

A STUDY OF LIVESTOCK MANAGEMENT PATTERNS IN SAGARMATHA NATIONAL PARK, KHUMBU REGION: TRENDS AS AFFECTED BY SOCIO-ECONOMIC FACTORS AND CLIMATE CHANGE

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ABSTRACT

The landscape of Sagarmatha National Park (SNP) evolved under centuries of livestock grazing and farming activities of the Sherpa people. This study attempts to determine changes in livestock population and composition, and explore major driver of changes in the six major year-round settlements in SNP that will be helpful to introduce management interventions for sustainable level of farming in the Park. The necessary data are collected through questionnaire survey. The study indicates that the total number of livestock in Khumbu has not declined, but their type and distribution have changed in each settlement over time. The male cattle breeds are increasing as these animals are used as pack animals and make twice the income of a human porter. However, female cattle breeds are declining because of the meager returns. Likewise, the number of livestock is comparatively less in places like Namche and Khumjung which are on the main tourist route, while in places like Forste and Thamicho where tourism flow is comparatively less, livestock number is high. As tourism created many employment opportunities with substantial income, people are gradually scaling down yak farming. Though tourism is the main driver of changes in livestock patterns, there are other socio-economic factors like education, prestige, political change, and globalization which have modified the animal husbandry practices. Increasing atmospheric temperatures, changes in precipitation patterns, and increased frequency of extreme weather events are the climatic changes seen in the area which are the result of climate change. But the socio-economic factors have actually outweighed the impacts of climate change on livestock in the area. However, as global warming continues, changing climatic patterns could possibly affect high altitude indigenous breeds like yak by creating shortage of water, fodder and increase in pests and diseases.

Key words: Livestock, tourism, climate change

INTRODUCTION

Background

Livestock sector is an important economic activity in Nepal. Livestock contributes to 31% of Nepal's total agricultural output (HMGN/MFSC, 2002). It contributes to national food security, fiber, power, fertilizer, fuel, and transportation and income resources (HMGN/MFSC, 2002). The selection and distribution of various indigenous types of animals raised in different parts of the country are guided by socio-economic values and ethnological preferences, climate, animal

husbandry system and in some cases by marketability. While water buffalo and cattle are economically important livestock types in the mid-hills and Terai, yak and yak-cow hybrids are dominant livestock types in the mountains.

Yak and nak (female yak) are native to Nepal, Bhutan, China and India. They are adapted to high altitudes and seldom found below 3000m while the hybrids are more adapted to the lower altitudes. The Sherpa people of Solukhumbu are important breeders of yak and yak cattle hybrids in Nepal (Epstein, 1977). The other livestock types kept widely both in highlands and lowlands of Nepal are sheep, goats, and horses. Livestock in general provide food (milk and milk products, meat), raw materials (wool, hair and skin), transportation, draft power and manure for agriculture. They are very important for livelihoods of people who are dependent on subsistence farming such as that of Nepal.

Climate change is one of the most challenging issues at present. Its impacts on socio-economic wellbeing of the rural farmers and herders have become a major issue of concern recently. Though it is a natural phenomenon that has been occurring since the earth originated five billion years ago, it is seen recently that its effects are changing the natural cycle of the environment. Impact on Himalayan glaciers has become one of the most visible evidences of global warming on high altitude landscape that has important implications on various aspects including freshwater flow, agriculture, biodiversity and health (DHM, 2004). It is stated that the effects of climate change are more pronounced at higher elevations (Khadka, 2007) environment such as Khumbu region because of their fragile nature of mountain ecosystem. Global warming is known to have significant impact on the high altitude plants and animal species including their migration, breeding and development pattern.

Significance of the Study

Since the detailed research work conducted by Brower (1991) on people, livestock and landscape of the Khumbu, there has not been similar research conducted over the last 20 years. The Sagarmatha National Park Management Plan 2007-2011 (2006) states the need to introduce management interventions to encourage sustainable level of livestock farming in SNP for cultural, ecological and economic reasons. The landscape of SNP evolved under centuries of livestock grazing and farming activities of the Sherpa people. There is a need for a research that will help determine the trends of livestock population change in SNP. More importantly there is a need to determine the driver of these changes in order to design effective policy intervention and incentive programs to maintain traditional livestock herding activities in SNP. Research on the impacts of climate change in the Himalayas has generally been limited to temperature and precipitation trends, glaciers and glacial retreat, and glacier lakes outburst floods (Gurung, 2007). Although not studied to date, it is possible that high-altitude livestock, including yak and yak-hybrids, may be sensitive to the effects of global climate change. This research aims to fill the information gaps identified above.

