

## Highland-lowland interaction in mountain regions: a study of changing patterns among Bhotiya tribes of Garhwal Himalaya

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The highland-lowland interaction among the Bhotiya tribes is a centuries-old tradition. Bhotiyas generally have two dwellings, one in the highland and one in the lowland. During winter, when the highland areas are covered with vast amounts of snow, the tribes migrate to their valley dwellings. Similarly, they migrate to the highland villages during the summer to cultivate the land and graze their animals. The trend of highland-lowland interaction has been changing, mainly declining over time. This study examines these changes. A case study of eight villages of the Niti Valley was conducted, and a total of 292 Bhotiya households were surveyed. The authors have noticed that the practice of highland-lowland interaction decreased by 55% during the last two decades. The main drivers of change were increased education, cultural differences, reservation policies for Bhotiyas, increasing disasters in the highlands, lagging infrastructural facilities, and changes in climatic conditions. The study suggests that agriculture, livestock development, and improved infrastructure - transportation, education, markets, and employment - can revive the highland-lowland interaction. The role of the state government and the community is noteworthy to conserve the traditional practices of Bhotiyas.

**Key Words:** *highland-lowland interaction, Bhotiya tribes, mountain, Garhwal, Himalaya*

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## Introduction

Bhotiyas were predominantly traders and shepherds by occupation in the Trans-Himalayan region, practising highland-lowland interaction in the past (Mitra et al., 2013; Maiti, 2003). They were the pioneers of Indo-Tibetan trade and service providers for pilgrims visiting Kailash and Mansarovar. For centuries, Bhotiyas were the connecting link between highlands and lowlands (Bhatt et al., 2009). Further, they traded with Tibetans, using pack goats to transport goods and services (Nusser & Gerwin, 2008). They imported clothes, jaggery, dry fruits, barley, rice, and unrefined brown sugar from the big cities and exported sheep, goats, wool, ghee, borax, salt, animals, and gold. After the Chinese War of 1962, the Indo-Tibetan border in Niti Valley was seized, and therefore the Bhotiyas turned into shepherds. They were also involved in farming, raising livestock, cultivating medicinal plants, and making wine and handicrafts to sustain their lives (Chand, 1983). The total population of Bhotiyas is around 120,000, and they mainly live in the union territories of Ladakh and Jammu and Kashmir and the states of Himachal Pradesh, Uttarakhand, Uttar Pradesh, Sikkim, West Bengal, Tripura, and Arunachal Pradesh (Sharma, 2020). However, the largest population of tribes reside in the Uttarakhand Himalaya.

The Garhwalis and Kumaonis used the term Bhotiya to refer to people "from the north". It also refers to Tibetans because they live in the north (Chatterjee, 1976). The Census of India states that Bhotiya comprises several tribes residing in the Uttarakhand Himalaya's highlands, close to the Indo-Tibetan border (Phakaliyal & Rawat, 2015). Bhotiyas' habitats are located in Uttarkashi, Chamoli, and Pithoragarh districts in Uttarakhand. Generally, their habitats are situated in seven river valleys such as Bhagirathi Valley, Alaknanda Valley, Dhauli Ganga Valley, the valley of Ramganga (E), Kali River Valley, Dhauli Ganga (E), and Gauri Ganga. The Chamoli and Uttarkashi districts are located in the Garhwal Himalayas, whereas the Pithoragarh district is in the Kumaon Himalayas. Although the habitats of Bhotiyas are distributed sparsely in the entire land of Uttarakhand, they are always integrated (Santhosh & Nair 2019), and their socio-cultural transaction is similar (Farswan, 2017).

The Bhotiyas, also known as Marchha and Khanpa, have two seasonal dwellings (i.e., in the highland and lowland). In the summer, they migrate to their highland dwellings called *Mait* to cultivate the land and pasture their animals, such as goats, sheep, cattle, and horses. These pastures are generally located above 2,800 m, locally called Bugyals, and remained snow-capped for about six months. Further, the summer dwellings are called *Mait*. In the summer, new grasses grow; many have medicinal value. These grasses are very useful for raising animals and enhancing dairy farming. In the winter, the pasturing communities migrate back to their valley dwellings, called Gunshas, between 1,000 m and 2,000 m. In the highlands, the Bhotiyas also cultivate crops and collect medicinal plants. A very high-value medicinal plant, *Faran* is used as an ingredient in vegetable and pulses curry. Bhotiyas are transhumance, involved in rearing goats and sheep. When they return to their winter dwellings, they hand-make several products –

*Pajamas*, mattresses, *Pankhee*, and carpets, which are sold in the local market. Wine is an essential drink for Bhotiyas because they reside in cold climates.

According to the scholars, the Bhotiya community of the Niti Valley was economically prosperous in the past due to their trade with Tibetans (Agarwal & Maiti, 2005; Maiti, 2009). After the closing of the Indo-Tibetan border, the Bhotiyas lost their main source of livelihood (Naithani & Kainthola, 2015). This was a significant turning point in their lives. Owing to the seizure of the Himalayan border, goats, mules, yaks, and horses started to be sold. Following this, they focused on farming and sheep rearing as they had no other options (Dangwal, 2009). The Nanda Devi Wildlife Sanctuary (NDWLS) served as a popular destination for mountaineering. The inhabitants of Niti Valley harnessed this opportunity by providing services, and they were able to enhance their livelihoods. After Nanda Devi was designated a protected area in 1982, the forest department banned tourism and animal grazing within the Niti Valley.

