



Conservation Policies, Eco-Tourism, and End of Pastoralism in Indian Himalaya?

Rashmi Singh^{1*}, Rishi Kumar Sharma², Tsering Uden Bhutia³, Kinzong Bhutia³ and Suresh Babu¹

¹ School of Human Ecology, Ambedkar University Delhi, New Delhi, India, ² World Wildlife Fund-India, New Delhi, India, ³ Khangchendzonga Conservation Committee, Sikkim, India

OPEN ACCESS

Edited by:

Iain James Gordon,
Australian National University, Australia

Reviewed by:

Maxine Anne Whittaker,
James Cook University, Australia
Mongi Sghaier,
Institut des Régions Arides, Tunisia

*Correspondence:

Rashmi Singh
rashmi89singh@gmail.com

Specialty section:

This article was submitted to
Agroecology and Ecosystem Services,
a section of the journal
Frontiers in Sustainable Food Systems

Received: 04 October 2020

Accepted: 04 February 2021

Published: 17 March 2021

Citation:

Singh R, Sharma RK, Bhutia TU,
Bhutia K and Babu S (2021)
Conservation Policies, Eco-Tourism,
and End of Pastoralism in Indian
Himalaya?
Front. Sustain. Food Syst. 5:613998.
doi: 10.3389/fsufs.2021.613998

State-led policies of pastoralist removal from protected areas, following the fortress model of biodiversity conservation, have been a common practice across parts of Asia and Africa. In the Himalayan region of South Asia, restrictive access and removal of pastoralist communities from protected areas have been compensated by the state through “eco”-tourism. In this paper, we critique the current conservation model adopted in the Indian Himalaya, which focuses on a conservation-pastoral eviction-ecotourism coupling. With a focus on pastoralists and pastoral practices, we argue that this model is neither an inclusive engine of development, nor does it always help conservation. Instead, it recreates a landscape favoring the state’s interests, produces exclusions, and may also negatively affect both society and ecology. We build on the case of Khangchendzonga National Park (KNP) situated in Sikkim, Eastern Himalaya. We used mixed methods and conducted 48 semi-structured interviews, 10 key informant interviews, and two focused group discussion in the four village clusters situated in the vicinity of KNP, West Sikkim. The grazing ban policy and concomitant promotion of tourism caused the end of pastoralism in KNP. It transformed a pastoral cultural landscape into a tourist spot with a transition in livestock from the traditional herds of yak and sheep to the pack animals and non-native hybrid cattle. Locally perceived social impacts of the grazing ban include loss of pastoral culture, economic loss, and the exclusion of the pastoral community from the park. As per the respondents, perceived ecological effects include a decline in vegetation diversity in the high-altitude summer pastures, altered vegetation composition in the winter due to plantation of non-native tree species, and increased incidents of human-wildlife conflict. Rangelands of the Himalaya transcend political boundaries across countries. The conservation model in Himalaya, should henceforth be done with a trans-boundary level planning involving the prime users of high-altitude rangelands, i.e., the pastoralists. The lessons from this study can help design effective future policy interventions in landscapes critical for both pastoralist cultures and wildlife conservation.

Keywords: rangeland conservation, grazing ban, pastoral livelihood, eco-tourism, conservation policy, Khangchendzonga National Park, Himalaya

INTRODUCTION

The conservation discourse on pastoral use of natural resources is replete with two polarized and opposing narratives. The first narrative looks at all forms of human land-use practices, especially pastoralism and agriculture as necessarily leading to degradation and a decline in biological diversity (Johnson, 1977; Briske and Richards, 1995; Beinart, 1996; Weber and Horst, 2011; Ren et al., 2012; Thapa et al., 2016; Wang and Wesche, 2016). Pastoralist communities are blamed for being responsible for the degradation of rangelands. This assumption follows the classical approach to the equilibrium model that assumes that rangeland ecosystems are potentially stable systems destabilized by pastoralist communities' improper use and overstocking of the rangelands (Stebbing, 1935; Brown, 1971). Based on this line of thought, conservationists often see humans' exclusion from areas of conservation interest as the only viable solution.

A contrasting line of thought emerged as a critique of the equilibrium paradigm, becoming widespread as "new rangeland ecology." Scholars of new rangeland ecology argued that the equilibrium model did not consider the social heterogeneity, climatic variability and the adaptive resource use by the pastoral communities (Behnke and Scoones, 1992; Scoones, 1994; Leach et al., 1999). They argued that pastoralists have co-existed with nature following their institutional systems embedded in the social and ecological heterogeneity (Scoones, 1994; Robbins, 1998; Berkes et al., 2007; Jun Li et al., 2007). These systems also constantly evolve in response to the local geo-climatic conditions, and ecological and social variabilities (Scoones, 1994; Mortimore, 1998; Mortimore and Turner, 2005; Butt, 2011; Haynes and Yang, 2013; Wu et al., 2014; Singh et al., 2015).

The debate on compatibility between grazing and pastoral resource use and conservation remains unsettled. However, the former view influenced conservation policies. It led to, curtailed access to pastures, sedentarization, and even removal of pastoralists communities from their traditional pastures across the pastoral landscapes of Asia and Africa (Behnke and Scoones, 1992; Mortimore, 1998; Yeh, 2005; Zhizhong and Wen, 2008; Gonin and Gautier, 2015; Schmidt and Pearson, 2016).

The high altitude region of Himalaya in South Asia is a multiuse landscape with a wide variety of pastoralist communities that includes agro-pastoralists, seminomadic, and transhuman system (Rao and Casimir, 1982; Bhasin, 2011; Yamaguchi, 2011; Kreutzmann, 2012; Namgay et al., 2013; Yeh et al., 2017), as well-being a critical landscape for wildlife conservation with its unique assemblage of wild ungulates and carnivores (Mishra et al., 1998). Resource sharing by livestock and wildlife in the region, especially in the Trans-Himalaya, is often seen as being in conflict with the conservation efforts (Fernandez-Gimenez and Allen-Diaz, 1999; Kala, 2005; Sangay and Vernes, 2008; Shrestha and Wegge, 2008; Suryawanshi et al., 2010; Bagchi et al., 2012; Berger et al., 2013; Namgay et al., 2013; Ashraf et al., 2014), with very few exceptions of coexistence (Bhatnagar, 2009; Sharma et al., 2015).

The generalization that rangelands degradation occurs due to pastoral resource use resulted in multiple policies for pastoral restrictions in protected areas and physical evictions of pastoral

