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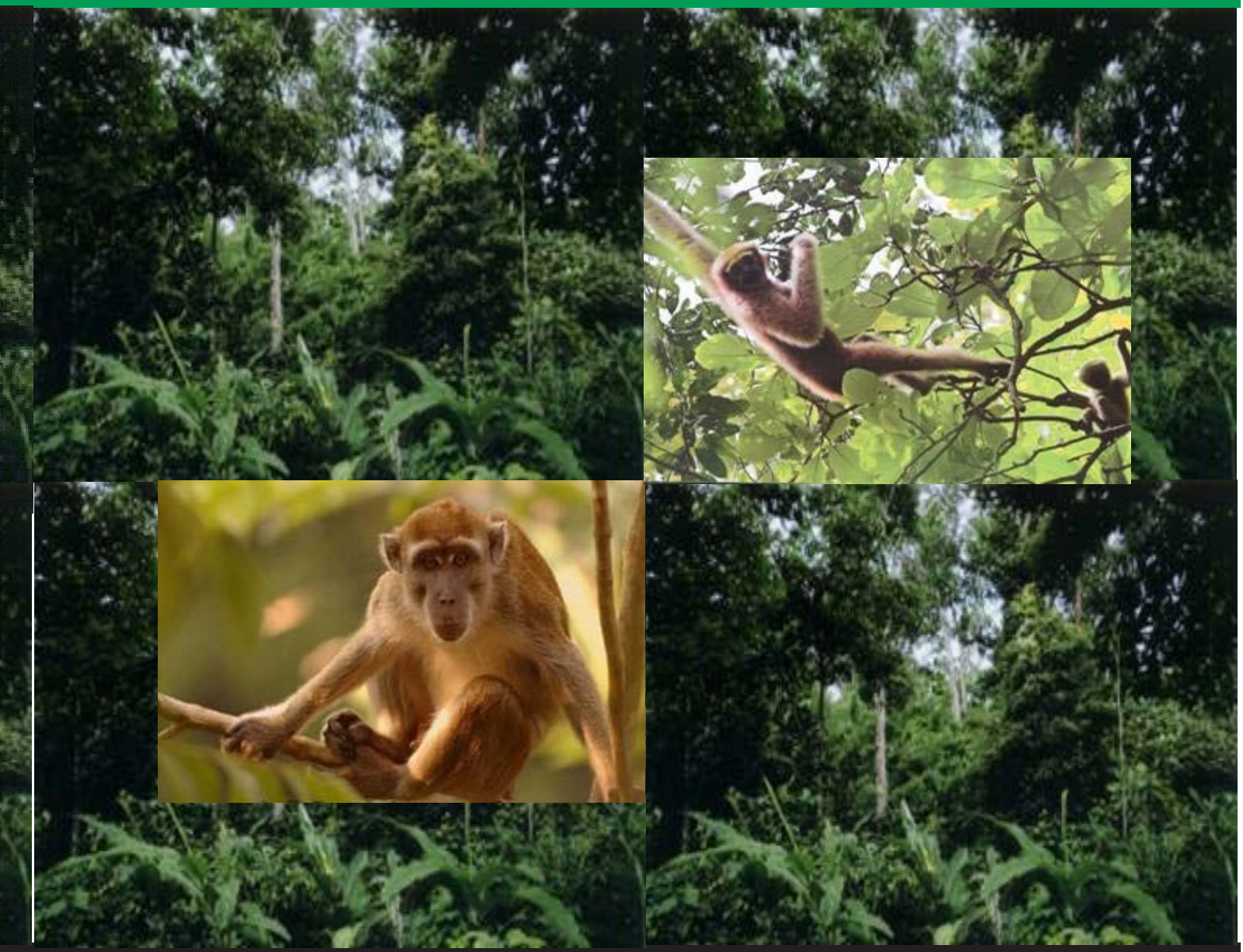

Featuring

FOREST NEWS

Vol. XXIII: No. 3

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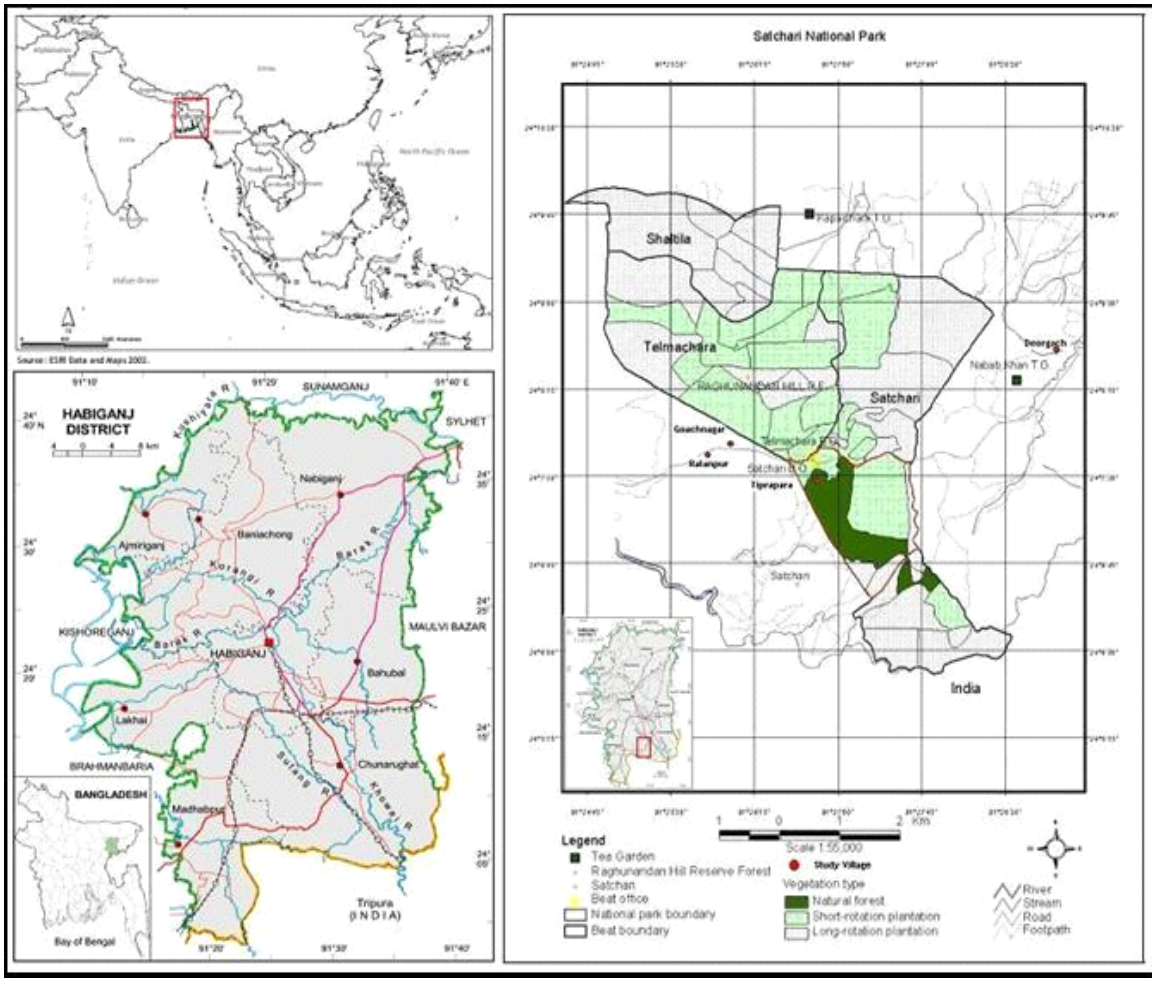
TIGERPAPER

FOREST NEWS

TIGERPAPER is dependent upon your free and voluntary contributions in the form of articles, news items, and announcements in the field of wildlife and nature conservation in the region. In order to better serve the needs of our readers please write to us and send in the information you have or let us know if there is any information that you need. We appreciate receiving your letters and make all efforts to respond.

Front cover: Background: A diverse ecosystem in Satchari NP; Left foreground: Rhesus macaque; Right foreground: Female & infant Hoolock gibbon in Chalta tree (Photos: Sarif Ahmed Mukul)
Back cover: Left foreground: juvenile Hoolock gibbon; Right foreground: Hoolock gibbon family (Photos: Sarif Ahmed Mukul)



PROTECTED AREA AN EFFICACY FOR ECOTOURISM DEVELOPMENT: A VISITORS' VALUATION FROM SATCHARI NATIONAL PARK, BANGLADESH

by Sayma Akhter, Md. Parvez Rana and Md. Shawkat Islam Sohel

Introduction

Protected areas (PAs) now cover more than 12% of the world's land area. These protected areas are on the front line in the campaign to conserve biodiversity, as well as to promote ecotourism on the planet Earth (Chape *et al.*, 2003; Hales, 1989). Tourism use of PAs basically involves traveling to discover and learn about wild environments. The importance of nature in attracting tourists is significant, and the natural resources and cultural heritage represent a competitive advantage for many areas. Different kinds of protected areas (e.g., national parks, wildlife sanctuaries, game reserves, eco-parks) provide opportunities to see wildlife and undisturbed nature, which is rated as a very important reason for visiting PAs (Goodwin, 1996). PAs are becoming more popular destinations for both national and international wildlife tourists. In addition, the economic benefits derived from tourism can be observed in different PAs. Protected area-based eco-tourism can give rise to economic benefits for local communities as well as for the nation. (Hales, 1989; Goodwin, 1996; Wells *et al.*, 1992; Western &

Wright, 1994; Ghimire & Pimbert, 1997; Hannah, 1992; GOI, 1994; Fiallo & Jacabson, 1995; Ite, 1996; Mehta & Kellert, 1998; Rao, 1996; Lindberg & Enriquez, 1994; Walpole & Goodwin, 2000; Walpole *et al*., 2001). Nature-based or forest-based tourism is a key category of eco-tourism, which is one of the fastest growing sectors in the world (Landell-Mills & Porras, 2002). However, in Bangladesh, this promising sector is poorly utilized. It has been reported that less than 10,000 foreign visitors visited Bangladesh in 1992; domestic tourism, on the other hand, appears to be a strongly flourishing sector of the market (Vantomme *et al*., 2002).

Protected areas have long played a significant role as tourist attractions in many countries (Butler & Boyd, 2000). The landscapes, flora and fauna, as well as the cultural elements, continue to attract tourists (Cebalos-Lascurain, 1993). Eco-tourism has become a management strategy for many protected areas. There are numerous opportunities for ecotourism in protected areas which also generate revenue (e.g., user fees, entranced fees and donations), create employment, reinforce the justification for protected areas, contribute to healthier economies, and promote environmental education and improved conservation efforts (Borrie *et al*., 1998; Drumm & Moore, 2005). Presently, there are 19 notified protected areas in Bangladesh (11 national parks, 7 wildlife sanctuaries and 1 game reserve) (NSP. 2006b). Compared to other regions of the world, this figure is still very poor. The PAs of Bangladesh cover nearly 1.7% of the total landmass of the country, which is the second lowest per capita area under PAs in any country (Sharma *et al*., 2005). As the tourism industry is quickly becoming one of the most profitable industries in developing countries, the Government of Bangladesh should give emphasis to increasing the number of protected areas for ecotourism development. PAs have become a new tool to promote environmentally and culturally friendly tourism, but there is little reliable or published information available regarding the tourism potential of the PAs of Bangladesh. Thus, the present study was conducted in Satchari National Park of Bangladesh to understand the importance of PAs in ecotourism development.

Study site

Satchari National Park is a recent addition to the protected areas of Bangladesh and was notified in 2006. The park was established in the year 2005 to protect and preserve the remaining patch of natural forests within the forest of Raghunandan Hill Reserve. The area of the park is about 242.82 ha (600 acres) which comprises the forests of Raghunandan Hills Reserve within the Satchari Range (NSP, 2006a). Administratively, Satchari National Park is located in Chunarughat Upazilla of Habigonj District and situated nearly 130 km northeast of Dhaka, and about 60 km southwest of Srimongol. The forests of the park originally supported indigenous types of vegetation cover comprised of tropical evergreen to semi-evergreen forests. Currently, the forest has turned to a secondary forest because of the substantial alteration of the original forest, except for 200 ha of natural forest. The park falls under the bio-ecological Zone-9b, with the broad zone "Sylhet Hills" (Nishat *et al*., 2002). The soil texture in general is sandy loam to silty clay and more acidic than the adjoining ecological zones (Choudhury *et al*., 2004). The area of the national park is undulating, with slopes and hillocks ranging from 10-50 m scattered in the forest. The forest is drained by a number of small, sandy-bedded streams, all of which dry out following the end of the rainy season in October-November. The total annual average rainfall of the area is 4,162 mm. July is the wettest month, having an average of about 1,250 mm of rain, while December is the driest month with no, or very little, rainfall. May and October are the hottest months (average maximum temperature around 32°C), while January is the coldest month, when the minimum temperature drops to about 12°C. The relative humidity is about 74% during December and over 90% during July-August (BBS/UNDP, 2005).

Methods

To collect data and information, an opinion poll was conducted in the study area because most recreation seekers like to visit these eco-tourism spots. The visitor's survey method was conducted to determine the value of outdoor recreation. Thirty respondents were interviewed, representing different socio-economic and occupational groups.

The selection of respondents was done randomly to avoid serious bias. A semi-structured questionnaire was designed for this purpose. The data collected from visitors included the visitor's category, age group, educational status, occupational status, economic condition, nature of visit, etc. The field survey was carried out during the period December 2007 to February 2008. The relevant information was sorted, compiled and analyzed.

Results and discussion

Age was identified as an important factor in choosing the site to visit, and was in turn related to gender because both male and female visitors engage in tourism. The total number of visitors surveyed in the study area was 30, of which 76% were male and the rest female. In Foy's Lake, the percentage of male and female tourists is about 75% and 25% respectively. The majority (43.33%) of the visitors belonged to the younger age groups (25-35 years). This indicates that young and middle-aged adults were eager to learn about wildlife and enjoy natural beauty. A similar study was done at the Foy's Lake Zoological Garden, which showed the maximum number of tourists to be in the age group below 30 years (60%) (Jashimuddin & Alamgir, 2005), again confirming that young and energetic people are willing to visit the forest-based natural beauty. In both studies the sex of the tourists played a great role in the recreational activity.

The study revealed that 100% of the visitors were literate. It was also observed that 36% of the visitors were H.S.C. level and 30% were graduates. In the Foy's Lake Zoological Garden study 99% of the tourists were literate. Among them, 68% were below graduate level and 31% were graduates or post- graduates (Jashimuddin & Alamgir, 2005). This implies that education plays a vital role in determining the demand for green nature-based recreational activities in the study areas. Thus, it seems the park attracts educated persons who like to take advantage of unique opportunities to learn about wildlife, which might eventually promote conservation awareness. Educating visitors about wildlife has increased awareness and contributions towards wildlife conservation in the world (Luck, 2003).

According to the interviews, about 36.67% of the visitors listed their occupations as "employee" followed by "student" (33.33%), "business" (23.33%) and 6% listed "farming". In the study areas service holders formed the major groups of visitors. There were also a good number of students. The study done in Foy's Lake with the Zoological Garden showed 48% of the tourists were students (Jashimuddin & Alamgir, 2005). This indicates that students are the major partakers of recreational activities in the study area.

Data analysis showed that the average monthly income of a service holder was Tk. 12,000, and that of a businessman was Tk 13,500. A similar study done by Chowdhury (2006) in Baldha garden (Botanical garden) of Dhaka city showed most of the respondents to be middle class in earnings. The range of income was between TK 8,000-12,000. This indicates that income is an important factor controlling the visitor's potential to visit distant places which are beyond their income and people earning less face difficulties in traveling to visit and enjoy places of natural beauty.

The results of the study also revealed that most of the visitors in the study areas were visiting in a group with friends (55%), followed by groups comprising family members (20%), couples (15%) and individual visitors (8%). Institutions represented the lowest number of visitors (2%). The study done in Foy's Lake with the Zoological Garden showed that 80% of the tourists came with their family, but here the highest percentage were groups of friends (Jashimuddin & Alamgir, 2005).

The majority (67%) of the visitors preferred to time their visits with religious holidays and the remaining 33% of the visitors visited the ecotourism recreation areas during their spare time. The majority (45%) of the visitors preferred the spring season, followed by autumn (23%), winter (20%) and summer (12%). A similar study done in Tilagor eco-park of Sylhet city showed that visitors liked to visit there mostly in the spring (47%) (Akhter, 2008).

Three types of tourists were found in the park: first time vsitors, which was the largest group (72%), followed by second time visitors (18%)

and visitors who returned more than two times (10%). A study done in Jafflong of Sylhet district recorded that 63.63% of the tourists had visited for the first time (Ali, 2008). In a comparison of the studies Satchari National Park had the highest number of first time visitors.

Eighteen percent of the respondents were of the opinion that Satchari National Park needs huge improvements, followed by 31% who desired moderate improvements. The study in Tilagor eco-park, which showed that the majority (57%) of the respondents felt that this eco-park needed huge improvements, followed by 35% who desired for moderate improvements (Akhter, 2008).

Most of the respondents (80%) knew about the park from their friends, 18% learned about it from their relatives, and 2% from the mass media. In the study in Baldha garden (Botanical garden) of Dhaka city, most of the respondents (59%) knew about the place from their friends, 11.75% from their relatives, and 22.75% from the mass media (Chowdhury, 2006). From the studies it can be said that the mass media can play an important role in tourism development

The interviewed visitors were asked to identify problems in the study areas. The findings revealed that 80% of the visitors faced problems with accommodation and drinking water, followed by food (77%), sanitation (73%), security (40%), communication (26%) and guides (10%). In the study done in Baldha garden (Botanical garden) of Dhaka city, 76% of the respondents mentioned toilet problems, 68% emphasized security problems, and 58% respondents mentioned scarcity of drinking water (Chowdhury, 2006). From the studies it is evident that accommodation, food and sanitation problems need to be resolved in order to attract more tourists.

