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Decline of Jakar sheep population in pastoral communities of Bhutan: A consequence of diminishing utility, alternate income opportunities and increasing challenges

Jigme Dorji*, Sonam Tamang and Tashi Yangzome Dorji

Abstract

Jakar sheep population in Bhutan is declining at unprecedented rate (44.4% per annum), and current population is little over 1,700. This study attempts to understand the current status of Jakar sheep and investigate the causes and drivers behind the rapid decline in population. The utility of sheep and wool in particular for clothing by herders is also declining. Sheep farming is increasingly becoming less attractive in face of alternative income sources and opportunities such as sale of potatoes and cordyceps ("caterpillar fungus") in the pastoral communities. The average monetary returns from sheep to annual herd income constitute less than 0.26% in sites with large alternate income sources. Wool processing and product-making continues to employ traditional, labour-intensive and time-consuming tools. Further, wildlife depredation (77%), skin disease (54%) and farm labour shortages (10%) continue to challenge Jakar sheep farming. Therefore, immediate interventions targeted to address the issues through incentive schemes in niche production development, use of labour-saving devices and marketing to generate monetary benefits including compensation to animal loss are recommended. In addition, the initiation and strengthening of *ex situ* conservation programs for sustainable utilization of its genetic resources is highly recommended.

Keywords: Jakar sheep, Challenges, Conservation, Sustainable use, Bhutan

Introduction

The roles of diverse animal genetic resources for food and fibre production, livelihood, ecosystem services and socio-culture are well recognized. In addition, they have a crucial role in adaptation to the emerging challenges and issues related to climate change in animal-based food production (FAO 2015). Globally, such diverse traditional breeds are at threat and losses are unprecedented rate. Jakar sheep is one of the rapidly declining livestock breeds in Bhutan. The breed in the past was an important livestock species in addition to yak and horse in northern alpine pastoral communities of Bhutan. They are primarily

kept for wool and a species associated with annual ritualistic sacrificial animals in some communities.

Jakar sheep is characterized by a small body size and weighs about 34 kg (Dorji et al. 2008) (Figure 1). They are predominantly black coated (80%) (Tamang 2015) and produce medium-fine wool (Kishore and Gopikrishna 2011). The wool is processed to a variety of traditional woolen garments. It is believed that Jakar sheep is introduced from a place called Tshona in south east Tibet (China) during the seventh century a.d. (Dorji et al. 2008). Since then, it has evolved and adapted to the cold, harsh and rugged environment in alpine areas of the country and established as a prominent breed in the country. However, they are currently found only in high-altitude areas: Chhoekhor, Chummey and Phobji sub-districts of the country.

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Figure 1 Jakar sheep ram

In this view, this study was designed to understand the current status of Jakar sheep population and identify drivers/causes for its decline. The findings of the study were expected to help in devising appropriate measures to address the issues, stabilize population and promote sustainable utilization of the breed.

Study area

The study sites (Figure 2) were selected based on existence of Jakar sheep population and the history of their importance in the livelihood of the communities: Dhur in Chhoekhor, Chungphel in Chummey and Phobji sub-blocks of Bhutan.

Methods

In total, 68 Jakar sheep farmers (26 males and 42 females) were interviewed using semi-structured questionnaires

containing a mix of open and closed-end questions to capture current status of sheep (flock size, composition and population trends), income and key issues. Further, 24 farmers actively involved in wool processing and/or product development were chosen as key informants. The data was entered in Statistical Package for Social Science 23 by IBM Corp (2013) and performed descriptive analyses, parametric and nonparametric tests. The yearly statistical data from Department of Livestock, Bhutan, over the past decade was used for the changes of Jakar sheep population.

Results

Household utility of Jakar sheep

Jakar sheep continue to be primarily kept for wool by all of the respondents. The average wool yield was 448.66 ± 109.4 g per animal per shearing and generally shorn twice a year. The skin diseases reduced the wool yield among 54% of the herders. The manure is emerging as an important utility among sedentary sheep farmers in Chungphel and Phobji (80%), who also grow a few seasonal crops. The previously reported practice of ritualistic sacrifice of Jakar sheep was nonexistent in the current study.