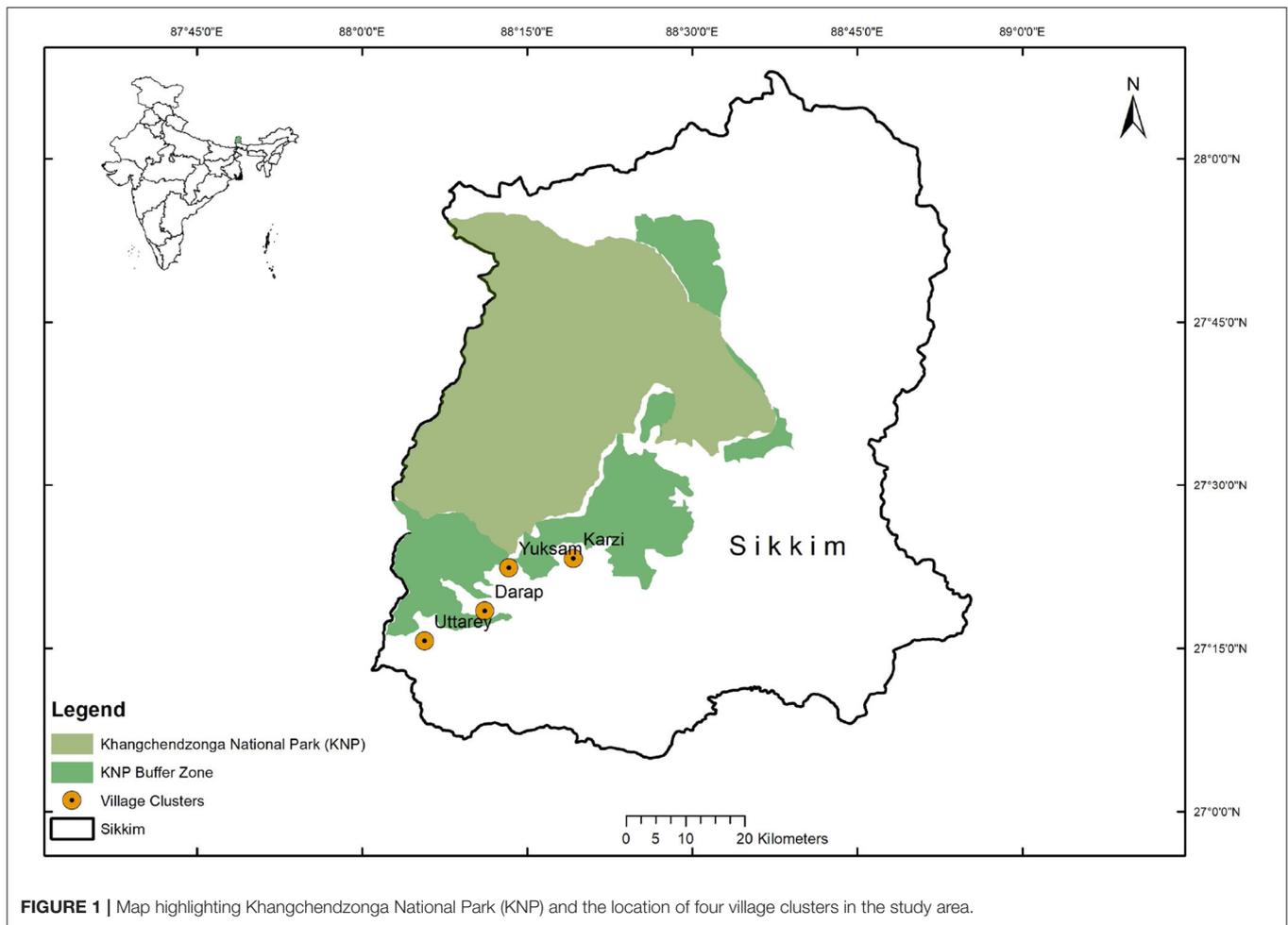
communities from several states of Indian Himalaya. Nanda Devi National Park (Nautiyal et al., 2003) the Valley of Flowers National Park (Rawat and Uniyal, 1993; Kala, 2005; Gairola et al., 2015) in Uttarakhand, and Greater Himalaya National Park of Himachal Pradesh (Mehra and Mathur, 2001; Chhatre and Saberwal, 2005, 2006) are some of the examples of ostensibly science-based policymaking. What is striking is that ecotourism has been the state's solution to the conservation conflict in each of these landscapes. Ecotourism in the region has been promoted by the state and agencies, such as the World Bank as an alternative to fortress conservation and a win-win solution capable of meeting both conservation and community development goals.

The State of Sikkim, in the Eastern Himalaya of India, implemented a ban on livestock grazing inside protected areas in the year 1998. Pastoralists who have been living and herding yaks, sheep and cattle inside the protected area were no longer allowed to herd their animals in the national parks and sanctuaries of Sikkim. Protected areas across Sikkim witnessed massive physical evictions of pastoralists between the year 2000–2002. In 2002, the state government constituted eco-development committees around the protected areas to implement a range of eco-development and ecotourism practices. The grazing ban, followed by pastoral removal and implementation of eco-development committees, followed the similar chain of events that have become a part of the Himalayan region's conservation model.

In this paper, we argue that the current conservation model, implemented in the Himalayan states with the restrictive conservation policies, pastoral eviction and ecotourism coupling, is neither an inclusive model of development nor is it embedded in the local socio-ecological needs for conservation. Using the case study of Khangchendzonga National Park (KNP), West Sikkim, we show how it entails a massive social cost, particularly for pastoral livelihoods, and results in elite capture, with no guarantee of ecological benefits. To support my argument, we draw upon the empirical data on four village clusters in the vicinity of KNP, West Sikkim gathered between the year 2017–2019. This study aimed to understand the influence of the conservation-pastoral eviction-ecotourism coupling on the pastoral system in KNP. Specific objectives were to (1) document the long term change in the traditional pastoral livelihoods and livestock composition in the KNP region, (2) Examine the influence of two key events *viz.* advent of tourism and ban on livestock grazing on pastoralism, and (3) Understand the locally perceived ecological and social influence of the resultant transition, primarily for the landscape and the local community.

STUDY AREA

This study was conducted in four village clusters of West Sikkim situated at the periphery of the Khangchendzonga National Park (KNP) (**Figure 1**). These four village clusters *viz.* Yuksam, Darap, Uttarey, and Karzi lie at the intersection of the questions that we explore in this paper. These were the most important village clusters for pastoral practices in West Sikkim and were the most



affected by the grazing ban. KNP covers an area of 1,784 sq. km. The State of Sikkim is located in the Eastern Himalaya of India. The state is 7,096 km², which is only 0.2% of India's total geographical area but is identified as one of the 34 global biodiversity hotspots (Myers et al., 2000). Khangchendzonga National Park is a UNESCO World Heritage site in the mixed natural/cultural category.

The local community includes Gurungs and Mangers-traditional shepherds, Bhutia-traditional traders and yak herders, Limboo-hunter-gatherers and shifting cultivators, the Chettris and Bahuns who were traditionally agro-pastoralists and Tibetan Dokpas-nomadic Yak herders (Tambe and Rawat, 2009a). Historically, only 10–15% of the study area's total households practiced pastoralism. The majority of families were involved in agriculture and cultivated cash crops, such as large cardamom, maize, and vegetables like potato and cauliflower. People also worked as a wage laborer in the agricultural fields of relatively wealthier families. At least one person from each household is also eligible to get work under the Mahatma Gandhi National Rural Employment Guarantee Act 2005 (MNREGA). The region, and especially Yuksam is also popular amongst the international trekking community and gained increasing

attention in the last two decades, as the starting point of the Yuksam-Dzongri-Geochala trek to the base of Mount Khanchendzonga. With the influx of tourists, a few households in Yuksam village cluster also got involved in the hotel and restaurant business.

KNP has a wide range of ecosystem from sub-tropical to alpine with numerous lakes and peaks of religious importance to Sikkim's Buddhist and Hindu communities. The park harbors a unique assemblage of mammals which includes clouded leopard (*Neofelis nebulosa*), Tibetan wolf (*Canis lupus chanco*), wild dog (*Cuon alpinus*), Asiatic black bear (*Ursus thibetanus*), Musk deer (*Moschus chrysogaster*), Himalayan marmot (*Marmota himalayana*), blue sheep (*Pseudois nayaur*), argali (*Ovis ammon hodgsoni*), ibex (*Capra sibirica*), and the charismatic snow leopard (*Panthera uncia*) (Sathyakumar et al., 2011). It is home to an extraordinary faunal diversity with 18 forest types (Champion and Seth, 1968), 1,580 species of vascular plants comprising 106 pteridophytes, 11 gymnosperms and 1,463 species of angiosperms (Maity and Maiti, 2007). Holding critical ecological, religious, and cultural importance, KNP has been designated a UNESCO World Heritage site.

MATERIALS AND METHODS

The primary data used in this study was collected during two phases, first during October–December 2017 and second between September and November 2019. During the pilot surveys conducted in April 2017, we identified four village clusters essential for examining the proposed questions in the landscape. Majority of the herders who used KNP for their livestock rearing were from these village clusters. Herders from these clusters reared sheep, cattle, yak, dzo, and horses in the KNP and KBR area. According to the key informant interviews, ~103 herders used to herd their livestock in KNP. The majority of these (close to 70%) were from four village clusters selected for this study. We attempted to cover the maximum number of ex-herders during the field surveys and could conduct interviews with 50 ex-herders (40 semistructured interviews and 10 in depth interviews). Many of the elderly ex-herders had died of old age, and some had moved to the capital city Gangtok and other parts of Sikkim after selling their animals. We could not trace the herders who had moved out. The ethical approval for this research was received from the Research Studies Committee at the Ambedkar University Delhi and informed oral consent was gained from all the respondents.

