PARK-PEOPLE INTERFACE: A CASE STUDY OF AYODHYAPURI VDC, CHITWAN, NEPAL

Anita Pant* and **Shivraj Bhatta****
*Central Department of Environmental Science, Tribhuvan University,Kathmandu, Nepal.
**World Wide Fund for Nature (WWF), Baluwatar, Kathmandu, Nepal.

Abstract: The study in Ayodhyapuri Village Development Committee in Buffer Zone of Chitwan National Park revealed that the main source of energy is fuel wood, most of which is supplied from Buffer Zone Community Forestry (BZCF) and Chitwan National Park (37.93%) and partially from private land (2.15%). Agriculture was main source of livelihood among the villagers. Fuel wood consumption per household was found to be 3516.11 kg per year in the study area. Landless and low-income households were found using more fuel wood from BZCF and National Park. The root problems in the study area are the maximum extraction of fuel wood and fodder from the CF and National Park, and the crop depredation by wildlife. The depredation of the crop by wildlife is one of the major barriers influencing the conservation attitude of local people. The CF is rich in biodiversity as revealed by presence of 36 species of trees, 54 species of shrubs and 66 species of herbs. *Shorea robusta* is the most dominating species in both trees and shrub strata whereas *Imperata cylindrica* is the most frequent herbaceous species.

Key words: Buffer zone; Biodiversity; Socio-economy; Vegetation; Park and people.

INTRODUCTION

Buffer zone is defined as an area in a reserve surrounding the central core zone, in which non-destructive human activities such as ecotourism, traditional (low intensity) agriculture, or extraction of renewable natural products are permitted (Groom et.al, 2006). The buffer zone is an incremental step in effort to employ participatory methods and collaborative management in biodiversity conservation, and to shift the paradigm of 'Protection of the park from the people' towards 'Protection of the park through the people' (Budhathoki, 2005). Traditionally, National Parks and Reserve management has focused on protected areas only and rarely does park authority have jurisdiction of the land outside park boundaries. However, conservation of biological diversity inside protected areas is possible only if productive forests outside protected areas are also managed sustainably (Oldfield, 1988). The buffer zone is supposed to reduce biotic pressure in core areas and to improve the socio-economic conditions of buffer zone communities by strengthening and mobilizing community-based buffer zone institution. There is a close linkage between forestry and rural people in Nepal where people from rural area mostly depend on the forest resources to meet their fuel wood, fodder and timber need. Over 95% of the Nepali population directly depends on the forests for their need of timber and non-timber forest products (Gautam, 2006). Threats in Chitwan National Park are mainly due to excessive poverty around the park and the lack of alternatives that force local people to intrude park's resources and degrade forest in and around CNP (NTNC, 1996). Mostly five different types of Park–People conflicts are noted in CNP namely, illegal extraction of park resources by people, livestock grazing, hunting and fishing, crop raiding by wild animals and loss of human life due to wild animals (Nepal and Weber, 1993). Due to excessive depredation of crops by animals such as rhino, deer, elephant, etc., people near CNP are forced to take action against them. Wildlife resources that are scarce and diminishing fast require human intervention with three fundamental steps to reconsolidate their resilience: explore, secure and maintain. Despite its several successes in biodiversity conservation, threats to sustainable biodiversity conservation in Chitwan continue to exist in many forms and at different scales (Budhathoki, 2005).

Chitwan National Park, established in 1973, is world renowned for its unique diversity of flora and fauna. The biological richness of the park encompasses eight ecosystem types, five wetlands and three main river system habitats. The floral diversity consists of more than 600 plant species including 10 endemic species. The faunal diversity of the park consists of 56 species of mammals, 539 species of birds, 47 species of reptiles, 9 species of amphibians and 126 species of fishes. Major vegetation types are Sal forest, Tropical mixed hardwood forest (Khair-sissoo), riverine forest and grasslands. The park is especially renowned for the protection of endangered one- horned rhinoceros, tiger and Gharial crocodile. The park also secures population of endangered species of wild gaury, wild elephant, four horned antelope, striped hyena, pangolin, Gangetic dolphin, monitor lizard and python (Basnyat, 1999). The research was carried

Author for Correspondence: Anita Pant, Central Department of Environmental Science, Tribhuvan University, Kathmandu, Nepal. Email: anitapant11@gmail.com.

out in the Ayodhyapuri Village Development Committee (V.D.C.) which is located in the buffer zone. The research aimed to determine socio-economic status of the local people and its impact in forest resource utilization as well as to document the vegetation of buffer zone community forest.