Age and gender of Jakar sheep farmers

Figure 3 represents the engagement of different age groups in sheep farming. The number of farmers engaged under different age categories was not significantly different, although involvement of the old age range was the lowest. Overall, more women (twice as many as men) were engaged into sheep farming. Although women were

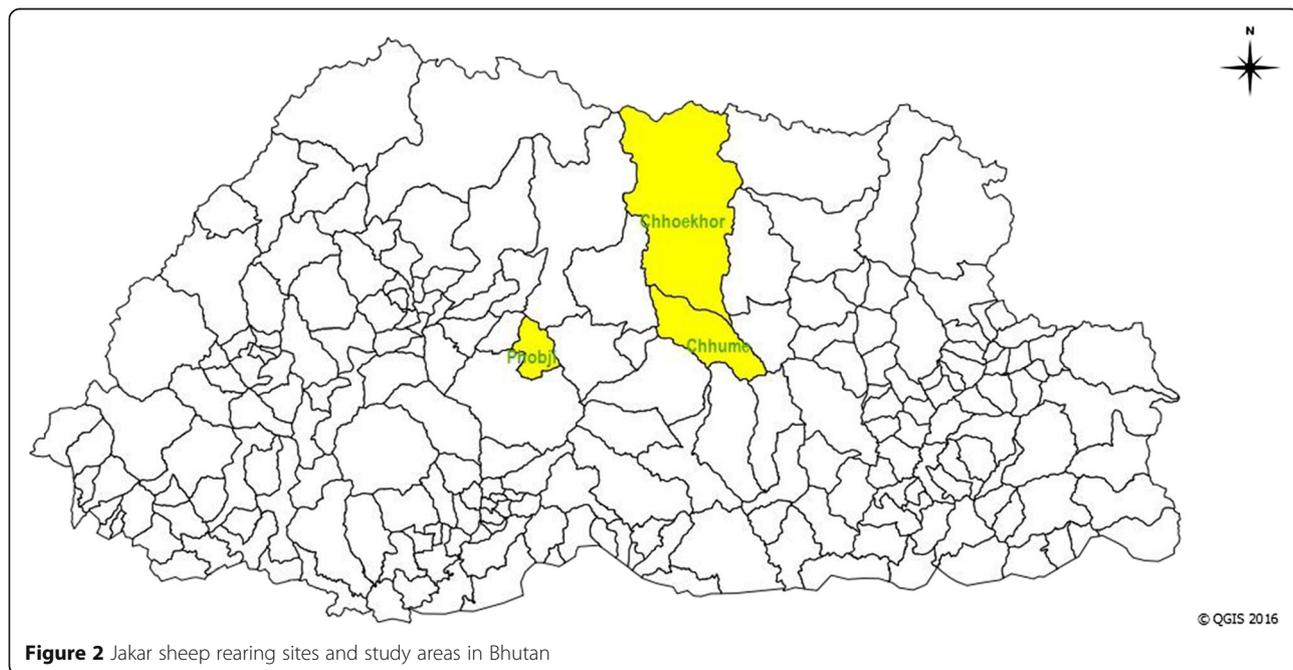
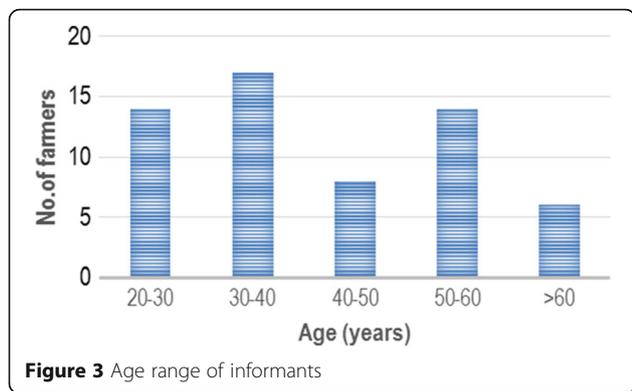


Figure 2 Jakar sheep rearing sites and study areas in Bhutan



generally involved in product processing, there was no association between the gender and type of involvement in sheep farming.

Jakar sheep management

Unlike in the past, Jakar sheep farming is increasingly becoming sedentary (57%) followed by sedentary with summer migration (38%). True migration (year-long) along with the yaks is limited to Dhur, representing about 5% of the respondents. Sheep farmers in Chungphel had abandoned yak farming in the recent past and switched to sedentary sheep management. The sedentary management is characterized by letting out animals to graze on natural pasture during the day and collected to the homestead by evening. About 50% of respondents in Phobji practise a unique two-month long migration in a year specifically in June to July, along with yaks.

Sheep population, composition and trend

Jakar sheep population and its composition in the study areas are presented in Table 1. The estimated total population of Jakar sheep at the sites is 1,737. Dhur had the highest average flock size followed by Phobji. However, Phobji possessed the highest population of Jakar sheep. The proportion of breeding male to female was 1:9. The castrates were thrice the number of adult

breeding male population because the castrates are considered to produce more wool than uncastrated adults.

The majority of the respondents (92%) indicated that the sheep population has declined over the years and specifically the individual flock sizes declined at an average of 54.67% during the last five years.

Income from sheep

Table 2 presents some of the major income sources of the sheep farmers and the relative proportion of monetary benefits. The sale of potatoes and *cordyceps* represented burgeoning income alternatives to sheep farmers. Potatoes contributed over 97% to household income for farmers in Phobji (average annual household income (AAHI) of Nu. 214,000). The lack of income from sheep farming was cited by one fifth of respondents for the purposive reduction of flock size in their herds.

