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Featuring

FOREST NEWS

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Front cover: A subadult Mishmi Takin (*Budorcas taxicolor*) in Dibang Valley. Photo: Anwaruddin Choudhury

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MAMMALS AND BIRDS IN DIHANG-DIBANG BIOSPHERE RESERVE, ARUNACHAL PRADESH

by Anwaruddin Choudhury

Introduction

Dihang-Dibang [notified as Dehang-Debang] Biosphere Reserve (28°26'-29°21'N, 94°21'-96°31'E) is a poorly-known tract in eastern Arunachal Pradesh, India. It covers 5,111.5 km² (4,095 km² is Core Area; Fig. 1) in West Siang, Upper Siang and Dibang Valley districts. It was notified on 2 September 1998. Physiographically, the area consists of mountainous country, which is part of the Eastern Himalaya up to the Siang or Dihang River and beyond are the Mishmi Hills. The lowest parts are about 500 m asl while the highest parts are over 5,000 m asl. Tropical wet evergreen forests occur mainly in the lower areas in Siang gorge. Tropical semi-evergreen forests occur in the same general area where evergreen forest occurs. Normally such forests are found wherever human interference occurred in an evergreen area. The higher altitudes have subtropical forest with both broadleaf as well as conifers. Farther up the mountains are the temperate forests, both broadleaf and conifer. Alpine vegetation occurs between 4,000 and 5,500 m elevation, above the timber line. These areas remain snow-covered for the greater part of the year and hence, no tall trees can grow.

Some available published works on the mammals and birds relevant to the area include McClelland (1839), Thomas (1914), Choudhury (1986, 1996, 2001, 2007), Chatterjee (1989), Borang (2002) and Ringu (2002). Choudhury (2003) produced the first book on the mammals of Arunachal Pradesh. Regarding the birds, however, the information from both published and unpublished sources was relatively better. The earliest publications were those of Jerdon (1870), and Godwin-Austen (1876). Another earlier reference of significance is Ali & Ripley (1948). It was from 1989 onwards that a

sizeable amount of research work, including birdwatching, was carried out. Starting with Choudhury (1994), the flow of publications with vital data on Siang, Dibang and Lohit basins continued. The noteworthy publications and unpublished reports consulted were Choudhury (2005, 2009), Katti *et al.* (1992), Singh (1994), Kaul *et al.* (1995) and Pawar & Birand (2001). In addition, there were various trip reports as well, some of which may require a thorough review before being referred to in any research report. General information on birds found in Arunachal Pradesh (often referred to as Assam or NEFA) are found in some synoptic works, notably those of BirdLife International (2001) and Hume & Marshall (1879-1881). Islam & Rahmani (2004) listed the 'Important Bird Areas' of the state with detailed site accounts. Like mammals, the first book on the birds of Arunachal Pradesh was also by Choudhury (2006). Field works were carried out in November-December 2002, February 2003 and March 2004. In November-December 2008, a final visit was made to update the earlier field observations (Choudhury 2010).

Results

More than 76 species of mammals and 252 species of birds were recorded during this study. With records by other workers, the numbers are 100 and 312 respectively. The list includes two mammals new to science (Mechuka Giant Flying Squirrel *Petaurista mechukaensis* and Mishmi Giant Flying Squirrel *P. mishmiensis*) and a bird new to India (Blue-and-white Flycatcher *Cyanoptera cyanocephala*). The Eastern Imperial Eagle *Aquila heliaca*, Upland Buzzard *Buteo hemilasius* and Savanna Nightjar *Caprimulgus affinis* are new

state records for Arunachal Pradesh. The Gongshan Muntjac *Muntiacus gongshanensis*, Leaf Muntjac *Muntiacus putaoensis*, and Gaur *Bos gaurus* have been recorded for the first time in or near the reserve. Some other noteworthy species recorded during this study were Red Panda *Ailurus fulgens*, Asian Golden Cat *Catopuma temminckii*, Marbled Cat *Pardofelis marmorata*, Tiger *Panthera tigris*, Snow Leopard *Uncia uncia*, Takin *Budorcas taxicolor*, Red Goral *Naemorhedus baileyi*, Golden Eagle *Aquila chrysaetos*, Tragopans (*Tragopan blythii* and *T. temminckii*), Himalayan Monal *Lophophorus impejanus*, Sclater's Monal *L. sclateri* and Rufous-necked Hornbill *Aceros nipalensis*. For some species such as Red Panda, Takin, Red Goral and Sclater's Monal, the Dihang-Dibang Biosphere Reserve is a stronghold.

Conservation issues and recommendations

Poaching of Black bear for bile and gall bladder, Musk deer for musk pod and otter for the pelt are the most serious conservation issues in and around the reserve. All these items fetch high prices in international trade. While most foreign poachers take the materials directly across the border, the local poachers sell them to middlemen, mostly traders from Rajasthan located at Hayuliang, Tezu, Roing, Along and Pasighat in Arunachal Pradesh and Dibrugarh and Tinsukia in Assam. In addition to these items of international trade, some other items such as meat of Takin are also taken by foreign poachers for their consumption in Tibet. Some gypsies from Gujarat came to Dambuen and killed at least 15 otters in 2005-06.

A large number of mammals and birds are poached by local hunters for meat supplement. There are several types of crude snares used, which are destructive to mammals and birds. Some of the snares used to catch galliformes as observed near Mechuka were alarming. Each is about 40-50 metres in length and these virtually 'fence off' certain areas with 4-5 openings where they put lassos of plastic thread or bamboo snare.

Threats from poaching gangs from across the border were surprisingly more serious than the author thought. While these poachers are known to operate on and off for Tiger, Black bear and

Musk deer, their effect on Takin and galliformes was severe. During interactions with villagers and hunters in several villages of upper Dibang Valley, the author came to know that Tibetan poachers set up camps within Indian territory and kill large numbers of Takins for meat. They dry the meat at their camps and wait for another group to either replace them or take away the dry meat while bringing provisions for the camp inmates. This exercise continues throughout the entire summer months (due to snow fall it is not possible in winter).

Other issues are shifting cultivation, felling of trees, construction of roads and major hydro-electric projects. These dams are going to have seriously adverse impacts on the biosphere reserve as well as on local communities, the reasons being: a) large stretches of forest area will be submerged; b) construction of infrastructure and road networks will further destroy forest habitat; c) more than 50,000 (could be much more if the works progress simultaneously) labourers from outside Aunachal Pradesh will be camping near the sites and will cut trees for their use and also deposit waste in the area; and d) many of these labourers will resort to poaching, mainly snaring by crude traps and illegal felling as has been experienced elsewhere. Dams are required for generation of hydro-electricity as well as overall development; however, in such biodiversity rich areas a careful approach is necessary. A couple of big dams on the major tributaries such as Siyom and several medium to smaller dams on other tributaries in a phased manner could have been a better alternative.

The biosphere reserve should be extended towards the east, west and north. Adequate enforcement of laws, stopping of poaching, review of mega dams, restrictions on arms licenses, building awareness and motivation, and alternatives to shifting cultivation have been recommended. Many people have already started cultivating cardamom. A major problem faced by the villagers is transportation of their produce to the markets. The funding from various government programmes could be of help in providing market linkages.

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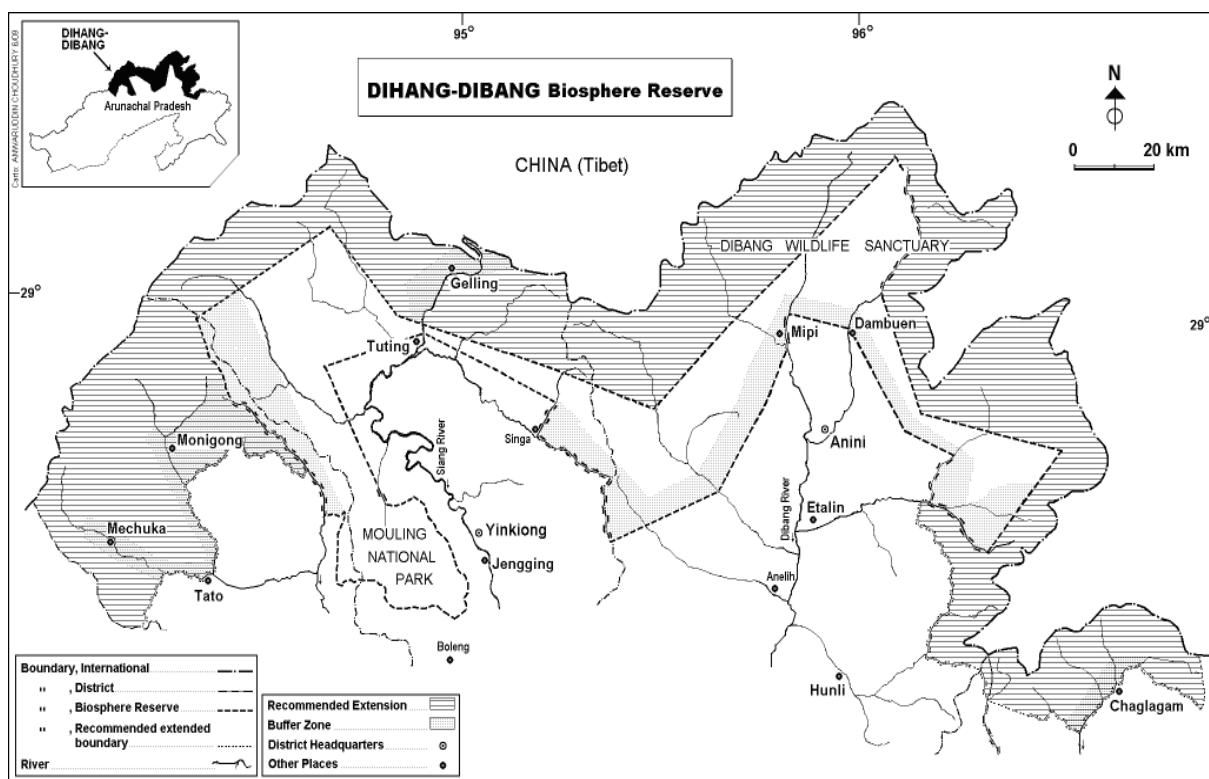


Figure 1. Dihang-Dibang Biosphere Reserve with recommended extensions

TRANSBOUNDARY MOVEMENT OF ELEPHANTS IN EASTERN NEPAL

by N.G. Baidya

Introduction

Asian elephants (*Elephas maximus*) occur in four places in Nepal. The seasonal migrating elephants that move from West Bengal, India to Bahundangi of Jhapa, i.e., the eastern population, numbers 50-70 individuals and there is a resident herd of 10-13 individuals (Elephant Action Plan, 2007); the central population (40-50 individuals) is confined to Parsa Wildlife Reserve and recently has moved outside the reserve; the mid-west population of 70-80 individuals resides in Bardia National Park (Pradhan, 2007), while the far western population of 2-18 elephants are found in the Churia foothills (Velde, 1997).

Elephants from Assam, India, migrate to eastern Nepal, passing through the plains of Darjeeling district of West Bengal, India, in search of food and shelter. Thirty-four percent of the total forest area falls in the protected areas of West Bengal, comprising 15 wildlife sanctuaries, 5 national parks and 2 tiger reserves. Darjeeling Wildlife Division One, Kurseong Forest Division and Mahananda Wildlife Sanctuary lie in the migration route of the elephants (<http://westbengalforest.gov.in>). Kurseong forest divisions are contiguous with the Mechi-River on the eastern border of Nepal with

tropical broad leaf forest where the elephants migrate to Nepal.

Their nodal point of entry is Bahundangi, Jhapa district. During migration these elephants cause much damage to property and life because the migration corridors are fragmented and used for human settlements and agricultural purposes. As a result, elephants are killed, crops damaged and human lives lost.

Study area

The study area is located in the three administrative districts namely Sunsari, Morang and Jhapa between 86° 53' 48" to 88° 11' 33" longitude and 26° 20' 33" to 26° 53' 132" latitude. These three districts cover an area of 4,718 km² (Jhapa: 1,606 km², Morang: 1,855 km² and Sunsari: 1,257 km²) which is 3.20% of the total land coverage (147,181 km²) of the country. These districts used to be a contiguous forest area and a free moving route for wild elephants before malaria was eradicated in the 1960s. Forest has been fragmented time and again whenever there is political instability and the settlement of emigrants from the hilly region and population growth are the main factors accelerating human-elephant conflicts (HEC).

Table 1: Forest cover in 1991 and 2001

District	Forest cover in 1991 (area in ha.)	Forest cover in 2001 (area in ha.)	Change in forest cover (area in ha)	Change %
Sunsari	21659	21365	-294	-0.14
Morang	45718	45184	-534	-0.12
Jhapa	21274	21000	-274	-0.13

Source: DoF, 2005

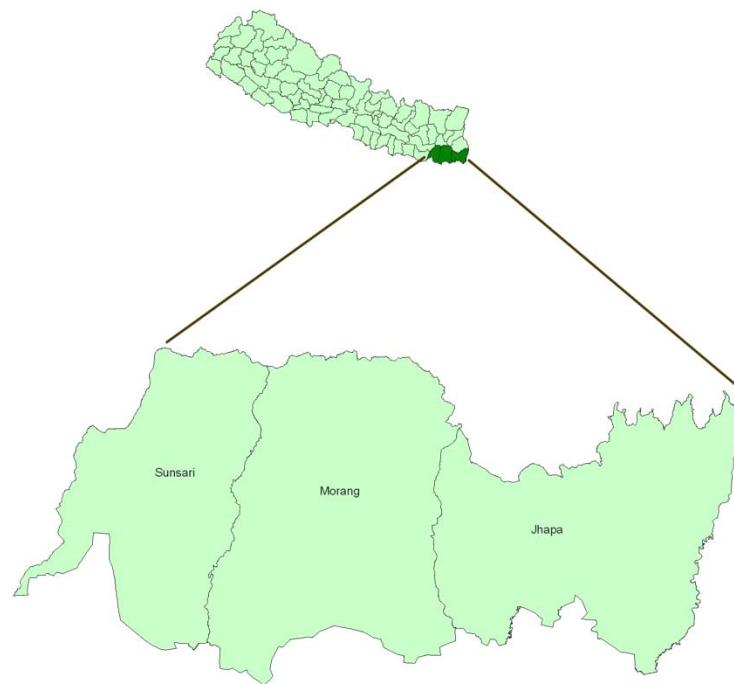


Fig.1: Study area

Jhapa has the least forest cover area amongst all 20 districts of the terai region, which is 12.9% of the total land area, whereas Morang and Sunsari have 24.5% and 18.1% forest cover respectively. In all three districts forests have been decreased and degraded from 1991-2001 (Table 1). According to the locals, deforestation and encroachment of forest area has continued to date, thus, figures mentioned in the table might have changed significantly by now. In 2001, 4,670 ha out of a total 21,000 ha of forest in Jhapa were categorized as degraded forest. Similarly, 6,838 ha and 2,288 ha of forest were categorized as degraded forest in Morang and Sunsari districts respectively.

Present status

Though human-elephant conflicts in this area are quite a new phenomenon, every year 5-10 people and 3-4 elephants lose their lives to the conflict. Now, elephants must use a route fragmented by agricultural land and villages, thus aggravating the conflict. While migrating, elephants are in constant danger and the possibility of crop raiding and damage to life and property of marginalized people is also high.

