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# Transhumant Pastoralism in the Context of Socioeconomic and Climate Change in the Mountains of Nepal

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*This research explored how transhumant pastoralism has been sustained and promoted in the context of socioeconomic and climate change in the mountain regions of Nepal. Based on case study research conducted*

*in Nepal's western mountains, the status, opportunities, and constraints of transhumant pastoralism in the changing context were analyzed. We found that indigenous and traditional knowledge, feelings of cultural identity, collective ownership, income, and mutual benefits have acted as motivating factors*

*in sustaining transhumant pastoralism for generations. The continuation of this practice is threatened by the following challenges: the impacts of climate change on mountain ecosystems, socioeconomic changes, market influence on livelihood decisions, youth migration and labor shortage, low motivation of local people to engage in livestock rearing, and conflicts between herder and nonherder communities and institutions, as well as inadequate policy support and institutional arrangements. We conclude that unless there are positive policy and institutional arrangements to support transhumant pastoralism, the age-old practice will disappear.*

**Keywords:** Transhumant pastoralism; in-depth interviews; mountains; climate change; livelihoods; Nepal.

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## Introduction

Transhumant pastoralism (THP)—the seasonal migration of livestock and humans between many agro-ecological zones—is an age-old practice in many mountain regions (Byers 1996; Rota and Sperandini 2010). In the Himalaya, for more than 1000 years pastoralists have transformed the ecosystem into economically productive assets for their livelihoods, and even today the region provides a home for a large number of people dependent on livestock (Miller 1995; Byers 1996; McVeigh 2004; Kreutzmann 2012).

Mountain regions cover 27% of the earth's land surface (Ebi et al 2007), accommodate 10% of the global population, contain half the world's biodiversity hotspots, are rich in global heritage and culture, and provide a source of fresh water for half the world's population (Kohler et al 2010). Mountain regions are also home to many indigenous people whose livelihoods depend on mountain ecosystem services such as water, forests, agriculture, and medicinal plants (Hunzai et al 2011). In addition to direct livelihood opportunities, mountain regions provide other ecosystem services such as watershed protection and biodiversity conservation, as well as ecotourism services to people living in the mountains and downstream (Macchi et al 2011).

About 90% of global mountain populations live in developing countries including China, India, Nepal, and other Asian countries and depend upon various ecosystem services for their livelihoods (Huddleston et al 2003). However, the incidence of poverty is higher in the mountains than in the plains in the same regions (Hunzai et al 2011). Despite its cultural significance and various contributions to livelihoods, transhumant pastoralism in the mountain regions of Nepal is uncertain, and the practice may even disappear due to policy, institutional, governance, and climatic factors (Banjade and Paudel 2008; Banerjee 2009; Aryal et al 2014).

Livestock are considered capital assets and a source of wealth and power by mountain communities (Messerschmidt 1976; Banjade and Paudel 2008; Gerber et al 2010; Aryal et al 2014). Transhumance arrangements are mostly guided by indigenous rules, practices, and institutions (Messerschmidt 1976; Dong et al 2007, 2009; Moktan et al 2008; Wang et al 2013). However, in many cases indigenous institutions and their rules have been replaced by formal institutions; this has led to conflict in balancing conservation and livelihoods in the mountain regions (Chakrabarti 2011).

Modifications of livelihood options due to changes in demography, migration, labor shortage, diversification of agriculture, and market influence on rural economy,

as well as privatization and nationalization of rangelands are reported as constraints to transhumant pastoralism in the mountains (Banerjee 2009; Bassett 2009; Galvin 2009; Banerjee et al 2011; Bhasin 2011; Yamaguchi 2011; Namgay et al 2013). Traditional livelihoods in mountain regions are increasingly influenced by trends such as the growth in remittances and migration of people from rural areas (Shishido 2009; Banerjee et al 2011; GoN 2012; Chapagain and Gentle 2015). Migration is also causing populations in many mountain regions to decrease. In contrast to nationwide population growth, Nepal's 2011 population and housing census showed that there is a general depopulation trend in 27 hill and mountain districts, with negative population growth rates during the last decade (GoN 2012).

