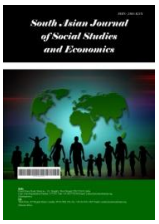

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Tsamdro (Rangeland) as a Source of Livelihood to the People of Bhutan

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Tsamdro plays an essential role in providing resources for the survival of yaks, cattles and horses as these animals provide continuous support to herders in Naro, Merak and Logchina gewogs. There has been numerous change in land tenure system of ownership in *tsamdro* since 1960s of the ownership of *tsamdro*. However, in Land Act 2007; it was stated that *tsamdro* will be nationalized and policy will be implemented by 2017, yet the policy has not been implemented and herders still use the *tsamdro* as used earlier, where the owners had to obtain written permits from the Dzongkhag authorities to graze one's livestock on one's own grazing land by paying an annual grazing permit fee. This study aimed at determining whether *tsamdro* is a source of livelihood for the herders in Naro, Merak and Logchina gewogs. It was carried out *in* Naro, Logchina and Merak subdistricts (gewogs) of Bhutan. It employed a quantitative method by distributing questionnaire survey. Data was collected through semi-structured interviews and the data was collected from a convenience sampling method of (N=75) herders through moderation analysis. The moderation analysis showed that *tsamdro* is a source of livelihood (land asset 571.526*** and livestock 37.670***) to herders. Further research is limited to study area and findings are likely to hold good for similar area only. Further research to find other sources of livelihood and their socio-economic impact on herders is recommended.

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Keywords: Herders; livelihood; ownership; regression; Tsamdro.

LOCAL TERMINOLOGIES

Brokpas : *Highlanders / Nomads.*
Dzongkhag (s) : *District (s).*
Gewog (s) : *Sub-district (s) / Block.*
Tsamdro : *Bhutanese term for grazing areas including pastureland, meadows or rangelands in general. Many areas registered as tsamdro are in government owned forests.*
Tshogpa : *Elected block representative/ leader.*

1. INTRODUCTION

In Bhutan 70% of the population depend on livestock and crops for their sustenance [1]. Yak herding is the main pastoral practice in all the mountain communities of Bhutan. Presently, there are 1,156 yak herding households, with over 49,617 yaks that contributing about 4 % to the livestock product generated in the country [2]. Pastoral yak herding is sparsely distributed across the northern belt of Bhutan with over 34 sub-districts in 10 districts. The livelihood of highlanders does not only depends on yaks but also the availability and prosperity of pasture land which plays a vital role in supporting the survivability and productivity of the yaks [3]. Pastureland is a necessary resource for the survival of the yaks as these animals provide continual support to the semi-nomads of the higher Himalayas [4].

High altitude rangelands are described as those areas of land, which by reason of physical limitations, low and erratic precipitation, rough topography, poor drainage or extreme temperatures not suitable for cultivation, and which are a source of forage for free ranging native and domestic animals as well as a source of wood products, headwaters and habitat for endangered wildlife species [5]. For ages, rangelands and its natural resources have benefitted mainly the highland pastoralist. Yak herding is one of the main activities for the pastoralist which prevails in ten of the twenty Dzongkhags benefitting roughly 1,400 households [5]. High-altitude pastoral communities with yak herding as the primary source of livelihood and more than 90% of households dependent on *tsamdro* [6]. The highlanders depend mostly on pasture to feed livestock for their livelihood. To improve the quality of pasture management activities such as building extensive border structures, the stone walls in summer pastureland and wooden fences in winter grazing land [7] are necessary so that it can enhance the livelihood of the herders. In the research, questions were asked, whether management activities improve the livelihood of the herders? So, the objective is to determine whether *tsamdro* is a source of livelihood to the herders.

Yak farming is one of the main farming activities of the highland communities in northern Dzongkhags for decades. Various activities were included under the fodder station development program [7]. Nine acres of *tsamdro* at Gyentsa under Sephu gewog under Wangdue Phodrang Dzongkhag was brought under improved pasture development, oat and fodder beet plantation including fencing work [7]. The community of Narut under Tang Gewog in Bumthang Dzongkhag who was the immediate beneficiary has executed the field works such as rangelands fencing and clearing unwanted shrubs under the supervision of technical staff from Rangeland unit, NCAN [8].

