

YAK MORTALITY CAUSES IN SELECTED RANGELAND AREAS OF BHUTAN

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ABSTRACT: Yak mortality in the highlands has been a persistent problem from the past ten years to this present day. The study was carried out to determine the causes of yak mortality in selected highland areas of Bhutan. Data were collected from 60 highlanders, 20 each from Merak, Chokhor and Bji Gewogs, through face-to-face interviews, using semi-structured questionnaires involving both open and close-ended questions. Simple means, averages and frequencies were calculated. The study recorded 76.7 % of respondents having issues with yak mortality. The causes of yak mortality reported were wildlife depredation (<50% respondents) from bear and feral dogs, gid disease (28.3%), fodder shortage (17.4%) and lack of alternative feed resources (4.3%). Fodder shortage verbally claimed to be the major causes of mortality was ranked third thereby nullifying the hypothesis. Nonetheless, the vast majority of the respondents still regarded acute fodder shortage in the winter as the major concern that calls for immediate intervention. According to them, having sufficient land for improved pasture development, registered tsamdro of their own, good rangeland policy and relaxed forest and conservation rules were seen as workable solution to mitigate fodder shortages. Other problems reported are lack of road connectivity, poor telecommunication facilities, and makeshift tents. Increasing waste and declining interest of highland youths on yak farming are some of the concerns among others.

Keywords: Fodder shortage; rangeland; wildlife depredation; yak mortality

1. INTRODUCTION

Yak (*Bos grunniens*) is one of bovine species that thrives well in the cold and harsh mountainous rangeland at an attitude between 3000 to 5000 masl. The area extending from Haa in the west to Tashigang in the east of Bhutan (Chophyel 2009). The rangeland plays a significant role in the sustenance of the pastoralists' livelihood by providing fodder for the animals and other cultural and environmental functions. Globally, more than five billion hectares of rangeland supports for day to day living of about 120 million pastpralists (Joshi et al. 2013). In the Hindu Kush Himalayan (HKH) regions rangeland accounts for about 60% of the land use system and it is reported to provide forage for livestock grazing and main source of water to the downstream settlements (Miller 1996). Bhutan has 1.24 million acres of rangeland covering 3.9% of the country's geographical area (Dorji 2013). The yak farming is one of the main

income sources for highlanders besides providing daily basic requirements such as food, shelter and clothing. Milk products and meat are used as food, wool and leather for clothing, shoes, blankets, rugs and tents. Further, yaks are extensively used for transportation and draft purposes. Yak also has religious significance. The highlanders of Bhutan benefit from yak husbandry that extends across 12 districts (International Centre for Integrated Mountain Development [ICIMOD] 2016). The yak population of Bhutan stands at 40897, which accounts for 5.2% of the total livestock population (Department of Livestock [DoL] 2020). The yak rearing is highly remunerative eco-friendly livestock farming system. But it is confronted with numerous challenges such as harsh geo-climatic conditions, overgrazing and degradation of rangeland pasture leading to acute fodder shortage particularly during the winter months. The insufficient fodder production under poorly managed rangeland was considered as an important

factor attributing to yak mortality in Bhutan (Wangchuk and Wangdi 2015).

Nutritional deficiency leading to poor health and production was reported in Arunachal Pradesh, India (Krishnan et al. 2015). Insufficient forage shortage resulted from varying factors such as competition on foraging by wild animals, reduction of grazing areas due to growth of unpalatable shrubs, inadequate feed alternatives and poor rangeland management systems was perceived as the main causes of yak mortality in highland areas (Jamtsho, 2002) of Bhutan.

According to the author, shrub invasion was found to have effectively controlled by prescribed burning until it was banned in early 1970s. Such practice was even recommended in United States and seen to have improved grass quality if carried out every five years intervals. The rangeland degradation might have direct repercussion on the health of other domestic animals as well (Wilkes 2008). Rangelands of Bhutan have suffered from multiple environmental and grassland degradation mainly caused by over grazing and improper waste management system (Wangchuk and Wangdi 2015). The authors mentioned horses used by tourists and cordyceps collectors were found to be the main competitors for the available pasture in the area. Similar findings were reported by Berville and Bonnemaire (2010).

Over the years, there has been a gradual decline of yak herders as well as the yak population. One of the reasons is high yak mortality, and if this trend continues and left unchecked the herders and yak population will decline further leading to the loss of rich and unique culture and traditions of highland communities. Acute fodder shortage especially in the winter months is one of the factors leading to starvation and death. Therefore, the main aim of the study was to find out the causes of yak mortality in the highland areas, and interventions to help mitigate the yak mortality is expected to encourage the highlanders to increase their yak herds and contribute to the sustained livelihood of the highlanders.

