

Changes in Property Rights and Management of High-Elevation Rangelands in Bhutan: Implications for Sustainable Development of Herder Communities

Authors: Tenzing, Karma, Millar,, Joanne, and Black, Rosemary

Source: Mountain Research and Development, 37(3) : 353-366

Published By: International Mountain Society

URL: <https://doi.org/10.1659/MRD-JOURNAL-D-17-00016.1>

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Changes in Property Rights and Management of High-Elevation Rangelands in Bhutan: Implications for Sustainable Development of Herder Communities

Karma Tenzing*, Joanne Millar, and Rosemary Black

* Corresponding author: ktenzing@csu.edu.au

Institute of Land, Water and Society, Charles Sturt University, Elizabeth Mitchell Drive, Thurgoona, New South Wales 2640, Australia

© 2017 Tenzing et al. This open access article is licensed under a Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>). Please credit the authors and the full source.



Property rights and management regimes for high-elevation rangelands in Bhutan have evolved over centuries in response to environmental, cultural, and political imperatives. The 2007 Land Act of Bhutan aims to redress

historical inequities in property rights by redistributing grazing leases to local livestock owners in a process known as rangeland nationalization. This study explored 3 related issues: property rights and management regimes in 3 distinct high-elevation rangeland systems, herders' and government officials' perceptions of the proposed rangeland nationalization process, and the implications of rangeland nationalization for herder livelihoods and sustainable development. Qualitative research methods were adopted to capture the lived experiences of 151 livestock farmers, seminomadic herders, and government officials, including 40 individual interviews and 9 focus group

discussions. The research revealed that herding in these high-elevation rangelands is governed by a complex combination of private, communal, and mixed property use rights regimes. Management regimes varied according to traditional rules, but development was limited because of lack of management rights. The rangeland nationalization process is expected to promote sustainable management of high-elevation rangelands by incentivizing provisioning and maintenance activities. However, the lack of clear implementation guidelines and a coherent replacement for traditional practices have created confusion and anxiety in herder communities. Providing tenure security and management rights in an equitable manner will be vital for fostering sustainable development for herder communities living in the high-elevation rangelands of Bhutan.

Keywords: High-elevation rangelands; property rights; management regime; seminomadic herders; rangeland nationalization; tenure security; Bhutan.

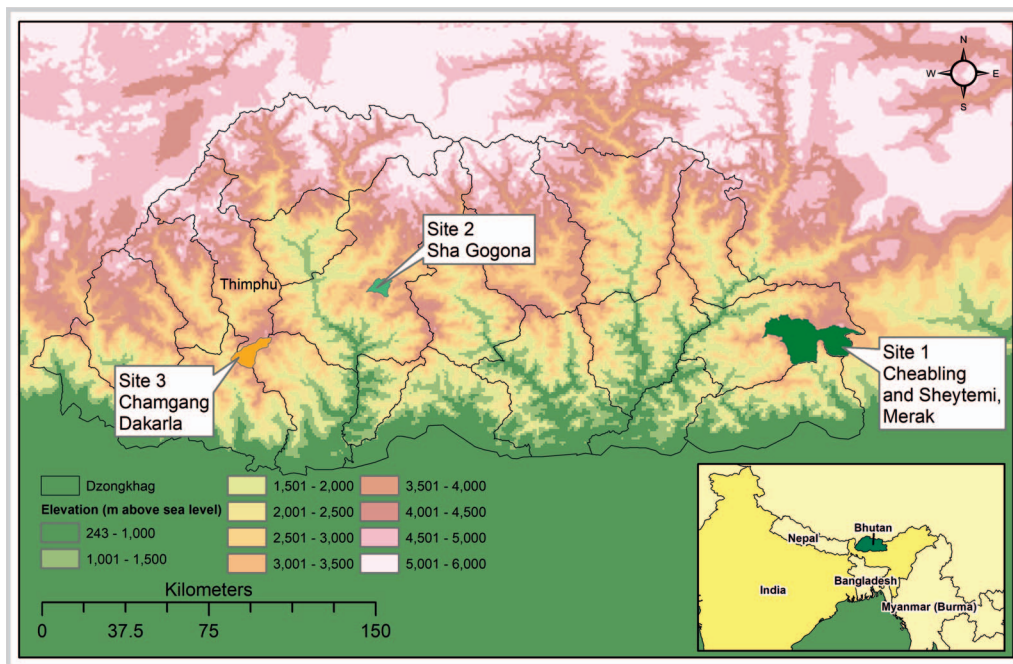
Peer-reviewed: June 2017 **Accepted:** July 2017

Introduction

The high-elevation rangelands of the Himalayas and Tibet–Qinghai Plateau are rich in biological, cultural, and religious diversity and people living there have adapted their lifestyles to a harsh and challenging environment (Miller 2005; Harris 2010). Traditionally, rangeland management has been embedded in social and cultural institutions based on norms and access strategies (Singh and Sureja 2006). Property rights play a crucial role in maintaining these institutions, with variations in who benefits most (Kreutzmann 2012; Ojanen et al 2014). The rangeland property rights landscape is also complex because herders and their livestock migrate between summer and winter pastures to optimize use of available fodder (Næss 2003, 2013; Dong et al 2009; Li 2012; Cao et al 2013).

Property rights determine who can or cannot access and use resources. Rights can be thought of as existing in a bundle. The bundle theory considers property as a disparate “bundle” of entitlements or “sticks” that are determined by the specific entitlements granted by law to property owners. Changes to laws can alter property entitlements by adding or removing particular sticks from the bundle (Breakey 2013). In the context of natural resource governance, the bundle of rights comprises access, withdrawal, management, exclusion, and alienability rights (Schlager and Ostrom 1992), which Ostrom (2000b: 332) suggested can be “viewed as a cumulative scale moving from the minimal right of access through possessing full ownership rights.” Clear, equitable, and secure property rights reduce uncertainties about benefits and future returns (Sjaastad and Bromley 2000; Omura 2008; Laurent-Lucchetti and Santugini 2012) and are vital for encouraging investment in natural

FIGURE 1 Map of Bhutan with case study site locations.



resource management and governance (Bromley 1991; Blomquist 2009). However, high-elevation rangelands across the world have been subject to elite capture, collectivization, privatization, and nationalization under land tenure reforms, with varied impacts on local users (Fernández-Giménez et al 2006; Kerven et al 2012; Cao et al 2013; Crewett 2015).