This further resulted in declining animal rearing and livelihood activities in the region. Over time, the Bhotiyas left practising farming, their primary livelihood source (Maiti, 2005). Besides, the agriculture of the Niti Valley is subsistence-based chiefly, which is carried out for six months during the summer and monsoon seasons. In the sixth month of the winter, the Bhotiyas settlements and farmlands remain snow-capped (Sharma et al., 2019). The yield of subsistence farming is insufficient to sustain a family for a long time (Sharma & Sharma, 1993; Sati, 2019; 2021).

Consequently, many Bhotiya families began migrating elsewhere in search of alternative livelihood options, and they also started permanently settling in their lowland settlements (Bergmann et al., 2011). In the meantime, the Bhotiyas attained the status of Scheduled Tribes in 1967 (i.e. the various tribes of India were given the status of Scheduled tribes in the Constitution, and they are now under the reserved category). This was the reason which diverted Bhotiyas towards attaining higher education. Later on, they got several jobs in the government sector (Pathak et al., 2017). As a result, they have shifted their livelihood activities from trade and farming to the service sectors.

Several studies show that there has been a decline in highland-lowland interaction in the entire Hindu Kush Himalayan region (Pasakhala et al., 2021; Namgay et al., 2021; Gentle and Thwaites, 2016; Aryal et al., 2014). For example, a study by Namgay et al. (2021) shows how transhumance is declining in Bhutan under changing circumstances. Similarly, many studies have been conducted in the Nepal Himalaya and Tibetan Plateau, which indicates that the highland-lowland interaction is continuously declining in the different mountain regions of the world (Pasakhala et al., 2021; Pandey et al., 2017; Gentle & Thwaites, 2016).

The Niti Valley is situated in the geo-strategically important Greater Himalayan region, protecting the entire area. In the past, the highland-lowland interaction happened through seasonal migration.

They cultivated medicinal plants in the highland and cereals in the valleys. Further, practising livestock farming, mainly with goats and sheep, was a subsidiary occupation. In time, the process of highland-lowland interaction

decreased, and many Bhotiya families out-migrated to other parts of India. Now, the entire Niti Valley is facing the problem of depopulation, and their traditional occupation and wisdom decreased.

Several studies have been carried out on the tribes of Uttarakhand by scholars in the Himalayan region of Uttarakhand. However, no systematic study was conducted on highland-lowland interaction among the Bhotiya tribes of the Niti Valley, Garhwal Himalaya. The main research question raised in this study was to investigate the drivers of changing lowland-highland interaction among the Bhotiya tribes. The authors also explored how to restore the old practices of highland-lowland interaction and people's sustainable livelihood. This study also assesses the factors affecting highland-lowland interaction. The Himalayas represents the newly folded mountain regions of the world, where the landscape, socio-economic, and cultural aspects are similar such as the Hindu Kush Himalaya, Pamir, and the Andes. Therefore, this study will be helpful for international scholars who are working in the Himalayas or other similar mountain regions.

### **Case study: Garhwal Himalaya**

The Garhwal Himalaya is situated in the western part of the Uttarakhand Himalayas. Tibet from the north, the Kumaon Himalaya from the east, Uttar Pradesh from the south, and Himachal Pradesh from the west delimit its boundary. It has seven districts – Chamoli, Rudraprayag, Tehri, Uttarkashi, Dehradun, Haridwar, and Pauri. It comprises three-dimensional landscapes – the Shivalik hills and river valleys, the Middle Himalayas, and the Greater Himalayas. The Bhotiyas have habitats in the high-altitude regions close to the Greater Himalayas. The Alpine grasslands, locally known as Bugyals, are where Bhotiyas graze their animals. In the Garhwal Himalaya, Bhotiyas dwellings are situated in the Niti and Mana valleys of the Chamoli district and the Nilang and Jadhong valleys of the Uttarkashi district.

Apart from these districts, Bhotiyas have habitats in the Johar and Ran valleys of the Pithoragarh district, the Kumaon Himalaya. The Bhotiyas are also known as Marchha, Jadhhs, and Khanpa. Before 1962, the Bhotiyas had a prosperous trade relationship with the Tibetans. The Bhotiya communities were nomads. Their economy was mainly based on rearing livestock and practising agriculture. They also collected medicinal plants from the alpine pastureland and made woollen handicrafts and wine. The situation has changed; most of them are working in the tertiary sector. This study was conducted in the eight villages of Niti Valley along the Dhaul Ganga. The Niti Valley is situated in the higher Himalayas, bordered by Tibet. Therefore, the impact of Tibet on the region is significant. The altitude of these villages is above 3,000 m. The river valley villages of Bhotiyas, situated along the Alaknanda River, were also studied. These villages are mainly located in the alpine pastureland above the tree line, extending from 3,100 m to 3,500 m with a 3,241 m mean altitude.

Total arable land was 1716 ha (mean value), while land under cultivation was only 278 ha, and the rest of the land was barren. Joshimath is an administrative town and a service centre situated on the way to the Badrinath Highland pilgrimage and the Niti Valley. The average distance between the highland villages from Joshimath is 91 km. Roads connect some villages, and some are situated about 1 km from the road. However, the road conditions of the villages are not good, mainly during the rainy season, when heavy rain-triggered landslides cause roadblocks. As a result, the Bhotiyas migrate seasonally from the highland to the lowland. Therefore, every highland village has its respective two or more villages in the lowland (Table 1). Figure 1 shows that the highland villages are located in the Niti Valley in the upper Dhaul Ganga, and the lowland villages are along the Alaknanda River and its tributaries.