Conflicts in rangeland management and use have also been identified as a threat to the continuation of transhumant pastoralism in Nepal. Conflicts occur between local communities and government, as well as between herder and nonherder communities with different institutional arrangements in natural resource management (Oli 1996; Banjade and Paudel 2008). Acharya (2003) has argued that the Nepal Pasture Act (1974) is responsible for decreasing the role of indigenous institutions in pastureland management and regulation. Conflicts between transhumant pastoralists and members of community forest user groups often occur as a result of incorporation of many traditional grazing lands into community forests, where grazing is now restricted, limiting pastoralists' traditional user rights (Banjade and Paudel 2008). Livestock in Nepal are managed as private property, but grazing lands are typically public property or commons. These differences in regimes are a source of conflict between herder and nonherder communities (Dong et al 2009).

Impacts of climate change have been observed on high-elevation pasturelands in Nepal. Xu et al (2007) have reported greater increases in mean temperatures at higher elevation than at lower elevation, along with changing precipitation patterns and increasing glacier melting. Other observed impacts of climate change in the mountains include variation in rain and snowfall, drought, glacial lake outburst floods, and landslides leading to crop failure, as well as increasing food and livelihood insecurity, water scarcity, and income insecurity (Kohler et al 2010; Macchi 2011; Gentle and Maraseni 2012). As a result, these mountain regions are recognized as a "climate change hotspot," with serious consequences for mountain ecosystems and people, as well as for ecosystems, human settlements, and the economy of downstream areas (Macchi 2011). THP is seen as an adaptation strategy, because it uses pasture resources at different elevations depending on seasonal variability (Agrawal 2010).

These studies reveal that changing livelihood scenarios in mountain regions of Nepal are triggered by

demographic, institutional, and market changes—along with climate change and its impact on mountain ecosystems and THP. It is therefore important to understand how transhumant pastoralism is being sustained in the mountains of Nepal and what the projected scenario is for THP. The present study addressed the following questions:

1. What is the current status of transhumant pastoralism and how is it contributing to local livelihoods?
2. What indigenous and locally developed institutional arrangements exist to sustain this system?
3. What major opportunities, constraints, and challenges will THP face in future?

## Study area and methodology

### Case study location

The research was conducted in the Ghermu Village Development Committee (VDC) of Lamjung district, Nepal (Figure 1). Ghermu VDC is home to indigenous and ethnic Gurung communities with a population of 1776 in 402 households in 2011. Within Ghermu VDC (28.44°N; 84.44°E) the traditional practice of THP contributes to the livelihoods of indigenous Gurung communities, who mainly rely on subsistence agriculture with a strong linkage between farming, pasturelands, and forestry. Lamjung is ranked as a district with very high vulnerability to climate change, based particularly on high vulnerability to landslides and glacial lake outburst floods (GoN 2010). The 4 adjoining settlements of the VDC (Niuri, Chhichu, Ghermu Phanta, and Khani Gaun) were selected for primary data collection. Their total population in 2012 was 750 in 151 households, comprising 21 herder and 130 nonherder households.

### Research methods

We adopted a qualitative research approach with in-depth face-to-face interviews (Babbie 2007). A total of 30 interviews were conducted at community level, with 6 herder and 24 nonherder households. A further 12 interviews were conducted with district-level participants from government and nongovernment organizations related to forestry, agriculture, livestock, banking, and community development activities (Tables 1 and 2). Three focus group discussions (FGDs) were carried out with 21 participants—8 herder and 13 nonherder participants from 3 different villages. Interviews and FGDs with the representatives of herder and nonherder communities were designed to enable an understanding of their perspectives on the importance of THP and to map how they perceive conflicts between formal and nonformal institutions. The participants of in-depth interviews and FGDs were purposely selected to represent all geographical locations in the village and all categories of

FIGURE 1 Location of the research site. (Map by Him Lal Shrestha)



ethnicity, caste, class, gender, and occupation (Table 1). Participant observation was conducted in the research area by spending a week following daily herding activities and observing the conflicts between herders and community forest user groups (CFUGs). The observations were noted in a diary, and important events were captured in photographs. The qualitative data collected through interviewees and FGDs were recorded using a voice recorder; they were then transcribed, translated, and analyzed using NVIVO 10 under the thematic hierarchical approach.