Human-elephant conflicts in Jhapa district, especially in Bahundangi, were the highest. Agricultural lands were raided by elephants and crops destroyed. It was found that the main crop raiding season is from December to January, as this is the harvest time, and during the monsoon, i.e., June to July. In July 2009, a herd of elephants entered Bahundangi and raided agricultural fields. While chasing away the elephants a few individuals, including two police personnel, were injured and a baby elephant was killed. The dead body of the calf was taken to the District Forest Office, Chandragadi, for a post-mortem. Mitigation measures such as the installation of solar fences and awareness programs conducted in the region lessened the conflict during 2008-2009, but problems still persist.

Although the solar fencing was a buffer to migrating elephants, human-elephant conflicts in the region appear to arise from resident wild elephants. Three wild elephants have been seen in Jhapa and Morang district, while 5 have been observed in Sunsari district.

Most local farmers think that the existing conflicts should be addressed through governmental bodies. In order to draw the attention of policy makers

WCN conducted meetings with the Ministry of Forest and Soil Conservation and its concerned departments regarding a compensation scheme for victims injured by wildlife and for crop damage. A proper mechanism must be developed so that compensation to the victims would lessen the conflict and encourage people towards protection and conservation. The government has endorsed the compensation scheme to provide money to those injured or killed by elephants.

Analysis

For the conservation of elephants in the long run, the identification of migration routes and developing corridors encompassing the elephant migration route is the most important task. Route identification is done by recording GPS points where primary and secondary evidence of human-elephant conflicts and the presence of elephants

are noticed. After collecting enough data in all three districts, point maps were created and overlaid on the district map and Landsat imagery of three districts using ARCVIEW 3.2 and Ilwis 3.2 software gives the exact elephant migrating route. When VDCs with recorded human-elephant conflict incidents were plotted against the migrating route, it gave a clear picture that the conflict is higher in the region where forests are fragmented. The highest number of human-elephant conflicts are in Jhapa district, followed by Sunsari district. Morang district has the least human-elephant conflicts as there is more forest coverage than in the other districts (Table 1) although the coverage is decreasing. It is very crucial to protect the remaining forest, otherwise human-elephant conflicts will be on the rise and will have a negative impact on the conservation of wild elephants in this region.

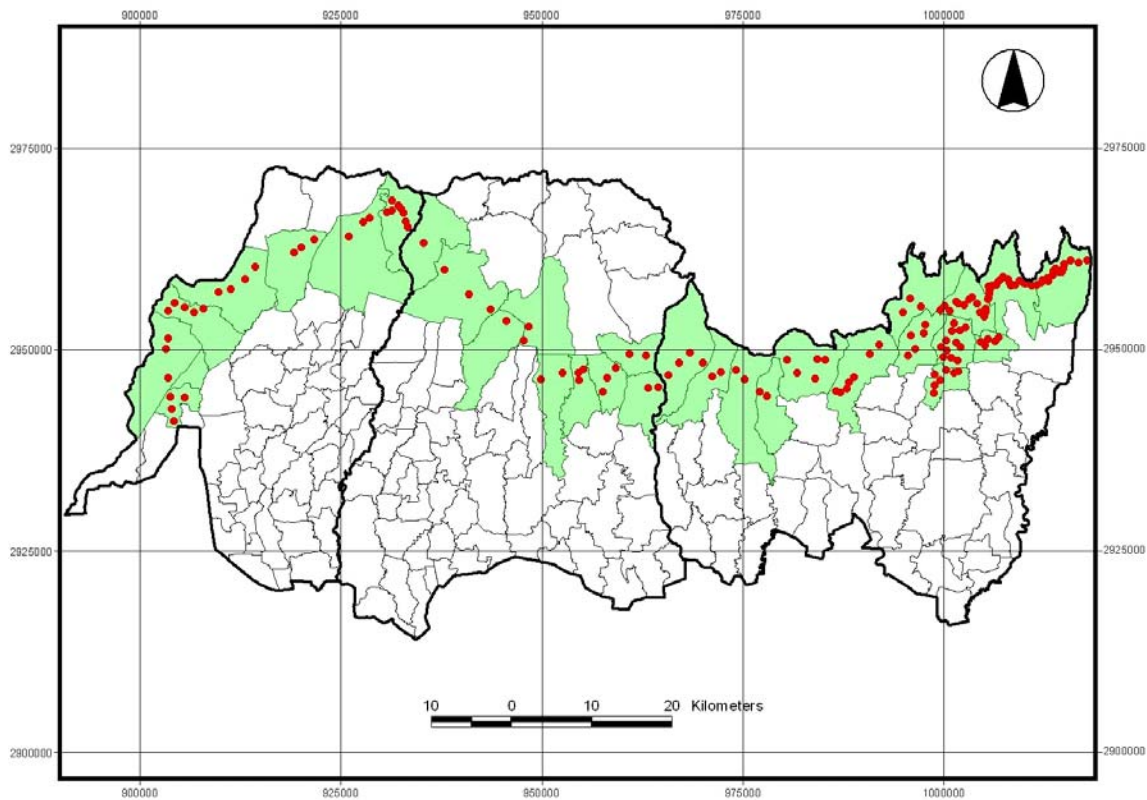


Fig 2: GPS data showing elephant route through 31 VDCs

Awareness in communities to avoid human-elephant conflicts

Over a period of one year, WCN has been successful in conducting different awareness programs at the community level by involving local youths after they were provided with leadership training. During outreach programs to communities and students, documentaries were screened and the participants were involved in various hands-on activities. To reach out to a wide audience from different walks of life and to generate awareness at the policy level for the conservation of wild elephant, public interaction meetings, seminars and workshops were conducted. Waterholes were also constructed in eight locations within the elephant migration route to prevent wild elephants in the forest from coming out in search of water during the drought season. A story writing competition was also conducted in which more than 500 students participated. The winning story was published in the form of a story book in partnership with INGO Room and will be distributed to more than 150,000 students in the country. This story has been able to showcase the perception of locals that live at the front line with human-elephant conflicts.

Final output and recommendation

This study shows that Bahundangi, Jhapa is the main entry point of the migrating elephant herds. It was found that wild herds enter through a village in Bahundangi to reach the nearby forest (Telpani CF) north-west to Bahundangi. Most of the herds were checked at this point by locals using crackers, fires and drums, thus the highest number of human-elephant conflicts have been recorded in Jhapa compared to the rest of the districts. This is the crucial time during which loss of life and property occurs. Only some solitary male elephants cross this VDC and move towards other districts. In Sunsari district human-elephant conflicts are highest in Prakashpur VDC and Kushaha VDC as Koshi Tappu Wildlife Reserve is situated in this VDC and is home to five female domestic elephants. These elephants are used for patrolling the reserve by game scouts and enforcement officers. They are also used to carry tourists and conservationists. Wild male elephants from Ramdhuni Community forest come to Kushaha

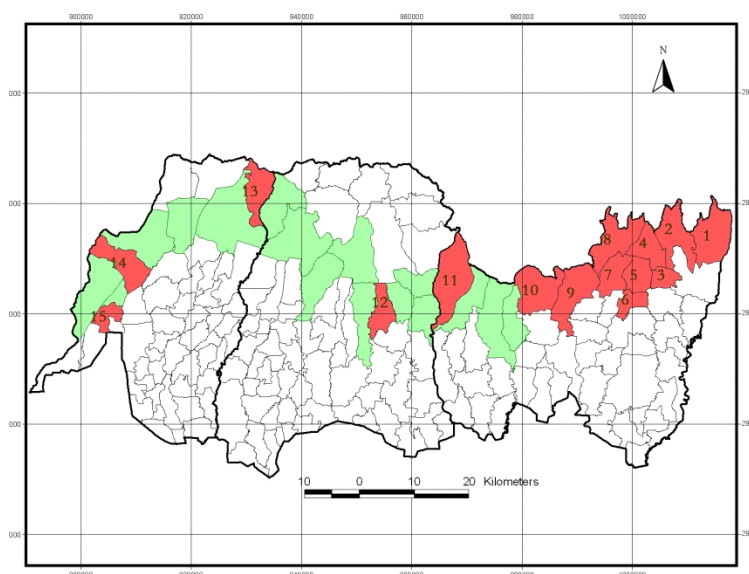
hattisar to mate with the domestic females. Morang district faces the least amount of human-elephant conflict in the region.

Thirty-one VDCs fall under the migratory route of the elephants and 15 VDCs have been identified with high rates of human-elephant conflicts (Fig 3). The elephant population in eastern Nepal is under intense pressure for survival because the habitat has shrunk. Deforestation and rampant encroachment are major causes of human-elephant conflicts. Elephant habitat fragmentation and crop depredations along with human and elephant deaths due to the conflict has resulted in an antagonistic view by communities towards elephant.

Such a detailed study has not been previously carried out in eastern Nepal.

An elephant corridor should be developed encompassing the elephant route and different programs promoting co-existence should be launched in the region in order to conserve wild elephants in eastern Nepal.

The human-elephant conflicts have grabbed the attention of GOs and NGOs in the region. The Government has allocated budgets for different measures to mitigate the conflict, but unfortunately without vision and proper study. The budget is mostly spent on the construction of roads and other infrastructure and the installation of solar fences which attract more people from other regions to the area, which in fact results in further habitat fragmentation and higher human-elephant conflicts. Solar fences have been installed in the region without proper study. The solar fence installed on the bank of Mechi River actually blocked the traditional migrating route of elephants. Such fences should be designed to protect villages rather than blocking the migration route of the elephants.

**VDCs with recorded HEC**

- 1 Bahundangi VDC, Jhapa
- 2 Shantinagar VDC, Jhapa
- 3 Dhajjan VDC, Jhapa
- 4 Budhabare VDC, Jhapa
- 5 Sanischare VDC, Jhapa
- 6 Anarmani VDC, Jhapa
- 7 Arjundhara VDC, Jhapa
- 8 Khudunabari VDC, Jhapa
- 9 Surunga VDC, Jhapa
- 10 Satashidham VDC, Jhapa
- 11 Damak Municipality, Jhapa
- 12 Sanischare VDC, Morang
- 13 Panchkanya VDC, Sunsari
- 14 Prakashpur VDC, Sunsari
- 15 Kushaha VDC, Sunsari

Fig 3 : VDCs that lies in elephant migrating routes and with recorded HEC

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INVENTORY OF WETLAND FAUNA AND SUSTAINABLE RESOURCE UTILIZATION OF BAHRAIYA LAKE, BARDIYA, MID-WESTERN NEPAL: ISSUES AND FUTURE PROSPECTS

by Prem Bahadur Budha

Introduction

The term 'wetland' is defined differently by different people. There are about 50 definitions of wetlands in the world in current usage (Dugan 1990). Wetlands are areas where a water table is at, near, or just above the surface and where soils are water-saturated for a sufficient length of time. National Wetlands Policy (2003) of Nepal defines wetland as follows:

"Wetlands denote perennial water bodies that originate from underground sources of water or rains. It means swampy areas with flowing or stagnant fresh or salt water that are natural or man-made, or permanent or temporary. Wetlands also mean marshy lands, riverine floodplains, lakes, ponds, water storage areas and agricultural lands".

Altogether, 163 wetlands have been reported from the Tarai region of Nepal. Wetlands in the Tarai are represented by lakes and ponds (48%), followed by riverine floodplain (33%) and reservoirs and swamps (3%) (Bhandari, 1998). The Far-western Development Region (FWDR) is the richest area for maintaining wetlands (38%), followed by the Central Development Region (CDR) (23%) and the Western Development Region (WDR) (21%). The Mid-Western Development Region (MWDR) comprises 7% of the Tarai wetlands of Nepal. Almost two-thirds of the wetlands of MWDR are located in Bardia district. Wetlands in Bardia comprise three lakes (Bahraiya-105 ha, Tara tal-3 ha and Bhagaraiya tal-12 ha); four river floodplains (Karnali-15,625 ha, Babai-12,812 ha, Aurahi-2,188 ha and Kaurahi-375 ha); and one Ghol (Bathuwa-25 ha).

Bahraiya tal is a monsoon flood-fed and highly exploited lake of Bardia district. The lake has been

utilized for irrigation, fishing and extraction of wetland resources by local people. In the 1980s, Bardia District in Panchayat officially handed over the lake to local contractors for fish farming. The entire lake area and associated khetland was converted into a commercial fish production region of the district. However, the contract system was stopped during the insurgency period and the lake remained under control of the local Maoist leader for about three years (from 2003-2005). Overexploitation and encroachment of the lake area reached a climax afterwards and conservation issues were also raised simultaneously about the wetland habitat, biodiversity conservation and sustainable utilization. United Youth Community (UNYC), a local NGO, initiated sustainable conservation of this wetland with financial aid from the Global Environment Fund (GEF) in coordination with the Bardia District Development Committee (DDC), government line agencies and surrounding Village Development Committees (VDC). But the conservation plan was not fully implemented and remained unsuccessful due to the bad decision of the Bardia DDC to hand over the lake to local fish contractors to exploit it. The lake is in a strategic geographic location for providing habitat to globally significant migratory bird species in the Mid Western and Far Western Development Regions of the lowland Tarai of Nepal.

Wetlands are very important areas for biodiversity, but detailed surveys of the flora and fauna of many Nepalese wetlands of global significance are lacking and updated information for monitoring wetland biodiversity and sustainable management is urgently needed. The present work attempts to document the wetland fauna of Bahraiya lake and its surrounding environment to fill the information gaps as well as disseminate current issues and future perspectives for its conservation and sustainable utilization.

Materials and methods

Study area

Bahraiya is the largest lake in Bardia district. It lies in Sorhawa VDC (Ward Nos. 1 and 2) and Mainapokhar VDC (Ward No. 3). The exact area of the lake varies in different reports, ranging from 100-105 ha, but the lake area has not yet been delineated and verified by the District Survey Department, Bardia and a large area has been encroached on.

Data collection

A literature review about Nepal's wetlands was carried out. Secondary information from different sources in published journals, books, and articles, government and non-government reports were examined.

Field observations were carried out to observe the wetland fauna of the lake in October 2007. During the field survey the lake area was visited at night to find reptiles and amphibians. Vernacular names of herpetofauna were noted in the field and verified from literatures (Shah 1998; Shah and Tiwari, 2004). Birds were observed with binoculars early in the morning and at other times during the day and identified using Grimmet *et al.* (2000). Fishes were sampled with the help of local fishermen by using drag nets. All caught fishes were photographed and identified using Shrestha (1994). Many species of fishes remained unidentified which were not collected during the sampling periods. However, their names were included in

the Tharu language. Freshwater molluscs were collected, photographed and identified in Kathmandu using Subba Rao (1989) and Nesemann *et al.* (2007).

Local fishermen, women and knowledgeable persons of Bahraiya village were interviewed. A structured questionnaire was used to discuss fauna diversity. Local leaders of Bardia, the District Development Committee (DDC) personnel and officers of other line agencies were also interviewed.

Results

Bahraiya lake is rich in wetland fauna. During the field inventory seven species of molluscs, 35 species of fishes (20 species were sampled and 15 other species were reported by local Tharu fishermen to be present), 13 species of herpetofauna (4 species of frogs, 1 toad, 3 snakes, 2 lizards, 1 skink, 1 turtle and 1 species of crocodile) and 40 species of birds were reported from the lake. Some of the mammals such as jackal and wild cat were said to visit the lake occasionally during the monsoon period.