Tourism potential of Satchari National Park

The Satchari National Park is very rich in flora, with about 241 species. Fauna species include 24 mammals (including 6 species of non-human primates), 149 birds, 6 amphibians, and 18 reptiles (NSP, 2006b). Key mammals include Hoolock gibbon (*Hylobates hoolock*) Capped langur (*Trachypithecus pileatus*), Fishing cat (*Prionailurus viverrinus*), Wild boar (*Sus scrofa*), Barking deer (*Muntiacus muntjac*) and Rhesus macaque (*Macaca mulatta*). The park is one of the last habitats for Hoolock gibbons and the rare bird species Hooded Pitta (*Pitta sordida*) in Bangladesh (Choudhury *et al.*, 2004).

There are many types of bamboo in the park such as *Bambusa burmanica* and *Melocanna baccifera* and various canes such as *Calamus guruba* and *Daemonorops jenkinsianus*. There are also many types of climbers, vines, herbs and shrubs. Tipra polli Tea garden is also an attraction for tourists (Ali, 2008). The field observations and the visitors study revealed that the opportunity to see wildlife and the beauty of nature attracts many visitors, although a number of improvement and developments are needed.

Satchari National Park was declared with the primary objectives of conservation and management of both flora and fauna in their natural state, with access for research, education, culture and public recreation allowed. The present study revealed that the visitors' willingness to come to Satchari National Park was extremely satisfactory. About 98% of those interviewed responded positively to returning in the future. In the study done in Baldha garden (Botanical garden) of Dhaka city, about 94.75% of the respondents said that they would return. (Chowdhury, 2006). This study reflects the potential of park visitors and the level of their satisfaction with the existing facilities. If the authorities take proper steps to solve the problems mentioned by the visitors to Satchari National Park, it would be an excellent international tourism spot.

Conclusion

Tourism in Satchari National Park is a very new development. In order to develop this sector further, a separate management plan and an action plan for tourism should be developed. Many people come to Satchari National Park to see forests, wildlife, and natural beauty, and to visit the surrounding attractions. The park has good potential for ecotourism, although it does not offer any lodging facilities. The Government of Bangladesh can create opportunities to develop the tourist industry (ecotourism) based on protected areas. Tourism as a wildlife and forest conservation and sustainable

development tool can be promoted, and from a community perspective it is expected to provide benefits that will ultimately enhance local support for the conservation of natural resources. The results of the study did not reveal any negative attitudes about tourism development at Satchari National Park, but this could change in the future as tourism develops. Therefore, further studies will be needed to gather quantitative data on the performance of tourism at the protected areas in terms of ecological, socio-economic, and community conservation levels.

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References

Akhter, S. 2008. **Present status and potentiality of North Sylhet range-1 and Rajkandi range of Sylhet forest division.** B.Sc. (Hons.) Project paper. Department of Forestry, Shahjalal University of Science and Technology, Sylhet. Bangladesh. 68pp.

Ali, D. 2008. **Present status and Tourism potentiality of Sylhet forest division, Bangladesh**. B.Sc. (Hons.) Project paper. Department of Forestry, Shahjalal University of Science and Technology, Sylhet. Bangladesh. 55pp.

BBS/UNDP (Bangladesh Bureau of Statistics/ United Nations Development Programme). 2005. **Compendium of Environment statistics of Bangladesh**. Ministry of Planning, Government of the People's Republic of Bangladesh. 12-227 pp.

Borrie, W.A.T., McCool, S.F. and G.H. Stankey. 1998. **Protected Area Planning Principles and Strategies**. In: Lindberg, K., Wood, M.E. and Engeldrum, D. (Eds). *Ecotourism: A guide for Planners and Managers. Volume 2*. 133-154. pp.

Butler, W.R. and W.S. Boyd. 2000. **Tourism and National Parks: a Long but Uneasy Relationship**. In: Butler, W.R. and Boyd, W.S. (Ed). *Tourism and National Parks: Issues and Implications*. John Wiley and Sons Ltd, UK. 70-75 pp.

Cebalos-Lascurain, H. 1993. **Ecotourism as a Worldwide Phenomenon**. In: Lindberg, K. and Hawkins, D.E. (Eds). *Ecotourism: A Guide for Planners and Managers*. Natraj Publishers, Dehradun, India. 80-83 pp.

Chape, S., Blyth, S., Fish, L. and M. Spalding. (Eds). 2003. **United Nations List of Protected Areas**. IUCN, Gland, Switzerland and UNEP-WCMC, Cambridge, UK 44 pp.

Choudhury, J.K., Biswas, S.R., Islam, M.S., Rahman, O. and S.N. Uddin. 2004. **Biodiversity of Satchari Reserved Forest, Habiganj**. IUCN, Bangladesh Country Office, Dhaka, Bangladesh. 30 pp.

Chowdhury, S. H. 2006. **Ecotourism potentiality of Baldha garden, Dhaka city, Bangladesh.** B.Sc. (Hons.) project paper. Department of Forestry, Shahjalal University of Science and Technology, Sylhet. Bangladesh. 7-72 pp.

Drumm, A. and A. Moore. 2005. **Ecotourism Development: A Manual for Conservation Planners and Managers**. Arlington, VA: The Nature Conservancy. 55pp.

Fiallo, E.A. and S.K. Jacabson. 1995. **Local communities and protected areas: attitudes of rural residents towards conservation and Machalilla National Park, Ecuador**. *Environmental Conservation* 22 (3), 241–249.

Government of India (GOI). 1994. **National Tiger Action Plan**. Ministry of Environment and Forests, Government of India, New Delhi. 44pp.

Goodwin, H. 1996. **In pursuit of ecotourism**. *Biodiversity & Conservation* 5(3): 277–292.

Ghimire, B.K. and M.P. Pimbert. 1997. **Social change and conservation: an overview of issues and concepts.** In: Krishna, P.G. and Michel, P.P. (Eds) *Social Change and Conservation*. Earthscan Publications Limited, London. 1–45 pp.

Hales, D. 1989. **Changing concepts of national parks**. In: Western, D. and Pearl, M. (Eds) *Conservation for the Twenty-First Century*. Oxford University Press, London. 139–144 pp.

Hannah, L. 1992. **African people, African parks: an evaluation of development initiatives as a means of improving protected area conservation in Africa**. USAID/Biodiversity Support Program/ Conservation International, Washington. 145pp.

Ite, U.E. 1996. **Community perceptions of the Cross River National Park, Nigeria**. *Environmental Conservation* 23 (4), 351–357.

Jashimuddin, M. and M. Alamgir. 2005. **Visitors of urban green space based recreation: A case study from Chittagong Metropolitan Area.** *The Chittagong University Journal of Science* 29 (2): 45-52.

Landell-Mills, N. and I.T. Porras. 2002. **Silver bullet or fools' gold? A global review of markets for forest environmental services and their impact on the poor.** International Institute for Environment and Development. London. 254 pp

Lindberg, K. and J. Enriquez. 1994. **An Analysis of Ecotourism's Economic Contribution to Conservation and Development in Belize**. Belize City, Belize, WWF/Ministry of Tourism and Environment. 105 pp.

Luck, M. 2003. **Education on marine mammal tours as agent for conservation - but do tourists want to be educated?** *Ocean and coastal management* 46: 943-956.

Mehta, J.N. and S.R. Kellert. 1998. **Local attitudes towards community-based conservation policy and programmers in Nepal: a case study of the Makalu–Barun conservation area**. *Environmental Conservation* 25 (4): 320–333.

Nishat, A., Huq, S., Imamul, M., Barua, S., Reza, P., Ali, A.H.M. and M.A.S. Khan. 2002. **Bio-ecological Zones of Bangladesh.** IUCN, Bangladesh. 141pp.

NSP. 2006a. **Site Information Brochure: Satchari National Park**. Nishorgo Support Project, Bangladesh. 8pp.

NSP. 2006b. **Protected Areas of Bangladesh: A visitor's guide**. Nishorgo Support Project, Dhaka. 41pp.

Rao, K. 1996. **Management problems: people in protected areas**. Proceedings of the SAARC Workshop on Wildlife Management, Dehradun, India.

Sharma, R., DeCosse, P., Khan, M. and A. Mazumder. 2005. **Co-Management of Protected Areas in South Asia with special reference to Bangladesh**. Nishorgo Support Project, Dhaka, Bangladesh. 16pp.

Vantomme, P., Markkula, A. and R.N. Leslie. 2002. **Non-wood forest products in 15 countries of tropical Asia: A regional and National overview.** FAO-RAP, Bangkok. 15-24 pp.

Walpole, M. J. and H.J. Goodwin. 2000. **Local economic impacts of dragon tourism in Indonesia.** *Annals of Tourism Research* 27: 559–576.

Walpole, M. J., Goodwin, H.J. and K.G.R. Ward. 2001. **Pricing policy for tourism in protected areas: lessons from Komodo National Park, Indonesia**. *Conservation Biology* 15: 177-185.

Wells, M., Brandon, K. and L. Hannah. 1992. **People and Parks: Linking Protected Area Management with Local Communities**. World Bank, Washington, DC. 122pp.

Western, D. and M. Wright. 1994. **Natural Connections: Perspectives in Community-Based Conservation**. Island Press, Washington, DC. 110pp.

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Table 1: Visitors profile

SAMPLE CHARACTERISTIC	%	SAMPLE CHARACTERISTIC	%
Age (n = 30)		Gender (n = 30)	
15-25	23.33	Male	76
25-35	43.33	Female	24
35-45	20		
45-55	10		
55+	3.33		
Occupation (n = 30)		Education (n = 30)	
Agriculture	6.67	S.S.C	27
Business	23.33	H.S.C	36
Employee	36.67	Graduate	30
Students	33.33	Masters	7
Problems identified by the visitors (n=30)		Potentiality of visitors (People's willingness of coming here in future) (n = 30)	
Sanitation	73		
Drinking water	80		
Security	40		
Communication	26	Yes	98
Accommodation	80	No	2
Food	77		
Guiding	10		
Monthly income (n = 30)		Visiting season (n = 30)	
Agriculture	6500	Spring	45
Business	13500	Autumn	23
Employee	12000	Summer	12
Students	0	Winter	20
Source of information (n = 30)		Frequency of visit (n = 30)	
Friends	80	1st time	72
Relatives	18	2nd time	18
Mass-media	2	>2 time	10
Existing Facilities (sufficient or not) (n =30)		Visiting day (n = 30)	
Need huge improvement		Holydays	33
Need moderate improvement	18	Spare time without holyday	67
Satisfied	31		
	51		
Monthly Income (n = 30)	Tk	Nature of the visit (n = 30)	
Agriculture	6500	Individual	8
Business	13500	Friends	55
Employee	12000	Couple	15
Students	0	Family	20
		Institute	2

WETLAND BIODIVERSITY IN NEPAL -- STATUS AND STRATEGY FOR SUSTAINABLE MANAGEMENT OF RESOURCES

by Kunjani Joshi

Introduction: Wetlands and biodiversity

Wetlands are among the most productive eco systems and are very important in terms of their ecological, economic, cultural, spiritual and recreational values. In Nepal, wetlands occupy approximately 5% (743,500 ha) of the total area of the country and can be classified into natural (riverine, lacustrine, palustrine) and man-made categories (Joshi, 1996). They range from high altitude glacial lakes to hot springs, ponds, ox-bow lakes, rivers, flood plains, swamps to marshes. Among the various ecological zones, the highest wetland sites (45%) are distributed in the lowland zone (Table 1).

Table 1: Distribution of wetland sites

Ecological zones	Number of wetland sites	Percent
Highland	78	26
Mid-Hills	86	29
Lowland	133	45
Total	297	

Source: Bhandari (2009)

Wetlands support a wide variety of habitats for flora and fauna. It is believed that 26% of the country's estimated 7,000 vascular plant species are wholly or partly wetland-dependent (IUCN, 2004). Wetland plants are comprised of floating, submerged and emergency hydrophytes. Notable species include the following:

Floating hydrophytes : *Nelumbo nucifera, Nymphaea noucholi, N. stellata* (lotus), *Nymphoides indica* (water-lily), *Trapa quadrispinosa, T. bispinosa* (water chest-nut), *Eichhornia crassipes* (water hyacinth), *Lamna minor, L. perpusilla* (duck weed), *Pistia statiotes* (water cabbage), *Azolla imbricate, Sagittaria guyanensis* (arrowhead).

Submerged hydrophytes: *Hydrilla verticillata* (water fern), *Utricularia aurea* (bladderwort), *Vallisneria natans, V. spiralis* (ele grass), *Potamogeton crispus. Ceratophyllum demersum*

Emergency hydrophytes: *Alternanthera sessilis, Ipomoea aquatica* (swamp-cabbage), *Persicaria barbata, P. hydropiper* (hydropiper), *Ranunculus scelerates* (celery-leaved buttercup), *Typha angustifolia* (cat tail), *Stellaria patens* (stitchwort), *Cyperus difformis, C. digitatus.*

Besides the above-listed plants, algae, diatoms, liverworts, mosses, and ferns are also distributed in wetland bodies. The plant species commonly found in river beds and floodplains include *Acacia catechu* (cutch tree), *Dalbergia sissoo* (sissoo), and *Bombax ceiba* (silk cotton tree).

Nepal's wetlands hold several species of cultivars and wild relatives of cultivated crops, including

four species of wild rice (*Oryza nivara, O. granulose, O. officinales*, and *O. rufipogon*) and two species of wild relatives of rice (*Hygrorhyza aristata* and *Leersia hexandra*).

Wetlands also ensure a remarkably high diversity of animal species, including: wild water buffalo (*Bubalus bubalis*), greater one-horned rhinoceros (*Rhinoceros unicornis*), pygmy hog (*Sus salvanius*), tiger (*Panthera tigris*), elephant (*Elephas maximus*), Gangetic river dolphin (*Platanista gangetica*), snow trout (*Schizothorax* sp.), water snake (*Natrix plutyceps*), gharial (*Gavialis gangeticus*), marsh mugger crocodile (*Crocodylus palustris*), rohu (*Labeo rohita*), and frogs (*Rana* sp.) Of the 863 bird species found in Nepal, nearly 200 (23.8%) are known to be heavily dependent on wetland habitats (Baral, 2009). A total of 182 fish species have been recorded from Nepal, including eight endemic species.

This remarkable diversity has made Nepal a veritable gene bank for a number of crops, trees, medicinal and aromatic plants, as well as animals (Joshi, 1985; Joshi and Joshi, 2005).

Values and functions of wetlands

In the past, wetlands were mostly considered as wasteland and regarded as unproductive land inhabited by disease-carrying insects and pests. Only in recent years have the direct and indirect values of many of these areas come to be recognized. They support a wide range of flora and fauna and are very important in terms of biodiversity uses. They play important roles in meeting various human needs for food, fodder, drugs, raw materials, etc. Out of 103 ethnic and cast groups of Nepal, 20 of these groups are traditionally wetland-dependent (IUCN, 2004). At present, the values of wetlands are also recognized for carbon dioxide sinks and climate stabilization.

Stress on wetland biodiversity

The wetland ecosystems and species face a wide range of threats from human as well as natural influences. The rapidly increasing human population has resulted in acute pressure on wetlands and their resource base. People tend to destroy wetlands by using them for intensive agriculture, by filling them to create land for industrial or urban development, or use as a landfill for dumping garbage. The major causes of decline and loss of wetland resources include the following:

- fragmentation and modification of habitat;
- unsustainable use of water resources;
- unsustainable harvesting of wetlands and nearby ecosystem products;
- siltation;
- over-exploitation;
- unplanned development and haphazard implementation of development activities;
- unregulated garbage and sewage disposal;
- eutrophication;
- introduction of exotic fish farming; and
- use of persistent organic pesticides.

The alteration of the wetland ecosystem is reflected in the conservation status of the country's environment. The list of threatened and endangered species needing conservation is increasing. In Table 2, the status of some plants have been listed as threatened and endangered species (Joshi and Joshi, 1991; Joshi, Joshi and Joshi, 2001; CAMP, 2001).

Among the wetland-dependant fauna, pygmy hog (*Sus salvanius*), Gangetic river dolphin (*Platanista gangetica*), wild water buffalo (*Bubalus bubalis*), greater one-horned rhinoceros (*Rhinoceros unicornis*), elephant (*Elephas maximas*), tiger (*Panthera tigris*), sahar (*Tor putitora*), jalkapor (*Clupisoma garuwa, Ompak bimaculatus*), Bengal roof turtle (*Kachuga kachuga*), three-striped roof turtle (*Kachuga dhongoka*), elongated tortoise (*Indotestudo elongate*) and gharial (*Gavialis gangeticus*) and 29 species of wetland birds are considered critically threatened or endangered.

Conservation efforts and achivements

Realizing the importance of wetlands and their species in maintaining the ecological balance, and as being crucial for human survival and economic well-being, more attention has been given to the conservation and management of the natural resources, including wetlands and their resources, in Nepal.