We used mixed methods and conducted 48 semi-structured interviews, ten in-depth key informant interviews, and two focused group discussions. Among the 48 semi-structured interviews were forty ex-herders, three interviews with the forest officials, four interviews with members of local and regional conservation organizations- who had an essential role in implementing the ban, and one with a senior journalist who has been writing about the conservation issues in the region for more than two decades. Despite several attempts, we could not secure interviews with most of the forest officials involved in planning and implementing the grazing ban policy.

We prepared a list of ex-herders for each village cluster with the help of the elderly ex-herders of Yuksam village cluster first. We crosschecked the list in each village cluster and deployed the snowball sampling technique to maximize the number of interviewees. In-depth questions related to the historical pastoral system and changes in pastoralism were reserved for the elderly ex-herders only ($n = 10$), and the data collected was triangulated with the secondary data analysis. Semi-structured interviews were conducted with 48 respondents to understand the perceived social and ecological influence of the ecotourism and grazing ban in KNP. Respondents were asked about the social and environmental impacts of the grazing ban and ecotourism on the KNP and the local community.

Qualitative data from the interview transcripts and related set of notes were analyzed using the content analysis technique following “open coding process” where the data was assembled in blocks and patterns and examined concerning the context in the indexed text-based dataset. All the primary data was supplemented with the secondary data analysis of published and unpublished reports, research papers, newspaper articles and data from the livestock husbandry department. This helped in my understanding of the pastoral system’s historical trends, significant events in the history of pastoralism, and how the

state implemented conservation and tourism-related policies around KNP.

RESULTS

Historical Accounts of Pastoralism in Sikkim

Since Monarchy, pastoralists have had rights to graze in the forests of Sikkim, and in return provided a herding tax to the monarch of the kingdom. The Kazis who were landlords collected the herding tax annually (Lachungpa, 2012). Livestock herding has been a vital livelihood practice in the West Sikkim. Local communities, before the grazing ban, reared sheep, goat, cow, buffalos, and yak. Local herders used the temperate, sub-temperate and alpine pastures in and around KNP for the seasonal rotational grazing. The region has a diverse social composition of herders consisting of Bhutia, Lepcha, and Limboo community members with more recent immigration from Nepal, during the 1950s, who currently comprises more than 50% of the total population of Sikkim now (Duff, 2015). *Bhutia* were primarily yak herders but also engaged in agriculture and trade, they migrated from Eastern Tibet to Sikkim in the 14th century. *Limboo*, the traditional cattle herders and butchers also have originated from Tibet. Limboos and the Lepchas, who have been primarily the agriculturists, are one of Sikkim’s earliest settlers (Duff, 2015). Immigrant population from Nepal includes members from the *Gurung*, *Mangar*, and *Chhetri* community who traditionally reared sheep and cattle.

The monarchy had a significant role in resource management by the herders in the past. In 1911, the tenth Chogyal of Sikkim, Sidkeong Tulku marked Sikkim’s forests as reserves and community forests (Gupta, 1975; Lachungpa, 2012). Following the principles of sustainable management of natural resources, and prioritizing the villagers’ needs for grazing land and firewood requirements, in 1911, patches of forests in the vicinity of the villages were notified as “forests reserved for the village” under categories of *khasmal* forests and *gaucharan* forests. The *gaucharans* were primarily the area designated for livestock grazing and meet their livestock requirements. The yaks, sheep and cattle grazed in these *gaucharans* during winter (Lachungpa, 2012).

Yak herding in west Sikkim was first introduced during the monarchy to worship Mount Khanchendzonga and celebrate the *Pang Lhabsol* festival for the prosperity and protection of the kingdom. There was only one yak herd that belonged to the King till the late 1950s. Yak rearing in West Sikkim was thus more of a cultural practice than an economic activity. Other livestock species, such as cattle, buffalo, dzo-hybrids of yak and cattle- have been introduced in the last 70 years (Tambe and Rawat, 2009a). Before that herders of west Sikkim reared only sheep and yak. Both sheep and yak herding followed a seasonal resource use. Herders used to keep the yak and sheep in the high-altitude alpine region of KNP in summers, In the peak winters, i.e., November to March, they were brought back to the temperate and sub-temperate pastures near the villages. There are also traces of fascinating historical instances of conflict over the pasture use

between the pastoral communities mediated by the British during 1834–35 (Gupta, 1975). Pastures were also a source of medicinal plants and that were sold in the markets (Singh et al., 2002; Idrisi et al., 2010). The most important and lucrative income source, the caterpillar fungus, has medicinal value and is sold in the international markets at a very high price (Maity, 2013).

Demographic Changes, Tourism, and Livestock Compositions

Sikkim became the 22nd State of the Indian Union on 16th May 1975 after 300 years of being a monarchy Kingdom in Himalaya (Gupta, 1975). In the late 1980s, the Government of Sikkim relaxed restrictions on national and international tourists to raise state revenues through tourism. During the 1990s, the number of tourists increased exponentially (Rai and Sundriyal, 1997). The immigration of people from Nepal had steeply increased during the period of colonial influence. Post-merger with India, Sikkim experienced another wave of mass immigration from Nepal and immigrants began settling in Sikkim villages.

In west Sikkim, following better connectivity and linkages to the market, many yak and cattle herders from Nepal settled in the bordering villages of Nepal and Sikkim, which increased the livestock numbers many folds (Duff, 2015). Other than yak and sheep, herds of cattle became a common sight. With the increasing numbers of livestock and herders, livestock grazing, earlier restricted to *gaucharans* became comparatively intense and pervasive in the region.

Demographic changes and increased tourism at the regional level influenced pastoral practices and livestock numbers and composition in and around KNP. While the traditional pastoralism was restricted to yak and sheep herding (Tambe and Rawat, 2009a), immigration and tourism brought cattle, buffalo, horses, and the hybrid of cow and yak—locally known as *Udaag and Dzo*. Dzo was first introduced in KNP in 1971 when four dzos were bought from Nepal by villagers of Tshoka, a village settled inside present-day KNP by the former King of Sikkim, the *Chogyal*¹. Several interviewees highlighted that the late Sir Tenzing Norgay, world-famous mountaineer, and member of the Himalayan Mountaineering Institute (HMI) provided a loan to buy and operate pack animals to carry rations and trekking gear from Yuksam Bazar to HMI base camp inside KNP. By 2000, Tshoka's four dzos had increased to 24 dzos, three horses, and 30 cows (personal conversation, ex-resident of Tshoka village and ex-dzo herder, October 2017).

Inside KNP the total number of dzo exceeded 100 by the year 2000 and primarily catered to tourism. Concurrently, there was a 10-fold increase in the number of yaks in the villages situated on the India-Nepal boundary. Yak numbers inside KNP, which were <100 before Sikkim's merger with India, reached above 850 by the year 2002 (Figure 1). These dzo, yak, and horses belonged to the villagers primarily from the study area's four village clusters. Dzo, horse and udang, which were not the traditional livestock

species in the region, reached 785. Sheep, on the other hand, showed a decline of 87% between 1950 and 2004 (Figure 2).

Conservation Policies and Pastoral Transition in KNP

As mentioned earlier, tourism in and around KNP, started increasing in the late 1980s due to the relaxation in rules and regulations on domestic and foreign tourists (Karan, 1987, 1989) which were earlier restricted for security reasons. During the same period, following the state's conservation mission, the boundaries of KNP were extended from 850 to 1,789 sq. km. In the year 2000, Khangchendzonga Biosphere Reserve (KBR) was notified, resulting in the combined area of KNP and KBR reaching to 2,620 sq. km, one-fourth of the state's total area. A number of restrictions on community use of natural resources were implemented in the reserve and protected areas. In 1995 forest felling and export of timber in the protected area was restricted.