The research adopted a multiscaled and multiphased data collection process. Data collection was carried out at community and district level in 2 phases focusing on various actors related to the research. The primary data were collected during 2 field trips in Nepal, the first from December 2011 to April 2012 and the second in May 2013. In the first phase, data were collected through interviews at community level and through FGDs, while the second phase involved interviews at district level. In addition, secondary data on herd size and community forestry were collected from records obtained from different organizations and institutions related to the research focus.

## Results

### Status of transhumant pastoralism

According to the 2010 records of the Lamjung district veterinary office, 62 main *goths* (herds of sheep and goats, also commonly called *bhedi goth*, or sheep herds) containing 12,982 sheep and 4595 goats (for meat not dairy) were held under the THP system.

In 2012 there were 14 *goths* in Ghermu VDC, the research location, with a total of 4350 sheep and goats. The *goth* size ranged from a maximum of 700 to a minimum 150, with an average of 311 sheep and goats per *goth*. Each *goth* was looked after by 3–5 herders. The 120 nonherder households owned between 1 and 30 sheep or goats (an average of 12 per household) that were looked after by the *goth* herders.

The nonherders entrust their livestock (called *nasho*) for rearing by herders under an informal arrangement based on mutual understanding and trust, and in many cases the nonherders do not know which herder is looking after how many of their livestock as *nasho*. However, the herders know all the livestock and their offspring, and to which nonherder they belong. The herders return



**TABLE 1** Community-level interviewees and FGD participants.

	Interview (n = 30)	FGD (n = 3 with a total of 21 participants)
<b>Village locations</b>		
Niuri	6	9
Chhichu	5	
Khani Gaun	8	6
Ghermu Phanta	11	6
<b>Age</b>		
Below 30	10	7
30–40	13	10
Above 40	7	4
<b>Gender</b>		
Men	20	15
Women	10	6
<b>Caste/ethnicity</b>		
Dalit	4	2
Ethnic group	26	19
<b>Occupation</b>		
Herders	6	8
Nonherders	24	13

some money (at their discretion, but usually about 50%) to the nonherders when they sell any livestock they took as *nasho*. The *nasho* system was found to be an age-old tradition based on trust and reciprocity. Herders help nonherders rear their livestock and provide some financial returns. In return, the nonherders offer grazing on their farmlands when the *goths* come down close to residential areas and provide food (*kharcha*) to the herders during their time on the high-elevation pasturelands (*kharkas*), which are as far as 2 or 3 days' walk from the residential areas.

Transhumant pastoralism in Ghermu VDC ranges from the lower grounds along the valley floors and residential areas (at an elevation of about 800 m) to *kharkas* at an elevation of 4500–5000 m. The *goths* are kept in the lower grounds for about 6 months each year from September/October to March/April, where livestock graze in community forests (even though this is no longer permitted), farmlands, and other grazing lands along rivers, roads, and forests. From April/May to September/October the *goths* are taken to the *kharkas*; moving the livestock between grazing grounds (Figure 2)

**TABLE 2** District-level interviewees (n = 12).

	Number of participants
<b>Professional area</b>	
Government officers	4
NGO chairpersons	3
Constituency-based organization (Executive Committee members)	2
Private-sector service providers (senior staff)	2
Research organization (researcher)	1
<b>Age</b>	
Below 30	1
30–40	5
Above 40	6
<b>Gender</b>	
Men	10
Women	2

takes time, as reported by a herder interviewee, “It takes 1 to 2 months to reach our final destination at the highest elevation, as we graze our livestock in more than 20 *kharkas* on the way there.” According to the herders, the 6-month period at higher elevations is best for livestock because they can graze on highly nutritious *kharkas* with plenty of grass, while at lower elevations they face scarcity of grazing lands and nutritious grasses.