2. MATERIALS AND METHODS

2.1 Study area

Three gewogs namely Sakteng in Tashigang, Chokhor in Bumthang and Bji in Haa were selected for this study (Figure 1).

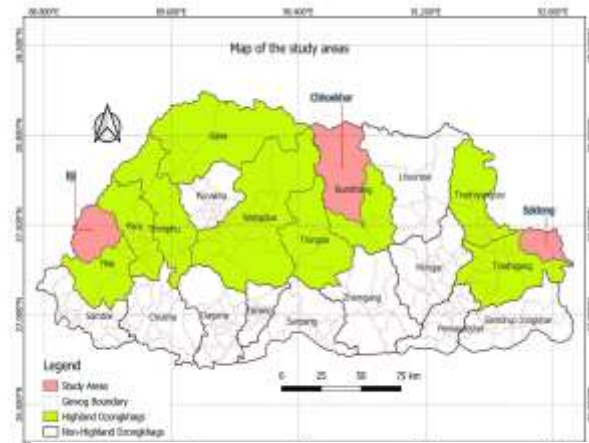


Figure 1: Study areas

The districts were stratified based on the geographical regions that adopt the similar type of yak rearing systems. The eastern, central and western regions were represented by Tashigang, Bumthang and Haa districts respectively. The respondents were purposely selected for the study in close consultation with the respective livestock extension officers. Other criteria for the respondents included those who had a good experience in yak herding, owned a large number of yaks and continue to depend on yak farming.

2.2 Data Collection

The data were collected from 60 respondents, 20 each from the three study locations using a semi-structured questionnaires involving both open and close-ended questions. The open-ended questions provide the respondents an opportunity to express and share their views and experiences.

The information included variables like, socio-economic characteristics, perceptions on rangeland resource degradation causes, constraints and opportunities, yak mortality causes, indicators and proposed workable solutions; awareness on indigenous and modern rangeland management methods. Prior to enumeration, the questions were put for pretest to ensure that all relevant information was collected. The enumerators

engaged for data collection were familiarized on data collection techniques.

2.3 Data analysis

The data was described through comparisons of simple statistical means, averages and frequencies. The data was analyzed using statistical package for social sciences (SPSS version 23.0) and Microsoft excel.

3. RESULTS AND DISCUSSION

3.1 Household characteristics

The major factors impacting the future prospects of yak rearing were education level, household size, landholding and rearing a mixed of livestock. Amongst these factors, labor shortage and limited land were the most critical factors perceived by the farmers that have an impact on the yak husbandry practices in Bhutan. Education level of the respondents was also considered to be one of the important factors that enabled them to take decisive action.

The study revealed that 63% of the respondents were illiterate as shown in figure 2 most of the herders attended non formal education followed by primary school and monastic school.

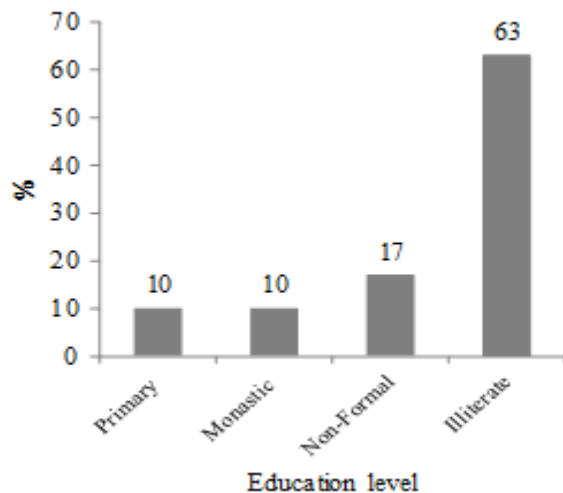


Figure 2: Educational level of the respondents

The respondents from the eastern region were more educated (55%) followed by western (40%)

and central (10%). This may be due to the location of education facilities in the areas. In the eastern region, the schools are located in the middle of the village and the herders have easy access to education. In the central and western regions, the yak herds are very far away from the villages.

