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Weakening Socio-Cultural Linkages Imperils the Sustainability of the Transhumant Pastoralism: A Case Study of *Kinnaura* Community of Western Himalaya, India

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ABSTRACT

Kinnaura community inhabiting the Kinnaur district of Himachal Pradesh state of India in the Western Himalaya practices transhumant pastoralism (THP) helps it to adapt to cold-arid climate and remoteness. However, the age-old practice is dwindling fast amidst socio-economic and cultural changes. The present study explores the linkages of THP with socio-cultural norms and practices of the *Kinnauras* and factors responsible for the weakening of such linkages. The study was undertaken between May 2016 and October 2018 in three high- altitude villages namely Chhitkul, Rakchham, and Batseri in Kinnaur district. Semi-structured interview and participant observation methods were followed for carrying out the study. The changes have impacted the THP particularly after the 1980s in such a way that the number of herds of sheep and goats declined by 44 % and the proportion of households practicing transhumance from 67 to 42 % in the corresponding period. The study has helped in bringing forth people's voices for the revitalization of the practice in Kinnaur.

Keywords: Transhumance; Culture; Traditional knowledge; Socio-economic transformation; Livelihoods; People's voices

INTRODUCTION

The Indian Himalaya covering 16.2 % of the total geographical area is home to nearly 25 % of the total number (>700) of indigenous groups of the country with their own culture evolved over centuries (Government of India Report 2010). They are repository of vast array of traditional knowledge and practices (Ramakrishnan 2007). Transhumant pastoralism (THP) involving seasonal migration of livestock between diverse ecological regions is one such traditional practice reflecting on an adaptation strategy of peoples inhabiting high altitude areas in the Himalaya to cope with shortages of fodder and food under extreme biophysical conditions (Negi and Gadgil 1997, Moktan et al. 2008, Aryal et al. 2014). The sheep and goat based transhumance involving long distance migration with herds not only plays a key role in shaping the biodiversity in mountain landscapes but also in socio-cultural life and sustainable livelihoods of the pastoralist communities in Himalaya (Rawat and Uniyal 1993, Saberwal 1996, Kala et al. 2002, Nautiyal and Kaechele 2007). The THP contributes in almost all of the wool production from the Indian Himalayan region which is 21 % of the total wool production of India from the three Western Himalayan states of country namely, Jammu & Kashmir, Himachal Pradesh and Uttarakhand (Government of India Report 2010). Indigenous groups such as *Bakarwals, Gaddis, Kinnauras* and *Bhotiyas* practice sheep and goat based transhumance in the Western Himalaya (Saberwal 1996, Farooquee and Nautiyal 1999, Nautiyal et al. 2003, Bhasin 2011). Among these, the *Kinnaura* community which is the third most populous scheduled tribe of Himachal Pradesh state of India inhabits the cold and arid high-altitude areas of Kinnaur district in the Western Himalaya. Traditionally, agriculture, sheep and goat based transhumant pastoralism and trade including trans-boundary trade with Tibet, which stopped abruptly in the wake of Sino-Indian border conflict in 1962, were the key livelihood earning activities for the community (Singh 1994, Garkoti et al. 2018). The transhumant pastoralism is not only the integral part

of the socio-cultural life of the *Kinnauras* but also supplements their subsistence economy in a major way by provision of various products and services given the severe limitations on their agriculture under cold and arid climate (Negi and Gadgil 1997). However, as elsewhere in the Himalaya, the practice is dwindling alarmingly in Kinnaur in recent times mainly due to cultural transformation brought about by a number of factors including policy and socio-economic and land use changes catalysed by the improved accessibility (Aryal et al. 2014, Namgay et al. 2014, Gentle and Thwaites 2016). Climate change related degradation of pastoral resources and increasing natural hazards are also among the new challenges facing the practice (Gentle and Thwaites 2016).

Although many studies from the Indian Himalayan region reported different dimensions of transhumant pastoralism (Saberwal 1996, Farooquee and Nautiyal 1999, Nautiyal et al. 2003, Negi 2007), studies exploring its socio-cultural linkages are lacking. Therefore, the present study was carried out to investigate such linkages of THP among the *Kinnaura* community and understand the impacts of socio-economic and cultural transformation on the linkages and the sustainability of the practice.

