Local perceptions of forest rules and interactions between rules, ecotourism, and human-wildlife conflicts: Evidence from Chitwan National Park, Nepal

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ABSTRACT
There is always a conflict of interest between conservation efforts and communities living near conservation areas. Buffer zones and opportunities for ecotourism are sometimes created to lessen the negative impact of the stringent rules involved in conservation which directly impacts the livelihoods of neighbouring communities. This paper examines a Nepalese community’s perceptions of the Buffer Zone Community Forest (BZCF) rules, and investigates the interplay of rules, ecotourism, and human-wildlife conflict (HWC). Data were obtained from face-to-face household surveys and key informant interviews carried out in two Buffer Zone Villages in Chitwan National Park, Nepal. It was found that access to forest resources has become more restricted since ecotourism was introduced in the BZCF. Furthermore, contrary to expectations, settlements both closer to and farther from the forest are largely affected to the same extent by these restrictions. This study recommends better livelihood opportunities for disadvantaged groups in and around the BZCF, along with the development of forest policies based in reality to improve compliance with forest rules and to gain local support for conservation efforts.

Key words: Buffer Zone Community Forest, Chitwan National Park, Conservation policy, Ecotourism, Forest resources

INTRODUCTION

Protected areas (PAs) such as national parks (NPs) and wildlife reserves are considered an effective means of conserving biological diversity (Katel and Schmidt-Vogt 2011; Wells et al. 1992). In addition to ensuring biodiversity and ecosystem benefits, PAs assist in reducing poverty (den Braber et al. 2018; CBD 2008). Internationally, PAs incorporate various governance systems, including public governance, private governance, and local communities (Mitchell et al. 2018). However, PAs around the world have historically followed a conventional and exclusionary top-down approach, as exemplified by the world’s first PA, Yellowstone National Park (Andrade and Rhodes 2012; Wells et al. 1992). Their objectives were initially focused on global issues while disregarding those of local communities. However, this resulted in conflicts caused by conservation efforts which spread beyond the areas targeted for protection of biodiversity (Harada 2003). Communities living next to PAs have deep-rooted connections to these areas that affect their environmental, cultural, and economic sustainability. These connections make it necessary to consider their needs and attitudes while formulating policies (Rao et al. 2003; Trakolis 2001; Xu et al. 2006). According to Trakolis (2001), the establishment and management of PAs and the use of forest resources must be socially responsible and fair. When local communities are excluded from decision-making concerning PAs, and their needs and desires are ignored, it becomes difficult to apply an effective PA management strategy.

Nepal hosts 3.2 % and 1.1 % of the world’s known flora and fauna, respectively. These environmental elements are interlinked with the livelihoods and economic well-being of most Nepalese people (GoN 2014). The number of floral and faunal species have been recently updated in Nepal to include a total of 2,467 species of fungi, 792 species of lichens, 1,213 species of bryophytes, 10,204 species of insects, 238 species of mollusks, 232 species of fish, 886 species of birds, and 212 species of mammals (GoN 2018a). Of the 118 types of ecosystems in Nepal, 80 such ecosystems are protected areas thus far (GoN 2018b). An evaluation of the representativeness of ecoregions in the PAs in Nepal will help identify important areas of unique biodiversity as well as develop sustainable global policies (Shrestha et al. 2010).

The concept of the PA was introduced in Nepal with the establishment of the Royal Chitwan National Park (CNP) in 1973 and the National Parks and Wildlife...
Currently, there are twenty PAs in Nepal, including twelve national parks, six conservation areas, one wildlife reserve, and one hunting reserve, which cover 23.39% of the land area of Nepal (DNPWC 2019).

PAs in Nepal functioned initially based on a top-down approach, wherein people-oriented approaches to conservation were ignored (Sharma 2012). To gain the support of local communities in the management of PAs, the Government of Nepal enacted the fourth amendment to the National Parks and Wildlife Conservation Act in 1993 (CNP 2013; Kanel 2012), and promulgated the concept of the buffer zone (BZ) (Bhandari and Zhou, 2017). This was a significant policy transformation and tenure reform for PAs to institutionalize participatory conservation (Thing and Poudel 2017). The amendment granted authority to User Groups (UGs; comprising representatives from each household) to call meetings with various group members for discussion and agreement before preparing a work plan; these meetings focus not only on conservation, but on social development as well (GoN 1999). The intent was to promote participatory discussion to gather the local community’s input on their needs and aspirations so that a balance could be achieved between natural resource management and social development (Paudel 2007). The request to incorporate these changes in the policy was forwarded to the Buffer Zone Community Forest User Committee (BZCFUC) and the Buffer Zone Management Council (BZMC) for further consideration. The BZMC consists of a User Committee (UC), which has a representative chairperson from each User Group and all of the chairpersons of the respective UCs, along with a PA official (Paudel 2007). However, the discussions to incorporate changes are dominated by elite groups, thereby ignoring the opinions and voices of the poor and disadvantaged at the UG and UC levels (Shrestha and Nepal 2010). As the elite groups have a pro-conservation mind-set, they are supported by PA authorities (Paudel 2007). This inequitable power distribution at the UG and UC levels reduces the value of a tripartite agreement among the UG, UC, and PA, resulting in negligible benefits for the poor and disadvantaged groups. To provide maximum benefits for those