The average land holding of the highlanders in the study areas were found to be less as compared to the people residing in lowlands. The overall average dry land holding recorded per households was 1.73 acres with an average land holding of 3.610 acres in the western, 0.997 acres in the central and 0.574 acres in the eastern region. The average household member size was found to be between 7- 9 members amongst the highlanders. On an average, the young farm labor aged above 18 years were 4 and students accounted for 2 members, which succinctly depicts that there are less numbers of young farm labors which could take up yak farming in the future. In all three regions, yak dominated the livestock followed by horse and sheep. Respondents in this study on an average owned 70 yaks, 4 horses and 6 sheep. However, intensity of yak is highest in central 83, western 76, and eastern 51. Only the eastern region yak herders reared sheep alone with the yaks.

3.2 Major income sources

Herders have several income sources. Herders mainly generate income through sale of cordyceps, agriculture and other activities (transportation, collection and marketing of non-wood forest product (NWFP). There was not much difference in the source of income between the 3 regions. Yak husbandry, cordyceps collection, crops and others (transportation, collection and marketing NWFP) were found to be the predominant income source (Table 1).

Table 1: Income sources of yak herders from different study areas

Study area	Income Sources			
	Yak	Cordyceps	Crop	Others
Bji	16	0	2	2
Chokhor	6	14	0	0
Sagteng	19	0	0	1
Total	41	14	2	3

The study revealed yak husbandry was the predominant source of income indicating the importance of yaks for their livelihood. Other sources such as cordyceps were found to be main source of income in some regions especially in the central regions accounting for 14 (23.33%) households. Some studies also suggest cordyceps as a main source of income for the highlanders but in this study the income from yak dominated over cordyceps in western and eastern regions due to the non-availability of cordyceps in these two areas. Agriculture farming was adopted by almost all the respondents in the study sites. This was limited to kitchen garden for household consumption. This was constrained by the short growing season and cold climate conditions.

3.3 Feed resources management

The study revealed that 54% of the respondents experienced acute feed shortage in winter until early spring season (December to April). The herders have to depend on the rangelands, except in some cases, they are left with small quantity of conserved hay and remains of the wilted herbage. During the lean season, the herders adopt different coping strategies to address the feed shortages. 54 % of the herders depend on the forest by lopping tree leaves. 33% depended on conserved fodder and 13% fed the animals with concentrate feed, salt and flour. About 52% of the herders felt that overgrazing was one of the major factors leading to inadequate forage resources for yaks in the rangeland areas. However, 38% of the herders felt that uncontrolled growth of unpalatable fodder species led to fodder shortages. 10% of the them felt that competition from wild animals made less fodder available to their yak herds. Table 2, shows some of the major causes of fodder shortages in the alpine highlands.

Table 2: Causes of fodder shortages in the alpine highlands

Study area	Overgrazing	Growth of unpalatable Species	Competition from wild animals
Bji	14	4	2
Chokhor	10	10	0
Sagteng	7	9	4
Total	31	23	6

In the previous years, the herders used prescribed burning as an effective traditional management tool to control the growth of invasive plants in the rangelands. The herders reported that the ban on prescribed burning was one of the factors contributing to aggressive growth of unpalatable fodder species resulting in fodder shortages and overgrazing. Unlike dairy farmers in the lowlands who depended on improved pasture for fodder, only 43% of the highlanders owned improved pasture especially in the eastern region as compared to 85% in the western and 45% in the central regions respectively. The ownership of less pasture lands was mainly due to short growing season, unavailability of fodder seeds, limited land holding, limited awareness on the importance of feed and fodder technologies in increasing the performance of yaks. Furthermore, 38% of the respondents reported that limited land was one of the main factors for not developing improved pasture.

The study suggests that feed shortage was found to be one of the major problems that caused yak mortality especially in the lean winter seasons. In addition, feed shortages also affected milk production and other reproductive problems such as age at first calving and inter calving period.

3.4 Rangeland conditions and management

The present rangeland conditions were compared to that of the rangeland conditions 10 years ago through recall methods. Some of the parameters used for the comparison were rangeland productivity, intensity, overgrazing prevalence, growth of unpalatable species and existence of competitors from wild animals. The details are presented in table 3.

Table 3: Rangeland conditions and management

Parameters	Before 10 years		Now	
	Yes	No	Yes	No
Productivity	47	13	15	45
Overgrazed	35	25	39	21
Growth of unpalatable shrubs	48	12	38	22
Competition on rangeland by wild animals	30	30	50	10

Approx. 75% of the respondents have reported that the rangeland productivity had reduced as compared to 10 years ago. The banning of prescribed burning, which used to be the traditional rangeland management practice adopted in the past to suppress the growth of invasive plants and triggered regeneration of palatable grasses and plant species was reported as the impending factor. Reinstating prescribed burning through policy intervention, providing tsamdros ownership to the herders and providing impetus on the sustainable rangeland management were some of the workable measures suggested by the herders to improved rangeland conditions.