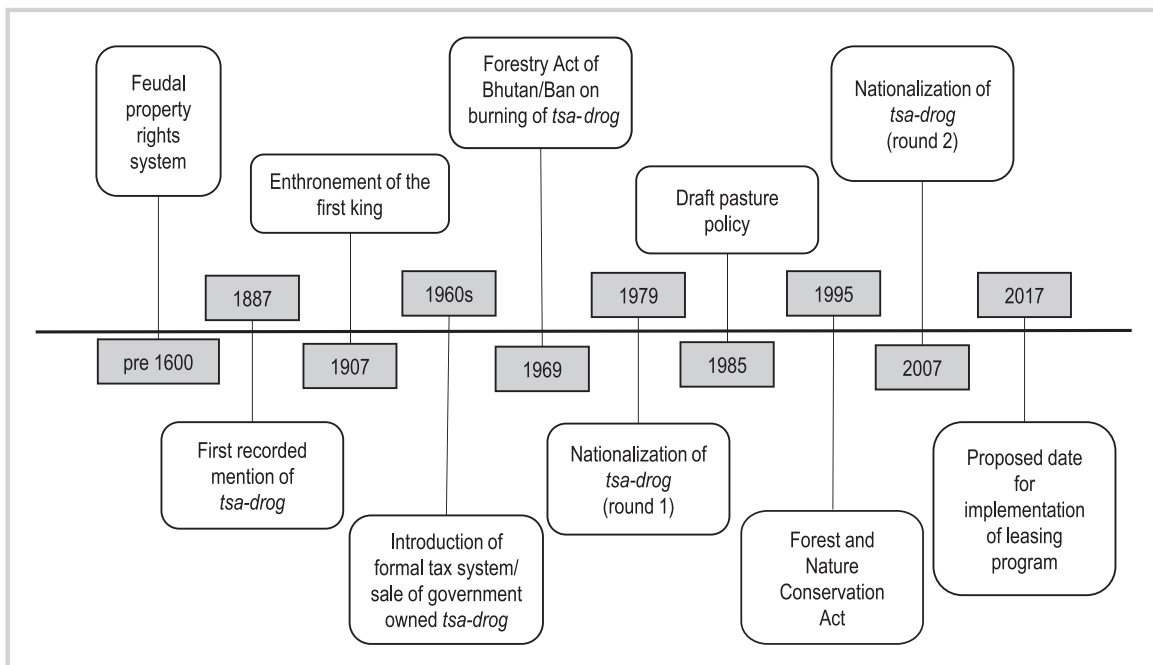
In Bhutan, rangelands—known as *tsa-drog* (or *tsamdrog*) in Dzongkha, the national language of Bhutan—include all subtropical, temperate, subalpine, and alpine pastures, constituting 4% of the total land mass (Gyamtsho 2002; NSB 2014). This study focused on *tsa-drog* located between 2500 and 5500 m above sea level (Figure 1). These high-elevation *tsa-drog* support over 38,000 yaks belonging to 993 households in 11 districts (DOL 2015). They are scattered and isolated, without road connectivity, and herders have limited access to health care, education, and extension services (Derville and Bonnemaire 2010).

Property use rights and management regimes for high-elevation rangelands in Bhutan have evolved over centuries in response to environmental, cultural, and political imperatives (Wangchuk 2000). A number of historical events have influenced the evolution of *tsa-drog* property rights in Bhutan, as shown in Figure 2. Five major events occurred in the 1960s and 1970s that changed the traditionally informal system of *tsa-drog* property rights and management regimes. First, the introduction of a formal tax system and the government's decision in the 1960s to sell *tsa-drog* confiscated from the descendants of feudal lords further entrenched elite

capture and absentee landlordism, as only the wealthy could afford to buy the rights. Second, the enactment of the 1969 Forest Act and imposition of a ban on burning of *tsa-drog* undermined traditional *tsa-drog* management practices such as periodic burning, leading to the growth of woody species such as dwarf rhododendron (eg *Rhododendron anthopogon* and *R. setosum*) and *Juniperus* species (eg *Juniperus wallichiana*) and loss of native pasture plants (Chophyel 2009). Third, following the enactment of the 1979 Land Act, the government took over *tsa-drog* ownership from *tsa-drog* titleholders. Henceforth, only use (ie grazing) rights were granted to titleholders. Fourth, the passing of the 1995 Forest and Nature Conservation Act resulted in further restrictions on clearing and cutting of shrubs and bushes growing on *tsa-drog*. Moreover, herders and livestock farmers were no longer allowed to develop the land (eg improve pasture). In other words, management rights were not included. The most recent government act with a significant impact on *tsa-drog* property and management rights is the 2007 Land Act, which nullified all *tsa-drog* use rights granted under the 1979 Land Act.

The laws mentioned above have eroded and undermined traditional *tsa-drog* property and management regimes. Two plausible arguments offered in support of the Bhutan government's decision to nationalize *tsa-drog* use rights are that (1) the previous arrangement was inequitable, favoring wealthy families, monasteries, and absentee landlords, some of whom do not have livestock, and (2) unsustainable herding practices

FIGURE 2 Historical timeline of *tsha-drog* property rights in Bhutan.



such as overgrazing and overstocking have caused *tsha-drog* degradation (Gyeltshe et al. 2010).

The 2007 Land Act of Bhutan aims to redress historical inequities in property use rights by buying back use rights from existing *tsha-drog* title holders, including absentee landlords and monasteries, and redistributing them to livestock owners only, in a process known as rangeland nationalization. The aim is to give preference to herders and livestock farmers whose livelihoods depend directly on yak rearing and *tsha-drog* management. Under this arrangement, the nationalized *tsha-drog* will be leased back to herders and livestock farmers along with rights to develop and maintain them, activities that were not permitted under the old arrangement. Enhancing tenure security and access to *tsha-drog* is an integral part of the strategy to make yak herding more attractive and to encourage its practice. Giving herders and livestock farmers more secure, lease-based rights to *tsha-drog*, with eligibility based on developing a mandatory management plan, is expected to promote sustainable management and improve herders' livelihoods and wellbeing (Gyeltshe et al 2010; Namgay et al 2017). At the time of writing, the Bhutan government had not fully implemented the program but had started paying compensation to those who will lose their use rights.

This paper describes research on *tsha-drog* property rights and management systems from the perspective of *tsha-drog* users in Bhutan. The study's aim was to understand (1) property rights and management regimes in 3 high-elevation *tsha-drog* systems; (2) perceptions of herders, livestock farmers, and government officials on

the proposed *tsha-drog* nationalization process; and (3) implications of *tsha-drog* nationalization for herder livelihoods and sustainable development. Our research makes an important contribution to sustainable development in Bhutan and in similar yak-rearing areas in the region, as it demonstrates how laws and regulations can inform and constrain *tsha-drog* management. In particular, this research demonstrates that issues related to property rights, such as granting of use rights without management rights, and inequities in distribution must be resolved before mountain rangeland can be managed sustainably. For example, a restrictive government policy environment can undermine customary and traditional *tsha-drog* management regimes with adverse environmental and socioeconomic consequences for herders and livestock farmers. The research also identifies potential risks and challenges that should be addressed to ensure successful implementation of a high-elevation rangeland nationalization program.

Methods

Three sites with different livestock systems, all above 2500 m elevation, were selected to compare *tsha-drog* property rights and management systems. Case study sites 1 and 3 predominantly use traditional systems, whereas in case study site 2, individual *tsha-drog* plots are demarcated using modern cadastral survey methods and leased to herders and livestock farmers for improved pasture development. Yak-herding practices are similar across the 3 sites.

TABLE 1 Sample sizes for interviews and focus group discussions.^{a)}

Case study site	Total number of households	Interviews		Focus group discussions	
		Participating households	% of total	Participating households	% of total
Site 1: Cheabbling	80	9	11	29	36
Site 1: Sheytemi	12	5	42	11	92
Site 2: Sha Gogona	30	6	20	25	83
Site 3: Dakarla	20	5	25	6	30
Total/average	142	25	18	71	50

^{a)} Interviewees and focus group discussion participants from downstream communities and government agencies were excluded from the sampling size ratio calculation to prevent distortion of final results, as the total number of households from downstream communities and total number of government staff substantially outnumbered the total households in Cheabbling, Sheytemi, Sha Gogona, and Chamgang.

Case study site 1 comprised the upstream herding communities of Cheabbling (27°20'31.87"N; 91°45'44.67"E) and Sheytemi (27°19'24.07"N; 91°44'23.38"E) in Merak *gewog* in Tashigang district in eastern Bhutan. (A *gewog* is the lowest administrative unit of governance and may comprise several villages and hamlets.) The winter *tsa-drog* of Cheabbling and Sheytemi are grazed by yaks, yak-cow crosses (*dzo dzom*), and cattle belonging to 80 and 12 households, respectively. This site is located within a protected area with significant natural resource management problems and conflicts between upstream and downstream communities. The downstream communities practice mixed farming including livestock raising and cropping.