| Period     | Conservation Context                                                                                                                                                                                                 |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1846–1950  | Under the Rana regime, Chitwan valley was a hunting ground for privileged classes. Declaration of one-horned rhinoceros as royal game and establishment of stringent punishment for poachers by then Prime Minister Jung Bahadur Rana |
| until 1950 | Dense forest cover in Chitwan valley                                                                                                                                                                                  |
| after 1950 | Malaria eradication; influx of hill migrants and deforestation                                                                                                                                                         |
| 1957       | Establishment of rhino sanctuary followed by mobilization of a ‘rhino patrol’ to protect endangered Asiatic one-horned rhinos                                                                                         |
| 1959       | Declaration of Mahendra Mriga Kunja (Deer Park) by King, Mahendra by 1960                                                                                                                                              |
| 1963       | Area south of Rapti River declared a rhino sanctuary                                                                                                                                                                    |
| 1973       | The National Parks and Wildlife Conservation (NPWC) Act 1973 (2029 BS) was ratified and the Royal Chitwan National Park (RCNP) was eventually gazetted in 1973 as the first National Park in Nepal                                           |
| 1974       | Formulation of CNP Regulation 1974                                                                                                                                                                                     |
| 1975       | The Royal Nepal Army joined the Park with sole responsibility for law enforcement.                                                                                                                                     |
| 1977       | The park was extended from 544 sq km to 932 sq km.                                                                                                                                                                    |
| 1984       | CNP Declared a world Heritage site by UNESCO                                                                                                                                                                           |
| 1993       | Emergence of Buffer Zone Policy under the 4th Amendment to the NPWC Act 1973                                                                                                                                              |
| Late 1994  | Parks and People Programme started by Department of National Parks and Wildlife Conservation assisted by UNDP                                                                                                          |
| 1996       | Buffer Zone Management Regulation passed and buffer zone declared around CNP                                                                                                                                          |
| 1999       | Buffer Zone Guideline passed to provide policy and legal frameworks for the Buffer Zone programme.                                                                                                                     |

Source: (Jana 2007; Paudel, Budhathoki, and Sharma 2007)
dependent solely on forest resources, the buffer zone community and PA staff should facilitate easy access to
forest resources for forest communities (Dhakal and Thapa 2015; UNDP 2013). Furthermore, availability of livelihood 
alternatives must be ensured for maintaining cordial relations between buffer zone communities (Thapa 2015). 
Buffer Zone Community Forests (BZCFs) are of great value to local communities when the extraction of resources from 
core PAs is prohibited (Thing and Poudel 2017).

Among the various PA systems in Nepal, the CNP has 
broadly applied the buffer zone concept as a key conservation and management strategy (Dhakal and Thapa 2015). 
Since the 1990s, ecotourism has been encouraged in a few BZCFs to offer an alternative livelihood strategy for the 
people living adjacent to the PAs (Thapa 2012). The fundamental principles of ecotourism also include nature conservation, 
local community involvement, sustainable use of natural resources, and cultural preservation, which are similar to the elements of a Buffer Zone Program (Bhatt and Dhakal 2018).

According to Nepal and Weber (1995), the establishment of the park severely affected the households living 
adjacent to the forest, because they had previously enjoyed free access to the NP but were now prohibited from 
extracting resources from the park for their livelihood. Therefore, in consideration of their needs, an area of 
75,000 ha surrounding the park was declared a buffer zone in 1996. According to the CNP’s annual report for 2017–
2018, a total of 68 BZCFs around the periphery of CNP were relinquished to the local community for their 
management and utilization (CNP 2018). The Buffer Zone Management Program was implemented to gain public support for biodiversity conservation and to improve the livelihood of the buffer zone communities (Dhakal and Thapa 2015; Heinen and Mehta 2000); BZCFs represent a key land use to meet the objectives of the buffer zone concept (Jones 2007).

Local communities’ perception of PAs depends on the perceived values and benefits (Allendorf 2007; Mir et al. 
2015). The success of PAs depends on the local population’s support, reaction, and involvement (Rao et al. 2003; 
Shibia 2010). However, since conflicts might arise due to restrictions on using forest resources (Fiallo and Jacobson 
1995). Thus, understanding local communities’ perception is a crucial step toward preparing an appropriate management strategy (Allendorf 2007; Xu et al. 2006). Many studies on the CNP have utilized household surveys to assess issues, such as the supply and demand of forest products, contribution of buffer zone management to livelihood support, dependence on forest resources, and

STUDY AREA AND METHODS

Study area

The CNP is situated between 27°34’ to 27°68’ north latitudes and 83°87’ to 84°74’ east longitudes, while the 
Buffer Zone ranges from 27°28’ to 27°70’ north latitudes and 83°83’ to 84°77’ east longitudes (CNP 2016). 
According to the constitution of Nepal 2015, CNP is spread across 95,263 ha through Chitwan, Parsa, Makwanpur, and 
Nawalparashi districts in states 2, 3, and 4 of Nepal (CNP 2018). Establishment of the CNP has been successful in 
protecting the habitats of many endangered wildlife species, particularly the one-horned rhinoceros (Rhinoceros 
unicornis), Bengal tiger (Panthera tigris tigris), and Gharial crocodile (Gavialis gangeticus) (IUCN 2017).

For this study, two hamlets of two buffer zone villages in the Kumroj Buffer Zone Community Forest (KBZCF) and 
Gundrahi Dhakaha Buffer Zone Community Forest (GDBZCF) adjacent to the CNP were considered (Fig. 1).