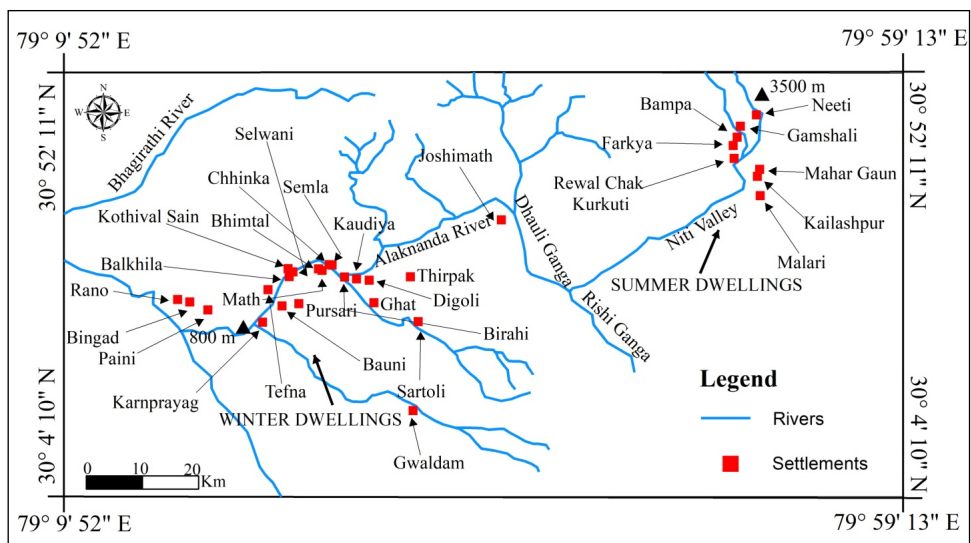
Before 1980, the goat and sheep herders of the Bhotiya tribes migrated from one mountain to another via river valleys throughout the year. They covered about two months from the highland to the Tarai and Bhabhar regions of the UP Hills. After staying in the Tarai and Bhabhar regions for about four months during the winter, they returned to the highlands during the summer. They further spent nearly two months travelling back and stayed in the highland alpine pastures for about four months. They travelled with thousands of goats and sheep, four-five horses, and a few Bhotiya dogs. Horses were used to carry food items and other goods, and Bhotiya dogs protected goats and sheep from wild animals. Their livelihood depended on selling goats, sheep, and wool. The route was from the Niti Valley, the Dhaul Ganga to Tarai and Bhabhar via the Alaknanda Valley, Nandakini Valley, Pindar Valley, and the Ramganga Valley (Figure 2). The distance of the route was about 380 km on one side. The Forest Act of India was implemented in 1980, which prohibited the animal herders of Bhotiya tribes from freely moving to the forest areas along with their animals. This has led to a decline in inter and intra-montane mobility of Bhotiyas' herders. Now, the entire route is no more as the practice has been abandoned.

**Table 1.** Summer and winter dwellings of Bhotiyas in the Niti Valleys

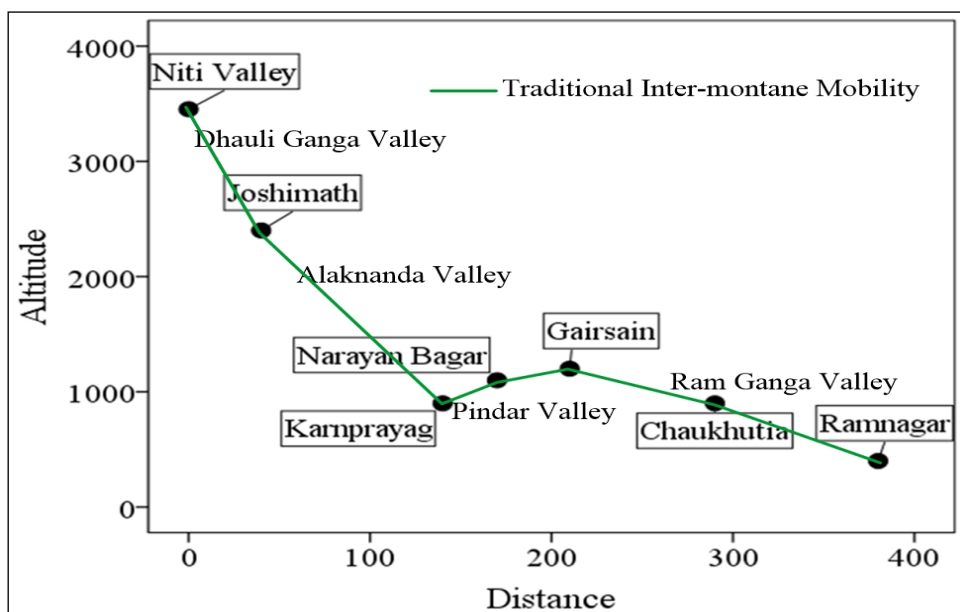
<b>Highland villages (summer dwelling)</b>	<b>Lowland village (winter dwelling)</b>
Malari	Digoli, Balkhila, Chamoli, Tefna, Thirpak, Bingar, Ghat, Joshimath, Birahi, Sonla (10 villages)
Kailashpur	Bajpur, Birahi, Bingar, Sonla, Sartoli, Pursari, Joshimath, Painsi (8 villages)
Mahar Gaun	Chhinka, Chamoli, Selwani, Kothiyal Sain, Joshimath (5 villages)
Rewal Chak	Chhinka, Bingar, Chamoli, Selwani, Kothiyal Sain (5 villages)
Farkiya	Bingar, Thirpak (2 villages)
Bampa	Chhinka (Single village)
Gamshali	Chhinka, Baunla, Semla, Bhimtala, Math, Chamoli (6 villages)
Niti	Chamoli, Rano, Bhimtala, Kaudiya (4 villages)