MATERIALS AND METHODS

Study Area

Three villages viz., Batseri, Rakchham and Chhitkul in Sangla valley of Kinnaur district were surveyed during May 2016 to October 2018 (Fig. 1). These villages are permanent settlement of the transhumant pastoralists belonging to *Kinnaura* community. The study villages are situated at an altitudinal range of 2750 to 3450 meters above sea level (m asl) on either side of the Baspa river which is a tributary of Sutlej river and north to the watershed divide line between Ganges and Indus river basins. The water of the northern side watershed is drained into Arabian sea through Sutlej river, while of the southern side flows into Yamuna river and eventually drained into Bay of Bengal. The study villages experience semi-arid climate with four seasons: spring from middle of March to middle of May; summer and rainy mid-May to mid-September; autumn mid-September to November and winter season from December to March. The villages remain cut-off from other parts of the state due to heavy snowfall during winter season (Singh 2004). The area receives a total of 720 mm precipitation of which about 50 % occurs in winter season mainly in the form of snow and ice (average value of 1993 to 2017 from nearest Indian Meteorological station Kalpa).

Socio-economy and cultural background of the community

The *Kinnaura* community is the third most populous scheduled tribe of the state with a total population of nearly 51,000. The people belong to Aryan-Mongolian mixed race and follow Hinduism apart from a few cultural elements of Buddhism. They speak *Kinnauri* dialect and use *Himachali* for inter-group communication. *Kinnauras* are characterized by their unique traditional woollen attire, particularly cap of greyish or brown colour with green velvet band on the outer fold which distinguishes them from rest of the local communities of the state. The community is divided into two major social groups namely *Khosia* and *Beru* (Singh 1994). The *Khosias* are the main cultivators constituting nearly 74 % of the total population and practice transhumance, while the *Berus* possess specialised occupational skills and work as carpenters, masons, blacksmiths, weavers, drummers, tailors and leather workers.

Settled agriculture is practiced in which crops are grown mainly during summer and rainy seasons (May to October). Main crops grown are *Fagopyrum esculentum*, *F. tataricum* (buck wheat), *Hordeum vulgare* (barley), *Triticum aestivum* (wheat), *Pisum sativum* (pea), *Solanum tuberosum* (potato), *Phaseolus vulgaris* (kidney bean) and *Brassica sp.* (mustard). Apple-based horticulture started nearly four decades ago (Singh 2004) constitutes about 43 % of the total cultivated land presently. In addition to the migratory sheep and goats, local people also keep livestock acclimatized to the high-altitude climate such as cattle, yak, *dzo*, and *dzomo* (male and female offspring of hill cow-yak cross) in their permanent settlements providing them a range of products and services. Yak bull is primarily used for breeding, hair; female yak (locally called *bremme*) for milk and hair; cattle comprising hill cow and oxen for milk, ploughing and manure. The male and female offsprings of hill cow-yak cross are used for draught