The grazing ban policy was formulated in 1998, and cattle grazing in the Reserve forests as restricted, followed by the Sikkim Forests Cattle Trespass Rule in the year 2002 (Government of Sikkim, 2006; Lachungpa, 2012). During the field surveys, the key respondents mentioned that the grazing ban policy was based on the assumption of overgrazing. Ecologists working in the area claimed that the herding practices in KNP were negatively influencing the vegetation and the wild herbivore population of the region (Tambe et al., 2006; Tambe and Rawat, 2009a). According to the key respondents ($n = 10$), no research was conducted prior to the grazing ban policy to assess or quantify the effects of grazing. Majority of the key respondents ($n = 9$) believed it was not the grazing by livestock, which was a conservation challenge, but a few influential herders engaged in the illegal timber and medicinal plant extractions.

Following the grazing ban's announcement, between 2002 and 2004, there was forceful removal of herders from the protected areas across Sikkim, except for North district. Based on the conversation with ex-herders and the key respondents, in my study area in West Sikkim, a total of 103 herders who had a little over 200-*goaths*, the temporary shelters for rearing livestock—were evicted during this period. The grazing ban resulted in the complete exclusion of locals and especially herders from KNP. The livestock composition that was slowly being influenced by tourism in the region had a significant shift after the grazing ban. Traditional livestock rearing got entirely wiped out from West Sikkim, especially in and around KNP.

In years between 2002 and 2004, while the Government of Sikkim restricted pastoralists' access to pastures, the state policies were encouraging dairy business by distributing non-native hybrid cattle. The indigenous cattle were being replaced with the new hybrid cattle in the study area with the State's Dairy Mission and the hybrid cattle distribution program. The state was promoting these new hybrid cow varieties to support the local economy with milk production. The market-oriented plans of the state were also detailed in an assessment report specifically noting "There was strong political will from the greenest Chief Minister Dr. Pawan Chamling to convince the herders to shift

¹ According to one of my respondents, late. Tsonam Ongye, Tenzing Norgay, the world-famous mountaineer had himself suggested his father to buy Dzo to carry ration, trekking gears and tools for the base camp inside KNP.

from herding large numbers of less productive cattle to limited numbers of productive cattle” (Tambe et al., 2005). Demand for dzo continued with increasing numbers of tourists on Yuksam-Dzongri trekking (Rai and Sundriyal, 1997). Yak rearing, a practice encouraged by the *Chogyal*-the monarch, to embrace the local cultural and religious importance in the past, was now seen as a backward way of living. Increasing tourism demanded pack animals and restrictions on pastoralists livelihood inside the park left most pastoralists of KNP with no other option but to quit pastoral practices. Some of the ex-herders and a few others started rearing pack animals since this was the only practice allowed for the locals in KNP. The long-term influence of tourism, the state’s vision of KNP, and eventually the grazing ban transformed KNP from a pastoral cultural landscape to a tourist destination.

The state’s participatory conservation and development attempts came *ex post facto* when herders had already been removed from the protected areas. Notifications for Eco-Development Committees were issued in 2002, and a network of committees was formed the same year. With a lack of human resource for patrolling the remote and rugged terrain, *Himal rakshak* program was launched (Singh, 2020). Ex-herders were designated honorary guardians of the mountains to help the forest department patrol the high-altitude rangelands and support the conservation initiatives in and around KNP. In the same year, the State Green Mission was announced to reinforce further Sikkim’s already widespread recognition as being a green state (Lachungpa, 2012).

At present, there are 248 pack animals in the KNP region which belong to 47 households. These pack animals, primarily dzo and horses, are hired to trekking tours at \$6–7 per animal per day. Pack animals carry the trekkers’ personal load, camping equipment, ration, and other useful things crucial for the 9–12 days of treks. There are two trekking seasons in KNP, between early March to mid-June in summers and between September to early December in winters. During these two time periods, the pack animals follow the trekking trails from Yuksam to Geochala and graze at typical camping and resting places for trekkers.

Perceived Social and Ecological Influences

Respondents mentioned a range of social and ecological influences of the exclusion model of pastoral evictions combined with eco-tourism in and around KNP. A total of 179 responses were recorded from 48 respondents, which included both positive and negative influence on the region’s ecology and social components (Table 1). The grazing ban’s two most critical impacts were the cultural loss (22.34% responses) and economic loss (18.43% responses) associated with the pastoral practices. The respondents mentioned that while the state evicted most herders from the park post the grazing ban, the most influential yak herders ($n = 3$) continued to stay inside the park and continued yak herding.

In more than 11% of responses, it was highlighted that the grazing ban had resulted in marginalization of the pastoralists and has favored the local and non-local elites. Out of the total ex-herders that we interviewed ($n = 50$), who lost their pastoral livelihoods for “saving” the floral and faunal diversity of KNP, only 13% ($n = 6$) were now involved in the livelihoods associated

TABLE 1 | Locally perceived influence of grazing ban and tourism in KNP.

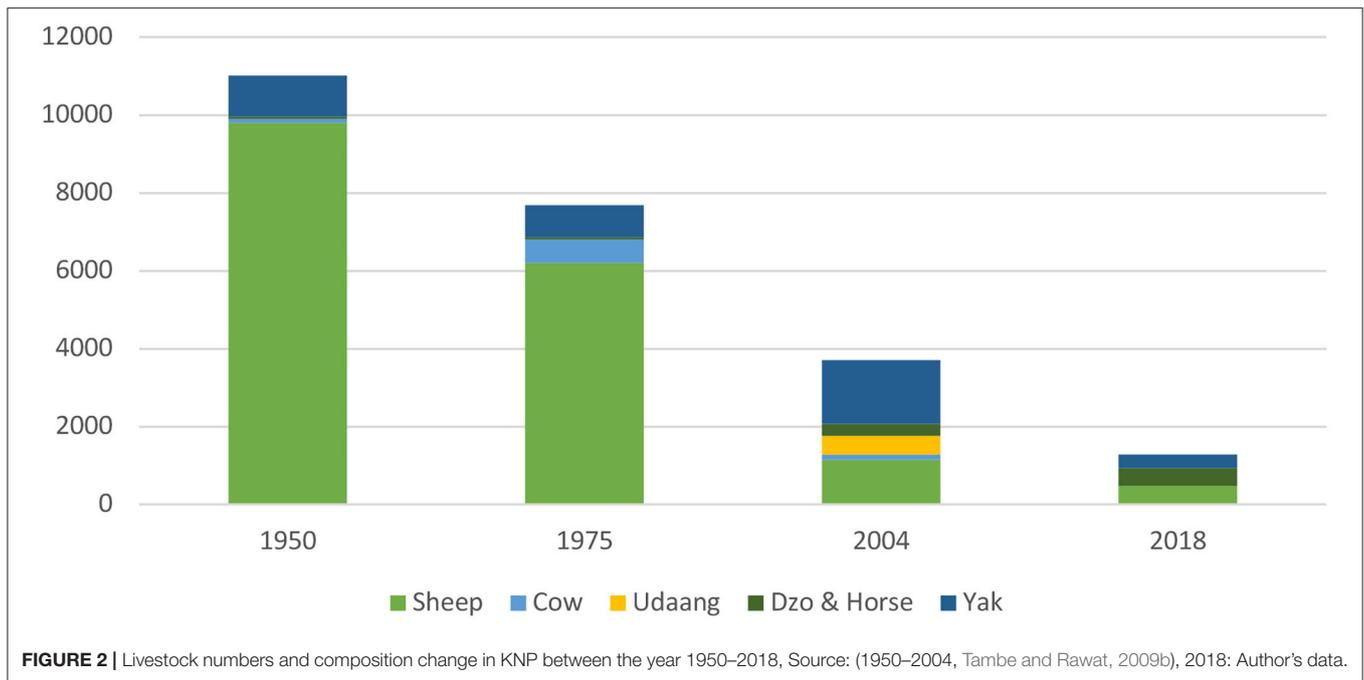
Influence of grazing ban and tourism promotion	Percentage of responses ($n = 179$)
Economic and livelihood loss	22.34
Loss of culture	18.43
Increased inequality and elite capture	11.17
Changes in agriculture (from traditional to cash crop varieties)	7.8
Negative influence on the ecology of summer pastures with pastoral removal and current pack animal rearing	6.7
Altered ecology of winter pastures due to plantation	6.7
Increased events of human-wildlife conflicts	9.1
Helped in reducing illegal medical plant extraction and wildlife poaching	9.1
Improved education among pastoralist families	2.2
Increased income from tourism and homestays	0.5

Total number of respondents = 48, total number of responses = 179.

with tourism. They were all working for the lowest paying jobs, such as porters and the pack animal operators. Only the elite within the local community benefitted since they can afford to establish hotels and homestays that are now rented by the tourists for INR 500 to 4,000 per night (\$7–\$55 per night). The number of hotels increased from four in the year 1998 (Rai and Sundriyal, 1997) to more than 26 hotels and homestays and eight restaurants in the year 2018 in Yuksam. Multiple conversations with the local tour operators revealed that the ex-herders and local youth committee members worked at the lowest paying jobs *viz* porters and cooks. Non-local tour operators from other states like West Bengal and Bangalore made the greatest profits from tourism activities in KNP. These operators worked at the national level and collaborated with the local guides from parts of Darjeeling and Sikkim.