FGD participants said buffalo *goths* used to be grazed under THP in the study area in the past, but these had now disappeared. As reported by a former buffalo herder:

*We used to have more than 20 buffalo goths in our village. Now we don't have any. This is due to a shrinkage of grazing land and lack of grasses on the farms. Lack of labor is another reason, as buffalo farming requires high labor input for milking and processing of dairy products.*

Former buffalo herders reported that they had converted their buffalo *goths* into sheep and goat *goths*. As reported by interviewees in the FGDs, the total number of livestock (cows, buffaloes, goats, and sheep) fell by 25% in the decade from 2001 to 2011. However, pressure on grazing land at low elevation had increased due to conversion of grazing lands into forests, agriculture, and residential areas.

#### Contribution to local livelihoods

Transhumant pastoralism was found to be a major source of livelihoods for local communities, through various

**FIGURE 2** A sheep and goat herd on the way to winter pastures. (Photo by Popular Gentle)



direct and indirect contributions. The major contribution was cash income from the sale of livestock. As reported by interviewees, each herd owner sells about 15–25 livestock per year (about 7% of the total). This generates a total of about 3 million NRs ( $\approx$ US\$ 35,000) for the 14 *goths* in the research area in Ghermu VDC, or an average gross annual income of about US\$ 2500 per herder. The indirect contributions reported by informants included provision of manure for farmlands, employment, as well as cultural values, as explained by a herder interviewee: “Sheep have a cultural and spiritual value in the Gurung community, and we need sheep in most of our religious and cultural functions.”

When the *goths* are brought down, local residents, particularly those who provided *nasho*, invite the herders to graze their animals on their fallow farmlands, benefiting from nutrients from the manure. Local people also offer food and drinks to the herders and the overnight stay of *goths* on their farmlands. However, there is very limited grazing on farmland, as nutritious grasses have been replaced by invasive plants.

#### **Indigenous and traditional institutional arrangements sustain the system**

Various indigenous and traditional institutional arrangements were found to contribute to the maintenance of this system in the community. The reciprocity created by the *Nasho* system, for example, the exchange of grazing access for manure nutrient, is an example of an informal institutional arrangement benefiting both herder and nonherder communities. Such arrangements create connections in communities by

demonstrating that pastoralism is not the individual business of herders, but rather a collective action of local communities.

Another form of indigenous institutional arrangement sustaining this system is *thiti*, an indigenous custom in the Gurung community. *Thiti* is responsible for the regulation and management of livestock grazing on common land and involves the collection of revenues from livestock owners for allocation to community projects. This informal institution was described by one interviewee in the following way:

*Thiti samaj is a tradition in our community initiated by our ancestors. This is an indigenous practice of the Gurung community ... guided by the verbal understanding of members. Through thiti samaj, 50 rupees per livestock head with stall feeding and 200 rupees per livestock head with grazing are collected annually, and the money is spent on local development and welfare-related activities.*

As reported by interviewees, *thiti* is a highly respected customary practice that is very important in local-level decision-making, as it is based on the traditions, culture, and identity of the community:

*Thiti is a customary practice which regulates when and where to graze livestock and how to collect money. Its operation is based on understanding and informal rules. ... In the past thiti was more powerful than the village development committee ... but we still follow thiti rules.*

The interviewees said that in contemporary society, formal institutions had replaced the role of informal and

indigenous institutions such as *thiti*. For example, *thiti* was responsible for promoting and regulating livestock grazing in the past, but now CFUGs are the formal institutions responsible for protecting, managing, and using forest resources. *Thiti* rules play no part in community forest management, and thus grazing access to herders in the forests has been restricted. A nonherder CFUG member reported that “the objective of community forestry is to protect and manage forest resources: we are not allowed to provide grazing inside the forests ... the *goth* system is only for a few herders to continue their livelihoods.”

