

Dependence of Local Communities on Forest Resources: Implications for Protected Area Management in Melghat Tiger Reserve, Maharashtra, India

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ABSTRACT

This paper discusses the factors responsible for the dependence of local communities on the forest resources of Melghat Tiger Reserve in Maharashtra and possible steps that can be taken to reduce this dependence to make it sustainable. Melghat was declared a Tiger Reserve in 1973 and covers an area of 1597 km². The area is inhabited by tribals and non-tribals and is under anthropogenic pressures due to extraction of natural resources for subsistence by a large number of people and livestock. There were 61 revenue villages located within the tiger reserve with a human population of more than 25000 and a livestock population of more than 26000. While 69% of the households were tribal households the remaining 31% were non-tribal households, mostly agro-pastoralists. The local people in the protected area had subsistence forest-based economies and were therefore dependent on the forest resources for their sustenance throughout the year. The level and nature of dependence was found to be determined both by the lifestyle of the people as well as the degree of accessibility of the protected area from urban and semi-urban areas. Economic dependence was the result of “lack of alternatives” either due to “non-availability” or due to “lack of purchasing power”. Direct economic dependence of the local communities was for fuel wood, non-timber forest produce (NTFPs), timber, bamboo, water and pasturing of cattle. While the tribals largely practiced subsistence agriculture and mostly worked as labour, the agro-pastoralists were engaged in dairying activities. Socio-economic data were collected through household interviews in villages located within the protected area using open and closed-ended questionnaires. A total of 243 households (>20%) were sampled of which >50% were tribal households, >70% were landless, marginal or small landholders, and >80% families owned livestock. The creation of the tiger reserve brought about significant changes in the dimension and equations of dependence. For local communities it translated in loss of economic opportunities and benefits which they traditionally derived. This has resulted in negative attitudes towards the forest department due to increased human-wildlife conflict bringing considerable strain on park-people relationships. Major management issues that need to be addressed are- dependence of local communities resulting in conflicts with the objectives of conservation and negative attitudes of the people towards forest department; inadequate coordination between forest department and district administration and other institutions/agencies working in the area and exploring employment opportunities especially for 8% of the families who are without land and livestock.

Key Words: Forest Conservation; Local Communities; Alternatives; Economic Opportunities; Attitudes.

INTRODUCTION

While forest ecosystems are crucial in maintenance of ecological balance, they are also the major sources of fodder, fuel wood, timber and a variety of non-timber forest produce. However, increasing human and livestock populations are escalating the anthropogenic pressures on the forests resulting in their degradation

(Erickholm 1975, Upreti 1987, Pearce et al. 1990, Upreti 1994). The scenario is especially serious in developing countries, where a combination of factors, such as large-scale commercial exploitation of forest in the past, clearance of forests for agriculture, building of large hydro-power projects and unplanned industrialisation has led to large-scale losses in forest cover. This has resulted reduction, fragmentation and degradation of wildlife

habitats leading to decline in wildlife populations and loss of biodiversity. Moreover, a very high proportion of human population in developing countries lives below the poverty line and therefore depends on a wide range of forest based resources for their everyday needs. Consequently, forests in these countries continue to be degraded.

The National Forest Policy of 1952, for the first time provided for declaration of Protected Areas in the post independence years. With the enactment of Wildlife (Protection) Act in 1972, serious efforts to conserve India's biodiversity were initiated at the state level. Moreover the concept of scientific management of protected areas for perpetuation of wildlife gained momentum with the launching of "Project Tiger" in India in 1973. Initially nine tiger reserves were established in different states during 1973-74; Melghat Tiger Reserve was one of them. Moreover to regulate the unabated diversion of forest land, the Government of India enacted the Forest (Conservation) Act, 1980. However, the 1988 National Forest Policy made the most significant difference to management of forests by pronouncing maintenance of biological diversity, by its implications a central and mandatory requirement.