Objectives and Research Methods

The major objectives of this study are:

- To determine the changes in livestock number and composition in the six major villages in SNP

- To explore the main socio-economic causes behind the livestock population change in the study area
- To determine the possible role of climate change on the livestock in the study area

This research is mainly based on primary data which is obtained through household survey, direct observation, group discussion and key informant interviews. Secondary data related to climatic parameters (temperature) were collected from Syangboche Automatic Weather Station within the Park. Only available metrological data of 12 years are used to determine the trend of warming in this region. The livestock census was done using a data sheet for listing the livestock number and types in all the six major villages of Sagarmatha National Park. A total of 17 wards (9 wards in Namche VDC and 8 wards in Khumjung VDC) are surveyed that represents the whole Khumbu area. A stratified random sampling was done based on the different permanent settlement. Considering the large study population only 117 households (15% of the total households) are sampled and interviewed using a pre-tested structured questionnaire. Quantitative data was compiled, coded, tabulated and analyzed descriptively by calculating frequency, percentages and mean. A comparative study was done to show the trend of livestock population and composition in Khumbu. Linear regression method was applied for analyzing climatic data and to determine climate trends within the past twelve years.

STUDY AREA

Khumbu is a sub-district of north-eastern Nepal, on the border with Tibet, also known as Sagarmatha National Park (SNP) and is home to the highest mountain in the world, Mt. Everest at 8,850m. This Park was declared in 1979 and enlisted as a UNESCO World Heritage Site in 1981. The climate of Khumbu is characterized by moist summer and cold dry winters. There are a total of 5,869 permanent residents in the park and buffer zone area (DNPWC, 2006). The pattern of Sherpa settlement in Khumbu region has been shaped by climate and environment suitable for farming and rearing livestock. The main livestock includes yak and nak, cows and bulls, dzo and dzomo, sheep and goats and horses (DNPWC, 2006). Yak and nak (female yak) are the pure indigenous breeds whereas dzo and dzomo are the crossbreeds of bulls (*lhang*) and nak. There are six major settlements and many subsidiary settlements in Khumbu. The study is done in the six major year-round settlements in the two VDCs of SNP: Namche and Thamichok villages in Namche VDC, and Khumjung, Khunde, Phortse and Pangboche villages in Khumjung VDC. These main villages are situated at an altitude of 3600 – 3900 m while subsidiary settlements and pastures extend up to 5000 m. The subsidiary settlements are located either along the major tourist routes along Imja Khola and Dudh Koshi or in the less visited Nangpa Valley.

RESULTS AND DISCUSSION

Khumbu cattle population and distribution in 2008

Out of the total 771 households in the six major year round settlements in SNP, 54% of the households own livestock of different types. The total number of livestock in Khumbu in 2008 is 3,065. Fig. 2 represents different types of livestock in Khumbu in 2008. The majority of the livestock population is concentrated in Thamichok area which own 38% of Khumbu's livestock. Namche being the center of Khumbu owns only 4% of the total livestock population in Khumbu. The livestock ownership pattern varies depending upon the type of cattle owned. Naks

are maintained in larger groups than any other type of livestock as these animals are economically worthwhile only by keeping in large groups.

Yaks on the other hand are usually kept in small numbers at household level with a maximum herd size of 10. Similarly, zopkiok, dzum and cow are kept only in small numbers usually at a range of 1 to 5. Recently the trend of owning horses is on rise within the Park because of its high commercial value. Khumbu's livestock also includes sheep which is basically kept for manure. However, goat which is considered to be an agent of environmental degradation was outlawed by the Park in 1983.