Respondents also believed that banning of the traditional rotational herding had influenced the ecology of the winter pastures. The locally perceived impacts include a decreased abundance of preferred forage species, late flowering of some of the high-altitude species, and increased dominance of the less preferred pasture species. The ex-herders ($n = 6.7\%$ responses) mentioned that many species require grazing to ensure contiguity in flowering periodicity. These respondents also raised concerns with the current pack animal management. At present, the pack animals graze in a limited area for 2–3 months where yak and sheep grazed earlier. But unlike rotational grazing practiced previously, pack animals are left in one space during the non-tourist season resulting in high stocking density and pressures on rangelands.

The respondents mentioned that the afforestation done after pastoral removal is also problematic (6.7% responses). As soon as the pastoralists were intimated of their impending removal, the forest department started conducting plantation drives in the region. Around the study area, saplings are still planted every year and fenced. Plantation and fencing were done in the *gaucharans*



and *khasmal*, which used to be livestock grazing grounds during winters. In the plantations, rather than focusing on the endemic species like *Quercus* spp, *Castanopsis* spp, forest department planted fruit-bearing trees like cherry, and species with economic values like *Magnolia* spp. and *Bambusa* spp., Bamboo being a fast-growing plant has helped increase the green cover, but not the local biodiversity. These plantation drives are still carried out by the forest department staff members every year.

One of the most critical issues highlighted by the respondents was an increase in the human-wildlife conflict (9.1% responses) events post-grazing ban. After removal from the park, most of the herders started cash crop plantations, which changed the traditional cropping pattern (as highlighted in 7.8% responses) to the cash crop plantation and increased events of crop damage by wild boar and bear and resulted in human-wildlife conflicts.

The positive influence of the grazing ban and tourism as perceived by the respondents included a reduction in illegal medicinal plant extraction and wildlife poaching (9.1% response), improved income with tourism and homestays and better education (2.2% responses) among the pastoralists families (0.5% responses).

DISCUSSION

Studies conducted across parts of Asia and Africa have highlighted that state-led conservation policies in the form of restrictions on pastoral mobilities, physical evictions and sedentarization tend to have a range of unfavorable influences on the social, cultural and ecological components of the pastoral systems and rangelands (Li et al., 2013; Conte and Tilt, 2014; Ichinkhorloo and Yeh, 2016). Conservation induced pastoral

restrictions, coupled with tourism initiatives, result in the reinforcement of the local inequality by widening the economic gaps between small and big herders (Ichinkhorloo and Yeh, 2016), violate pastoral rights by unlawful encroachments of pastures (Mwaikusa, 1993), transition pastoral communities to agriculturalist in absence of access to pastures (Schmidt and Pearson, 2016), and cause loss of access and pastoral livelihoods through state violence and territorialization (Saberwal, 1996; Yeh, 2005; Gonin and Gautier, 2015; Korf et al., 2015; Caravani, 2019; Weldemichel, 2020).

Removal of pastoralists from the protected areas of Sikkim, followed by ecotourism, closely mirrors the conservation model in vogue in the states of Indian Himalaya. Many studies have highlighted the societal and ecological impacts of the conservation and tourism entanglements (Mwaikusa, 1993; Chhatre and Saberwal, 2006; Conte and Tilt, 2014; Das and Chatterjee, 2015; Ichinkhorloo and Yeh, 2016; Schmidt and Pearson, 2016; Brandt et al., 2019), but what is unique in the case of West Sikkim is the end of pastoralism in KNP. In some Himalayan states, pastoralists could sustain their livelihood by moving to new pastures or negotiating for rights and access with the state and forest department. With the limited summer pastures restricted to protected areas and the lack of the alternative regions for livestock grazing, the grazing ban caused the end of pastoralism in KNP, except for a few (<5) yaks herder who defied the ban and continued herding in KNP.

Regional entanglements of development, tourism and conservation policies reproduced the Khangchendzonga landscape from a pastoral cultural landscape to a tourism hot spot with exclusive access to the tourism and associated livestock species. Due to lack of any rehabilitation program, the conservation-tourism coupling resulted in a loss of access for

most pastoralists inside KNP. Besides, while some ex-herders did adopt livelihoods associated with tourism, they have remained at the lower end of the tourism sector hierarchy getting low paying jobs like porters and cooks. These findings share similarities with studies conducted in pastoral landscapes in parts of Asia and Africa. In Inner Mongolia and Xinjiang, tourism activities in the pastoral landscapes resulted in a loss of access to traditional pastures. Pastoralists, who adopted tourism-related livelihoods remained on the lowest paying jobs (Lam and Paul, 2014). Similarly, in case of Kenya, the government implemented conservation and tourism policies to diversify livelihood incomes of Mara pastoralists resulted in restrictions on livestock mobility and reduced access to good quality pastures (Bedelian and Ogutu, 2017).

In the study area, within the local community, local elites have managed to reap most of the benefits with the conservation and tourism coupling, a phenomenon also seen in the state-led conservation-development model in the similar socio-political contexts of Tanzania (McCabe et al., 1992; Weldemichel, 2020), Uganda (Cavanagh and Benjaminsen, 2014), and Columbia (Ojeda, 2012). Negative social influences, such as social disparity and the emergence of conflict between the villages in West Sikkim share similarity with other geographies with the policy implementation of pastoral bans. For example, in Mongolia, failing to account for a pastoralist community's heterogeneity, one such approach resulted in widening the gap between the small subsistence-based herders and powerful big herders by giving more power and access to the later (Ichinkhorloo and Yeh, 2016). In China, a grazing ban and sedentarization policy resulted in deterioration of clan social bonds crucial for the community resource use, subsistence and dealing with the climatic and social variabilities (Conte and Tilt, 2014).

Respondents mentioned that the removal of pastoralists and the current pack animal rearing practices in KNP, might have adverse effects on the area's ecology. Degradation of pastures by the changes post a grazing ban and the new private grazing approach has also been seen in Inner Mongolia (Conte and Tilt, 2014). A recent study conducted across 15 biodiversity hotspots in four Himalayan countries Nepal, Bhutan, China and India found that relationship between the conservation and ecotourism is highly context-specific and that in India forest loss in the ecotourism sites was higher than the control site without ecotourism (Brandt et al., 2019). Also, the grazing ban and removal of pastoralists from the park has led to new conservation challenges in increasing human-wildlife conflict incidents. The transition from a traditional livestock herding to pack animal rearing and removing pastoralists from KNP has neither benefitted the ecology nor society.

One of the significant drawbacks of the grazing ban and ecotourism in KNP is lack of local participation at the planning stage. Participation was only sought in the form of *formation* of the Eco-development Committee (EDC), Joint Forest Management Committees (JFMC) and the *Himal Rakshak* Programme (Government of Sikkim, 2006). But the members of all three programs were supposed to simply follow the

state instructions of afforestation for the first two and monitor the rangelands for the third. The local community members of these committees were not involved in identifying the problems or suggesting potential solutions to issues, such as the increasing tourist footprint in the protected areas. Better local participation could have elevated local actors in the tourism sector at a higher level and not limited to potters and guides' jobs. The absence of local consultations paved the way for external tourist operators to establish themselves in and around KNP and further marginalized the local community.

