Forestry projects funded by the World Bank have already begun to experiment with some of these ideas and they could be attempted on a pilot basis.

### **Establishing a reliable data base and information sharing**

To achieve operational impact, data and information on the forest sector needs to be routinely collected and made available on a timely basis to a large number of potential users so as to increase their awareness of the impact of a variety of forces on degradation, and improve the process of land-use planning through the development of effective operational programs, i.e. by actively involving all affected groups in planning and implementation at various levels. Currently the information seems to be mainly confined to the governmental ministries and departments rather

than being widely available for the purposes of research, program design and implementation. The Forest Departments need to take leadership in generating information and proactively sharing it with a view to improving planning and implementation in this way.

### **The growth/equity/environment conundrum**

The workshop demonstrated clearly how difficult it is to define the concepts of growth, equity and sustainability in the context of the forestry sector, to understand the nature of trade-offs among these three objectives, and particularly to measure empirically the extent to which one or more of these objectives are being realised. Yet operational definitions and measurements of productivity growth of both natural and managed forests, particularly including the impacts of the 1988 Forest Policy interventions on the local communities from the perspectives of growth/equity and sustainability, will be crucial to provide useful input into the future design and monitoring of policies and programs.

### **Need for policy reforms**

Subsidised supplies of timber from the government and the priority given to industry for supplies in times of shortage, have led to the establishment of excess capacity in industrial processing and its inefficient use. This is now a disincentive to technological upgrading. Some supplies are siphoned off to the open market illegally by concessionaires.. Arbitrary supply/price fixing encourages corruption and results in revenue loss. Small farmers are then discouraged to establish private plantations due to depressed market prices and demand. Subsidies to industry need to be withdrawn.

Distribution of some forest products, such as seeds, is nationalised and they can only be traded by government agencies. This policy, originally designed to eliminate middlemen, has been ineffective. Middlemen still exist and play an important function in assisting farmers to sell their produce. Also, with few legal buyers, the flow of goods is choked and the suppliers face delays in payments. Competition needs to be fostered among public, cooperative and private agencies.

Legal controls over the harvest and transport of forest products, including those from private lands, increase risks, corruption and transaction costs and need to be abolished. Access to market

information is poor among small farmers, gatherers and producers, and needs improvement.

### **Need for policy research**

Given the vast differences in the “requirements” vs. “effective demand”, the existing evidence suggests that there is need to:

1. Improve the estimation of demand as well as requirements of key forest products used by households and their determinants.
2. Explore solutions - both inside and outside the forestry sector - to generate income for India's poorest households, and to realise the effective demand for food and fuelwood. This calls for rapid growth in factor productivity and an employment and income-oriented approach throughout the economy, including the forestry sector.
3. Identify the impact of factors such as market failures and price distortions, and measure the extent to which they are caused by the lack of infrastructure and information, as distinct from government policies and subsidies.
4. Analyse the implications of these estimates for production and trade policies, and for investments in the forestry sector, particularly as the participants revealed a strong consensus that the overall resources allocated to the forestry and environment sectors including those through the Ministry of Environment and Forests (but not necessarily confined to it) need to be rationalised, used more effectively, and increased considerably.

The workshop papers provide a rich, empirically based policy research agenda worthy of support. To that agenda could be added the likely impact of structural changes, now under way in the Indian economy, on the future growth in demand for forest products. For example, the present internal utilisation of wood products is low due to the discouragement, through public policy, of the use of wood in the construction industry. The slow growth of investment in education and literacy has arrested growth in demand in the paper industry. These factors may well change in the near future as India becomes increasingly outward-oriented, and human capital assumes more importance. Moreover, the response of exports to the liberalisation measures will also accelerate demand for packaging material.

The impact of these structural factors on future demand may well be considerable, and call for an increase in productivity of India's forests. The issue

of productivity growth appears to have been overshadowed in the aftermath of the 1988 Forest Policy and its implementation, perhaps in reaction to the earlier Social Forestry programs that excessively focused on increasing timber supply, but the pendulum may have swung too far in the other direction.

### **Joint forest management and ecodevelopment**

Because Joint Forest Management is expected to involve the entire nation, systematic comparative studies to assess the extent to which the policy is currently implemented and its impact, is crucial at this stage to evaluate and fine tune policy and its implementation. The papers illustrate that far too little quantified information is available.

Ecodevelopment programs designed to improve productivity of private lands and resources in an ecologically sustainable way, will only be effective if combined with other measures such as IFM. Social Forestry should change the species Tom Teak and Eucalyptus to usufruct-based trees like Neem (*Azadirachta indica*), Mahua (*Madhuca longifolia*), Mango (*Mangifera indica*), Sal (*Shorea robusta*), Arjun (*Terminalia arjuna*), and should be supplemented with grasses, shrubs and bushes. The 1988 Forest Policy has accepted these suggestions to a certain extent but its implementation does not reflect the use of a broader scope of species.

