ABSTRACT

A GEOGRAPHIC ANALYSIS OF THE VULNERABILITIES AND COPING STRATEGIES OF TIBETAN HERDERS IN GANSU, CHINA

by Luci Xi Lu

A dominant narrative of rangeland degradation in western China is that degradation is caused by overstocking and poor land use practices. Consequently, the state has designed and implemented a series of grassland policies (e.g., privatizing common grazing land, depopulating livestock, and relocating herders) in pastoral regions of China. Although the government sees communal rangeland management as inefficient and unsustainable, collective rangeland management persists. Using Machu County in Gansu Province as a case study, I examined the differences between de jure and de facto land tenure on eastern Tibetan Plateau. This study employed semi-structured interviews and extensive participant observation with 43 Amdo Tibetan herders in Machu County, Gansu province, Western China. I also triangulated the first-hand empirical data with the secondary data I obtained from Bureau of Poverty Alleviation and Bureau of Animal Husbandry in Machu. Research findings show that instead of herding individually and maximizing the economic benefit, the majority of herders are pooling resources communally in kin-based encampments in order to avoid risks. Because of the spatio-temporal variation of precipitation, certain encampments perceive themselves more vulnerable to water shortage and topography-related hazards. Renting pastures and seeking alternative livelihoods then become the key strategies for herders to restore mobility and flexibility.

A GEOGRAPHIC ANALYSIS OF THE VULNERABILITIES AND COPING STRATEGIES OF TIBETAN HERDERS IN GANSU, CHINA

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Chapter 1: Introduction

Pastoralism is a mode of production that is often characterized by extensive and opportunistic grazing, communal pooling of resources, and a subsistence economy. Nowadays there are 20 million households around the world whose livelihoods depend on pastoralism (FAO 2001). However, the pastoral system is vulnerable to institutional changes. Global change in land use and land tenure has led to fragmentation, privatization, and intensification of pastures (Klein et al. 2012).

My study area of Machu County in Gansu, located on the Eastern Tibetan Plateau, is no exception to this global trend in pastoral land use change. Machu's unpredictable weather and high altitude have protected the region from the encroachment of agricultural activities; however, the privatization-oriented land use policies have changed the local land tenure. Guided by Hardin's "Tragedy of the Commons" theory, the State sees herders and their extensive "poor land use practices" as the major reasons for land degradation (Li 2012). The State also blames herders as unsustainable and exploitative up-stream resource users who jeopardize downstream water security (Blaikie and Muldavin 2004). Starting in the 1980s, the State developed a series of grassland improvement policies aiming to privatize grassland and sedentarize pastoralists (Yeh 2009). These policies were designed to provide herders the incentives to utilize resources more efficiently and sustainably by securing individual land tenure.

However, a secured tenure also means a restraint on pastoral mobility, which is fundamental to a sustainable pastoral livelihood. Fernandez-Gimenez (2002, 49) describes the paradox of pastoral land tenure as a situation where "mobile pastoralists are subject to potentially conflicting needs for secure resources tenure and socially and spatially flexible patterns of resource use". Therefore, by staying on a fixed fenced pasture, a herder household is guaranteed for certain pastoral resources, but is also at risk for losing the spatio-temporally distributed ones. Loss of mobility may also render a herder household vulnerable to extreme climatic events.

Despite the State's continuous efforts to privatize the pastoral land, some previous studies indicate collective grassland management still persist in Machu, and in various other areas in

Western China (Banks et al. 2003; Cao, Holden and Du 2011; Li 2012). However, there are still not many studies that have addressed the complexity of de facto tenure systems in pastoral China, especially through the lens of geography. Therefore, the objective of this study is to examine the changes in land tenure, its impact on pastoral livelihoods, and consequently the coping mechanisms developed by local herders (Figure 1). Considering a spatio-temporal distribution pattern of resources and hazards may render certain populations more vulnerable, I examine the differences in their coping strategies. This research project is guided by the following research questions:

Research Question 1: *How do herders manage their rangeland collectively and privately?*

Research Question 2: *How do they perceive their vulnerability differently?*

Research Question 3: *What are the different coping strategies used by herders in Machu?*