Molluscs

Altogether 8 species of freshwater snails and mussels were identified from the lake, i.e., *Pila globosa*, *Bellamya bengalensis*, *Indoplanorbis exustus*, *Melanoides tuberculatus*, *Lymnaea acuminata*, *Gyraulus* sp., *Segmentina* sp. and *Lamellidens marginalis* (Table 1 and Figure 1).

Table 1. Freshwater mollusc species of Bahraiya Lake, Bardia

Tharu name	Scientific name	Abundance
Ghonghi	<i>Bellamya bengalensis</i>	High
Lamba ghongi	<i>Melanoides tuberculatus</i>	Rare
Sippi	<i>Lamellidens marginalis</i>	Low
Ghongha	<i>Pila globosa</i>	Medium
Chaparka ghonghi	<i>Indoplanorbis exustus</i>	Medium
Chhotki Chaparka ghonghi	<i>Gyraulus</i> sp.	Medium
Chaparka ghonghi	<i>Segmentina</i> sp.	Low
Ghonghi	<i>Lymnaea acuminata</i>	Rare

Note: Abundance was measured on the basis of numbers collected within the study period.

High- More than 20 specimens, Medium- 10 to 20 specimens, Low- 5 to 9 specimens,

Rare- Less than 5 specimens.

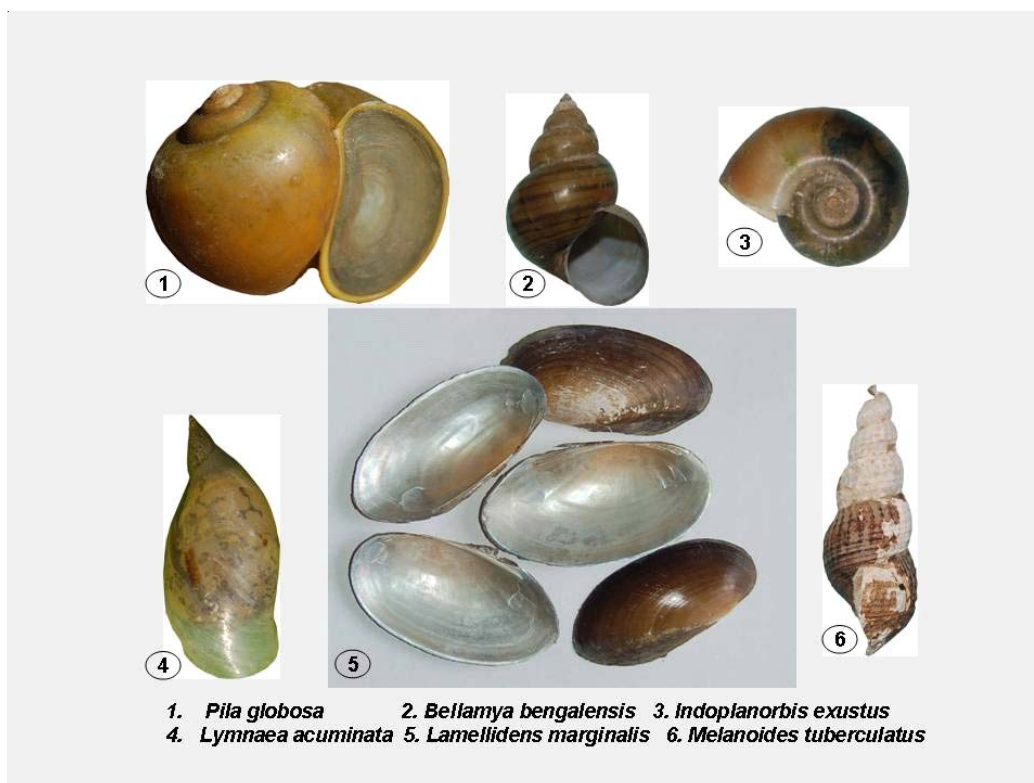


Figure 1. Freshwater Molluscs of Bahraiya lake

Table 2. Fish diversity of Bahraiya lake

Zoological name	Nepali name/ Tharu name	Remarks
1. <i>Amphipnous cuchia</i>	Bam/Andhara	Uncommon
2. <i>Barilius</i> sp.	Fageta/ Namsehara	Common
3. <i>Botia lohachatta</i>	Baghe/ Baghuwa	Rare
4. <i>Chanda nama</i>	Nata channa/ Chandrabijua	Common
5. <i>Channa punctatus</i>	Bhote, Garai/ Charangi	Common
6. <i>Chela labuca</i>	Deduwa/ Diruwa	Common
7. <i>Clarias batrachus</i>	Mungri/ Mangura	Local and introduced
8. <i>Ctenopharyngdon idella</i>	Silver carp	Introduced
9. <i>Cyprinus carpio</i>	Common carp	Introduced
10. <i>Heteropneustes fossilis</i>	Singhi/ Singhiya	Rare
11. <i>Hypothalmichthys molitrix</i>	Grass carp	Introduced
12. <i>Labeo rohita</i>	Rohu/ Rohu	Common
13. <i>Macrogathus aculeatus</i>	Gainchi/ Bamli	Common
14. <i>Mystus cavasius</i>	Tengra, Junge/ Tangna	Common
15. <i>Mystus seenghala</i>	Kanti/ Prayash	Rare
16. <i>Mystus tengara</i>	Tengri/ Tangana	Common
17. <i>Ompok</i> sp.	Pabhta/ Ghuktaharia	Rare
18. <i>Puntius chola</i>	Pothi/Sidhara	Common
19. <i>Wallago attu</i>	Bohari/ Padhni	Uncommon
20. Unidentified	/ Bolna	Rare

Source: Field survey October, 2007.

The diversity and abundance of freshwater molluscs in the lake was comparatively low. A single individual of *Lymnaea acuminata* was collected during the study. Similarly, only shells of *Melanoides tuberculata* and *Lamellidens marginalis* were collected.

Fishes

A group discussion with local fishermen and women who are generally involved in traditional

fishing provided the list of thirty-five fish species names in the Tharu language. Altogether 20 species of local and introduced fishes were sampled from the lake during the field survey. This number indicates that Bahraiya Lake probably has the highest number of fish species among the natural lakes in Nepal. The sampled fish fauna are given in Table 2 and Figure 2.

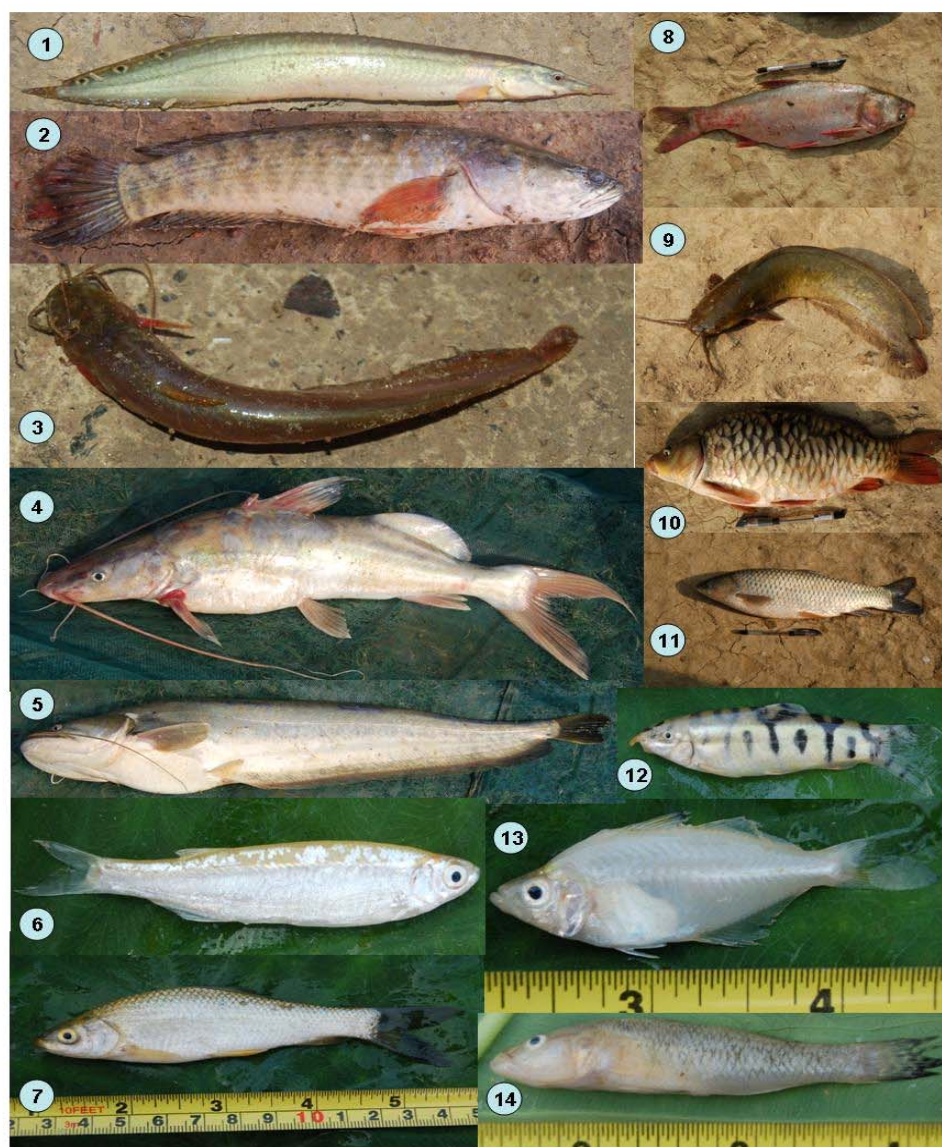


Figure 2. Fishes of Bahraiya Lake, Bardia

1. *Macrognathus aculeatus* 2. *Channa punctatus* 3. *Heteropneustes fossilis*
 4. *Mystus seenghala* 5. *Wallago attu* 6. *Barilius* sp. 7. *Labeo* sp.
 8. *Ctenopharyngodon idella* 9. *Clarias batrachus* 10. *Cyprinus carpio*
 11. *Labeo rohita* 12. *Botia lohachatta* 13. *Chanda nama* 14. Unidentified sp.

The above list represents only the sampled fish species found during the survey period. Other fishes identified by local fishermen in their local Tharu language were Bhansariya, Bichhula, Pattharchatti, Mailuwa, Suity, Gheuri, Chitaina, Keuncha, Kursa, Sauri, Kauwa, Bistengra, Moi, Ghorachhuwa, Rawa, and Sujaha.

Herpetofauna (Reptiles and Amphibians)

Thirteen species of reptiles and amphibians were reported from the lake area including the threatened Golden monitor lizard *Varanus*

flaviscens. The present survey identified three species of snakes (*Xenochrophis piscator*, *Bungarus caeruleus*, *Ptyas mucosa*), one species of skink (*Mabuya carinata*), one common garden lizard (*Calotes versicolor*), one turtle (*Lissemys punctata*), four species of frogs (*Hoplobatrachus crassus*, *H. tigerinus*, *Euphlyctis cyanophlyctis*, *Euphlyctis* sp.) and one species of toad (*Bufo melanostictus*) (Figure 3). One individual of Marsh mugger (*Crocodylus palustris*) was reported a few years back in the associated fish pond which was said to have been accidentally flooded from the Babai river.



Figure 3. Herpetofauna of Bahraiya Tal

1. *Xenochrophis piscator* 2. *Hoplobatrachus crassus* 3. *Euphlyctis* sp.
4. *Euphlyctis cyanophlyctis* 5. *Lissemys punctata* 6. *Mabuya carinata*

Birds

The Bahraiya is an important lake for many migratory bird species of global importance. Winter migratory birds such as Cotton pygmy goose (*Nettapus coromandelianus*), Lesser whistling duck (*Dendrocygna javanica*), Eurasian spoonbill (*Platelea leucorodia*), Ruddy shelduck (*Tadorna ferruginea*), Eurasian wigeon (*Anas Penelope*), Northern pintail (*Anas acuta*), Northern shoveler (*Anas clypeata*), Common snipe (*Gallinago gallinago*), Pintail snipe (*G. stenura*), Common redshank (*Tringa tetanus*), Marsh sandpiper (*T. stagnatilis*), Wood sandpiper (*T. glareola*) and Common coot (*Fulica atra*) were reported from the lake. Similarly, Sarus crane (*Grus antigone*), a species protected by the government, was also reported from the lake. Forty bird species were observed during the survey period, which could possibly increase by 4-5 fold using proper survey techniques during the peak migration periods in the summer and winter seasons.

Freshwater biodiversity conservation issues

Bahraiya lake is an important source of irrigation during the dry season. In addition, water from the lake is also used to fill the private fish ponds located around Bahraiya tal. Presently, the lake has been exploited for commercial fish farming by contractors. Local people use the barren land for livestock grazing. During the dry season the water level drops and grasses grow above the water level, which is suitable for grazing cattle. Cattle also use the lake water for drinking and bathing. The peripheral area includes abundant *I. fistulosa*, which is collected by the local people for fuelwood and other household purposes such as for fencing vegetable gardens, roofs for houses, etc.

Existing problems

Disturbance to birds

Fishing, grazing and peripheral farming practices around the lake are major disturbances to migratory and residential bird species. Commercial fish farming in the lake has disturbed the entire natural ecosystem of the lake. Due to open fields and the lack of large trees around the lake, most of the visitor birds cannot stay freely in the lake. Many

large flocks of wetland bird species were observed above the lake and trying to land near the lake for a long time, but unable to land easily due to human activities. Attempts to kill birds by children or other people were also observed in the lake area.

Use of fertilizer and pesticides

Fertilizers and pesticides commonly used in the surrounding agricultural land are ultimately flushed into the lake. These activities are responsible for changes in the water chemistry of the lake, which has negative impacts on the aquatic fauna.

Encroachment of the lake area

Encroachment on the lake has been very high in Bahraiya wetland and still continues. Many private fish ponds have been constructed on the western and northern sides of the lake. As the water level decreases the rate of use of barren land has proportionately increased. Thus, the demarcation of the entire lake area for proper management is urgently needed.

Introduced fish species

The introduction of improved varieties of the fish for commercial purposes has reduced the number of local fish species. The local people reported about 35 species of local fishes believed to be present in the lake, but nearly half of the species were not sampled during the present survey.

Soil erosion

Heavy monsoon rains and flooding are responsible for erosion from the surrounding embankment and siltation respectively. The lake is situated in the flat land and has not experienced much problem with sedimentation like other natural lakes in Nepal, but the monsoon floods carry soil, sand and other debris from surrounding hills and fill the lake each year during flooding season. The inlets and outlets are not properly constructed. Direct inflow of water from the irrigation canal of Babai river and floods during the monsoon feed into the lake, depositing debris in the lake during the flood season. Widening of the outlet canal was observed in the northern side due to soil erosion by the water current. The outlet joins the Mankhola river, which is gradually

approaching the lake by cutting along the lake outlet. This is one of the big future threats to draining the entire lake.

Future perspectives

Delineation of the lake area

Due to regular encroachment of the lake area, the lake size has been shrinking and its area is not exactly known. Various data were found about the lake area in different reports. Therefore, the first prerequisite is to delineate the area for further conservation management and public participation to restore the entire lake. All illegal private fish ponds need to be merged within the lake and private land associated with the lake also needs to be managed by providing compensation to the owner or by purchasing such land.