During the last few years, some policy initiatives have been undertaken for the management of

Table 2: List of endemic, threatened and endangered plant species

Botanical name	Status	Sources
Aconitum balangrenre	endangered	CAMP 2001
Carex rhombifructa	endemic /threatened	Joshi, Joshi and Joshi, 2001
Carex rufulistolon	endemic /threatened	Joshi, Joshi and Joshi, 2001
Cratava unilocularis	endangered	CAMP 2001
Cyathea spinulosa	endemic/endangered	Joshi, Joshi and Joshi, 2001
Cyperus trisulcus	endemic /threatened	Joshi, Joshi and Joshi, 2001
Eriocaulon exsertum	endemic /threatened	Joshi, Joshi and Joshi, 2001
Eriocaulon kathmanduense	endemic /threatened	Joshi, Joshi and Joshi, 2001
Eulaliopsis sykesii	endemic /threatened	Joshi, Joshi and Joshi, 2001
Operculina topethrum	endangered	CAMP 2001
Pandanus nepalensis	endangered	Joshi, Joshi and Joshi, 2001
Saccharum williamsii	endemic/ threatened	Joshi, Joshi and Joshi, 2001
Scytonema contorta	endemic /threatened	Joshi, Joshi and Joshi, 2001
Scytonema felilia	endemic /threatened	Joshi, Joshi and Joshi, 2001
Sphagnum nepalensis	endangered	Joshi, Joshi and Joshi, 2001
Spiranthes nepalensis	endemic /threatened	Joshi, Joshi and Joshi, 2001
Spiranthes sinensis	endangered	Joshi, Joshi and Joshi, 2001

wetland biodiversity. The Five-Year Periodic Plans, National Conservation Strategy 1988, Master Plan for the Forestry Sector 1989, Nepal Environmental Policy and Action Plan (NEPAP) 1993, Nepal Environmental Policy and Action Plan (NEPAP) 1993, Forestry Sector Policy 2000, Water Resource Strategy 2002, Nepal Biodiversity Strategy 2002, and the National Wetland Policy 2003 have given thrust for the conservation of ecosystems and wise use of wetlands and their resources with the involvement of local people.

Though Nepal does not have a specific law that deals with wetlands, several existing laws relating to the resources, such as the Wildlife Protection Act 1958, Aquatic Life Protection Act 1961, National Parks and Wildlife Protection Act 1973, Soil and Watershed Management Act 1982, Electricity Act 1992, Water Resource Act 1992, Forest Act 1993, Environment Protection Act 1996, and Local Self Governance Act 1999 have provided a legal basis for the management of habitats and wetland biodiversity in environmentally sound and sustainable ways. Nepal is also the signatory of several multilateral environment agreements, of which three can be considered the most important for wetland biodiversity conservation: 1) Convention on Wetlands (Ramsar 1971); 2) Convention on Biodiversity Conservation (CBD, 1992); and 3) Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, 1973).

Among the 39 nationally protected species of fauna under the National Parks and Wildlife Conservation Act 1973, 9 wetland-dependent fauna are legally protected, i.e., the wild water buffalo, Gangetic dolphin, tiger, elephant, greater one-horned rhinoceros, white stork (*Ciconia ciconia*), black stork (*Ciconia nigra*), sarus crane (*Grus antigone*) and gharial. Very few wetland plant species are protected by law. Under the Forest Act 1993 (amended 2001) *Valeriana jatamansi*, a wetland-dependent species, is banned for export, and three timber trees (*Acacia catechu, Dalbergia latifolia* and *Bombax ceiba*) are banned for felling, transportation and export.

Within the constraints of the resources and technical know-how, Nepal has been involved in conservation efforts for over two decades. Various activities are under implementation to manage the wetlands in a sustainable manner, such as conservation of wetland species *in situ* and *ex situ*, management of some wetlands with the involvement of local communities and NGOs, restoration of threatened wetlands, clearing of water bodies, control of the introduction of alien invasive species, survey of wetland habitats and documentation of species, and use of aquatic

Table 3. Wetlands of international importance in Nepal

S No	Ramsar Site No.	Name of wetlands	Location	Date of designation	Area (ha)	Altitude (m)
1	380	Koshi Tappu	Sunsari	17.12.1987	17,500	75-81
2	1313	Beeshazari and associated lakes	Chitwan	13.08.2003	3200	286
3	1314	Ghodaghodi lake area	Kailali	13.08.2003	2563	205
4	1315	Jagadishpur reservoir	Kapilvastu	13.08.2003	225	197
5	1692	Gokyo and associated lakes	Solukhumbo	23.09.2007	7770	4700-5000
6	1693	Gosaikund and associated lakes	Rasuwa	23.09.2007	1030	4000-4700
7	1694	Phoksundo lake	Dolpa	23.09.2007	494	36115
8	1695	Rara lake	Mugu	23.09.2007	1583	2990
9	1850	Mai pokhari	Illam	28.10.2008	90	2100

plants in waste treatment (Joshi and Joshi, 2003). Nepal has already designated 9 sites as Wetlands of International Importance, with a total area of 34,455 ha (Table 3). These wetlands broadly represent high altitude, mid hills and lowland wetlands.

Gaps and constraints

Despite the implementation of various activities for the conservation of the aquatic species and their habitats, there are still some gaps and constraints relating to policy and legal framework, coordination among stockholders, inventory of species and information on wetlands, species and genetic diversity, and the involvement of local people in wetland biodiversity management.

Strategy for sustainable management

For the sustainable management of the wetland biodiversity and their habitats, emphasis should be given to implementing the following strategies in an integrated manner:

- Major thrust should be given to conduct an intensive inventory and documentation of useful species with their present status and indigenous uses.
- Priority should be given to formulating a national integrated policy and plan, taking into consideration the productivity of the species and carrying capacity of habitats and the needs of the people.
- Initiate development of national comprehensive legislation for conservation, wise use and sustainable management of wetlands and their biodiversity, and also formulate mechanisms for the integration of components of international conventions in the acts and regulations.
- Major emphasis should also be given to identifying critical wetlands and management plans for the sites.
- Attempts should be made to strengthen the capacity of the existing relevant institutions and local organizations in order to conserve the habitats and species and use them in a sustainable manner.
- Priority should be given to developing a database and information network with appropriate parameters related to the status of wetlands and biodiversity.
- Emphasis should be given to implementing a special integrated program with environmentally friendly activities such as sustainable use of wetland resources, ecotourism and conservation of indigenous practices, income-generating activities, rehabilitation of the degraded wetlands, etc.
- Initiate launching special activities to raise people's awareness about conservation and sustainable management of habitats and species.

References

Baral, H.S. 2009. **Updated status of Nepal's wetland birds**. *Banko Janakari, Special Issue*, February 2009. pp. 30-35.

Bhandari, B. B. 2009. **Wise use of wetlands in Nepal**. *Banko Janakari, Special Issue*, February 2009. pp. 10-17.

CAMP. 2001. **Report on Slected Medicinal Plant Species of Nepal.** MAPPA, IDRC and HMG/N MFSC.

IUCN Nepal. 2004. **A Review of the status and threats to wetlands in Nepal**. IUCN Nepal, Kathmandu, Nepal.

Joshi, A.R. 1985. **The Conservation of Genetic Resources in Nepal**. Post-Graduate Thesis, University of Wales, University College, Cardiff, UK.

Joshi, A.R. and D.P. Joshi. 1991. **Endemic plants of Nepal Himalaya: Conservation status and future direction**. *Mountain Environment and Development*, 1(2):1-35.

Joshi, A.R., Joshi, D.P. and Kunjani Joshi. 2000. **Status of some endemic plants of Nepal**. *Tigerpaper* 27(3):15-20.

Joshi, A.R. and Kunjani Joshi. 2005. **Ethnobotany and Conservation of Plant Diversity in Nepal.** RubRick, Kathmandu, Nepal.

Joshi, A.R., Shrestha, S.L. and Kunjani Joshi. 2003. **Wetland**. In: *Environmental Management and Sustainable Development at the Crossroad*, AnKuS, Kathmandu, Nepal

Joshi, Kunjani 1996. **Wetland conservation in Nepal: Present status and future direction**. *Environment* 1(1):82-89.

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FUELWOOD DEPENDENCE ON FORESTS BY LOCAL COMMUNITIES AND CONSERVATION EFFORTS IN PERIYAR TIGER RESERVE IN INDIA

by Mammen Chundamannil and C.N. Krishnankutty

Introduction

The focus of forest conservation has been to create a network of biodiversity-rich and unique protected areas (PAs) all over the planet. Protected areas in the tropical zones have very high value due to their biological richness. The pace of deforestation in the tropics during the last century was alarming and measures to arrest and reverse the trend of forest degradation were considered and implemented with varying degrees of success. The high population pressure in the tropical zone creates great dependence on the forest for goods to meet basic needs such as fuelwood for cooking. Small enterprises that come up with development also rely on forest fuelwood. The traditional approach has been to strengthen the Forest Department as a protection force to prevent the local people from collecting forest produce. When societies become democratic, the use of force to regulate access to an essential basic needs item such as fuelwood becomes impractical or unacceptable. It also becomes a human rights issue in which the people living in and around forest have to bear the cost or make sacrifices for conservation.

Human populations in and around protected areas affect conservation efforts by their daily requirements for fuelwood for cooking. Conservationists are divided on whether all human communities should be shifted out of PAs or

allowed to continue without compromising the conservation values. Even on the fringes, human populations require fuel for survival and forest degradation on the periphery is inevitable. Understanding fuelwood dependence and the factors that influence such dependence is critical for formulating useful strategies for addressing the issue of forest degradation by communities foraging for fuelwood in PAs. Fuelwood dependence and removal is often equated with forest destruction and degradation. There are very few studies that examine how and to what extent the dependence on forest fuelwood degrades the forest (Balasubramanian, 1999). It may even be a scapegoat to mask the more insidious forms of forest degradation like expanding road networks, mining, dams, tourism, etc.

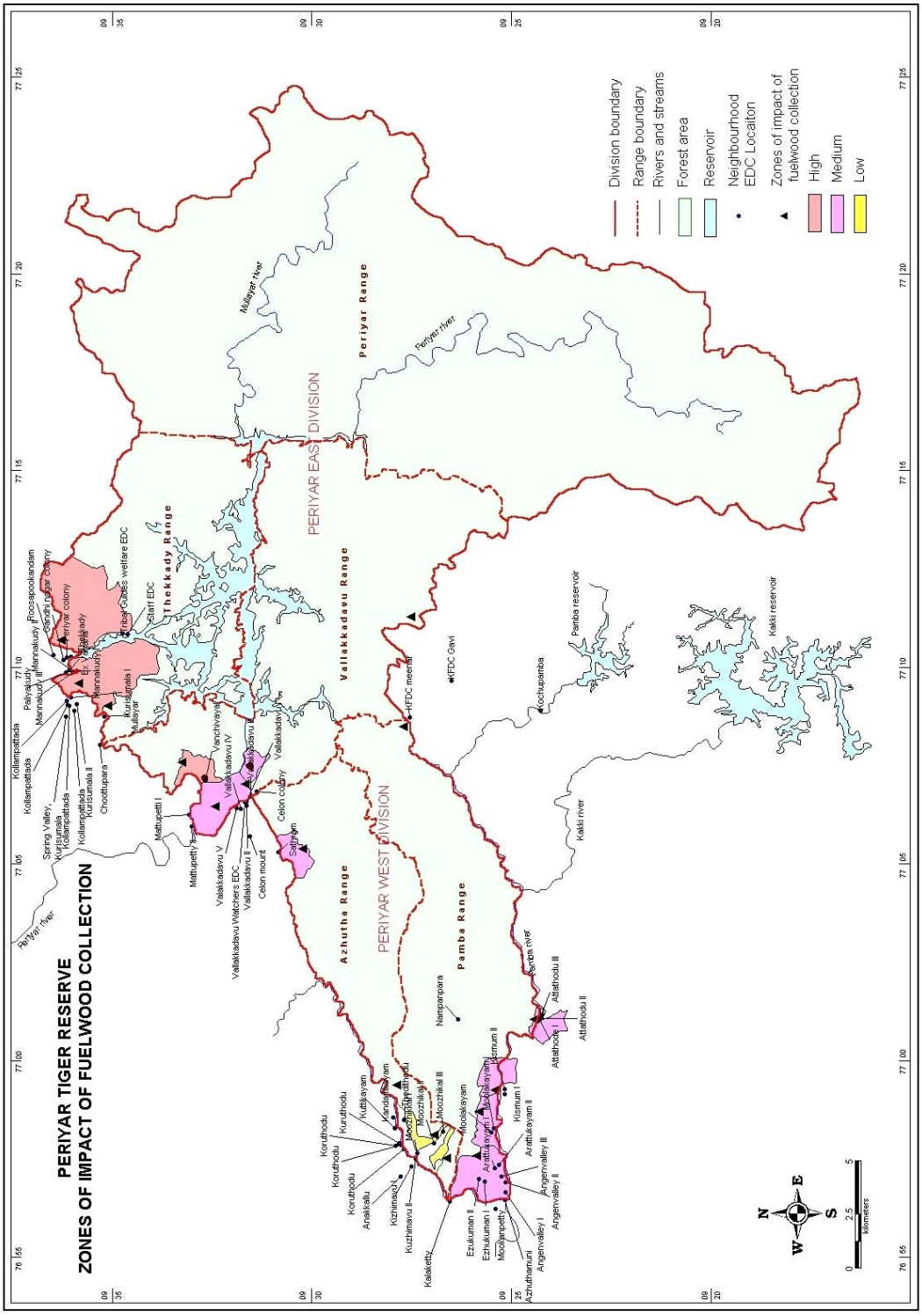
Periyar Tiger Reserve (PTR) is the largest and most popular protected area in Kerala State of India. It occupies an area of 777 km^2 (Government of Kerala, 2001; 2006). PTR is one of the seven Eco-Development Project sites funded through the Global Environment Facility of the World Bank in India. PTR received a funding grant-cum-loan of US$6 million for the conservation of PTR. The project adopts a participatory mode by creating Eco-development Committees (EDC) to implement its objectives. There are some studies on the Eco-Development Project and the performance of EDCs in PTR, but there are hardly any reviews of the project regarding the fuelwood consumption pattern and its impact on the forest. Arun *et al.* (2001) examined the institutional and social aspects of the project and opined that lack of commitment, corruption and lack of management skills are some of the more important reasons for the malfunctioning of the Eco-development Committees. They go on to say that if tribal households are freed from the clutches of money lenders, the share of agricultural income could be increased substantially. A few years later, Gurukkal (2004) found evidence of phenomenal improvement of the cash crop economy of the Mannan tribe in Kumily, supported by the EDCs. The increased income from the pepper crop showed manifold improvement of material conditions of the households, an increase in school enrolment and attendance, and considerable reduction of dependence on the forest. However, Gubbi (2008), whose study was conducted two years after the close of the project, observed that only a third of the community benefits created by the project continued to be used or maintained. Nevertheless, local institutions of Eco-development Committees were created, which fostered political mobilization and the emergence of leadership from hitherto disadvantaged groups.

This paper examines the fuelwood-using behavior of the households and settlements within and adjoining the PA. The study considered the location of the habitation, accessibility to urban conveniences, length of occupation of the settlement, the history of agriculture development, employment opportunities, level of technology utilized and the composition of the settlement, including whether they are tribals, migrant farmers or other groups. Fig. 1 shows the localities and zones of influence of fuelwood collection within PTR. Within each settlement, the availability of alternate fuel sources such as fuelwood and non-wood biomass from own land holdings, rubber plantations, other forests and the availability of alternate fuels such as LPG, kerosene and biogas, etc. are important determinants. How far does the size of the home garden influence the availability of fuelwood from own sources and how far does agriculture development contribute to reducing the dependence on forest fuelwood are important questions. These questions are analyzed through the intensive household survey carried out in PTR.

Methodology

During the year 2001-02, a sample survey was conducted among households in and around PTR, to estimate the consumption of different fuels such as fuelwood, non-wood biomass, LPG, biogas and kerosene (Krishnankutty, C. N., 2002). The sampling design adopted was a stratified sampling plan. Contiguous hamlets in a settlement were grouped together to form a stratum or hamlet group. From all thirteen strata, two hamlets each were selected at random. All the households in the selected hamlets were visited and listed in a schedule by a team of trained personnel. At the time of listing, information on household size, extent of homestead land, type of fuels used and their sources were collected.

Fig.1 Zones of impact of fuelwood collection in Periyar Tiger Reserve



The households in each of the selected hamlets were classified on the basis of homestead size. The different size classes according to local norms were: very small (below 0.04 ha), small (0.04 to 0.199 ha), medium (0.2 to 0.399 ha), large (0.4 to 0.799) and very large (above 0.8 ha).

In order to assess fuel consumption, data on consumption of fuelwood in terms of head-loads, persons who gathered forest fuelwood, number of times this was done in a week and number of days such a head-load would last as fuel in the household, were recorded. Since the quantities of fuelwood transported as head-loads by men and women were found to vary, mean head-load weight was determined separately for men and women per trip. Fuelwood head-loads brought by men and women were weighed separately in selected localities at Kokkara, Boat Landing, Anchuruly, Vallakkadavu, Koruthodu and Attathodu. The weight of twigs, branches, poles and split-wood contained in a bundle were recorded separately to analyze the composition of head-loads. Information on fuelwood species, sources such as PTR, adjacent reserved forests, homesteads and rubber plantations were also gathered to assess the source-wise quantity collected or purchased.