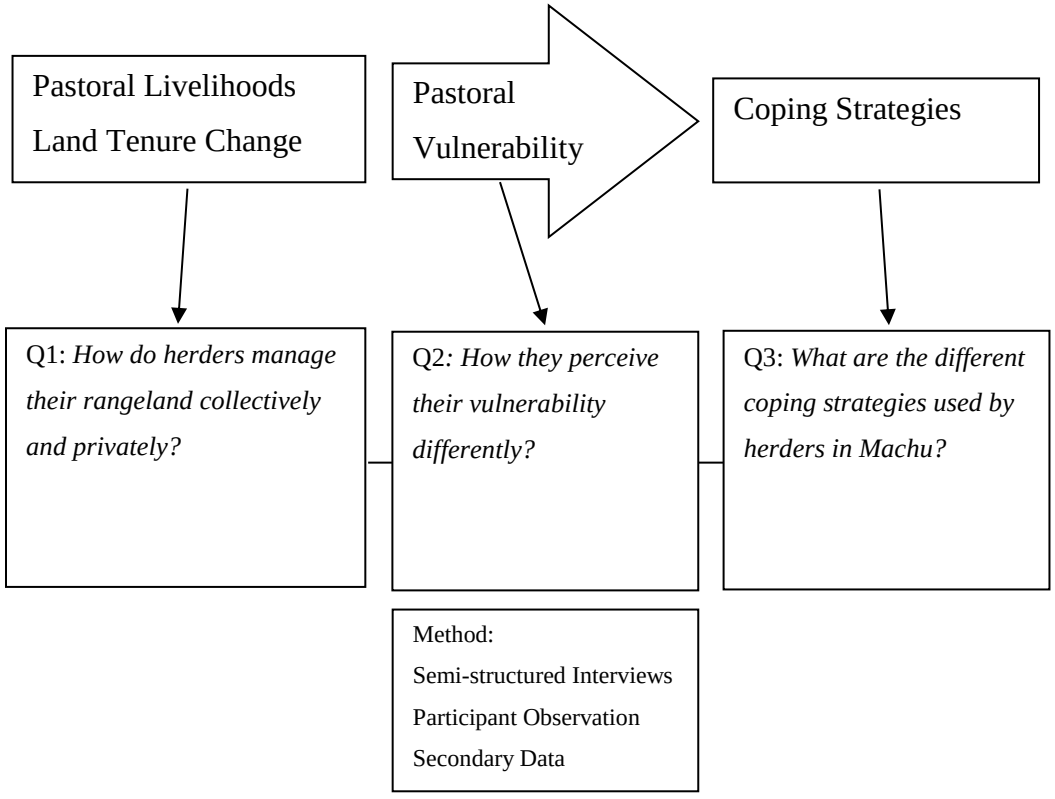

Figure 1. Research framework.

I focused on Tibetan herders in southern Machu County in this study and employed semi-structured interviews and participant observation as methodologies. I chose the Khro-Kho tribe

of Tibetans because of their rural setting; most herders still rely on traditional livestock raising for their livelihood. I also interviewed herders from a previous State-owned Ranch called Matang (where individual household herding is more popular) as a comparison in this study. The interviews were directed by questions on household demography, livelihoods, land entitlement, and management patterns. The open-end informal questions then extended to how herders experience water scarcity and hazard-related livestock losses.

This thesis is organized into six chapters. Chapter Two introduces the literature on pastoral livelihoods, vulnerability and coping strategies. I present the physical, economic, and political landscape of my study area Machu in Chapter Three. I examine how the case study of Machu situates in the broader discussion on rangeland management and institutional change, while uniquely shaped by its local ecology. Chapter Four explains the two major methods, semi-structured interviews and participant observation that I used for this study. My results are presented in Chapter Five. In this chapter, I first compare the difference between de jure tenure and de facto tenure in Machu. Secondly, I examine how land tenure change influenced herders' perceptions of vulnerability. Finally in this chapter, I examine the different coping strategies adopted by herders. Chapter six contextualizes how external interventions have changed local land tenure, and how local communities adjust and negotiate by changing herding practices and coping strategies. In Chapter Seven I conclude with a discussion of this thesis' contribution to the literature and future research implications.