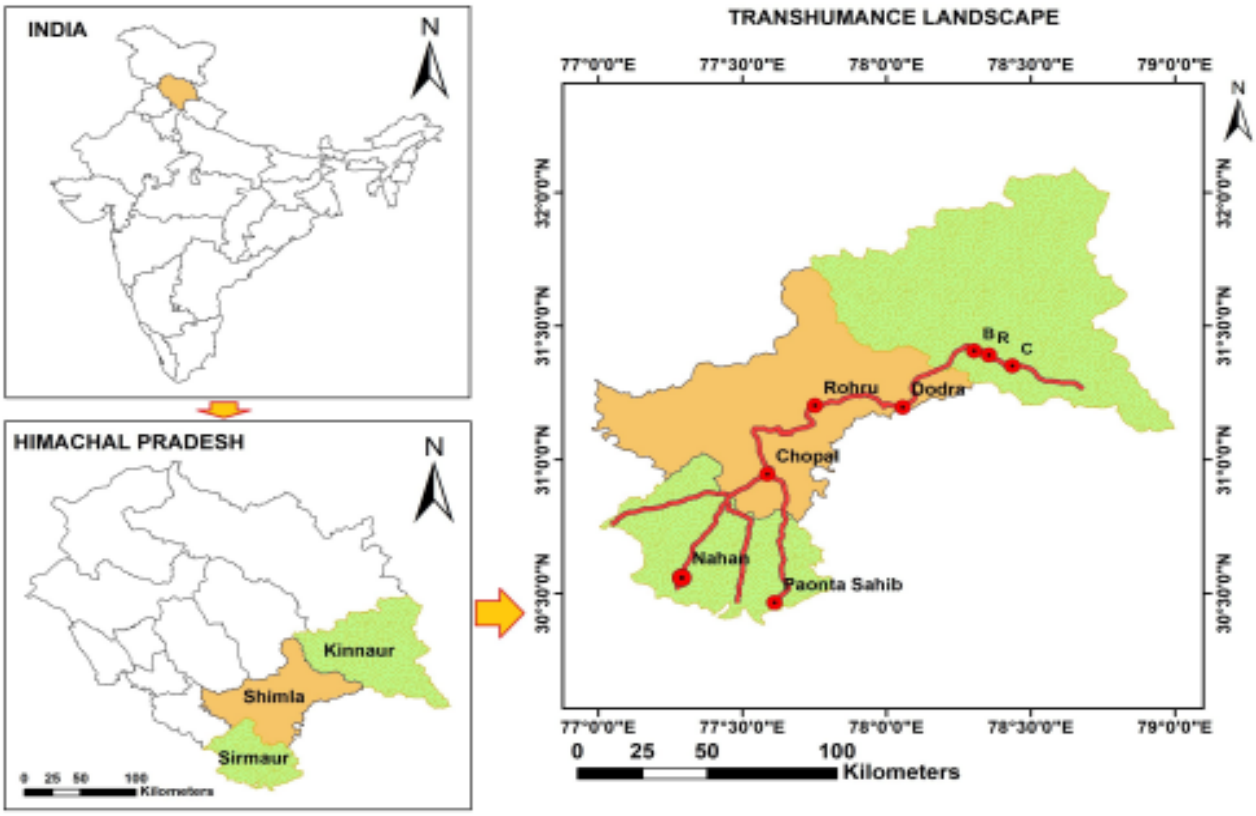

Figure 1. Map showing the location of the study villages (B – Batseri, R – Rakchham, C – Chhitkul) and migration route of transhumant pastoralist in Himachal Pradesh, India

power, milk, hair and manure; donkeys for transporting manure from homestead to the agricultural fields and alongside horses also to transport the necessary grocers to herders' camps in summer pastures (Table 1 and Table S1, Fig. 2).

Data collection

Information was obtained from key informants (N= 48; 38 men and 10 women) through semi-structured interview and participant observation methods. Key informants were selected based on the recommendation of formal community council and chain referrals (Huntington 2000, Martin 2004). Age of key informants varied from 33 to 78 years with an average age of 55 years. They included herd owners and herders, ex-herders, weavers, and tailors. Relevant data from various line-agencies such as revenue, forest, animal husbandry, horticulture departments and the H.P. State Wool Procurement and Marketing Federation Limited locally known as 'woolfed' were also collected.

Table 1. Geographical and socio-economic features of study villages in Kinnaur district, Himachal Pradesh, India

Attribute	Chhitkul	Rakchham	Batseri
Mean Elevation (m asl)	3450	3100	2750
Cultivated land (ha)#	77.36	108.68	88.00
Agriculture area (ha)#	67.16	68.01	19.77
Horticulture area (ha)#	10.21	40.67	68.24
Number of Households*	105	150	161
Total Population*	708	760	741
Scheduled Tribes (Khosia/Kanet)*	562	605	477
Scheduled Castes (Beru)*	146	155	264
Literacy (%) **	73.5	70.5	73.9
Livestock***			
Sheep	2191	1278	1737
Goats	1487	1474	1261
Cattle, Yak and their crossbreeds	356	507	314
Donkeys and Horses	17	1	7

Source: # Revenue department, Sangla; *Village council records till 31.12.2017; **Census of India 2011; ***Household survey