MATERIALS AND METHODS

Vegetation Survey:

In order to design the survey, the maps of the forest patches were prepared and systematic random points were generated within the patches at an interval of 500 m using GIS. The latitude and longitude of these random points were noted with the help of GPS, the points were located in the field. Those points which are found to be inside the buffer zone community forest were selected to conduct the vegetation survey. Vegetation analysis carried out at 25 locations. The number of plots surveyed for trees, shrubs and herbs were 25, 50 and 50 respectively. Survey represents all three buffer zone community forests of Ayodhyapuri village.

Plot Design:

At each sampling points, altogether five plots were laid out. Quadrate plot of 20 m x 20 m were laid to study tree species. Within the tree plot, nested plot of 5 m x 5 m were laid on the opposite corners to study shrub. Similarly, for herb species 1 m x 1 m plots nested in shrub plots were laid. All tree species having diameter at breast height (dbh) greater than 10 cm were taken into account within 20 m x 20 m plot. Dbh and height of all trees were measured with the help of dbh tape and clinometers, respectively. Density, relative density, frequency, relative frequency, basal area, relative basal area, importance value index, diversity index, species richness index, dominance and similarity index were also calculated using Zobel et. al (1987). The stand size classification is presented in Table 1, based on standards of the Forest Inventory Division (FSRC, 1995).

Table 1: Stand size classification

Symbol	Stand Size	Dbh (cm)
1	Sapling	<12.5
2	Poles	12.5 – 25
3	Small saw timber	25 – 50
4	Large saw timber	> 50

Socio-economic Survey:

The sample size (n) of the household in the study area was determined by using statistical formula given below (Arkin and Colton, 1963; cited in Sharma, 2000); at 95% confidence level.

$$n = \frac{NZ^2 P(1-P)}{Nd^2 + Z^2 P(1-P)}$$

Where, n = sample size, N= total number of households, Z= confidence level (at 95% level z=1.96), P=estimated population proportion (0.05, this maximize the sample size), d=error limit of 5% (0.05)

Set questionnaires were developed to collect data related on household information, buffer zone community forest and buffer zone management issues and rhino/ wildlife related issues. The survey was conducted by direct interview with household member using structured and semi structured questionnaire with some close ended and some open-ended questions.

Data Analysis:

The quantitative data obtained from the field was analyzed using Statistical Package for Social Sciences (SPSS) and Microsoft Excel.

RESULTS AND DISCUSSION

Socio-economic Survey:

Most of the population was predominately students (35.6%). About 16.2% of the total population was engaged in both agriculture and household work followed by 15.4% in agriculture as their main occupation. Only 2.6% of total population work in government service, 0.9% had small business along with agriculture and 9.7% went to foreign for earnings. Households were predominantly farmers. The percentage of population working in Government service is 2.6 which is less as estimated by DNPWC/PPP (2000). The population involved in the business 0.9 % is comparatively much lower than given by DNPWC/PPP, 2000 at VDC level (5.7%). On the other hand, population going outside the country for job has significantly increased as compared to report of DNPWC/PPP (2000), at that time nobody had gone outside the country for remittance.

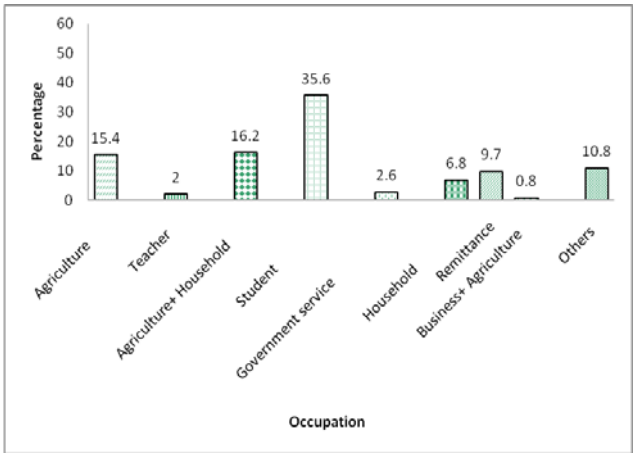

Fig. 1: Distribution of population by occupation.