Management of water level

Preventing overflow in the rainy season and keeping the lake from drying up in the dry season are management priorities for Bahraiya lake. A certain water level needs to be maintained in all seasons. The direct water inflow from the Babai irrigation canal from the north-west corner of the lake needs to be blocked. It is recommended to feed the lake from the south where the newly planned Babai irrigation canal will pass through. Since the Babai irrigation project has extended its irrigation project in the area, the lake water will not be needed as in the past. Thus, the water level of the lake can be maintained in all seasons.

Habitat restoration for birds

Bahraiya village is located at the southern part of the lake and there is not much area left to be managed due to associated private lands. Most of the encroached part of the lake area is located in the east, west and north. Much of barren land is from north-east to north-west, which needs to be delineated for plantation. This area is the most suitable for resting migratory birds and other aquatic biodiversity, i.e., fish, molluscs (mussels and snails), birds and aquatic plants. The marginal area of these sites contains the *I. fistulosa* plant where many aquatic birds live. Local varieties of plants are recommended for the restoration of the wetland

habitat. The list of recommended plants for the restoration of bird habitats and economic benefit for the local people includes:

- **Economically important plants:** Bamboo *Bambusa* spp., Munj *Saccharum munja*, Bet *Calamus acanthospathus*, Babiyo or Bankas *Eulaliopsis binata*, Kush *Desmostachya bipinnata*, Kurilo *Asparagus racemosus* and Sarpagandha *Raulvolfia serpentina*.
- **Religious plants:** Bar *Ficus bengalensis* and Pipal *Ficus religiosa*.
- **Fruits:** Mango *Magnifera indica*, Barro *Terminalia bellirica* and Bayar *Zizyphus mauritiana*.
- **Other plants beneficial for birds:** Simal *Bombax ceiba*, Kusum *Carthamus tinctorius*, Jamun *Syzygium cumini*, Gular or Dumri *Ficus racemosa* and Timilo *Ficus auriculata*.
- **Fencing plants:** Mehandi *Lawsonia inermis*, etc. These are recommended to be planted parallel to the road above the water level.

Locating seed bank areas for fish and molluscs

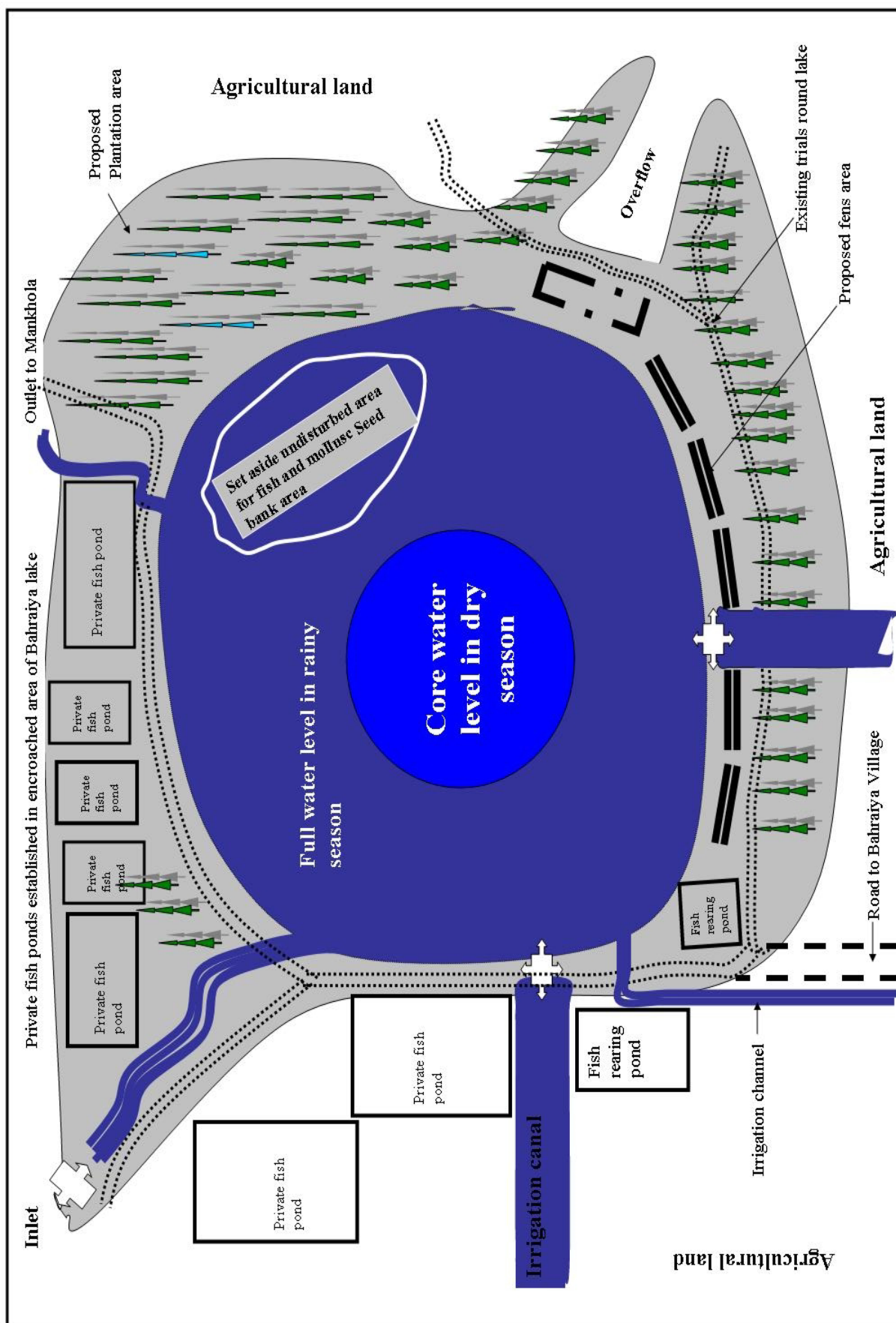
Freshwater molluscs are the most threatened aquatic animals and populations are declining due to the destruction of aquatic habitats, use of fertilizers and pesticides, fish poisoning and encroachment of wetlands. Freshwater mussels and fishes have a close relationship for their survival. Freshwater mussels usually need local fishes to develop their larval stages. Mussels need host fishes in the lake in order to survive. Thus, to establish local populations of fishes and mussels, a special conservation area is recommended for a mollusc conservation zone in the lake. No human disturbances would be allowed in the conservation zone, including fishing, harvesting aquatic plants and livestock bathing. This area will be important for not only the conservation of molluscs, but it will be an example in conservation and restoration of wetland biodiversity and to attract tourists.

Establish community management practices

The commercial farming practices in the lake do not promote wetland biodiversity conservation. But the Bardia District Development Committee has issued licenses to local contractors for commercial fish farming in the lake. This activity is causing deterioration of the lake and affecting migratory

(continued on p.17)

(continued from p.16)



birds. Without the active participation of the local people it is almost impossible to manage wetlands for sustainable use and wetland biodiversity conservation.

Prevention of invasive water plants

Jalakumbhi *Eichornia crassipes* is a serious invasive aquatic plant species which has not yet been introduced in Bahraiya lake, but has been observed in many parts of Bardia, Banke and Kailali districts. There is a high probability that it will arrive in the lake soon unless preventive measures are taken.

Discussion

The wetland fauna of Bahraiya Lake is poorly investigated. The only existing faunal inventory of the lake exists in BPP (1995) and Bhandari (1998). According to the BPP report the lake is said to support 3 mammalian species (Common otter *Lutra lutra*, Spotted deer *Axis axis* and Sambar deer *Cervus unicolor*), 23 species of birds, 8 species of herpetofauna and 7 species of fish. Bhandari (1998) reported one mammalian species (Smooth otter *Lutrogale perspicillata*), 26 species of birds, 4 species of fishes, and one Softshell turtle (*Aspiderter gangeticus*). The present study did not find any evidence of the presence of wild ungulates in the lake and its surrounding habitats. Because the lake area is surrounded by villages there is not suitable habitat for wild ungulates, even several kilometers from the lake. However, jackals and wild cats are said to occasionally visit the lake area during the rainy season. Similarly, earlier documents reported the presence of small populations of two otter species – *L. lutra* (BPP, 1995) and *L. perspicillata* (Bhandari 1998). There might be some accidental chances of their visiting the lake during the flood season, but neither of these two species could stay there for any length of time due to the high disturbance in the lake and the presence of two otter species in the lake is doubtful. The present study reported one species of North Indian Flapshell Turtle *Lissemys punctata*; the identification of *Aspiderter gangeticus* by Bhandari is doubtful because this species is found in the running water of deep rivers (Shah and Tiwari, 2004).

The present study tried to include a comprehensive inventory of aquatic fauna of the lake, including freshwater molluscs, fish, herpetofauna and birds. However, aquatic insects and other arthropods were outside the scope of the study. Seven species of freshwater molluscs, 35 species of fishes, 13 species of herpetofauna and 40 species of birds were reported. This is the highest fish species diversity in any lake in the Tarai region after Jagdishpur reservoir (39 species) (http://www.ramsar.org/pdf/danone_ecoles_nepal_commrpt.pdf). Likewise, the number of expected bird species in the lake might be 4-5 fold higher than found in the present study, which was limited in time.

Sedimentation, habitat loss, discharge of industrial and agricultural runoff, unsustainable harvesting of resources, alteration of species composition due to heavy grazing and colonization of alien invasive plant species are some of the reported threats to Nepalese wetlands (Siwakoti and Karki, 2009). These activities are causing even higher threats to lakes which are not included in the Ramsar list. There is an urgent need for proper documentation of wetland biodiversity, including vertebrate and invertebrate fauna, and the participation of local people in biodiversity conservation and sustainable resource utilization. The present study proves that the lake holds rich aquatic fauna and is a key spot for wetland biodiversity conservation in Nepal. A considerable number of fish species (20) were sampled even after the complete drying up of the lake in the previous season. Thus, the lake not only contains a fish stock of river and streams of Bardia district, but also supports molluscs, an important diet of internationally important migratory bird species. A low mollusc diversity in the lake was attributed to disturbance in the wetland ecosystem due to unsustainable fish harvesting. Freshwater mussels are dependent on native fish fauna to complete their life cycle from larval stage to glochidia to adult. The larvae must attach parasitically to a fish host and obtain nutrition from the fish blood, which enables it to transform into a juvenile mussel (Neves, 1991). Once metamorphosis has occurred, juvenile mussels drop from the host fish and begin the benthic phase of life in the substrate. Reproductive maturity is reached in three to five years. The mussel-host fish relationship is species-specific, with a particular

species of mussel only able to develop on certain species of fish. Anthropogenic influence is another key factor for the juvenile survival. They are susceptible to water contamination. Wetland ecosystem disturbances reduce the habitat quality for globally significant migratory bird species because molluscs supply one of the major diets for many wetland bird species.

The present study proposes to develop a key zone for freshwater mollusc and fish conservation to restore the natural wetland ecosystem and establish a model for wetland biodiversity conservation in Nepal. The proposed wetland biodiversity conservation plan is given in Figure 4. The most difficult part of this conservation plan would be proper implementation. The Bardia District Development Committee has commercialized the lake by giving licenses to fish contractors who have introduced exotic fish species and exploit the lake to grow them. Although local NGOs and local communities are in favour of wetland management, the full support of local governance to poor beneficiaries is still required. Political will seems to be the primary need to solve the conservation problem of Baharaiya lake. At the present moment, the lake is under the hold of fish contractors and the actual poor beneficiaries are left out of participatory wetland management practices and do not share benefits from the lake income. But community participation is required for the future conservation program and sustainable management practices. The benefits from the lake need to be given to the local people to educate the surrounding poor communities and save the Tharu culture. Conservation and monitoring committees need to be established for the long term conservation efforts. At the local level biodiversity monitoring youth groups will be very effective in monitoring biodiversity of the lake.

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THE ECO-POLITICAL PERSPECTIVE: TIGER CONSERVATION IN BANGLADESH AS CASE STUDY

by Mohammed A. Ashraf

Wild tigers are the largest terrestrial carnivores in the felid guild and are facing extinction due to various anthropogenic impacts in the tropical belt. This obligate mega-fauna remains endangered despite the large-scale global conservation efforts for the past several decades to revive its dwindling populations, which are scattered across 10-11 countries in South and South-East Asia and Russia's Amur region. Tigers now live in an increasingly human-dominated heterogeneous landscape mosaic that has become fragmented or too small to support viable breeding populations for long-term survival. The exception appears to occur in the case of the Sundarbans mangrove ecosystem, which is the last stronghold for the wild tiger subspecies *Panthera tigris tigris*, commonly known as Bengal tiger in Bangladesh. This is a unique, relatively unfragmented ecosystem and has significant socio-economical and ecological values, thus receiving considerable conservation attention from government and nongovernmental organizations (NGOs) for the past few decades. This paper primarily focuses

on the political dimension surrounding tiger conservation in the Sundarbans and its long-term implications on society, culture, sustainability and the biodiversity of Bangladesh.

Tigers evolved from the genus *Panthera* approximately two million years ago during the Cenozoic era and were widely distributed in China and Southeast Asia. They then expanded their range northwards into Russia, Japan and Korea, and south and westwards into the Indian subcontinent and Caspian regions about one million years ago. Tigers branched off as a distinct species under the *Panthera* genus long before lion *Panthera leo*, leopard *Panthera pardus*, and jaguar *Panthera onca*. Tiger is essentially an Asian species and the fossil evidence suggests that it has never been found on any other continents, primarily due to the geo-climatic factors that shaped its ecological niche, along with its obligate mode of adaptation which is primarily based on preying on large ungulate mammals from tropical and sub-tropical monsoonal forests and

riparian grassland ecosystems in South Asia. Empirical evidence suggests that in the 19th century there were over 100,000 tigers living in Asia, but by the turn of the mid 20th century, tiger numbers had astronomically plummeted to less than 10,000 across its range nations – due to the large scale British colonial hunting regime administered fashionably and ruthlessly to systematically kill tigers and other charismatic species in the Indian subcontinent. Current estimations suggest that there are less than 4,000 extant subspecies of wild tigers living in scattered pockets of forested areas across its range nations and facing stochastic and deterministic threats in disproportionate level. Wild tiger numbers are now twenty-five times less than its historical population size and, more importantly, the population now lives under a chronic human-induced disturbance gradient in landscapes that are too small to support long-term breeding population sizes and are becoming too fragmented for potential breeding females to disperse. Long term conservation initiatives at the national level must focus on politically justifiable policy formulations that embrace the science of conservation biology and integrate the national scholars in the development of a biodiversity conservation framework. In the context of Bangladesh, this politically challenging modern conservation paradigm is much needed to help preserve the tiger ecosystem of the Sundarbans.