Conservation at times has been considered as a protective 'locking away' of resources by the powerful elite. In India, reserved and protected forests were established during the 19th century, with the prime objective of harvesting timber and other produce, and also conserving and protecting forest ecosystems. This was done through policies, legislation and enforcement of laws to regulate the use of forest resources. Imposing restrictions on forest-based rural communities resulted in a number of negative consequences such as, denial of access to traditionally used resources, illegal removal of timber and non-timber produce, increased human-wildlife conflict and sometimes even displacement of people from their traditional lands (Croft 1981, Mishra 1984, Calhoun 1972, Lusigi 1984, Hough 1988, Sunderraj et al. 1993, Murthy 1999). Unfortunately the laws governing the Protected Areas (PAs) have also alienated the local people from the PA managers. Another factor that has proved detrimental to conservation has been the sectoral programmes of other agencies working in and around the PAs. These programmes are mostly counterproductive to the conservation efforts of the PA managers. It has also proved difficult to make these governmental agencies to change their policies. In reality, however, PAs play a central role in the social and economic development of

rural environments (MacKinnon et al. 1986) and provide a range of benefits, from preservation of natural ecological processes to provision of timber, wildlife, water or recreational use at sustainable levels (Dixon and Sherman 1990).

It is therefore necessary to review our development and conservation policies in the light of the present socio-economic scenario. Such an approach would require a detailed understanding of causes, magnitude and impact of people's dependence on forests. In order to develop area specific management guidelines for conservation of biodiversity the Wildlife Institute of India under took a study in the Satpura Conservation Area (a cluster of four PAs viz., Melghat Tiger Reserve, Bori Wildlife Sanctuary, Satpura National Park and the Pachmarhi Wildlife Sanctuary). Baseline information was collected on two of the PAs (Melghat and Bori) under the study on the underlying causes of dependence of local communities, the resulting impact on the forest and possible steps that can be taken to reduce this dependence to make it sustainable (Musavi 1999). The paper discusses the extent of dependence of local communities on forest resources of MTR, the factors responsible for the dependence, resulting problems and possible steps that can be taken to reduce this dependence to make it sustainable.

STUDY AREA

MTR lies between 21° 15' N to 21° 45' N latitude and between 76° 57' E to 77° 30' E longitude in the state of Maharashtra. It covers an area of 1597 km² and comprises the Gugamal National Park, Melghat Wildlife Sanctuary and the Multiple Use Area (Musavi et al. 2006). It is located in the Satpura hills within the 'Central Highlands' province of the Deccan Biogeographic Zone of Peninsular India (Rodgers et al. 2000). MTR consists of a succession of hills and valleys marked by abrupt variations in altitude. Forests of Melghat typically represent the dry deciduous forest type of Central India, dominated by Teak (Champion and Seth 1968). MTR has both environmental and derived values, in terms of soil conservation and maintaining water regimes, floral and faunal diversity, in addition to being a valuable habitat of some of the country's endangered species (Sawarkar and Panwar 1987). However, these forests are under increasing anthropogenic pressure from villages located both within as well as on the periphery.

Socio-Economic Scenario

There were 61 revenue villages within the tiger reserve with more than 25,000 people and 26,000 livestock residing in these villages. Most villages lacked basic civic amenities like proper drinking water, electricity, roads, dispensaries, etc. There were three broad community groups living in MTR viz. a) scheduled tribes (ST), b) scheduled and backward classes (SC) and c) agro-pastoralists. Major scheduled tribes were *Korku*, *Gond*, *Burad*, *Nehal* and *Rathiya* who were hunters and shifting cultivators before the British took over these forests. They worked as labourers and also practiced subsistence agriculture which was mostly rain-fed. Different communities which belonged to the scheduled and backward classes included *Balai*, *Vanjaris*, *Gaolan*, *Lohars*. They were engaged either in agriculture, small business enterprises or were employed in government jobs. The agro-pastoralist or Gawli community was mostly engaged in cattle rearing and dairying activities and were recent migrants to the MTR from adjoining regions due to increasing population pressure and depleting resources. Most of the people living in MTR were dependent on it for subsistence. Major sources of income were forestry works outside the tiger reserve, collection of NTFP, commercial head-loading of fuelwood and dairying activities especially for the agro-pastoralists. Although agriculture was primarily for subsistence, it also helped the local people to supplement their incomes. However, population growth and the increase in family size resulted in fragmentation of agricultural fields leading to small non-viable land holdings.