The study shows that most dominant population is Brahmin and Chettri living as joint family (35.21%) followed by dalits (16.90%). The percentage of population living in joint family (66.19%) was higher than those living in a nuclear

family (Table 2). Likewise, majority of the Brahmin/Chettri were found to live in a joint family than other ethnic groups.

Table 2: Family structure based on ethnicity in Ayodhyapuri VDC.

Caste	Family structure		Total
	Nuclear	Joint	
Brahmin/ Chettri	12 (16.90)	25 (35.21)	37 (52.11)
Gurung/Magar/Tamang	1(1.40)	8 (11.26)	9 (12.67)
Newar	1(1.40)	1 (1.40)	2 (2.82)
Tharu	-	1(1.40)	1 (1.40)
Dalit	9 (12.67)	12 (16.90)	21 (29.57)
Bote	-	1 (1.40)	1 (1.40)
Total	**24 (33.8)**	**47 (66.19)**	**71 (100)**

Data in parenthesis are in percent.

Table 3 shows the distribution of households by farm size. The population of landless households were 5.63%, which is higher when compared with report of DNPWC/PPP (2000) (3.9%), indicating the number of landless has increased in the area. Similarly, the population having 10-20 katta (1 katta = 0.034 ha) were 46.48% and that having greater than four bigha (1 bigha = 0.68 ha) were 2.81%, has increased than that given by DNPWC/PPP (2000) 34.1% and 1.6%, respectively.

Table 3: Distribution of households by farm size.

Categories	Scale	Scale in ha	Percentage of HH
Landless	0 katta	0	5.63
Small farm	0-10 katta	0-0.34	29.58
Medium farm	10-20 katta	0.34-0.68	46.48
Big farm	1-4 bigha	0.68-2.72	15.49
Very big farm	>4 bigha	>2.72	2.81

Fuel wood Consumption and Sources:

Buffer zone community forest, National Park and personal land were the main sources of households' fuel wood. The annual consumption of fuel wood of the sampled household was found to be 249,644 kg. Of this, buffer zone community forest fulfilled most of the demand (59.92%) followed by National Park (37.93 %). According to DNPWC/ PPP (2000), 44.7% of fuel wood was supplied by National Park but the present study shows that the collection has decreased to 37.93 % indicating that there is less pressure on park compared to past. Previous reports showed no fuel wood was supplied from private land (DNPWC/PPP, 2000) whereas present research showed that 2.15% is supplied by private land.

In average, fuel wood consumption per household was found to be 3516.11 kg per year in the study area. The per capita fuel wood consumption was found high among the landless (1051.62 kg/person/yr) and small farm households (883.64 kg/person/yr) (Table 4). The study shows that the consumption of fuel wood was related with the family size. This is because landless and small farm households were more dependent on fuel wood as they have less access to biogas, kerosene and other sources of energy.

The average fodder consumption in study area was estimated to be 895.52 kg per year per livestock unit (LSU) i.e 2.45 kg/ day/LSU. It was observed that fodder consumption increased with increase in LSU except for medium farm (Figure 2). The very big farm households had higher consumption of fodder than small farm size households. Very big farm had highest value of daily fodder consumption i.e 4.01 kg/day/ LSU. Households with large farm required high amount of fodder as they had comparatively large number of livestock than the small farm households.

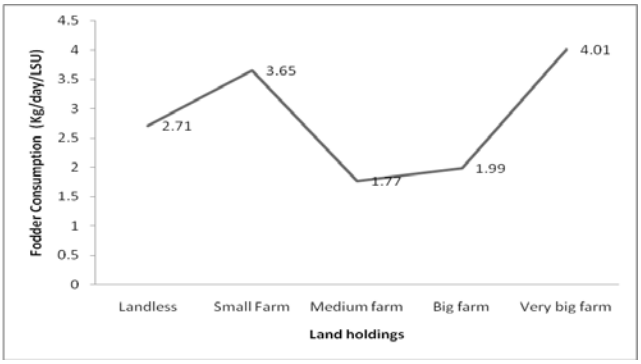

Fig. 2: Fodder consumption (kg/day/LSU) in Ayodhyapuri VDC

Table 4: Per capita fuelwood consumption (FWC) per household in Ayodhyapuri VDC.

