



# **An Assessment on Role of Yak/ Chauries Herder Communities for the Conservation and Management of Rangeland in Mustang District, Nepal**

**<sup>1</sup>Bhojan Dhakal, <sup>1</sup>Ram Bahadur Rana, <sup>2</sup>Shankar Raj Pant, <sup>3</sup>Sabita Subedi, <sup>4</sup>Naba Raj Devkota**

<sup>1</sup>National Animal Science Research Institute, Nepal Agricultural Research Council, Nepal

<sup>2</sup>National Pasture and Fodder Research Program, Khumaltar, Lalitpur

<sup>3</sup>Tribhuvan University, Kirtipur

<sup>4</sup>Agriculture and Forestry University, Rampur/Gandaki University, Pokhara

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## **ABSTRACT**

The sustainable development of rangeland ecosystems, the vital ecosystems that provide numerous important ecosystem services to millions of people in the Hindu Kush-Himalaya region, faces a number of challenges at present. Taking the condition into account, research was designed in 2020 to identify the socioeconomic scenarios of the yak/Chauries farming system in Mustang's high hill region. The data were inferred using a combination of techniques, including descriptive statistics such as frequency, percentage, bar graph, pie chart, multiple liner regression, description chart, and secondary data. The preliminary results indicated that household economics, such as the number of animals on the farm and the availability of human resources, as well as socioeconomic factors such as educational status, significantly influenced ( $P < 0.05$ ) the overall rangeland utilization pattern. Our overall socioeconomic data revealed that for the sustainable management of the rangeland, a set of interventions are required, including an increase in education, training, and information for the herders, as well as a long-term improvement of their socioeconomic status.

Keywords: *Grazing, High hills, Rangeland degradation, Resource utilization*

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## **INTRODUCTION**

About 11.5% of Nepal's total land resources are rangelands (Dong et al., 2007; Pokharel et al., 2009). Nepalese rangeland-based livestock farming is crucial to the Himalayan people's way of life. Over ninety-eight percent of rangelands are located in the Himalayas and other mountainous regions (Pokharel et al., 2009; SpringerLink, n.d.). Over 2500 meters in altitude, more than 65 percent of livestock feed comes from rangeland (Dong et al., 2007; Shrestha et al., n.d.). Rangeland production and productivity range from 0.12 to 3.2-ton dry matter (DM) per hectare (Chetri et al., 1970) Accessible only 64% of the rangelands (Shrestha, 1999). The majority of rangelands are overstocked and severely overgrazed. The estimated carrying capacity ranges between 0.06 and 1.40 livestock units per hectare (LU/ha). Up to 37 times the carrying capacity, the stocking rate on rangelands is very high. Indigenous rangeland management practices cannot keep up with the rising livestock population (Shrestha, 1999; Chetri et al., 1970; Devkota & Kolachhapati, 2010; Dhakal & Subedi, 2020). The Tibetan/Chinese Government stopped the traditionally practiced trans frontier pasturing between Tibet and Nepal for Nepalese migratory herds in 1990, which compelled the Nepal Government to initiate various rangeland development activities to meet the feed supply demand for Yak/Chauries (Dong et al., 2010; Limenih, 2016; Pokharel et al., 2009; Shikui DONG et al., 2010; Ulziibaatar & Matsui, 2021).

The management of the rangeland is determined by the pastoral landscape, the seasons, the climate, the topography, and sociocultural factors (Aryal, 2010; Chetri, 2011; Dong et al., 2007). The resultant transhumance system of herding involved spring migrations of yak herds to high summer pastures, followed by a slow return to winter pastures and more permanent herder settlements in autumn. During the summer and early autumn, when herds grazed at higher elevations, herders traditionally lived in camps and relocated as needed, depending on the availability of forage. During the winter and early spring, yak was kept at lower elevations (Chaudhary & Bawa, 2011; DK Chetri, 2011; Yi et al., 2007), closer to the herders' permanent homes. Increasingly, calves are provided with shelters to protect them from the harshest weather conditions.

Summer and winter, the natural vegetation is almost the only food source for yaks. Summer is an abundant season. After severe weight loss during the winter and early spring, the animals gain weight quickly. During this time, animals can be on the verge of starvation, and deaths are common, particularly in snowy years (Aryal, 2010; Chetri, 2011; Dong et al., 2007; Yi et al., 2007). Supplemental feeds, such as hay or crop by-products, have historically only been available in extremely limited quantities and primarily for weak animals. The relationship between yak herding and the availability of grazing was and remains crucial to the economic success or failure of a system that is believed to have persisted almost unchanged until recent times. The topic of contemporary rangeland management highlights the dangers of overgrazing and the fragility of the ecosystem.