METHODS

Data were collected both from primary and secondary sources. The villages in the study area were classified on the basis of the size of human and livestock populations and stratified random sampling was carried out. Both closed/ open-ended questions were used to collect socio-economic data. Fixed response questions for easier interpretation were used to gather data on problems faced by the people. Effort was made to interview the entire family, especially the adult members, during the household surveys. This was done to reduce any gender or generation bias. The information obtained during the interviews was further corroborated with that obtained through observations during my stay in each of the sample villages.

RESULTS

Both people and livestock residing within the PA were dependent on its forest resources resulting in management problems for the PA management. Data collected from different communities residing in MTR were analysed to assess the level of dependence on the forest ecosystem. A total of 243 households (22.9%) were sampled in 15 out of 61 villages (24.5%). Out of the sampled households 68.7% were tribal households and the remaining were non-tribal households (Table 1). Mean family size was around 6. All communities, except the agro-pastoralists practised subsistence agriculture which was primarily dependent on the monsoon. However, population growth over the years had resulted in fragmentation of land holdings.

Table 1. Socio-economic profile of sampled households in Melghat Tiger Reserve

Parameters	Number	Percent
Villages included in sampling	15	24.5
Population sampled	1616	26.4
Households sampled	243	22.9
Scheduled Tribe households	167	68.72
Scheduled/Backward class households	48	19.75
Agro-pastoralist households	28	11.52
Landholders	168	69
Livestock holders	210	86.4

Out of the total sampled households, 168 (69%) owned land, out of which 83 families were marginal and small landholders (≤ 2 ha), and 85 families were medium and large landholders (> 2 ha). The remaining 75 households (30.8%) were landless. Moreover only a few of the sampled households (7.4%) rented land for agriculture. Traditional agriculture was practiced irrespective of landholding size. Only the large landholders (5.35%) hired diesel pumps to irrigate their fields (Table 2). Consequently not many households were able to grow winter crops. The main monsoon crops were various indigenous varieties of paddy, soya bean and pulses, while the main winter crops were wheat, gram and *jagani* (oil seed).

Table 2. Landholding pattern of sampled households in Melghat Tiger Reserve

Parameters	Number	Percent
Landholder households	168	69.13
Marginal & small landholders (<2 ha)*	83	49.5
Medium & large landholders (>2 ha)*	85	50.5
Landless households	75	30.8
Households renting land	18	7.4
Households using irrigation	9	5.35

* As percent of land holding families

Table 3. Land and livestock holding (mean±S.E.) pattern of sampled households across different communities in Melghat Tiger Reserve

Communities	Landholding (ha)	Livestock
ST households	9.10 ±1.02	5.37 ±0.50
SC households	9.70 ±1.58	4.97 ±1.06
Agro-pastoralist households	6.89 ±2.02	19.96 (±3.32)

The mean landholding size (in hectares) has been calculated for landholding families only.

ST=Scheduled Tribes; SC=Scheduled / Backward Classes.

Although the mean landholding size was about 9 acres for ST and SC households, it was comparatively lower for agro-pastoralist households. The livestock holding pattern however contrasted with the landholding

pattern, with the agro-pastoralist households owning more than 19 cattle while the other two communities owned 4 to 5 animals on an average (Table 3). It was also observed that, while majority of the agro-pastoralist families (>65%) were landless, they owned large number of livestock, while 8% (14) of ST and 18% (9) of SC households owned neither land nor livestock, none of the agro-pastoralist families were in this category.

Dependence

The local economy was basically a subsistence economy. Agriculture was primarily for domestic consumption and only the surplus was sold or exchanged in weekly markets for essential commodities. Consequently the local communities were largely dependent on forest resources of MTR for sustenance, especially during monsoons as by this time the agricultural produce from the previous cropping cycle was exhausted. During the monsoons the roads were also cut off in remote villages making it necessary for the people to depend on the forest. The non-commercial NTFP collected by the local communities especially by the Scheduled tribes were Bamboo shoots, mushrooms, tubers, forest vegetables, fruits, fish and crabs. Although these were for domestic consumption some were exchanged for other commodities (especially grains, etc.). At times dried fish was also sold in the local weekly market. Moreover, all households depended on MTR forest for grazing their livestock.