In Bhutan, Merak and Sakteng, communal grazing lands have wooden gates, short length stone walls and wooden fences at the main routes along the *tsamdro* border to prevent livestock grazing prior to the community's agreed entry dateline to guard the common pasture [9]. In Laya, the grass starts growing only after May and by the end of October, the entire place turns dry [10]. Yaks and horses are one of the main sources of livelihood for Layaps besides cordyceps collection. To help people overcome problems related to the shortage of fodder, the livestock department distribute pasture seeds annually [10].

In the high altitude regions, above the tree line rangelands are the main vegetation [11]. The livelihood of the Himalayan Sherpa people depends on rangeland based livestock farming in Nepal [11]. During rainy days and intense cropping days in the summer season, fodder grass harvesting is undertaken to meet the needs of forage to feed the livestock [11]. In semi-arid areas of India, common property resources, such as pastures, are an essential component of community livelihood properties, providing critical income and sustenance opportunities in the harsh agro-climatic

conditions [12]. Village commons in Rajasthan constitute an indispensable part of the livelihood basis of rural communities. They are the primary source of fodder for grazing animals, and also a source of fuel wood and many important non-timber forest products. The poorer segments of the rural society depend disproportionately on the common pastures, as they derive a larger share of their income and sustenance from livestock rearing, particularly the small ruminants [13].

2. MATERIALS AND METHODS

The study sites were Naro gewog under Thimphu Dzongkhag, Merak under Trashigang Dzongkhag, and Logchina gewog under Chukha Dzongkhag (Fig. 1). Naro gewog lies at an altitude of 4547 metres above sea level and is located at 27.65o N, 89.49o E. Merak lies at an altitude of 3653 m and is located at 27.25o N, 91.88o E. Logchina lies at an altitude of 1117 m and is located at 26.96o N, 89.41o E. These gewogs were chosen as the study sites because they were established as pasture-based villages [14] and they rely heavily on yaks and cattle for their livelihoods.

Different gewogs were chosen on the basis of ownership of *tsamdro* in different Dzongkhags. The information about respondents was accessed through convenience sampling, where one informant or group indicates that a particular repondent would be helpful, who in turn recommends the next potential key informant and so on. The first respondents was randomly selected for an interview with the help of Tshogpa and then the information on the next respondent was taken after the end of the interview.

The survey was conducted through questionnaires with open- and closed-ended questions. A study carried out by [7] also used a semi structured questionnaire for data collection from the selected yak farming households in Merak and Sakteng. The interviews were conducted face-to-face by interviewers because most of the nomadic herders were illiterate to acquire the required information. The semi structured questionnaire and interview provided more in-depth interviewing, that offered freedom to both interviewer and respondents to follow new leads but also served as a general guide to cover a set of topics. The questionnaires was enumerator administered. The first part solicited information on demographic characteristics of the respondents, landholdings, livestock population, and livestock production. The second part of questionnaire contained information on the sources of income, and expenditure for livelihood.

For inferential statistics, linear regression analysis was used where the outcome variables γi represented the total number of livestock (yaks, horses, cattle, sheep), total number of land assets in acres (*tsamdro* and land), and average family income in Ngultrums, which are continuous variables, hence linear regression was used for analysis as shown in analytical model in (Fig. 2). Statistical Package for the Social Science (SPSS) was used for the analysis and Geographical Information Survey (GIS) was used to extract the map for the study area as shown in Fig. 1.