These study sites are in the north-eastern and western parts of the CNP, located in the Kumroj and Amaltari 
villages, respectively. The forest users of these villages manage the Kumroj and Gundrahi Dhakaha BZCFs, which 
cover 697 ha and 738.40 ha, respectively. The two BZCFs are surrounded by human settlements, with 9 and 14 
hamlets, respectively, in Kumroj and Amaltari. The Kumroj and Gundrahi Dhakaha BZCFs have 9,390 and 13,586
The livelihood of the local communities mainly depends on subsistence agriculture crops like rice, maize, and wheat, and on livestock husbandry. Kumroj and Amaltari have incorporated ecotourism activity since 1996 and 2010, respectively, to improve their livelihood opportunities and reduce their dependence on forest resources.

In addition, the study sites comprise multi-ethnic and underprivileged groups. However, most of the residents around the CNP are indigenous Tharu people, who are the original residents of the Buffer Zone villages near the CNP (Table 3).

| Village | Forests       | Forest Area (ha) | Hamlets | Household | Forest users |
|---------|---------------|------------------|---------|-----------|--------------|
| Kumroj  | Kumroj        | 697              | 9       | 1682      | 9,390        |
|         |               |                  |         |           | (Female 4,641, Male 4,749) |
| Amaltari| Gundrahi Dhakaha | 738.4           | 14      | 2699      | 13,586       |
|         |               |                  |         |           | (Female 6,589, Male 6,997) |

Source: Records of respective CFUGs, (2017–2018)

Methods

Both primary and secondary data were collected for this study. Primary data were collected via face-to-face household surveys in April 2017 and January 2018. A structured questionnaire was used, with open-ended opinions of one household member considered representative of the entire household.

Before compiling the questionnaire, we made a preliminary visit to the CNP and interviewed the Assistant Conservation Officer (ACO) to identify potential research sites that could fulfil our study objectives. Based on the information gathered from the ACO, we determined that Kumroj and Amaltari share similar ecotourism activities and place greater emphasis on forest protection than do other areas, thus, providing us with a favourable baseline.
### Table 3. Basic attributes of study hamlets

| Village (Hamlet) | Total HH | HH by ethnicity | Sampled HH (Sample intensity) | HH Percentage by ethnicity | Attributes of selected Household | Land holding status | Livestock holding HH |
|-----------------|----------|-----------------|------------------------------|---------------------------|---------------------------------|--------------------|---------------------|
| Entire Hamlet (181 HH) | Brahman-Kshetri (58), Tharu (82), Janajati (34), Dalit (7) | n = 32, 17.68% | Brahman-Kshetri 6 (18.8%), Tharu 19 (59.3%), Janajati 6 (18.8%), Dalit 1 (3.1%) | No Formal education 17 (53.2%), Primary 7 (21.8%), Secondary 8 (25.0%), Tertiary 0 (0%) | Landless/ Squatters 13 (40.6%) | Private land 19 (59.4%) | 29 (90.6%) |
| Close Settlement (119 HH) | Brahman-Kshetri (38), Tharu (54), Janajati (25), Dalit (2) | n = 16, 13.45% | Brahman-Kshetri 3 (18.8%), Tharu 11 (68.7%), Janajati 2 (12.5%), Dalit 0 (0%) | No Formal education 8 (50.0%), Primary 5 (31.2%), Secondary 3 (18.8%), Tertiary 0 (0%) | Landless/ Squatters 13 (81.2%) | Private land 3 (18.8%) | 14 (87.5%) |
| Far Settlement (62 HH) | Brahman-Kshetri (20), Tharu (28), Janajati (9), Dalit (5) | n = 16, 25.81% | Brahman-Kshetri 3 (18.8%), Tharu 8 (50.0%), Janajati 4 (25.0%), Dalit 1 (6.2%) | No Formal education 9 (56.3%), Primary 2 (12.5%), Secondary 5 (31.2%), Tertiary 0 (0%) | Landless/ Squatters 0 (0%) | Private land 16 (100%) | 15 (93.8%) |
| Entire Hamlet (290 HH) | Brahman-Chhetri (46), Tharu (143), Janajati (64), Dalit (37) | n = 32, 11.03% | Brahman-Chhetri 7 (21.9%), Tharu 15 (46.9%), Janajati 5 (15.6%), Dalit 5 (15.6%) | No Formal education 14 (43.8%), Primary 5 (15.6%), Secondary 7 (21.8%), Tertiary 6 (18.8%) | Landless/ Squatters 6 (19%) | Private land 26 (81%) | 20 (62.5%) |
| Close Settlement (131 HH) | Brahman-Chhetri (4), Tharu (80), Janajati (41), Dalit (32) | n = 16, 12.21% | Brahman-Chhetri 0 (0%), Tharu 7 (43.7%), Janajati 4 (25%), Dalit 3 (18.8%) | No Formal education 7 (43.7%), Primary 3 (18.8%), Secondary 4 (25%), Tertiary 2 (12.5%) | Landless/ Squatters 6 (37.5%) | Private land 10 (62.5%) | 8 (50%) |
| Far Settlement (159HH) | Brahman-Chhetri (42), Tharu (63), Janajati (23), Dalit (5) | n = 16, 10.12% | Brahman-Chhetri 7 (43.7%), Tharu 8 (50%), Janajati 1 (6.3%), Dalit 0 (0%) | No Formal education 7 (43.7%), Primary 2 (12.5%), Secondary 3 (18.8%), Tertiary 4 (25%) | Squatters 0 (0%) | Private land 16 (100%) | 12 (75%) |

Source: Records of respective CFUGs and Household survey, (2017-2018)
We interviewed key informants among BZCF officials of both villages and gathered secondary data. Based on these interviews, two hamlets from the two villages were selected by level of community dependence on forest resources, degree of HWC, and grievances of the local community on compliance with the existing forest rules, particularly from the community dependent on forest-based resources such as fodder, fuelwood, NTFPs for household consumption, and livestock grazing. In addition, people representing all castes and groups of the ethnic community reside in these hamlets. However, our time and budget constraints prevented us from including a larger percentage of households (HHs) from the study sites, which had high population density. Nevertheless, we attempted to include people from each community and ethnicity so that they could share their valuable perceptions through the face-to-face interviews. Thus, 64 HHs were selected from 471 HHs in the two hamlets, at 13.58% sample intensity (Table 3). To analyse and compare the perceptions of the forest users of each village, we further classified the 64 HHs within the hamlets into close settlement (CS, \( n = 16 \)) and far settlement (FS, \( n = 16 \)). The respondents from both hamlets were randomly selected. The distances from the BZCF boundary with the CNP were \( \leq 500 \) meters for CSs and 501–2,000 meters for FSs.