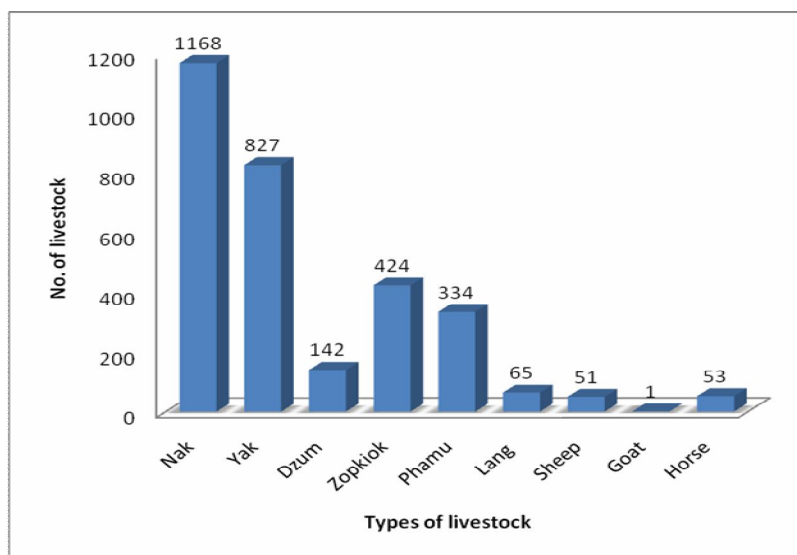


Fig 1. Different Types of livestock in Khumbu 2008

Changes in Livestock number and composition in the six major settlements in Khumbu

Thamichok

Thamichok, the scattered permanent village in the Nangpa Valley, is considered to be the most productive for rearing livestock and is the place where the largest herd size of livestock is found. The total number of yak has doubled in the last 24 yrs whereas the zopkiok number is increasing steadily as shown in the chart. The line chart shows that the numbers of female breeds (nak and dzum) are slightly decreasing in recent

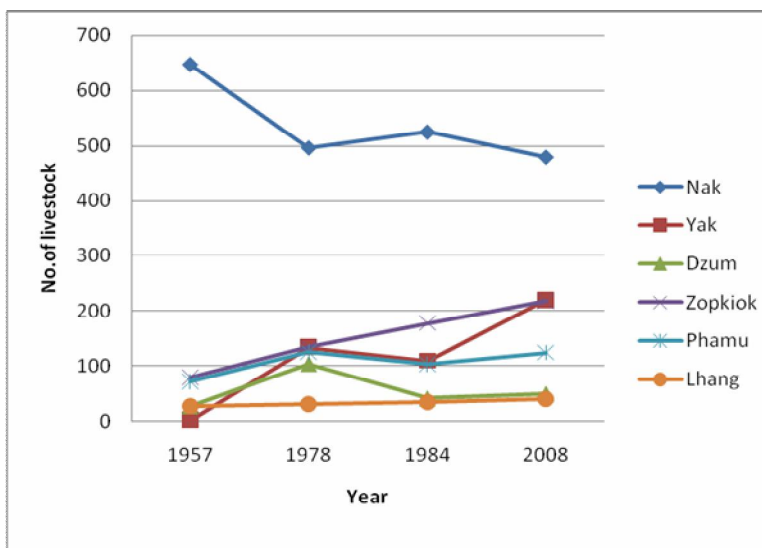


Fig 2. Changes of livestock by type at Thamicho.

years.

Namche

Namche Bazaar also known as Nauje is the centre of Khumbu and has the lowest number of cattle. Livestock of all kind are decreasing in Namche. There has been 60% decrease in resident zopkiok numbers since 1984 and the yak numbers have gone down. Another interesting pattern of livestock in Namche to note is that of the female cattle breeds. There are 14 fewer cows, only one dzum and most significant of all the nak number is nil.

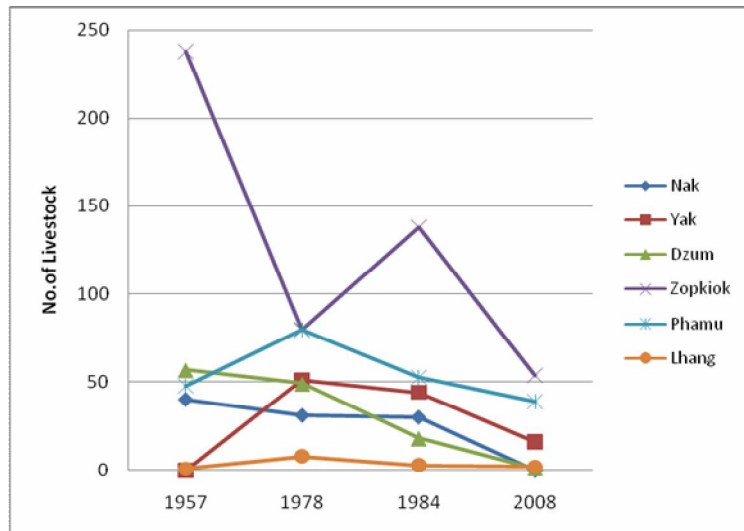


Fig 3. Changes in livestock by type at Namche.