The grazing ban policy was forced on the pastoralist of KNP by highlighting the negative impacts of grazing during the "sensitization" meeting conducted with the herders. The pastoralist's views on the role of grazing in influencing rangeland biodiversity were neither sought nor understood. Pastoralists, the prime users of rangelands were not consulted regarding potential alternatives that could have harmonized pastoral communities' needs and conservation concerns. The knowledge of ex-herders, who were pushed out of KNP and had lost their livelihoods, was later feted as "mountain guardians" to help conserve and manage the remote regions of KNP. Instead of taking an exclusionary approach, engaging the ex-herders and the local village community members in conservation planning could have resulted in better outcomes for resource management, livelihoods and conservation. In hindsight, limiting the livestock numbers based on the rangeland carrying capacity and ensuring equity amongst herders rather than ending the cultural practice of pastoralism could have been a viable solution.

The transition from self-sufficient herding practice to the market-driven economy has made the local communities highly vulnerable to external risks and shocks. Political unrest in the neighboring State of West Bengal and constant landslides in the region have been chief issues that influenced the new tourism-based economy of West Sikkim. The recent emergence of Covid-19 and the resulting closure of tourism in Sikkim highlighted how state induced pastoral transition has magnified the local communities' vulnerability to external factors like never before.

CONCLUSION

In this article, focusing on pastoral practices in KNP, we show how the conservation-pastoral eviction- tourism coupling resulted in the transition of traditional herding to pack animal economy and have transitioned KNP from a pastoral cultural landscape to an exclusive tourist spot. The livestock composition, which was slowly being influenced by the demographic changes and tourism influence, became drastically altered post the grazing ban causing an end to the traditional pastoralism. The locally perceived adverse effects of the grazing ban and current tourism practices include wide-ranging social and ecological issues and the emergence of new conservation challenges in increased human-wildlife conflict incidents. Building on the case study of KNP, we suggest that instead of curtailing local participation which is one of the most significant critiques of environmental

policies globally, the state should fully and meaningfully involve pastoralists, the primary stakeholders of high altitude rangelands in designing and implementing conservation plans. Since most of the high altitude areas in Himalaya share International borders, the conservation and development planning could also benefit from trans-boundary level planning and cooperation.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Research Advisory Committee, School of Human Ecology, Ambedkar University Delhi. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

RS conceived the study, conducted fieldwork, and wrote the manuscript. RKS provided intellectual inputs in study design,

manuscript writing, and revisions. TUB and KB contributed to study design and data collections. SB provided overall guidance in study design, data collection, and analysis. All the authors edited and approved the final manuscript.

ACKNOWLEDGMENTS

We sincerely thank Forest, Environment and Wildlife Department, Government of Sikkim for their cooperation and support. Pilot study for this research was funded by the Ambedkar University Delhi with the Learning Enhancement Fund. We are grateful to Rufford Foundation Small Grant (no. 23379-1) for supporting our work.

RS sincerely thank members of her Research Advisory committee- Asmita Kabra and Rohit Negi for their guidance and critical feedback during study design, analysis, and writing stage of this paper. Critical comments and suggestions from Harry Fischer and Vasant Saberwal helped improving the manuscript tremendously. A special thanks to Carol Kerven for her unparalleled support and mentoring in past few years. This research would not have been possible without my field assistants-Ramesh Chettri and Chatur Singh Limboo. All the respondents, especially the ex-herders are thanked for sharing their knowledge, and people of West Sikkim for their generous support and warmth.

REFERENCES

- Ashraf, N., Anwar, M., Hussain, I., and Nawaz, M. A. (2014). Competition for food between the Markhor and domestic goat in Chitral, Pakistan. *Turk. J. Zool.* 38, 191–198. doi: 10.3906/zoo-1306-6
- Bagchi, S., Bhatnagar, Y., and Ritchie, M. (2012). Comparing the effects of livestock and native herbivores on plant production and vegetation composition in the Trans-Himalayas. *Pastoralism* 2, 1–16. doi: 10.1186/2041-7136-2-21
- Bedelian, C., and Ogutu, J. O. (2017). Trade-offs for climate-resilient pastoral livelihoods in wildlife conservancies in the Mara ecosystem, Kenya. *Pastoralism Res. Policy Pract.* 7, 1–22. doi: 10.1186/s13570-017-0085-1
- Behnke, R., and Scoones, I. (1992). "Rethinking range ecology: implications for rangeland management in Africa," in *Issues Paper 33* (London: International Institute for Environment and Development).
- Beinart, W. (1996). "Environment destruction in Southern Africa," in *The Lie of the Land: Challenging Received Wisdom on the African Environment*, eds M. Leach and R. Mearns (Oxford: James Curry), 54–72.
- Berger, J., Buuveibaatar, B., and Mishra, C. (2013). Globalization of the cashmere market and the decline of large mammals in central Asia. *Conserv. Biol.* 27, 679–689. doi: 10.1111/cobi.12100
- Berkes, F., Colding, J., and Folke, C. (2007). Rediscovery of traditional ecological knowledge as adaptive management. *Ecol. Appl.* 10, 1251–1262. doi: 10.1890/1051-0761(2000)010[1251:ROTEKA]2.0.CO;2
- Bhasin, V. (2011). Pastoralists of Himalayas. *J. Hum. Ecol.* 33, 147–177. doi: 10.1080/09709274.2011.11906357
- Bhatnagar, Y. V. (2009). Relocation from wildlife reserves in the greater and Trans-Himalayas: is it necessary? *Conserv. Soc.* 6, 263–270. doi: 10.4103/0972-4923.49219
- Brandt, J. S., Radeloff, V., Allendorf, T., Butsic, V., and Roopsind, A. (2019). Effects of ecotourism on forest loss in the Himalayan biodiversity hotspot based on counterfactual analyses. *Conserv. Biol.* 33, 1318–1328. doi: 10.1111/cobi.13341
- Briske, D., and Richards, J. (1995). "Plant responses to defoliation: a physiological, morphological and demographic evaluation," in *Wildland Plants: Physiological Ecology and Developmental Morphology*, eds D. Bedunah and R. Sosebee (Denver, CO: Society for Range Management), 635–710.
- Brown, L. H. (1971). The biology of pastoral man as a factor in conservation. *Biol. Conserv.* 3, 93–100. doi: 10.1016/0006-3207(71)90007-3
- Butt, B. (2011). Coping with uncertainty and variability: the influence of protected areas on pastoral herding strategies in East Africa. *Hum. Ecol.* 39, 289–307. doi: 10.1007/s10745-011-9399-6
- Caravani, M. (2019). 'De-pastoralisation' in Uganda's Northeast: from livelihoods diversification to social differentiation. *J. Peas. Stud.* 46, 1323–1346. doi: 10.1080/03066150.2018.1517118
- Cavanagh, C., and Benjaminsen, T. A. (2014). Virtual nature, violent accumulation: The 'spectacular failure' of carbon offsetting at a Ugandan National Park. *Geoforum* 56, 55–65. doi: 10.1016/j.geoforum.2014.06.013
- Champion, H. G., and Seth, S. K. (1968). *A Revised Survey of Forest Types of India*. Nasik: Government of India Press.
- Chhatre, A., and Saberwal, V. (2005). Political incentives for biodiversity conservation. *Conserv. Biol.* 19, 310–317. doi: 10.1111/j.1523-1739.2005.00012.x
- Chhatre, A., and Saberwal, V. (2006). Democracy, development and (re-) visions of nature: rural conflicts in the western Himalayas democracy, development and (re-) visions of nature: rural conflicts in the western Himalayas. *J. Peas. Stud.* 33, 37–41. doi: 10.1080/03066150601119991
- Conte, T. J., and Tilt, B. (2014). The effects of China's Grassland contract policy on pastoralists' attitudes towards cooperation in an Inner Mongolian banner. *Hum. Ecol.* 42, 837–846. doi: 10.1007/s10745-014-9690-4
- Das, M., and Chatterjee, B. (2015). Ecotourism: a panacea or a predicament? *Tourism Manage. Perspect.* 14, 3–16. doi: 10.1016/j.tmp.2015.01.002
- Duff, A. (2015). *Sikkim: Requiem for a Himalayan Kingdom*. London: Random House Group Limited.
- Fernandez-Gimenez, M. E., and Allen-Diaz, B. (1999). Testing a non-equilibrium model of rangeland vegetation dynamics in Mongolia. *J. Appl. Ecol.* 36, 871–885. doi: 10.1046/j.1365-2664.1999.00447.x
- Gairola, S., Rawal, R. S., and Todaria, N. P. (2015). Effect of anthropogenic disturbance on vegetation characteristics of sub-alpine forests in and around valley of flowers national park, a world heritage site of India. *Trop. Ecol.*