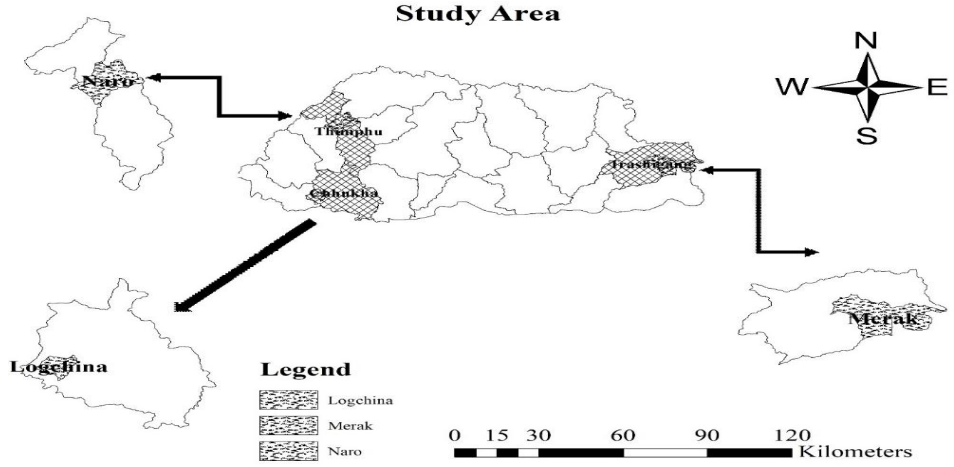

Fig. 1. Study Area

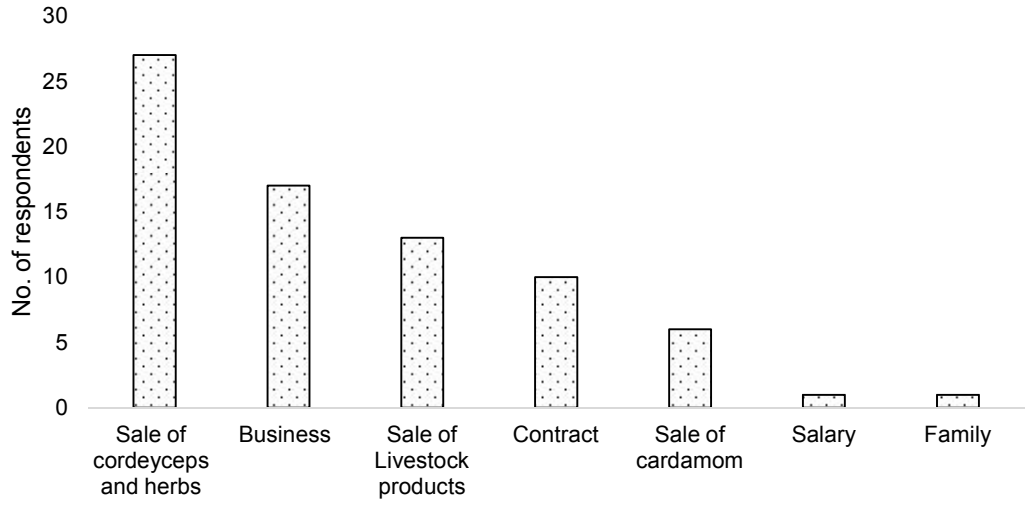

Fig. 2. Source of income for the family

2.1 Analytical Model

$$\gamma_i = (b_0 + b_1X_1 + b_2X_2 + \cdots + b_n X_{ni}) \quad (1)$$

In the above equation by replacing the Xs with the names of predictor variables, and the Y with outcome variable, the linear model becomes:

$$Outcome = b_0 + b_1predictor + b_2predictor + \cdots$$

Outcome variables γ_i represent the total number of livestock (yaks, horses, cattle, sheep), total number of land assets in acres (tsamdro and land), and average family income in Ngultrums, which are continuous variables, hence linear regression was used for analysis.

3. RESULTS AND DISCUSSION

3.1 Bio Data of the Respondents

In this study, out of total sample size (*N*=75) of respondents, 60% (*n*=45) were males and 40% (*n*=30) were females. There were 8% *(n*=6) from Logchina gewog under Chukha Dzongkhag, 40% (n=30) from Merak gewog under Trashigang Dzongkhag, and 52% (*n*=39) from Naro gewog under Thimphu Dzongkhag respectively. A total of 65.3% (*n*=49) respondents owned *tsamdro* and 34.7% (*n*=26) did not own *tsamdro* as shown in Table 1.

3.2 Bio Data of Landholdings, Livestock Populations and Livestock Productions of the Respondents

Majority of the respondents 65% (n=49) of them owned *tsamdro.* In terms of landholdings, most of respondents who owned tsamdro; 29 of them owned more than 300 acres of *tsamdro.* In terms of livestock populations, majority of herders owned yaks (1409) compared to other animals. In terms of livestock productions, 74555 liters of milk, 58168 cheese balls, 12264 kilograms of butter and 1527 kilograms of meat was produced yearly as shown in Table 1.