The questionnaire was prepared in English and translated into the Nepali language. Two indigenous language interpreters were deployed in places when the indigenous people did not understand the Nepali language. One interpreter was from the Tharu community and spoke the traditional language of the Tharu, while the other interpreted the Mushahar language. The questionnaire was structured for both forest officials and users based on the following items: i) forest resource usage rules imposed after the introduction of ecotourism, ii) compliance with forest resource usage rules, iii) local communities’ perceptions of the buffer zone community forest policy, iv) local communities’ perceptions of the interplay between ecotourism and forest rules, and v) local communities’ perceptions of the impact of the forest rules on HWC. Each section consisted of several questions and statements designed to determine forest users’ perceptions of the BZCF. When the household heads were not available, household members above 18 years of age who were actively engaged in the extraction of forest resources were requested to provide their views. To explore respondents’ perceptions of forest management rules by different settlement classification factors, descriptive statistics, such as percentage and frequency, were calculated using Excel 2010.

RESULTS

Rules and regulations for using forest resources

According to the Buffer Zone Management Rules of 1996, the Forest Users Committee has the right to determine the forest resource usage rules and usage fees after receiving input regarding the needs and changes required by the UG members (NLC 1996). The existing forest rules prescribed by both study sites, obtained from a BZCF official, are presented in Table 4.

In the study areas, forest users were determined to be using the nearest BZCF mainly for gathering fodder, fuelwood, and wild vegetables such as niuro (fiddlehead fern) and sisno (nettle) for household consumption. The field study revealed that stricter rules and regulations were gradually imposed after the introduction of ecotourism activities in the BZCF. Forest users who had been freely using the BZCF to collect fodder for their livestock and fuelwood, as well as to graze their livestock, began experiencing issues due to the frequently changing new rules.

Fodder collection times and the application of fodder extraction charges were similar for both villages, but their frequency and management were different. Forest users from Kumroj were allowed to collect fodder every day in designated areas while those from Amaltari were only allowed to collect fodder once every four months for up to a month, depending on the users’ demands and requirements. However, designated areas for fodder collection were not specified. Forest users of both BZCFs were required to pay a fee for access (Kumroj: NPR 100 for 5 years; Amaltari: NPR 25 for 30 days) [USS 1 = NPR 111.7611 as of June 18, 2019]. The policy for fodder extraction was based on need, as there was a scarcity of fodder in the village during the dry season (personal communication with a BZCF official, July 2018). Forest users in both areas were permitted to harvest fodder only when no ecotourism activities were being conducted in the BZCF.

Forest users from Kumroj were permitted to collect fuelwood only one day per year between November and February, free of charge. According to forest officials, in the near future, the Kumroj BZCF is planning to completely prohibit access to fuelwood. The BZCFUC is planning to gather fuelwood and distribute it for a fee determined by their office. Amaltari forest users were permitted fuelwood collection for one day every 3–4 months, but they had to pay NPR 5 per entry. According to the forestry office staff, there is no intention to enforce stricter rules regarding fuelwood collection. Ecotourism activity in Kumroj is suspended during fuelwood collection day, while
ecotourism and fuelwood collection activities are carried out simultaneously in Amaltari. A certain area outside each BZCF was allocated for livestock grazing. Thus, newly allocated grazing land was found within the BZ area but at a distance from the local settlements. Prior to the introduction of the new grazing area, the forest users allowed their livestock to graze freely within the BZCF. According to the BZCF office secretary, each BZCF was now fenced off to prohibit livestock from accessing the forest and to protect the wildlife habitat. In addition, this boundary prevented wildlife from entering the village to reduce HWC, etc.

Compliance with forest resource usage rules

Table 5 shows that Amaltari respondents were more aware of forest resource harvesting rules than Kumroj.
respondents. Similarly, the overall awareness position shows that the CS respondents were more aware of the rules than the FS respondents. It was also determined that Amaltari respondents were more compliant with fodder extraction rules. Significant differences between the CS and FS were not observed in either hamlet in terms of obeying fodder extraction rules.

The hamlets did not differ in terms of compliance with fuelwood extraction rules. However, CS forest users showed a lesser degree of compliance than FS forest users. CS users acquired fuelwood without exposure to significant risk of being caught; they somehow managed to escape by ignoring the existing rules. Conversely, FS users followed the rules against their own will as they were at higher risk of being caught by PA authorities. Their compliance prevented them from engaging in illegal extraction, thereby affecting them more when compared to CS users.

Amaltari users were more compliant with livestock grazing rules than Kumroj users; However, there was no difference observed between CS and FS users in obeying these rules.

### Locals’ perception of imposed forest rules

Local communities’ perception of BZCF management is shown in Table 6. Most respondents agreed that conservation of the BZCF was their responsibility. A greater number of Amaltari respondents agreed that forest conditions improved after the establishment of the BZCF. Both hamlets and all settlements agreed that the forest has become denser since controls were imposed on the extraction of fuelwood and fodder, as well as on livestock grazing.