### Perceived impacts of climate change

The impact of climate change on livestock and transhumant pastoralism was reported by interviewees in various ways. Herders said that the production of the most common nutritious grasses on the high-elevation pasturelands depended on the time and intensity of snowfall. All herder interviewees mentioned that in recent years the snowfall pattern had been erratic, the amount of snow was decreasing, and the accumulated snow in the lower mountains was melting earlier than in the past. As described by one of the leading herders:

*I have been herding my livestock in this area for the past 30 years. I travel the same route each year. I have observed that the thickness of snow in many kharkas is decreasing, and it is not enough for the grasses to grow. In the past we used to graze our livestock many days in a single kharka, now we have to move to many kharkas to find nutritious grasses.*

Interviewees also reported a scarcity of water in traditional water sources such as streams and wells along the livestock migration routes. As mentioned by one of the herders:

*There are 9 water sources where we need water for livestock on the way to high-elevation kharkas. There was plenty of water in all water sources in the past. In recent years we have noticed that out of 9 sources, 2 wells have already dried and 5 water sources are gradually drying. Due to the scarcity of water, we have to change our travel route and locations of overnight camps these days.*

In addition, in the low-elevation areas, an increasing presence of invasive weeds, replacing valuable grasses in farmlands and forests, is perceived as a climate-driven effect related to increasing temperature and an erratic rainfall pattern with a significant impact on livestock grazing. One of the herder respondents reported: “all the farmlands are now covered by *nilo gandhe* [an invasive weed, *Ageratum* sp.] and we don’t have other grasses. *Banmara* [another weed, *Eupatorium* sp.] is also everywhere in the forests. Our traditional grasses are replaced by invasive weeds.” Another interviewee said: “*Nilo gandhe*

has replaced many grasses. So we don’t have enough grasses now. If we provide *gandhe* to our livestock they have diarrhea and we need another medicine for that.” *Banmara*, a nonpalatable invasive weed, was reported as a major problem for the regeneration of undergrowth vegetation in the forests and pasture lands. According to a herder interviewee: “When we bring livestock to the forests for grazing, there is no grass as it is replaced by *banmara*. *Banmara* has now covered the forest and nothing is regenerating.”

Research participants reported increasing incidences of livestock diseases due in their view to the changing climate. As reported by a herder interviewee:

*Livestock diseases are now increasing with extreme hot and extreme cold days. In the winter many goats and sheep are dying due to pneumonia. We mostly live far from the service centers and don’t have any support from the government and other agencies to take care of our livestock. We need veterinary support and livestock insurance to continue this profession.*

Another interviewee described the increasing use of medicines against livestock diseases in recent years: “There are new livestock diseases. *Namle* [foot-and-mouth disease] has become quite common, a disease we had never experienced before. Now we have to provide medicines against *namle* to our goats every six months.” One of the agricultural service providers described the increase in livestock diseases in the hills in the following way: “In the past, livestock diseases were common in the *terai* [plains] and there were not many livestock diseases in the hills. Now there are many livestock deaths in the hills due to diseases.”

### Impacts of socioeconomic dynamics

Interviewees reported rapid socioeconomic changes in the middle hills and mountains of Nepal in the form of access to communication, transportation, development initiatives such as road construction, and the influence of markets on livelihood diversification.

A major change was reported in traditional and subsistence farming in the upland villages. Research participants informed us that interest in farming in the upland slopes, where they used to grow maize, millet, potatoes, and barley, was decreasing because of decreasing revenues. As mentioned by a nonherder interviewee who was a school teacher:

*There is no profit in farming in the nonirrigated uplands. There is a scarcity of labor and compost following a decrease in livestock numbers, and the rainfall pattern is uncertain. So we have abandoned our farmlands in the uplands and are now only cultivating in the valley floors where we have irrigation facilities. More than 40% of farmlands in the uplands of this VDC have been abandoned.*



Moving away from subsistence farming implies that people need to buy food, and thus need to diversify their livelihoods by seeking work beyond subsistence farming to have money for food. The herder communities reported that although commercialization of products is the only viable option to sustain agriculture in the mountains, they lacked support for livestock-based product diversification and value addition: “There is no support to commercialize livestock production and products. We need support for pasture management, as well as for marketing of wool and meat products.”