The forest resources were an important component of the forest-based economy of the local communities and the extent of dependence was reflected in the seasonal calendar of activities (Table 4). Whereas MTR

Table 4. Seasonal calendar of subsistence activities of sampled households in Melghat Tiger Reserve

Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cultivation & Agriculture	*	*	*				*	*	*	*	*	*
Collection of Mahua flowers & seeds			*	*		*	*					
Collection of Tendu				*	*							
Collection of tubers, bamboo shoots, mushrooms, etc.							*	*	*	*		
Collection of grasses & fodder	*		*						*	*	*	*
Agricultural labour	*	*	*					*	*	*		
Forest labour		*	*		*	*					*	*
Repair of houses, fence, agricultural implements, etc.					*	*						
Storage of fuelwood	*	*	*	*	*	*					*	*
Fishing	*	*	*					*	*	*	*	*

Table 5. Annual collection of non-timber forest produce (kg per household) by sampled households in Melghat Tiger reserve

Major items	Schedule Tribes	Schedule Class Backward class	Agro-pastoralist
<i>Madhuca latifolia</i> flower (Mahua)	92.97 (± 8.7)	78.63 (± 11.6)	-
<i>Madhuca latifolia</i> seed (Mahua)	8.43 (± 1.8)	5.92 (± 2.5)	-
<i>Buchanania lanzan</i> seed (Chironji)	0.54 (± 90.3)	-	-
<i>Terminalia chebula</i> seed (Hirda)	0.77 (± 0.6)	2.08 (± 2.08)	-
<i>Diospyros melanoxylon</i> leaves* (Tendu)	13.57 (± 10.6)	20.83 (± 15.4)	-
<i>Chlorophytum tuberosum</i> roots (Musli)	0.05 (± 0.03)	-	-

The figures in parentheses are Standard Error values.

* *Diospyros melanoxylon* leaves were collected and quantified in bundles of 100 leaves each.

was a major source of fuelwood and timber for all communities, NTFPs were however collected only by the ST and SC households. The local communities were engaged almost throughout the year either in collecting NTFP, forest related labour, collecting timber / repairing of houses and agricultural implements, collection / storage of fuel wood and fishing. The local communities also collected NTFPs which had commercial value. While the major NTFP collected in MTR was Mahua (*Madhuca latifolia*) flowers as well as seeds, primarily collected for domestic consumption, other NTFP, were seeds of *Buchanania lanzan* and *Terminalia chebula*, leaves of *Diospyros melanoxylon* and roots of *Chlorophytum tuberosum* (Table 5).

On an average more than 2 kg of fuel wood per family was used daily with the scheduled and backward classes consuming comparatively more fuel wood (2.76 ± 0.19) than other communities (Table 6). While fuel wood and timber was used by all, irrespective of community or economic status, NTFP was extracted in different intensities by ST and SC households. Similar was the case for dependence on forest for grazing the cattle and collection of leaf fodder, however, the pattern varied between the agro-pastoralists and ST and SC households, reflecting differences in their lifestyles. While all the livestock grazed in the forest, those belonging to the scheduled tribes and scheduled / backward classes stayed in the forest only during the day hours and grazed as part of a common village herd. The livestock of agro-pastoralists, however, spent maximum time in the forest and often camped there, especially at the end of monsoon and during early winter, in temporary cattle camps called "haites", occupied and operated by family members, mostly adult males and

Table 6. Fuelwood consumption (kg \pm S.E.) pattern in sampled households across communities in Melghat Tiger Reserve

Communities	Daily	Annual
Scheduled Tribes	2.30 \pm 0.09	839.2 \pm 33.6
Scheduled Castes and Backward Classes	2.76 \pm 0.19	1007.9 \pm 168.6
Agropastoralists	2.13 \pm 0.28	776.4 \pm 100.9

All values are mean per capita consumption.

young boys. The young calves and bulls used for ploughing the fields were however stall-fed with grasses and green leaf fodder collected from the forest.