A majority of respondents (excluding FS respondents from Amaltari) were not satisfied with the current policies imposed on extraction of fodder. FS users were more likely to be caught by forest officials for illegal fodder collection, thus, inciting dissatisfaction. Similarly, most respondents seemed dissatisfied with the current policy on firewood extraction. A greater number of respondents in Amaltari were satisfied with the policy for controlling livestock grazing as compared to respondents in Kumroj. No significant difference was observed between CS and FS users in this regard.

### Locals’ perception of the interaction between ecotourism and forest rules

In ascertaining forest users’ perceptions of the BZCF, it was also necessary to examine their perceptions of the ecotourism activities conducted in these forests as well as how ecotourism has influenced the forest rules. The forest
users’ perceptions were examined using four statements to which respondents could agree or disagree (Table 7). The results demonstrate that most respondents of both hamlets agreed that accessibility to forest products that can be gathered such as fodder and fuelwood decreased after the introduction of ecotourism activities in the CF. Kumroj users believed that livestock grazing had become more restricted after the introduction of ecotourism activities. No significant differences were observed between CS and FS users. Similarly, more than 62% of respondents from both

| S/N | Statement                                                                 | Kumroj                | Amaltari              |
|-----|---------------------------------------------------------------------------|-----------------------|-----------------------|
|     |                                                                           | EH (n = 32)           | CS (n = 16)           | FS (n = 16)           | EH (n = 32)           | CS (n = 16)           | FS (n = 16)           |
| 1   | The conservation of CFs is also my responsibility                        | Agree 32 (100%)       | 16 (100%)             | 16 (100%)             | 30 (94%)              | 14 (88%)              | 16 (100%)             |
|     |                                                                           | Disagree 0 (0%)       | 0 (0%)                | 0 (0%)                | 1 (3%)                | 1 (6%)                | 0 (0%)                |
|     |                                                                           | Don’t know 0 (0%)     | 0 (0%)                | 0 (0%)                | 1 (3%)                | 1 (6%)                | 0 (0%)                |
| 2   | Forest conditions are getting better after the establishment of CFs       | Agree 27 (85%)        | 14 (88%)              | 13 (81%)              | 29 (91%)              | 14 (88%)              | 15 (94%)              |
|     |                                                                           | Disagree 1 (3%)       | 1 (6%)                | 0 (0%)                | 3 (9%)                | 2 (12%)               | 1 (6%)                |
|     |                                                                           | Don’t know 4 (12%)    | 1 (6%)                | 3 (19%)               | 0 (0%)                | 0 (0%)                | 0 (0%)                |
| 3   | CFs became denser due to controls on the extraction of fuelwood and fodder| Agree 26 (82%)        | 15 (94%)              | 11 (69%)              | 30 (94%)              | 14 (88%)              | 16 (100%)             |
|     |                                                                           | Disagree 5 (15%)      | 1 (6%)                | 4 (25%)               | 1 (3%)                | 1 (6%)                | 0 (0%)                |
|     |                                                                           | Don’t know 1 (3%)     | 0 (0%)                | 1 (6%)                | 1 (3%)                | 1 (6%)                | 0 (0%)                |
| 4   | CFs became denser due to controls on livestock grazing                    | Agree 26 (82%)        | 14 (88%)              | 12 (75%)              | 31 (97%)              | 15 (94%)              | 16 (100%)             |
|     |                                                                           | Disagree 4 (12%)      | 1 (6%)                | 3 (19%)               | 0 (0%)                | 0 (0%)                | 0 (0%)                |
|     |                                                                           | Don’t know 2 (6%)     | 1 (6%)                | 1 (6%)                | 0 (0%)                | 0 (0%)                | 0 (0%)                |
| 5   | Satisfied with the current policy imposed on the extraction of fodder    | Agree 8 (25%)         | 3 (19%)               | 5 (31%)               | 17 (53%)              | 6 (38%)               | 11 (69%)              |
|     |                                                                           | Disagree 21 (66%)     | 13 (81%)              | 8 (50%)               | 14 (44%)              | 9 (56%)               | 5 (31%)               |
|     |                                                                           | Don’t know 3 (9%)     | 0 (0%)                | 3 (19%)               | 1 (3%)                | 1 (6%)                | 0 (0%)                |
| 6   | Satisfied with the current policy imposed on the extraction of fuelwood  | Agree 8 (25%)         | 3 (19%)               | 5 (31%)               | 15 (47%)              | 6 (38%)               | 9 (56%)               |
|     |                                                                           | Disagree 21 (66%)     | 13 (81%)              | 8 (50%)               | 17 (53%)              | 10 (62%)              | 7 (44%)               |
|     |                                                                           | Don’t know 3 (9%)     | 0 (0%)                | 3 (19%)               | 0 (0%)                | 0 (0%)                | 0 (0%)                |
| 7   | Satisfied with the controls on livestock grazing inside the CFs          | Agree 14 (44%)        | 6 (38%)               | 8 (50%)               | 26 (82%)              | 11 (69%)              | 15 (94%)              |
|     |                                                                           | Disagree 13 (41%)     | 8 (50%)               | 5 (31%)               | 5 (15%)               | 4 (25%)               | 1 (6%)                |
|     |                                                                           | Don’t know 5 (15%)    | 2 (12%)               | 3 (19%)               | 1 (3%)                | 1 (6%)                | 0 (0%)                |
| 8   | Forest rules have affected livelihood                                     | Agree 19 (59%)        | 11 (69%)              | 8 (50%)               | 16 (50%)              | 9 (56%)               | 7 (44%)               |
|     |                                                                           | Disagree 13 (41%)     | 5 (31%)               | 8 (50%)               | 16 (50%)              | 7 (44%)               | 9 (56%)               |
|     |                                                                           | Don’t know 0 (0%)     | 0 (0%)                | 0 (0%)                | 0 (0%)                | 0 (0%)                | 0 (0%)                |
| 9   | Forest rules should be amended                                            | Agree 27 (84%)        | 14 (88%)              | 13 (81%)              | 18 (56%)              | 8 (50%)               | 10 (62%)              |
|     |                                                                           | Disagree 5 (16%)      | 2 (12%)               | 3 (19%)               | 14 (44%)              | 8 (50%)               | 6 (38%)               |
|     |                                                                           | Don’t know 0 (0%)     | 0 (0%)                | 0 (0%)                | 0 (0%)                | 0 (0%)                | 0 (0%)                |