Chapter 2: Literature Review

This chapter examines the literature related to my study in Machu County, Gansu Province, China. Firstly, this chapter reviews the uniqueness of pastoralism as a mode of production, and the influences of policy interventions on pastoral livelihoods. Secondly, I examine the definition of vulnerability, emphasizing the discussion on apolitical physical vulnerability and social vulnerability. I also highlight the importance of precipitation and mobility to pastoral livelihoods. Thirdly, this review illustrates the theoretical framework of rural adaptation and livelihoods.

2.1 Pastoral Livelihoods

Pastoralism

Pastoralism is a land use practice characterized by extensive grazing and the husbandry of several domesticated animal species (e.g., cattle, goats, reindeers, horses) (Fernandez-Gimenez et al. 2012; Sutton and Anderson 2004). Pastoralism occupies approximately 25% of the global landscape (especially in dryland areas) and supports over 20 million households to produce approximately 10% of the meat that is consumed by humans (FAO 2001). Sutton and Anderson (2004) further categorize pastoralism into three types: nomadic, seminomadic and semisedentary pastoralism. As pastoralists become more sedentary, they gradually decrease their mobility and dependence on opportunistic livestock grazing.

Pastoralism and commercial ranching both emphasize livestock production, but there are key differences between the two methods of livestock raising. Pastoralism prioritizes subsistence need, and relies more on human labor, local knowledge, common tenure, and a certain type of mobility (Richard 2000). Commercial ranching emphasizes intensive livestock grazing on individual-managed pastures (Table 1). However, under the institutional and socio-economic changes in the past century, the differences between these two livelihoods were less clear. Tibetan herders as traditional subsistence nomadic herders are not necessarily isolated from the global market. As the government liberalized the livestock market, and allocated winter pastures to individual households, herders started to become active market participants (Yeh and Gaerrang 2011).

Table 1. Eastern Tibetan Plateau pastoralism compared with a ranching operation in Rocky Mountains of Colorado, USA.

Tibetan Plateau Pastoralism	*Colorado Ranching*
Subsistence focus, diverse products for home consumption with some surplus for sale	Commercial, single product focus (e.g. meat)
Majority of population engaged in pastoralism (livelihoods necessity)	Very few ranchers with most people engaged in other livelihoods (ranching is a lifestyle choice)
Several households have access to a large area which is communally managed	One operator has exclusive access to the same amount of area and livestock
De facto tenure (customary, common property)	De jure tenure (legal, individual)
Low capital and high labor investment	High capital investment-only larger operations are profitable
Risk averse, engage in multiple economic strategies	Risk-taking (insurance schemes and legal mechanisms to protect commercial interests)

Source: (Richard 2000).

Pastoralists and State Interventions

As dispersive and marginalized groups located within countries dominated by agricultural populations, pastoral tribes are often at odds with the States that favors regulation and order (Fernandez-Gimenez 2012). Firstly, the elusive and loose tribal structure of the nomadic people creates barriers for the State to centralize its control and management. Herders' mobility and fluid boundaries render them hard to govern. It is also hard and costly to deliver infrastructures and social services to such sparsely populated places (Cencetti 2010; Fernandez-Gimenez 2012). Furthermore, Amdo herders' rebelliousness, inclination to violent revenge and despising toward the imposition of criminal punishments make them unruly objects of state-governance (Pirie 2005). Secondly, pastoralism is often regarded as a mode of production that belongs to non-industrialized societies. Pastoralism is regarded by the government officials as "inferior to modern agricultural and livestock rearing," anachronical to a "world [that] has entered the most modern and civilized era ever know" (Hutzler 1999). Therefore, coupled with the degradation

narrative, herders can often be seen as "backward" and "ignorant," culprits who cause environmental degradation and passive participants of the state's "modernity" and "development" programs (Sayer et al. 2013, 348). However, the purpose of this paper is not to build a simple dichotomy between the disobedient highland pastoralists and the dominative Chinese cultivators. As the history of Silk Road has informed us, the interactions of highland pastoralists and lowland dwellers (core-periphery) are constant and complex (Frank 1992).