Land Category	Total HH	Total Family Size	FWC (Kg/yr)	FWC(Kg/HH/yr)	FWC(Kg/person/yr)
Landless	4	26	27342	6835.5	1051.62
Small farm	21	97	85713	4081.57	883.64
Medium farm	33	142	96824	2934.06	681.86
Big farm	11	74	35029	3184.45	473.36
Very Big farm	2	12	4736	2368.00	394.66
Total	**71**	**351**	**249644**	**3516.11**	**711.24**

Impacts of Wild Animals on Local Community:

The entrance of rhino, elephant and wild boar was reported frequently in the field. Other wild animals such as tiger, deer, bear, monkey, fox, peacock, etc. were also noted to occur. Local people residing in the vicinity of buffer zone forest and core areas were adversely affected due to livestock and crop depredation.

There was higher pressure on crop raiding by wildlife. Of total respondents, 78.87% agreed that wildlife damage their crops and only 5.63% did not have damage to their crops because either they did not have agricultural land or protected it well by guarding the crop. The crop damage was not merely by feeding but also due to trampling during grazing crops. Rhino preferred to feed on mature paddy and wheat, and usually come solitarily in the field but sometimes accompanied by their calves. On the other hand, deer mostly fed on young plants of paddy, maize, wheat, oil seeds and potatoes.

Thus, they have considerable damage to crops. Many respondents said that they had given up growing wheat because of its heavy destruction, mainly by rhino. Feeding on the agricultural crop by wild animals generally occurred from eight in the night to dawn. Problems made by them as quoted by respondents are shown in Table 5.

Table 5: Problems created by wild animals.

Problems by Wild Animals	No. of HH	Percentage
Crop Damage	56	78.87
Crop Damage+ Livestock Loss	8	11.26
Livestock Loss+ Human Injury	1	1.41
Human Injury/Loss	2	2.82
None	4	5.63
Total	**71**	**100**

Table 6: Quantitative status of tree species in the community forests of Ayodhyapuri VDC.

S.N.	Species	D (no./ha)	RD (%)	F (%)	RF (%)	BA (m^2/ha)	RBA (%)	IVI
1	*Shorea robusta*	99.00	41.60	80.00	17.7	14.63	54.33	113.62
2	*Anogeissus latifolius*	24.00	10.08	52.00	11.5	2.82	10.47	32.06
3	*Terminalia alata*	11.00	4.62	36.00	7.96	3.04	11.28	23.87
4	*Syzygium cumini*	10.00	4.20	28.00	6.19	0.67	2.49	12.88
5	*Mallotus philippensis*	11.00	4.62	16.00	3.54	0.46	1.71	9.87
6	*Semecarpus anacardium*	10.00	4.20	20.00	4.42	0.27	1.00	9.63
7	*Acacia catechu*	9.00	3.78	20.00	4.42	0.22	0.82	9.02
8	*Schleichera oleosa*	5.00	2.10	16.00	3.54	0.66	2.45	8.09
9	*Desmodium oojeinense*	5.00	2.10	16.00	3.54	0.57	2.12	7.76
10	*Antidesma acidum*	4.00	1.68	8.00	1.77	1.16	4.31	7.76
11	*Glochidion velutinum*	5.00	2.10	16.00	3.54	0.28	1.04	6.68
12	*Bombax ceiba*	3.00	1.26	8.00	1.77	0.61	2.26	5.30
13	*Lagerstroemia parviflora*	4.00	1.68	12.00	2.65	0.21	0.78	5.12
14	*Dillenia pentagyna*	5.00	2.10	12.00	2.65	0.08	0.29	5.05
15	*Toona ciliata*	3.00	1.26	8.00	1.77	0.38	1.41	4.44
16	*Bauhinia purpurea*	3.00	1.26	12.00	2.65	0.04	0.15	4.06
17	Mitragyna parviflora	3.00	1.26	8.00	1.77	0.09	0.33	3.36
18	*Dalbergia latifolia*	2.00	0.84	8.00	1.77	0.06	0.22	2.83
19	*Cassia fistula*	2.00	0.84	8.00	1.77	0.03	0.11	2.72
20	*Spondias pinnata*	2.00	0.84	8.00	1.77	0.02	0.07	2.68
21	*Careya arborea*	2.00	0.84	4.00	0.88	0.15	0.56	2.28
22	*Bauhinia vahlii*	2.00	0.84	4.00	0.88	0.05	0.18	1.91
23	*Dalbergia sissoo*	2.00	0.84	4.00	0.88	0.03	0.11	1.84
24	*Leea crispa*	1.00	0.42	4.00	0.88	0.08	0.29	1.60
25	*Terminalia bellirica*	1.00	0.42	4.00	0.88	0.07	0.26	1.57
26	*Alstonia scholaris*	1.00	0.42	4.00	0.88	0.05	0.18	1.49
27	*Litsea monopetala*	1.00	0.42	4.00	0.88	0.04	0.15	1.45
28	*Ficus semicordata*	1.00	0.42	4.00	0.88	0.04	0.15	1.45
29	*Duabanga grandiflora*	1.00	0.42	4.00	0.88	0.03	0.11	1.42
30	*Wendlandia puberula*	1.00	0.42	4.00	0.88	0.02	0.07	1.38
31	*Cleistocalyx operculatus*	1.00	0.42	4.00	0.88	0.02	0.08	1.38
32	*Swida oblonga*	1.00	0.42	4.00	0.88	0.02	0.07	1.38
33	*Wendlandia exserta*	1.00	0.42	4.00	0.88	0.01	0.04	1.34
34	*Phyllanthus emblica*	1.00	0.42	4.00	0.88	0.01	0.04	1.34
35	*Bridelia retusa*	1.00	0.42	4.00	0.88	0.01	0.04	1.34