Sundarbans biodiversity conservation approaches and action frameworks have long-standing reputations for sustainable resource management and so far the Bangladesh government has undertaken a number of projects to ensure the ecological, social and economical sustainability of the Sundarbans. However, there are eco-political components associated with the tigers of the Sundarbans that are not adequately addressed both from ecological and socio-economical standpoints, despite the fact that tigers are now recognized as a keystone-umbrella species under which all other diversity of life forms and the evolutionary processes can have a fair chance for sustainable functionality over the long term. In other words, tigers of the Sundarbans act as an ecological litmus paper – also known as indicator species – to help detect any changes of the ecosystem. This concept is vitally important in the context of conservation priority settings under the broader eco-political

rubric surrounding Sundarbans and tigers of Bangladesh. Resource and land managers often need prompt and clear-cut management prescriptions based on the solid science of wildlife and conservation biology. The complexity of the matter and the funding crisis often pose significant challenges, hence the delay for the conservation biologists to provide quick and straightforward answers pertaining to species or ecosystem management frameworks to policy makers and natural resource managers. Therefore, one of the fundamental conservation components now focuses on establishing keystone species or the biome concept in order to make a scientifically justifiable, but relatively short-cut, approach for prioritizing available resources that are at resource managers' disposal under the prevailing socio-political and bureaucratic setbacks which are particularly pronounced in highly populated developing nations as such Bangladesh. The last decade of the 20th century witnessed some significant advancements in wildlife science with the remarkable shift of the conservation paradigm from a putative subspecies classification-based approach to an eco-regional-based conservation (ERBC) portfolio, which has now become the standard framework for conservation management of wild tigers across its range nations. The 20th century also witnessed the international recognition of the Sundarbans as one of the most important biodiversity hotspots on earth. It is a Ramsar site (Convention on International Wetlands for Waterfowl and Migratory Birds) cited for its global importance as a potential breeding site for waterfowl and migratory avifauna. In 1997, UNESCO (United Nations Education, Social and Cultural Organization) declared a portion (approximately 25%) of the Sundarbans ecosystem as a World Heritage Site, and most importantly, the World Wild Fund for Nature (WWF) and the Wildlife Conservation Society (WCS), USA – two of the world's most influential and prestigious conservation research organizations – scientifically delineated the Sundarbans as a global priority Tiger Conservation Landscape (TCL), which holds a high probability for the long-term survival of free-ranging Bengal tigers.

These international recognitions have serious underpinnings in the eco-political framework

relating to the tiger conservation approach in the Bangladesh Sundarbans. At present, the incorporation of science-based tiger conservation action programs and the all-out integration of national scholars are dishearteningly conservative by the Forest Department (FD), which is the central government body for preserving and conserving the biodiversity of the Bangladesh. In spite of the fact that almost all of the internationally accredited public and private universities in Bangladesh offer undergraduate and graduate degrees in natural science-related disciplines, notably environmental science and biology with specializations in wildlife ecology, nonetheless, the sad reality is that large numbers of potential biology graduates with solid conservation science backgrounds remain unemployed partly due to the inherent bureaucratic barriers to joining the forest department.

Forest officials of Bangladesh regularly conduct tiger census through tiger paw-print-based surveys and count tiger numbers of the Sundarbans. The population size is always reported to remain between 400-500. However, Bangladeshi biologist Monirul Khan, under potential funding support from the Save the Tiger Fund, USA, conducted a statistically valid and conceptually unified population survey to understand tiger and its prey distribution, population density and other associated parameters. Khan's pioneering camera-trap 'capture-recapture' statistical model suggests there are approximately 200 tigers left in Bangladesh Sundarbans, where they live with a density of 3.7 per 100 hundred km².

Bengal tiger is the national animal of Bangladesh and is often been referred to as a flagship species to bring about wildlife conservation advocacy and education among grassroots communities and the general public. National and international non-governmental organizations both have named the tiger as a keystone species in the tropical belt. Apart from the pure scientific implications to classify tiger as flagship keystone carnivore in the felid guild, this concept has major impact at the socio-political and cultural levels in South Asian countries and Bangladesh is no exception. The majority of people in Bangladesh inherently respect and to some degree revere tigers, although the understanding or motivation to preserve tigers is

not reflected evenly among people, especially among the poor and disadvantaged. Education and economic development can greatly reduce poverty and improve the people's acceptance of biodiversity conservation, or more precisely the tiger conservation ethic in the Bangladesh context. A good example of the non-utilitarian conservation ethic inherently present among most Bangladeshi can be illustrated by observing the relationship between natural resources and the population density of Bangladesh in the context of the Sundarbans. The Sundarbans in Bangladesh is the largest deltaic ecosystem on earth, situated in a densely populated nation (over 800 people per km²). These large numbers of highly impoverished and severely malnourished people have no access to a clean water supply, basic sanitation, standard housing facilities and the regular intake of nutrition to maintain healthy life, yet they possess a high degree of intrinsic and spiritual values and thereby care enough to spare the productive Sundarbans forest from the kind of large-scale exploitation which is found in the Amazon basin in Brazil, in tiger reserves in India, and in the virgin primary rainforest in Indonesia. The corollary is that a fair and just eco-political framework that incorporates a holistic conservation approach integrating gender equity, equitable distribution of rural income, access to education that has strong component of basic ecological understanding, and most importantly the development of rural economies that are not based on the exploitation of natural resources, will significantly improve Bangladeshis' standard of living and thus be able to put their conservation ethic in the form of eco-stewardship into better practice.

The challenge Bangladesh faces in the 21st century to conserve the Sundarbans, its national heritage and its magnificent treasure – the tiger – may appear enormous, but purely from the eco-political standpoint, some small adjustments can dramatically step up the process of tiger conservation. There is a strong mindset among government departments of Bangladesh that conservation of species or biodiversity can only be achieved by recruiting western biologists. Therefore, there is an urgent need to change this western-dependent biodiversity conservation mindset/practice in the direction of creating

conservation research opportunities for Bangladeshi biologists and encouraging national talents to work within government departments to save the tiger. Conservation biology is a multidisciplinary science drawing ethics, philosophy, tools and principles from such wide disciplines as anthropology, sociology, ethnicity and cultural diversity, linguistics, theology, political science and of course evolutionary biology and mathematics. The conservation success for a sympatric charismatic mega-carnivore as such tiger surely demands international cooperation, but it also demands that any international conservation initiatives must follow political, socio-cultural, and philosophically justified pathways and provisions for research and explorations. A good example is the dedicated conservation research work by WWF & WCS, USA. These organizations, along with the Smithsonian Institution USA, and other US graduate schools, have very strong reputations for working with the national governments of tiger range countries (Nepal and India are groundbreaking examples for Bangladesh) to develop tiger conservation frameworks based on the solid science of conservation biology. There are numerous examples where potential graduates from tiger range nations have collaborated with US organizations and have developed significant academic and technical capacity to indulge in *in situ* conservation and management with governments and NGOs in their respective home countries and within WWF & WCS network branches across the globe. These kinds of inter-social and inter-cultural graduate and research exchange and collaboration programs have strong elements of ecological, political and economically justified mission statements and thus need to be promoted in an eco-political conservation perspective in the Bangladesh context. The Bangladesh government must decide what kind of conservation paradigm and mindset-shift best benefits the tiger and the Sundarbans ecosystem in the long run against the backdrop of creating scholarly opportunities for potential wildlife biologists from Bangladesh and abroad.

Bangladesh has come a long way towards maintaining a healthy breeding population of wild tigers and has become one of the top nations for securing long-term prosperity for tigers, despite chronic population and poverty-related setbacks. With a population of over 130 million, every

Bangladeshi citizen has the right to participate in tiger conservation action programs, not only because tigers are their national pride, but also because of the high resiliency of these large numbers of landless socially destitute people who still protect the Sundarbans for tigers to safely breed and sustain an ecologically healthy life. This realization should help the Bangladesh government to develop an eco-politically justified and scientifically-based conservation perspective at the local, regional and national levels.

Finally, a successful conservation strategy for the tigers and the overall biodiversity of the Sundarbans can only be achieved by emphasizing conservation science-based research, grassroots community participation in multiple dimensions, conservation education both in formal and informal settings, graduate opportunities for Bangladeshi biologists and effective conservation partnerships with international organizations as such WWF & WCS that have strong multi-cultural and multi-ethnic open-door research and capacity building policy frameworks embracing the best available cutting-edge scientific conservation tools (GIS, Remote Sensing, Radio Telemetry) for delineating the best available tiger conservation landscapes on earth.

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DISTRIBUTION, DEMOGRAPHY AND CONSERVATION STATUS OF SARUS CRANE (*Grus antigone antigone*) IN CHITTAURGARH DISTRICT, RAJASTHAN, INDIA

by Mohammed Yaseen and Rashmi Saxena

Introduction

Sarus crane (*Grus antigone antigone*) has been listed as a Vulnerable species by IUCN (2010) with criteria A2cde+3cde+4cde. The criteria reflects the threat to the species through various means like decline in habitat quality, exploitation, pollution, competitors and parasites.

Sarus crane (*Grus antigone antigone*), the world's tallest flying bird (Archibald *et al.*, 2003), is the only resident breeding crane in India and southeast Asia and has suffered a rapid population decline within a few decades (Choudhary *et al.*, 1999).

It is obvious that anthropogenic activities, land use changes and degradation of wetlands due to agricultural expansion and industrial development have been found to be the most serious threats to the cranes (Gole, 1989; Parasharya *et al.*, 1989;

Meine *et al.*, 1996; Kaur and Choudhary, 2003). The present study was carried out in light of the above background. Monthly surveys of the wetlands and agricultural fields were conducted to observe the population in its natural habitat in Chittaurgarh District of Rajasthan (India). Many perennial water bodies are present in the study area which support this endangered bird in good numbers. During the study the distribution, population, breeding and seasonal movements of Sarus crane were recorded in the years 2007 to 2009.

Materials and methods

For observations, 20 wetlands of Chittaurgarh District were visited monthly. Out of these, seven large water bodies are perennial. For studying and recording, 8 x 40 binoculars and digital video camera (40 x zoom) were used. To determine the abundance and distribution the 'line transect' method was used.

The encounter rate was calculated by the simple relationship:

$$\text{Encounter rate} = \frac{\text{Number of cranes counted (abundance)}}{\text{Total length of transect (in km)}}$$

Other demographic parameters studied were, the percentage of breeding pairs, non-breeding pairs, percentage of successful hatching, juvenile-adult ratio, percentage of families with one chick and percentage of families with two chicks. Here, the percentage of breeding pairs means "percentage of Sarus crane pairs seen with eggs or young ones"; and juvenile-adult ratio means ratio of juveniles, i.e., chicks, juveniles and sub adults (as defined by Ali and Ripley, 1980) clubbed together and adults.

Results and discussion

During the year 2007-08, the total number of Sarus cranes found was 242, while this number increased to 257 in 2008-09 (Table 1). Out of these, in 2007-08 73.2 % (n = 177) cranes and in 2008-09 76.7 % (n = 197) cranes were observed in the seven perennial wetlands of the district. The encounter rate was 0.85 in 2007-08 and 0.82 in 2008-09, while Sunder *et al.* (2000) found the encounter rate to be 0.2 and 0.32 in the summer



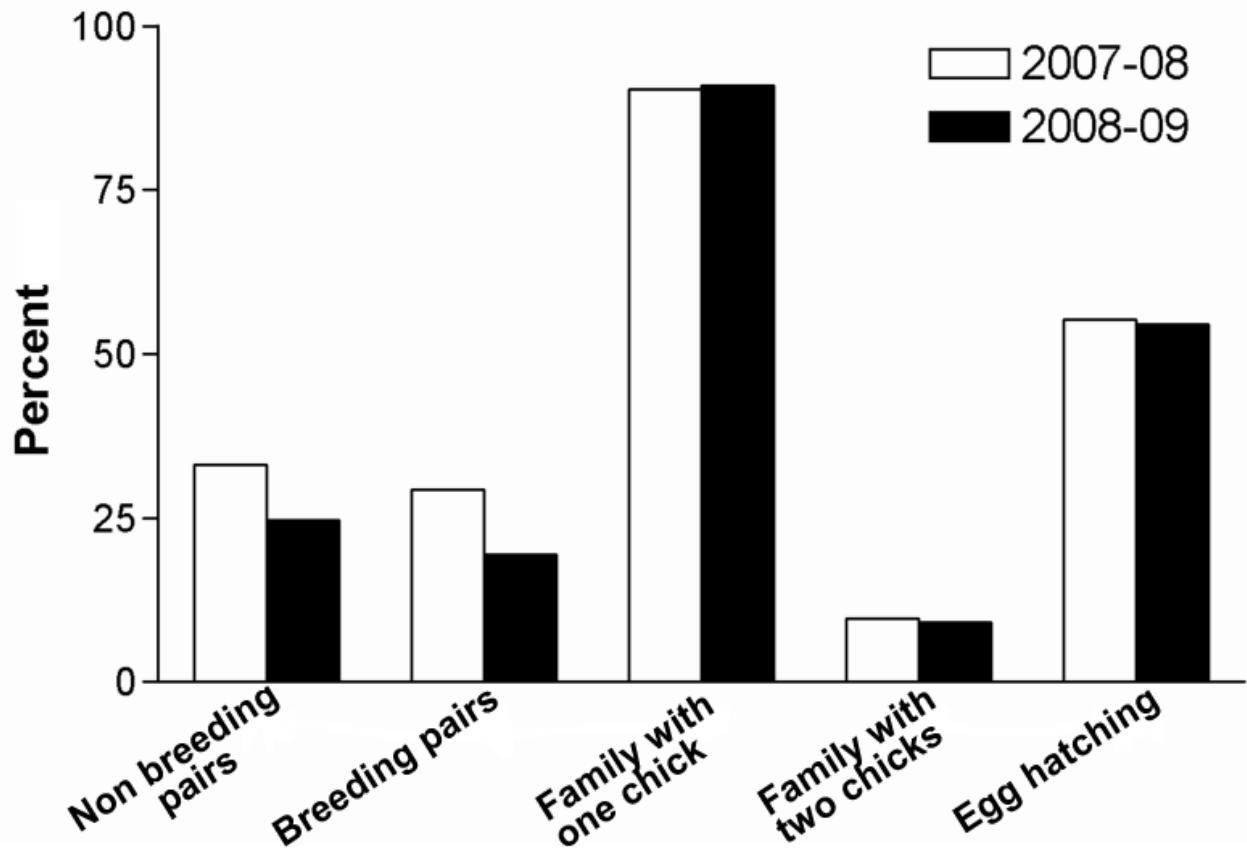


Figure 1: Demographic parameters of Sarus Crane in percentage during study period

Table 1:- Abundance and demographic characteristics of Sarus Crane population in Chittaurgarh District, Rajasthan.

Demographic Characteristic	2007-08 (June 07 to May 08)	2008-09 (June 08 to May 09)
Kilometers traveled	284	312
Total Number of Cranes	242	257
Number of adults	211	227
Non breeding pairs	35	28
Breeding pairs	31	22
Juveniles	39	33
Family with one chick	28	20
Family with two chicks	3	2
Number of nests observed	31	22
Number of eggs	58	44
Number of eggs hatched	32	24
Juvenile adult ratio	0.18:1	0.14:1
Encounter rate	0.85	0.82

and winter of the same year in Chittaurgarh district. The number of adults increased in 2008-09 but the number of breeding pairs was only 22, while it was 31 in 2007-08. This may be due to the shrinking of water bodies because of less rainfall during 2008-09. Similarly, egg laying was greater in 2007-08 (n = 58) and less (n = 44) in 2008-09.

The hatching success was 55.17% in 2007-08 and 54.55% in 2008-09 (Figure 1). The percentage of breeding pairs with two chicks was 9.67% and 9.09% respectively in the two years studied. These pairs were found to breed successfully in natural wetlands, which are also rich in food sources. A high juvenile to adult ratio (0.18:1) was found in 2007-08, which dropped (0.14:1) in 2008-09. During this study period 3 eggs and 2 chicks were eaten by stray dogs. No adult mortality was observed. Cranes were observed to breed twice a year depending upon the availability of water and

suitable nesting sites. They were observed to breed during July-August and February-March. Similar observations have been recorded by (Ali, 1958; Ali and Ripley, 1980). According to Gole (1991): "though Sarus is a monsoon breeder but in some areas of Kota, Sarus breeds even in the driest months of the year (i.e., May and June). This behavior of the bird is not seen anywhere in the state".