2.2 Pastoral Vulnerability and Coping Strategies

Vulnerability is a terminology shared by different bodies of literatures, since human-environment relationship is an interdisciplinary research topic. According to Cutter et al. (2003), scholars of different background apply different ontology and epistemology, which causes a disagreement on the concept of vulnerability. Vulnerability generally means "the potential for loss" (Cutter et al. 2003, 242). Wisner et al. (2004, 11) define vulnerability as "the characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard (an extreme natural event or process)." Turner et al. (2003) emphasize the importance of scale when examining interactions within the human-environment system. They define vulnerability as "the degree to which a system, subsystem, or system component is likely to experience harm due to exposure to a hazard, either a perturbation, or stress/stressor (2003, 8074)".

The definitions of vulnerability often fall into two categories. Brook (2003) categorizes vulnerability into physical (biological) vulnerability or social vulnerability. Researchers using physical approaches regard vulnerability as an exposure to external extreme climatic events. While those who use the social approaches see vulnerability as an internal state in which pre-determined social structures render certain populations more susceptible to hazards. Additionally, Cutter et al. (2003) identifies three different approaches to analyze vulnerability: hazard-oriented "vulnerability as exposure," human oriented "vulnerability as social conditions," and an integration of the former two with a contextualized focus.

Socio-economic marginalization makes certain populations more prone to loss when there is a hazard, and less able to cope and recover. Poor and marginalized populations are at higher risk of

flooding and disease, since they have to live in riskier areas (Watts 1983). Using the case study in Coastal Vietnam as an example, Adger (1999) illustrates how market liberalization and privatization cause income inequality, and further expose farmers to livelihood stress. Other than the power imbalance and economic disparity, Wisner et al. (2004, 5) illustrate that the key social factors that lead to vulnerability include race, class, gender, and ethnicity. They further indicate that the pressure from natural hazard is further amplified by social stratification and local geography. The social aspect of hazard poses a challenge to policy makers, since social inequality is often harder to tackle when compared to the technological interventions.

Vulnerability as a Loss of Mobility

Remaining mobile is one of the most important traditional practices for pastoralists to cope with the fluctuating rainfall and a spatiotemporal heterogeneity of resources. Pastoralists move opportunistically as a response to the heterogeneous resources distribution (e.g., nutritious forage, water) and changing weather in tropical Africa and arid Eurasia. In order to guarantee enough resources, pastoralists need to cautiously monitor climatic and environmental change in order to gather sufficient information to make a decision. Remaining mobile has been one strategy for arid Ivory Coast Fulani to deal with the uncertainties on arid lands (Bassett 1986). Through seasonal migration, traditional Tibetan encampment (T., ru-skor) also established a reliable and sufficient defense strategy towards the unstable alpine environment and climate (Ekvall 1939). In Mongolia, Murphy (2011) finds out that if a household is more capable of practicing *Otor* (nomadic grazing), it is less susceptible to loss caused by *Zud* (severe winter). Murphy then further points out that limited access to livestock, labor, and land has decreased certain herders' capability to mitigate the risk of *Zud*. In Addition, Inter-community sharing of grassland, which also offers pastoralists certain type of flexibility and cooperation, can enhance mobility.

Rural Adaptation Strategies

Herders often need to adjust their traditional coping strategies and develop new ones to cope with the risks brought by socio-economic and environmental change. According to the adaptation, institutions, and livelihoods framework developed by Agrawal (2010), basic adaptation strategies adopted by rural households include mobility, storage, livelihood

diversification, communal pooling, and market exchange. Agrawal further argues these adaptation practices focus on avoiding and distributing environmental risks. Mobility and storage distribute environmental risks across space and time, while diversification and communal pooling distribute risks across asset classes and households.

In sum, this study focuses on examining the influences of land tenure change on local communities and consequently on how local community cope with such stressors. By examining the literature on vulnerability and pastoral livelihoods, this study situates itself in a broader discussion on the causes and consequences of pastoral land tenure change.

Chapter 3: Study Area

Machu County (100°45′-102°29′N, 33°06′-34°30′E) is located at the eastern edge of the Tibetan Plateau. It is an administrative district of Kanlho Tibetan Autonomous Prefecture, at southern Gansu Province, China. Machu County borders upon Sichuan province in the south and Qinghai province in the West (Figure 2). Machu County consists eight townships (Nima, Oula, Oulaxiuma, Muxihe, Awanchang, Qihama, Cairima and Manrima) and previous state ranch (Matang) (Figure 3). My study areas include Awangchang, Qihama, Cairima, Manrima and Matang. Appendix 1 shows the different transliterations of these township names and other terms referred to in this chapter.