Note: D = Density, RD = Relative density, F= Frequency, RF= Relative frequency, BA= Basal Area, RBA= Relative Basal Area, IVI= Important Value Index.

Table 7: Quantitative studies of shrub species in the community forests of Ayodhyapuri VDC.

S.No.	Species	Density (no./ha)	RD (%)	Frequency	RF (%)
1	*Shorea robusta*	3584.00	18.15	46.00	9.96
2	*Phoenix humilis*	1480.00	7.49	46.00	9.96
3	*Leea crispa*	2720.00	13.77	36.00	7.79
4	*Viburnum nervosum*	832.00	4.21	24.00	5.19
5	*Curcuma aromatic*	1160.00	5.87	22.00	4.76
6	*Eupatorium adenophorum*	640.00	3.24	16.00	3.46
7	*Woodfordia fruticosa*	400.00	2.03	16.00	3.46
8	*Syzygium cumini*	504.00	2.55	14.00	3.03
9	*Dillenia pentagyna*	416.00	2.11	14.00	3.03
10	*Colebrookea oppositifolia*	568.00	2.87	12.00	2.59
11	*Mallotus philippensis*	296.00	1.49	12.00	2.59
12	*Acacia catechu*	456.00	2.31	12.00	2.59
13	*Bauhinia vahlii*	376.00	1.90	12.00	2.59
14	*Desmodium oojeinense*	360.00	1.82	10.00	2.16
15	*Xeromphis spinosa*	304.00	1.54	10.00	2.16
16	*Eulaliopsis binata*	1144.00	5.79	8.00	1.73
17	*Indigofera cylindracea*	320.00	1.62	8.00	1.73
18	*Phyllanthus emblica*	312.00	1.58	8.00	1.73
19	*Musa balbisiana*	256.00	1.29	8.00	1.73
20	*Bambusa nutans*	448.00	2.27	6.00	1.30
21	*Thalictrum chelidonii*	168.00	0.85	6.00	1.30
22	*Dalbergia latifolia*	104.00	0.53	6.00	1.30
23	*Litsea monopetala*	184.00	0.93	6.00	1.30
24	*Glochidion velutinum*	136.00	0.69	6.00	1.30
25	*Terminalia alata*	120.00	0.61	6.00	1.30
26	*Lagerstroemia parviflora*	184.00	0.93	6.00	1.29
27	*Desmodium confertum*	144.00	0.73	4.00	0.87
28	*Bridelia retusa*	32.00	0.16	4.00	0.87
29	*Buddleja asiatica*	144.00	0.73	4.00	0.87
30	*Imperata cylindrica*	184.00	0.93	4.00	0.87
31	*Grewia sapida*	88.00	0.45	4.00	0.87
32	*Antidesma acidum*	88.00	0.45	4.00	0.87
33	*Stereospermum chelonoides*	80.00	0.41	4.00	0.87
34	*Costus speciosus*	80.00	0.41	4.00	0.87
35	*Murraya koenigii*	208.00	1.05	4.00	0.87
36	*Toona ciliate*	240.00	1.21	4.00	0.87
37	*Barleria cristata*	112.00	0.57	4.00	0.87
38	*Gaultheria hookeri*	120.00	0.61	4.00	0.87
39	*Dalbergia sissoo*	88.00	0.45	4.00	0.87
40	*Zizyphus xylopyrus*	72.00	0.36	4.00	0.87
41	*Cassia tora*	112.00	0.57	4.00	0.87
42	*Ficus semicordata*	192.00	0.97	2.00	0.43
43	*Cleistocalyx operculatus*	24.00	0.12	2.00	0.43
44	*Semecarpus anacardium*	16.00	0.08	2.00	0.43
45	*Blumea balsamifera*	24.00	0.12	2.00	0.43
46	*Bombax ceiba*	56.00	0.28	2.00	0.43
47	*Anogeissus latifolius*	56.00	0.28	2.00	0.43
48	*Asparagus racemosus*	16.00	0.08	2.00	0.43
49	*Cassia fistula*	8.00	0.04	2.00	0.43
50	*Thysanolaena maxima*	16.00	0.08	2.00	0.43
51	*Cassine glauca*	16.00	0.08	2.00	0.43
52	*Wendlandia exserta*	16.00	0.08	2.00	0.43
53	*Lyonia villosa*	40.00	0.20	2.00	0.43
54	*Anthocephalus chinensis*	8.00	0.04	2.00	0.43

