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## DOES BUFFER ZONE BUFFER PROTECTED AREAS?

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### BENEFITS OF COLLABORATION

In mid 1980s, when the concept of sustainable development caught up with the biodiversity conservation (Yonzon, 2004), buffer zone management emerged as spin-off with the devolution of resource use rights to local communities. The twin objectives of buffer zone are to ensure the ecological integrity of protected areas and to enable local communities to sustain their livelihood through active management of natural resources outside the park. Therefore, the strategy of buffer zone in protected area is ambitious and many anticipate that it may resolve the much contested linkages between diminishing societal support for protected areas and the conservation of biodiversity (Sanderson & Redford, 2003).

Despite the global failure of ICDP (integrated conservation and development program), social capital has been rapidly gaining its ground in long-term conservation, which involves ecology, economic forecast and social strata. Unless these three fundamentals can be synthesized as one, forecasting scenarios and sustaining development activities to safeguard biodiversity, will remain difficult because of lack of accuracy and precision in what we want and what we are doing now (Yonzon, 2006). In 2005, Resources Himalaya Foundation (RHF) together with the faculties of environmental sciences, sociology/anthropology and economics of Tribhuvan University, have had consultations to triangulate issue on ecology, sociology and economics in protected areas in Nepal. The outcome was a consensus that RHF along with Tribhuvan University and Department of National Parks and Wildlife Conservation need to collaborate as a team to synthesize over 37 dissertations over three years of study (2006 – 2008) to forecast scenarios in biodiversity conservation in Chitwan, which do not exist today. By doing so, the project envisaged that many benefits can be realized: 1) master's level students in environment, economics and sociology/anthropology get opportunity to work in the current situation for their dissertation work; 2) a cohort of young, trained professionals are mentored, and their services would be readily available; 3) a new set of accurate information will be available to the park management for correct decision-making.

### BUILDING BLOCKS OF CONSERVATION

Chitwan National Park (932 Km<sup>2</sup>) has buffer zone (750 km<sup>2</sup>) encompassing 35 village development committees (VDCs) and 2 municipalities where 1,400 user groups represent 510 settlements and 36,193 households. Efforts to develop community based institutional model for management of biodiversity conservation and development activities, buffer zone management in Chitwan has been implemented in 1996 (Bajimaya, 2005). The buffer zone management identifies issues and activities for development allied with biodiversity protection measures. Poverty has all levels of threat to biodiversity (Rijal, 1997). Approximately US \$ 3 million of the park revenue, has been disbursed through buffer zone management activities in the past. Therefore, it is necessary to understand the relationship between livelihood issues and the contemporary conservation approach.

My study is a part of a three-year program to be completed by three batches of university graduates, supported by RHF. I studied Piple buffer zone VDC of Chitwan National Park, as a case study to ascertain VDC level conservation status and sustenance (Paudyal, 2007). Piple VDC (27° 34' - 27° 35' N and 84° 39' - 84° 43' E) (elevation 250 m) lies in the alluvial plain of the Rapti River (fig.1). Prior to the 1993 flooding, Piple (1,172 ha) had 13 villages, with agricultural land (899 ha), forest (190 ha) and others (83 ha). In 2006, the population density was 368 people/ha living in 8 villages. All 622 households were composed of mixed ethnic groups, mostly dominated by Brahmin and Chhetri caste groups (DNPWC/PPP, 2001; Karmacharya et al. 2004). Some 81.7 % of the populations were literate and 84.5 % predominantly farmers. The forest had two patches (245 + 46 ha) under the Lothar Buffer Zone User Committee which has four community forest user groups; Jayahari Janachetana, Janashakti, Brahamasthani and Shanti respectively. The natural forest patch (245 ha) had riverine vegetation with *Albizia lucidor*, *Ehretia laevis*, *Trewia nudiflora* and *Dalbergia sissoo*. The smaller patch (46 ha) was planted with *Dalbergia sissoo* as it is in the flood-prone area. In these two forest patches, some 17 species of mammals including the rhino and 33 different bird species are reported (NTNC, web