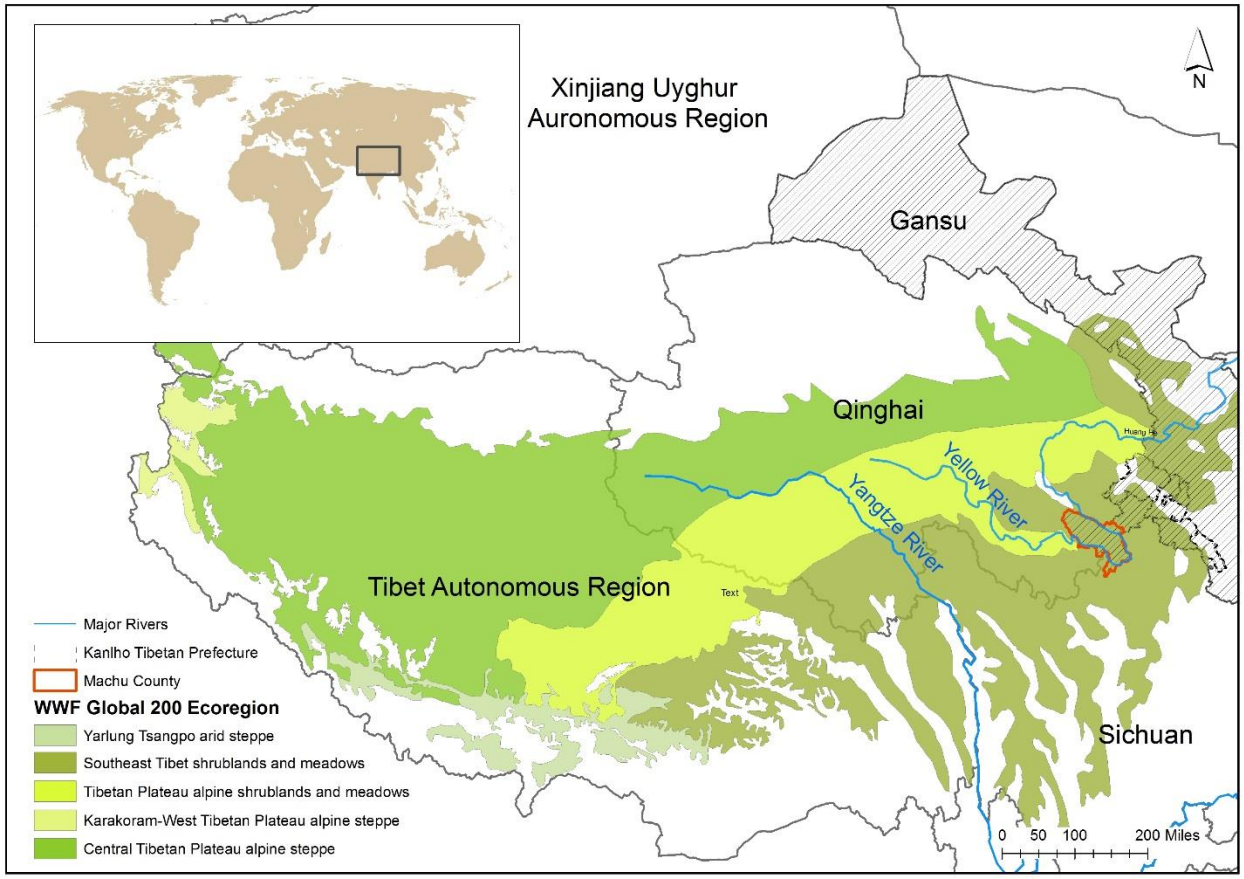

Figure 2. The location of Machu County, Kanlho Prefecture, Gansu Province, and WWF's Global 200 Terrestrial Ecoregions on the Tibetan Plateau (Olson et al. 2001). Map by Author