The major source of income for the ST and SC were labour related activities as they contributed more than 50% to the annual income of the households. On the other hand sale of milk and milk products contributed more than 80% of income for the agro-pastoralist households. However, the contribution of NTFP to household income for ST and SC households was negligible indicating that these were mostly collected for subsistence, except for Hirda seeds, Tendu leaves and Musli root which were collected primarily for sale. As the agro-pastoralist households did not collect any NTFP there was no contribution to their income from this source.

Protected Area –People Issues

Melghat Tiger Reserve was created for long-term conservation of biodiversity focusing on some of the

most endangered species, especially the tiger. The considerable population living in and around the PA has been exploiting the resources of these forests for their survival since time immemorial, though the equations and dimensions have undergone a significant change. The creation of the protected area during the first half of the 1970's created certain problems leading to conflicts between the local people and the protected area officials, who represent the nation's commitment for maintenance of biological diversity. The main problem that confronts the local people is the reduced economic opportunities and benefits, which they had traditionally derived from the area, prior to the change in legal status of these tracts of land to protected areas. On the other hand, crop raiding by wild herbivores and livestock depredation by wild carnivores creates a conflict not only between the local people and wild animals, but also with the protected area officials.

The protected area managers of MTR have to face the problem of hunting of wildlife by the local people using traps and dogs, mostly for domestic consumption. At times the local people also resort to killing of wild animals, especially the Sambar and Wild pig, by using country made bombs; illegally tapping power lines, poisoning the carcasses of livestock to kill tiger and leopard. The origin though may be rooted in retaliation for the damage caused to their agricultural fields and domestic livestock by these wild animals the situation may take a serious turn in support of illegal trade in wild animal products and plants. The local people also harvest fish illegally by blasting bombs under the water and poisoning the water bodies using agricultural pesticides and insecticides, even though they are permitted to catch fish for domestic consumption, using indigenous methods like nets etc. Moreover, grazing by large herds of livestock not only degrades the habitat, it causes a lot of disturbance, especially around water bodies. Often forest fires are also set off by the agro-pastoralists causing major problems in the PA.

This dual conflict situation, coupled with the problems stated above, was thoroughly examined by the author through interaction with the local respondents under study. Five major problems and conflicts from the point of view of local people were identified. Table 7 shows the perceptions of the respondents' towards these problems.

Inadequate / lack of employment opportunities were considered a major problem by majority of the households (more than 60%) from all the communities, except the agro-pastoralist families of MTR (less than 15%). The agro-pastoralists in MTR (more than 90%) however

felt that there was fodder shortage for their livestock and were resentful for not being allowed to graze their cattle in the NP and Tourism Zone of MTR. The rest of the communities did not consider it a major problem. Unavailability of land was considered a major problem by 20% of SC households, while less than 10% of tribal and agro-pastoralists households considered unavailability of land as a problem. Crop damage by wild herbivores was considered a major conflict by more than 50% of ST and SC households. Livestock predation however, was considered a major conflict by only 5% of ST households as compared to >7% agro-pastoralist households and >12% SC households.

Table 7. Major problems and conflicts faced by the respondents in Melghat Tiger Reserve

Problems /Conflicts	Melghat Tiger Reserve		
	A	B	C
LEO	63.47	85.42	14.29
SOF	31.14	47.92	92.86
UOL	8.98	22.92	3.57
CR	71.85	56.25	28.57
LP	5.39	12.5	7.14

LEO=Lack of employment opportunities; SOF=Shortage of fodder; UOL=Unavailability of land; CR=Crop raiding by wild herbivores; LP=Livestock predation by wild animals; A=Scheduled tribes; B=Scheduled castes and backward classes; and C=Agropastoralists. The figures are percentages of families in each community group.