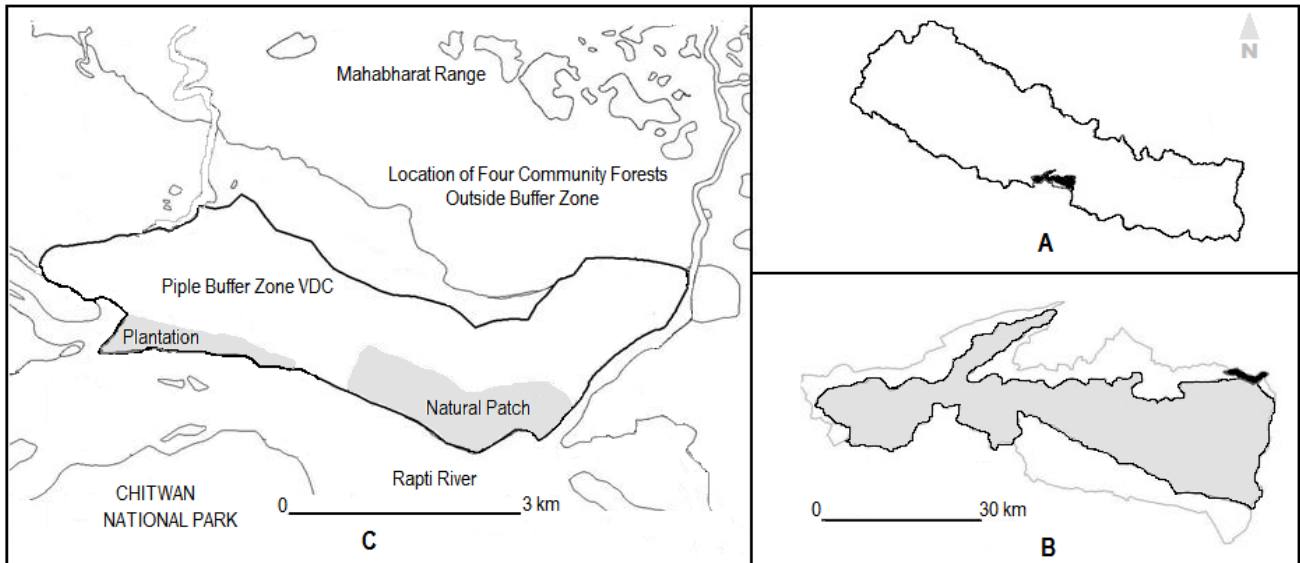


Figure 1. Study Area (A. Nepal and Chitwan National Park – dark shade) (B. Piple VDC – dark shade, Chitwan National Park—light shade, and Buffer Zone—white) (C. Piple VDC showing two patches of managed forest).

content). Forest resources are well protected and only once in a year, fuelwood (1.5 tons/household) was collected. For fodder and litter collection, a nominal fee was charged to individual household on each day.

I surveyed 65 households using random stratified sampling based on land-holding size. The vegetation survey was conducted to assess diversity and forest yield to know if they matched the household resource demand on annual basis. Using random nested plot quadrates, 13 tree plots of 20x20 m<sup>2</sup>, 26 shrub plots of 5x5 m<sup>2</sup> and 26 herb plots of 1x1 m<sup>2</sup> were sampled. The condition of forest data was analyzed, volume and biomass of tree species were estimated (FSSD, 1991; 1995) and annual yield and potential resources were calculated (HMGN, 1988a; 1988b).

#### BUFFER ZONE FOREST AND UTILIZATION

The natural patch (282 ha) had decreased by 33% (190 ha) from 1978 - 1992. Present two patches (245 ha + 46 ha) is a result of restoration by the buffer zone community and plantation in flood-prone area (NTNC, web content). Natural patch was degraded because of illegal collection of fuelwood and timber, man made fire, grazing in open and unfenced area, and emergence of invasive species (*Mikania micrantha* and *Urtica dioica*). A total of 13 tree species occurred and total live tree density was 563.46/ha whereas the total average density of cut stump was 107.69/ha. The cut stump density/ha in the natural patch (133.3 stumps) was higher than in the plantation (50 stumps). *Albizia lucidor*, *Ehretia laevis*, *Trewia nudiflora* and *Dysoxylum gobara* were the most common cut stump species in the natural patch and *Dalbergia sissoo*, *Bombax ceiba* and *Ehretia laevis* in the plantation. Although regulated, lopping intensity in plantation was higher than in the natural patch. However, number of species

lopped in the natural patch was higher than in the plantation.

#### WHO NEEDS FOREST MORE?

Household with large farms required more green fodder as they had more livestock than those of poorer households (table 1). There was a significant difference in fodder consumption between the poor (small and medium farms) and rich (big and large farms) households ( $\chi^2 = 14.48$ ; df = 1 p < 0.05).

Poorer households were more dependent on fuelwood as they have less access to biogas, electricity, kerosene and liquefied petroleum gas (LPG) (table 2). However, no significant difference was found on fuelwood consumption between poor and rich households ( $\chi^2 = 3.0$  df = 1 p > 0.05). The indifference was due to free access to park resources to the poor while willingness to adopt new energy sources was more for the rich. All household predominantly use park resources for fodder and fuelwood (table 3). Of these, pressing needs were evident in poorer household (table 4). Large farms get their fodder and fuelwood from outlying community forests and from their own land.