Note: D= Density, RD=Relative Density, RF=Relative Frequency.

Table 8: Quantitative status of herb strata in the community forests of Ayodhyapuri VDC.

S.No.	Species	D(no./ha)	RD (%)	Frequency	RF (%)
1	*Imperata cylindrical*	55800.00	30.56	42.00	9.81
2	*Shorea robusta*	16000.00	8.76	28.00	6.54
3	*Phoenix acaulis*	7600.00	4.16	26.00	6.07
4	*Eulaliopsis binata*	10800.00	5.90	20.00	4.67
5	*Phoenix humilis*	4800.00	2.63	18.00	4.21
6	*Pogonatherum crinitum*	12800.00	7.01	16.00	3.74
7	*Curcuma aromatica*	3800.00	2.08	14.00	3.27
8	*Dioscorea bulbifera*	2600.00	1.42	14.00	3.27
9	*Smilax ovalifolia*	1200.00	0.66	12.00	2.80
10	*Monochoria vaginalis*	3400.00	1.86	12.00	2.80
11	*Leea crispa*	1600.00	0.88	10.00	2.34
12	*Xeromphis spinosa*	2000.00	1.09	10.00	2.34
13	*Trachelospermum lucidum*	2600.00	1.42	10.00	2.34
14	*Viburnum nervosum*	2000.00	1.09	10.00	2.34
15	*Terminalia alata*	1400.00	0.77	8.00	1.87
16	*Piper longum*	5400.00	2.96	8.00	1.87
17	*Indigofera cylindracea*	1000.00	0.55	6.00	1.40
18	*Swida oblonga*	600.00	0.33	6.00	1.40
19	*Antidesma acidum*	600.00	0.33	6.00	1.40
20	*Boehmeria sps.*	1200.00	0.66	6.00	1.40
21	*Flemingia chappar*	1400.00	0.77	6.00	1.40
22	*Cissampelos pareira*	1200.00	0.66	6.00	1.40
23	*Heteropogan contortus*	2200.00	1.20	6.00	1.40
24	*Commelina* sps.	600.00	0.33	6.00	1.40
25	*Coccinea grandis*	600.00	0.33	6.00	1.40
26	*Woodfordia fruticosa*	800.00	0.44	4.00	0.93
27	*Bambusa nutans*	2800.00	1.53	4.00	0.93
28	*Syzygium cumini*	800.00	0.44	4.00	0.93
29	*Cyperus rotundus*	2200.00	1.20	4.00	0.93
30	*Thalictrum chelidonii*	600.00	0.33	4.00	0.93
31	*Blumeopsis flava*	4800.00	2.60	4.00	0.93
32	*Dalbergia latifolia*	400.00	0.22	4.00	0.93
33	*Asparagus racemosus*	400.00	0.22	4.00	0.93
34	*Mallotus philippensis*	800.00	0.44	4.00	0.93
35	*Caryoto urens*	1200.00	0.66	4.00	0.93
36	*Toona ciliate*	1000.00	0.55	4.00	0.93
37	*Eleusine indica*	1400.00	0.77	4.00	0.93
38	*Phyllanthus emblica*	400.00	0.22	4.00	0.93
39	*Dichanthium sps.*	600.00	0.33	4.00	0.93
40	*Glochidion velutinum*	1200.00	0.66	4.00	0.93
41	*Cynodon dactylon*	600.00	0.33	4.00	0.93
42	*Barleria cristata*	4200.00	2.30	4.00	0.93
43	*Zizyphus xylopyrus*	400.00	0.22	2.00	0.47
44	*Thespesia lampas*	600.00	0.33	2.00	0.47
45	*Pouzolzia zeylanica*	400.00	0.22	2.00	0.47