Kunde

Kunde is the smallest village in Khumbu with a total household of 64. This area owns 7% of Khumbu's total livestock. Like Namche, the livestock of Kunde shows a decreasing trend except that there are 8 more yaks now. The most significant changes seen here is the sharp decline in dzum number at least by 80% since 1984.

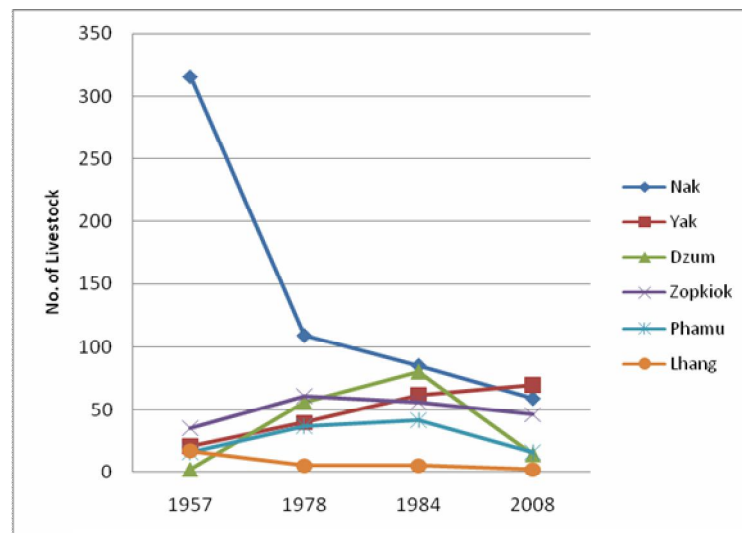


Fig 4. Changes in livestock by type at Kunde.

Khumjung

Khumjung is a large village with a total of 162 households located adjacent to Kunde. About 13% of Khumbu’s livestock are owned by the residents of Khumjung. Nak dominates Khumjung’s livestock population. Khumjung’s livestock also includes 31 naks that belong to the Syangboche Yak Development Farm, the only government sponsored livestock program in the area established in 1974. Livestock trend in Khumjung shows an increasing pattern of yak and nak population. As shown in the chart the dzum number reached its peak in 1978 following a decreasing trend.

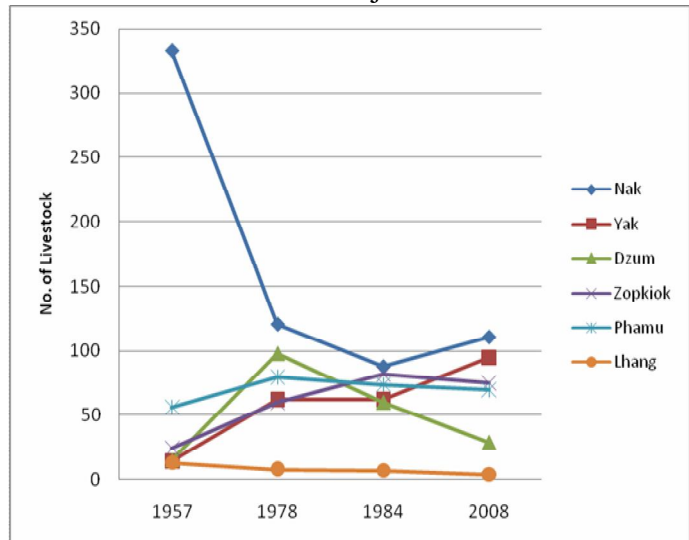


Fig 5. Changes in livestock by type at Khumjung

Pangboche

Pangboche’s livestock shows a significant fluctuation over time. The most notable change in Pangboche’s livestock is the sharp increase in nak population. Likewise, the yak number in 2008 shows a startling jump from 1984. Located on the way to Mt. Everest, the residents have more opportunity for transporting expedition loads. Moreover the less number of lhang and an overwhelmingly large number of naks signifies that the yaks are also kept to ensure progeny. The rest of the livestock shows somewhat declining trend in Pangboche.