#### HOW GOOD IS BUFFER ZONE FOREST?

The demand for fodder and fuelwood was estimated to be 15,244.3 t/yr and 2079.2 t/yr respectively and yields were 473.4 t/yr and 572.3 t/yr, suggesting a deficit of 14,771 t/yr of fodder and 1,507 t/yr of fuelwood (table 5). Forest yield and demand for forest products did not match and deficits were met through park resources and four community forest outside the buffer zone. Buffer zone forest was degraded because both tree and leaf biomass were subjected to over harvest. As all household irrespective of their land

Table 1. Household livestock status and fodder consumption.

Farm Size	No. of HH	Yearly Fodder Consumption		Total Fodder( kg/yr)
		Livestock unit/HH (kg/Livestock unit)		
Small (0-03 ha)	25	3.05	4470.51	341,100 (26.2%)
Medium (0.3-0.6 ha)	16	3.25	5069.44	264625 (20.3%)
Big (0.6-2.4 ha)	21	5.22	5391.07	591,400 (45.5%)
Large ( >2.4 ha)	3	5.1	6560.46	100,375 (7.7%)

Table 2. Percentage of household using different types of energy sources and fuelwood consumption.

Farm Size	Kerosene	Electricity	Biogas	LPG	Fuelwood in kg/Person (mean family size)
Small	80.00	48.00	—	12.00	661.11 (5.7)
Medium	87.50	62.50	6.25	31.25	374.96 (7.3)
Big	80.95	90.48	28.57	19.05	424.05 (8)
Large	66.67	100.	33.33	66.67	134.4 (8.3)

Table 3. Average household resources consumption pattern.

Sources	Fodder (kg/yr)	Fuelwood (kg/yr)
Buffer zone community forest	193025 (14.88)	52600 (24.57%)
National Park	645775 (49.77)	101660 (47.49%)
Private land	219100 (16.89)	6905 (3.23%)
Outside community forest	188750 (14.55)	61630 (28.79%)
Total	1297500	214045

Table 4. Household resources dependency on the park resources.

Farm Size	Fodder from the Park		Fuelwood from the Park	
	% Dependent HH	% Consumed	% Dependent HH	% Consumed
Small	56	69.22	80	54.87
Medium	75	59.53	75	55.74
Big	76.19	42.64	71.43	34.76

holding size, need more fodder and fuelwood. To cope with the demand, over 55% of sampled buffer zone households were found to be members of four community forest user groups outside the buffer zone, in the Mahabharat Range (fig.1c) These outlying community forests have undoubtedly helped the buffer zone management, but one household representing two user groups certainly makes equitable sharing of resources, a complex issue.

#### NO ROAD MAP ON SUSTAINABILITY

Villagers strongly felt that buffer zone forest management was not faring well. Although a majority of households suggested more plantation (15.3%) and transparency (13%) in managing forest, there was no acceptance and debate by the management regarding deficit in their forest yield and

concurring damages to park resources through extraction.

The dangers of conservation planning based on poor quality information affect conservation itself because of ill priorities (Blake and Hedges, 2004). Therefore, how to cope with forest resource demand is fundamental question to maintain the ecological integrity of Chitwan National Park. Truly, the Piple VDC can not be a successful example of a functional buffer zone because village needs and demand hurt the Park.

#### RIGHT TO INFORMATION

This paper raises more questions and provides a few answers on the 10 year old buffer zone management. Can Piple VDC represent the distress call for all other

Table 5. Annual demand (tons air dry) and supply situation of fuelwood and fodder in Piple.

Forest Area (ha)	291
Stem Yield (t/yr)	416.55
Branch Yield (t/yr)	281.83
Potential Fuelwood supply from BZCF (t/yr)	572.31
Estimated Fuelwood extraction from BZCF (t/yr)	689.57
Total household Fuelwood Need (t/yr)	2079.21
Deficit Fuelwood (t/yr)	<b>-1506.90</b>
Total household green fodder need (t/yr)	15244.27
Estimated green fodder extraction from BZCF (t/yr)	2137.04
Potential green fodder supply from BZCF (t/yr)	473.43
Deficit green fodder (t/yr)	<b>-14770.8</b>

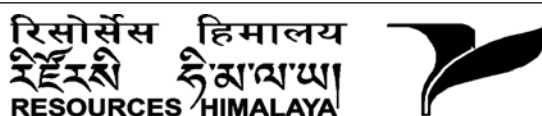
VDCs in Chitwan? If not, which VDCs show that they are self-reliant and what makes them tick? What are the ecological standards for buffer zone VDCs? Who keeps the book on the loss of ecological integrity of the Park? Perhaps buffer zone is like any other area in Nepal where poverty prevails in the absence of good governance and transparency. Enshrined in the

Constitution of Nepal, "right to information" is a fundamental right of the Nepalese. Therefore, an early warning system based on ecology, is warranted. We must ask why buffer zone, if it does not buffer Nepal's protected areas? In this regard, knowing what works for the poor and biodiversity conservation is vital for the buffer zone communities and their wellbeing.

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