Results and discussion

Sources of fuelwood used in households varied significantly among settlements. Households were classified into three groups based on the degree of dependence on PTR for fuelwood. Households exclusively depending on fuelwood from PTR, either directly collected or purchased from other collectors, were classified as 'Fully PTR dependent'. Households depending on several sources, including PTR, were categorized as 'Partially PTR dependent'. Households depending on sources other than PTR were classified as 'Non-dependent'. The survey showed that, of the total number of households in and around PTR, 23% households were fully, 45% partially, and 32% not dependent on PTR for fuelwood. The size of the homestead land has a direct bearing on the degree of dependence for fuelwood on outside sources, where fuel materials such as twigs and branches are available. Large homesteads with a greater number of trees and coconut palms are a major source of domestic fuelwood. Table 1 shows the percentage distribution of households by homestead size and degree of dependence on PTR for fuelwood. The association between homestead size and degree of PTR dependence was tested using $\chi 2$ statistics. The test was found to be statistically significant. It indicated that households occupying large homestead farms had less dependence and those with small homestead land holding had more dependence on PTR for fuelwood. This was found true in all the regions. Of the total number, 60% of the households had homestead land below 0.2 ha. Out of these, 78% were fully or partially PTR dependent. The number of households having large land holdings and fully dependent on PTR for fuelwood was found to be negligible in and around PTR. The fuelwood sources of households which are not PTR-dependent are either their own homesteads or neighbouring homesteads, including rubber plantations or adjacent forests outside PTR.

The relative dependence of households on PTR for fuelwood in different settlements can be seen in Table 2. In Kumily Township, 77.8% of the fuelwood was obtained from PTR and the remaining 22.2% from homesteads, including rubber plantations. Households in Vallakkadavu Settlement obtained about 50% of their fuelwood from PTR and about 42% from other forests. The quantity collected from non-forest sources was marginal. In Koruthodu settlement, households obtained the major part of fuelwood from homesteads, including rubber plantations. Only 20.5% of the fuelwood was obtained from PTR. Although Moozhikkal Settlement is within the PTR boundary, most of the hamlets are similar to villages outside forests. Most of the households have larger holdings. The major commercial crop is rubber and therefore, most of the fuelwood was collected from rubber plantations. Households in Sabarimala Settlement collected about 36% of their fuelwood from PTR and 42% from the forests adjacent to PTR. The remaining quantity was collected from homesteads and rubber plantations. In the Tribal Hamlets, which are within the forests of PTR, about 80% of the total fuelwood consumption was collected from PTR and the remaining 20% from their own homesteads. From the preceding analysis, it can be seen that the dependence on different sources of fuelwood varied according to settlements.

Table 1: Distribution of sample households by homestead size and degree of dependence on PTR for fuelwood

Homestead size (ha)	Number of households & Degree of dependence on PTR for fuelwood			
	Fully dependent	Partially dependent	Non-dependent	All households
Very small (below 0.040)	305 (17.6)	181 (10.5)	113 (6.5)	299 (34.6)
Small (0.040 to 0.199)	80 (4.7)	245 (14.1)	115 (6.6)	440 (25.4)
Medium (0.200 to 0.399)	11 (0.6)	157 (9.1)	56 (3.2)	224 (12.9)
Large (0.400 to 0.799)	7 (0.4)	129 (7.4)	124 (7.2)	260 (15.0)
Very large (above 0.800)	0 (0.0)	67 (3.9)	142 (8.2)	209 (12.1)
All households	403 (23.3) *	779 (45.0)	550 (31.7)	1732 (100.0)

** Figures in brackets are percentage to row total.*

Calculated χ^2 =556.65 which is statistically significant at 0.01 probability level.

Table 2: Distribution of households by degree of dependence on PTR for fuelwood in different Settlements

Settlements	Fully dependent	Partially dependent	Non dependent	All households
Kumily	116 (37.2)	108 (34.6)	88 (28.2)	312 (100.0)
Vallakkadavu	15 (5.6)	162 (60.4)	91 (34.0)	268 (100.0)
Koruthodu	43 (17.4)	107 (43.3)	97 (39.3)	247 (100.0)
Moozhikkal	31 (8.3)	165 (44.0)	179 (47.7)	375 (100.0)
Sabarimala	154 (37.3)	164 (39.7)	95 (23.0)	413 (100.0)
Tribal hamlet	44 (37.6)	73 (62.4)	0 (0.0)	117 (100.0)
Total	403 (23.3)	779 (45.0)	550 (31.7)	1732 (100.0)

Calculated $\chi 2$ = 203.98 which is statistically significant at 0.01 probability level.
Figures in brackets are percentage to row total.

(continued on p.17)

(continued from p.16)

In Kumily and Koruthodu Settlements, which are in non-forest areas outside PTR, small enterprises mainly depended on fuelwood from PTR and rubber plantations outside, whereas in the Vallakkadavu Region, small enterprises depended mainly on fuelwood from other forests and rubberwood. In Moozhikkal Settlement within PTR boundary, small enterprises relied upon fuelwood from PTR (71%) and purchased rubberwood (29%) for the rest of their requirements. In Sabarimala Region, the medium to large restaurants were mainly dependent on rubberwood (84%). The tea-shops and small restaurants in small towns like Kalaketty and Mookampetty in the same settlement relied upon fuelwood from PTR, forest areas adjacent to PTR and homesteads. For enterprises in tribal hamlets within the forests of PTR, the only source of fuelwood was PTR. The total quantity used there was relatively small and was supplied mainly by gatherers of fuelwood from PTR.

Fuelwood gathered from the forests includes twigs, branches, poles and split pieces. Small branches and twigs are gathered without doing any damage to the trees or biodiversity, whereas split pieces are obtained by cutting pole-sized trees and splitting them into lengthy pieces. Fuelwood is also collected from wind-fallen dry trees. People make specific trips to collect fuelwood from locations as far as 3-5 km from home. Fuelwood gatherers usually collect fuelwood of medium calorific value. They try to collect a full bundle, which may consist of split pieces, poles, branches and twigs. Most of the fuelwood collected for household use and sale are from wind-fallen dry trees. Twigs and branches are taken for household use. Pole-sized logs and split pieces are usually made into bundles, which are preferred for sale.

Mean air-dry weight and composition of fuelwood bundles transported as head-loads from PTR are presented in Table 3. The proportion of poles and split wood is significantly higher in the case of male head-loads than female head-loads and the proportion of twigs and branches in male head-loads is slightly lower (66.6 %) than that in female head-loads (73.2 %). It was reported that earlier fuelwood bundles consisted mainly of split pieces of wood, which was obtained by cutting large pole-sized trees. Considering the composition of fuelwood bundles currently transported as head-loads from the Reserve, it can be inferred that the composition is changing. A decline in the proportion of split wood and increase in the proportion of twigs or branches in fuelwood bundles indicates that the incidence of cutting trees has decreased,

Table 3: Mean composition of fuelwood bundles collected and transported as head-loads from Periyar Tiger Reserve

Type of fuelwood	Composition of fuelwood bundle					
	Male head-load		Female head-load		Combined	
	Weight (kg)	% to total	Weight (kg)	% to total	Weight (kg)	% to total
Twigs and branches	41.5	66.6	30.6	73.2	32.4	71.7
Poles	16.4	26.4	9.1	21.9	10.4	22.9
Split wood	4.3	7.0	2.1	4.9	2.4	5.4
Mean weight (kg/bundle)	62.2	100.0	41.8	100.0	45.2	100.0

while that of collection of twigs or branches has increased. The decline in the proportion of large-sized split wood is due to the success of the participatory involvement of the tribal people in the eco-development of the Reserve.

People engage in fuelwood collection not only for their domestic needs, but also for selling a substantial quantity of the same for their livelihood. While fuelwood collection and sale is a seasonal activity for some, it is a year-round occupation for others. Most of the fuelwood sellers have more than one occupation. Collection of fuelwood is usually done by women two or three times a week, depending on their requirements in the summer season. For the rainy season, additional quantities of fuelwood are collected and stocked during March to May. Good quality pieces are stocked for use during the rainy period. Average time spent to collect and transport 40-60 kg of fuelwood by one person has been estimated as 5-6 hours. Fuelwood collection usually begins between 8-10 a.m. and ends between 2-4 p.m.

The tree species most frequently used as fuel were reported to be *Grewia tiliifolia, Stereospermum colais, Lagerstroemia lanceolata, Xylia xylocarpa, Calophyllum inophyllum, Mesua ferrea, Agrostistachys longifolia, Palaquium ellipticum* and *Schleichera oleosa*, which are fairly good quality fuelwood. These species are most abundant in the natural vegetation. Most of the households reported that almost all types of woody biomass were collected and used as fuel. This indicates that there may not be any active selection of species for fuelwood. However, *Heritiera papilio, Dysoxylum malabaricum* and *Chukrasia tabularis* were the most preferred species. This is due to the fact that such species are easily combustible and can be ignited even in wet conditions. These species are available only in interior forests. Combustibility of wood and its availability are the major factors determining the choice of species for fuelwood. Wood pieces of such trees were reported to be collected in smaller quantities.

The biotic effects on the forest are considered to be negative. Human activities such as collection of fuelwood, fire, grazing, etc. on the periphery of human settlements in and around forest are considered to be some of the prime reasons for forest degradation. This is true to a certain extent, but there are other factors for forest degradation. These include conversion of natural forest into plantations or agriculture, extraction of timber and non-wood forest produce, building of dams, etc. Increasing the accessibility to forests by building roads eventually leads to forest modification. Considering the fuelwood collection activity alone, it can be seen that forest dependence of communities within and adjoining the forests is related to the size of the land holding of a household and the nature of the agricultural practice in that holding. It is seen that when adequate land is available in the homestead farm, forest dependence is minimal. The regional comparison showed that the communities who had access to commercial fuel such as cooking gas preferred it to forest fuelwood.

When the local community has been involved in a participatory forest management program, as in the case of the Eco-development project of PTR, the effect on the protected forest is dramatic. Participatory management definitely improves forest quality. However, when there are non-protected forests in the vicinity, it is likely that fuelwood collection activities would simply shift location from the protected forest to the neighbouring un-protected forest when no alternate fuel sources are created. This was the case in Sabrimala and Moozhikkal settlements of PTR.

The farming system in the home gardens of Kerala is generally a mixed cropping coconut-based system. Several multiple-use trees such as mango, jack, cashew, etc. are grown along with banana, tapioca, yams and spices. Coconut provides a continuous stream of non-wood fuel, and the other trees in the homestead provide twigs and occasionally fuelwood. The development of home garden agriculture reduces forest dependence for fuelwood. In certain tribal hamlets where such tree-based home garden agriculture has not developed, in spite of having large land holdings, the dependence on forest for fuelwood continues.

Among the six settlements, the highest dependence on forest for fuelwood was in the tribal hamlets cluster. This was followed by Sabarimala. The least dependence on forest for fuelwood was in

Moozhikkal. Koruthodu and Vallakkadavu had low dependence on the forest. The Kumily settlement was placed in between the two extremes. The main factors influencing the dependence on forest for fuelwood are: i) the size of holding and level of agriculture development in the homestead farm; ii) the availability of alternate fuels; and iii) the proximity to the forest and the people depending on firewood collection for their livelihood.

In settlements where large holdings are made up of rubber plantations or pepper, the dependence on other sources of fuels will continue. If forests happen to be close, forest fuelwood could be used. In places where LPG and kerosene are available, there is a dramatic shift towards these fuels which are preferred for their cheapness and convenience. When alternate employment opportunities are available and people are involved in eco-development and conservation activities, the collection of forest fuelwood from the protected areas declines. Yet, if unprotected forests are available close by, and no alternate fuels such as LPG are made available, the unprotected forest will suffer degradation due to the shift in the location of fuelwood collection. After all, fuelwood is a basic needs item and it is essential for the survival of the people. Therefore, for conservation measures such as reducing the collection of forest fuelwood to succeed, it requires that alternate fuels are made available to the households. Otherwise, the result will be just shifting the problem of degradation from one place to another. Eventually, when that resource is also degraded, the adverse impact will return to the original locations.

Moozhikkal is located just inside the PTR. The households have fairly large holdings and the land has been developed over the last 50 years into a coconut-based, mixed cropping home garden system. The population consists of migrant farmers who adopt the best farming technology available. Apart from fuel from coconut farms, LPG is accessible to many households in that region. It is no wonder then that Moozhikkal, which is actually inside the PTR, is the settlement least dependent on fuelwood from PTR forest.

Koruthodu and Vallakkadavu are both located outside the PTR. The population consists of settler farmers and a few tribal households. In Koruthodu, the farming system is mixed cropping home gardens with coconuts. Rubber plantations also exist. In Vallakkadavu, which is in the large plantations belt, there are many laborer households with very small holdings. But there are also households with larger holdings and mixed cropping coconut-based home gardens and rubber plantations. After Moozhikkal, these settlements are the least dependent on PTR forest for fuelwood.

Proximity to forests outside PTR which are not covered by Eco-development committees also diverts the pressure for forest fuelwood.

The tribal hamlets in which all households are fully or partially dependent on PTR forest are located inside the PTR. In spite of having large holdings, the settlements cultivate pepper almost as a monocrop in these lands. Coconut, banana, tapioca, etc., are not cultivated because they would be subject to the raids of wild elephants and boars. Thus, forest firewood is their only source of fuelwood.

The Sabarimala settlement, which is just outside the PTR, is also dependent on PTR forests for fuelwood, as the terrain is steep and the vegetation has been converted to rubber plantations.

Conclusions and recommendations

An intensive household survey was carried out in and around the PA and the results show that the size of land holdings, the nature of agriculture practiced, the availability of alternate fuels and community participation in conservation efforts all influence the degree of dependence on forests for fuelwood. The fuel consumption pattern in households was found to vary among settlements depending on the proximity to forests, size of homestead land and other socio-economic factors, including the availability of cooking gas (LPG). About 48% of the total quantity of fuelwood used was collected from the forests of PTR. Of the total number of households in and around PTR, 23% were fully dependent and 45% were partially dependent on the forests of PTR for fuelwood. The remaining 32% were not dependent on PTR for fuelwood. The study also revealed that households with small holdings of homestead land

were found to be more dependent on forests for fuelwood than those with large homestead land holdings. Furthermore, the nature of agriculture practiced, particularly, the development of coconut-based mixed cropping homestead farming reduces the dependence on forests as a source of fuelwood, while monoculture plantations of rubber or pepper do not provide sufficient fuelwood for households around forests.

These findings enlarge the options for conservation by looking beyond just the resettlement of forest communities and are also relevant for other protected areas. The simplistic approach of looking at fuelwood gathering as the sole cause of forest destruction is inappropriate. Detailed studies on fuel collection and use can lead to more modulated approaches for coexistence and effective conservation. The strategy of involving the people for forest conservation and arranging for alternative cooking fuels and livelihoods in Periyar Tiger Reserve is a success story worth examining and emulating where appropriate.

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References

Arun, L.K., Jayasankar, B. and K.M. Abraham. 2001. **Biodiversity conservation and livelihood issues of tribesfolk: a case study of Periyar Tiger Reserve**. Discusion Paper No. 37. Kerala Research Programme on Local Level Development. Centre for Development Studies, Thiruvananthapuram.

Balasubramanian, M. 1999. **Study on the extent and impact of fuelwood collection and baseline survey for firewood and thatching grass collector's EDCs.** India Eco-development Project, Periyar Tiger Reserve, Thekkady. (mimeo)

Government of Kerala. 2001. **Management Plan: Periyar Tiger Reserve. 2001-02 to 2010-11** (Final Draft). Forests and Wildlife Department, Thiruvananthapuram.

Government of Kerala. 2006. **Administration report for the year 2000-01**. Kerala Forest Department, Thiruvananthapuram.

Gubbi, Sanjay, Linkie, M. and N. Leader-Williams, 2008. **Evaluating the legacy of an integrated conservation and development project around a tiger reserve in India**. *Environmental Conservation* 35(4):1-9.

Gurukkal, Rajan. 2004. **The Eco-developmemt project and socio-economic dynamics of fringe area of Periyar Tiger Reserve: A concurrent study**. Discussion Paper No. 100. Kerala Research Programme on Local Level Development. Centre for Development Studies, Thiruvananthapuram.

Krishnankutty, C.N. 2002. **Fuelwood consumption pattern in and around Periyar Tiger Reserve and suggestions for alternatives in reducing negative impacts on the Park**. KFRI Consultancy Report No.10, Kerala Forest Research Institute, Peechi, India.