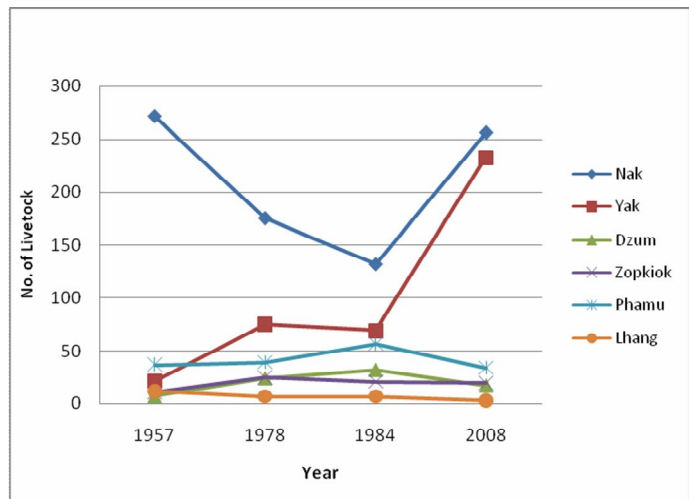


Fig 6. Changes in livestock by type at Pangboche

Fortse

About 18% of the total livestock in Khumbu are owned by the residents of Fortse. In contrast to other settlements, Fortse has only a tiny percentage of crossbreeds. Fortse has livestock overwhelmingly of nak and yak. The most significant change is that the yak number

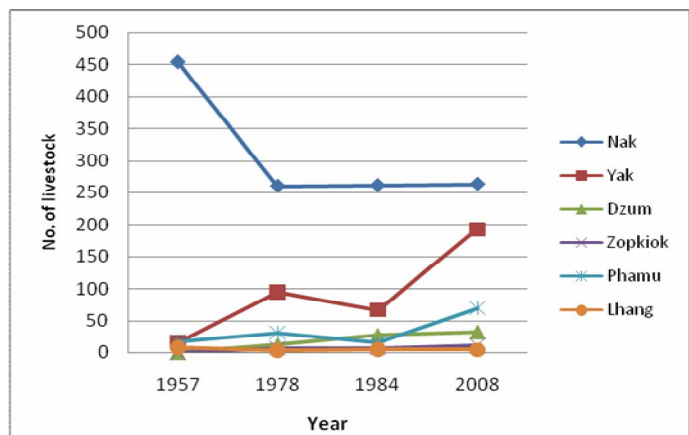


Fig 7. Changes in livestock by type at Fortse.

shows a sharp increasing pattern. The number of yak at present is almost triple the number of yaks in 1984.

SOCIO-ECONOMIC FACTORS CAUSING CHANGES IN LIVESTOCK

Social factors affecting the livestock number and composition

These days most of the people prefer tourism-related activities or going overseas to rearing livestock. This created labor shortage which is a chronic problem for livestock owners. Education has become another social factor affecting labor availability. As people recognize the importance of education, they send their children to school instead of sending them to tend animals grazing on remote pasture. Furthermore, the younger generation lacks interest in animal husbandry because this yields only meager returns. Moreover the commonly encountered in-charge of the family livestock these days are the ones with some physical or mental disabilities. So, this traditional occupation does not hold that much of prestige as in earlier times. This diversion has modified animal husbandry practices as a consequence.

Economic factors affecting livestock number and composition

Traditional livelihood strategies of the Sherpas in the park were subsistence agriculture, transhumance herding and barter trade with Tibet. However, with the opening of Khumbu region to tourism in 1950, the economy of the area began to change rapidly with a shift towards tourism as the main livelihood strategy. Tourism industry provided new employment opportunities like trek guiding, mountaineering, running lodges and shops. Another way of income generation is the use of male cattle breeds for carrying loads. A yak and a zopkiok for example can earn twice the income of a human porter (DNPWC 2006). This explains the increasing trend of yak and zopkiok in Khumbu. Tourism has become one of the driving factors affecting the livestock number and composition in Khumbu region. The role of tourism on the changes in livestock number and composition in a particular place depends upon the number of visitors visiting that place or the intensity in which it is being affected by tourism.

Namche being the center of Khumbu region is visited by about 97.9 % of visitors entering the Park in a season (CESVI 2006). As the tourism flow in this place is quite high the residents prefer to run lodge, shops for tourism than rearing livestock, the former being much easier and makes more money. Figure 8 shows the percentage of HH by income source type in the six major settlements. Thus, Namche has the lowest number of livestock and livestock shows a declining trend over time. On the other hand in Forste where only about 25.8% of visitors' visits each season, the residents have less opportunities of income generating activities like running lodge and shops. Instead they keep livestock especially yaks which can be use as pack animals. So, Forste has a considerable numbers of livestock as compared to Namche. This explanation also holds true for Thamichok area where majority of Khumbu's cattle population are concentrated.