In Nepal, natural resources, particularly forest and rangeland resources, have degraded as a result of the tremendous increase in demand. Since the 1980s, two debates have emerged regarding the condition, status, and degradation of forest and rangeland resources in the hills of Nepal. Since the 1950s, the first group of social scientists, environmentalists, resource planners, and researchers have emphasized that forest and rangeland resources are under significant pressure (Shrestha, 1999; Aryal et al., 2014; S. Dong et al., 2009; Pokharel et al., 2009; SpringerLink, n.d.). In contrast, a second group of scholars argues that the reality has been exaggerated (AB Shrestha, 1999; Chetri et al., 1970) and that the depletion of forest and rangeland resources has occurred gradually over the past two centuries as the human and livestock populations have grown (Akis, 2011; Baker & Hoffman, 2006; Chetri, 2011; J Liu, 2007; Yi et al., 2007). Some have even discovered favorable changes in forest and rangeland resources in specific regions (J Liu, 2007). Such arguments have piqued the interest of researchers and resource planners, who are now conducting studies at the local level on the current state, management, and utilization practices of the rangeland.

## MATERIAL AND METHODS

### *Survey of rangeland production and utilizations*

From January to March of 2020, a field survey was conducted in the Nepalese district of Mustang to collect primary information from the field. The Mustang districts was chosen for the field surveys due to the popularity of the yak in Mustang, which has a relatively higher number of documented yak and Chauries production than other districts in Nepal. This study focused on farmers who are currently engaged in the production and rearing of livestock, specifically yak production. Altogether, 75 households were included in the study. We used a combination of open-ended and closed-ended questionnaires to collect general demographic information as well as respondents' knowledge and attitudes regarding rangelands, and then we attempted to analyze the data to identify the rangeland's most pressing problems. This study relies on primary and secondary data gathered in the field. There was a meeting, group discussion, and review of management plans and analysis.

The evaluation was conducted with the aid of a semi-structured questionnaire administered by trained and experienced enumerators. Before actual data collection commenced, the questionnaire was drafted and pretested. The questionnaire data were supplemented with information obtained from key informants, including (among others) elderly people and community leaders of the rangelands, as well as an expert in animal science and statistics.

### *Statistical model*

The following models were utilized in the three studies:

Within the statistical model rangeland was considered as the primary source of income for farmers as defined as:  $Y_i = x_i + I$ , where  $Y_i$  is the decision vector,  $x_i$  represents the vector of explanatory variables derived from household surveys, represents the respective regression coefficient, and represents the error term.

## RESULTS

### *Demographic information regarding the family*

The demographic information of the households of Yak/ Chauries producing farmers in the Mustang Area revealed a higher proportion of people aged 41 to 60 (46.67%) and nearly a quarter of the young population (26.35%) engaged in Yak/ Chauries farming. This indicates that relatively few young people are participating in the Yak/Chauries farming system in the region (Figure1).

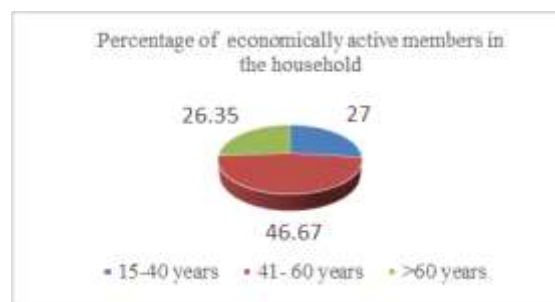


Fig. 1 Socioeconomic and biophysical characteristics of the respondents (N=70)

### *Household age of the farmer involved in the Chauries/Yak farming*

The past and present study on the number of yak available in the areas depicts that the total number of Yak/Chauries as well as number per household found to be in decreasing trend.