3.3 Sources of Income and its Expenditure

Majority of the sources of income of the herders in Naro, Merak and Logchina gewogs 36% (*n=27*) were from sale of cordyceps and herbs and 22.7% (*n*=17) earnings from their business. This result aligned with the findings of [15] where most of the herders still consider the yak herd as the most reliable source of livelihood through cordyceps collection as shown in (Fig. 2). In addition, findings from [16] found out that most of the young and adult family members prefer to be engaged in other activities than yak farming, such as collecting the mushroom cordyceps (Cordyceps sinensis) and medicinal plants, which gives them a relatively high economic return. Majority of the income earned was spent on children's education (*n*=13); spent on pilgrimage (*n*=7) and buying animals feed (*n*=6) respectively.

Table 1. Information of the herders

Variable		Frequency	Percentage
Gender	Female	30	40
	Male	45	60
Gewog	Logchina	6	8
	Merak	30	40
	Naro	39	52
Tsamdro owned	Yes	49	65.3
	No	26	34.7

Table 2. Relationship of ownership of tsamdro on source of livelihood

Dependent	Independent	*Coefficient (Standard error)*
Income	Tsamdro owned	67412.873 (86683.786)
Land assets	Tsamdro owned	571.526*** (104.998)
Livestock	Tsamdro owned	37.670*** (6.900)

Significance level:-10%,**-5%,***-1%;*

Table 3. Bio data of landholdings, livestock populations and livestock productions of the respondents

Assets Owned by herders	Response	Frequency
Land Holdings (Tsamdro owned)	Yes	49
	No	26
Tsamdro owned in Acres	Less than 99 acres	18
	Between 100 to 199 acres	0
	Between 200 to 299 acres	2
	More than 300 acres	29
Livestock Populations	Yaks	1409
	Sheep	53
	Cattle	438
	Horse	266
Livestock Productions	Milk	74555 Litres
	Cheese	58168 Balls
	Butter	12264 Kilograms
	Meat	1527 Kilograms

Table 4. Bio data of expenditure on the income earned by respondents

Investment on the income earned	Frequency
Spent on Children's Education	13
Invest in Construction of Houses	4
Buying Animals Feed	6
Business	1
Paying Debts	2
Save in the Bank	1
Going for Pilgrimage	7

3.4 Tsamdro as Source of Livelihood for Herders

The herder's dependence on *tsamdro* as a source of livelihood was estimated through linear regression model. Result in Table 2 shows that when herders owned *tsamdro* had a significant relationship on their livelihood (land assets, livestock). This may be due to dependence of herders on livestock such as yaks, horses, cattle, and sheep for their livelihood and land assets such as dry land and *tsamdro* for agriculture purposes and for their livestock to graze. This result also aligned with the findings of research

done in Papali, Bempu, Tshebji, and Damchena in the western region, and Urchi and Doshi in the central east region in Bhutan where it highlighted the crucial role of livestock, particularly cattle in Bhutanese Transhumant Agro-Pastoralism (TAP) society, providing food, income, social security, companionship and drought power [15]. Further, the study carried out by [7] also concluded that yak herding is and will continue to be a reliable resource of livelihoods for brokpas, and the *tsamdro* will play a significant role in shaping the socio-economic developments of highlanders in Bhutan.

Further, the high altitude rangelands of Bhutan have sustained generations of yak herders, providing them forage for their herds and income from the collection of medicinal and incense plants [17]. There is no significant difference in income earned among the herders in the study areas. The respondents earned more income from other sources because the result is overshadowed by income from other sources such as sale of cordeceps and herbs, 36% (*n*=*27*) and doing business 22.7% (*n*=17) as shown in Fig. 2, irrespective of dependence on livestock and land assets for their livelihood. The findings of Moktan *et al.,* 2008 [18] stated that cattle are the mainstay of the herders' subsistence economy, contributing 71% of gross annual household income in Haa and 84% in Merak in Bhutan contradicts the results of this study.

4. CONCLUSION

Most of the herders in Naro, Logchina and Merak gewogs depend on tsamdro for the source of income of their families. *Tsamdro* plays an essential role in providing resources for the survival of yaks as these animals provide continuous support to the herders. Majority of the income earned from the livestock productions were invested in children's education and buying animals feed respectively. However, the role and economical function of the *Tsamdro* has changed due the more number of people involved in cordyceps collection. The findings can be used for an appropriate intervention. For example, livelihood indicators (land assets, livestock, and income) shows *tsamdro* as a source of livelihood to the herders. Hence, authorities should also take into consideration these result and let herders use *tsamdro* without restrictions.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author's.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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