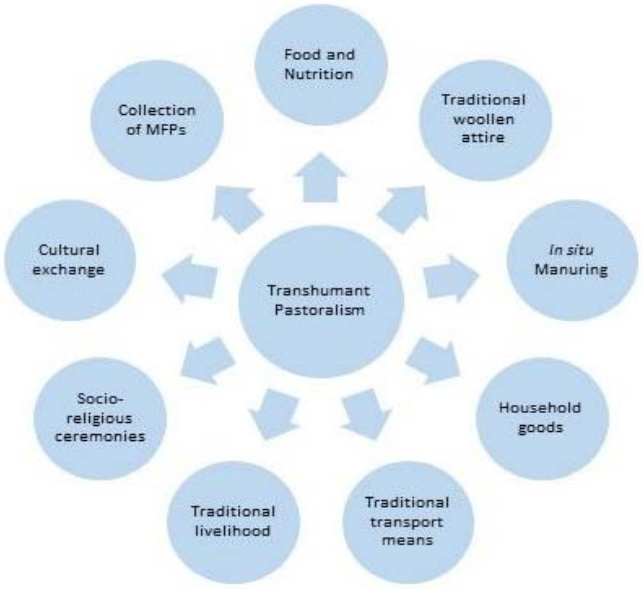

Figure 2. Linkages of transhumant pastoralism with various socio-economic and cultural practices of *Kinnaura* community in Kinnaur district, Himachal Pradesh, India

Information on livestock holdings at present and 35 years before including number of horticultural (apple) trees in the village orchards were obtained by conducting door to door surveys considering all households in the study villages. Taking into account that the villages were not connected by road till late 1970s/ early 1980s and sheep, goats and horses were used to be the only means of transporting goods from long distances, the 35 year timeline was considered for collecting data of the livestock population in the past. Furthermore, a sizable number of pastoralists had to shift their winter pastures in 1979 while rest shifted in 1989 from Dehradun district in neighbouring Uttarakhand state (then Uttar Pradesh state) to Sirmaur district of Himachal Pradesh due to changes in policy of the government of Uttar Pradesh. Winter pastures in Sirmaur district were allocated to the permit holder pastoralists for fixed number (same number of livestock as was permitted in Dehradun district) of livestock on payment of grazing fee (locally called *Punchhi*) to state forest department. Pastoralists pay 40 paise (100 paise = 1 rupee; 1 US$~71 Indian Rupees) per sheep, 80 paise per goat and 2 rupees per horse or donkey as grazing fee for one year. Fee is not charged for lambs and kids. Grazing permits are valid for three years and renewed thereafter for the same number of livestock. As per the state government policy, neither new grazing permits nor the number of livestock in existing permits can be increased. However, they have customary rights of pasturage in summer pastures adjoining native villages allocated to herd owners by informal traditional institution of pastoralists at village level.

RESULTS AND DISCUSSION

General features of transhumant pastoralism

Pastoralism is integral to socio-economic and cultural belief system of the *Kinnauras* inhabiting the study villages (Table S-2; Figs. 2, 3 and 4). The pastoralists involved in the vertical transhumance seasonally migrate with the herds of sheep and goats to foothill forests (400-1000 m asl) in Sirmaur district of the state where they stay during winter season and return to the alpine meadows adjoining their native villages in the summer. Migration takes place through established traditional routes of more than 200 km and over an elevation gradient of nearly 4000 metres. It takes about 45 to 60 days to reach winter pasture from summer pasture and vice-versa. Downward migration from summer pastures starts between mid-September and mid-October while upward movement from winter pastures in the month of March.

Till 15-20 years ago, the *Kinnaura* pastoralists were involved in all the activities associated to THP. However, factors like road connectivity established in late 1970s, the climate and the scenic beauty of the Sangla valley facilitated development of less labour-intensive apple-based horticulture and tourism in a major way in the study villages. In addition, benefits from the affirmative action policies of the government of India after 1975, applicable in Kinnaur and simultaneous improvement in education provided comparative advantage to local people in securing jobs in government and private sectors. As per the key informants, the alternative means of livelihoods helped raising the socio-economic status of the *Kinnauras* enabling them to give up the labour-intensive job of working as herders and instead started hiring herders from the neighbouring villages of Dodra-Kwar valley of Shimla district with whom they have strong social ties. Unlike Sangla valley in

Figure 3. Culturally it is mandatory for *Kinnauras* to wear traditional woollen attire during festivals

Figure 4. Traditional *Kinnauri* woollen attires sold in annual fair at Reckong Peo, Kinnaur

Kinnaur, due to lack of year-round metalled road connectivity, prevailing remoteness and non-applicability of the affirmative policy of scheduled area, people of Dodra-Kwar accept working as hired herders for earning livelihood, explained the key informants. Presently all the herds are tended by hired herders locally called as '*Phuhal*'. Similar trends of change in pastoral practices due to socio-economic transformation, less willingness among young people to engage in labour intensive pastoral activities (often required remaining out of home for nearly 11 months in a year) and diminishing required skills have been reported from various parts of the world including the Himalaya (Bassett 1994, Namgail et al. 2007b, Mijiddorj et al. 2019, Dai et al. 2020).