### **Concepts of a forest community**

The Forest Policy envisages the creation of a massive people's movement with a strong involvement of rural people, including women, to protect biodiversity and minimise pressure on forests. Therefore, design of the programs requires a proper understanding of the composition and characteristics of forest communities and the rules by which different communities can regulate and manage the use of their own resources. Since the composition of communities tends to be highly varied in the diverse Indian society, development of systematic typologies is essential to understand the effects of the particular characteristics of a community on the types of community actions which would be appropriate to achieve growth, equity and ecological outcomes. These factors need to be explored systematically in the JFM programs, especially to devise guidelines for the future design of programs to achieve maximum impact. In this context, the forestry literature appears not to have benefited from the rich literature on political and administrative decentralisation, the design and



evaluation of rural, development programs and so on. Nowhere is this lack more apparent than in the issues related to the participation of women and tribals who often also constitute the poorest segment of the population. The papers on JFM make it clear that women's participation seems to be sorely lacking, but the treatment of the issue itself took on a controversial character in the workshop, suggesting that there is not yet a strong consensus among researchers, policy makers and implementers in India about the fundamental importance of women's active participation in joint forest management.

### **Non-timber forest products and common property resources**

Measures such as providing energy alternatives and augmenting incomes through organised collection, processing and efficient marketing of a large number of NTFPs are required. Given the central importance of NTFPs for the livelihoods of the poor, more data-based analysis of their role is urgently needed. To maintain productive common property lands, the following policy actions for CPRs are suggested:

- Stopping the regularisation of encroachments and ensuring a minimum area under CPRs for every village.
- Entrusting CPRs to community management based on concerns about equity and sustainability, with foresters as catalysts.
- Ensuring a proper balance between fodder and trees - both for subsistence and income generation.  
Protecting the rights of the local groups by helping them to clearly define sharing arrangements for grasses, bamboos, timber and other NTFPs.

### **Forestry and livestock**

Continued free access to forest lands results in high rates of growth of cattle numbers which causes land degradation and arrests the development of markets for forage crops. Grazing fees, where they exist, are so nominal as to be insignificant. A consequence of the degradation of grazing lands appears to be an increase in the goat population, which rose by 139% in 40 years. Because the capacity of goats to survive on poor forage is causing further land degradation, a grazing fee differential for cattle and goats may

well persuade owners to reduce their more destructive goat population.

Other areas that must be addressed include:

- 1) The current number of livestock dependent on forest lands in different areas of the country;
- 2) District-level data and factors influencing the demand for, and the supply (production) of, forage crops;
- 3) Economics of livestock production under alternative technologies and marketing arrangements;
- 4) Area of non-agricultural pasture land (much has been lost by encroachments);
- 5) Appropriate silvicultural systems to optimise fodder production from different forest types;
- 6) Social cost of free grazing in forest lands; and
- 7) Economics of stall feeding.

### **Forest lands and development projects**

It was argued by some authors that development projects have been responsible for significant land-use conversion from forests to other uses, and have been insensitive to the impact of their activities upon the livelihoods of the local people. Typically these projects export water, power and minerals to distant industrial locations, when some of these resources, e.g., water, could benefit local communities by providing them with irrigation. However, environmental and poverty concerns do not always intersect, as illustrated by the case of Sardar Sarovar. One of the largest multi-purpose projects in the world, it is expected to produce 1200 megawatts of electric power, domestic water for 40 million people, irrigation for 1.8 million hectares of land, and 3.8 million tons of additional grain, enough to feed 18 million people. These expected benefits must be weighed against the costs of environmental degradation and the displacement of some 100,000 families in a country which still contains over 200 million poor and whose population is projected to increase by over 500 million persons between 1990 and 2025.

### **Extent of biodiversity and conservation**

Research on ecology poses greater challenges than socio-economic research, particularly of a quantitative nature. India's forests abound in biological diversity with about 13,000 species of flowering plants, and 65,000 species of animals, including 2,000 species of fish, 140 of amphibians, 420 of reptiles, 1,200 of birds and 340 of mammals.

Conservation offers potentially large economic benefits, by harnessing a gene pool of environmentally friendly medicinal plants and pest control agents that can contribute to increased forest

productivity. Well-documented evidence of such benefits and success in harnessing them needs to be established.

## Recommendations

The streamlined and prioritised recommendations of the five groups of workshop participants are presented below.