DISCUSSION

All the communities residing within MTR depend on the forest resources both directly and indirectly. For the purpose of this study dependence has been considered as "lack of alternatives", either due to non-availability or due to lack of purchasing power. While the direct economic dependence was in the form of their requirement for domestic consumption, indirect dependence was more of derived requirement. Direct economic dependence on the forest was for 1) fuelwood; 2) timber, bamboo, leaves and grasses, etc. for house construction, fencing, agricultural implements and thatching; 3) fruits, seeds, forest vegetables, mushrooms, roots, tubers, bamboo shoots, fishes, crabs, etc., for sustenance; and 4) water and pasturing of cattle. Indirect dependence on the forest was for 1) cultivation and income from the sale of

agricultural surplus; 2) income from sale of commercial NTFP and head-loading fuel wood; 3) income from the sale of dairy products; and 4) income from forest related and alternate employment opportunities, within the PA.

The findings of the study have brought out differences in the lifestyles of the various community groups especially the agro-pastoralists and the non-agro-pastoralists (scheduled tribes, scheduled castes and backward classes). Moreover, the level of dependence on forest and its resources was found to be both, the outcome of lifestyles as well as the accessibility/remoteness of the PA from the urban centres. The agro-pastoral communities however, had fewer landholders as they were recent entrants in these villages and therefore could not legally acquire land.

The non agro-pastoralist families who had neither land nor livestock were completely dependent on labour and other employment opportunities. At times, they rented land to grow cash crops. However, none of the agro-pastoralist families were without livestock. This was a reflection of their basic lifestyle and higher level of dependence on dairying and related activities. Thus their primary profession was pastoralism, agriculture being secondary. However, for the agriculturists, livestock has traditionally been considered as stored wealth to be used in times of need, for providing milk for domestic consumption and for ploughing their fields.

As far as landholding pattern was concerned, most of the landholders were in 'marginal' and 'small' categories, i.e., less than 5 acres of land. The landholdings were mostly either along streams or on hill slopes. Both the size and the location of the landholding necessitated traditional agriculture practices. Moreover, lack of finances and other support facilities in this sector were also responsible for the existing agricultural pattern. There was a high dependence on the monsoon due to lack of irrigation facilities.

This is a scenario that is prevalent all over the country, with a large percentage of its people dependent on subsistence agriculture on marginal lands within or close to PAs. These people depend heavily on forest areas for fuel wood and grazing of livestock, collection of NTFP, wood and other material for construction of their houses (Saharia, 1984). Fuel wood formed the major item of "dependence on the forest" as it constitutes the largest single source of supply of domestic fuel in the country. Moreover, for the unemployed landless, its collection and sale forms a major source of livelihood.

The pattern of fuel wood consumption varied across the communities. It was seen that no alternative fuel was used by either of the communities, even if they had the

resources to afford alternative energy sources. Consequently, those with higher standard of living were observed to be spending more on food and consequently consuming more firewood. Comparatively, the landless, especially in the tribal communities were using less amounts of fuel wood, as they could afford fewer and very modest meals. Moreover, they migrated to urban areas for long periods in search of employment opportunities from early winter to beginning of monsoons.

In contrast to the fuel wood consumption pattern, wood for heating purposes was used by all families except those with a higher standard of living; they could afford blankets and woollen clothes to keep themselves warm during winter. Moreover, their houses were better built to keep the monsoon rains out thus excluding the need for large logs of wood for heating purposes.

NTFP collection by different communities brought out the importance of this resource in their lives. The agricultural communities greatly depended on NTFP to support them during the lean periods. NTFP provided sustenance both to the landholders as well as to the landless during the monsoons; at this time of the year the agricultural reserves of the previous year were over and the new crop had not yet ripened. Moreover, due to the overflowing of the innumerable rivers and streams the villages were completely isolated. Thus the various NTFP items like the new bamboo shoots, mushrooms, the forest vegetables and roots and tubers that came up with the onset of the monsoon, were their only source of sustenance in such times. For the agro-pastoral communities this was not so, as they were dependent on the earnings from the sale of milk. During monsoons, there were plenty of grasses for the livestock to feed on. This resulted in enhanced milk yield and higher income during this season. NTFP like *Madhuca* and *Buchnanina*, which were collected during late winter and early summer, were also missed by the agro-pastoral communities in MTR. This was because from mid-winter to late summer the agro-pastoralists migrated to plains for grazing their livestock due to scarcity of grasses in the PA.