A total of 88 hired herders in the age group of 18 to 60 years (average age of 38 years) were found

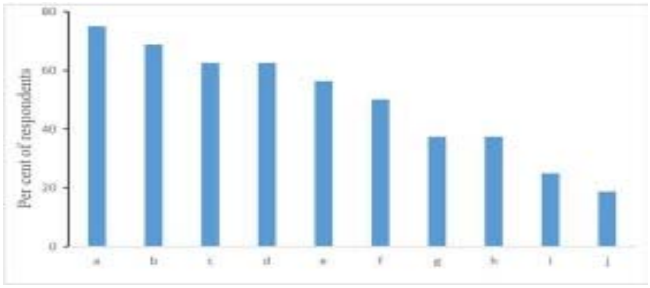

Figure 5. Aspirations of transhumant pastoralists for revitalization of transhumance practice: a, Restoration of degraded winter pasture; b, Enhanced rate of wool procurement; c, Allocation of greater area in winter pastures; d, Modern Gadgets, e, Rams and bucks of improved breed; f, Compensation for livestock loss, g, Encroachment free migration route; h, Security of herders and livestock; i, Increase in number of livestock in permit; j, Construction of water points in winter pastures.

managing 14 herds maintained into 28 herds of sheep and goats for grazing separately from the study villages. A herd is made up of sheep and goats of 10-30 *Kinnaura* families linked socially to each other. Herd size ranged from a minimum of 700 to a maximum of 1700 with an average of 660 sheep and 480 goats per herd which is determined mainly by the availability of winter pastures to the herd owners in the foothills. Availability of winter pasture as a key determinant of herd size has also been reported from Sikkim and Tibetan Plateau (Tambe and Rawat 2009, Yeh et al. 2017). Depending on the herd size, 2-5 herders with a few shepherd dogs (2-5) of Tibetan Mastiff breed accompany the herd while 2-3 horses or donkeys are also part of some of the herds. Taking into account the general disposition and grazing behaviour though separate herds of sheep and goats are maintained throughout, in a sheep herd few goats (n = 20-30) are kept to show path to sheep during migratory grazing and also to ensure supply of goat milk consumed by herders and their dogs. Based on herding experience, a herder is given 10-12 sheep/goats as wages for looking after of 100 heads per annum and other living expenses. The sheep and goats earned by herders year after year also form the part of herd looked after by them.

Socio-economic and cultural linkages of the community with transhumant pastoralism

Traditional lifestyle of the *Kinnauras* revolves around their sheep and goat based transhumance (Table S2). The community derives a range of products from the THP such as cash income, food, clothing, soil fertility maintenance, transport before 1980s, and cultural services essential for their survival.

Kinnauras are primarily non-vegetarian and consuming mutton is an important part of their traditional diet (Singh 1994). Sacrificing goats and sheep is an integral to their socio-cultural ceremonies and functions. Depending on economic status and family size, majority of the families slaughter 1 to 6 heads of sheep/goats in their permanent settlements in the month of November and meat is preserved for consumption throughout the winter season. Different parts of the preserved meat starting from head, chest, shoulder and ribs, and limbs are consumed during various cultural festivals viz., *Khepa, Sazo* and *Unima* celebrated during the season. Head is consumed first and limbs in the last. Preserved meat is made into various traditional recipes such as *Thukpa*, providing food and nutraceutical security when the villages are snow covered. Goats milk and its products are also essential parts of the traditional diet of *Kinnauras*.