Authors' address: Kerala Forest Research Institute, Peechi – 680 653, Kerala, India. Email:mammen@kfri.org

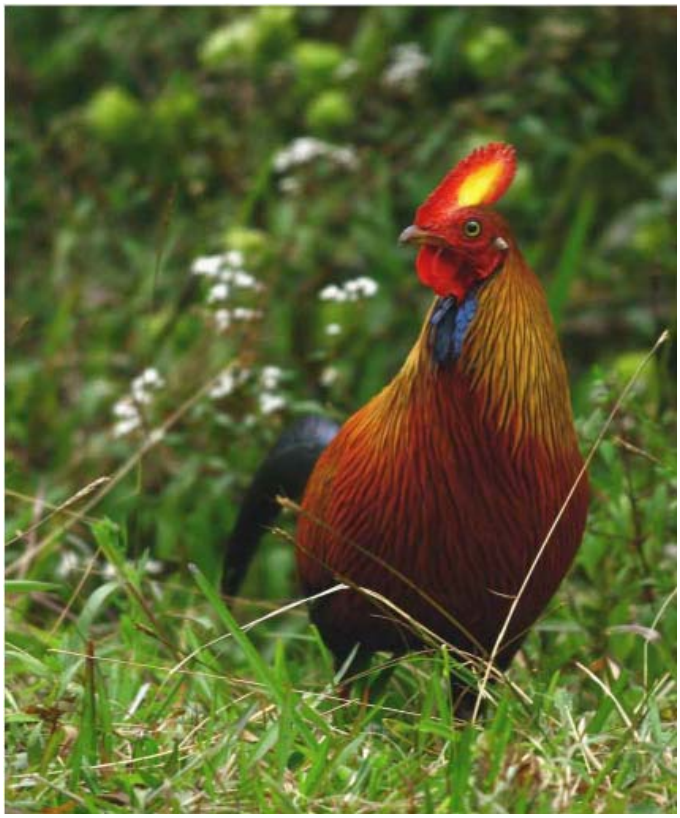

Plate 1 : Sri Lanka Jungle fowl (Gallus lafayetii) – An endemic wild relative of globally important domestic chickens (Gallus gallus). (Photo: Vimukthi Weerathunga)

A REVIEW OF AVIAN AGRO BIODIVERSITY OF SRI LANKA WITH SPECIAL REFERENCE TO LOCAL WILD RELATIVES

by Sarath Ekanayake and Sampath de A. Goonetilleke

Introduction

Agro biodiversity has been defined as the variety and variability of animals, plants and micro-organisms that are used directly or indirectly for food and agriculture, including crops, livestock, forestry and fisheries. It comprises the diversity of genetic resources (varieties, breeds) and species used for food, fodder, fiber, fuel and pharmaceuticals. It also includes the diversity of non-harvested species that support production (soil micro-organisms, predators, pollinators), and those in the wider environment that support agro-ecosystems (agricultural, pastoral, forest and aquatic), as well as the diversity of the agro-ecosystems (FAO, 1999). The avian agro biodiversity, including those in the wild, are of paramount importance. They have played an extremely important role in sustaining society for thousands of years by providing meat, eggs, feathers and manure. Globally, there are 26 avian species domesticated for food and agriculture (FAO/UNEP, 2000) (Table 1).

Table 1: Global list of avian farm animals and their representation in Sri Lanka

	SCIENTIFIC NAME	COMMON NAME
1	*Anas platyrhynchos*	Mallard Duck*
2	*Anser anser*	Greylag goose #
3	*Anser cygnoides*	Swan goose*
4	*Anser cygnoides*	Swan goose*
5	*Coturnix coturnix*	Common quail*
6	*Coturnix japonica*	Wild Japanese quail*
7	*Struthio camelus,*	Ostrich
8	*Casuarius casuarius*	Southern cassowary
9	*Casuarius bennetti*	Dwarf cassowary
10	*Casuarius unappendiculatus*	Northern cassowary
11	*Dromaius novaehollanidiae*)	Emu
12	*Egretta garzetta*	Little egret #
13	*Gallus gallus*	Chicken*
14	*Meleagris gallopavo*	Turkey*
15	*Rhea Americana*	Common rhea/ Nandu
16	*Rhea pterocnemiapennata*	Darwin's rhea / Nandu
17	*Phasianus colchicus*	Common pheasant
18	*Phasianus versicolor*	green (or Japan) pheasant
19	*Perdrix perdrix*	grey partridge
20	*Colinus virginianus*	Bobwhite quail
21	*Numida meleagris*	Helmeted guinea fowl*
22	*Cairina moschata*)	Muscovy duck
23	*Pavo muticus*	Green peafowl
24	*Phalacrocorax capillatus*	Japanese cormorants
25	*Phalacrocorax carbo*	Great cormorants #
26	*Columba livia*	Rock Pigeon #

Key: * present in Sri Lanka as farm animals; # present in Sri Lanka in natural habitats

As shown in the above table, there are eight avian species found in Sri Lanka as farm animals.

Some historical records on avian agro biodiversity of Sri Lanka

Several ancient chronicles of Sri Lanka provide evidence of the occurrence of avian farm animals and their wild relatives in the distant past.

In the more recent past, Deraniyagala (1927) submitted a paper on *Sinhala Game cock* to the Ceylon Poultry Club Magazine and highlighted Sri Lankan domestic fowls. Thereafter, he published several papers (1934, 1944, 1945) on *Sinhala game fowls* in the publications of the Ceylon Poultry Club. In 1953, 1956, and 1958, Deraniyagala published three papers on hybridization of Sri Lankan Jungle Fowl cock (*Gallus lafayetti*) with English Game bantam hen (*Gallus domesticus*). However, his main attention was given to Gamecocks. In 1965, Deraniyagala made a presidential address to the Royal Asiatic Society and mentioned the importance of conserving the Sri Lankan fowl breeds.

Current status of avian agro biodiversity of Sri Lanka

As mentioned above, Sri Lanka has eight species of avian farm animals. These have been well documented in scientific literature on farm animals (e.g., FAO/UNEP, 2000; FAO, 2002). One species – *Anas platyrhynchos* (Mallard Duck) – is represented both in the wild and in some farms in the country. Moreover, four species that are farm animals in the global context, are not farm animals in Sri Lanka, but found only in the wild in the

country. It should be noted here that in Sri Lanka, the wild relatives of globally important avian farm animals belonging to the same genera amount to a significant number.

The importance of such wild relatives has been well recognized in science and development. The genes of wild relatives can be used to boost the genetic makeup of farm animals to improve the nutritional value, disease resistance and productivity of the domestic animals. However, an examination of relevant scientific literature in the Sri Lankan context (FAO/UNEP, 2000; FAO, 2002) shows that over the years studies have focused more on popular avian farm animals. Studies and documentation of wild relatives of avian farm animals are alarmingly inadequate in relation to the significance of wild relatives in stabilizing the global food security in the long run. An attempt has been made here to show the full spectrum of avian wild relatives, at the generic level (Table 2) in order to provide a baseline for future actions. Altogether, 21 species of wild relatives of avian farm animals are found in Sri Lanka; these include *Gallus*, *Anas*, *Anser*, *Phalacrocorax*, *Egretta*, *Pavo*, *Columba* and *Coturnix*. They are related to 7 species of globally important avian farm animals.

Table 2: Globally important wild relatives of avian farm animals recorded from in Sri Lanka (status of species is based on Kotagama *et al. (2006)*

	SCIENTIFIC NAME	COMMON NAME AND STATUS OF SPECIES
1	*Anas acuta*	Northern Pintail Mi / LI
2	*Anas clypeata*	Northern Shoveler Mi / LI
3	*Anas crecca*	Common teal Mi / LII
4	*Anas Penelope*	Eurasian Wigeon Mi /LII
5	*Anas platyrhynchos*	Mallard. Vg / LIII
6	*Anas poecilorhyncha*	Spot-billed duck Mi/ LII
7	*Anas querquedula*	Garganey Mi /LI
8	*Anas strepera*	Gadwall Mi/ LII
9	*Anser anser*	Greylag Goose Vg / LII
10	*Coturnix chinensis*	Blue-Breasted Quail In /LI
11	*Coturnix coromandelica*	Rain Quail Su / LII
12	*Egretta garzetta*	Little Egret In
13	*Egretta gularis*	Western Reef Heron In
14	*Gallus lafayetii*	Sri Lanka Jungle fowl En
15	*Pavo cristatus*	Pea fowl In
16	*Phalacrocorax carbob*	Great Cormorant In
17	*Phalacrocorax fuscicollis*	Indian Cormorant In
18	*Phalacrocorax niger*	Little Cormorant In
19	*Columba livia*	Rock Pigeon In
20	*Columba torringtoni*	Sri Lanka Wood Pigeon En
21	*Columba punicea*	Pale-capped Pigeon Mi / LII

Key: **En**- Endemic species; **In**- Indigenous species; **Mi** – Migrant species; **Vg** – Vegrent; ; **Su**- Status Uncertain ; ***L I.*** *Includes species whose presence is confirmed by one or more specimens;* ***L II.*** *Includes species for which there are three or more sight records;* ***L III****. Includes species for which there are one or two sight- records.*

As shown in Table 2, seven species are indigenous (including one endemic), eight species are migrants and three species are considered as vagrants. The majority of them are spread throughout aquatic habitats, which are highly threatened ecosystems in the island. A number of wet and arid zone aquatic ecosystems are degrading due to the threat of spreading invasive plant species such as *Anona gbara* and *Prosophis longifera*, which can convert aquatic systems to terrestrial systems. Some examples are Belanwila-Attidiya marsh, Muthuraja wela marsh and Bundala National Park. In addition, a number of aquatic ecosystems are disappearing due to large scale development projects and urbanization.

Intra-specific diversity of indigenous avian farm animals

The intra-specific diversity of avian farm animals is relatively well documented and shown by the existence of various breeds. So far, 1,970 avian farm animal breeds have been recorded globally. Among them, 610 breeds (30%) are said to be at the risk of extinction and 47 breeds are reported to be extinct (Rischkowsky *et al.*, 2006).

Among the diverse avian farm animals in Sri Lanka, only the chickens are represented by locally adapted indigenous breeds (FAO, 2002) such as scavenging village chickens; CPRS white and brown egg layers (recently developed at Kundasale, Sri Lanka); a naked neck breed of chicken; and fighting cocks.

In 1934, Deraniyagala identified two intra-specific variations among the Sinhala game fowls, which differ from each other in the shape of the comb and feathers (normal and heavy). He suggested these structures are probably due to Sri Lanka jungle fowl blood. Deraniyagala also identified two fairly well differentiated sub species from the island. One of them is restricted to the semi-arid northern part and the other occurs throughout the rest of the island (Deraniyagala, 1956). Therefore, the intra-specific diversity of village chickens is known to be significant, but only a limited number of works have been carried out to characterize them (Silva, 2003). One of the major threats to local breeds is their hybridization with recently imported exotic breeds and subsequent dilution of the genetic makeup. Most of the local fowl breeds are now difficult to trace due to this reason. Research to document the traits, occurrence, pattern of distribution, ecology and socio economic aspects in order to support conservation activities of local avian breeds would be highly relevant at this moment.

Conclusion

Avian agro biodiversity is a remarkable national living resource of Sri Lanka. Therefore, every attempt should be made using national and international tools to promote understanding, conservation and sustainable use of this biodiversity heritage.

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References

Adithiya, L.A. 1981. **Fauna of the Mahavamsa**. *Ancient Ceylon*. 4:1-48.

Buddhatta, P. 2006. *Seehalavattuve Sinhala anuvadaya, Itha parani Sinhala bana katha*. (Sinhala text) Buddhist Cultural Centre.

Deraniyagala, P.E.P. 1927. **The Sinhala game cock**. *Ceylon poultry Club Magazine*. 9(8): 252-255.

Deraniyagala, P.E.P. 1934. **Some features of game.** *Ceylon Poultry Club Year Book*. p.165-170.

Deraniyagala, P.E.P. 1944. **The Asil game fowls of India**. *Ceylon Poultry Club Year Book*. P.13-27.

Deraniyagala, P.E.P. 1945. **Sinhala, Siamese and Waduga game fowl**. *Ceylon poultry club Year Book*. 31-33.

Deraniyagala, P.E.P. 1953. **Hybridization in the Jungle Fowl of Ceylon**. *Spolia Zeylanica*. 27(1): 45-46.

Deraniyagala, P.E.P. 1956. **Growth Subspeciation and Hybridization in the Ceylon Jungle fowl *Gallus lafayetii*.** *Spolia Zeylanica*. 28(1): 99-106.

Deraniyagala, P.E.P. 1958. **Hybridization and some aspect of behavior in the Ceylon**

Jungle fowl *Gallus lafayetii*. *Spolia Zeylanica*. 28(2): 175-179.

FAO. 1999. **Agricultural Biodiversity, Multifunctional Character of Agriculture and Land Conference, Background Paper 1**. Maastricht, Netherlands. September 1999.

FAO/UNEP. 2000. **World Watch List for Domestic Animal Diversity.** 3rd Edition, B. Scherf, ed., FAO, Rome.

FAO. 2002. **Country Report on the state of animal genetic resources (Sri Lanka)**. Ed. Dr. A.D.N. Chandrasiri, FAO, Rome.

Geiger, W. 1953. ***Culavamsa* 1-Vols**. Colombo, Ceylon Govt. Information Dept.

Kotagama, S.W., De Silva, R.I., Wijesinghe, A.S., and V. Abeygunawardena. 2006. **Avifaunal list of Sri Lanka**. In: Ed. C.N.B. Bambadeniya, *The Fauna of Sri Lanka*, 164-203, IUCN-Sri Lanka, Colombo.

Rischkowsky, B, Pilling, D, Scherf, B, Cardellino, R, and I. Hoffmann. 2006. **Insights from FAO's State of the World's Animal Genetic Resources reporting process**. Conference on International Agricultural Research for Development, Bonn, October 11-13, 2006

Silva, P. 2003. **Status of genetic characterization of Sri Lanka**. Paper presented at the first national workshop UNEP-GEF-ILRI-FAnGR Asia project on "Development and application of decision support tools to conserve and sustainable use of genetic diversity in indigenous livestock and wild relatives," December 2003, Institute of Continuing Education, Gannoruwa.

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GIANT INDIAN FRUIT BAT (Pteropus giganteus Brunnich) ROOST IN KARNATAKA, SOUTH INDIA: A CASE FOR PRESERVATION AS A HERITAGE SITE

by A.K. Chakravarthy, H.M. Yeshwanth, L. Vijay Kumar and N.R. Prasanna Kumar

Introduction

Many of the lesser-known taxa such as bats have received little protection and face considerable threats and higher rates of endangerment. India's bat fauna is rich and diverse. More than 11% of the world's bat species occur in India, including 13 megachiroptera and 99 microchiroptera (Bates and Harrison, 1997). However, the Chiropteran diversity in the Indian subcontinent is presently represented by 121 species, belonging to 37 genera and 8 families, with 112 species belonging to 33 genera and 8 families within Indian limits (Srinivasalu and Srinivasalu, 2001). These species provide substantial ecological and economic services via pollination, seed dispersal and agricultural pest control (Mistry, 2001). For example, the common species of fruit bats (*Cynopterous sphinx* Vahl., *Pteropus giganteus* and *Rousettus leschenaultia* Desmarest) visit over 114 plant species and act as important pollen and seed vectors (Micheleburgh *et al*., 1992, Molur *et al*., 1998).Yet, many bat species in India face numerous threats. They may cause economic loss while feeding on fruits (Varghese, 1998; Srinivasalu and Srinivasalu, 2001a), but this is negligible compared to their beneficial roles. In India, the meat and other body parts of fruit bats are used to cure respiratory disorders, menstrual problems, and for food. Fruit bats are often referred to as messengers of the god Lord Shiva. Bats also help to conserve rain forests. For instance, *Latidens salimali* Thonglongya is the prime seed disperser

in the rain forest, which is vital for the restoration of tall fruiting trees of the Agasthiyarmalai range of southern Western Ghats (Vanitharani, 2005). In Bihar, bats viz., *Megaderma lyra*, are known to keep destructive rodent species in check in the cultivated crops, godowns and houses (Sinha, 2002).

Materials and methods

Roosting site

The roosting site studied is located in a village called Gidadapalya, located 15 km north of Kunigal town in Tumkooru (Lat/Lon: 13.3°N 77.1°E). The village has about 50% vegetation cover. The farmers cultivate diversified crops such as tomato, ragi, arecanut, coconut, sapota and other vegetables . The village is surrounded by forest plantations of *Casurina*, *Acacia* and indigenous tree species like *Ficus*, *Bahunia*, *Samanea saman*, *Tamarindus indica* and others. The roosting site extends to about one acre (10,000 m^2) and is covered with indigenous species of trees as mentioned above. The canopy cover is almost 100%. The ground cover is diverse and surrounded by thick *Lantana* bushes.

● Bat roost at Kunigal (Tumkooru)

History

It is believed that the bats (or flying foxes) (*Pteropus giganteus*) have been residing in this village for the past 75 years. The present roosting site is the third place that the bats have occupied, since the trees were cut at the first site as it was a private property. The bats then shifted to a second site, but the trees there were also cut down. Finally the bats shifted to the present site, where there are 30 banyan (*Ficus bengalensis*) trees and some bamboo clumps. The land and property where bats have been roosting for the past 18-20 years belongs to Mr. Gangadhar. Mr. Gangadhar and the other villagers are very keen to see that the roost site be declared a heritage site.

It is believed that a rishi (i.e., seer or shaman) had advised Mr.Gangadhar's father to protect these bats. So this place is conserved/protected by the villagers. The villagers' love of nature is evidenced by the maintenance of good vegetation cover (75%) in the village.

A small temple is located at the center of the roost site. Lantana plants were planted as a buffer to deter the intrusion of cattle and people inside the roost site, so bats are left undisturbed. There is a substantial collection of leaf litter from the banyan trees and bat guano (fecal droppings) at the site. It is collected in April-May after the rains, and around 10 tractor loads (each load costs Rs. 1000/-) are collected per year. The villagers use this manure for cultivating ragi, areca, coconut and other crops.

Bat counts

An effort was made to estimate the number of bats at the roost. Two observers armed with binoculars (80x30 and 70x50) counted the number of bats clinging to branches of trees by going round the roosts prior to evening flight. The two observers counted the bats independently and separately, and the counts were averaged. At 6.20 pm, a few bats were observed making foraging flights. Four observers placed in four directions counted the number of bats issuing out of the roosting trees. The counts of each observer were added to calculate the size of the roost.

Observations

Feeding and foraging behavior of bats was recorded on four dates during the period December 2007 to January 2008, using four-wheel-drive vehicles, binoculars (80 x 30) and telescopes. Bats were recorded feeding on fruits, twigs and flowers in and around the roost in a 5 km^2 area. Opportunistic observations were also recorded on population numbers, reproductive status and threats to the roost. A performa was developed for interaction with the villagers on the importance of bats and the roost site.