In contrast, in Chungphel, with a lack of alternative income sources, the sale of wool products often targeted for tourists continued to be the most important source of income (Nu. 28,000) for the sheep farmers. The sale of milk and milk products from yak and cattle contributed up to 17.7% (Dhur) and 2.47% (Phobji) of household’s income and livelihoods. Unlike other sources, herders counted cattle and yaks as more reliable source of income due to their consistency.

Major challenges in sheep farming

Depredation of sheep by wildlife was the most common challenge (77%) among the respondents (Figure 4). The predators included bear, leopard, wild dogs and stray dogs. The most incidences of depredation occurred during free ranging on pastures where the animals are often unattended.

Other challenges included lack of or inadequate processing skills (78%) and labour shortages (1:10), and for this reason, only about 38% of respondents processed wool into products while others sold raw wool. Wool processing and making wool product is limited to traditional products and employs traditional processing techniques and devices.

Table 1 Sheep population, composition and sheep holding in study site

| Site | N ^o | Male | | | Female | | Total nos. | Flock size | Decline ^a (%) |
|------------------------|----------------|------|----------|----------|--------|-------|------------|------------|--------------------------|
| | | Lamb | Adult | | Lamb | Adult | | | |
| | | | Breeding | Castrate | | | | | |
| 1. Chungphel (Chhumey) | 9 | 17 | 12 | 14 | 28 | 58 | 129 | 14 | 61.67 |
| 2. Dhur (Chhoekhor) | 3 | 14 | 9 | 51 | 13 | 39 | 126 | 42 | 61.00 |
| 3. Phobji | 55 | 96 | 95 | 261 | 196 | 834 | 1,482 | 27 | 41.34 |
| Total | 67 | 127 | | | | | 1737 | | |

N^o, No. of households

^aDecline during last five years (2010 to 2015)

Table 2 Average annual household income from various sources for sheep farmers

| Site | Income sources | No. HH | AAHI (Nu.) | Proportion ^a (%) |
|---------------------|------------------------------------|--------|------------|-----------------------------|
| Chungphel (Chhumei) | Sale of wool and wool products | 6 | 28,000 | 100.00 |
| Dhur (Chhoechor) | Sale of cheese and butter (yak) | 3 | 48,000 | 17.71 |
| | Sale of <i>cordyceps</i> | 3 | 223,000 | 82.29 |
| | Sale of wool and wool products | | 0 | 0.00 |
| Phobji | Sale of milk products (yak/cattle) | 21 | 12,681 | 2.47 |
| | Sale of wool and wool products | 25 | 1,124 | 0.26 |
| | Sale of potato | 49 | 214,000 | 97.27 |

No. HH, Number of households; AAHI, Average annual household income

^aRelative to AAHI; * 1 USD = Approximately 68 Nu

Wool product processing is labour intensive and employed traditional tools: *Thochu*, *Chanab*, *Bayshay*, *Yoke*, *Kheel*, *Chafang*, *Thakshing*, *Thritha*, *Pangtha* and *Pubrat* in all the three sites (Figure 5). The wool carding and spinning was the most time-consuming (four to six days per kilogramme of raw wool) steps in wool processing. In addition, weaving is also another time-consuming process. For instance, the weaving of a traditional dress (Gho and Kira) besides wool processing required at least five and four days, respectively.

Discussion

The population of Jakar sheep in the country declined from estimated 11,000 in 2003 (Dorji et al. 2003) to less than 2,000 (DoL 2014) over a decade corresponding to about 80% decline. The current rate of decline, if unchecked, is likely to result in breed extinction within next five years. Further, the comparison of the breed distribution reveals a drastic shrinkage in distribution from over 11 sub-districts to three sites in the current study (Chhoechor, Chhumei and Phobji). The current population and ratio of breeding males to females according to FAO risk classification system (FAO 2015) is categorized as breed 'not at risk'. However, the rapid rate of decline in population warrants immediate attention and interventions.

Some of the drivers attributing to the decline in Jakar sheep population are as follows.