46	*Murraya koenigii*	200.00	0.11	2.00	0.47
47	*Bauhinia vahlii*	200.00	0.11	2.00	0.47
48	*Galium hirtiflorum*	600.00	0.33	2.00	0.47
49	*Quercus glauca*	200.00	0.11	2.00	0.47
50	*Persicaria barbata*	400.00	0.22	2.00	0.47
51	*Rungia parviflora*	200.00	0.11	2.00	0.47
52	*Trichilia connaroides*	200.00	0.11	2.00	0.47
53	*Osyris wightiana*	2000.00	1.09	2.00	0.47
54	*Dillenia pentagyna*	200.00	0.11	2.00	0.47
55	*Cassine glauca*	200.00	0.11	2.00	0.47
56	*Litsea monopetala*	600.00	0.33	2.00	0.47
57	*Phyllanthus urinaria*	200.00	0.11	2.00	0.47
58	*Emilia sonchifolia*	200.00	0.11	2.00	0.47
59	*Mimosa pudica*	400.00	0.22	2.00	0.47
60	*Trichodesma indicum*	600.00	0.33	2.00	0.47
61	*Eupatorium adenophorum*	200.00	0.11	2.00	0.47
62	*Bombax ceiba*	400.00	0.22	2.00	0.47
63	*Crotalaria prostrata*	1000.00	0.55	2.00	0.47
64	*Trifolium sp.*	3200.00	1.75	2.00	0.47
65	*Blumea balsamifera*	1400.00	0.77	2.00	0.47

Vegetation Analysis

A total of 35 tree species from 19 families were found. The density, relative density, frequency, relative frequency, basal area, relative basal area and IVI value of tree species is presented in Table 6. The study shows higher density of *Shorea robusta* followed by *Anogeissus latifolius*. Highest IVI of *Shorea robusta* shows that it is predominant ecologically important species. Similarly, *Anogeissus latifolius* comprised the second highest IVI. This indicates that the forest type is predominantly *Shorea-Anogeissus* type in the study area.

From the stand size classification of observed trees, a high percentage of poles (31.51 %) were found in the sampled plot. Small timber size stand contributes 30.25% and large saw timber only 16.81%. Study showed that high number of pole-size tree was found and there was poor representation of large saw timber in the study area indicating young forest in the area.

The research showed that *Shorea robusta* is most dominating species among shrub strata with highest density, and associated common species are *Leea crispa* and *Phoenix humilis*. Similarly, *Cassia fistula* and *Anthocephalus chinensis* were found to be least common species with density of 8 plants/ha. Highest frequency was both of *Shorea robusta* and *Phoenix humilis* i.e.46.0% followed by *Leea crispa* with frequency 36% (Table 7).