Results and discussion

The breeding season among these bats commences in December. The young ones are born during February to April. Adult bats can weigh up to 1 kg. The bats foraged on trees like *Eucalyptus*, species of *Ficus*, banyan tree, *Madhuka*, and sapota (*Achras zapota*). They feed on the young shoots and buds of these trees and the fruits of *Ficus*. In general, the bats were observed leaving the roost for foraging by 6 pm in the evening. They were observed to first make flights around the trees and then would disperse in all directions to forage. The young ones were left at the roost and the mother bats foraged close by in order to return to the roost early. The bats were observed drinking water from nearby ponds by surface diving. Thus, the area around the roost provided shelter, food and breeding requirements for the fruit-eating bats. Surveys for the roosts of *P. giganteus* during the last four years have indicated a sharp decline in Bangalore urban and rural districts, Tumkooru, Chickmagalur, Shimoga and Hassan in southern Karnataka. In this context, a roost size of 2,600 breeding individuals assumes significance.

Threats

Hunting has been one of the great threats to bats here, as elsewhere (Mickleburgh *et al.*, 1992, 2001). People come from far off places (*viz*., Shimoga and Tumkooru) for hunting. The hunters, who hail from outside the village, observe the flight paths, time, height and direction of flyways. They erect large poles to hang mist nets from. The trapped bats are collected and sold at Rs.200/bat.

However, if the hunters are spotted by the villagers, they are chased away and punished. The hunters also use guns. Apart from serving as food, the bats are used for medicinal purposes. Interviews with the villagers revealed that on an average about 10% of the bats are killed at this roost. Observations at other roosts revealed that about 30% of the bats are eliminated by hunting alone in different parts of Karnataka.

Economic importance

Bats play a crucial role in the ecosystem. A very simple example being the fruit bat's role as flower pollinators and in seed dispersal, and that of insectivorous bats in controlling much of the insect pest population. Although fruit bats damage a small percentage of agricultural crops, their role in forest regeneration more than compensates this loss in the long term from the perspective of the greater good. However, in the present study the bats were not observed inflicting any economic damage on any cultivated crops.

Folivorus bats consume flowers and fruits, effecting seed dispersal and pollination. Some of the adaptations of "bat pollination syndrome" among plants include nocturnal anthesis, color emission and presentation of rewards to the pollinators. We studied bat-pollinated plants such as *Parkia bidandulas*, *Bassia latifolia*, *Ciba pentendra* and *Kigelia pinnata*. Bats also helped in cross pollination. (see Nathan *et al*., 1991).

Public awareness on the importance of bats in pollination, seed dispersal and the benefits of their excrement (as natural organic manures) may create better understanding to preserve their roosting habitats.

Table 1: Nutrients and microbial composition of guano and bolus of flying fox, *Pteropus giganteus* (range in parentheses)

Parameter	Guano	Bolus
Total nitrogen (%)	2.6±0.5 (2–3.3)	3.3±0.82 (2–4)
Total phosphorus (%)	4.2±0.8 (3.1–5.2)	4.3±0.6 (3.5–5)
Potassium (%)	0.6±0.04 (0.6–0.7)	0.7±0.04 (0.6–0.7)
PH	7.3±0.1 (7.1–7.4)	7.1±0.3 (6.7–7.4)
Bacteria (cfu/g dry wt)	$29x10^4$±50 ($25–32 x 10^4$)	$48 x10^4$ ± 28 ($46–50x10^4$)
Actinomycetes (cfu/g dry wt)	$5.55x10^4$±7.8 ($5–6x10^4$)	$4.1 x 10^4$ ± 7.8 ($3.5–4.6x10^4$)
Fungi (cfu/g dry wt)	$2.9x10^4$±3.5 ($3.1–4.3x10^4$)	$4.6 x 10^4$ ± 3.5 ($4.3–4.8x10^4$)

Source: Santhosh *et al.* 2006

Fruit Bat Roost at Kunigal {See Inset}

Leaflitter with Bat guano {note black patches}

Over 200 species of bats are distributed throughout the tropics, and being frugivorous they play a major role in pollination and seed dispersal (Sharoukh Mistry, 2000). The Giant Indian bat or flying fox, *P. giganteus*, commonly roosts on large trees such as *Ficus*. They earned the name "flying fox" because the head and fur resemble that of a fox. Their roosting results in the accumulation of substantial amount of guano on the floor. They swallow soft fruits or extract juice and spit out the remains known as bolus, containing the residual fruit pulp of fibrous fruits and seeds. Besides fruits, they are also known to feed on the juice and pollen of various tree flowers. Although bats are widespread species, they are facing threats mainly due to loss of roosting trees, hunting, and pesticide use.

The Giant Indian bat is the largest bat occurring in the region and is known to live in close proximity to humans. Anecdotal accounts of *P. giganteus* suggest that populations are increasing at some roosts while they are decreasing at others. Isolated studies have provided some insights into possible disturbances and their impacts. However, as a species very little is known about *P. giganteus* population trends in the wild.

Some development work around human habitations and the expansion of roads in the recent past have affected roosts by the roadside. An increasing interest in hunting bats for meat and medicine has resulted in depleted numbers in some roosts. Disturbances to traditional roosts have resulted in bats having to find alternate roosts, whether nearby or farther away (Molur and Walker, 1998). Bats have been known to shift roosts from old native trees such as the fig trees to introduced non-native trees such as Eucalyptus and Casuarina; some roosts are reported to have disappeared completely (Chakravarthy, 2007).

Heritage site

Mr. Gangadhar, the owner of the property containing the roosting site, is ready to donate this one acre site with its 30 *Ficus* trees to government agencies if it can be declared as a heritage site and protection is provided to these roosting bats.

There is a small Muneshwara temple at the roosting site where people worship and they believe the whole area is protected and conserved. Observations have revealed that the bats are not of any nuisance value to the villagers as they do not damage the crops of the farmers and only feed on sprigs of foliage of *Ficus*, *Madhuka latifolia*, *Eucalyptus* and other tree species; thus, the people have good opinions about these bats. Interviews with villagers using the performa revealed that they all supported the idea of declaring the roost as a heritage site and protected area for the following reasons:

- The village has a small population – around 150 families – who are conservation-minded and want to conserve the bats and trees.
- Bats roosts, especially of *P. giganteus*, are rapidly dwindling due to cutting of trees and increasing human populations in Karnataka; therefore, the traditional roosts have been drastically reduced.
- The village (Gidadapalya) has good vegetation all round and forest lands too, far and near, which should be protected.
- Lantana bushes act as a buffer zone preventing intrusions by cattle and humans in the roosting site.
- Many villagers are organic farmers and the by-products of the roost will encourage farmers to go for organic farming and derive multiple benefits.
- Other animals and birds inhabit the roost site, e.g., mongoose (*Herpestes auropunctatus*), wild boars (*Sus scrofa*), snakes, birds such as peacocks, woodpeckers, chloropsis, pied cuckoo and owls, hares, rodents, foxes, etc, are found here. These indigenous biodiversity elements are crucially important for the productivity of the village.
- The area has 30 Ficus trees – so in addition to the bats, other biodiversity components will also be protected.
- The roost site will be conserved in the long run because the whole community is involved and a participatory approach can be sustained, as with the conservation of spotted pelicans and painted storks in Maddur, Mandya district Karnataka, South India.

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References:

Chakravarthy, A.K.2007. **Observations on roosts of Indian Flying Fox, *Pteropus giganteus* in Karnataka**. *Bat Net Newsletter* 8(1-2): Jan-Dec.2007.p

Bates, P. J .J. and D. L. Harrison. 1997. **Bats of the Indian Subcontinent.** Harrison Zoological Museum Publication. Sevenoaks.

Mickleburgh, S.P., Hutson, A.M. and P.A. Racey (Compilers). 1992. **Old world Fruit Bats – An Action Plan for their Conservation**. IUCN/SSC Chiroptera Specialist Group., IUCN, Gland, Switzerland, pp.1-16.

Mickleburgh, S.P., Hutson, A.M. and P.A. Racey (Compilers). 2001. **Microchiropteran Bats – Global Status Survey and Conservation Action Plan.** IUCN/SSC Chiroptera Specialist Group, IUCN, Gland, Switzerland pp.Ix-x

Molur, S. and S.Walker. (Eds.) 1998. **Conservation Assessment and Management Plan (C.A.M.P) workshop**. Mammals of India report summary. Zoo Outreach Organization, India.

Nathan, T., Rulan, P.I., and G. Marimuthu. 2005.**Department of Animal Behaviour and Physiology School of Biological Sciences.** Madhurai, Kamaraj University. *Current Science*, 88:10-25.

Sinha Y.P. 2002. **Status and distribution of Chiropteran diversity of Gangetic plains of Bihar**. *Records of the Zoological Survey of India*, Calcutta.

Santosh, W.G., Eldrich, C. M., Sahadevan, Seena and R. Sridhar Kandikere. 2006. **Observations on guano and bolus of Indian flying fox, *Pteropus giganteus*.** *Current Science* 90**(**2):160-162.

Sharoukh, Mistry. 2000. **Tropical Ecosystems: Structure, diversity and human welfare**. In: Ganeshiah. K. S., R.Umashankar and K.S. Bawa (Eds.) *Proceedings of the International Conference on Tropical Ecosystems*, Oxford-IBH, New Delhi. Pp.707-710.

Srinivasalu,B. and C, Srinivasalu. 2001. **Bats of the subcontinent- An update**. *Current Science* 80:1378-1380.

Varghese, A. 1998. **Non destructive control of the bat, *Cynoptera sphinx* (Chiroptera: Pteropolidae) in grapes in India.** *International Journal of Pest Management* 44(2):81-85.

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DISPERSAL OF Prosopis juliflora SEEDS IN THE FECES OF WILDLIFE IN THE BANNI GRASSLAND OF KACHCHH DESERT, GUJARAT

by Karthik T., Yatin Patel, Mukesh Koradiya, Manoj Pardeshi and Pankaj Joshi

Background

Prosopis juliflora is an exotic and invasive widespread, multi-branched tree species in the Banni grassland of Kachchh desert of the Gujarat state. In the drylands of India, *P. juliflora* is considered one of the most valuable tree species (Pasiecznik *et al*., 2001). It is an exotic species that was introduced on the fringes of Banni to stop desertification in the early 1950s (Gavali *et al*.,

2003). Its deep root system and aggressive growth enables *P. juliflora* to spread rapidly and displace native vegetation.

Over the years, *P. juliflora* has come to occupy half of the Banni grassland. Nowadays, *P. juliflora* is a troublesome invasive plant in many areas of the Banni grassland. In addition, the pods of *P. juliflora* are occasional fodder sources for local livestock. Domestic animals such as cows, buffaloes, goats and horses feed on the pods of *P. juliflora* and disperse them to other adjoining habitats through the excretory material during the process of the grazing. Dispersal of seeds of *P. juliflora* in the Banni grassland is mainly through domestic animals and this makes this plant species more successful in spreading over many habitats.

Observations

During the biodiversity survey of the Banni grassland, seeds of *P. juliflora* were recorded from the feces of jackal (*Canis aureus*) and wild boar (*Sus scrofa*). In total, 18 samples of feces containing seeds of *P. juliflora* were recorded from different locations such as Luna Village (5 samples from wild boar), Sargu (2 samples from jackal), Bhaghdiya (3 samples from jackal), Dhordo (2 samples from wild boar), Bhirandiyara (samples from one jackal and one wild boar), Berdo and Servo each had one sample from Jackal and Bhitara Dhadhar moti had one sample from wild boar in the Banni grassland. The presence of *P. juliflora* seeds in the dung of domestic animals is common in this region, but the presence of these seeds in the feces of wildlife is rare.

Recent evidence shows that wild animals are also occasional feeders of the pods of *P. juliflora*. Thus, it can be concluded that not only the domestic stock, but also wild animals like jackal and wild boar are responsible for the dispersal of the seeds of *P. juliflora*.

Research recommendations

The following broad strategies are suggested for long-term ecological study on seed dispersal by wildlife in Banni grassland:

- Systematic documentation on dispersal of the *Prosopis* seed in the Banni grassland by wildlife species.
- Develop short and medium-term perspective research plans on the interaction between *Prosopis* and wildlife.
- The above-listed localities can be used as permanent study areas for the ecological understanding of the seed dispersal mechanism by wildlife species.
- Seed viability and seed germination studies of *Prosopis* seeds in the feces of wildlife should be part of the research program in Banni.

References

Gavali D.; Lakhmapurkar J.; Wangikar U. and Sharma D. 2003. **Impact of *Prosopis juliflora* Invasion on biodiversity and livelihood in the Banni Grassland of Kachchh**. Gujarat Ecology Society, 3rd floor Synergy house, Subhanpura, Vadodara- 390023. Web site accessed on 23 November 2008. http://www.ncbi.org.in/nbeii/poster/Gavali%20abstract.pdf.

Pasiecznik, N., Felker, P. and P.J.C. Harris *et al*. 2001. **The *Prosopis juliflora-Prosopis pallida* Complex: a Monograph**. HDRA, Coventy, UK.

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FOREST NEWS

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Financing the future -- What roles for carbon and communities?

(Photo: ©RECOFTC)

Contributed by Marija Spirovska-Kono, FAO Consultant

Carbon financing offers promising new avenues for simultaneously addressing climate change and chronic forest management challenges. In order for carbon financing to deliver long-term, sustainable methods for reducing rural poverty and improving the health of the world's forests, it has to demonstrate the multiple benefits forest ecosystems provide to today's society.

With the approach of the 15th Conference of the Parties of the United Nation's Framework Convention on Climate Change, scheduled for December 2009 in Copenhagen, Denmark, fundamental issues such as equity, transparency and ownership are increasingly capturing public attention. Understanding and addressing the needs of over 450 million forest-dependent people across the Asia-Pacific region may be of vital importance for reaching a new global climate change agreement and designing functional carbon payment schemes.

At the *First Regional Forum for People and Forests***,** held 18-20 August 2009, in Hanoi, Vietnam, key country decision-makers and over 80 participants from 12 Asia-Pacific nations met to consider the important links between carbon financing and local people.

Forum highlights

The forum was organized jointly by The Center for People and Forests (RECOFTC) and the Food and Agriculture Organization of the United Nations (FAO), with support from the Forest Sector Support Partnership of Vietnam (FSSP) and the Department of Forestry of the Vietnam Ministry for Agriculture and Rural Development (MARD).

The overall objective of the forum was to develop a collective outlook on the importance of engaging local communities in carbon financing. Benefits, risks and options for fully integrating local people in the carbon sequestration equation were addressed through plenary presentations, guided discussions and group work.

Key forum topics included:

- Concepts of payments for environmental services (PES) and forest carbon financing;
- Lessons learned from more than 30 years of community forestry and comparable devolved forest management models;
- Current and potential concerns of buyers and sellers of carbon credits;
- Current and potential effects of (PES), the Clean Development Mechanism (CDM), voluntary carbon financing arrangements and Reducing Emissions from Deforestation and Forest Degradation (REDD) pilot projects;
- Recent developments under UN-REDD;
- Issues to be addressed to turn the potential opportunities of forest carbon financing into tangible benefits on the ground that not only help battle climate change globally, but also contribute to poverty reduction locally.

Carbon farming in the field

The second day of the workshop provided a unique opportunity to visit Vietnam's only afforestation/reforestation (A/R) site registered under the Clean Development Mechanism (CDM). The fact that to date there are only 6 registered A/R sites worldwide, has triggered vigorous discussions about the complexity of involving forestry in the compliance markets. It was therefore beneficial for the participants to learn more about the process of developing and registering CDM projects, the role of various stakeholders, and to see the plots allocated for plantation establishment. Participants discussed the project with farmers, project developers and project implementers, and addressed issues related to opportunity costs, motivation and expectations. The summary of the field visit findings underlined some critical issues such as the high transaction costs, unclear land ownership and land use patterns and uncertainties regarding the economic return and benefit sharing. Despite all uncertainties, the local farmers seemed to have little doubt about their main motives "*Trees are good for preventing floods and maintaining our lifestyle; if we can also receive this carbon money after five years all the better.*"

Reaching consensus

The field trip findings and the plenary presentations set the stage for open and frank discussions which helped to identify the main factors hindering the involvement of local forest communities in the expanding carbon markets. Some of the key constraints pinpointed included:

- lack of clear and secure land and resource tenure;
- unclear carbon ownership rights;
- high transaction costs for accessing carbon markets;
- complex framework of regulated carbon markets; and
- lack of information regarding how to access voluntary carbon markets.

Emerging from the discussions, a consensus was reached about the need for commitment at all levels to include the rights of local people in climate change negotiations and in developing carbon financing mechanisms. Although uncertainties related to REDD and other carbon financing mechanisms dominated the discussions, the participants were able to draw from some positive experiences with community forestry, payments for environmental services and voluntary markets, and to identify important enabling conditions.

Acacia mangium (Photo: © RECOFTC)

Cao Phong reforestation project plans to establish 308.5 ha of tree plantations on currently degraded grass and shrub land in Hoa Binh province in northwest Vietnam. The project was formulated with support from JICA, and is implemented by the Vietnam Forestry University and the Department of Forestry under the Ministry of Agriculture and Rural Development. Honda Vietnam Co. Ltd is providing financial support for project activities. *Acacia mangium* and *Acacia auriculiformis* were selected for establishing the plantations for wood production with a rotation period of 15 years.