Source: Primary survey

Some Bhotiya communities were involved in the exchange of goods. For example, during the winter, they carried potatoes, salt, medicinal plants, and woollen clothes to the rural areas through goats and sheep and exchanged them with food grains. This was practised for more than two months. After it, they moved to the highland villages.



**Figure 1.** The highland and lowland villages where the Bhotiyas make intra-montane mobility  
 Source: processed by authors



**Figure 2.** Places located on the route of traditional inter-montane mobility (distance in km and altitude in m)  
 Source: processed by authors

## **Methodology**

This study was mainly based on the data collected from primary sources and field observation. A household-level survey was conducted in April and May 2021. Eight villages of the Niti Valley were selected for the detailed study. These villages are Malari, Kailashpur, Mahar Gaun, Rewal Chak, Farkiya, Bampa, Gamshali, and Niti. There were 662 households living in the highland villages in 2001, which has reduced to 292 households (55.9%) in 2021. The total population was 612 in 2021. All households were surveyed. These households have winter dwellings in the 41 villages situated in the river valleys, mainly along the Alaknanda River. The head of each household, with an average age of 52 years, was interviewed. Some of them were educated, and a few were illiterate.

The main survey questions regarded family size, education, occupation, infrastructural facilities, and income. These questions were further divided into the number of people engaged in practising agriculture, livestock, making wool crafts and wine, and doing jobs in tertiary sectors. A few of them were collecting medicinal plants. Data on all these variables were gathered for 2001 and 2021. Since the head of households' average age was 52 years, they were well known about the situation in 2001. Population and literary data for 2021 were also gathered at the household level, whereas 2001 data on population and literacy was gathered from the Census of India, 2001. Data were further collected on the area and production of crops grown in the highland villages. Global Positioning System (GPS) was used to obtain data on altitude, the distance of villages from the road, distance from Joshimath town, latitude, and longitude. The authors visited the case study villages and observed changes in highland-lowland interaction.

Both qualitative and quantitative methods were used to conduct this study, which was empirically tested. The data on all variables – socio-economic, educational, livestock, occupation, and the number of households practising highland-lowland interaction between 2001 and 2021 were analyzed, and changes were noticed. The changes were presented using descriptive statistics, and mean value and standard deviation were obtained. The villages of Bhotiyas, located in the highlands and the valleys, were mapped. A route was constructed showing the track used to highland-lowland by the goat herders in the past. Data were shown using diagrams and graphs. The observation method was also used to describe the highland-lowland interaction after visiting the Alaknanda and Dhauli Ganga valleys.

## **Results**

Households, population size, and literacy rates between 2001 and 2021 of eight villages are presented in Table 2. The number of households was just double in 2001 in comparison to 2021. The percentage change was -57.5% (mean value). During two decades, a significant decrease in the number of households was

noticed. Similarly, the population size of the villages decreased in the same proportion, with a reduction of 56.11%.

**Table 2.** Households, population size, and literacy rate (2001-2021) n=8 villages

Variables	Mean	Std. Deviation
HHs 2001	82.75	68.58
HHs 2021	36.5	30.79
Change (%)	-57.5	20.3
Population 2001	163.38	141.5
Population 2021	76.5	69.27
Change (%)	-56.11	20.87
Literacy 2001	70.1	6.08
Literacy 2021	74.39	30.17
Change (%)	20.78	10.42

Source: Processed by authors

In the meantime, the literacy rate increased by >20% during the period. The authors observed that the literacy rate increased due to the opening of a few schools. However, the educational level could not increase proportionately because of lacking higher educational institutions.

Two variables – total population and literacy rate (in %) have been elucidated to understand the demographic changes among the Bhotiya tribes of the Garhwal Himalaya. Rewal Chuk village had a few households in 2001, whereas the village was entirely abandoned in 2021. A total of >50% population decreased in all villages of the Niti Valley. About 50% of villages saw a >50% decrease, and the rest observed a <50% decrease in population size. The population reduction was mainly due to out-migration. The increase in literacy rate varies from 33% maximum to 15% minimum (Table 3).

Bhotiya is known as a transhumance community inhabiting the highland areas of the Indian Central Himalayas. The occupational structure of the Bhotiyas has also been transformed. In the past, their main occupation was practising subsistence agriculture, including cultivating medicinal plants, mainly rearing livestock, goats and sheep, and weaving. Only a few households are practising these activities, whereas most of the Bhotiyas are working in tertiary activities. A 57.5% decrease in the number of people involved in farming was noticed between 2001 and 2021. Similarly, a 72.6% decrease was seen in people involved in livestock rearing. A reduction of 69.8% was noted in weaving and craft occupations.