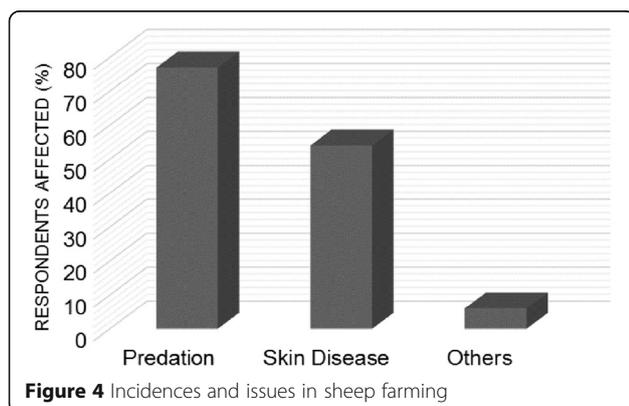


Figure 4 Incidences and issues in sheep farming

Diminishing utility of Jakar sheep

The objective of sheep farming to produce wool and household clothing to protect against harsh winters has become obsolete in the light of the rapid socio-economic development of the country. Ready-made garments (Figure 6) are available for sale in the areas and increasingly preferred for their cheaper costs. The costs of traditional wool products are exorbitantly higher due to labour (minimum daily wage rate of Nu. 211) and more number of days required. Further, the lesser common use of Jakar sheep in ritualistic offering is no longer practised by the communities and substituted with offering of eggs or potatoes. The Jakar sheep do not have meat utility as sheep slaughter is considered a religious taboo among the communities. Thus, Jakar sheep is surviving with a diminishing utility of wool and herders favouring the reduction in flock sizes.

Relatively low or no income from sheep farming

The road accessibility in many areas has led to adoption and expansion of potato cultivation with a lag period of only a few years (Roder 2004). Potatoes are one of the important cash crops for areas above 2,500 masl. Wangduephodrang district with mostly Phobji is the highest potato production area in the country (DoA 2014), and accounted up to 28% of potato export volume (Roder et al. 2007).

The sale of *cordyceps* accounted for about 82% of AAHI (Nu. 223,000) in Dhur. The annual income from *cordyceps* (Nu. 23,000) for yak herders (Wangchuk and Wangdi 2015) is lower than the current study. The price of *cordyceps* has steadily increased by over ten folds from 2004 (legalization of *cordyceps* collection) to 2014 (DAMC 2014), thereby attracting more herder collectors each year. The alternative income sources provide livelihood improvement and economic resilience but when disproportionately high incomes such as from *cordyceps*, this can negatively impact other pastoral species such as yak farming in Bhutan (Wangchuk and Wangdi 2015). This also suggests that *cordyceps* as an alternate income source also have negative



impact similar effect on sheep farming in Phobji and Dhur sites.

Dying skill of wool processing and products making

This study found that little more than third of the respondents are involved in wool processing and product making. The cessation of the activity was attributed to highly inter-related factors such as farm labour shortage and lack of skills which was further discouraged by a low monetary benefit. Cessation was also in part due to tedious steps involved in wool processing and making products. Except for the Chummey farmers, other sites continued to make traditional products for sale in the locality.



Figure 6 Jakar sheep farmers clad in imported and readymade shawls

Loss of animals to wildlife depredation

Sheep are the most susceptible livestock species to depredation (Li et al. 2015). Depredation of livestock is common in Bhutan (Sangay and Karl Vernes 2008) and a major constraint in yak farming among the pastoralists (Wangchuk and Wangdi 2015). While the direct contribution of depredation to the decline in Jakar sheep population is minimal, it indirectly encouraged farmers to reduce the flock sizes for optimum sizes.

Conclusions

There is only a near critical population of Jakar sheep in the country, and declining at rapid rate. Sheep farming has lost its importance due to no further need to produce clothing from the herd; minimal or no income; and other challenges dissuading sheep farming. Depredation by wildlife, skin diseases, feed shortages and labour shortages continue to impede sheep farming and has led to reduction in flock size or farmers giving up sheep farming.

Recommendations

In view of the rapidly declining Jakar sheep population in the country, the promotion of conservation and sustainable utilization of the breed warrants immediate intervention through the following recommendations:

- *In situ* conservation and utilization by addressing the issues and challenges and making sheep farming a viable economic enterprise for sheep farmers

- Income generation through development of niche wool products, product diversification and marketing in addition to capacity building of farmers
- Encouraging the use of labour-saving devices in wool processing and product development to moderate the hard labour requirement and also to address farm labour shortages
- Initiation of *ex situ* conservation of the breed in form of semen and nucleus farms to complement field interventions

Abbreviations

AAHI: Average annual household income; DAMC: Department of Agricultural Marketing and Cooperatives; DoA: Department of Agriculture; DoL: Department of Livestock; FAO: Food and Agriculture Organization; masl: Meters above sea-level; Nu.: Ngultrum

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Availability of data and materials

The dataset supporting the conclusions of this article will be available in the offline data repository of National Biodiversity Centre repository and may be available on request at info@nbc.gov.bt. Other statistical data are all available online at hyperlinks provided in the reference section.

Authors' contributions

JD was involved in the conception and design of the study, data analysis and interpretation, drafting and revising the manuscript. ST contributed to the study conception, data collection and drafting of manuscript. TYD contributed to the study conception and design, analyses and interpretation of data and revision of the manuscript. All authors read and approved the final manuscript.

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Competing interests

The authors declare that they have no competing interests.

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