However, the availability of water throughout the year plays a vital role in sustaining the crane population. The presence of seven perennial water bodies in the district viz. Gousunda dam, Mangalwad talab, Talou, Bassi Dam, Ori dam, Modia Mahadev and Pangarh provides very suitable habitat and support for increasing populations of Sarus crane. According to Ramachandran and Vijayan (1994) "The quantity of water plays a major role in determining the breeding population

of the species” and according to Walkinshaw (1973) “more substantial movements of the crane occur only in response to monsoons and droughts”. But it is disheartening to observe that the increase in population did not contribute much increase in the breeding population. It was about 29.38 % in 2007-08, which dropped to 19.38 % the next year. Degradation of wetlands, poaching, nest destruction, changes in agricultural practices and conflict with farmers in the catchments of the wetlands have been the main factors behind this decline.

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BREEDING OF VULTURES IN THE WILD

by Devinder Singh Dhadwal

The situation is grim, but it is not all over yet. The master flier is in danger and the danger is not from Nature but from Man. The population of some gyps vultures in South Asia fell by more than 95% in just a few years in the 1990s and three of them are classified as critically endangered: *G. bengalensis*, *G. tenuirostris* and *G. indicus*. All three species have been declining at an alarming rate across the Indian sub-continent. IUCN has listed them as critically endangered and indicates that they will become extinct in the near future. Initially, scientists weren't able to identify the reason for this crisis. The breakthrough came in the year 2004 when new research identified a veterinary drug as the reason behind this debacle. Hopefully, the bird now can be saved if some other cause does not attack it, as there is no conclusive evidence that any other cause is involved. The veterinary drug "diclofenac" has been banned recently by the government to reduce the impact on this bird. But in spite of the ban on this lethal drug, it is still easily available in the market is still in use.

Vultures have helped in disposing of carcasses and reducing the risk of diseases. With the decrease in the population of vultures, the carcasses are taking more time to decay and as such, the sanitation

problems are on the rise and feral dogs are increasing in number, subsequently increasing the risk to human health. Vultures are very important birds and their decline will have an adverse effect upon other wildlife and domestic animals and ultimately affect the existence of human beings.

The doomsday for this master bird has not yet arrived as the breeding of the bird in the wild has created new hopes for the survival of this species.

Total nesting of gyps since October 2006 = 40.
Total successful breeding = 38. Mortality = 5%.
The successful survival percentage of these birds in the wild is 95%, which is a ray of hope in the dark. The mortality of 5% is recorded in the case of white rumped vultures and the mortality of Himalyan griffin and Egyptian vultures is nil.

Distt. Kangra, Himachal Pradesh, India, is blessed with the breeding of these birds in the wild. Various sites have been recorded in the district where vultures are breeding without any kind of mortality.

Table 1 records the species that have been under supervision since October 2006:

Table 1: Nesting populations under supervision since October 2006

No.	Name of forest	Location	Altitude (in ft)	Name of vulture spp.	Name of nesting tree spp	No. of nests	Fledgelings
1	P-14kc2c1 Pandhbar, Lapiana range	N-32-9.937, E-076-08.476 & surrounding 10 ha area	2,100	White rumped vulture	<i>Pinus roxburgii</i> Class-1-d	10	10
2	U.p-45k & 46k Upper Pandu	About 1.50 km from location (1)	2,500	White rumped vulture	<i>Pinus roxburgii</i> Class-1-d	02	2
3	Salol	N32-07.493 to n32-07.577, e-076-10.818 to e-076-10.972	About 2,000	White rumped vulture	<i>Pinus roxburgii</i> Class-1-d	06	06
4	U-26 Barla, c3	N 32-01.721, e-075-56.500	About 1,470	White rumped vulture	1) <i>Pinus roxburgii</i> Class-1-d 2) <i>Ficus religiosa</i>	1) 03 2) 01	1) 01 2) 01
5	U-15 Dhameta c3	N 32-01.758, e-075-56.937	About 1,550	White rumped vulture	..do..	01	01
6	U-13 Junath c8&c9	N 32-01.123, e-075-56.206	About 1,635	White rumped vulture	1) <i>Pinus roxburgii</i> 2) <i>Ficus religiosa</i>	1) 01 2) 01	1) 01 2) 01
7	R-29d, Loh jung, c2b	N 32-00.395, e-075-56.801	About 1,550	1)White rumped vulture 2)Egyp-tian vulture	1) <i>Pinus roxburgii</i> 2) Rocks	1) 05 2) 02	1) 05 2) 02
8	U 40 Katrah, C2	N 31-59.565, e-075-57.842	About 1,470	1)Hima-layan griffin 2)White rumped vulture 3)Egyp-tian vulture	1) <i>Ficus bengalensis</i> 2) <i>Pinus roxburgii</i> 3)Rocks	1) 01 2) 04 3) 02	1) 01 2) 04 3) 02
9	U 40 Katrah	N 31-58.986, e-075-58.190	About 1,440	White rumped vulture	<i>Pinus roxburgii</i>	01	01

It was observed that sometimes the young are left unattended during the nights as their parents remain out for one reason or another. The nests in this case are made with leafs and branches of the chil tree. The bird is breeding species-wise in colonies of about 3 to 10 nests. They are breeding in the branched old conifer trees and therefore such trees need special care to protect the existing habitat.

Conclusion

Man himself is responsible for the mismanagement. For long term sustainability of the fragile ecosystem it is now essential for mankind to reconsider, redefine and replan some of the vulnerable global issues for its own existence. Giving protection to the vulture is one of such steps that man has taken for the ecological balance and subsequently, to reduce the aftereffects on mankind. There is a ray of hope if such breeding grounds that exist in the wild are taken care of in the future, as it is difficult to re-introduce gyps in the forest after captive breeding as is being tried in different parts of the world.

Recommendations

- Nesting areas have to be identified in different forest divisions for basic future planning.
- The felling of trees in potential nesting areas has to be stopped at once, keeping in view the importance of the issue. Even the dried trees from such areas should not be felled as the vultures use such trees for roosting. The mother plants need special care as all the breeding is recorded in the old mother plants
- The local public should be involved in the protection of the bird and its breeding grounds.
- The unaffected animals which were never given drugs like declofenac in the surrounding areas should be identified so that the animals after natural death could be supplied to the breeding ground so that the mortality chances of the birds can be reduced.
- Sensitivity and co-ordination of various government sectors, NGOs and the public at local and global levels is required to reduce the cruelty to the vultures and to help protect the habitat of the birds.
- Education and awareness campaigns are needed to highlight the contribution of this sky bird to the overall importance of mankind.

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FOREST NEWS

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KIDS TO FORESTS “FOR THE FUTURE OF THE WORLD!”

Sometimes we're so concerned about giving our children what we never had growing up, we neglect to give them what we did have growing up.

– James C. Dobson

The FAO Regional Office for Asia and the Pacific and the National Forest Programme Facility recently launched a new youth education program, aimed at enhancing learning and understanding of issues related to trees and forests, forest management and sound utilization of forest resources. The “Kids-to-Forests” initiative seeks to introduce students to the wonders of the world’s trees and forests, and expose them to the multiple benefits of forests through hands-on learning aimed at better understanding of sustainable forest management.

“We hope to instill a sense of appreciation among students by taking them to working forests, introducing them to local people who use and depend on forests, and helping them to understand the environmental benefits of managing forests in an active manner,” explained Patrick Durst, FAO’s senior forestry officer for Asia-Pacific and architect of the Kids-to-Forests initiative.

While many schools and NGOs organize environmental and forest-related educational activities for children, most existing programs stress forest protection and ecology while paying little or no attention to forest management and utilization. “The Kids-to-Forest initiative grew out of my personal frustration with environmental programs that my own daughter was participating in, which continually stressed that cutting trees was bad and logging was evil,” Durst elaborated.

“Students are regularly bombarded with messages about the need for forest protection – which is important, of course – but kids are rarely taught

about the potential for sustainable management and use of forests,” according to Durst. “The Kids-to-Forests” program aims to build greater appreciation among students for the multiple benefits of forests and the potential to manage and use forest resources sustainably.”

The new initiative targets primary and secondary school students and teachers. Education is particularly effective when it involves hands-on learning experiences with younger school students, some of whom have never previously set foot inside a real forest.

One of the main reasons that environmental education programs fail to address management and sustainable use of forests is that teachers generally lack relevant educational materials. The Kids-to-Forests initiative therefore is also emphasizing the development and local adaptation of balanced and creative forestry-related educational materials to be made available to schools and teachers.

The NFP Facility is supporting seven countries (Cambodia, China, Fiji, Lao PDR, Mongolia and the Philippines) to pilot the Kids-to-Forests program. Partner NGOs and forestry agencies are currently testing a wide range of innovative educational activities for students and youth, with a view toward identifying the most promising approaches. Earlier efforts were piloted in Thailand, where support for expanding the program is currently being sought from other sources.

Activities

Phase I: Designing and implementing country programs

The NFP Facility will provide selected implementing institutions in each participating country with US\$10,000 for Kids-to-Forests activities. Each country is expected to conduct Kids-to-Forests activities in at least two schools, with each education program focusing on how sustainably managed forests contribute to economic growth, improved livelihoods, and environmental services.

The two primary components of country programs are:

1. Engaging students with hands-on learning experiences such as interactive field visits, games, activities and discussions.
2. Developing appropriate educational materials by working with teachers and school officials to adapt materials to local needs, and make them more interesting and engaging.

Possible Kids-to-Forests learning modules include:

- Harvesting forest products;
- Community forestry;
- Diversity and value of forest-based products;
- Regenerating and enriching natural forests; and
- Wilderness and ecosystem services.

Expected outputs:

- Students of at least two schools in each selected country participate in activities tailored to enhance sustainable forest management education and gain associated knowledge, values, attitudes and skills.

- Teachers become more knowledgeable about sustainable forest management and better able to convey information on its underlying principles.
- Teachers and education officials in each participating country understand current sustainable forest management education materials and methodologies and suggest how they can be improved.

Phase II: Sharing of experiences and lessons learned

Two representatives from each country will be invited to share their experiences at a workshop held during the 2nd Asia-Pacific Forest Week in November 2011 in Beijing, China.

The workshop during Forestry Week is expected to focus on the following:

Expected outputs:

- Synthesize lessons learned to assess whether Kids-to-Forest should be scaled-up into a larger project in Asia and the Pacific.
- Evaluate lessons learned to determine additional opportunities and approaches for including environmental and forestry issues in primary school education programs, such as submitting lessons learned to the Ministries of Education and Culture.
- Establish a network of educators and forest managers, strengthening the individual capacity of institutions to undertake sustainable forest management educational activities.
- Determine if benefits, opportunities and funding prospects exist to scale up “Kids-to-Forests” activities.



THAI SCHOOL CHILDREN AND FAO STAFF SWEAT TOGETHER TO REFOREST DEGRADED AREA IN KANCHANABURI

Prepared by Sverre Tvinnerheim (Associate Professional Officer), FAO Regional Office of Asia and the Pacific



On a hot Saturday in September 2010, a degraded forest in Kanchanaburi province in Thailand was “invaded” by rag-tag groups dressed in green T-shirts. These active and environmentally-minded people were local schoolchildren and staff from FAO. The one-day tree planting excursion kicked off a larger initiative on forestry education for youth called “Kids-to-Forests.”

In the early morning of 11 September, about 25 FAO staff and associated family members embarked on a 3-hour bus ride to Kanchanaburi province. Students from several classes of a collaborating school waited for them. The main objective of the day was very clear: plant tree seedlings in the adjacent degraded forest – and do so in an interactive way. Special green t-shirts were produced for the occasion. Participating youths from the International School Bangkok organized ice-breaking games to foster friendship from the very beginning. The Thai school children on their side, most aged between 5 and 14 years, were very enthusiastic. During the tree-planting activity

itself, 2-children teams were linked with an FAO staff, who guided the work and highlighted the importance of trees and forests. Altogether approximately 1,200 trees were planted within a few hours. The trip also included a visit to the students’ school, and the beautiful green surroundings.

The FAO Regional Office for Asia and the Pacific, in collaboration with the National Forest Programme Facility, is developing the new “Kids-to-Forests” initiative, which seeks to strengthen and modernize school education on forestry-related matters. A core philosophy in this endeavor is that forestry education activities need to go beyond mere recognition of forests as a beautiful and healthy place, and to also focus on the merits of sustainable management and utilization of forest resources it represents. A central pillar of the Kids-to-Forests initiative is to take a fresh look at education materials and teaching methods applied in forestry education – with the aim of making both more interactive and exciting for the students.

KIDS-TO-FORESTS - A KID'S-EYE PERSPECTIVE

Contributed by Regina Durst



The first Thailand Kids-to-Forests program was one of great success, aside from getting up before dawn for the departure. As we got on the bus, I wondered who had chosen such an early hour to leave and marveled at everyone else's ability to be so perky that early in the morning. Falling asleep, I didn't really notice the length of the bus ride, but it still managed to feel like ages before we got to the remote village in Kanchanaburi, Thailand.

When we got to the village, the school kids sat in rows to hear the introductory speeches. It was a necessary step of the day, but definitely not the most exciting one. Finally, the formalities were over and we began to make nametags for everyone. After everyone had gotten their nametags, we gathered up the seedlings and headed up the mountain.

As we walked up, I examined the young tree I was holding. It wasn't particularly strong-looking; as a matter of fact, it seemed as though I could snap it if I wasn't careful! Still, I had high hopes for this seedling. With proper care, and a little bit of luck, it would grow wonderfully.

Before long, I found a hole to put my seedling in. The villagers had set up hundreds of holes for us in advance. Pulling off the plastic that held the

tree's roots together, I laid it in the hole, and used my hands to push the dirt back into the hole to fill it. Carefully, but firmly, I packed down the soil around my tree. Already feeling the sun beating down upon my neck, I wondered why I hadn't thought of bringing a hat.

Two hours and many, many trees later, everyone was sweaty and dirt-covered. Despite being mildly exhausted, everyone had big smiles on their faces, congratulating themselves and each other for a job well done as we looked out over the fields of seedlings.

The local people were wonderful in preparing lunch for us. Their cooking was so delicious, I was sorely tempted to go back for thirds, but my embarrassment decided for me. Besides, I had yet to try their dessert!

After everything else was done, we took a big sheet of paper and each person drew a picture of what they'd like to see in forests in the future. Most of us added a plant or an animal, but one child drew a person. It didn't seem out of place or awkward, and in my eyes, it summed up everything that this day was about. It was a drawing of a future in which people understood how to manage the forest properly and felt at home in one.

TREE PLANTING CEREMONY, NAKHON PHANOM UNIVERSITY, THAILAND

Prepared by S. Appanah, NFP Advisor (Asia-Pacific)



In Thailand, imbued with a rich Buddhist culture, ceremonies are common scenes. FAO continued the tradition with its tree planting ceremony in a small corner of the world that is lapped by the mighty Mekong River. In conjunction with the World Food Day event, a Tree Planting Ceremony was organized on 22 October in the grounds of Nakhon Phanom University. It was organized jointly by FAO/RAP, the Royal Forest Department (RFD) and Nakhon Phanom University. The main objective was to promote the planting of indigenous long-rotation tree species in Thailand.