Over grazing was reported as one of the issues ten years before and it still seem to be an important issue in the present moment. Overgrazing may be due to shrinkage of grazing land through land fragmentation, interface grazing on winter grazing land by other livestock such as horse and cattle and also exerted grazing pressure from yaks across the borders.

The growths of unpalatable shrubs seem to be a persistent problem before and even to this day. Fewer herders reported this issue as a problem in the present moment than compared to ten years before. The growth of unpalatable shrubs in the rangelands are rampant and reported favored by the ban on rangeland burning a traditional rangeland management practice adopted by yak herders. The responses suggest that there was not much problem of competition on rangeland resources with wild animals in the past ten years. However, in the recent years, a greater number of respondents mentioned confronting grazing competition with wild animals as a significant issue. This may be as a result of decline in grazable rangeland areas. The availability of less palatable fodder grasses due to uncontrolled growth of unpalatable fodder species. The respondents mentioned that the notable wildlife competitors were blue sheep (*Pseudois nayaur*) and Takin (*Budorcas taxicolor*).

3.6 Prevalence of yak mortality

The herders were asked on their experience with yak mortality for the last ten years. Approximately 77% of the herders reported that they experienced

mortality of yak in their herds. About 23% of the herders reported that they did not experience any yak mortality for the last 10 years. The responses have been enumerated in the following Table 4.

Table 4: Prevalence of yak mortality in the highland areas

Herders experience with yak mortality	Nos. of herders	Frequency (%)
Herders with no yak mortality for the last 10 years	14	23.3
Herders with yak mortality for the last 10 years	46	76.7
Total	60	100

The study revealed that acute shortage of fodder leads to high yak mortality. Similar findings have been reported by Wangchuk and Wangdi (2015). The mortality rate was slightly higher than before with six deaths than four deaths 10 years ago.

The mortality was reported to have occurred from December to April when there was acute shortage. Khan (2003) also reported similar yak mortalities in Pakistan due to fodder shortages in the lean winter months. The respondents were also of the impression that stringent forest conservation rules could be the sole reasons for aggravating the yak mortality due to increased number of predators, increased wild animals competing for grazing resources with yaks and shrinkage of grazing areas in the rangeland due to invasive plant species. Similar study done by Dorji et al. (2020), reported fodder unavailability and an increasing predation on yak are reasons for decline in yak populations.

Khwarrae (2006) in a similar study done in India,

Table 5: Causes of yak mortality

Causes	Frequency (n 46)	Percent
Wildlife depredation	23	50
Diseases	13	28.3
Insufficient fodder	8	17.4
No Feed alternatives	2	4.3

reported that fodder shortage was one of the factors for yak mortality. Lack of veterinary facilities were some of the additional factors leading to yak mortality in the highlands. (Singh, 2009). The following table 5, describes the percentages of yak mortality caused by other factors like wild life depredation, diseases and lack of feed alternatives.

Wildlife Depredation is the highest cause for yak mortality in the study areas and predators mentioned were feral dogs, snow leopards and bears. Wangchuk and Wangdi (2018) also reported yaks being lost to wildlife predation in northern Bhutan. Yak mortality caused by diseases are another critical concern shared by the respondents. The mortality in winter is perceived to have been caused by water poisoning and in summer by plant poisoning (Sharma, 2011). However, respondents asserted that disease related mortality was less compared to past due to the availability of improved veterinary services. However, some felt that extension services were not assessable to all herds and felt gid diseases among the yak was one of the factors for huge mortality among the yak herds.

3.5 Constraints and opportunities

Highlanders are challenged with numerous problems ranging from rugged mountainous terrain to harsh climatic conditions, absence of modern amenities and declining interest to take up yak husbandry in the future. Other emerging problems include limited land holdings, limited knowledge on modern technologies. Having reliable and potable drinking water for both herders and yak is a persistent problem in many migratory herder camps, especially in winter seasonal herds due to drying up of water sources. Unlike other countries, Bhutanese herders lack awareness on rangeland management tips and also, they do not have any community group wherein they can participate and voice for rangeland improvement. Further, less attention and focus from the government side as compared to low land farmers. Waste problems are persisted in all of the study areas due to increased frequency of tourist and cordyceps collectors. Stringent forest rule was seen as a hindrance to the rangeland improvement. They also complained for not having a strong house in some strategic

seasonal herds which can be used to store rations. This has led to ration being eaten by bears.