Village-wise changes in occupational structure - farming, livestock, and weaving and crafts were also noticed. The households involved in agriculture decreased from 35% to 66%, whereas livestock practices decreased from 59% to 78%. Similarly, households engaged in weaving and crafts decreased from 53% to 76%. The highest decrease was noticed in livestock rearing in all villages, followed by weaving and crafts, which also included making local wine. With the decline in population due to exodus out-migration, the occupational structure – livestock rearing, weaving, and crafts, including making wine decreased in all villages.



**Table 3.** Village-wise change (%) population and occupation (2001-2021)

Village	Altitude (m)	Population size	Literacy rate	Farming	Livestock	Weaving and crafts
Malari	3,104	-50.7	+30.19	-53.34	-72.2	-67.01
Kailashpur	3,182	-62.6	+15.23	-66.92	-78.5	-76.67
Mahar Gaun	3,150	-38.46	+26.4	-50	-66.67	-62.5
Rewal Chak	3,100	-100	-	-	-	-
Farkiya	3,222	-54.59	+18.06	-61.48	-73.59	-73.01
Bampa	3,340	-43.24	+19.78	-37.5	-60	-56.76
Gamshali	3,380	-34.01	+33.62	-35.21	-59.68	-53.03
Niti	3,452	-65.3	+22.92	-55.56	-71.05	-69.04

Source: \*\*Primary Survey 2021

Source: processed by authors

Although agriculture is only possible during the summer and monsoon season due to excessive cold and snow cover during the rest of the six months, agro-diversity is high in the Niti Valley. The different cultivars/races of cereals, fruits, spices, and medicinal plants are grown here. Medicinal plants are naturally grown and cultivated. The data on the principal crops' area, production, and productivity at two different times were gathered and analyzed (Table 4). The areas with other traditional crops have decreased by 38.81% from 2001 to 2021. Similarly, production has reduced by 63%, and productivity decreased by 27%. The arable land in these villages is limited and not sufficient because these villages are situated in the alpine pasturelands.

Table 5 shows the change in the area, production, and productivity of the principal crops from 2001 to 2021. The area and production of pulses and fruits have increased, while all other crops noted a decrease in the area and production. Only apples received an increase in productivity, whereas other crops registered a decrease. The authors noted a significant decline in the cultivation of spices and medicinal plants in the study villages. In the three study villages of Malari, Kailashpur, and Mahar, apple cultivation gained momentum with high output. One of the reasons for the increasing production of apples was changing climatic patterns. The apple orchards shifted to the high altitudes due to the warming of the river valleys and middle altitudes.

**Table 4.** Area (ha), production (kg), and productivity (kg/ha) of principal crops (n=5)

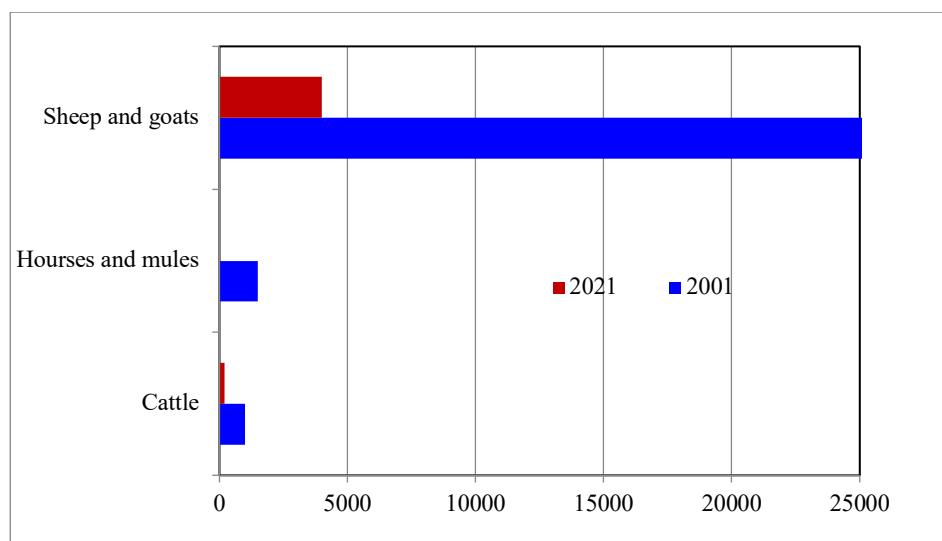
Variables	Mean	Std. Deviation
Area 2001	15.65	13.99
Area 2021	8.94	5.7
Change (%)	-38.81	217
Production 2001	92.98	99.7
Production 2021	34.34	25.96
Change (%)	-63	155
Productivity 2001	5.28	4.61
Productivity 2021	3.93	3.75
Change (%)	-27.11	15.45

Source: Processed by authors

**Table 5.** Change (%) in the area (ha), production (quintal), and productivity (Quintal/ha) of principal crops

Crops	Area	Production	Productivity
Barley	-61.99	-63.67	-4.39
Pulses	+427.31	+276.7	-28.42
Oilseeds	-54.05	-73.03	-41.62
Millets	-57.56	-74.77	-40.63
Potato	-59.64	-67.91	-20.5
Apple	+10	+35	+25
Medicinal plants	-32	-34	-12
Spices	-58	-74	-27

Source: Processed by authors

**Figure 3.** Changes in the number of livestock (2001-2021)

Source: processed by authors

Aside from the decline in agricultural practices, the number of livestock in the valley is also steadily declining and has fallen considerably over time. In the past, Bhotiyas used pack goats to transport goods between the plains and mountains of India and Tibet. For this purpose, they raised large numbers of livestock. However, everything changed after the Indo-Tibetan border was closed in 1962. For Bhotiyas, this was a pivotal moment. Following the seizure of the Himalayan border, Bhotiyas began to sell their goats, mules, yaks, horses, and other animals, which has continued to this day, reducing the number of livestock in the valleys. The changes in livestock numbers in the study villages are shown in Figure 3. The most significant negative growth was observed in the numbers of sheep and goats, followed by horses and mules. Cattle, however, marked the slightest decline.