The downstream communities were included in case study site 1 mainly because there is frequent interaction with upstream communities, as they share geographical boundaries. Hence, conflicts between upstream and downstream communities over *tsa-drog* property rights are not uncommon. The involvement of downstream communities in the final analysis is restricted to the extent to which the perceptions of interviewees and focus group discussion participants from downstream communities help throw more light and facilitate better understanding of conflicts over *tsa-drog* property rights.

Only 2 interviewees each from each downstream community (Radhi, Phongmey, and Chaling) participated in the semistructured interviews. The number of participants from downstream communities in the focus group discussions was also small compared to the total number of households, which ranges between 700 and 800 households per downstream community. Hence, in order to minimize outliers and distortion, downstream communities were excluded from the calculation of percentages of the sampling size ratio (Table 1).

Case study site 2 is Sha Gogona (27°26'6.04"N; 90°5'47.38"E) community in Gangtey *gewog* (Wangdiphodrang district) in west-central Bhutan, where 3 households depend on yak herding and the remaining 30 households are sedentary livestock farmers and lay

monks who raise improved crossbred cattle. In 2004, the Bhutan government introduced a pilot program under which government land is leased out (2.5 ha per household) to promote improved pasture development and support a community-based milk processing unit. Before the introduction of the leasing program, the local temple owned use rights to summer and winter *tsa-drog* and herders and livestock farmers had to pay rent in the form of butter and cheese to the local temple.

Case study site 3 is Chamgang (27°25'1.03"N; 89°42'13.70"E), the main winter settlement for the herders of Dakarla in Dakarla *gewog* (Thimphu district) in western Bhutan. This case study site has a more extensive *tsa-drog* system and fewer yak herders. Although Dakarla *gewog* is close to the capital city of Thimphu, yak-herding areas are remote and difficult to access. In the early 1990s and in 2013, the Bhutan government allotted government land at Chamgang to the herders of Dakarla to enable them to build permanent houses close to civic amenities and send their children to school in the area.

Government officials from the Council of Renewable Natural Resources, the Department of Livestock, and the Department of Forestry and Park Services under the Ministry of Agriculture and Forests (MOAF) participated in the interviews and focus group discussions. Moreover, officials from regional offices such as the Park Office and local governments including livestock extension staffs participated in the interviews only. Official representatives from the headquarters of the above-mentioned line departments under the MOAF participated in a focus group discussion. The rationale for including government officials in the interviews and focus group discussions was to get their perceptions of *tsa-drog* property rights and management regimes and compare them with those of herders and livestock farmers. Hence, the "government officials" group may be treated as a fourth case study site. Government officials who participated in the interviews and focus group discussions were also excluded from the analysis (Table 1), for the

TABLE 2 Study participants by gender.

Case study site	Semistructured interviews		Focus group discussions		Total by site	% by site
	Male	Female	Male	Female		
Site 1: Cheabbling	6	3	14	15	38	25.16
Site 1: Sheytemi	4	1	8	3	16	10.59
Site 1: Downstream communities	6	0	25	5	36	23.84
Site 2: Sha Gogona	5	1	5	20	31	20.52
Site 3: Dakarla	2	3	3	3	11	7.28
Government agencies	9	0	8	2	19	12.58
Total by gender	32	8	63	48	151	100.00
% by gender	80	20	57	43	100	

same reason that downstream communities were excluded from the calculation of sampling size ratio.

Qualitative research methods were used to understand people's perceptions of how they manage and allocate property rights to high-elevation *tsa-drog*, with 40 semistructured interviews and 9 focus group discussions involving 151 participants comprising herders, livestock farmers, and national, regional, and district government officials (Table 1). The herder household was the unit of interview. The sampling sizes for the interviews and focus groups are given in Table 1, and the gender distribution is shown in Table 2.

Specifically, focus group discussions provided an interactive platform to inform people, collect feedback, and foster consensus among a wider audience on salient points collated from interviews. All interviews and focus group discussions were conducted in local languages, recorded on a digital recorder, and then translated into English and transcribed.

During analysis, the transcripts were coded using the computer-assisted program NVivo (versions 9 and 10) (Bouma 2000). Similar codes were grouped to form categories, which are higher-level codes in terms of complexity and abstraction (Lempert 2007). The analysis involved several iterations to ensure congruence between codes, categories, and key themes aligned with the interview guide questions. The second stage of analysis comprised cross-case analysis of key themes and categories from the different case study sites to identify similarities and differences. The third stage involved theoretical reflections to compare the results with international literature on property rights and rangelands.

Results

Types of *tsa-drog* property rights regimes

Most herders in all 3 sites accessed multiple *tsa-drog* in different locations under different property rights

regimes—mostly private or communal regimes, with one mixed regime. Private use rights were held by herders, absentee landlords, and religious institutions such as local temples and monasteries. Communal *tsa-drog* were managed at the village, group, or subgroup level depending on who was eligible for grazing. (Here “group” means a coming together of 2 or more households from the same village or community for equitable sharing and utilization of communal *tsa-drog*.)

Some herders rented *tsa-drog* on a long- or short-term basis, either individually or as part of a group, in times of fodder shortage. A few herders grazed a single *tsa-drog* throughout the year. Some herders did not have yaks or access to *tsa-drog* and made their living by selling their labor. Table 3 summarizes property rights regimes in the study sites. Across all 3 sites, herders had developed traditional management norms and rules, such as strict *tsa-drog* entry and exit times and penalties for violating use agreements; in 2 of the 3 sites, herders had appointed community stewards to enforce these rules. Management systems adopted by herders and livestock farmers are summarized in *Supplemental material*, Table S1; (<http://dx.doi.org/10.1659/MRD-JOURNAL-D-17-00016.S1>). The following section describes the qualitative results for each case study site.

Case study site 1 (Cheabbling and Sheytemi): The communal winter *tsa-drog* of Cheabbling is divided into 5 parcels and used by 80 herder households with a list of eligible herders (Figure 3). There is no restriction on the number of livestock. A 59-year-old male herder from Cheabbling explained:

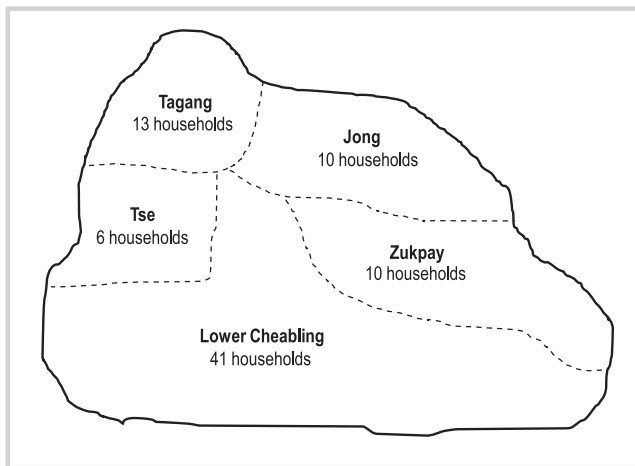
There is only 1 thram [title] for the communal tsa-drog. Each subgroup has its designated tsa-drog area with boundary demarcation. There is a lead household—for example, I head a group of 5 households.

(semistructured interview, Cheabbling, interviewee 01)

TABLE 3 Property rights regimes in the study sites.