### **Table 1 Descriptive statistics on number of Yak per household in the area**

Parameters	N	Minimum	Maximum	Sum	Mean	Std. Deviation
Yak/Chauries before 10 years	70	2	35	485	7.48	4.52
Yak/Chauries at present	68	1	25	414	6.09	3.15

N= Number of HH surveyed

### Resources and Feeding System

In both seasons, feed shortage mitigation options were extremely limited. During the summer, grazing accounted for more than 90 percent of the livestock's diet, whereas in the winter, this proportion varies between 70 and 80 percent (Figure 2). During the winter, livestock migrates from the mountain's upper rangeland to the lower altitude range, which has more farmland and sometimes fodder trees as well (Baker & Hoffman, 2006; Gentle & Maraseni, 2012; J Liu, 2007; SpringerLink, n.d.; Yi et al., 2007). In addition, greater amounts of concentrate were fed during the winter due to the distance between the shed and the home. The rangeland would have more grasses available during the summer. After the start of the monsoon and a rise in temperature, according to the farmer, grass grows more quickly and poses less of a problem for grazing. The majority of mountain dwellers practice transhumanism, which necessitates the seasonal migration of livestock. Due to the lack of irrigated land, the majority of the region dries out during the winter, creating an acute fodder shortage problem. During the winter, there is a severe feed shortage problem with the livestock. As a result of restrictions, a vast majority of the forest surrounding the villages is off-limits to grazing, and land that was available for grazing in the past is no longer available; this has led to a shift from yak farming to other occupations, especially among the younger generation (Gentle & Maraseni, 2012; J Liu, 2007;). As documented by numerous researchers, the shift from yak farming to other occupations is alarming and contradicts our findings.

The result revealed that all summertime herders feed their animals by grazing continuously throughout the day. During the winter months, the majority of farmers (78.57%) also adopt grazing practices, while some (7.14%) only adopt crop residue feeding in its entirety. During the summer, nearly every farmer practice full-time grazing, whereas during the winter, the majority of farmers (81.42%) employ some form of supplementation. The supplementation consists primarily of seasonal forage gathered from a nearby forest, dried leaves gathered from the forest, dried hay, and cereal straw. During the summer, the supplementation of grazing Yaks and Chauries with various concentrates was found to be minimal (15.71 percent), according to the findings. The primary reason for this was that sufficient summer grazing forages would be available at high altitude. Animal is not confined to their shed at any time and wanders far from their shed, resulting in inadequate nutrition. During the winter, they migrated to the vicinity of croplands and villages, where they had a 90% greater chance of obtaining feed supplements.

**Table 2. Feed resource and feeding system practice of respondents in study districts (N=70)**

Parameters/ Resource for livestock	Season			
	Summer		Winter	
	N	%	N	%
Grazing only (yes)	70	100	55	78.57
Crop residue only(yes)	0	0	5	7.14
Full day grazing(yes)	70	100	50	78.75
Grazing and night time supplementation (yes)	0	0	57	81.42
Supplementation with concentrates *				
Supplement your livestock (yes)	11	15.71	63	90.00
Supplement your livestock (No)	59	84.28	7	10.00

N=Number, %=percentage

## DISCUSSIONS

### Utilization of rangeland by Yak and Chauries herders in Mustang

According to Table 3, all of the respondents (100%) use rangeland grass as animal feed, indicating that greater emphasis has been placed on the utilization of rangeland as grazing land. The primary source of income as grazing land was influenced by variable characteristics. Significant positive correlation ( $P < 0.01$ ) was found between the age of the respondent and the use of rangeland as a primary or substitute source of income. A significant negative correlation ( $P < 0.01$ ) was found between the age of the respondent and the use of rangeland as a primary or substitute source of income. The obtained results suggest that older populations utilize rangelands more effectively than their younger counterparts (Aryal et al., 2014; SpringerLink, n.d.).

Farmers with a greater number of animals per household appear to be more dependent on rangeland ( $P < 0.01$ ). The age of the farmer was positively correlated with a rangeland utilization pattern. The adoption of information such as rotational practices appears to have improved the utilization of grazing land. Some farmers were still found to practice rotational grazing on a monthly basis. When they traveled to the most recent section of the range, they would return to the initial section where the new grass had already become established. In order to adhere to this custom, farmers used to designate year-round grazing areas for their particular household (Aryal et al., 2014; S. Dong et al., 2009; Karki & Mcveigh, 1999; Moktan et al., 2008; Watanabe,

1994). Local herders appeared to have participated in the distribution of grazing areas, or at least adhered to a convention that had been in place for at least a decade.