Niti Valley observed development in transportation after Uttarakhand got statehood in 2000. For instance, road connectivity in the valley has improved since then; now, all Bhotiya villages in the Niti Valley are well-connected by roads, except Dronagiri village, where people still walk 9 km to reach it. In addition, all of the villages have been electrified and connected to the telecommunications

network. Meanwhile, other infrastructure services, such as healthcare, education, clean water, adequate electricity, and agricultural infrastructure, are lacking in the villages, or their conditions have not improved. In a field survey, the authors found that there was only one primary health center in Bampa with only one doctor among eight villages. Further, the medical facilities available at the time were very nominal. During serious times, people must go either to Joshimath, about 70 km away or to Dehradun, about 380 km away.

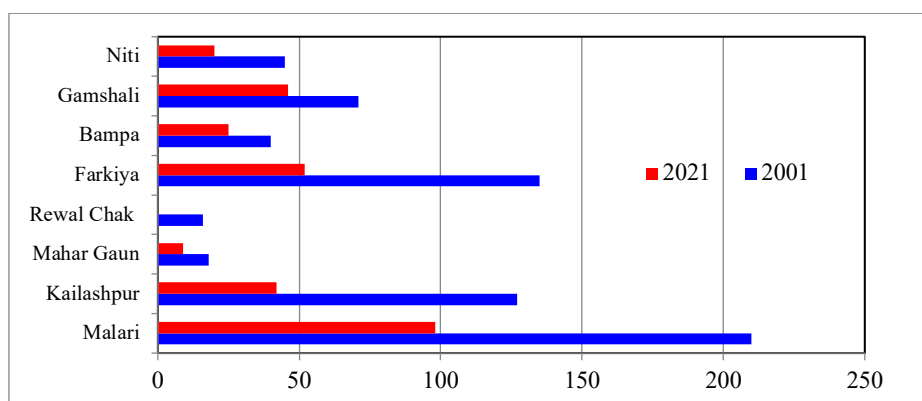
At present, there are no schools or degree colleges in any of the study villages. Gamshali had a degree college that was closed around 1980 as all of its students moved to the lowland villages permanently. The government also closed all the primary, secondary, and high schools in the valley after 1990 because there were no students in these highland schools. Schools for the students of highlands are run in the lowland villages in the name of their respective highland villages. Now, the youth study in their lowland dwellings. After completing studies, they do not return to the highland villages; therefore, the population is decreasing, and there is a large decrease in primary sector activities. This is also why they have detached from farm activities and are drawn toward highly educated jobs in the service sectors.

Water and electricity supply is intermittent. Whenever landslides occur, and pipe and power lines are damaged, these remain unattended for days or even months. Such incidents are prevalent. Besides these hindrances, irrigation facilities are also very limited in the Niti Valley. It was noticed that only 12% of arable land was irrigated, and others were rain-fed. Additionally, agricultural infrastructure such as canals, modern farm equipment, HYV seed, and fertilizers were lacking.

Historically, Bhotiyas have adopted a semi-nomadic way of life and transhumance, a seasonal migration that involves highland-lowland migration or northward-southward migration in the Indian Himalayas. Generally, Bhotiyas live in the highland villages between April and October (six months) and in the lowland villages from October until March (six months). Their summer villages are called *Mait*, generally located above 3,000 m, and their winter villages are called *Gunshas*, located at between 1,000 and 2,000 m. In the highlands, they cultivate crops, whereas, in the lowland villages, agriculture is practised (on a very small patch of land) along with making handicrafts and wine, and other local goods such as *Pajamas*, mattresses, *Pankhee*, and carpets, which are sold in the local market.