Case study site	Communal use rights	Private use rights			Mixed regime	Remarks
		Herders	Absentee landlords	Institutions		
Site 1: Cheabling (community)						
Winter <i>tsa-drog</i> in Cheabling	X					Internally divided into 5 plots, but animals can move freely without restriction.
Winter <i>tsa-drog</i> in other <i>gewog</i> and districts	X	X	X			Herders with larger herds leave for other winter <i>tsa-drog</i> in adjoining <i>gewog</i> and districts after fodder resources in communal <i>tsa-drog</i> are depleted. They may have private use rights to a <i>tsa-drog</i> or may rent it from other herders, downstream communities, or absentee landlords.
Summer <i>tsa-drog</i>	X	X	X			Herders may use a communal or private <i>tsa-drog</i> or rent one from other herders or absentee landlords.
Site 1: Sheytemi (community)						
Winter <i>tsa-drog</i> in Sheytemi		X	X			Four herders have private-use rights to <i>tsa-drog</i> ; 10 herders rent <i>tsa-drog</i> from an absentee landlord.
Winter <i>tsa-drog</i> in other <i>gewog</i> and districts	X	X	X			Same as in Cheabling.
Summer <i>tsa-drog</i>	X	X	X			Same as in Cheabling.
Site 2: Sha Gogona (community)						
Winter <i>tsa-drog</i> in Sha Gogona				X		Herders and sedentary livestock farmers rent <i>tsa-drog</i> from the local temple.
Summer <i>tsa-drog</i>		X		X		One herder has private use rights to a summer <i>tsa-drog</i> ; 2 rent summer <i>tsa-drog</i> from the local temple.
Pilot leasing program					X	In 2004, the government pooled and redistributed individual plots of government land for improved pasture development at 2.5 ha/ household to 3 herders and 27 sedentary livestock farmers.
Site 3: Chamgang (community)						
Winter <i>tsa-drog</i> in Chamgang		X	X			Herders have private use rights and/or rent from other herders and absentee landlords.
Winter <i>tsa-drog</i> in other <i>gewog</i> and districts	X	X	X	X		Same as in Cheabling.
Summer <i>tsa-drog</i>	X	X	X	X		A subgroup of 20 herders from Dakarla rent summer <i>tsa-drog</i> from the central monastic body (<i>dratsang lhentshog</i> , which is the apex body of state-owned and state-funded monasteries and temples); it can support grazing for a month. After that, herders leave for other summer <i>tsa-drog</i> , whose use rights may be communal or private or rented from another herder or absentee landlord.

FIGURE 3 Communal winter tsa-drog property rights in Cheabling.



The internal plots are not fenced, and animals can move freely between them. Cheabling is unusual in that the same subgroupings are maintained for both winter and summer tsa-drog.

Herders said that agreeing in advance on entry and exit timing and having a penalty system are vital for minimizing disputes and conflicts. As another male herder from Cheabling described it:

On the 15th day of the fifth Bhutanese month [May/June], animals leave for summer tsa-drog near Merak and return on the 10th day of the eighth Bhutanese month [September/October]. Some members bring their animals before the agreed date. To penalize such offenders, we have come up with a system. Breaking the entry/exit timing carries a fine of 50 ngultrum [about US \$1] per animal. A repeat offense usually carries a fine of twice the amount.

(semistructured interview, Cheabling, interviewee 01)

An exception to this rule is made under special circumstances, as described by a 46-year-old female herder:

Since there is not enough fodder in the summer tsa-drog area, some households, after consultation with the community, are allowed to bring their animals earlier than others.

(semistructured interview, Cheabling, interviewee 03)

Such herders are required to keep their animals inside their own designated tsa-drog area (Figure 3) until the rest of the community members arrive.

Community stewards, locally known as *tshogpa* (group representatives), monitor and guard winter tsa-drog against encroachment and violation of local rules. In the words of a 46-year-old female herder:

We appoint community stewards to guard the communal tsa-drog from encroachment by animals from other communities. ... Each household contributes labor for guarding the main entrance and exit points on a rotational basis. Those who cannot contribute labor

contribute cash of 100 to 200 ngultrum [about US\$ 2 to 4] per household.

(semistructured interview, Cheabling, interviewee 03)

The same herder offered another interesting revelation:

We do not commence guarding the main exit entry points immediately after we leave for summer tsa-drog. Guarding begins about a month before the animals return to this wintering area.

(semistructured interview, Cheabling, interviewee 03)

In contrast, the winter tsa-drog of Sheytemi, located on an adjoining range, is held under private use rights (Figure 4); two thirds of it belongs to an absentee landlord, and the remainder is shared between 4 herders (2 each from Merak and the downstream village of Chaling). A portion of the tsa-drog belonging to the absentee landlord is rented by a group of 10 herders from Merak and managed under an informal arrangement developed by herders and livestock farmers to facilitate smooth management of a rented tsa-drog. The absentee landlord collects annual rent in the form of butter and cheese. The winter tsa-drog of Sheytemi has deteriorated over the years, according to a 64-year-old female herder:

The grass used to grow this tall [hands showing about 3 feet high] and wavy like the golden paddy. We could even tie our animals by the tall grass. ... Now there is nothing left for the animals to eat. Now instead of tall grass, there is only dust.

(semistructured interview, Sheytemi, interviewee 01)

Increase in livestock population is resulting in greater competition for tsa-drog resources, as recounted by a 50-year-old herder:

In terms of production and productivity, it has gone down. Before, the fodder resources from the tsa-drog used to last at least for 2 months. But these days, it does not last even for a month. ... There are more animals; the number has gone up. It is mainly because of this.

(semistructured interview, Sheytemi, interviewee 04)

As in Cheabling, there are no restrictions on the number of animals or where they can graze. Unlike the herders of Cheabling, whose entry and exit timing is based on a *kasho* (decree) issued by the subdistrict administration in the 1980s, herders of Sheytemi consult among themselves to decide the timing, as described by a 50-year-old herder:

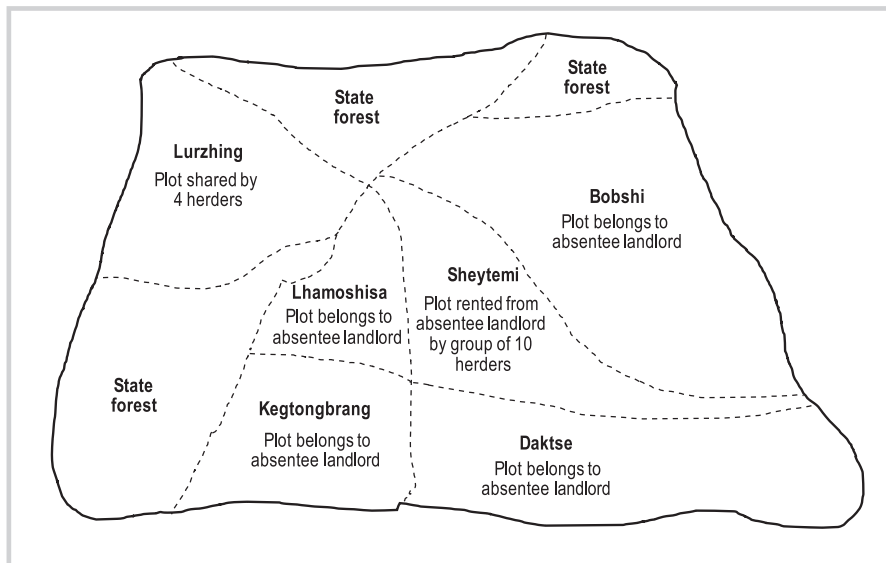
The mang [community] comes together to discuss and agree on a date of going up and then once the grass here is fully grown, the mang reconvenes to discuss, agree, and finalize the date of return.

(semistructured interview, Sheytemi, interviewee 04)

Herders who have private use right tsa-drog can come and go as they wish depending on the seasonal availability of fodder.

Herders in Cheabling and Sheytemi lop fodder trees in the state forest, especially near the winter tsa-drog, to offset

FIGURE 4 Private winter tsa-drog property rights in Sheytemi.



the winter fodder shortage. Asked why he and others lopped fodder trees, a 52-year-old herder who was herding cattle inside the forest near Cheabling replied:

The lopping lasts from September till April. There is no alternative as there is not sufficient fodder for animals. It is risky to our lives, and yet we have to take the risk of climbing the trees for lopping. If we do not lop fodder trees, our animals will die of starvation and ultimately we too will die from hunger and starvation. We don't have much choice; we are helpless.