As for opportunities, highland areas are rich in biodiversity along with good landscape where there is potential for the development and promotion of highland eco-tourism. There are many untapped resources which can be put into use for beneficial purposes.

4. CONCLUSIONS AND RECOMMENDATIONS

Yak husbandry is still the major source of livelihood to the highlanders especially in the western and eastern regions, where cordyceps are not available as an additional income source. Wild life depredation has become a concern due to strict forest and environment rules. Although it was perceived that fodder shortages during the lean winter months were the most important factor contributing to the yak mortality, but this study revealed that wildlife depredation was the most important factor contributing to the large-scale yak mortality in the highlands. The prevalence of diseases especially gid was more significant than fodder shortages. Limited land holdings, lack of proper grazing pasture, stringent forest rules, labor shortages were some of the important factors which contributed to fodder shortages in the highlands. If left unchecked, the culture and traditions of the unique highland communities may vanish entirely with the decline of yak population and yak herders.

Wildlife depredation in the highlands could be minimized by providing good animal shelters, working closely with the park management to make them more aware of the issues and need for supports. We could facilitate the introduction of animal insurance schemes in collaboration with the insurance companies. Animal diseases could be minimized through better extension services coverage, providing better incentives to the extension agents and initiating an aggressive gid control program in the affected areas. In order to increase the fodder availability to the animals, the concerned agencies could facilitate the lease of rangelands to the herders based on scientific principles. Scientific growing and management practices could be introduced in these areas to maximize the benefits from these areas.

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REFERENCES

- Berville M and Bonnemaire J. (2010). Marginalisation of herders in Bhutan: can public policy generates new stabilities that can support the transformation of their skills and organisation. HAL archives-ouvertes.fr, 11.
- CBS. (2013). Rangeland tenure transfer- An analysis of policy and legal issues in Bhutan. The Centre for Bhutan Studies & GNH Studies, Thimphu, Bhutan.
- Chophyel P. (2009). A consultancy report 2009. Bhutan: AMS consultancy.
- DoL (2020). Livestock Statistics. Department of Livestock, Ministry of Agriculture and Forest, Thimphu:
- Dorji K. (2013). Rangeland tenure transfer- an analysis of policy and legal issues in Bhutan. The Centre for Bhutan Studies & GNH Studies, Thimphu.
- ICIMOD. (2016). Yak on the move. Transboundary challenges and opportunities for yak raising in changing Hindu Kush Himalayan Region. International Centre for Integrated Mountain Development (ICIMOD), Katmandu, Nepal:
- Jamtsho P. (2002). Condition and potential for improvement of high-altitude rangelands. 17.
- Joshi L, Shrestha RM, Jarsa AW, Joshi S and Galani H. (2013). Rangeland Ecosystem Services in the Hindu Kush Himalayan Region. Kathmandu, Nepal: International Centre for Integrated Mountain Development.
- Khan AG. (2003). NASSD Background Paper: Rangeland and Livestock. Pakistan: IUCN Pakistan, North Areas Program.
- Khwarrae GM. (2006). Community perception of Rangeland degradation and management system in Loologane and Shadishadi. Botswana: Norwegian University of Life science.
- Krishnan G, Paul V, Shanah S, Bam J and DAS PJ. (2015). Effect of climate change on yak production at high altitude. Indian Journal of Animal Science, 621-626.
- Miller DJ. (1996). Rangeland and pasture development in the Hindu Kush Himalayas. Kathmandu: ICIMOD.
- NSB. (2016). Statistical year book of Bhutan. National Statistical Bureau. Thimphu:
- Sharma B. (2011). Hand book on livestock & poultry diseases of Bhutan. Chukha.
- Singh RK. (2009). Indigenous knowledge of yak breeding and management by Brokpa community in Eastern Himalayan, Arunachal Pradesh. Indian Journal of Traditional Knowledge, 495-501.
- Squires VR. (n.d). Range and Animal Science and Resources Management. Range and Animal Science and Resources Management, 11.
- Wangchuk K and Wangdi J. (2015). Mountain Pastoralism in transition: consequences of legalizing Cordyceps collection on yak farming practices in Bhutan. Pastoralism, 10.
- Wangchuk K and Wangdi J. (2018). Signs of climate warming through the eyes of yak herders in Northern Bhutan. 8.
- Wiener G, Jianlin H and Ruijin L. (2010). Encyclopedia of animal science. Yak, 6.
- Wilkes A. (2008). Towards Mainstreaming Climate Change in Grassland. China: ICRAF China 2008.