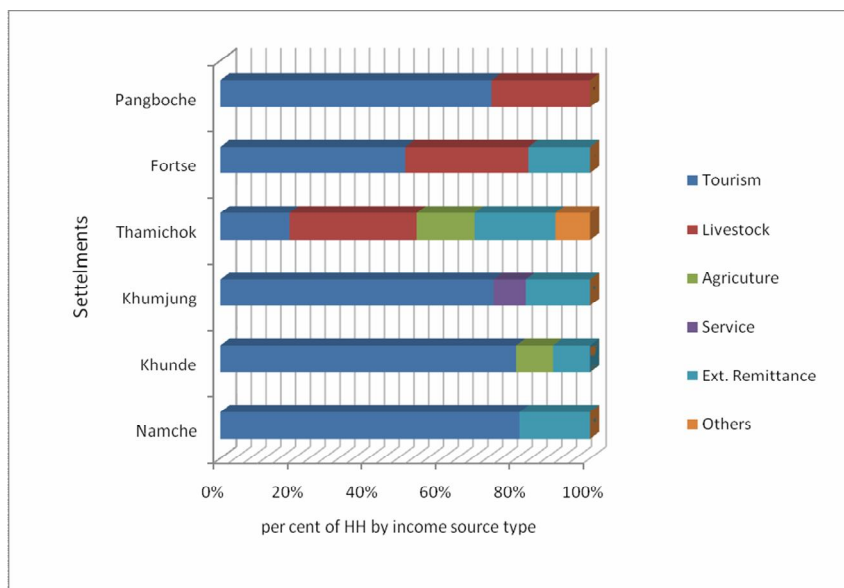


Fig. 8. Percentage of HH by income source type in different settlements.

Climate change and its possible impact on livestock

The monthly mean air temperature recorded at Syangboche Automatic Weather Station (3833 m a.s.l.) in Khumbu shows a positive trend. Figure 9 show that the lowest temperature in winter months (Dec., Jan. and Feb.) of each year recorded in the station is slightly increasing from 1994 to 2007 signifying a warming trend in this region.

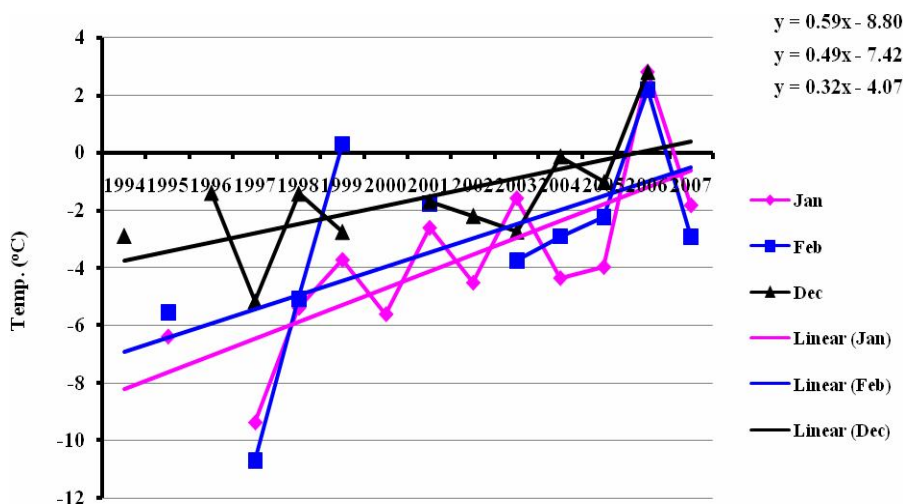


Fig. 9. Temperature variation in winter months from 1994 to 2006 A.D.

Rising atmospheric temperature, changes in precipitation pattern, increased frequency of extreme weather events etc. are the prevailing climatic changes seen in the local climatic pattern as mentioned by most of the local people of Khumbu. However, the changing climate has not made any significant impact on livestock in this region. Though the impact of climate change on livestock is not evident, as global warming continues there is a possibility that high altitude

livestock like yak could also be the sufferer. The global climate change might not affect the cross-breeds which are more adaptable to warmer climate than the indigenous breeds like yak. The possible impacts of climate change on the high altitude livestock in the Khumbu region has been analyzed based on the interview with herders and local people. The following points will elucidate its possible impacts on high altitude indigenous livestock in Khumbu.