(informal conversation with a seminomadic yak herder)

Widespread lopping of fodder trees over many years has caused forest degradation in the area culminating in landslides and flash floods during the monsoon, a trend that herders acknowledge. A 45-year-old herder from Merak said:

In the past, the lopped fodder trees were allowed to rest and regenerate for 3 years. But now, due to a shortage of fodder resources, the 3-year rest and regeneration period is not followed and people lop fodder trees even when there is little regrowth of fodder leaves. In this way, fodder trees begin to degenerate and become scarcer and scarcer every year. That's why there are landslides and landslips.

(semistructured interview, Cheabling, interviewee 05)

Case study site 2 (Sha Gogona): The tsa-drog at Sha Gogona is used in the winter for yaks and year-round for improved cattle breeds belonging to sedentary livestock farmers and lay monks. Herders and sedentary livestock farmers rent tsa-drog from the temple and manage it under an informal communal arrangement similar to that followed by the herders in Sheytemi. Three seminomadic yak herders in Sha Gogona follow a seasonal migration, and 27 resident

households raise improved Swiss Brown and Jersey crossbreeds on improved pastures on land leased from the government. The farmer's group has a written constitution and bylaws. The pilot leasing program has reduced lopping of fodder trees from the state forest, according to a 41-year-old male livestock farmer from Sha Gogona:

In the past we had to lop and fetch fodder from the forest and we did not have land to grow improved pasture. Traditional winter fodder crops like radish and turnip were always in short supply. Now that we can grow improved pasture on the lease land, there is fodder for livestock.

(semistructured interview, Sha Gogona, interviewee 01)

The leasing program has also empowered poor and marginalized people in the Sha Gogona community, as observed by a 64-year-old male yak herder:

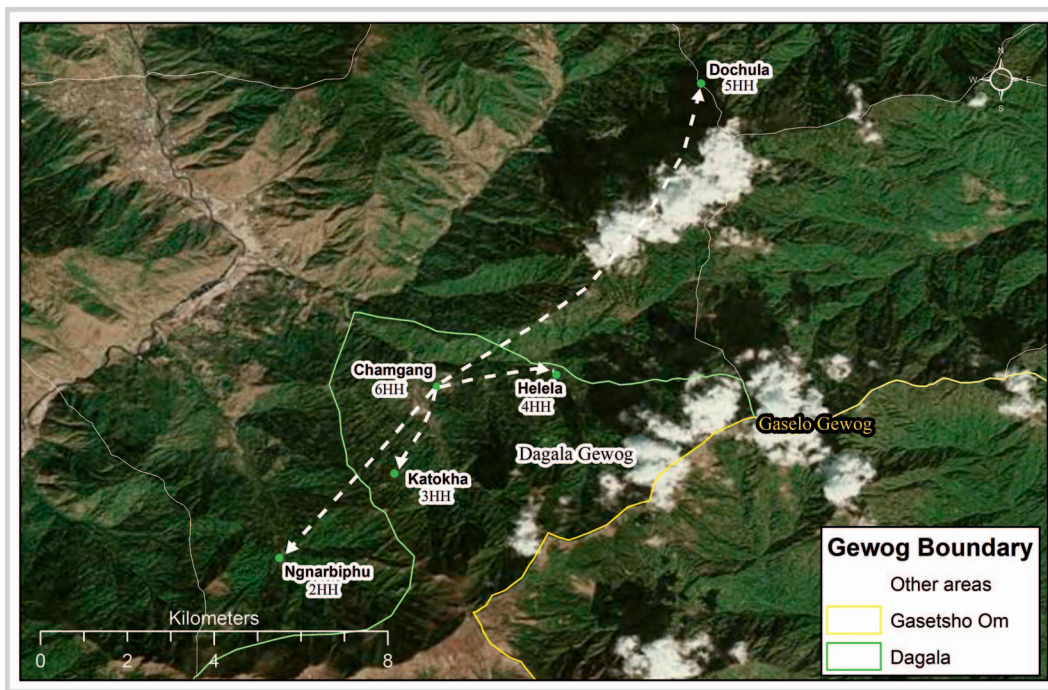
After the lease land was given to individuals, those who are better off were no longer able to say much to the weaker ones. Now everybody has their own areas, and that way it was beneficial.

(semistructured interview, Sha Gogona, interviewee 06)

In Sha Gogona, individual plots were demarcated using modern cadastral survey methods and leased to individual livestock farmers, who were encouraged to improve the pastures. Livestock farmers use rotational grazing and/or cut and carry fodder to stall feed their animals; they make silage for use during the winter fodder shortage. Members supply milk to the community milk-processing center for collective marketing.

The pilot leasing program in Sha Gogona has pioneered a mixed property rights regime by incorporating characteristics of both private and

FIGURE 5 Aerial photograph of winter *tsa-drog* in the Chamgang area.



communal property rights regimes and taking advantage of the resulting synergies.

Case study site 3 (Dakarla): Twenty herders from Dakarla use 5 different winter *tsa-drog* in and around the Chamgang area (Figure 5). The winter *tsa-drog* of Chamgang is held under private user rights. Herders rent both winter and summer *tsa-drog* from the central monastic body (*dratsang lhentshog*, the apex body of state-funded monastic schools and institutions in Bhutan) and manage them under individual or communal (*mang-ri*) arrangements. Like their counterparts in Cheabling and Sheytemi, they agree on entry and exit times and appoint *risuup* (range guards) on a rotational basis to guard communal summer *tsa-drog* from encroachment. They monitor and enforce local rules and collect fines in the form of butter and cheese. The summer *tsa-drog* is divided into parcels, and herders must set up their camps in their assigned plots. However, animals are permitted to run together. Herders who do not have *tsa-drog* use rights graze their livestock on *tsa-drog* land that has been grazed and vacated by its primary users. One problem facing herders of Dakarla is extensive depredation of *tsa-drog* by wild pigs, according to a 21-year-old female herder:

There will be about 200 pigs in a single group; they uproot and destroy our tsa-drog. Once the tsa-drog soil is opened, the grass eventually dies.

(semistructured interview, Dakarla, interviewee 05)

Perceptions of the rangeland nationalization process and its potential impacts

Although most herders and livestock farmers were unsure about the future *tsa-drog* arrangements under the nationalization and leasing program, a few seemed to have understood the purpose behind it. For instance, a 45-year-old herder from Merak explained:

One of the main aims of the nationalization policy is ... only those who are directly dependent on high-elevation rangeland and yak rearing will be given rights to tsa-drog. I think this policy is really good.

(semistructured interview, Cheabling, interviewee 05)

There seems to be a consensus among government officials that *tsa-drog* nationalization will particularly benefit herders and livestock farmers. A local government official said:

As I understand, the first and foremost reason is to ensure more equitable tsa-drog redistribution.

(government department, livestock, interviewee 01)

A government research officer maintained:

Basically, ownership will be revoked from these people [absentee landlords] and will be given to the highlanders irrespective of whether they have livestock or not. ... Highland pastures are only for the highlanders.

(government department, research, interviewee 01)

The government's decision to nationalize *tsa-drog* has, however, generated mixed reactions among herders. For example, a forestry official who was part of a team responsible for evaluating the impact of the policy on herders said:

There are 2 opposite reactions . . . those who do not have tsa-drog but who have animals are very happy with this policy shift. However, those who have tsa-drog do not appreciate the policy. Those people living in the high-elevation areas, who depend on livestock rearing for their livelihood, appreciate and are happy with this policy.