Over 100 participants, including school children, staff of the University, RFD and FAO/RAP gathered in the university auditorium. Mr. Adulrat Tongtawee, Director of Forest Planning and Information (RFD), delivered the welcome address where he thanked FAO/RAP for supporting this important initiative in Thailand. Mr. Hiroyuki Konuma, Assistant Director-General/Regional Representative (FAO/RAP), addressed the participants about the cooperation achieved between FAO and RFD, the world's concern with hunger and food security, and how the situation is further exacerbated by climate change and natural disasters being observed increasingly worldwide.

In this regard, tree planting and forest conservation are becoming valuable tools for reducing global carbon emissions and reversing the impact of climate change. Additional values of tree planting were also pointed out.

Following the addresses, the tree planting ceremony was conducted. One hundred saplings of mostly timber species (*Shorea roxburghii*, *Shorea siamensis*, *Dipterocarpus* spp., *Swietenia macrophylla*, *Fagraea fragrans*, etc.) were planted. RFD staff assisted with the planting, and each plant was tagged with its name and that of the person who planted it. T-shirts were also distributed to the school children to mark the occasion. The tree planting ceremony was partially supported by the "Participation of tree plantation farmers in sustainable forest management" project (TCP/THA/3203 (D)). The project is working to increase participation of farmers in planting long-rotation indigenous species in the country. Existing government programmes have been desultory, and the project is currently looking at some of the policy and regulatory frameworks which constrain the participation of farmers in planting long-rotation indigenous species.

FAO SEES OPPORTUNITY IN THAILAND'S BIOFUEL PLANS, BUT QUESTIONS REMAIN

Prepared by Beau Damen

Improvements in agricultural productivity and the responsible management of natural resources in support of the biofuel sector will unlock additional benefits for farmers, industry and the environment in Thailand. This was one of the key findings to emerge from FAO's year-long Bioenergy and Food Security (BEFS) Project.

Thailand has ambitious plans to develop its biofuel industry. The Thai Government's Alternative Energy Development Plan (AEDP) aims to expand the production of biofuels six-fold to 5 billion liters by 2022 (Figure 1). Using the BEFS analytical framework and tools specially developed by FAO, a research team consisting of Thai and international experts was assembled to look at these plans in detail.

Opportunities to raise farm output and productivity

While Thailand is one of the world's largest exporters of agricultural commodities, farm productivity is, in some cases, well below world benchmarks. As a result, the BEFS research team found that meeting the government's biofuel targets will provide a number of opportunities to drive fresh agricultural development in Thailand.

To meet the requirements of the biofuel targets and domestic demand, production of key biofuel feedstock will need to grow substantially over the next decade. FAO projections indicate that production of sugar cane molasses and palm oil is anticipated to double by 2018, while cassava production is expected to grow by 50 percent.

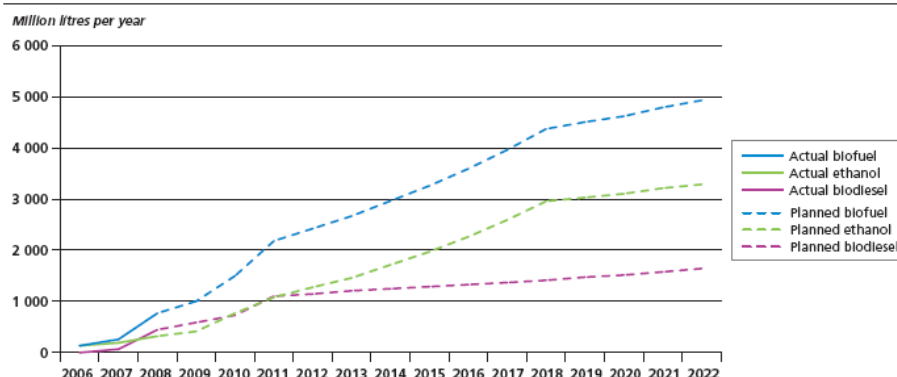
Due to government policies designed to control land allocations for certain crops, the Thai

Government expects that this growth will not be accompanied by significant changes in crop and land use. As a result, substantial growth in the productivity of Thai farmers is required. It is hoped that this will draw fresh attention to the plight of many in Thailand's poorer farming regions and attract new assistance to improve farming systems and lift yields.

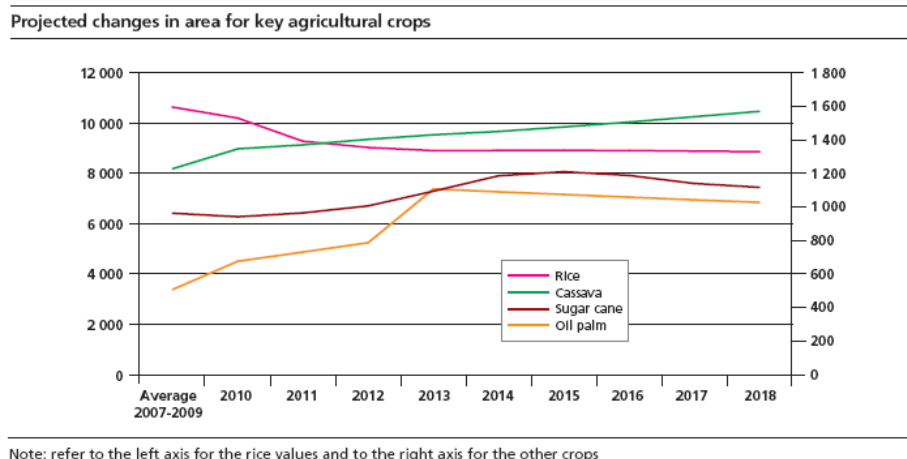
In fact, the research suggests that better yields will deliver multiple benefits beyond the farm. While biofuels production in Thailand was already found to be economically competitive and offer measurable greenhouse gas mitigation advantages over fossil transport fuels, improving the productivity of feedstock producers would

Figure 1: Actual and planned biofuel production under AEDP

Actual and planned biofuel production under AEDP



Source: Thailand Ministry of Energy

Figure 2: Projected changes in area for key agricultural crops

Source: FAO

stabilize feedstock costs and reduce greenhouse gas emissions per unit of fuel produced.

Questions remain

But the findings also raise a number of questions. Even with predictions of substantial yield growth, the BEFS research team found that it will be unlikely to account for all of the growth in production. As a result, expansion in biofuel crop plantings are predicted despite the government's preventative policies (Figure 2). In addition, the expected growth in production will not be able to meet the country's additional demand for biofuel feedstock crops and sustain existing domestic and export markets. Consequently declines in the export of some commodities are also anticipated. This outlook presents a number of potential problems.

FAO's projections suggest that the increase in biofuel crop plantings will come at the expense of rice cultivation. Meanwhile, the productivity of rice growers is expected to stagnate. While these developments are projected to lead to a relatively small decline in rice production, increasing domestic consumption of rice to meet the demands of Thailand's growing population will halve the country's rice exports by 2018. Given that rice is a key staple food crop in the region and Thailand is one of the world's largest rice exporters, this

could lead to escalation of regional food prices. This situation will be further complicated by the expectation that the decline in Thailand's rice exports will be matched by similar declines in the

The anticipated drop in exports indicate that the successful achievement of the Thai Government's biofuel targets is underpinned by an assumption that the potential returns farmers will receive fueling the domestic biofuel sector will be greater than those on world export markets. There is growing reason to believe that this assumption may not hold.

Rising prices could upset plans

Prices for many traded biofuel feedstock commodities including sugar, cassava and vegetable oils have been climbing. In Asia and the Pacific, increasingly robust demand from China, not only for food but also for biofuel feedstock, is likely to ensure prices remain high for some time.

In the case of cassava, the situation in Thailand has been complicated by a recent pest infestation. After ten years of growth, Thailand's cassava output in 2010 is expected to decline by around 25 percent from 2009 levels and a further four percent in 2011. The confluence of growing demand, limited supply and, ultimately, higher

prices, will translate into wafer thin margins for Thai cassava ethanol producers and increasingly unacceptable opportunity costs for cassava farmers supplying the domestic biofuel industry. If this situation persists it will jeopardize the Thai Government's timetable for achieving its biofuel targets and perhaps its resolve to stick by them in the long run.

Policy commitment will be pivotal

But faltering on policy, in general, should be avoided. Strong commitment to the plan should attract necessary investment and support to Thailand's agriculture sector. Better extension services and training regarding crop management and the effects of land use change will foster more sustainable, productive and profitable farming enterprises. The expansion of regional demand for biofuel feedstock and other agricultural commodities fuelled by robust regional growth and expanding markets in China and India could also have spillover benefits for other developing

agricultural communities in the neighboring Mekong region.

FAO's findings were presented to government and private sector representatives at two public consultations held in March and June 2010. The final Thailand reports are now available from the BEFS website (<http://www.fao.org/bioenergy/foodsecurity/befs/en/>). FAO hopes that the capacity this exercise has developed within public and private institutions in Thailand will enable regular, similar assessments of the biofuel sector over the life of the AEDP.

In the meantime, FAO is looking to better quantify and assess the regional impacts of developing biofuel and forms of bioenergy on food security and the environment. A regional assessment is currently underway in South Asia, with potential for similar regional assessments to be undertaken in South East Asia. FAO believes this work will be essential in helping governments in the region assess the many, sometimes unforeseen, trade-offs associated with bioenergy development.

The role of forests and forestry in the prevention of landslides and rehabilitation of landslide affected areas in Asia

Prepared by Jeremy Broadhead, Consultant

Forest policy changes in Asia have often been driven by natural disasters such as floods, droughts and landslides. Perceived roles of trees and forests in averting or mitigating such disasters have been used to support radical policy realignments, but how important are they in comparison with other factors?

In Asia, populations, infrastructure and economic activity are expanding into marginal lands. The associated loss of vegetation and alteration of hillslopes, particularly from road construction, logging and agricultural activity, has increased risk to life and assets from landslides, while environmental degradation has also taken place. The projected increase in the frequency of extreme rainfall events in many parts of Asia is also likely to raise landslide incidence, further compounding the problem.

The preponderance of landslide deaths in poorer countries and experience of successful reduction of landslide risk in many areas around the region and around the world suggest that much can be done to avoid future landslides and associated losses.

An upcoming FAO publication looks at the roles of trees and forests in the prevention of landslides and rehabilitation of landslide-affected areas in Asia. It aims to bring information to policy makers aimed at safeguarding lives and environmental and economic assets in times of rapid development and predicted changes in rainfall and climate in the region.

The report will be published in June 2011 and will be available at the following address: <http://www.fao.org/world/regional/rap/nre/about>

INTERACTIVE SHARING OF KNOWLEDGE AND EXPERIENCE ON RESTORING FOREST LANDSCAPES

Prepared by Marija Spirovska-Kono, Consultant

The world's forests are endangered. Every year, an area of forest the size of Greece disappears. The planet's capacity to support itself is constantly being whittled away. Governments, industry and campaigning groups are working hard to reduce deforestation. But that alone is not enough. Forest Landscape Restoration (FLR) can remedy the damage done to landscapes and livelihoods by the destruction and degradation of forests. It can help to build sustainable relationships among communities, commercial interests and the damaged ecosystems on which they depend.

But it is not a quick or easy fix. There is no one-size-fits-all formula for restoring forest landscapes. Simply planting trees and crossing fingers doesn't work. Every landscape, every set of social, economic, environmental and legal circumstances is different and complex. Tropical forests are marked by different dynamics and levels of resilience than boreal forests. Societal needs and policy frameworks differ across the world. Therefore, solutions have to be tailored to each individual situation. They have to be flexible over time and incorporate sustainable practices that can serve the needs of many stakeholders in the long term.

This is the rationale behind the Learning Network on Landscape Restoration, established by the Global Partnership on FLR (GPFLR). The aim of this growing network is to provide a store of FLR experiences, capturing the real-world nuances

and uniqueness of different approaches, and generating tools and knowledge that can support practitioners in the field. Besides providing general information on FLR, the learning network draws out and shares insights into the practical activities and outcomes in a number of selected learning sites all over the world. And an interactive discussion forum allows practitioners and policy makers to directly share their experiences, and increase their knowledge.

A recent online learning event gathered 175 practitioners across the globe to jointly define and discuss FLR and its various forms of implementation. By collectively reading articles, watching videos, and virtually visiting learning sites, participants gradually built up their common pool of knowledge. Through online discussions and teleconferences, participants shared their ideas on issues like restoration techniques, stakeholder involvement, land ownership, private sector involvement, and climate change. In this interactive way, policy development was brought closer to what is happening on the ground, as it happens.

For further information on the Global Partnership on Forest Landscape Restoration and its learning group, visit www.ideastransformlandscapes.org, or visit the online discussion on <http://forestlandscaperestoration.ning.com/>.

ADVANCING STRATEGIC PLANNING IN PACIFIC FORESTRY

Prepared by Fan Xiaojie, nfp Facility Coach (Asia-Pacific)

As part of the Asia-Pacific Forestry Sector Outlook Study 2020 process, eight countries in the Pacific region drafted country papers aimed at assessing trends in forestry and developing scenarios for the future up to 2020. The Outlook Study is nearing completion and there is a plan for follow-up work to be conducted in most Asia-Pacific countries to facilitate uptake and use of the information and results.

At the Pacific Heads of Forestry Meeting, held in Nadi, Fiji in September 2009, FAO was requested to provide support to Pacific countries for follow-up to the Asia-Pacific Forestry Sector Outlook Study 2020, with a focus on strategic planning, rationalization of forest policies, and re-orientation of policies to meet emerging challenges in forestry. In responding to the request, the Secretariat of the Pacific Community (SPC), with support from FAO, the National Forest Programme Facility (NFP Facility) and German Development Cooperation (GTZ), organized the “Workshop on Strategic Planning for Pacific Forestry” in Nadi, Fiji, 21–23 April 2010.

The main objective of the workshop was to advance strategic planning in Pacific forestry on the basis of forestry outlook studies completed under the Asia-Pacific Forestry Outlook Study

2020, and to produce related policy briefs and recommendations for each country.

The workshop brought together senior forestry officers, who are working for governments and other agencies in the areas of forestry policy,



planning, legislation, etc., from Fiji, Kiribati, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu. Participants analyzed the impacts of drivers of change in forestry at the country level in the context of forest products production and employment,

protection forests and environmental services and on policies and institutions. As an outcome, the five most important drivers of change for the region were identified as follows:

- Climate change
- Invasive species
- Forestry and poverty reduction
- Innovative funding arrangements for forestry-related programmes
- Human resources and capacity building.

Participants also prepared policy briefs with defined sections on each of five thematic areas, taking into account the issues highlighted in the previous analysis. These policy briefs will be the basis for planning future activities in the region.