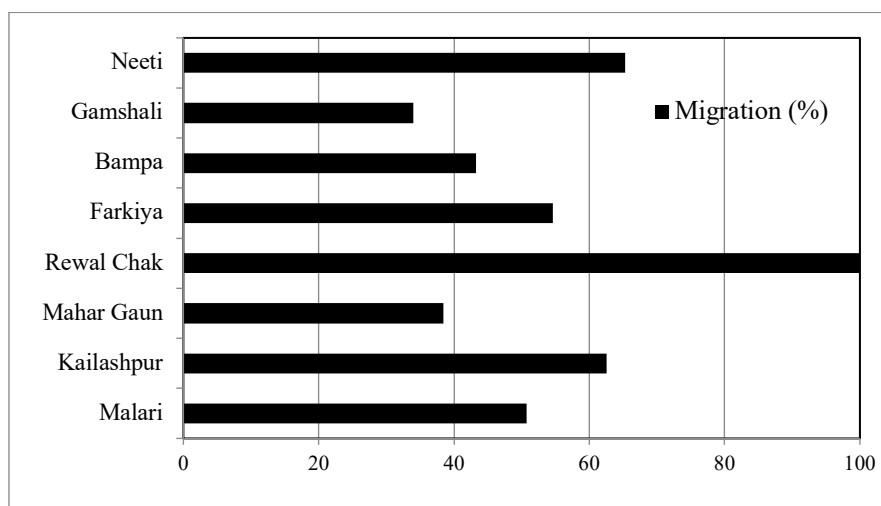
The highland-lowland interaction among the Bhotiya tribes of the Niti Valley is now confined to agriculture. The primary data show that the highland-lowland migration of the Bhotiya tribes has diminished significantly (Figure 4). The number of households visiting these villages for agriculture and other activities has reduced from 662 to 292 (55.9%). Moreover, the most significant decline was recorded in Rewal Chak (now uninhabited), while the lowest drop was noted in Gamshali. The substantial changes in the highland-lowland interaction between 2001 and 2021 were essentially a result of Bhotiyas' preference for working in the other sectors, mainly the public sector jobs.

Bhotiya tribes migrate between highland and lowland villages, spending six months in the highland villages and the rest of the year in the lowland villages. However, over the past decades, their migration to the highland villages has declined significantly (Figure 5). They are instead migrating elsewhere in search of quality education and better livelihood options. Further, data collected from the study villages show that a large percentage of people permanently out-migrated from the villages after 2001. In total, 53.18 % of people left these villages between 2001 and 2021. While some have permanently settled in their respective lowland villages, others have migrated to different places. Besides, 100% permanent out-migration was noticed in Rewal Chak Kurkuti, which has now become a ‘ghost village’ as all the people have permanently out-migrated, leaving their homes and land abandoned. It was followed by Niti (65.3%), Kailashpur (62.6%), Farkiya (54.6%), Malari (50.7%), Bampa (43.34%), Mahar Gaun (38.46%), and the lowest out-migration was noted in the Gamshali village (34.01%).



**Figure 4.** Households involved in the highland-lowland interaction (2001-2021)

Source: processed by authors



**Figure 5.** The percentage of people who permanently migrated from the villages (N=1307)

Source: processed by authors

## Discussion

The study revealed that the population of the Bhotiya tribes decreased significantly (>50%) between 2001 and 2021. Moreover, the Rewal Chak village has been abandoned because all households in the village have permanently out-migrated. In the other villages, many people have permanently out-migrated to their lowland dwellings. The literacy rate among Bhotiyas has increased by over 20% during the period, higher than the State's average. In terms of occupational structure, it has been transformed drastically. This study revealed that traditional practices of agriculture, livestock rearing, collecting medicinal plants, and making handicrafts and wine have declined by 50%. It has also been noticed that now the Bhotiyas prefer working in tertiary sectors.

The reasons are higher salaries and readily available jobs in tertiary sectors because of the reservation policy of the Government of India for them. The people residing in the villages cannot afford the increasing prices of market commodities, and their income from traditional practices is insufficient (Photo 1). The agricultural practices in the Niti Valley have declined significantly. Our study shows that the area (>40%), production (>60%), and productivity (>30%) have decreased during the corresponding period. The cultivation of medicinal plants and apples is suitable even under climate change situations. However, owing to large-scale out-migration from rural areas, the cultivation of crops has declined.



**Photo 1.** (a) Traditional village of Bhotiyas (b) Ruined settlements, (c) Goats and sheep herders, (d) Traditional weaving industry

Source: processed by authors

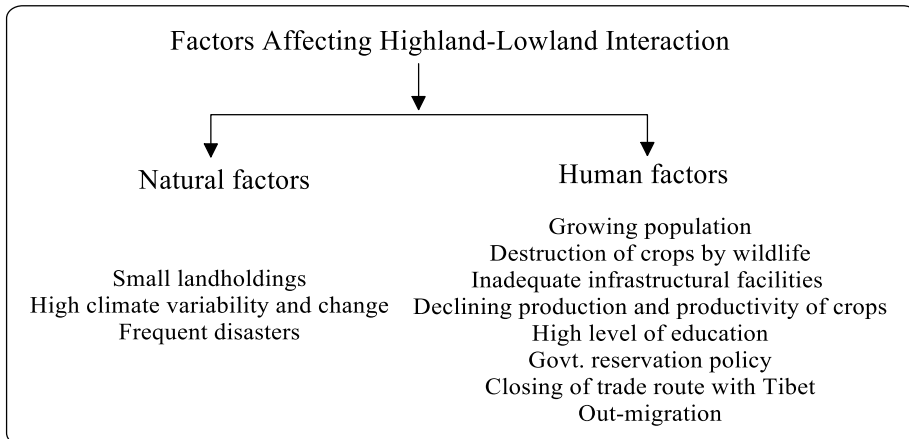
The number of goats, sheep, and cattle has also reduced significantly, which has become a very challenging task at present. Those with sheep must either migrate to alpine meadows to graze their herds or hire a shepherd to do the job for them. Today, however, finding a shepherd is very difficult. Moreover, the present generation is not willing to practice livestock farming. Consequently, the livestock population is declining rapidly, and if the current trends continue, all livestock will disappear from the valley soon, which will have severe repercussions in the region. Owing to all these constraints related to the livelihood of Bhotiyas, they have not only migrated (>50%) to their lowland dwellings in the river valleys but also other parts of the State.