(government department, forestry, interviewee 02)

On the one hand, some herders think that nationalization means automatic annulment of their *tsa-drog* rights and hence ceasing yak herding, which is their main source of livelihood and their way of life. They have the mistaken impression that *tsa-drog*, once taken by the government, will not be given back to them. Hence, they are worried that they will not be able to raise yaks and that this will have a negative impact on their livelihoods. For example, some herders said the nationalization process will dismantle the traditional practices and knowledge systems perfected over centuries. A 54-year-old herder from Dakarla said:

The nationalization process will erode traditional knowledge and experience, which are proven and tested for their usefulness and ingenuity in tackling on-the-ground realities. It will be in complete disarray, inconveniencing the herders in many ways. I feel it is better to keep the traditional system.

(semistructured interview, Dakarla, interviewee 01)

There was a sense of fear and a perception that the government was trying to discourage yak rearing. Hence, a few herders have sold their entire herds. Those herders who oppose the nationalization and leasing program maintained that it is unfair to annul *tsa-drog* rights passed down by their parents. A 38-year-old herder from Cheabbling observed:

The tsa-drog of today did not happen just like that. Our parents invested a lot of time, sweat, toil, and resources. They slashed and burned impenetrable bamboo groves. Now if you want to give that tsa-drog that was built with our parents' sweat and toil to someone who has done nothing, this is not dra-nyam dang drang-dhen [equity and justice].

(semistructured interview, Cheabbling, interviewee 08)

A similar sentiment was expressed by a 68-year-old herder from Dakarla:

While some people suffered and put in a lot of effort, and others simply enjoy the fruits of another man's hard labor, this will cause a lot of inconveniences and heartaches.

(semistructured interview, Dakarla, interviewee 02)

He added:

Those who did not have tsa-drog did not have to pay tax. We had to take meat and butter all the way to Bumthang [the main seat of government from 1907 to 1974] right from the first, second, and third king until his demise.

(semistructured interview, Dakarla, interviewee 02)

This herder argued that their grandparents and parents were the ones who came forward to register *tsa-drog* when the government asked them to do so, and paid taxes accordingly. However, he said that he is not against nationalization if adequately compensated:

What to do—after all, it is a ka [decree] from higher authorities and a government policy. It is not fair for me to have enough to eat while the rest are starving. . . . As long as we are compensated, we don't see much problem in redistributing it.

(semistructured interview, Dakarla, interviewee 02)

Some herders argued that nationalization may fan hatred and animosity in local communities and undermine traditional *tsa-drog* management practices and that there is no guarantee that it will lead to a fair and just *tsa-drog* redistribution. They maintained that nationalization is indirectly discouraging yak herding by destroying herders' hopes and aspirations. The revocation of *tsa-drog* rights has created some apathy in the community, according to a 38-year-old herder from Cheabbling:

Ever since the tsa-drog ownership right was revoked, people have lost interest in taking care of it any more. People feel that it is not their responsibility anymore as it now does not belong to them. It belongs to everyone. Now nobody takes care of tsa-drog anymore.

(semistructured interview, Cheabbling, interviewee 08)

Similarly, a 27-year-old herder, who was originally from Merak but married and settled in the downstream community of Phongmey, said:

Now that tsa-drog is nationalized, herders might forcefully put their animals into someone else's tsa-drog, causing more conflicts.

(semistructured interview, Phongmey, interviewee 01)

An elected member of the local government in Merak said that during his consultations with the herders of Merak, their overwhelming preference was to reinstate the old system:

Despite our explaining that the policy of the government is to put in a system which is more fair, equitable, and balanced, people want the old system back.

(semistructured interview, Cheabbling, interviewee 05)

On the other hand, herders who have little or no *tsa-drog* access perceived nationalization of *tsa-drog* as a way to improve their livelihoods. For example, a 64-year-old woman herder from Sheytemi said:

We'll be very happy if the government could nationalize all the tsa-drog of those who have plenty and redistribute among us in a

manner that promotes dra-nyam and drang-dhen [equity and justice].

(semistructured interview, Sheytemi, interviewee 01)

A 55-year-old woman from Cheabling, when asked in an interview whether she would be happy if the government decided to divide *tsa-drog* equally among all herders, replied:

I will be happy. . . . Because our animals will have something to eat.
(semistructured interview, Cheabling, interviewee 06)

Herders who supported nationalization considered it as a timely opportunity to rectify historical inequities and injustices suffered at the hands of the rich and the powerful. They saw it as an opportunity to avoid unfavorable contracts that they were compelled to enter into with absentee landlords. For example, a 50-year-old herder from Sheytemi argued that there are a number of advantages if the government nationalizes the *tsa-drog* and leases it back to people in a fair and equitable manner:

Unlike in the past, we don't have to approach the individual landlords or owners and offer ara [homemade alcoholic beverage] and martang [butter] as a gift asking them to lease their tsa-drog to us. We don't have to do such things, and it will bring peace to the entire community.

(semistructured interview, Sheytemi, interviewee 04)

The same herder said that with nationalization, people can instead sign a lease with the *gewog* administration and pay tax directly to the government instead of to a landlord. Under such an arrangement, people cannot claim a particular *tsa-drog* belongs to them or others, and in that way conflicts and disputes over *tsa-drog* may subside. In response to the existing owners' claim that the taxes their parents paid justified their opposition to nationalization, his argument was:

Whatever tsa-rin [grass charge] they have collected so far or are still collecting is profit for them. Tsa-rin collected so far should more than offset the taxes they have paid in the past.

(semistructured interview, Sheytemi, interviewee 04)

He insisted that it was not enough for a few individuals to be happy and peaceful while the rest suffered. Thus, he said that nationalization is one way to spread happiness and peace among the entire population of Merak:

If there are 200 households in Merak, then all the 200 households must be happy and peaceful. Only then is it a sign of Gyalyong Gakith Penzome [Gross National Happiness, which is both a national development goal and a philosophy that guides conservation and development in Bhutan and was first enunciated by the fourth King of Bhutan in the 1970s].

(semistructured interview, Sheytemi, interviewee 04)

He recognized that there might be some initial resistance from the current *tsa-drog* owners to the new proposal, but

added that there will always be trade-offs. He argued that nationalization will bring the greatest benefits to the greatest number of herders and that the benefits far outweigh the costs. Hence, the government should go ahead with the nationalization program in alignment with the national development philosophy and goal of achieving *Gyalyong Gakith Penzome*.

One aspect of nationalization on which there is unanimity among herders is the dismantling, nationalizing, and redistributing of *tsa-drog* belonging to absentee landlords and elites among existing tenants. They see absentee landlordism and elite capture as impediments to progress, prosperity, wellbeing, and the hopes and aspirations of seminomadic yak herders.

Discussion

This paper has explored property rights and management regimes in 3 distinct high-elevation rangeland systems, herders' and government officials' perceptions of the proposed rangeland nationalization process, and implications of rangeland nationalization for herder livelihoods and sustainable development. Property rights regimes found in the study sites—private, communal, and mixed—are in line with the dominant regimes found in the property rights literature (Yandle and Morris 2001; Smith 2002; Lehavi 2008; Harris 2010). In Bhutan, only use rights have been granted to title holders since the passage of the 1979 Land Act; ownership is vested in the state.

Successive laws have systematically eroded rights from the herders, with adverse impacts on environmental integrity and herders' socioeconomic wellbeing. Herders have developed customary management norms and rules, such as mutually agreed exit and entry dates for communal *tsa-drog*, appointment of community stewards, and penalty and conflict-resolution mechanisms. However, a ban on burning and the granting of use rights only, without management rights, has undermined traditional *tsa-drog* management practices. Reduction in both the quantity and quality of pastures due to the spread of unpalatable woody species compels herders to lop fodder trees from the state forest to provide supplementary fodder for their stock. Indiscriminate lopping ultimately causes forest degradation, culminating in landslides and flash floods, with both environmental and socioeconomic consequences.