### Investments

A widely shared view among workshop participants that the forestry sector is grossly under-funded relative to its contribution to income, employment, value added or government revenues, led to a number of recommendations to raise the level of public investment, improve coordination of existing investments and improve policies and procedures which would attract greater private investment. The state of West Bengal's example of 1.8% of its total budget was viewed as a model. The workshop, therefore, recommends that:

- Public investments to rehabilitate 30 million hectares of degraded forests and traditional pastures be substantially increased so as to meet the subsistence, employment and income requirements of millions of forest dwellers, rural artisans and women.
- Fiscal policies be modified, and restrictive laws with regard to, land ceiling, tree felling, transit passes, transport and marketing be relaxed to attract private investments to meet the needs of the industrial sector.
- Long-term, and assured levels of funding be allocated, which would take into account gestation lags in the planning and implementation of forest sector investments.
- Co-ordination of funds allocated through several ministries and agencies and different levels of administration that deal with forestry and related activities be improved.
- Funds be allocated by taking into account the different levels of absorptive capacity of different states.
- Funding be increased for the training at the state level and below, including allocations for the necessary equipment, audio visual aids, texts, books, and funds for the preparation of new materials.

### Improved informational systems

Informational gaps were visible in all aspects of the forestry sector. The workshop, therefore, recommends:

- The strengthening of the Forest Survey of India (FSI) as the nodal agency for collection, storage and dissemination of information, including provision of additional funding for its GIS activities.
- Identifying areas of high priority for natural regeneration with the information being aggregated at the district, state and national levels. The importance of the autonomous status of FSI was stressed, including the need for coordination with the National Information Centre (NIC) of the Planning Commission.
- A concurrent bottom-up system of information collection, through Panchayat Sanitis managed by the Block Development Officer (BDO), Range Forest Officer (RFO), and local NGOs as the nucleus for data collection,
- The strengthening of databases, particularly in the case of wastelands and forests other than reserved forests, in respect of:
  - their magnitude and size distribution; tenurial arrangements; and
  - production practices and potentials, including shifting cultivation.

### Training

Human resource development is one of the most important challenges for the implementation of the revised Forest Policy. Since expenditures on training and development of human resources tend to be inadequate, it was recommended that:

- There is a need to view training as an integral part of the personnel management, linked to the recruitment, career and promotional avenues, human resource development and general environment of governmental functioning.
- There should be a radical shift in training objectives directly geared and linked to improving the efficacy of the organisations.

- A realistic assessment of the training needs involving top management should be made, pinpointing deficiencies in the implementation of forest policies, procedures, management and organisational culture.  
Training of staff at all levels ranging from senior managers to forest guards, the people and NGOs, should take into account institutional aspects, on-the-job training, short workshops, orientation courses and visits.  
A minimum target of one week of training be ensured.
- Training should be strongly linked to policy formulation and implementation in order to update knowledge, prepare case studies and other useful training materials based on actual field experience.
- Training should be linked to research, including social sciences, bringing to bear the successful innovative cases of participatory forest management.
- There should be increased coordination, including streamlining the existing 55 training institutions, linking them with E-mail and NICNET.

### Research and technology development

The goals and purposes of research and technological upgrading can be broadly classified as stability, productivity and equity. Each of these can be analysed at four major functional or operational levels. They are: (a) ecological, (b) technological, (c) socio-economic, and (d) institutional.

The group addressed the research needs, based on the above-mentioned format, keeping in mind changing economic conditions and policies such as structural adjustment and liberalisation in the country, global integration and environmental concern, as well as the need for meeting livelihood and sustainability at the decentralised, village ecosystem level.

The objective of stability requires attention the ecological issues of: (a) existing levels of biodiversity; (b) sustainable levels of biodiversity and carrying capacity of the ecosystem; (c) nutrient status; and (d) forest hydrology. Research in these areas should be addressed with both short- and long-term perspectives and priorities. These ecological issues need to be approached in an integrated manner with other natural resource systems such as soil and water.

The technological backup for reducing pressure on forests requires analysis of the regeneration status of various species and afforestation prospects among the various biotic species (including wildlife). Studies should address linkages, richness, site qualities of different species and methods of conserving the ecosystem in harmony with the socioeconomic system.

Raising forest productivity is both a matter for scientific and socio-economic research. The technological options and management practices for maximising productivity consistent with stability and equity need to be identified. Specifically, the technological options should address the yields of timber as well as the non-timber forest products, including grasses. Specific attention should be given to the alternative technologies for value addition, the costs and benefits of these technologies and the extent to which they can accrue to local people rather than others.

Existing institutional constraints, laws, rules and regulations that act as barriers to improvement of productivity and distribution of benefits to the local people should be identified. Policies should be implemented to eliminate them and introduce others which support the current goals of the forestry sector.