EH = Entire Hamlet, CS = Close Settlement, FS = Far Settlement
Source: Field survey (2017–2018)
hamlets agreed that the number of tourists had increased after controls were imposed on the extraction of fodder and fuelwood and on livestock grazing in the BZCF. No significant differences were observed between the opinions of hamlets and settlements.

**Locals’ perception of the interaction between forest rules and HWC**

Table 8 demonstrates the interaction between forest rules and HWC in the study sites. Respondents in both hamlets believed that the wildlife population has increased in the BZCF. The percentage of respondents who had experienced conflict with wild animals, such as rhinos, wild boars, and elephants, was higher in Kumroj than in Amaltari. Regarding the issue of HWC, respondents disclosed that due to lack of sufficient food, most conflict prone species left the protected area, damaging agricultural crops and sometimes causing human casualties. The majority of forest users have raised livestock for additional household income. They use the CF livestock feeding material, including fodder that is readily available in the forest; however, the forest users are at high risk of encountering wildlife while collecting livestock feeding material.

Survey results reveal that a greater number of respondents from Kumroj than Amaltari agreed that controlling the extraction of fodder and fuelwood has led to an increase in wild animals wandering into human settlements. No significant difference of opinion was observed between CS and FS in Kumroj. The forest users stated that when their cattle strayed into the forest, vines and creepers would be destroyed, making it easier to spot the wild animals, who could also more easily roam through the forest. However, since the restrictions were imposed, vines and creepers have grown wild and meadows have become overgrown with bushes, making it harder to walk in the forest; thus, wild animals have ventured into human settlements to seek easier food sources. Some respondents complained that wild animals destroyed their crops and houses, and ate their stored grain, and that the surge in wild animals entering the village increased HWC. The results show that 68% of respondents in Kumroj agreed that the entry of wild animals into human settlements has increased after controls were imposed on livestock grazing. Conversely, 53% of the respondents in Amaltari disagreed with this statement. Most of these respondents live in the FS where residents are less likely to encounter wild animals because it is located farther from the BZCF. In the CS, 63% of the Amaltari respondents and 75% of Kumroj respondents tended to agree that wild

| S/N | Statement                                                                 | Kumroj | Amaltari |    |
|-----|---------------------------------------------------------------------------|--------|----------|----|
|     |                                                                           | EH (n = 32) | CS (n = 16) | FS (n = 16) | EH (n = 32) | CS (n = 16) | FS (n = 16) |
| 1   | After the introduction of ecotourism in the CF, the accessibility to forest products has decreased | Agree: 27 (85%) 15 (94%) 12 (75%) | Disagree: 1 (3%) 0 (0%) 1 (6%) | Don’t know: 4 (12%) 1 (6%) 3 (19%) | Agree: 27 (85%) 15 (94%) 12 (76%) | Disagree: 3 (9%) 1 (6%) 2 (12%) | Don’t know: 2 (6%) 0 (0%) 2 (12%) |
| 2   | After the introduction of ecotourism activity, livestock grazing inside the CF has been more restricted | Agree: 31 (97%) 16 (100%) 15 (94%) | Disagree: 1 (3%) 0 (0%) 1 (6%) | Don’t know: 0 (0%) 0 (0%) 0 (0%) | Agree: 25 (78%) 14 (88%) 11 (69%) | Disagree: 6 (19%) 2 (12%) 4 (25%) | Don’t know: 1 (3%) 0 (0%) 1 (6%) |
| 3   | The number of tourists in the CF has increased due to controls on the extraction of fuelwood and fodder | Agree: 21 (66%) 11 (69%) 10 (64%) | Disagree: 4 (12%) 0 (0%) 4 (24%) | Don’t know: 7 (22%) 5 (31%) 2 (12%) | Agree: 20 (62%) 10 (62%) 10 (62%) | Disagree: 6 (19%) 3 (19%) 3 (19%) | Don’t know: 1 (3%) 0 (0%) 1 (6%) |
| 4   | The number of tourists in the CF has increased due to controls on livestock grazing inside CF | Agree: 27 (85%) 13 (81%) 14 (88%) | Disagree: 2 (6%) 0 (0%) 2 (12%) | Don’t know: 3 (9%) 3 (19%) 0 (0%) | Agree: 23 (73%) 12 (76%) 11 (69%) | Disagree: 5 (15%) 2 (12%) 3 (19%) | Don’t know: 4 (12%) 2 (12%) 2 (12%) |

EH = Entire Hamlet, CS = Close Settlement, FS = Far Settlement
Source: Field survey (2017–2018)
Interaction between rules, ecotourism, and human-wildlife conflicts

Animal entry into the villages has increased after controls were imposed in the BZCF. Only 12% of respondents in the Amaltari FS agree with this statement, because increased HWC has caused local people engaged in agricultural activities to abandon their land. Once that land became barren, wild animals entered the FS in search of food. However, the percentage of respondents who agree is higher (63%) in the Kumroj FS. The CNP annual report for 2017-2018 also states that the forest has become overrun by invasive species like Mikania micrantha, which has caused the shrinkage of space for wildlife in the forest (CNP 2018). As the wildlife have moved out toward the settlement areas, HWCs have increased, as evidenced by forest users’ statements.