For sustainable natural resource management, as this research demonstrated, management rights are key. Without management rights, the types of property rights regimes have had little or no influence on *tsa-drog* condition and management aspects. For example, overgrazing, the ban on burning shrubs, and logging or bamboo flowering have affected and degraded *tsa-drog* equally under private, communal, and mixed user-rights regimes. Bamboo flowering is a massive flowering phenomenon, after which the bamboo dies. The bamboo

flowering cycle may range from 50 to 200 years (Keeley and Bond 1999).

The most recent law to significantly affect *tsa-drog* property rights and management is the 2007 Land Act of Bhutan. The requirement that *tsa-drog* be leased only to those whose livelihoods directly depend on yak herding and livestock raising effectively dismantles absentee landlordism and elite capture, representing a major leap forward in terms of incentivizing yak herding and securing the future of yak herding and high-elevation *tsa-drog* in Bhutan. However, this study found that there are both critics and supporters of rangeland nationalization, a finding that is in line with the findings of a review conducted by Gyeltshen et al (2010) on the implications of the proposed nationalization program. The latter authors found that the proposed nationalization process has polarized herders into supporters and opponents. One plausible reason for the prevailing uncertainty and fear among herders and livestock farmers is that the 2007 Land Act of Bhutan and *tsa-drog* nationalization were announced without a clear *tsa-drog* property rights and leasing implementation mechanism. Inadequate sensitization and consultation with relevant stakeholders and a prolonged time lag between the enactment of the Land Act and its implementation are other plausible reasons. Provisions to address administrative, financial, and logistical challenges and costs were insufficiently detailed, and mechanisms to address public concerns about redistribution were lacking.

Dismantling functioning traditional property rights and management systems before a better and more coherent alternative is put in place is counterproductive. Dorji et al (2006) argued that previous land nationalization attempts in Bhutan resulted in widespread degradation of *sokshing* (household woodlots used for leaf litter collection and firewood during emergencies) due to the loss of local property rights and lack of incentive for collective action. According to Ostrom (2000a), land nationalization has often proved less effective and efficient in controlling natural resources, mainly because of the poor monitoring ability of government agencies, often culminating in degradation with disastrous consequences.

Globally, land tenure and property rights laws provide the overall framework for natural resource management and governance, including of rangelands (Schlager and Ostrom 1992; Ojanen et al 2014). However, attempts at land reform can be inequitable and can inadvertently trigger gradual degradation of rangelands, as has occurred in Bhutan since the 1950s (Gyaltsen 1996; Gyamtsho 1996; Turkelboom and Wangchuk 2009; Namgay et al 2014). Lessons learned from experiences of rangeland reforms in China (Cao et al 2013), Mongolia (Fernández-Giménez et al 2006), and Central Asian countries (Kerven et al 2012; Crewett 2015) highlight risks associated with nationalization. For example, in China, privatization of

use rights and household enclosures caused rangeland degradation due to spatial and temporal disjuncture between pasture production and livestock access to forage, resulting in fragmentation of the pastoral landscape and localized grazing pressure (Cao et al 2013). On the other hand, Zhang et al (2013) argued that the privatization policy in China improved herders' enthusiasm for production and reduced free-rider problems by assigning clear rights to resources in Inner Mongolia. Similarly, the Sha Gogona pilot leasing program described in this paper showed that it is feasible to distribute *tsa-drog* equitably and foster sustainable *tsa-drog* management provided that there is a clear government policy and that sustained logistical and technical support by government is given to herders and livestock farmers, especially during the initial period.

The proposed nationalization policy of the Bhutan government may be different from the nationalization exercises implemented in other Asian and in African countries in 3 respects: (1) it gives preference to herders who depend directly on *tsa-drog* and yak herding for their livelihoods, (2) it confers management rights and tenure security to allow development (eg pasture improvement) and management of *tsa-drog*, and (3) it dismantles elite capture and absentee landlordism to incentivize yak herding. However, the challenge for the government of Bhutan is to ensure that the needs and priorities of the poor and marginalized sections of the yak-herding community receive adequate attention during the allocation and leasing process. Recognizing the challenges and complexity involved in rearranging traditional *tsa-drog* property rights and allocation, successive governments have assured herders that the status quo will be maintained regarding yak herding and traditional *tsa-drog* property-rights arrangements. However, it is not clear how equitable *tsa-drog* redistribution can be ensured and sustainable development encouraged if the status quo is indeed maintained. Adopting a path of least resistance for administrative and logistical convenience is bound to fail the poorer sections of the yak-herding community, thereby defeating the purpose of the nationalization program. Thus, any future changes to the *tsa-drog* property rights and management regime in Bhutan should be built on good practices and the successes of historical property rights and management regimes.

A limitation of the present study was the low number of Dakarla herders interviewed, because of the remoteness and scattered nature of their winter camps; however, many of their responses and themes were similar to those of Cheabling and Sheytemi herders. Lack of time and contact information also prevented the main researcher from contacting absentee landlords in sites 1 and 3 and other institutional *tsa-drog* title holders for their views on nationalization and how it affected them. Future research could explore the perspectives of those losing their use rights in tenure reform process.

Conclusion

This research has shown that while rangeland nationalization is expected to promote sustainable management of high-elevation rangelands by incentivizing provisioning and maintenance activities, it has been hampered by a lack of clear implementation guidelines and a coherent replacement for the old *tsa-drog* property rights and management strategy. This has resulted in confusion and anxiety in herder communities. This research has demonstrated that to achieve sustainable mountain rangeland management, herders first need tenure security and management rights provided in an equitable manner. For example, assigning clear property rights along with clear responsibilities and duties for title holders, demarcating clear physical

resource boundaries and eligibility requirements, providing tenure security, and allowing provisioning and maintenance activities are vital to incentivize sustainable rangeland management. In particular, this research has shown that the design and implementation of a mixed property regime, as piloted in Sha Gogona, can achieve equity and sustainability goals simultaneously by harnessing advantages and synergies, and this may be replicable in other yak-herding areas with similar settings. However, sustained government support in the form of herder training in group dynamics and conflict resolution, and assistance with drafting a constitution and bylaws, are prerequisites during the initial phase of nationalization to lay a strong foundation for sustainable natural resource governance.

ACKNOWLEDGMENTS

The authors are grateful to Charles Sturt University, Australia, for providing a research grant. They would like to thank officials from the Ministry of Agriculture and Forests and the yak herders and livestock farmers from Merak, Sha Gogona, and Dakarla for their kind support. We would also like to

thank Anne Zimmermann and 2 anonymous reviewers for reviewing the manuscript and for their valuable comments and suggestions for improvement.