Livestock-grazing pattern was also found different across the communities. Livestock belonging to agro-pastoralists often camped in the forest from the end of the monsoon to early winter. These campsites were mostly close to some water source. This provided maximum grazing opportunity to their large herds of livestock, as the forest close to most of the villages was highly degraded compared to the forest, which was away from the villages. Thus the pressure exerted on the forest

by the agro-pastoralist livestock was much higher. As mentioned above, most of the agro-pastoralists in MTR migrated to plains for about six months till the onset of the monsoons. However, the rest of the livestock stayed within the PA.

Income by different sources showed significant variation across the communities. Agriculture was mostly for subsistence with the major portion of agricultural produce for domestic consumption. Most of the large landholders in MTR were able to sell commercial crops like soya bean, pulses and oil seeds in the market. This greatly enhanced their incomes. On the other hand, small and marginal farmers traded small portions of their agricultural output, in times of need, for essential commodities like salt, chillies, other cereals etc. Thus the percentage contribution of agriculture, in monetary terms, to the overall household income was low or negligible.

Most NTFP were collected for domestic consumption. In times of need, small quantities of NTFP, especially *Madhuca* (Mahua) flowers, were traded for cereals and other essential commodities. Consequently, the overall contribution of NTFP to total income of a household was low for all communities except agro-pastoralists in MTR; for the latter this source was entirely missing. These agro-pastoralists could not collect or earn an income from the sale of NTFP as they were not present during most of the collection season.

Labour activities contributed substantially to the annual household income. For the agro-pastoralists in MTR however, the contribution of this source was very low. This was because they were involved in cattle rearing and very few of them took up labour activities. Thus, while all communities were found to be dependent on the forest resources, the pattern of dependence varied across the communities. While for the tribal households, collection and sale of NTFP has been a source of sustenance and income; livestock for them has traditionally been a form of stored wealth. The ST households mostly exploited the forests for their bonafide use, i.e., fuelwood, small timber for house construction and NTFPs like flowers, fruits, seeds, roots, tubers, etc. Therefore, their dependence was more due to lack of alternatives than for commercial gain.

Agriculturists with assorted professions continued to practice their traditional profession. However, they were progressive enough to diversify into other activities viz., small business in the villages or jobs in public and private sectors. All this can be attributed to higher literacy rate in this community group. They were also dependent on the forest for fuel wood, timber and NTFP.

However, they could probably afford alternatives.

Most of agro-pastoralists did not own land. Dairy and related activities formed major source of livelihood for them. Therefore, they had large livestock holdings. Agriculture was their secondary profession. They too were dependent on the forest for fuel wood and timber. In addition to this, they also depended on the forest for grazing their livestock. This latter form of dependence was purely for commercial purpose.

With change in legal status to a PA, legal restrictions have been imposed on people in the matter of extraction of resources from these forests. Consequently, people's perceptions of their problems have changed. As a result of this, the relationship between people and the PA manager has come under considerable strain leading to conflicts between the people and wildlife. It is necessary to appreciate that the popular perception of the wildlife damage problems being attributed solely to increase in the populations of wild animals due to protection is only partially true. There certainly has been some increase, but limited by habitat degradation and fragmentation. The most relevant is the rapid rise in human and cattle populations and increasing biotic pressures that have led to more encounters between people and wildlife.

Implications for Protected Area Management

On the basis of the findings of the study, three major management issues have emerged viz., socio-economic, administrative and protected area-people relationships. The socio-economic issues for the management are- (1) Employment opportunities, especially for those without land and livestock as these families are genuinely dependent on the forest resources for their livelihood; (2) Grazing by large number of livestock within MTR and the associated fires. This activity is a major cause for weed proliferation and soil compaction leading to decrease in ground cover and rate of regeneration and also spread of diseases to wild animals from livestock; (3) Fuel wood requirement of the people living within the PA, as in the absence of alternative sources, fuel wood is a major source of energy for these people.