Increase in pests and diseases

The heavy wool and other specialized thermo-regulatory mechanism of yak keep them alive in extreme conditions of high altitude but are a liability in warm weather (Brower, 1991). Moreover, the absence of immunity to lowland cattle diseases makes them prone to water and vector borne diseases. Yaks can survive in the summer pasture in high altitude even during the severe winter provided that there is sufficient fodder but they cannot withstand the warmer climate of the lower settlement in the sub alpine region which bring in flies, that irritates and force these animals to migrate upslope (Pers.com. A. P. Sherpa, 2008). Ang Phurba Sherpa is a herder from Thame. The black flies are more prevalent in the forest and scrub vegetation in the sub-alpine region during the summer time. The rising atmospheric temperature due to climate change will result in increase in pests as well as diseases especially in the lower permanent settlements in the sub-alpine region thereby making these areas unsuitable for livestock like yak.

Impact on rangeland quality

The Sherpas have their own indigenous pastoral land use and livestock management system. They practice transhumance, which is a system of migrating with livestock up- and down-slope (upslope in summer settlements called *yorsa* and downslope to lower elevation in winter settlements called *ghunsa*). This transhumance system is enforced by the community through a rotational grazing arrangement called *dee* (DNPWC, 2006). This traditional system ensures effective management of pastureland and conservation of natural resources. Brower (1991) argues that this system establishes a rotational grazing pattern which distributes livestock impact over time and space. But as discussed earlier, if the rising temperature due to climate change makes the lower settlements unsuitable for livestock rearing, this might interrupt existing rotational grazing arrangement and increase the possibility of overgrazing in the alpine region, which will consequently affect rangeland quality.

Fodder availability

Khumbu livestock entirely depends on the rangeland resources. Livestock are allowed to freely graze in the pastures when there is good grazing. But during winter and early spring season, all the livestock must be fed fodder in order to survive. This time of the year, especially the hard winter and dry summer is considered to be the most challenging times for herders as they may face shortage of fodder and livestock loss occurs due to starvation. Many people believe that the onset of rainfall in this region has delayed in the recent years, affecting the pastureland. Passang Y. Sherpa, a middle aged woman from Thamichok area shares “The rainfall pattern is quite unusual these days. The new grass has not yet arrived in the pasture because there is no rainfall; we already bought 80kg of hay to feed our cattle and still need to buy more.” (Pers.com. P. Y. Sherpa, 2008). Besides inadequate rainfall, some people consider poor pasture quality is also a consequence of strong wind and interruption in the natural nutrient cycling. Another crucial factor to note in this case is also the possibility of overgrazing. Overall, the change in

precipitation pattern due to climate change will result in poor pasture quality leading to shortage of fodder thus creating livestock morbidity and mortality.

Water Availability

Water is another crucial factor for livestock survival. Yaks prefer rangeland with good grass and source of water. Recently water has also become a big problem especially in those settlements which are located faraway from river. With no snowfall in winter and no rain even in late spring the water sources dry and create a shortage of water especially during early spring and winter season. The shortage of water is more prevalent in winter settlements (*gunsas*) like Khumjung, Khunde, Samde, Laudo and Mende. Tharkay Sherpa, a hired herder of a resident Sherpa shared that they no longer bring down their naks in Khumjung as there is a scarcity of water. There are other herders who also do the same or keep their livestock in these areas for only short duration because of shortage of water.

CONCLUSIONS

This study on livestock in the six permanent villages of Khumbu indicates that the total number of livestock in Khumbu has not declined, but their type and distribution have changed in each settlement. The male cattle breeds, especially the yak have increased drastically because of the high economic return acquired by using these animals for transporting loads of tourists. The growing tourism industry in Khumbu region is one of the major drivers of change that modifies the livestock population dynamics in different settlement and brought a transformation of barter based trade to a monetary economy.

Climatic changes are already seen in this area, but the changing climate has not much of effect on the livestock. In other words, socio-economic factors have actually outweighed the impacts of climate change on livestock in that area. However, as global warming continues the changing climatic pattern could possibly affect high altitude indigenous breeds like yak.

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