Cao Phong reforestation project (Photo: © RECOFTC)

First Regional Forum for People and Forests

Carbon Financing and Community Forestry

Call for Action

First Regional Forum for People and Forests
Carbon Financing and Community Forestry

2009 is a crucial year for global efforts to address climate change, with the hope that an ambitious and effective mitigation and adaptation agreement will be forged in Copenhagen this December.[1]

Deforestation and forest degradation contribute some 20 percent of global greenhouse gas emissions. Forest-related mitigation measures are now recognized to be amongst the most practical and cost-effective interventions to slow global warming – as well as providing a host of other environmental products and services.

However, rural poverty, weak law enforcement, and escalating demand for food and fuel continue to drive forest destruction at an alarming rate – in the Asia-Pacific region alone, some 3.7 million hectares of natural forest are lost every year. This also threatens millions of already vulnerable rural livelihoods, often undermining traditional rights to vital forest resources.

Carbon financing may provide promising new opportunities for maintaining and even improving the health of the world's forests and, if designed well, to reduce rural poverty. But if schemes such as 'REDD' fail to deliver tangible benefits to Asia-Pacific's 450 million forest-dependent people, then the social and economic impacts could be severe. Ultimately, this increases the risk that forest-related mitigation efforts will fail.

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[1] *The 15th Conference of the Parties of the United Nation's Framework Convention on Climate Change will convene in Copenhagen, Denmark, 17-18 December 2009.*

Key country decision-makers and over 80 participants from 12 Asia-Pacific nations considered these issues at the **First Regional Forum for People and Forests:** Carbon Financing and Community Forestry held in Hanoi, Vietnam, from 18 to 20 August 2009.

Key Forum Conclusions

As forests in the Asia-Pacific region can potentially absorb a large proportion of global carbon dioxide emissions, the need for healthy and sustainable forest ecosystems cannot be understated nor undersold. But we must go beyond carbon to promote and 'sell' biodiversity, watershed conservation, and sustainable forest management as an essential holistic package.

Local people **hold the key** to healthy forests in this region. They have the closest direct stake in forest resources and will affect the outcome of any forest management strategy, including those aimed at climate change mitigation. For carbon financing to succeed, it must learn from three decades of community forestry experience and actively engage and benefit local people.

Lessons from payment for environmental service (PES) schemes reveal that carbon financing presents both risks and opportunities for local people, and also constraints to their effective participation. Maximizing the opportunities and addressing the risks and constraints requires early and active community involvement, especially in negotiating roles, responsibilities and benefits.

Benefits from carbon financing must be additional and expand, not replace, local people's existing rights and benefits. Strong grassroots institutions and clear, secure, and fair rights to forests are critical prerequisites. Meaningful local participation, shared decision making, and high levels of transparency and accountability must be regarded as the 'minimum standard.'

Intermediary organizations that will build capacity and help broker carbon financing agreements have key roles to play in securing equity and local participation, and will require support in carrying out these important functions.

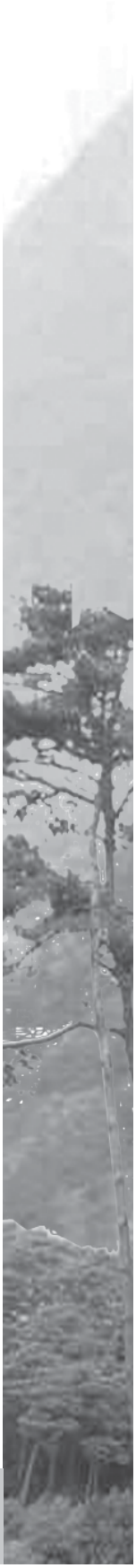
However, until carbon ownership, benefit-sharing arrangements, financing methods and legal issues are clarified, carbon markets will remain a risky area of investment for both the private sector and local people.

In considering the implications of carbon financing for local people, Forum participants called for:

National Governments to:

- Ensure community interests are represented during multi-stakeholder discussions involving civil society, NGOs, UNFCCC delegates, and other key stakeholders.
- Make the national position on forests and carbon financing clear and transparent, including engaging media to raise public understanding and stimulate debate.
- Use regional mechanisms to develop consensus among countries (e.g. ASEAN, SAARC) before the AWG-LCA meets in Bangkok.[2]
- Accelerate the process of clarifying fair and secure rights for local people to benefit from forests.
- Increase community, government, and intermediary capacity to design and implement REDD mechanisms.
- Establish cost-effective, transparent, equitable, and 'community friendly' carbon payment systems.

[2] *The UNFCC Bangkok Climate Change Talks take place from 28 September to 9 October 2009 and includes the seventh session of the Ad-Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA)*



International Organizations to:

- Target key information – including the outcomes of this Forum – to media and national decision makers, including UNFCCC delegates.
- Provide a bridge between civil society groups in developing countries and UNFCCC delegates from developed countries, making them aware of the implications of carbon financing for local people in Asia-Pacific.
- Seek to influence country positions, both developing and developed, to ensure that community interests are fully considered and addressed.
- Generate objective knowledge to inform policy making and implementation, and build capacity to research, analyze, disseminate, and use knowledge effectively at country level.
- Strengthen South-South cooperation for capacity building and information sharing on matters of forests and climate change.
- Encourage both developed and developing country governments to fulfill their commitments and obligations to support REDD-readiness in developing countries.

Civil Society to:

- Facilitate national and subnational civil society consultations, working closely with national governments to prepare for the COP-15 negotiations and beyond.
- Mobilize key groups with special interests and skills – including religious organizations and academia – as strategic partners to influence the debate.
- Review the negotiating text for future climate change arrangements, providing timely and constructive feedback promoting community interests.

Private Sector to:

- Maximize transparency in forestry and carbon-financing arrangements to build trust among stakeholders.
- Adopt clearly defined social responsibility roles, particularly promoting the concept of more socially responsible carbon trading.

The First Regional Forum for People and Forests brought together key people from government, civil society, the private sector, and international organizations to discuss options for strengthening the forest carbon-community connection in the Asia-Pacific region. The forum reached consensus on the importance of engaging communities in any sustainable carbon financing initiatives, and explored ways to achieve this.

Key Questions Included:

- What benefits could communities gain from carbon-financing schemes?
- What are the potential pitfalls and risks?
- How can carbon markets strengthen sustainable forest management regimes in ways that meet rural communities' needs and fairly reward their contributions?

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How do we measure forest degradation?

Contributed by Victoria Heymell, Forestry Department, FAO HQs

The challenge

Rates of deforestation and forest loss are regularly measured. Forest degradation – defined by international forest-related organizations as "the reduction of the capacity of a forest to provide goods and services" – is similarly important, but much more difficult to measure.

Beyond this core definition, perceptions regarding forest degradation are many and varied, depending on the driver of degradation and the main point of interest (e.g., biodiversity conservation, carbon sequestration, wood production, soil conservation, recreation).

In the absence of agreed definitions and assessment methods, few countries are currently able to report on the area of degraded forests or the degree of forest degradation.

The study

Under the umbrella of the Global Forest Resources Assessment 2010 (FRA 2010), and together with members of the Collaborative Partnership on Forests (CPF) and other partners, FAO has initiated a special study to identify the elements of forest degradation and the best practices for assessing them.

The primary objective of the work is to help strengthen the capacity of countries to assess, monitor and report on forest degradation.

Expected outcomes and benefits of the initiative include:

- better understanding of the concept and components of forest degradation;
- an analysis of definitions of forest degradation and associated terms;
- guidelines and effective, cost-efficient tools and techniques to help assess and monitor forest degradation; and
- enhanced ability to meet current and future reporting requirements on forest degradation.

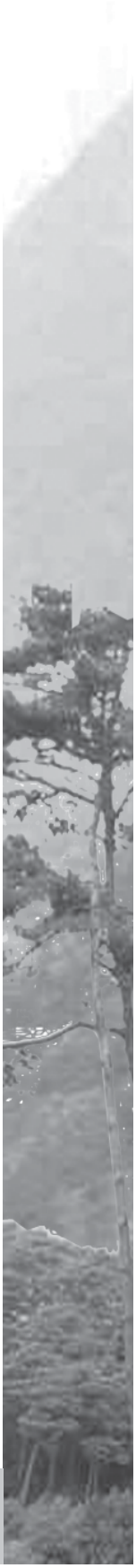
The study has undertaken a survey of existing country practices to see what is being measured, as well as an analytical study on definitions which provides a framework for the process. A series of case studies describing proven or promising methodologies and tools for assessing different aspects of forest degradation has also been undertaken.

Technical meeting

A technical meeting held 8-10 September 2009 in Rome, provided a forum where the analysis of definitions and case studies on forest degradation were presented, reviewed and discussed. The meeting provided an opportunity for participants to discuss technical aspects of methodologies for assessing and monitoring forest degradation.

The main conclusions were as follows:

- There was endorsement of the generic definition of "forest degradation" as a reduction in the capacity of a forest to provide goods and services.
- It was proposed that the many different aspects of forest degradation should be communicated better to the climate change negotiators.
- It was agreed that attention should be focused on harmonization of definitions and methods for monitoring five aspects of forest degradation, i.e., stocking level, biodiversity, forest health, level of use/production and forest soil.
- Methodologies do exist to monitor changes in carbon stocks and therefore to include forest degradation in terms of climate change in the proposed reducing emissions from deforestation and forest degradation (REDD) mechanism.



- There was a call for the development of tools and guidelines for measuring different aspects of forest degradation.

Outreach

Outreach activities have been ongoing during the process of the forest degradation project. Presentations on the forest degradation study were made at the 19th session of the Committee on Forestry (COFO) in March 2009 and at the Subsidiary Body for Scientific and Technological Advice (SBSTA) of the UN Framework Convention on Climate Change meeting in June.

A brochure on the initiative has been prepared in English, French and Spanish and a web page developed on the CPF website. This site contains all material related to the study and is regularly updated. The presentations made at the Rome meeting can be found at the following site: http://www.fao.org/forestry/cpf/degradation/en/

Ongoing work

Between now and the end of 2009 there is plenty to do. Following the Rome meeting, case studies, presentations and discussions will be incorporated into a publication. A side event will be hosted at the World Forestry Congress, where some of the case studies will be presented. Following that, the focus will be on the preparation of materials to be available at COP15 of the UNFCC in Copenhagen in December 2009.

In addition, a group of authors are contributing to an in-depth review of existing and promising new methodologies and tools to generate scientifically sound estimates of historical rates or levels of forest degradation in developing countries within the framework of REDD.

Next steps

Possible future steps will then be determined by partners at the end of 2009, based on a review of the results obtained by that time. These may include the following:

- Developing guidelines and effective and efficient tools and techniques;
- Building capacity in countries to undertake assessments; and
- Providing support to countries to enable them to meet their current and future reporting requirements on forest degradation.

This study is ongoing, and we would be grateful to hear from anyone who has experience in assessment methodologies for measuring forest degradation.

For more information please visit the website: http://www.fao.org/forestry/cpf/degradation/en/
Or contact Victoria Heymell: Victoria.Heymell@fao.org

RAP forestry staff movement

Josefine Munoz, a national of Sweden, joined the RAP forestry group in September 2009 as an intern. Her duties will include assisting in preparing for the 23rd Asia Pacific Forestry Commission and the 6th Asia Pacific Forestry Commission Executive Committee Meeting, and supporting technical officers implementing a new field project linking communities with voluntary carbon markets.

Ms Munoz attained a Master of Science degree in Biology with a specialization in management, maintenance, administration of and information about national parks and nature reserves from the University of Gothenburg.

Removing constraints to private investment in forestry

Contributed by Michael Pescott (FAO Forestry Consultant), Thomas Enters (RECOFTC Program Manager, Regional and Country Analysis and Support) and Patrick Durst (FAO Senior Forestry Officer)

The *Jakarta Globe* recently reported that a government lending program designed to rejuvenate Indonesia's plantations had so far fallen flat.[1] The newspaper reported that only about 11 percent of the target loans had been made during the first two and a half years of the four-year program. Critics blamed "a complicated regulatory structure and high interest rates" for the flop, and stated that only a handful of banks were participating in the program, making it difficult for farmers to obtain loans.

Such situations are not uncommon to the forestry sector, with complex regulatory frameworks, often burdensome bureaucratic procedures and high interest rates being just three of a considerable list of constraints that can reduce the capacity and overall interest of the private sector to invest in forestry. To address such challenges comprehensively, FAO commissioned a regional policy study (at the request of the Asia-Pacific Forestry Commission), to identify potential strategies for streamlining investment and overcoming constraints.

The workshop which convened 5-7 August 2009, in Khon Kaen, Thailand, was organized by the FAO Regional Office for Asia-Pacific and The Centre for People and Forests (RECOFTC). Phoenix Pulp and Paper Public Company Limited provided the venue, excellent support, and stimulating inputs for the event.

The scene was set for discussions with a debate led by Patrick Durst (FAO) and Thomas Enters (RECOFTC), presenting two contrasting points of view: one, somewhat cheekily, highlighting the positive prospects for future private sector investment in forestry, and the other pointing out many of the current and potential challenges, risks and pitfalls. This was followed by additional presentations, group discussions and a field visit to eucalyptus plantations owned by two local suppliers of logs to Phoenix Pulp and Paper Public Company Limited (one a farmer; the other a Bangkok-based investor working with local laborers).

There is no dearth of publications highlighting the diversity of the forest sector in the countries that make up the Asia-Pacific region. It should, therefore, not surprise us that a coherent picture of what draws investors to the forestry sector or what may cause them to think twice when it comes to putting money into trees and forests, did not emerge. The list of real and perceived constraints was long. Below is a brief list of issues that received the majority of votes:

Governance constraints

- costly, lengthy and complex legal procedures for buying, managing, selling and investing in forestry land, products and setting up and operating processing facilities;
- land tenure issues, including restrictions on shifting land use, size of land holdings, issues of exclusion, alienation and duration of ownership rights;
- weak or lacking government incentives, and unfavourable taxation policies and regulatory framework; and
- inappropriate, inconsistent and volatile public policies (e.g., shifting tax policies, changing carbon trading rules or resource use regulations).

[1] The article is available at http://thejakartaglobe.com/business/ministry-says-plantation-overhaul-scheme-a-failure/319370

Production constraints

- weak competitiveness of trees vis-à-vis other crops (especially those with government subsidies such as crops for biofuel production);
- poor infrastructure development (e.g., roads, ports, and communications);
- poor forest product yields due to management capacity and bio-physical limitations such as poor soil quality and shortages of high-quality seedlings; and
- challenges for corporate wood buyers in coordinating the activities of thousands of small-holder tree farmers.

Social and external constraints

- complex mechanisms for accessing credit, coupled with a lack of understanding about prices and interest rates;
- poor understanding by the public sector of private sector decision-making processes; and
- weak collaboration among different stakeholders in discussing and formulating visions, incentive schemes, legislation and workable solutions.

How to make a difference

While the long list of impediments and problems looks like doom and gloom, the participants were united by optimism, seeing a light at the end of the tunnel. How bright the light is depends to a considerable extent on the implementation of strategies that remove constraints and make investing in forestry more attractive. Among them are:

- increasing investor access to objective and up-to-date information;
- including all stakeholders in reviewing and revising policies to ensure consistency among different government institutions, and promoting policy stability;
- clarifying land and resource tenure, including the potential for increasing the land area and duration of land and forest rights where appropriate;
- reducing regulatory requirements and simplifying bureaucratic procedures related to forest production and wood processing;
- introducing favourable policies, incentive schemes and/or subsidies to serve as a "lever" for investment; and
- fostering linkages between farmers and corporate buyers through activities such as contract farming and out-grower schemes.

The above may look like a tall order but quite often, simple steps can make a significant difference. Take for example, Thailand. According to Thai laws, eucalyptus plantations on agricultural lands are not treated, in terms of regulations and incentives, as forests. Therefore, the same rules apply for eucalyptus as for agricultural crops. This means that planting, harvesting, transport and marketing are not restricted by burdensome bureaucratic procedures which are commonly encountered in other Asian countries. Simple, isn't it.

More answers lie in waiting

The workshop was just a stepping stone to finalizing the study's findings and their distribution. The final study report will provide more answers than this sneak preview. In fact, many findings are not new. They are well-known, but the political commitment to bring about change remains weak as different stakeholders defend their territory, current responsibilities and roles.

Overall, it was acknowledged that joining hands in finding workable solutions could make a huge difference and that much could be done in many countries to bring the various stakeholders together for joint deliberations and actions. The workshop was a small, but nevertheless fruitful contribution to join hands. All participants expressed their hope that we will see more of such productive discussions and subsequent efforts to increase investment in sustainable forest management.

Pakistan's participatory national forest program

Contributed by Syed Ahmad Raza Asif, Section Officer, Ministry of Environment, Government of Pakistan

There is worldwide recognition that forests are an essential component of the natural environment and life support systems. Efforts are now being made in almost every country for their sustainable development.

Pakistan has a meager forest area of 4.570 million hectares, which is only 4.8 percent of total land area of Pakistan (87.980 million hectares). Thus, Pakistan has only 0.03 hectares per capita of forest cover in comparison to the world average of 1.0 hectare per capita. The Government of Pakistan realizes that the area of public forests cannot be expanded; therefore, the potential of trees grown on private lands to meet the nation's future wood requirements is now being recognized.

In South Asia, like other sectors, forests have generally been managed on the principle of command and control (top-down approach) by the forest departments, and communities and other stakeholders have been largely excluded from decision-making processes. Over a century of experiences have taught decision makers in the forestry sector that the majority of their plans and programs have failed due to the non-cooperation of local people and a persistent lack of trust between the stakeholders. There is now increasing recognition of a more flexible approach that includes the participation of stakeholders, which develops a sense of ownership among the stakeholders with the assignment of roles and responsibilities, which in turn promotes sustainable development through equitable cost and benefit sharing. However, the main hurdles in promoting participation processes include the lack of a team of experts, non-conducive policies and legislative issues, lack of political will, lack of will to change the attitude favoring local participation and contradictions of interests among stakeholders.