The administrative issues are- (a) Inadequate coordination between district administration and the forest department; (b) Inadequate training and motivation of the forest staff, especially in terms of people related issues.

The issues regarding protected area-people relationship are: (1) Conflict (in people's perceptions) with the objectives of conservation. On one hand it is the struggle

for day to day survival of the socio-economic class dependent on the forest resources and on the other hand it is the un-sustainability of this resource-use which is undermining the conservation efforts; (2) Negative attitudes of the people towards the Forest Department due to the crop damage and livestock predation by wild animals.

Most of the protected areas today are facing a number of problems with respect to the people living within and adjacent to them, their dependence on these forests and their rights. Most of these problems require different management strategies as the protected area policy and management also has its implications for rural development of the local people (Schelhas 1991 and Brechin et al. 1991). IUCN's World Conservation Strategy (IUCN 1980) has emphasised the concept of joining economic development with conservation ('eco-development') for the better management of PAs. Such a holistic, people friendly and inter-agency approach can contribute to environmental security, higher productivity and the well-being of people (Panwar 1992).

Major management recommendations on the basis of area specific issues before the PA management are:

(1) Provision of alternatives to the genuinely dependent families, in terms of both alternative resources and sources of income, so as to reduce the pressure on the forest and make the local forest-based economies sustainable in the long run. Thus, the focus should be to address those who have the least range of sustenance opportunities, i.e., who are landless and also do not own any livestock.

(2) Incentives could be provided by both PA management and the animal husbandry department to encourage large livestock owners maintain smaller number of more productive livestock and to stall feed their livestock with cut grass from Tourism Zone and Gugamal National Park. Moreover, stall feeding should especially be encouraged during monsoons and early winter, as this is the period when grazing causes damage to the new seedlings that are coming up. Rotational grazing can also be introduced, with the help of local planning and participation.

(3) Introduction of indigenous fast growing timber and fodder species within village boundaries and on fallow lands to eventually take some pressure off the forest.

CONCLUSIONS

The present study was an attempt to understand the complex relationship between the PA and the people living in it. Local communities were found to be dependent on the forest because of their traditions, lifestyles or inability to purchase alternatives. Moreover, families who neither owned land nor livestock were genuinely dependent on the forest, but their dependence was limited to seasonal demand for fuel wood and NTFP. Majority of families who had traditionally worked as labourers in forestry operations felt deprived of employment opportunities. On the other hand, agropastoralists not only exerted more pressure on the PA because of their large livestock holding and grazing pattern, but also resented restrictions on grazing in the national park and tourism zone of MTR. It was felt that restrictions on resource-use had resulted in intensifying people's perceptions of their problems as opposed to direct costs due to damage by wild animals.

Developing countries like India though rich in biological diversity are having severe problems in protecting these resources in the face of rapidly growing human and livestock populations which to a large extent depend on these forests for sustenance due to increasing poverty and lack of alternatives. The situation has worsened as these countries are also subjected to the pressures of 'development' and the 'market forces', leading to increased pressures on the protected areas. Measures to conserve biodiversity must therefore provide economic incentives to the local indigenous communities so that they may be encouraged to use them sustainably. This however, is difficult to achieve in developing countries where poverty results in greater dependence on natural resources. Thus, while the gravity and the magnitude of the problems are formidable, tackling them on a long term basis through well formulated, adequately funded and properly executed programmes is a possibility (Panwar 1990).

The pattern of resource dependence of the local communities in MTR can also be reversed and reduced by providing viable and appropriate alternatives through implementation of well formulated programmes and schemes. Moreover, the long-term survival of the PA will also depend on the goodwill and support of the people living in and around it. Resource dependence however, cannot be sustainable in the long run due to the growth in population and change in lifestyles of these communities over time. The study suggests that for better management and long-term conservation of MTR the forest department ought to win people's support and co-

operation through trust-building activities and educational programmes aimed at convincing people about the need for and benefits of conservation. This should be complemented by providing appropriate alternatives and incentives to the local people for reducing their dependence on the forest, as well as encouraging the active participation of local governmental and non-governmental bodies in conservation efforts.

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