DISCUSSION

Our study confirmed that the two hamlets had different rules for using forest resources due to their different forest situations. Since ecotourism activities were introduced in both villages, BZCFs were given priority to dense natural forest for wildlife conservation. Therefore, extraction of fodder and fuelwood was restricted accordingly. Bhusal (2014) states that the objectives for the establishment of a BZCF are primarily to improve biodiversity and restore lost habitat for wildlife. Basic community needs, such as fuelwood, fodder, and income generation through ecotourism, are secondary. However, ignoring local communities and the needs of indigenous people in the BZCFU management strategy will adversely affect people who are dependent on the forests. This situation is consistent with studies by Mir et al. (2015) and Yang et al. (2015), who determined that indigenous people’s customary rights were restricted by pro-conservation UC representatives and PA officials.

Regarding the allocated area for livestock grazing, the CS respondents were somewhat dissatisfied because it was far from the BZCF and the village. Our study confirmed that livestock grazing in the BZCF has been gradually restricted since the introduction of ecotourism. This finding is consistent with Gurung et al. (2009).

Table 8. Local community’s perception of the impact of forest rules on HWC

| S/N | Statement                                                                 | Kumroj       | Amaltari     |
|-----|---------------------------------------------------------------------------|--------------|--------------|
|     |                                                                           | EH (n = 32)  | CS (n = 16)  | FS (n = 16)  | EH (n = 32)  | CS (n = 16)  | FS (n = 16)  |
| 1   | Do you think the number of wild animals has increased in the CF?          | Agree 32 (100%) | 16 (100%) | 16 (100%) | Agree 30 (94%) | 15 (94%) | 15 (94%) |
|     |                                                                           | Disagree 0 (0%) | 0 (0%)    | 0 (0%)   | Disagree 0 (0%) | 0 (0%) | 0 (0%) |
|     |                                                                           | Don’t know 0 (0%) | 0 (0%)    | 0 (0%)   | Don’t know 2 (6%) | 1 (6%) | 1 (6%) |
| 2   | Have you ever been in conflict with wild animals?                         | Agree 26 (82%) | 15 (94%) | 11 (69%) | Agree 16 (50%) | 9 (56%) | 7 (44%) |
|     |                                                                           | Disagree 6 (18%) | 1 (6%)    | 5 (31%)  | Disagree 16 (50%) | 7 (44%) | 9 (56%) |
|     |                                                                           | Don’t know 0 (0%) | 0 (0%)    | 0 (0%)   | Don’t know 0 (0%) | 0 (0%) | 0 (0%) |
| 3   | Due to controls on the extraction of fodder and fuelwood, the incidence of wild animals entering human settlements has increased | Agree 23 (72%) | 12 (76%) | 11 (69%) | Agree 14 (44%) | 10 (63%) | 4 (25%) |
|     |                                                                           | Disagree 7 (22%) | 2 (12%)   | 5 (31%)  | Disagree 16 (50%) | 6 (37%) | 10 (63%) |
|     |                                                                           | Don’t know 2 (6%) | 2 (12%)   | 0 (0%)   | Don’t know 2 (6%) | 0 (0%) | 2 (12%) |
| 4   | Due to controls on livestock grazing, the incidence of wild animals entering human settlements has increased | Agree 22 (68%) | 12 (75%) | 10 (63%) | Agree 13 (41%) | 10 (63%) | 3 (19%) |
|     |                                                                           | Disagree 5 (16%) | 1 (6%)    | 4 (25%)  | Disagree 17 (53%) | 6 (37%) | 11 (69%) |
|     |                                                                           | Don’t know 5 (16%) | 3 (19%)   | 2 (12%)  | Don’t know 2 (6%) | 0 (0%) | 2 (12%) |

EH = Entire Hamlet, CS = Close Settlement, FS = Far Settlement
Source: Field survey (2017-2018)
grazing rules.

An alternative reason could be that forest users in Kumroj were allowed to collect fodder every day, but only from designated areas inside the BZCF; in the absence of PA officials, they could easily break the rules and collect from nearby areas where quality fodder was available. Conversely, for Amaltari forest users, collection of fodder was permitted for up to one month every four months for a limited time during the day, and with no designated areas. This made it difficult for the forest users to enter the forest to collect fodder beyond the specified month. Similarly, during the fodder collection period, since there were no designated areas, there were fewer opportunities to break the rules. Clearly, due to the everyday collection of fodder, monitoring whether forest users follow the rules would be more complicated and costly in Kumroj than in Amaltari.

Compliance with fodder extraction rules did not differ between CS and FS; however, their compliance with fuelwood extraction rules did. Those who live closer to the BZCF admitted that they are sometimes tempted to sneak into the forest without authorization as the wood could easily be concealed in nearby houses. The risk of being reported for illegal extraction of fuelwood increased as the distance from the forest increased. Our results agree with Chhetri et al. (2013) and Varughese and Ostrom (2001) who also stated that distance is inversely correlated to fuelwood collection.