Studies on decision-making processes in alternative institutions (such as JFM, Panchayats, etc.) and their implications for equity, sustainability and productivity should be conducted. Specific issues relating to gender and conflict resolution among interest groups need to be analysed: The rights of forest dwellers, especially the tribals, under alternative institutional arrangements and management practices should be studied.

The socio-economic issues have a direct bearing on the stability, productivity and equity of the forest ecosystem. The following aspects need to be studied at different levels (national, regional, watershed, village): (a) the nature of markets and pricing; (b) the valuation of forest products and services including integration of forest accounts as part of total resource accounts; (c) links between forestry and livelihood of local people and downstream industries at both national and international levels; (d) the role of market failures and externalities; and (e) investment needs of the forest sector.

Forest sector database should be strengthened on a continuing basis along with the alternative avenues of dissemination to various users of information. The databases need improvements

particularly in the case of wastelands and forests, other than reserved forests, in respect of their magnitude and size distribution, tenurial status and production practices, and potential (including shifting cultivation and others).

Research on forest and energy related issues should focus on national reserves, buffer and extended buffer areas, energy system research and improved technologies for using new and renewable resources. In order to make research purposive, forest departments, universities, research institutions, NGOs and industries should act as partners by way of pooling capabilities, experience and funds. On the matter of implementing R&D programs, the following courses of action were recommended:

- The approach should be interdisciplinary.
- Basic research should be shared rather than duplicated.
- Adaptive research should be location specific.
- Proper dissemination processes should be in-built. Examples include networking and the publication of information bulletins and journals. ICFRE institutions should be involved in this process.

A methodology of integrating information from diversified fields beyond forestry be developed to strengthen forestry research (for example, information technology, geology).

### **References**

- Lele, Uma and Bumb, Balu. *South Asia's Food Crisis - The Case of India*. The World Bank, Washington D.C. 1994.
- Ostrom, Elinor. *Neither Market Nor State: Governance of Common-Pool Resources in the Twenty-First Century*. International Food Policy Research Institute Lecture Series, Washington D.C. 1994.

## Appendix I: List of Papers

1. State of India's Forests: concepts, definitions, trends, controversies  
**AK. Mukerji, Inspector General of Forests, Government of India**
2. Some aspects of demand, prices and markets for forest products  
**N. C. Saxena, LBS National Academy of Administration, Mussoorie**
3. Industrial wood in India: Key determinants of demand and supply  
**P.J. Dilip Kumar, Institute of Wood Science and Technology, Bangalore**
4. Fuelwood and other energy supply and demand in rural India  
**B.N. Dwivedi, Tata Energy Research Institute, New Delhi**
5. Determinants of the key elements of demand and supply of Non-timber Forest Products  
**M.P. Shiva, Centre of Minor Forest Products for Rural Development and Environmental Conservation Dehra Dun**
6. Grazing and forage management in the forests of India  
**R. V. Singh, Dehra Dun**
7. Indian forestry at the crossroads: Natural resource management and ecological revival  
**T.N. Khoshoo, Tata Energy Research Institute, New Delhi**
8. Forestry: Reconciling poverty and equity concerns  
**Kamla Chowdhry, New Delhi**
9. Regenerating India's Forests: Reconciling gender equity with Joint Forest Management  
**Madhu Sarin, Chandigarh**
10. Experience with the recent Joint Forest Management approach  
**Hema Arora and Arvind Khare, Society for Promotion of Wastelands Development, New Delhi**
11. Joint Forest Management in Haryana Shivaliks  
**O.N. Kaul, Tata Energy Research Institute, New Delhi, and S. K. Dhar, Haryantr Forest Department**
12. Management of common property resources  
**M.V. Nadkarni, Institute for Social and Economic Change, Bangalore**
13. Management of Public Forests  
**A.N. Chaturvedi, Tata Energy Research Institute, New Delhi**

14. Protected areas for biodiversity conservation in India: Problems and prospects  
***H.S. Panwar, Wildlife Institut of India, Dehra Dun***
15. Farm forestry in different agrarian regions of India  
***N.C. Saxena, LBS Academy of Administration Mussoorie***
16. Forestry research and extension implications in India  
***D.N. Tewari, Indian Council of Forestry Research and Education, Dehra Dun***
17. Education and Training needs for better implementation of forest policies and emerging forest management strategies and their implications  
***S. Palit, West Bengal Forest Department***
18. Production of planning material: Roles of public and private sectors  
***V.K. Bahuguna, Tripura Forest Department***

**Appendix II: List of Participants at the International workshop on India's Forest Management and Ecological revival, 10-12 February 1994, New Delhi**

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