- 56, 357–365. Available online at: http://216.10.241.130/pdf/open/PDF_56_3/8%20Gairola.pdf
- Gonin, A., and Gautier, D. (2015). Shift in herders' territorialities from regional to local scale: the political ecology of pastoral herding in western Burkina Faso. *Pastoralism* 5, 1–12. doi: 10.1186/s13570-015-0023-z
- Government of Sikkim (2006). *Towards Greener Sikkim 1994–2006: A Compendium of Achievements and Accomplishments*. Gangtok: Government of Sikkim.
- Gupta, R. (1975). Sikkim: the merger with India. *Asian Surv.* 15, 786–798. doi: 10.2307/2643174
- Haynes, M. A., and Yang, Y. (2013). Adapting to change: transitions in traditional rangeland management of Tibetan yak herders in northwest Yunnan. *Environ. Dev. Sustain.* 15, 1065–1077. doi: 10.1007/s10668-012-9426-9
- Ichinkhorloo, B., and Yeh, E. T. (2016). Ephemeral “communities”: spatiality and politics in rangeland intervention in Mongolia. *J. Peas. Stud.* 43, 1010–1034. doi: 10.1080/03066150.2016.1168812
- Idrisi, M. S., Badola, H. K., and Singh, R. (2010). Indigenous knowledge and medicinal use of plants by local communities in Rangit Valley, South Sikkim, India. *NeBio* 1, 34–35. Available online at: https://www.researchgate.net/profile/Hemant-Badola/publication/267917112_Indigenous_knowledge_and_medicinal_use_of_plants_by_local_communities_in_Rangit_Valley_South_Sikkim_India/links/554d86c808ae956a5d21917b/Indigenous-knowledge-and-medicinal-use-of-plants-by-local-communities-in-Rangit-Valley-South-Sikkim-India.pdf
- Johnson, D. L. (1977). The human dimensions of desertification. *Econ. Geogr.* 53, 317–321. doi: 10.2307/142968
- Jun Li, W., Ali, S. H., and Zhang, Q. (2007). Property rights and grassland degradation: a study of the Xilingol pasture, Inner Mongolia, China. *J. Environ. Manage.* 85, 461–470. doi: 10.1016/j.jenvman.2006.10.010
- Kala, C. P. (2005). A multifaceted review on the biodiversity conservation of the Valley of Flowers National Park, India. *Int. J. Biodiv. Sci. Manage.* 1, 25–32. doi: 10.1080/17451590509618077
- Karan, P. P. (1987). Development issues in Sikkim and Bhutan. *Mount. Res. Dev.* 7, 275–278. doi: 10.2307/3673205
- Karan, P. P. (1989). Environment and development in Sikkim Himalaya: a review. *Hum. Ecol.* 17, 257–271. doi: 10.1007/BF00889715
- Korf, B., Hagmann, T., and Emmenegger, R. (2015). Re-spacing African drylands: territorialization, sedimentation and indigenous commodification in the Ethiopian pastoral frontier. *J. Peas. Stud.* 42, 881–901. doi: 10.1080/03066150.2015.1006628
- Kreutzmann, H. (2012). “Pastoral practices in transition: animal husbandry in high Asian contexts,” in *Pastoral Practices in High Asia*, ed H. Kreutzmann (London: Springer), 1–29. doi: 10.1007/978-94-007-3846-1_1
- Lachungpa, S. T. (2012). *Green Governance: Policies, Programmes and Vision of the Forestry Sector of Sikkim*. Gangtok: Government of Sikkim.
- Lam, L. M., and Paul, S. (2014). Disputed land rights and conservation-led displacement: a double whammy on the poor. *Conserv. Soc.* 12, 65–76. doi: 10.4103/0972-4923.132132
- Leach, M., Mearns, R., and Scoones, I. A. N. (1999). Environmental entitlements: dynamics and institutions in community-based natural resource management. *World Dev.* 27, 225–247. doi: 10.1016/S0305-750X(98)00141-7
- Li, S. L., Yu, F. H., Werger, M. J. A., Dong, M., Ramula, S., and Zuidema, P. A. (2013). Understanding the effects of a new grazing policy: the impact of seasonal grazing on shrub demography in the Inner Mongolian steppe. *J. Appl. Ecol.* 50, 1377–1386. doi: 10.1111/1365-2664.12159
- Maity, D. (2013). A study on the ethnomedicinal uses of Yartshagumba, *Cordyceps sinensis* (Berk.) sacc. (Cordycipitaceae), by the Tribal Communities of the North Sikkim and its conservation. *Explor. Anim. Med. Res.* 3, 95–101. Available online at: https://www.researchgate.net/publication/331223824_Debabrata_Maity_A_STUDY_ON_ETHNOMEDICINAL_USES_OF_YARTSHAGUMBA_CORDYCEPS_SINENSIS_BERK_SACC_CORDYCEPITACEAE_BY_THE_TRIBAL_COMMUNITIES_OF_NORTH_SIKKIM_AND_ITS_CONSERVATION
- Maity, D., and Maiti, G. (2007). *The Wild Flowers of Kanchenjunga Biosphere Reserve, Sikkim*. Kolkata: Naya Udyog.
- Mccabe, J. T., Perkin, S., Schofield, C., Mccabe, J. T., Perkin, S., and Schofield, C. (1992). Can conservation and development be coupled among pastoral people? An examination of the Maasai of the Ngorongoro Conservation Area, Tanzania. *Hum. Organ.* 51, 353–366. doi: 10.17730/humo.51.4.d20010q600v50240
- Mehra, B. S., and Mathur, P. K. (2001). Livestock grazing in the Great Himalayan National Park conservation area—a landscape level assessment. *Himalaya J. Assoc. Nepal Himalayan Stud.* 21:14. Available online at: <https://digitalcommons.maclester.edu/cgi/viewcontent.cgi?article=1438&context=himalaya>
- Mishra, C., Bagchi, S., Namgail, T., and Bhatnagar, Y. V. (1998). “Multiple use of Trans-Himalayan rangelands: reconciling human livelihoods with wildlife conservation,” in *Wild Rangelands: Conserving Wildlife While Maintaining Livestock in Semiarid Ecosystem (Mishra 2001)*, eds J. T. du Toit, R. Kock, and J. C. Deutsch (Oxford: Blackwell Publishing Ltd), 291–311. doi: 10.1002/9781444317091
- Mortimore, M. (1998). *Roots in the African Dust: Sustaining the Sub-Saharan Drylands*. Cambridge: Cambridge University Press.
- Mortimore, M., and Turner, B. (2005). Does the Sahelian smallholder's management of woodland, farm trees, rangeland support the hypothesis of human-induced desertification? *J. Arid Environ.* 63, 567–595. doi: 10.1016/j.jaridenv.2005.03.005
- Mwaikusa, J. T. (1993). Community rights and land use policies in Tanzania: the case of pastoral communities. *J. Afr. Law* 37, 144–163. doi: 10.1017/S0021855300011219
- Myers, N., Mittermeyer, R. A., Mittermeyer, C. G., Da Fonseca, G. A. B., and Kent, J. (2000). Biodiversity hotspots for conservation priorities. *Nature* 403, 853–858. doi: 10.1038/35002501
- Namgay, K., Millar, J., Black, R., and Samdup, T. (2013). Transhumant agro-pastoralism in Bhutan: exploring contemporary practices and socio-cultural traditions. *Pastoralism Res. Policy Pract.* 3:13. doi: 10.1186/2041-7136-3-13
- Nautiyal, S., Rao, K. S., Maikhuri, R. K., and Saxena, K. G. (2003). Transhumant Pastoralism in the Nanda Devi Biosphere Reserve, India. *Mount. Res. Dev.* 23, 255–262. doi: 10.1659/0276-4741(2003)023[0255:TPITND]2.0.CO;2
- Ojeda, D. (2012). Green pretexts: ecotourism, neoliberal conservation and land grabbing in Tayrona National Natural Park, Colombia. *J. Peas. Stud.* 39, 357–375. doi: 10.1080/03066150.2012.658777
- Rai, S. C., and Sundriyal, R. C. (1997). Tourism and biodiversity conservation: the Sikkim Himalaya. *Ambio* 26, 235–242.
- Rao, A., and Casimir, M. J. (1982). Mobile Pastoralists of jammu and Kashmir: a preliminary report. *Nomadic Peoples* 10, 40–50.
- Rawat, G. S., and Uniyal, V. K. (1993). Pastoralism and plant conservation: the valley of flowers dilemma. *Environ. Conserv.* 20, 164–167. doi: 10.1017/S0376892900037681
- Ren, H., Schönbach, P., Wan, H., Gierus, M., and Taube, F. (2012). Effects of grazing intensity and environmental factors on species composition and diversity in typical steppe of Inner Mongolia, China. *PLoS ONE* 7:e52180. doi: 10.1371/journal.pone.0052180
- Robbins, P. (1998). Authority and environment: institutional landscapes in Rajasthan, India. *Ann. Assoc. Am. Geogr.* 88, 410–435. doi: 10.1111/0004-5608.00107
- Saberwal, V. (1996). The politicization of Gaddi access to grazing resources in Kangra, Himachal Pradesh, 1960 to 1994. *Himalaya J. Assoc. Nepal Himalayan Stud.* 16, 7–12.
- Sangay, T., and Vernes, K. (2008). Human–wildlife conflict in the Kingdom of Bhutan: patterns of livestock predation by large mammalian carnivores. *Biol. Conserv.* 141, 1272–1282. doi: 10.1016/j.biocon.2008.02.027
- Sathyakumar, S., Bashir, T., Bhattacharya, T., and Poudyal, K. (2011). “Mammals of the Khangchendzonga Biosphere Reserve, Sikkim, India,” in *Biodiversity of Sikkim—Exploring and Conserving a Global Hotspot*, eds M. L. Arrawatia and S. Tambe (Gangtok: Information and Public Relations Department, Government of Sikkim), 327–350.
- Schmidt, M., and Pearson, O. (2016). Pastoral livelihoods under pressure: ecological, political and socioeconomic transitions in Afar (Ethiopia). *J. Arid Environ.* 124, 22–30. doi: 10.1016/j.jaridenv.2015.07.003
- Scoones, I. (1994). *Living With Uncertainty: New Directions in Pastoral Development in Africa*. London: Intermediate Technology Publications.
- Sharma, R. K., Bhatnagar, Y. V., and Mishra, C. (2015). Does livestock benefit or harm snow leopards? *Biol. Conserv.* 190, 8–13. doi: 10.1016/j.biocon.2015.04.026