The respondents’ perceptions of the imposed forest policy were mostly similar in both study sites. Respondents have a positive perception of the establishment of the BZCF, and most consider it their responsibility to protect the BZCF. However, respondents from Kumroj disagreed with the prohibition on livestock grazing inside the BZCF, and wanted to be permitted to continue livestock grazing within certain areas of the BZCF. Since the respondents in Kumroj did not benefit from ecotourism activities as much as the respondents in Amaltari, their dependence on livestock increased and served as an alternative source of income. The restriction on cattle grazing access diminished this means of income because it affected other related products, such as dung and milk, thus reducing livelihood success. As stated earlier, this circumstance was attributed to the higher number of livestock in Kumroj. Forest users wanted permission for grazing in the BZCF. By incorporating this request into the policy, forest users in Kumroj could develop a positive perception of the PA. However, the forest authorities claim that livestock often disrupt wildlife, causing a negative impact on ecotourism. When forest users enter the BZCF with their cattle, they make loud noises to scare away the wild animals in the vicinity. This makes it difficult for eco-tourists on safari drives to spot wild animals, thus, detracting from their experience and adversely affecting ecotourism in the CNP.

Similarly, in both villages and all settlements, access to forest resources has decreased as a result of increased ecotourism. Our study showed no significant differences between CS and FS users’ perceptions of the imposed forest resource extraction policies. The promotion of local livelihood through ecotourism has been widely considered an important policy instrument for biodiversity conservation. It was demonstrated that almost half of the CS users benefited from the homestay program in Tharu communities in Amaltari. If benefits are not distributed evenly and are restricted to a certain class or community, there will always be different perceptions of wildlife conservation, especially among people who lost an alternative source of income due to stringent rules implemented to develop ecotourism. The recent increase in wildlife in the BZCF could have a severe impact on neighbouring communities, which may experience an increase in HWCs. Consequently, this may give rise to a negative attitude among forest users toward conservation, as also reported by Shibia (2010), Studsrød and Wegge (1995), and Thapa Karki and Hubacek (2015). Contrary to these previous studies, our study demonstrated that settlement distance from the BZCF did not make a difference in forest users’ opinions about the effect of wildlife on them. Our differing results between hamlets might be due to their variation in perceptions, as Kumroj forest users had experienced more conflict with wildlife than those in Amaltari. Observations from the field study confirmed that, although ecotourism activities were introduced earlier in Kumroj, the fencing was not properly placed; while Amaltari’s ecotourism, although recent, began with proper fencing. In addition, Amaltari’s profits from ecotourism activities compensated for the damages caused by HWC. Our study contradicted the general assumption that settlements located closer to PAs will be more adversely affected by HWC. Thus, the distance between a PA and a settlement is not the sole factor for understanding HWC. Other factors, such as management and compensation for damage, also shape local attitudes toward HWC, which present a perpetual challenge to biodiversity conservation efforts (Mehta and Kellert 1998).

We hypothesized that rules that were made more stringent after the introduction of ecotourism would benefit settlements located closer to the PA. Since most ecotourism activities are concentrated in nearby forest areas, people living in CSs would have a positive perception of new policies and wildlife tourism. Whereas people living farther away (in FSs), who are obligated to comply with these
policies, would not be satisfied, because they do not reap the benefits of these policies. Our results confirm that policies were made more stringent after the introduction of ecotourism. However, these results indicate that a slightly higher number of respondents residing in CSs in both villages had a negative response, which is approximately the same if compared with respondents residing in the FS. Thus, the hypothesis can be partially accepted. It was evident from the forest rules that the established policies are not satisfactory, because they prioritize resource conservation, thereby leaving locals with no choice but to either break the rules or follow the policies. Overall, the respondents' perception is that stringent policies established after the introduction of ecotourism have significantly restricted their accessibility to forest resources, and respondents agree that the number of tourists visiting the BZCF has increased. This study also revealed that HWC increased in both villages following the implementation of new rules. However, users in the Amaltari FS slightly disagree with this statement, indicating that they are somewhat less affected as compared to the Kumroj FS users following the implementation of the new policies.

CONCLUSION

The study reveals that more stringent rules and regulations were gradually imposed following the introduction of ecotourism activities in the BZCFs. The implementation of more rigorous forest rules contributed to improving the forest habitat and wildlife conservation, but also led to a decrease in accessibility to forest products which affected forest users' daily lives. More respondents from Kumroj were in favor of changing the rules, because they did not benefit from ecotourism activities as much as respondents from Amaltari. Regarding grazing rules, most respondents agreed with the new policies to implement increased control. Our results indicate that respondents who benefited from ecotourism had a positive perception of the policies implemented for the BZCF. Forest-dependent households living close to the forest experienced strict rules, as well as damage caused by wildlife, and thus, had a negative perception of forest conservation. Respondents believed that more stringent rules implemented to improve ecotourism resulted in increased HWC.

In light of these results, this study recommends that the following points be considered to foster sustainable forest management of BZCFs, and to encourage forest users' positive perception of forest conservation.

1) Since the timeframe for access to forest resources varies from once per month to once per year, this issue can be targeted through policy reimplementation wherein forest users' socioeconomic status, as well as needs, should be taken into consideration. Those with the greatest need should be given priority access to forest resources.

2) Feedback should be gathered from every UG and UC to revise the rules and strike a balance between conservation and local people’s needs.

Further study is recommended regarding compensation for scheme/alternative livelihood intervention, benefit sharing mechanism (BSM), and the underlying requirements of capacity building in community forest management.

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