They wear traditional dresses made up of sheep wool well suited to the cold climate and cultural belief system of the community. For the *Kinnauras*, it is customary to wear traditional woollen attire while entering temple and during religious ceremonies, festivals, fairs and on the occasions of marriage (Fig. 3). Traditional attires particularly *Thepang* (*Kinnauri* cap) is gifted to guests participating in marriage. Sheep wool, goat's hair and hides are used in making of various household goods like carpets, ropes and bags (Table S-2). Pastoralism fosters communal cooperation and interdependence among the *Kinnaura* community. In wool shearing, pastoralists often take help of relatives, while women from several families help each other in combing of the wool. *Khosia* are dependent on *Kolis* (a sub section of *Berus* specialising in weaving and tailoring) community for making traditional attires who in return gets grains or money from the former. The herd owners sell their surplus wool to woolfed (a government operated co-operative society responsible for promotion and growth of wool industry in Himachal Pradesh) at predetermined minimum support price and sometimes to traders. As per key informants, till late 1970s, when there was no motor road, male sheep and goats were used as pack animals to carry 8-15 kg of grains from low hills and plains and were the chief means for transport including for trans-boundary trade with Tibet until 1962. However, with the establishment in road connectivity in early 1980s, the practice has now been abandoned. Transhumant pastoralists make social relations and cultural exchanges with the inhabitants of villages located along migration route and in the vicinity of winter pastures. The pastoralists penned herds in agricultural fields along migration routes in the night for *in situ* manuring and also exchange of woollen attires, medicinal and aromatic plants in small quantities with the local villagers who in return provide them minor day-to-day facilities in several ways. Herders staying in alpine meadows and sub-alpine forests during summer, possess rich knowledge about plant resources and gather several species of wild edibles, medicinal and aromatic plants for self-use as well as for selling them occasionally in local markets (Farooqui and Nautiyal 1999).

Emerging challenges for the transhumant pastoralism

As elsewhere in the Himalaya (Nautiyal et al. 2003, Aryal et al. 2014, Namgay et al. 2014, Gentle and Thwaites 2016), socio-economic, policy and land-use related changes led cultural transformation in the *Kinnaura* community has been increasing the constraints on the labour-intensive transhumant pastoralism and the practice is on the decline. Table 2 shows the change in number of herds and livestock population and proportion of families practicing THP over last 35 years in the study villages viz., Chhitkul, Rakchham and Batseri. A decline of 44 % in number of herds, 60% in the population of sheep and goats, and 25 % in proportion of families practicing transhumance was recorded across the study villages. Among the villages, the magnitude of decline in number of herds was highest in Rakchham followed by Batseri and Chhitkul while it was highest in sheep and goat population and proportion of families

Table 2. Changes in transhumant pastoralism in past 35 years in study villages in Kinnaur district, Himachal Pradesh, India

Attribute	Chhitkul	Rakchham	Batseri
Number of herds 35 years before	9	9	7
Number of herds at present	6	4	4
Proportion of family practicing transhumance 35 years before	88.7	52.6	63.5
Proportion of family practicing transhumance presently	66.7	50.0	18.6
Number of sheep and goats 35 years before	9560	5115	8715
Number of sheep and goats at present	3678	2752	2998
Per cent decline in sheep and goats number	61.5	46.2	65.6

Table 3. Indicators of socio-economic change in the study villages in Kinnaur district, Himachal Pradesh, India

Indicators	Chhitkul	Rakchham	Batseri
Number of households havingat least one member in Government Service/ Pension	59	60	54
Number of households engaged in Apple based Horticulture	45	114	109
Total number of apple trees	3175	15524	22062
Number of commercial vehicle (LMV-TR*)	7	9	6
Number of Grocery Shop	4	3	4
Number of Hotels/ Home stays/Camps	17	8	6
Number of Café/ Restaurant/ Dhaba	3	1	0

*LMV-TR = Light Motor Vehicle-Transport

practicing THP in Batseri village (Table 2). It is evident from Table 3 that socio-economic changes in the study villages in terms of development of horticulture and tourism; apple-based horticulture is most developed in Batseri and significantly less in Chhitkul village while the tourism related infrastructure is developed more in the latter than in former village. Rakchham village falls in between the two so far as the aforementioned indicators of change are concerned. Across the villages, 15% of the total households while in Chhitkul 30% households are engaged in the tourism related activities. In addition, the affirmative action policies of the government (Kinnaur district has been declared as Scheduled Area under the Fifth Schedule of the Constitution of India in 1975) the educated youth opting for service sector jobs (Table 3). The joint family system is giving way to nuclear families leading to shortage of family labour (Negi and Gadgil 1997). The indicators reflect on the corresponding trend of decline in the THP systems in the study villages. Similar trends in significant decline and abandonment in traditional pastoralism with the development of less labour intensive alternative livelihoods such as tourism, jobs in government and private sectors, horticulture, outmigration and acculturation have been reported from different parts of world including the Himalaya (Negi 2007, Dong et al. 2011, Aryal et al. 2014, Namgay et al. 2014, Gentle and Thwaites 2016, Mijiddorj et al. 2019, Dai et al. 2020).