After the formation of Uttarakhand as a state, it attained several waves of development. However, many river valleys, which are situated in the highlands, including the Niti Valley, did not receive substantial growth (ND, 2017; Mangain, 2003; Mangain & Reddy, 2015; 2016). These areas are facing acute shortage of infrastructural and institutional facilities. Seizing trade with Tibet after 1962 was one of the reasons for declining livelihood and, consequently, exodus out-migration. High climate variability and change and therefore declining agricultural production posed challenges to the farmers in the Himalayan region (Eriksson 2009; Macchi 2010, 2011; Tiwari & Joshi 2015). Untimely rains and snowfalls often ruin the crops of people in the valleys. Moreover, their output is insufficient to feed a family for a long time (Tiwari & Joshi, 2016).

The valley lacks essential services and facilities. The traditional practices of making handicrafts are not economically viable because of the high cost of raw materials and lacking market facilities for selling these products. The Uttarakhand state is a tourist destination (Sati, 2018; 2015; 2013). However, because of Niti Valley's strategic location, many tourists are not allowed to visit. Further, the landscape is fragile, and it is remote. Natural disasters in the Niti Valley are a common phenomenon.

During the monsoon season, which is the main tourism season, this valley receives massive landslides and mass movements, which are frequent and intensive (Sati & Kumar, 2022) in the highlands of the Niti Valley. A glacier burst occurred in the Rishi Ganga and Dhaul Ganga valleys on February 7, 2022, which triggered flash floods and landslides and killed above 205 people at the Tapovan hydro-power plant (Sati, 2022). Due to this incident, two Bhotiyas' villages – Raini Chaklata and Raini Chaksubai have washed away. These prominent drivers have created a decline in traditional economic activities and reduced the highland-lowland interaction among the Bhotiyas of the Garhwal Himalayas.

The Niti Valley is facing significant declines in occupational structure – farming, livestock rearing, weaving, crafts, and making wine. Increasing population, small landholdings, high variability, climate change, destruction of crops by wildlife, inadequate infrastructure facilities, declining production and productivity of crops, frequent disasters, as well as out-migration are the significant factors affecting highland-lowland interaction.



**Figure 6.** Various factors that are affecting highland-lowland interactions among Bhotiya tribes

Source: processed by authors

Further, the Niti Valley is exceptionally vulnerable to climate change. It has experienced a substantial change in climatic conditions in the past few decades. The climate variability and warming of the valleys have resulted in a decline in the production and productivity of principal crops (Figure 6). Due to climate change, many crops have disappeared from the valleys. These climate changes have led to the high production and productivity of apples. Therefore, it has been noticed that the villages of Niti Valley are observing substantial growth in the cultivation of apples.

## Conclusions

This study revealed that the highland-lowland interaction amongst the Bhotiya tribes of the Garhwal Himalaya has significantly declined from 2001 to 2021. It has been noticed that the population, agricultural practices, rearing of livestock, and the Bhotiyas' involvement in collecting medicinal plants and making handicrafts and wine have decreased enormously in the past decades. The number of sheep, goats, and cattle in all the studied villages has reduced by >50%. The people who lived in their river valley dwellings in the low altitudes have also out-migrated. One of the essential reasons for declining highland-lowland interaction is the increasing education level, followed by the government's reservation policy for uplifting Bhotiya tribes.

The educated Bhotiyas got a high level of tertiary sector jobs because of the reservation policy and worked in different places in the country. They never returned to their native villages, and in due course of time, many villages were depopulated. Closing of trade routes with Tibet, climate change, decreasing crop production, modernization, lacking infrastructural facilities, and increasing natural disasters are the other reasons for declining highland-lowland interaction among the Bhotiyas of Niti Valley. In the past, the Niti Valley was one of the

routes for the Kailash-Mansarovar pilgrimage. The pilgrims supported the local people in return for their services. The route has been closed now. The Niti Valley comes under an eco-sensitive zone as it is highly fragile and prone to natural disasters. The forest areas are declared protected areas. The Bhotiyas were mainly nomadic and reared goats, sheep, and cattle to run their livelihood. Banning grazing land located in protected forests caused a significant decrease in animals.

The practices of collecting medicinal plants from the alpine pastureland were also forbidden. Along with all these hurdles on the way for the Bhotiyas to run their livelihood, they were out-migrated, and the centuries-old practices of highland-lowland interaction amongst the Bhotiyas vanished. We suggest that the traditional options of livelihood of the Bhotiyas can be revived by providing them with forest rights. This will allow them to rear animals and continue to practice traditional healthcare. Right to the collection of medicinal plants can be given to them. Only Bhotiyas know the medicinal value of some of the rarest medicinal plants. The government can provide market facilities for selling medicinal plants. Educational facilities, suitable transportation, and subsidies to revive woollen handicrafts can be given to the highland villages in order to maintain their traditional livelihood practices.

Providing electricity, health facilities, and a proper water supply will be the other milestones for restoring the Bhotiyas' habitats in the highlands. The entire valley is suitable for growing temperate fruits, some highland spices, potatoes, and medicinal plants. Suitable market facilities can be provided to the highland inhabitants to get an adequate return from the agricultural land. All these solutions will provide them with a convenient base for retaining their traditional dwellings and livelihood options.

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