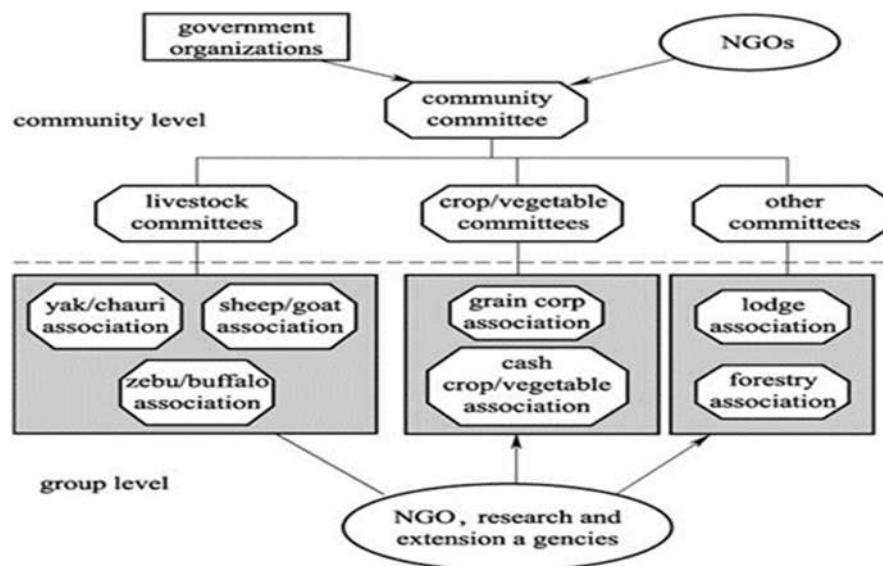
**Table 3. Factors affecting perception on the rangeland as a main source of income of Yak/ Chauries by smallholder farmers in the study districts**

Explanatory variables (Main source of income)	Est. Coeff.	SE	Level of significance
<b>Age of HH</b>			
15-45 years	-0.55	0.54	NS
40-60 years	-0.16	0.48	NS
60 and above	0.57	0.32	*
<b>Education level:</b>			
Illiterate	-0.68	0.36	*
literate	0.86	0.39	*
High school	-0.29	0.42	NS
Active labors (N)	0.54	0.26	NS
Information on rotational grazing (yes)	-0.93	0.26	**
Total livestock units (N)	0.98	0.36	**
R <sup>2</sup>	0.37		
No observations	70		

Note: NS- non significant ( $P>0.05$ ); \*= $P<0.05$ ; \*\*= $P<0.01$ , SE= standard error;  $R^2$ =Coefficient of determination.

#### *Institutional context of the grasslands*

To promote the sustainable development of rangeland resources, it was discovered that well-organized local organizations and efficient traditional rules and regulations had evolved (Dong et al., 2009). Essentially, there were two types of local organizations involved in rangeland management: community committees and civil associations (Figure 3). A community committee (normally 11 to 12 individuals) is elected by all community members (Acharya & Baral, 2017; Dong et al., 2009, 2010; Karki & Mcveigh, 1999; Shikui Dong et al., 2010) and serves as the community's leader, decision-maker, and representative. These groups were comprised of farmer households that shared interests or utilized the same resource pool (forest and rangeland) and made decisions based on these interests, such as grazing sites or herd movement (S. Dong et al., 2010; Ho & Azadi, 2010; Nega, 2018; Pokharel et al., 2009; Reed & Dougill, 2002; Ulziibaatar & Matsui, 2021). Through user groups, the community committee played a crucial role in disseminating government policies regarding rangeland management to community members. Tradition and experience have resulted in well-designed civil regulations and rules, which community committees and farmer associations are aware of (Dong et al., 2010; Reed & Dougill, 2002; Shikui Dong et al., 2010; Shrestha et al., n.d.). These civil regulations facilitated the formation of local organizations for rangeland resource management and conservation and ensured their sustainable growth.



**Fig. 2 Local rangeland institution arrangements and its linkages with other organization, As abstracted from Dong et al. (2010).**

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## CONCLUSION

This study concludes that sustainable rangeland management systems necessitate extensive research into the interactions between traditional socio-cultural and ecological factors that directly or indirectly affect rangeland resources. Knowledge (education, training, etc.) of farmers could play a crucial role in the management of a moderately complex rangeland ecosystem. Knowledge of Chauries/Yak herders could be crucial to the strategic development of rangeland in order to minimize risks and maximize benefits for livestock production and local resource utilization.

## CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest.

## ACKNOWLEDGE

The authors would like to thank specially to Yak/Chauries' herder, local farmer and for assisting to complete this research as well as Nepal Agricultural Research Council for providing financial support to accomplish this research project.

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