FAO has taken a lead role in establishing the "National Forest Programme (NFP) Facility" in collaboration with several international partners. The Facility offers catalytic support to national forest programs of developing countries. The Ministry of Environment of the Government of Pakistan and the NFP Facility signed a partnership agreement in 2004. Under this agreement, the Facility provides partial financial support for activities directed at the development and implementation of Pakistan's National Forest Programme.

Since its partnership with the Facility, Pakistan has launched a number of activities under the NFP geared at providing up-to-date information and raising awareness among all forestry stakeholders on forestry issues, and increasing the involvement of civil society, the local communities and other economic sectors in forestry, some of which have already been completed. The basic objective of the activities was to enable a more informed discussion on forestry issues amongst the stakeholders who had very weak understanding of critical issues. A Multi-sector National Steering Committee is continuously guiding the activities being carried out under the NFP.

Major achievements made so far under the NFP include the development of National Vision 2030 for Forest and Biodiversity Conservation, Identification of Fora for Consultation of Forest Policy at different levels and development of a Forest Communication Strategy. In addition, work is progressing on the development of a Public-Private Partnership in the Forestry Sector, development of a methodology for the valuation of forest goods and services, development of a National Response Strategy to combat the impact of climate change on forests, and development of a compensation mechanism in lieu of a ban imposed on commercial harvesting of forests.

National Vision 2030 for Forest Biodiversity Conservation states that:

"By 2030, Pakistan will be managing all types of forests on ecosystem approach, enabling them to perform potential functions of conserving biodiversity, providing sustainable livelihoods to dependent communities, meeting national demand for wood and contributing positively to mitigating global environmental problems."

All the policies and plans are now being made keeping Vision 2030 in mind. There is a clear change in the mind set of forest officials who are now recognizing the value of participation of forest communities and other stakeholders for effective and sustainable management of forests in an economical manner.

What are Asia-Pacific countries doing to improve forest law enforcement and governance (FLEG)?

Forest law enforcement and governance (FLEG) is not a new concept – with many countries in the region having already implemented a wide range of initiatives – but just how many, what type and how successful these initiatives are, remains largely unknown.

Current rates of illegal logging, land encroachment, wildlife trade, wild-land arson, tax evasion, corruption and other forest crimes indicate there is still considerable scope to strengthen FLEG across the region. The entire picture is not gloomy, however, and in reality there are an increasing number of initiatives aimed at strengthening forest law enforcement and governance across the region.

FLEG initiatives are developed and implemented by a variety of stakeholders, including government policy and enforcement institutions, bi- and multi-lateral agencies, NGOs, and the private sector. Initiatives include improving national legislative frameworks and enforcement strategies, boosting institutional staffing and budget capacity, forest crime prevention, detection and suppression strategies, strengthening economic governance and stakeholder participation, as well as monitoring and reporting on the results of FLEG implementation.

With such a wide range of FLEG initiatives undertaken by various stakeholders, it is important to document efforts, track progress and share lessons learned. It is against this backdrop that the Asia-Pacific Regional Workshop on Strengthening Forest Law Enforcement and Governance (FLEG) will be convened 30 November - 1 December 2009, in Kuala Lumpur, Malaysia.

The workshop is being co-organized by FAO, the World Bank, German Technical Cooperation (GTZ), the ASEAN Secretariat, the Institute for Environment and Development (LESTARI) and the Universiti Kebangsaan Malaysia. It is expected that participants will come from the ASEAN Member States (Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam), as well as China, India, Papua New Guinea, and others active in FLEG implementation.

The workshop will be based on FLEG country papers that participating countries are preparing in advance. The papers are designed to facilitate a "stock-taking" review of FLEG initiatives, to provide a greater understanding of the current status of FLEG implementation in the region. It is expected that the workshop will serve to share the knowledge and experiences from across the region, providing new ideas and ways forward. For further information regarding this workshop please contact: Michael.Pescott@fao.org

FAO uncovering links between bioenergy and food security in Thailand

Contributed by Beau Damen, FAO Consultant, Bioenergy

The ability to access the means to acquire appropriate food for a nutritious diet is the cornerstone of food security. Yet last year the food crisis that beset the world via soaring food prices posed a serious threat to this seemingly simple and self evident principle, particularly for people in the developing world. Bioenergy and liquid biofuels were fingered as a key cause of the crisis. And, while estimates of the actual influence of bioenergy demand varied, often wildly, there was little doubt the growing demand for bioenergy was one of the factors propelling food prices higher.

Recently, prices for food, feed and fibre have subsided from the highs witnessed last year. But despite this easing, FAO has continued to champion efforts to ensure that the world is better prepared to tackle future threats to food security. FAO's Bioenergy and Food Security (BEFS) project is one such effort that aims to bolster the capacity of developing countries to mitigate the impact of bioenergy on food security. Under the project, FAO has developed a quantitative and qualitative framework to analyze the interplay between land availability, bioenergy production potential, food security and poverty alleviation. The main result is an approach for policy makers that will encourage more informed decisions about the merits of specific bioenergy policies.

Thailand, with its diverse agricultural economy and growing biofuels industry, was chosen as a pilot country for the BEFS project in Asia. FAO RAP has been working closely over the past year with various Thai-based organizations to apply the BEFS framework to the Thai context.

A pivotal element of the BEFS project in Thailand is the development of specific future bioenergy scenarios for the country that will be charted with FAO's Commodity Simulation Model (COSIMO) partial equilibrium model. In June 2009, a team of trainers from FAO headquarters in Rome conducted a training session on the COSIMO model for staff from the Thai Government's Office of Agriculture Economics (OAE). Then, in July 2009, OAE held a special bioenergy scenario development meeting involving 20 participants from a range of public and private bioenergy-focused organizations. Participants enthusiastically discussed the possibilities for bioenergy development in Thailand over the next decade. OAE intends to refine the scenario parameters over the coming months and model their implications for agricultural markets and the broader Thai economy.

To complement the modeling work being undertaken by OAE, a number of thematic studies have also been implemented to highlight different aspects of the bioenergy-food security equation. The Joint Graduate School of Energy and Environment of King Mongkut Institute of Technology is developing detailed life-cycle assessments of different biofuel feedstocks. The Thai Rural and Social Management Institute is assessing a range of small-scale rural bioenergy projects in Thailand to uncover challenges to replicating successful, self-sufficiency-oriented bioenergy projects in other rural communities across the country. Finally, Professor Sombat Chinawong from Kasetsart University, is documenting the zero-waste biomass utilization system to present an alternative model for future bioenergy development in Thailand.

FAO RAP anticipates that most of this work will be completed before the end of 2009. The findings will be brought to the attention of the Thai Government policy makers and the broader public at the BEFS National Workshop, scheduled for February 2010 in Bangkok.

ASIA-PACIFIC FORESTRY CHIPS AND CLIPS

CAMBODIA SIGNS REDD AGREEMENT

In June 2009, US-based ecosystems services firm, Terra Global Capital (TGC), signed an agreement with the government of Cambodia for a new avoided deforestation project. It is expected that the project, which is undergoing third party validation, will reduce emissions from deforestation by 8.5 million tonnes of CO_2 equivalent over 30 years. TGC's partners in the project will include the Cambodian Forestry Administration and nine community forestry groups.

– Mongabay.com –

INDIAN SMALL-SCALE FORESTRY PROJECT WINS CDM CERTIFICATE

A community forestry project in northern India has become the first small-scale afforestation project in the world to receive a Clean Development Mechanism certificate. The project is part of a broader, ten-year community forestry project to provide tree cover on thousands of hectares of wasteland. It is estimated that the approved CDM project will absorb 12,000 tonnes of carbon dioxide over the next 20 years. The project will start producing carbon credits after the first five years of operation.

– Scidev.Net –

INDONESIA ISSUES FOREST-CARBON REVENUE RULES

In July 2009, Indonesia's forestry ministry released profit-sharing rules for forest carbon projects. The rules are believed to be the first of their kind in the world and aim to clear up questions that arose following the release of Indonesia's formal REDD regulations in May 2009. The regulations specified who could carry out a REDD project in Indonesia and where they could be located, but not how any profits generated by the projects would be distributed. The new revenue rules address this omission.

– Reuters –

US ENTERS DEBT-FOR-NATURE SWAP WITH INDONESIA

The United States has signed an agreement with Indonesia to forgo US$30 million in debt repayments in return for an agreement that Indonesia will protect forests in Sumatra. The agreement is being organized under the auspices of the US Tropical Forest Conservation Act and is the first such agreement between the US and Indonesia. The US has similar, smaller agreements with other countries including the Philippines, Guatemala and Peru.

– VOA News –

FIRST AUSTRALIAN CCB-CERTIFIED REDD PROJECT IN TASMANIA

A forest conservation project in the Australian state of Tasmania has become the first Australian REDD project to meet Climate, Community and Biodiversity standards. Logging of old-growth forest is an increasingly controversial issue in Tasmania. The project, which will be located on 860 hectares of private land, is seen as an opportunity to demonstrate that REDD could provide much needed incentive for landowners to preserve local old-growth forests.

– Mongabay.com –

INDIA TO PUMP MILLIONS INTO FORESTS

The Indian Government has announced that it intends to spend $200 million to improve protection of the country's forests. Indian Environment Minister, Jairam Ramesh, indicated the money will be used to conserve and restore unique vegetation, control forest fires and strengthen forestry infrastructure. At present, India's forest cover is 65 million hectares, or 20 percent of its total land area. The new funds will be used to expand forest cover by an additional six million hectares over the next six years.

– Reuters –

CLIM-FO-L: NEWSLETTER ON FORESTS AND CLIMATE CHANGE

CLIM-FO-L is an electronic newsletter compiled by FAO monthly as a source of information on forests and climate change. The newsletter provides information on developments in UNFCCC negotiations, publications, websites, events and job opportunities and project information. Readers are encouraged to contribute relevant information to be included in CLIM-FO-L For more information, to request a subscription or to request FAO to include news in CLIM-FO, please visit http://www.fao.org/forestry/54538/en or contact CLIM-FO-Owner@fao.org.

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FAO ASIA-PACIFIC FORESTRY CALENDAR

4 October 2009. Kuala Lumpur, Malaysia. ***5th APAFRI General Assembly.*** Contact: Sim Heok Chon, APAFRI, E-mail: simhc@frim.gov.my

5-8 October 2009. Kuala Lumpur Malaysia. ***International Forest Genetic Resources Symposium***. Contact: Oudara Souvannavong, FOMC, FAO Forestry Department, Via della Terme di Caracalla, 00100, Rome, Italy; E-mail: Oudara.Souvannavong@fao.org

5-9 October 2009. Siem Reap, Cambodia. ***FAO Training Workshop on Conflict Management***. Contact: Fred Kafeero, FOEP, FAO Forestry Department, Via della Terme di Caracalla, 00100, Rome, Italy; E-mail: Fred.Kafeero@fao.org

15 October 2009. Hanoi, Vietnam. ***National Workshop on Bioenergy for Rural Development & Poverty***. Contact: Sverre Tvinnereim, Associate Professional Officer, FAO Regional Office for Asia and the Pacific, 39 Phra atit Road, Bangkok 10200, Thailand; Tel.(662) 697-4196; Fax: (662) 697-4445; E-mail: Sverre.Tvinnereim@fao.org

18-23 October 2009. Buenos Aires, Argentina. ***XIII World Forestry Congress***. Contact: Olman Serrano, Associate Secretary General; E-mail: WFC-XIII@fao.org

4-6 November 2009. Bangkok/Chiang Mai, Thailand. ***Sixth Meeting of the APFC Executive Committee & Partners***. Contact: Patrick Durst, Senior Forestry Officer, FAO Regional Office for Asia and the Pacific, 39 Phra atit Road, Bangkok 10200, Thailand; Tel.(662) 697-4139; Fax: (662) 697-4445; E-mail: Patrick.Durst@fao.org

16-20 November 2009. Guilin, China. ***Workshop on Forests for People: the Role of National Forest Programmes and the Non-Legally Binding Instrument on All Types of Forests.*** Contact: Fan Xiaojie , nfp Facilitator for Asia and the Pacific, FAO Regional Office for Asia and the Pacific, 39 Phra Atit Road, Bangkok 10200, Thailand; Tel.(662) 697-4254; Fax: (662) 697-4445; E-mail: Xiaojie.Fan@fao.org

18-20 November 2009. Hiroshima, Japan. ***Sixth Biomass Asia Conference***. Contact: Sverre Tvinnereim, Associate Professional Officer, FAO Regional Office for Asia and the Pacific, 39 Phra Atit Road, Bangkok 10200, Thailand; Tel.(662) 697-4196; Fax: (662) 697-4445; E-mail: Sverre.Tvinnereim@fao.org

23-25 November 2009. Peechi, India. ***International workshop on production and marketing of teakwood: future scenarios***. Contact: S. Appanah, NFP Adviser (Asia-Pacific), FAO Regional Office for Asia and the Pacific, 39 Phra atit Road, Bangkok 10200, Thailand; Tel.(662) 697-4136; Fax: (662) 697-4445; E-mail: Simmathiri.Appanah@fao.org

30 November - 4 December 2009. Kuala Lumpur, Malaysia. ***Asia-Pacific Regional Workshop: Strengthening Law Enforcement and Governance (FLEG) Implementation; Fourth Meeting of ASEAN Knowledge Network on FLEG***. Contact: Patrick Durst, Senior Forestry Officer, FAO Regional Office for Asia and the Pacific, 39 Phra atit Road, Bangkok 10200, Thailand; Tel.(662) 697-4139; Fax: (662) 697-4445; E-mail: Patrick.Durst@fao.org

23-28 August 2010. Seoul, Korea. ***XXIII IUFRO World Congress***. Contact: Secretariat, IUFRO Headquarters, Mariabrunn (BFW), Haupstrasse 7, A-1140, Vienna, Austria; E-mail: office@iufro.org

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FORESTRY PUBLICATIONS: FAO REGIONAL OFFICE FOR ASIA AND THE PACIFIC (RAP)

- Report of the twenty-second session of the Asia-Pacific Forestry Commission (RAP Publication 2008/06)
- Re-inventing forestry agencies. Experiences of institutional restructuring in Asia and the Pacific (RAP Publication 2008/05)
- Forest faces. Hopes and regrets in Philippine forestry (RAP Publication 2008/04
- Reaching consensus. Multi-stakeholder processes in forestry: experiences from the Asia-Pacific region (RAP Publication 2007/31)
- Trees and shrubs of the Maldives (RAP Publication 2007/12)
- Coastal protection in the aftermath of the Indian Ocean tsunami: What role for forests and trees? (RAP Publication 2007/07
- Developing an Asia-Pacific strategy for forest invasive species: The coconut beetle problem – bridging agriculture and forestry (RAP Publication 2007/02
- The role of coastal forests in the mitigation of tsunami impacts (RAP Publication 2007/01)
- Taking stock: Assessing progress in developing and implementing codes of practice for forest harvesting in ASEAN member countries (RAP Publication 2006/10)
- Mangrove guidebook for Southeast Asia (RAP 2006/07)
- Proceedings of the workshop on forests for poverty reduction: changing role for research, development and training institutions (RAP Publication - 2005/19)
- APFC - The unwelcome guests: Proceedings of the Asia-Pacific Forest Invasive Species Conference (RAP Publication 2005/18)
- Helping forests take cover (RAP Publication 2005/13)
- Elephant care manual for mahouts and camp managers (RAP Publication 2005/10)
- Forest certification in China: latest developments and future strategies (RAP Publication 2005/08)
- Waves of hope – report of the regional coordination workshop on rehabilitation of tsunami-affected forest ecosystems: strategies and new directions (RAP Publication 2005/07)
- Forests and floods – drowning in fiction or thriving on facts? (RAP Publication 2005/03)
- In search of excellence: exemplary forest management in Asia and the Pacific (RAP Publication 2005/02)
- What does it take? The role of incentives in forest plantation development in Asia and the Pacific (RAP Publication 2004/27)
- Forests for poverty reduction: opportunities for Clean Development Mechanism, environmental services and biodiversity (RAP Publication 2004/22)
- Forests for poverty reduction: can community forestry make money? (RAP Publication: 2004/04)
- Advancing assisted natural regeneration (ANR) in Asia and the Pacific (RAP Publication 2003/19) - 2nd edition
- Bringing back the forests: policies and practices for degraded lands and forests (RAP Publication 2003/14) out of print
- Practical guidelines for the assessment, monitoring and reporting on national level criteria and indicators for sustainable forest management in dry forests in Asia (RAP Publication: 2003/05)
- Giants on our hands: proceedings of the international workshop on the domesticated Asian elephant (RAP Publication: 2002/30)
- Communities in flames: proceedings of an international conference on community involvement in fire management (RAP Publication: 2002/25)
- Applying reduced impact logging to advance sustainable forest management (RAP Publication: 2002/14)
- Trash or treasure? Logging and mill residues in Asia-Pacific (RAP Publication: 2001/16)
- Regional training strategy: supporting the implementation of the Code of Practice for forest harvesting in Asia-Pacific (RAP Publication: 2001/15)
- Forest out of bounds: impacts and effectiveness of logging bans in natural forests in Asia-Pacific: executive summary (RAP Publication: 2001/10)
- Forest out of bounds: impacts and effectiveness of logging bans in natural forests in Asia-Pacific (RAP Publication: 2001/08)
- Trees commonly cultivated in Southeast Asia: an illustrated field guide - 2nd edition (RAP Publication: 1999/13)

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