REFERENCES

- Blomquist W.** 2009. Current conceptions of natural resource systems. In: Volker B, Martina P, editors. *Institutions and Sustainability: Political Economy of Agriculture and the Environment*. Essays in Honour of Konrad Hegedorn. Berlin, Germany: Springer, pp 110–124.
- Bouma GD.** 2000. *The Research Process*. Melbourne, Australia: Oxford University Press.
- Breaker H.** 2013. Property concepts. *Internet Encyclopedia of Philosophy*. <http://www.iep.utm.edu/prop-con>; accessed on 24 July 2017.
- Bromley DW.** 1991. *Environment and Economy: Property Rights and Public Policy*. Cambridge, MA: Basil Blackwell.
- Cao J, Yeh ET, Holden NM, Qin Y, Ren Z.** 2013. The roles of overgrazing, climate change and policy as drivers of degradation of China's grasslands. *Nomadic Peoples* 17(2):82–101.
- Chophyel P.** 2009. *Rangeland Management in Bhutan: A Consultancy Report*. Global Environment Facility Funded World Bank Implemented Sustainable Land Management Project, National Soil Service Center, Semtokha. Thimphu, Bhutan: Department of Agriculture, Ministry of Agriculture and Forests.
- Crewett W.** 2015. Introducing decentralized pasture governance in Kyrgyzstan: Designing implementation rules. *Environmental Science & Policy* 32(3):267–274.
- Derville M, Bonnemare J.** 2010. Marginalization of yak herders in Bhutan: Can public policy generate new stabilities that can support the transformation of their skills and organisations? Paper presented at the *Innovation and Sustainable Development in Agriculture and Food (ISDA) Symposium*. Montpellier, France, 28 June–1 July 2010. <https://hal.archives-ouvertes.fr/hal-00522045>; accessed on 5 May 2015.
- DOL [Department of Livestock].** 2015. *Livestock Census 2015*. Thimphu, Bhutan: Department of Livestock, Ministry of Agriculture and Forests.
- Dong S, Lassoie J, Shrestha KK, Yan Z, Sharma E, Pariya D.** 2009. Institutional development for sustainable rangeland resource and ecosystem management in mountainous areas of northern Nepal. *Journal of Environmental Management* 90(2):994–1003.
- Dorji L, Webb EL, Shivakoti GP.** 2006. Forest property rights under nationalized forest management in Bhutan. *Environmental Conservation* 33(2):141–147.
- Fernández-Giménez ME, Batbuyan B, Oyungerel J.** 2006. Climate, economy and land policy: Effects on pastoral mobility patterns in Mongolia. Paper presented at *Mobility, Flexibility, and Potential of Nomadic Pastoralism in Eurasia and East Africa*. Kyoto, Japan, 13 November. Available from corresponding author of the cited article (gimenez@warnecnr.colostate.edu).
- Gyaltsen T.** 1996. *Rangeland and livestock management in Bhutan*. Rome, Italy: Food and Agriculture Organization of the United Nations. http://www.fao.org/ag/agp/agpc/doc/Publicat/TAPAFON/TAP_11.PDF; accessed on 24 July 2017.
- Gyamtsho P.** 1996. *Assessment of the Condition and Potential for Improvement of High Altitude Rangelands of Bhutan* [PhD dissertation]. Zurich, Switzerland: Swiss Federal Institute of Technology. <https://doi.org/10.3929/ethz-a-001616083>; accessed on 24 July 2017.
- Gyamtsho P.** 2002. Condition and potential for improvement of high altitude rangelands. *Journal of Bhutan Studies* 7:82–98.
- Gyeltsen T, Tshering N, Tsering K, Dorji S.** 2010. *Implication of Legislative Reform Under the Land Act of Bhutan, 2007. A Case Study on Nationalization of Tsamdro and Sokshing and its Associated Socioeconomic and Environmental Consequences*. Thimphu, Bhutan: Watershed Division, Department of Forestry and Park Services, Ministry of Agriculture and Forest.
- Harris RB.** 2010. Rangeland degradation on the Qinghai-Tibetan plateau: A review of the evidence of its magnitude and causes. *Journal of Arid Environments* 74(1):1–12.
- Keeley, JE, Bond WJ.** 1999. Mast flowering and semelparity in bamboo: The bamboo fire cycle hypothesis. *American Naturalist* 154(3):283–391.
- Kerven C, Steimann B, Dear C, Ashley L.** 2012. Researching the future of pastoralism in Central Asia's mountains: Examining development orthodoxies. *Mountain Research and Development* 32(3):368–377.
- Kreutzmann H.** 2012. Pastoral practices in transition: Animal husbandry in high Asian contexts. In: Kreutzmann H, editor. *Pastoral Practices in High Asia*. Advances in Asian Human–Environment Research. Dordrecht, The Netherlands: Springer, pp 1–29.
- Laurent-Lucchetti J, Santugini M.** 2012. Ownership risk and the use of common-pool natural resources. *Journal of Environmental Economics and Management* 63(2):242–259.
- Lehavi A.** 2008. Mixing property. *Seton Hall Law Review* 38:137–212.
- Lempert LB.** 2007. *Asking Questions of the Data: Memo Writing in the Grounded Theory Tradition*. London, United Kingdom: Sage.
- Li J.** 2012. Land tenure change and sustainable management of alpine grasslands on the Tibetan plateau: A case from Hongyuan County, Sichuan Province, China. *Nomadic Peoples* 16(1):36–49.
- Miller DJ.** 2005. The Tibetan steppe. In: Suttie JM, Reynolds SG, Batello C, editors. *Grasslands of the World*. Rome, Italy: Food and Agriculture Organization of the United Nations, pp 305–342.
- Næss MW.** 2003. *Living With Risk and Uncertainty: The Case of the Nomadic Pastoralists in the Aru Basin, Tibet* [MSc thesis]. Tromsø, Norway, University of Tromsø.

- Næss MW.** 2013. Climate change, risk management and the end of nomadic pastoralism. *International Journal of Sustainable Development & World Ecology* 20(2):123–133.
- Namgay K, Millar JE, Black RS.** 2017. Dynamics of grazing rights and their impact on mobile cattle herders in Bhutan. *Rangeland Journal* 39(1):97–104.
- Namgay K, Millar JE, Black RS, Samdup T.** 2014. Changes in transhumant agro-pastoralism in Bhutan: A disappearing livelihood? *Human Ecology* 42(5):779–792.
- NSB [National Statistics Bureau].** 2014. *Statistical Yearbook of Bhutan*. Thimphu, Bhutan: National Statistics Bureau, Royal Government of Bhutan.
- Ojanen M, Miller DC, Zhou W, Mshale B, Mwangi E, Petrokofsky G.** 2014. What are the environmental impacts of property rights regimes in forests, fisheries and rangelands? A systematic review protocol. *Environmental Evidence* 3(1):6–12.
- Omura M.** 2008. Property rights and natural resource management incentives: Do transferability and formality matter? *American Journal of Agricultural Economics* 90(4):1143–1155.
- Ostrom E.** 2000a. Collective action and the evolution of social norms. *Journal of Economic Perspectives* 14(3):137–158.
- Ostrom E.** 2000b. Private and common property rights. *Encyclopedia of Law and Economics*, Vol 2. Cheltenham, England: Edward Elgar, 332–379.
- Schlager E, Ostrom E.** 1992. Property-rights regimes and natural resources: A conceptual analysis. *Land Economics* 68(3):249–262.
- Singh RK, Sureja AK.** 2006. Community knowledge and sustainable natural resources management: Learning from the Monpa of Arunachal Pradesh. *Journal for Transdisciplinary Research in Southern Africa* 2(1):73–102.
- Sjaastad E, Bromley DW.** 2000. The prejudices of property rights: On individualism, specificity, and security in property regimes. *Development Policy Review* 18(4):365–389.
- Smith HE.** 2002. Exclusion versus governance: Two strategies for delineating property rights. *Journal of Legal Studies* 31(S2):S453–S487.
- Turkelboom F, Wangchuk T.** 2009. *Steep Land Farmers and Their Land Resources: A Holistic Land Degradation Assessment of Eastern Bhutan*. No 42/FS/2009. Wengkhar, Mongar, Bhutan: Council for Renewable Natural Resources Research of Bhutan, Ministry of Agriculture and Forests.
- Wangchuk T.** 2000. Change in land use system in Bhutan: Ecology, history, culture and power. *Journal of Bhutan Studies* 2:54–85.
- Yandle B, Morris AP.** 2001. The technologies of property rights: Choice among alternative solutions to tragedies of the commons. *Ecology Law Quarterly* 28:123.
- Zhang C, Li W, Fan M.** 2013. Adaptation of herders to droughts and privatization of rangeland-use rights in the arid Alxa Left Banner of Inner Mongolia. *Journal of Environmental Management* 126:182–190.

Supplemental material

TABLE S1 *Tsa-drog* management regimes in the study sites.

Found at DOI: <http://dx.doi.org/10.1659/MRD-JOURNAL-D-17-00016.S1> (58KB PDF).