- Shrestha, R., and Wegge, A. P. (2008). Wild sheep and livestock in Nepal Trans-Himalaya: coexistence or competition? *Environ. Conserv.* 35, 125–136. doi: 10.1017/S0376892908004724
- Singh, H. B., Prasad, P., and Rai, L. K. (2002). Folk medicinal plants in the Sikkim Himalayas of India. *Asian Folklore Stud.* 61:295. doi: 10.2307/1178975
- Singh, R. (2020). Himal Rakshak of Sikkim: the burden of being the flag bearer of community conservation. *Indian Soc. Ecol. Econ.* 3, 179–183. doi: 10.37773/ees.v3i2.110
- Singh, R., Sharma, R. K., and Babu, S. (2015). Pastoralism in transition: livestock abundance and herd composition in Spiti, Trans-Himalaya. *Hum. Ecol.* 43, 799–810. doi: 10.1007/s10745-015-9789-2
- Stebbing, E. P. (1935). The encroaching Sahara. *Geograph. J.* 86, 510–518.
- Suryawanshi, K. R., Veer, Y., and Charudutt, B. (2010). Why should a grazer browse? Livestock impact on winter resource use by bharal *Pseudois nayaur*. *Oecologia* 162, 453–462. doi: 10.1007/s00442-009-1467-x
- Tambe, S., Bhutia, N. T., and Arrawatia, M. L. (2005). *People's Opinion on the Impacts of "Ban on Grazing" in Barsey Rhododendron Sanctuary, Sikkim, India*. Report, The Mountain Institute, Gangtok, 1–22.
- Tambe, S., Bhutia, N. T., and Bhutia, T. U. (2006). *An Ecological Study of Pastoralism in the Khanchendzonga National Park, West Sikkim, India*. Sikkim, India.
- Tambe, S., and Rawat, G. S. (2009a). Ecology, economics, and equity of the pastoral systems in the Khangchendzonga National Park, Sikkim Himalaya, India. *Ambio* 38, 95–100. doi: 10.1579/0044-7447-38.2.95
- Tambe, S., and Rawat, G. S. (2009b). Traditional Livelihood Based on Sheep Grazing in the Khangchendzonga National Park, Sikkim. *Indian J. Tradit. Knowled.* 8, 75–80.
- Thapa, S., All, J., and Yadav, R. K. P. (2016). Effects of livestock grazing in pastures in the Manaslu conservation area, Nepalese Himalaya. *Mount. Res. Dev.* 36:311. doi: 10.1659/MRD-JOURNAL-D-13-00066.1
- Wang, Y., and Wesche, K. (2016). Vegetation and soil responses to livestock grazing in Central Asian grasslands: a review of Chinese literature. *Biodiv. Conserv.* 25, 2401–2420. doi: 10.1007/s10531-015-1034-1
- Weber, K. T., and Horst, S. (2011). Desertification and livestock grazing: the roles of sedentarization, mobility and rest. *Pastoralism* 1:19. doi: 10.1186/2041-7136-1-19
- Weldemichel, T. G. (2020). Othering pastoralists, state violence, and the remaking of boundaries in Tanzania's militarised wildlife conservation sector. *Antipode* 52, 1–23. doi: 10.1111/anti.12638
- Wu, N., Ismail, M., Joshi, S., Yi, S., Shrestha, R. M., and Jasra, A. W. (2014). Livelihood diversification as an adaptation approach to change in the pastoral Hindu-Kush Himalayan region. *J. Mount. Sci.* 11, 1342–1355. doi: 10.1007/s11629-014-3038-9
- Yamaguchi, T. (2011). Transition in mountain Pastoralism: an agro diversity analysis of the livestock population and herding strategies in southwest Tibet, China. *Hum. Ecol.* 39, 141–154. doi: 10.1007/s10745-010-9370-y
- Yeh, E. (2005). Green governmentality and pastoralism in western China: converting pastures to grasslands. *Nomadic Peoples* 9, 9–29. doi: 10.3167/082279405781826164
- Yeh, E. T., Samberg, L. H., Gaerrang, V. E., and Harris, R. B. (2017). Pastoralist decision-making on the Tibetan plateau. *Hum. Ecol.* 45, 1–11. doi: 10.1007/s10745-017-9891-8
- Zhizhong, W., and Wen, D. (2008). Pastoral nomad rights in Inner Mongolia. *Nomadic Peoples* 12, 13–33. doi: 10.3167/np.2008.120202

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright © 2021 Singh, Sharma, Bhutia, Bhutia and Babu. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.