An increase in internal and external migration was also reported. Recruitment of youth in the British and Indian armies was common in this village for many years. Overseas labor migration from the village began in 1996. During the research period (2012–2013), 63% (19 out of 30) of the local community households interviewed were receiving remittances from at least 1 household member working overseas or as an overseas pensioner. Where young members had left home to work overseas, women, children, and elderly were left behind, increasing the workload and burden for women. According to interviewees, 80% of households receiving remittances had migrated either to *Ghermu Phanta* (a nearby valley floor), *Beshisahar* (headquarters of the district), or other city areas. As a result, the upland remote areas were being depopulated and populations were growing around valley floors, roadheads, and semiurban areas. Interviewees who received remittances or had emigrated from upland rural areas were found to have little interest in livestock rearing and transhumant pastoralism. As reported by a nonherder interviewee,

*Those who are receiving remittances are seeking better opportunities to educate their children and are migrating to semiurban and urban areas. They are not interested in agriculture, instead, they are investing money in business, education of children, and settlement in city areas.*

The rapid expansion of communication facilities was also described by interviewees as contributing to livelihood diversification. They said telephone service had been introduced in the village in 2006 and mobile phone service in 2008. In 2012, 98% of interviewees (all except one very poor interviewee out of 42 total interviewees) had at least 1 mobile phone in the family. As reported, improved communication was contributing to access to information, technology, and basic services required for livelihood diversification.

Transport facilities have also improved in recent years. Construction of the Beshisahar (district headquarters of Lamjung) to Manang road began in 1998 and the new all-season road reached Ghermu VDC in 2007. Access to transportation, together with other factors such as increased flow of remittances, has increased market influence in the rural economy. It has improved access to markets for the supply of food, seed

varieties, vegetables, and chemical fertilizers and has gradually replaced local agriculture products. As reported by a nonherder interviewee, “The goods we used to produce in rural areas and sell to urban areas, we are now buying from urban areas. Now the rural population is gradually depending on market products rather than producing their own goods.” The increased access to transportation was reported as one of the major drivers for the migration of people towards roadheads, leaving their subsistence farms abandoned in the upland hills.

### Shrinking grazing lands and institutional conflicts

As reported by FGD participants, tree plantations were initiated after 1990, and many barren lands and pasturelands were converted into forest. From 1999, with the initiation of community forestry, forests close to the villages were handed over to the CFUGs. According to the District Forest Office (DFO), 6 forests with a total area of 1194 ha had been handed over to the local communities as community forests, and all households in the VDC are now members of at least one CFUG (DFO 2012). According to research participants, community forestry had been successful in regenerating and protecting forest resources, as well as in controlling forest fires, grazing, and shifting cultivation. However, community forestry was also blamed for converting pasturelands into forests, imposing restrictions on livestock grazing in forests, and undermining the role of customary institutions such as *thiti*. As reported by a service provider from the district veterinary office,

*Although livestock makes an important contribution to the local economy and livelihoods, livestock grazing in the community forests is now illegal. Pasture management and livestock grazing are not considered a part of forest management. Community forestry also undermines the role of traditional institutions such as thiti, which supports livestock grazing.*

The restriction of open grazing under community forestry, and a reduced interest among local people in livestock rearing, have resulted in a decreasing number of livestock. The interviewees also explained that the decreasing number of livestock has a direct impact on the amount of compost available, resulting in a decrease in agricultural production. Research participants also described that herding is considered the least preferred occupation in the community. As explained by one nonherder interviewee, “Herders have very low social status in the community. They are seen as those who are not educated and have no skills to do other occupations.” There is thus a low motivation for youth to become herders and to continue transhumant pastoralism.

### Discussion

Our research found that THP contributes to the livelihoods of herder communities and some other



nonherder communities associated with them. In addition to the direct benefits from the sale of livestock, the Gurung communities in the research area recognized THP as an indigenous practice associated with their culture and identity. In Gurung communities both herder and nonherder households benefit from the traditional *thiti* and *nasho* systems, providing a favorable environment to sustain THP. The *nasho* system was found to be a “connector” that binds herders and nonherders by creating opportunities of mutual interest, trust, and reciprocity.