A total of 66 species of herb strata was found in the study area with total density of 182600 individual/ha (Table 8). *Imperata cylindrica* was found to be most common species with highest density (55800 individual/ha) and other common associated species were *Shorea robusta* and *Pogonatherum crinitum*. Likewise, *Imperata cylindrica* was most frequent herb species found in the study area followed by *Shorea robusta*.

CONCLUSION

Households' socio-economic status in Ayodhyapuri Buffer Zone VDC primarily depends on subsistence agricultural system. Land holding size is found to play a vital role in the well beings of local people. The study area is dominated by Brahmin/Chettri and the increasing trend of literacy rate is noted. Efforts have been made to delineate the forest resources in buffer zones under community management but have not achieved much in equal distribution of forest resources to all people in the community. The root problems in the study area are the maximum extraction of fuel wood and fodder from the CF and National Park, and the crop depredation by wildlife. The depredation of the crop by wildlife is one of the major barriers influencing the conservation attitude of local people. The CF is rich in biodiversity as revealed by presence of 36 species of tree, 54 species of shrubs and 66 species of herbs. *Shorea robusta* is the most dominating species in both trees and shrub strata whereas *Imperata cylindrica* is most frequent herbaceous species. The result shows that the forest is *Shorea-Anogeissus* type in the study area.

ACKNOWLEDGEMENT

The authors like to extend their sincere thanks to the Resources Himalaya Foundation, Kathmandu for partial funding to carry out this work. Thanks are also due to the local people of Ayodhyapuri VDC for providing information during questionnaire survey.

REFERENCES

Basnyat, B. 1999. Tourism and Sustainability: A Case study of Royal Chitwan National Park. B.Sc. dissertation, Institute of Forestry, Pokhara Campus, Pokhara, Nepal.

Budhathoki, P. 2005. Chitwan National Park: A World Heritage Site with Buffer Zone. People & Protected Areas in South Asia, IUCN/ Resources Himalaya Foundation, Kathmandu, Nepal.

DNPWC/PPP, 2000. *Chitwan National Park and Buffer zone Resource Profile*. Department of National Parks and Wildlife Conservation/ Park and People Program, Kathmandu, Nepal.

FRSC, 1995. *Forest Resources of Chitwan District, 2051*. Forest Resource and Survey Centre, Ministry of Forests and Soil Conservation, Kathmandu, Nepal Publication No. 62.

Gautam, K.H., 2006. Forestry, politicians and power-perspectives from Nepal's Forest Policy. *Forest Policy and Economics*, **8**: 175-182.

Groom, M.J., Meffe, G.K., Carroll, C.R., 2006. *Principles of Conservation Biology*. Third Edition. Sinauer Associates, Inc. Publishers, Sunderland, Massachusetts, U.S.A.

K.C., A., 2007. Understanding Biodiversity Conservation and Buffer Zone Vegetation in Manahari Buffer Zone Village Development Committee, Chitwan National Park. M.Sc. dissertation, Central Department of Environmental Science, Tribhuvan University, Kirtipur, Kathmandu.

Nepal, S.K. and Weber, K.E., 1993. Struggle for Existence: Park People Conflict in Royal Chitwan National Park. Studies in Regional Environmental Planning, Division of Human Settlements Development. Asian Institute of Technology, Bangkok, Thailand.

NTNC, 1996. *Chitwan National Park after Twenty Years: An Assessment of Values, Threats and Opportunities.* National Trust for Nature Conservation, Kathmandu, Nepal.

Oldfield, S., 1988. *Buffer Zone Management in Tropical Moist Forest: Case Studies and Guidelines*. IUCN, Gland, Switzerland.

Reddy, V.R. 1999. Valuation of Renewable Natural Resources User Perspectives. *Economic and Political Weekly*, **34** (23), 1435-1441.

Sharma, A., 2000. Wildlife Corridor Management: Analysis of Biodiversity and Socioeconomics in the Buffer Zone of the Royal Chitwan National Park, Nepal. M.Sc. dissertation, Asian Institute of Technology, Thailand.

Zobel, D.B., Jha, P.K., Behan, M. and Yadav, UKR., 1987. A Practical Manual for Ecology. Ratna Book Distributers, Kathmandu.

■