PAKISTAN EXTENDS PARTNERSHIP WITH THE NATIONAL FOREST PROGRAMME FACILITY

Prepared by Fan Xiaojie, nfp Facility Coach (Asia-Pacific)

The first partnership between Pakistan and the National Forest Programme Facility was launched in February 2004. To achieve the goals of enhancing stakeholder participation in forest policy and creating greater ownership, eight studies have been initiated through allocation of \$300,000 of small grants to non-government institutions. The major accomplishments have included development of a number of important documents, such as: National Vision 2030 for Forest and Biodiversity Conservation; Methodology for Valuation Forest Goods and Services; National Response Strategy to Combat Impact of Climate Change on Forests; Compensation Mechanism in lieu of a ban on commercial harvesting of forests; and Forest Communication Strategy. Additionally, work has been carried out to develop a Public-Private Partnership within the forestry sector and establishment of a forum for consultation of forest policy issues at different levels. A variety of stakeholders at federal, provincial, district and local levels (including government agencies, NGOs, CBOs and research institutions and so on) have been invited to join in collaborative actions relating to the national forest programme.

Through the 5-year implementation of the First Partnership Agreement, the Government of Pakistan has recognized and appreciated the outcomes of the activities accomplished under the partnership and considered it has contributed greatly to Pakistan's forestry development in achieving sustainable forestry management. The evaluation on the outcomes and impact of the first phase of the partnership, carried out by the Government through involvement of key stakeholders, concludes that Pakistan should carry forward the partnership to a second phase and expand the scope of activities so that more

stakeholders from federal down to local levels could participate. This conclusion has led to the decision of the National Steering Committee to apply for the Second Partnership Agreement till 2012 for another \$200,000 support, and this request was approved by the Facility Steering Committee in February 2010.

The Concept Note submitted by the Office of the Inspector General of Forests of Pakistan presented a detailed logical framework for the second phase of the partnership, with a close link to the overall objectives of the nfp process in Pakistan. It aims to: i) promote synthesis and mainstreaming of the nfp initiatives' recommendations at national and sub-national level; ii) facilitate the process of policy evolution and improving legal framework; iii) establish mechanisms for knowledge management and communication among key players; iv) enhance understanding on the ecosystem-based forest management approach; and v) implement a monitoring mechanism for reporting on nfp activities. Besides the clearly illustrated objectives, activities and expected outputs to be carried out under the new Agreement, the Concept Note also stipulates the foreseen impact and indicators for monitoring, based on principles and indicators of the Facility M&E system – Outcome and Impact Monitoring and Evaluation System/Result Based Management (OIMES/RBM).

The extended partnership is seen as a value-added proposal to complement the current efforts in achieving a wider scope of nfp objectives in Pakistan, though the grant is relatively small compared to other national and international supports. Most importantly, it provides a practical mechanism to involve multi-stakeholders in the nfp process in Pakistan.

PREPARATIONS FOR THE SECOND ASIA-PACIFIC FORESTRY WEEK TOP THE AGENDA AT THE SEVENTH APFC EXECUTIVE COMMITTEE MEETING

*Prepared by Sverre Tvinnereim
(Associate Professional Officer),
FAO Regional Office of Asia and the Pacific*



The Asia-Pacific Forestry Commission's Executive Committee meeting, held 13-14 January 2011, brought together four members of the Committee (chairperson and three vice-chairs) and five members of key partner organizations of the APFC, supported by nine representatives of FAO. This was the first opportunity for the Secretariat of the APFC (based at the FAO Regional Office for Asia and the Pacific) to engage in substantial face-to-face discussions with representatives of the Chinese hosts for the upcoming APFC events, represented in Hua Hin by the State Forestry Administration (SFA) of the Chinese government and the Asia-Pacific Forestry Network for Sustainable Forest Management and Rehabilitation (APFNet).

Given the anticipated magnitude of the upcoming Second Asia-Pacific Forestry Week (APFW), which will be held 7-11 November 2011 in Beijing, China, preparations for this event naturally became the main discussion item. Patrick Durst presented the Secretariat's perspectives of expectations for the Second Asia-Pacific Forestry Week. He emphasized the desire to make the APFW *the most significant forestry event of the year in the region*.

The main objectives of the APFW include: i) bringing together a diverse range of stakeholders; ii) forging new collaboration and initiatives; iii) sharing knowledge and insights; and iv) influencing the agenda of the Asia-Pacific forestry sector. Mr. Durst outlined the resources available to support the event. Principal among these resources is the commitment of FAO to make the event successful,

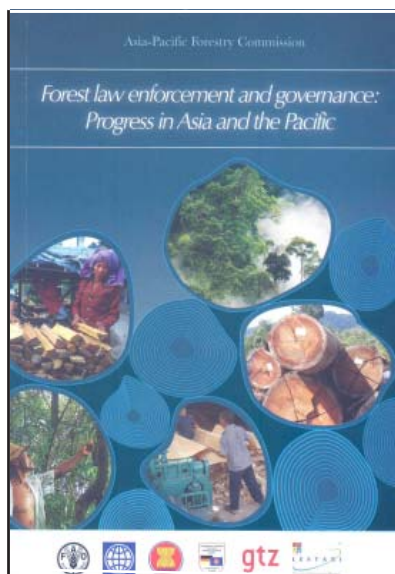
along with the dedicated support of APFNet. He also highlighted the experience obtained from organizing the first APFW. It was emphasized that the APFC Executive Committee should play an active role in shaping the content and profile of the event.

The meeting made recommendations on the overall theme for the event and also provided valuable suggestions for topics for plenary sessions and keynote speakers. Furthermore, crucial logistical issues were discussed.

Also on the agenda was a discussion on how to enhance the communication of the Asia-Pacific Forestry Commission. Activity and enthusiasm is always strong leading up to and during sessions of APFC, whereas it has proven more difficult to keep up interest and engagement in the periods between the sessions. The Committee made suggestions for enhancing communication with member countries and within the Executive Committee itself, such as more face-to-face meetings.

Finally, the Executive Committee spent considerable time reviewing APFC- and FAO-supported activities. The focus was on whether the APFC was on track in implementing recommendations from its 23rd Session held in Thimphu, Bhutan, in June 2011. The Executive Committee expressed overall satisfaction with the progress made, but noted that recommendations pertaining to forests and biodiversity remained a challenge.

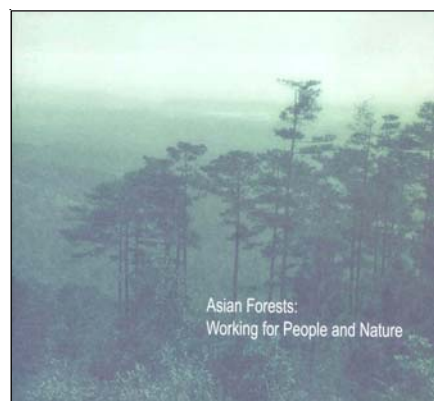
NEW RAP FORESTRY PUBLICATIONS



Forest law enforcement and governance: Progress in Asia and the Pacific RAP Publication 2010/05

This publication documents the efforts of 16 countries in the Asia-Pacific region to combat illegal forest activities. It is hoped that it will serve to identify and encourage the implementation of promising strategies and approaches in the fight against illegal and unsustainable forest practices. Rather than providing an in-depth analysis on the extent of issues and problems related to forest law enforcement and governance (FLEG), this publication provides an overview of the key FLEG initiatives and activities in each country, highlighting important achievements and the foundations for moving forward.

The recommendation to conduct this review was made by country delegates at the twenty-second session of the Asia-Pacific Forestry Commission, convened in Hanoi, Viet Nam, in 2008.



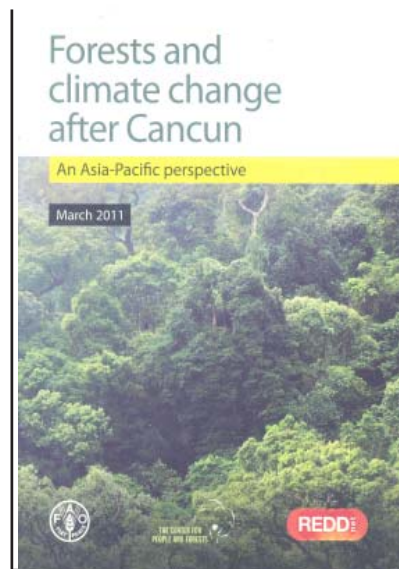
Asian forests: Working for people and nature

The future of the world's natural resources, including forests, will be decided in a large part in Asia, because the region imports a major portion of the resources it consumes. This brief argues that Asian forests today have a huge potential to contribute to people and nature in the region. It highlights key concerns and presents recommendations on how to more fully optimize the opportunities of forests today better than in the past.

Preparation of this brief was a joint effort of IUFRO's Special Project on World's Forests, Society and Environment (IUFRO-WFSE), FAO, and The Center for People and Forests (RECOFTC).

Report of the Asia-Pacific Forestry Commission Twenty-third session RAP Publication 2010/09 FO:APFC/2010/REP

At the invitation of the Government of Bhutan, the twenty-third session of the Asia-Pacific Forestry Commission (APFC) was held in Thimphu, Bhutan, 9-11 June 2010. Delegates from 28 member countries and 4 United Nations organizations participated in the session, along with observers and representatives from 17 regional and international inter-governmental and non-governmental organizations.



Agenda items included:

- State of Forestry in the Asia-Pacific region: forestry in transition
- In-session seminar: Asia-Pacific forests – now and in the future
 - Global Forest Resources Assessment 2010
 - Asia-Pacific Forestry Sector Outlook Study (APFSOS)
- Forests and biodiversity: conservation and sustainable use of our forest treasures
- Progress in improving forest law enforcement and governance in the region
- Heads of Forestry Dialogue
 - Forests, climate change and REDD: beyond Copenhagen
 - Harnessing new opportunities for financing sustainable forest management
- APFC and FAO-supported activities in the region
- Information items
 - Summary report from the pre-session workshop: “Forests: Moving Beyond GDP Contributions to Gross National Happiness Considerations”
 - Asia-Pacific Forest Invasive Species Network (APFISN)
 - International Year of Forests – 2011
 - 20th Session of the Committee on Forestry (COFO)

Forests and climate change after Cancun – An Asia-Pacific perspective March 2011

Introduction

In February 2010, FAO and the Center for People and Forests (RECOFTC), brought together regional experts in Bali, Indonesia to reflect on the outcomes of the 15th Conference of the Parties (COP) of the United Nations Framework Convention on Climate Change (UNFCCC). The resulting booklet “Forests and climate change after Copenhagen: An Asia-Pacific perspective” was distributed widely and very well received.

Building on the success of this initiative, in February 2011, FAO and RECOFTC, with support from the Norad-funded REDD-Net project, repeated the exercise. Eleven climate change and forestry experts gathered in Chiang Mai, Thailand, to reflect on COP16 held in Cancun, Mexico, in November and December 2010. This booklet summarizes their responses to 12 key questions.

RAP FORESTRY STAFF MOVEMENT

Wang Hong, a national of China, joined the FAO Regional Office Natural Resources and Environment Group in September 2010 as a consultant. Her duties include implementing the project “Making forestry work for the poor: Adapting forest policies to poverty alleviation strategies in Asia and the Pacific”, and providing support for the 24th session of the Asia Pacific Forestry Commission and Asia-Pacific Forestry Week to be held in China in 2011.

Ms. Wang gained her Master’s degree in silviculture from Northeast Forestry University, China, in 1989 and has more than 20 years experience in forestry research, education and project management. She has also worked with the multi-agency and multi-disciplinary project “capacity building for combating land degradation” under the PRC/GEF partnership on land degradation in dryland ecosystems. Prior to joining RAP, she was Director of the Human Resources and Finance Division of the Asia-Pacific Network for Sustainable Forest Management and Rehabilitation (APFNet).

Finella Pescott, a national of Australia, joined the RAP Natural Resources and Environment group in November 2010 as a Forestry Policy Officer under the Australian Youth Ambassadors for Development (AYAD) Programme. Miss Pescott’s main duties include facilitating a project in Papua New Guinea which serves to strengthen systems of forest planning and monitoring; assisting with an Assisted Natural Regeneration project to be implemented in four Asia Pacific countries and reporting on Reduced Impact Logging (RIL) publications and events. She will further provide support in the organization of the second Asia-

Pacific Forestry Week to be held in Beijing in 2011 and associated APFC events.

Miss Pescott holds a Master of Forest Science from the University of Melbourne, Australia, and has studied at the Faculty of Forestry on exchange at the University of British Columbia, Canada. Prior to arriving at RAP, she worked on climate change policy analysis and as a consultant for the Yukon Territorial Government in developing a manual on best forestry practices.

Elizabeth Fontein, a national of The Netherlands, transferred from the FAO country office in Mongolia to the RAP NRE group in Bangkok in November 2010. She will continue to work as an Associate Professional Officer, focussing on forestry policy and participatory natural resources management. Her duties will include the organization of the Fifth Forest Policy Short Course, providing support to community focussed forestry projects in the region and assist in the organization of APFC events, including the second Asia-Pacific Forestry Week.

Prior to joining FAO, Ms. Fontein worked as a consultant for the Environment and Sustainability section of a Dutch engineering and consultancy company on natural resources management and climate change adaptation projects for both public and private sector.

Marija Spirovska-Kono completed her initial assignment with the Natural Resources and Environment group, but continues to collaborate on various forestry initiatives.

ASIA-PACIFIC FORESTRY CHIPS AND CLIPS

INDIA TARGETS FOREST COVER OF 33% OF LAND AREA BY 2020

India targets another 10 million hectares of land under forest cover by 2020. The announcement was made by the Director General of Forest Department in New Delhi, during the Indira Priyadarshini Vriksha Mitra (IPVM) awards given for afforestation and wasteland development efforts.

The forest cover in India is currently 23% of the total land area and the plan is to expand it to 33% within the next ten years. Better soil and water conservation and afforestation efforts will result in expanding agriculture, less migration to cities and improved livelihoods.

The efforts of the government of India are supplemented by plantations of poplar, eucalyptus, casuarinas, semul, gmelina among others species, in order to improve raw material supply for the paper, plywood and panel industries. NGOs are establishing plantations for fruit and medicinal plants including mango, tamarind and ebony. Established plantations of eugenia, mimusops, subabul, sissoo, neem and acacia provide timber for the construction and furniture industries.

– ITTO Tropical Timber Market Report Vol.15 No.23
1-15 December 2010 –

CHINA TO SPEND \$30 BILLION MORE ON AFFORESTATION BY 2021

China's government will earmark a total 200 billion yuan (\$30 billion) to afforestation schemes to the end of 2021, the State Forestry Administration (SFA) announced Wednesday.

The central government spent 233.2 billion yuan on the 415 million mu (27.7 million hectares) of new forests planted from 1999 to 2009, said Wu Lijun, head of afforestation in the SFA, at a press conference in Beijing. Among the total, 139 million mu were farmland returned to woodlands. Since the government started to subsidize farmers who return their farmland to woodland in 1999 to combat soil erosion in central and west China, more than 124 million farmers had been subsidized.

China had 195 million hectares of forests by the end of 2008, according to the most recent survey by the SFA. In China, forest refers to woods covering an area of more than 1 mu (0.06 hectares) with crown density — the measure of skylight blocked by plant material — at or above 20 percent, according to the SFA.

– Xinhua 19 August 2010 –

FAO ASIA-PACIFIC FORESTRY CALENDAR

8-9 August 2011. **Second Regional Forum on People and Forests, Community Forestry: Key to Solving Current and Emerging Challenges. Bangkok, Thailand.** Contact: Patrick Durst, Senior Forestry Officer, FAO Regional Office for Asia and the Pacific, 39 Phra Atit Road, Bangkok 10200, Thailand; E-mail: Patrick.Durst@fao.org

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