However, rapid socioeconomic and environmental changes are causing demographic changes and pasture degradation, threatening the continuation of transhumant pastoralism as a form of livelihood. The practice of THP in general is declining, as also reported in other mountain areas (Intigrinova 2005; Banerjee 2009; Chakrabarti 2011; Kerven et al 2012; Namgay et al 2014).

Our study found that policy and institutional mechanisms were not supportive of THP. The government has not formulated or implemented supportive policies to manage pasturelands or to encourage pastoralists to continue their traditions. Instead, policies such as the Pasture Act (1974) and Forest Act are undermining the role of traditional institutions in the management of pastures and grazing rights of indigenous people (Acharya 2003; Banjade and Paudel 2008). Community forestry has been considered a strategy to manage local commons based on traditional user rights (Andersson and Agrawal 2011). However, the management objective of community forestry was found to obstruct the adoption of controlled grazing as a means to achieve forest management while enabling a diversity of livelihoods. Moreover, we found that community forestry was replacing and diminishing local rules and institutional arrangements created by customary institutions such as *thiti*, which play an important role in sustaining and promoting THP. Our findings are similar to those of Chakrabarti (2011) and Ostrom (2009) who explored how formal institutions replace indigenous knowledge and practices. Chakrabarti (2011) presented a similar situation from Sikkim state of India, where government-promoted institutions and provisions had created conflict with an informal traditional institution of pastoral communities called *dzumsa*, undermining the livelihood opportunities of traditional pastoral communities.

Another consequence of the socioeconomic and demographic changes in the mountains of Nepal is the massive and unplanned construction of roads and increasing role of the market economy. This is promoting livelihood diversification in areas beyond the agriculture and livestock sectors. The changes are also promoting the internal and external migration of local community members, resulting in an increased flow of remittances in the rural economy; while in itself this is a welcome improvement of people's livelihoods, it leads to a labor

shortage for agriculture and livestock management. There is little interest among the next generation in pastoral activities. A similar situation has been described in Bhutan, where socioeconomic change has resulted in a gradual shift from pastoral livelihoods towards nonpastoral sectors (Namgay et al 2014).

To continue carrying out their occupation, the herder communities require supportive policies and institutional provisions to support them in human and livestock insurance, veterinary services, and grazing rights. However, neither the government nor private sector is committed to providing such services. In contrast, positive initiatives by the Indian Government in the Changthang region, including the provision of supplementary fodder, disease control, and market linkage for cashmere, have resulted in increased herd size and positive changes in the socioeconomic condition of pastoral nomads (Namgail et al 2007).

Although there are limited climate data to confirm the impacts of climate change on pastures and livestock, local communities reported perceived impacts of climate change on livelihoods and mountain ecosystems. Climate change impacts are observed in terms of erratic snow/ rainfall and degradation of rangelands, water stress due to gradually drying-up water sources, increasing livestock diseases, and an encroachment of grazing lands by invasive species. The projected scenarios indicate a worsening future for THP, as the impact of climate change is expected to be greater in the mountains in comparison to other areas (Du et al 2004; Kohler et al 2010; Macchi et al 2011; Gentle and Maraseni 2012).

## Conclusion

For local communities, the THP system is means of livelihood as well as a matter of indigenous practice and cultural significance. However, the practice is gradually declining toward extinction due to the impacts of socioeconomic and environmental changes in the mountains of Nepal. To continue their occupation, herders are desperately in need of policy and institutional support, but neither government nor private sector has been effective in promoting and supporting the system. THP represents an adaptation strategy: it enables the rearing of livestock by seasonally moving animals through diverse weather and grazing opportunities in different ecological zones, but the opportunities it presents as a strategy have not been recognized. The practice still has the potential to contribute to local livelihoods and culture, but this will require policy and institutional support from the government and private sector through recognition and respect for the cultural and indigenous significance of THP. Such support should help maintain grazing rights, establish market linkages and promote diversification of products, and provide insurance and veterinary services. There is a need to learn from other

mountain communities where progressive policies and institutional arrangements are supporting pastoral communities to manage pasturelands, to increase

their herd sizes, and to improve their livelihoods. Otherwise, the age-old practice will disappear definitively.

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