Interviews with the key informants reveal that increasing process of acculturation and socio-economic changes have been significantly influencing many of the cultural norms and practices among the *Kinnaura* community such as lifestyle changes related to food, clothing, socio-cultural exchanges and livelihood earning, impacting the THP in multiple ways (Table 4). Inadequate policy support in terms of restriction in issuing new grazing permits and increase in number of livestock, climate change induced invasion of weeds such as *Lantana camara* and *Ageratum conyzoides* in winter pastures, increasing incidences of diseases outbreak in livestock and weather related extreme events, encroachment of traditional migration routes, increasing cost and trust deficit between herd owners and hired herders amidst changing socio-cultural milieu, and the likely non-availability of hired herders in near future due to alternative development opportunities arising in Dodra-Kwar have been listed as additional constraints for maintaining the practice in the longer run by the key informants. Among the mentioned constraints, climate change linked increase in disease outbreak in migratory flocks of

Table 4. People's perceptions on changes in socio-cultural and economic spheres and their impacts on transhumant pastoralism (THP) in Kinnaur district, Himachal Pradesh, India (n=48)

Change in socio-cultural attributes	Reason behind the change	Impacts on Transhumant Pastoralism	Socio-economic and culture impacts
Less number of people wearing traditional woollen attire	Increased availability of cheaper alternatives	Dependency on THP for wool/ skin declining	Livelihood of weaver community and associated traditional knowledge affected negatively
Food habit	Provision of food grains at subsidized rate from Public Distribution System. Increased vegetarianism under the influence of indic-culture	Dependence on THP for non-vegetarian food declining	Threat to nutritional security and health, erosion of traditional crops and loss of associated knowledge
Mass slaughtering of sheep and goats	Availability of meat in local market	Dependence on THP for meat declining	Threat to associated cultural festivals and loss of knowledge concerning traditional food and meat preservation
Social functions	Declining preference for non-vegetarian food and customary gifting of woollen clothes to guests	Dependence on THP for social functions and festivals declining	Loss of traditional cultural identity
Traditional household goods	Availability of alternatives in the market	Dependence on THP for wool and hides declining	Loss of traditional lifestyle and associated knowledge systems
Soil fertility management	Change in landuse leading to increased use of chemical fertilizers and other inputs from market	Dependence on THP for soil fertility maintenance in horticultural systems declining	Loss of soil quality and agricultural sustainability
Collection of minor forest products' (MFPs) for food and medicine	Availability of modern healthcare system, western medicines and less participation of Kinnauras in THP	Declined dependence on THP for collection of MFPs	Loss of traditional knowledge concerning collection and use of MFPs
Herding	Engaging hired herders	Dependence on THP as major source of livelihood declining	Loss of traditional herding and pasture management knowledge among Kinnauras
Transportation of goods	Increased road-network,Closure of trans-boundary trade	Dependence on THP for transportation seized completely	Loss of associated knowledge

sheep and goats and degradation of winter pastures have also been reported by Gentle and Thwaites (2016) in Nepal Himalaya.

Peoples' perception for revitalization of transhumant pastoralism

Notwithstanding the multifarious challenges of social, economic, cultural and ecological in nature, the pastoralists believe that revitalization of the practice is possible when it is able to fulfil their changing socio-economic aspirations. Figure 5 depicts the relative importance of various measures suggested by pastoralists for the revival of THP in Kinnaur. Accordingly, restoration of winter pasture by eradicating invasive species; enhanced rate of wool procurement; allocation of greater area in winter pastures and provision for modern gadgets emerged as the most important measures for

revitalization of the practice, though the importance of other measures cannot be overlooked. A very few among the key informants also highlighted provision of improved looms to weavers and local value addition in wool products and marketing will also enhance the effectiveness of other suggested measures (Figure 5). Many of these voices find support from the increase in livestock population of the pastoralists of Ladakh in Indian Trans-Himalaya brought about by provision of enhanced veterinary care and assured supply of livestock food and compensation for lost livestock (Namgail et al. 2007a).

CONCLUSIONS

Despite facing several existential constraints, the transhumant pastoralism albeit with diminished intensity is continuing because of some of its still unbroken linkages with socio-cultural norms of the *Kinnauras* and their livelihood. However, the future of the practice appears uncertain amidst fast changes occurring in socio-economic sphere and cultural milieu. The pastoralists believe that affirmative measures that support making the practice less labour intensive, less risky and economically appealing can help revitalizing transhumance in Kinnaur. Examples including that from the Himalaya do exist that supportive policies and actions aligned with the local aspirations and concerns have helped in the revival of pastoral practices whose socio-economic, cultural and ecological significance is widely recognized.

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Authors' contribution SCG conceptualised the work, DKS conducted data collection and both the authors analysed, interpreted and written the manuscript**.**

Conflict of Interest The authors declare that they have no conflict of interest.

Informed Consent Prior informed consent was secured from the relevant local authority (District Magistrate, Kinnaur) in accordance with National Biological Diversity Act (2002) and Rules (2004). Further, all informants gave verbal consent for the information they provided to be shared for academic purposes only.

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Supplementary data

Weakening Socio-Cultural Linkages Imperils the Sustainability of the Transhumant Pastoralism: A Case Study of *Kinnaura* Community of Western Himalaya, India

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Table S1. Livestock reared by pastoralist in their permanent settlement in Kinnaur district, Himachal Pradesh, India

Livestock	Uses
Yak	Breeding, Hair (Mat, Rope, *Chaune*/sacred fan), Manure
Bremme (Female yak)	Milk, Hair, Manure
Dzo (male offspring of hill cow-yak cross)	Ploughing (draught power), Transportation (Pack animal), Hair, Manure
Dzomo (female offspring of hill cow-yak cross)	Milk, Hair, Manure
Hill cow	Milk, Manure
Hill ox	Ploughing of agricultural field, Manure
Horses & Mules	Carrying loads before the establishment of road connectivity in the area
Donkeys	Transfer of manure from homestead to agricultural field, transport of grocers to herders' camps in summer pastures
Sheep	Wool, Meat, Pelt, Manure
Goats	Hair, Milk, Meat, Pelt, Manure

Table S2. Products of transhumant pastoralism used by *Kinnaura* community in Kinnaur district, Himachal Pradesh, India

Local Name	Description
Traditional Food	
Thukpa	A traditional dish made up of roasted barley flour and mutton. It is considered highly nutritious, easy to digest and keeps body warm during extreme winter season
Kapu	A traditional dish prepared mainly during winter by filling goat and sheep mutton, fat, with local spices in wheat flour dough covering and boiled in water
Khirang	Goat and cow milk
Doyang	Curd
Mar	Clarified butter made from goat and cow milk
Both	Butter milk
Chhura	Dried skimmed curd
Kakpol, Kokh	Cheese
Traditional attire	
Dhori	Woollen garment like sari made up of wool worn by women
Gachhang, Pya	Waistband made up of wool
Choli	Full sleeved woollen blouse
Chhanli, Foksang	*Kinnauri* shawl made up of sheep wool
Thepang, Num	Cap made up of grey/brown woollen cloth and green velvet band on the outer fold
Suthan	Woollen trousers
Rebdaarisuthan	Tightly fitting woollen trousers
Chhuba	Long woollen coat
Galbandh	Woollen muffler/ Scarf
Coat	Woollen coat
Gusab	Woollen gloves
Bangusab	Woollen socks
Balzam/ Malspon	Footwear made from sheep/goat skin sole and upper part of wool
Household goods	
Romobash	Rope made up of goat hair
Khercha	Carpet woven from spun goat's hair
Fogdhori	Thickly spinned woollen yarn is weaved and used as blankets/ quilt
Laaga	Sheep/goats skin cleaned and 3-4 skins are sewen together and used as blanket/quilt
Charu	Dead lamb's skin of wool cleaned and worn inside clothes during extreme winter
Moski	Tanned goats skin used by pastoralist in fetching water and storing of milk/ butter milk
Phad, Phach	Saddle bags made up of sheep wool used for carrying goods on male goats and sheep
Khul	Sacks made mainly from goat skin used for grain/flour storage
Pakpa	Sheep/ goat pelt used as flooring material
Soil fertility management	
Jed Kodh, Dull	Sheep and goats droppings