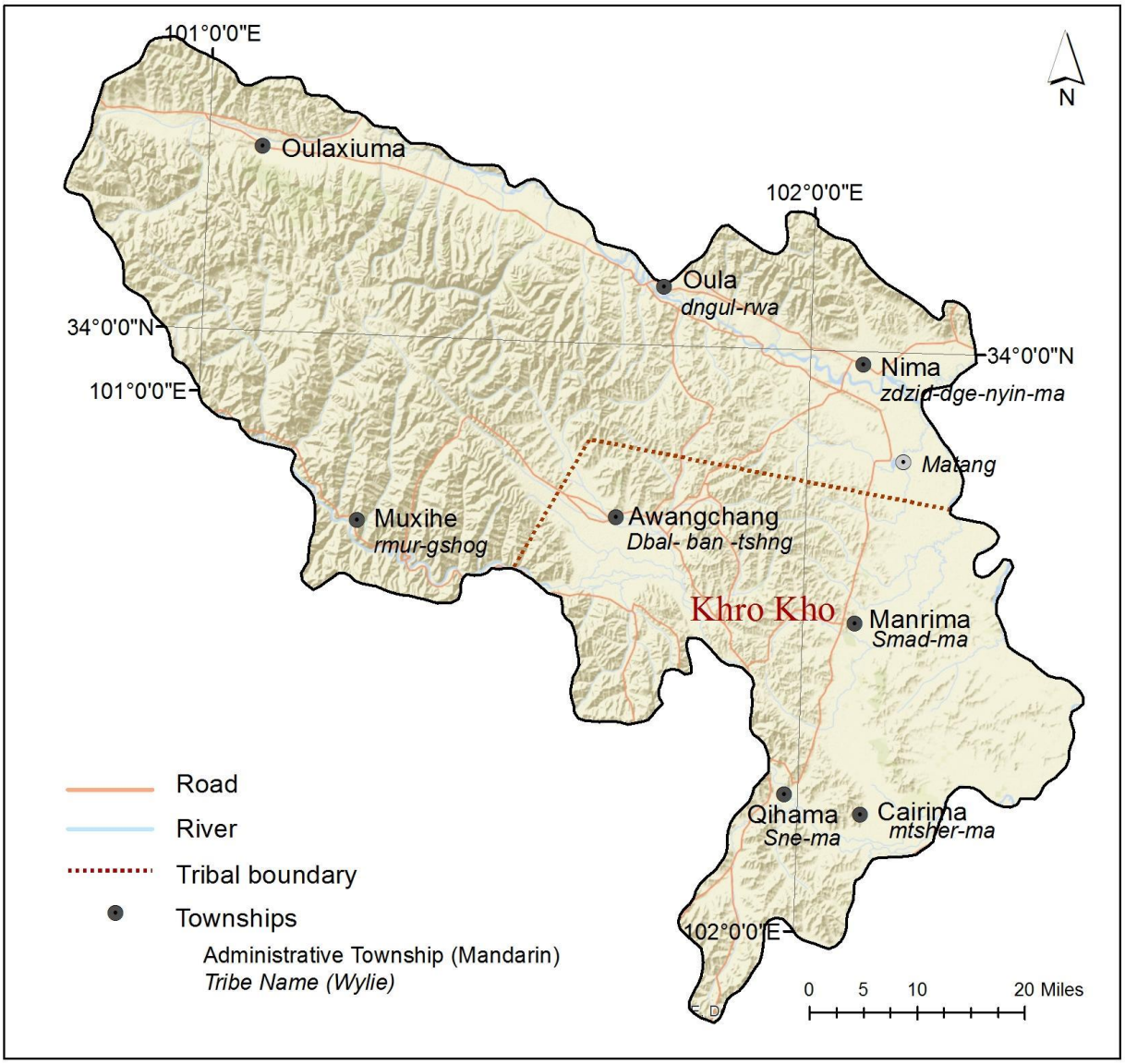

Figure 3. Topography and the administrative townships of Machu (ArcGIS database). I drew the tribal boundary of Khro Kho based on descriptions from the literature and interviews. Map by Author

3.1 Topography

With an average elevation of 3340 meters, the county with a size of 10190.8km^2 slopes from west to east (Machu County Annals 2001). The general physical landscape of Machu can be roughly divided into three categories based on elevation. The sacred mountain Amne Machin, often regarded by the locals as the residence of the mountain god of Amdo, extends from Qinghai province and crosses the county from northwest to southeast. The undulating hills

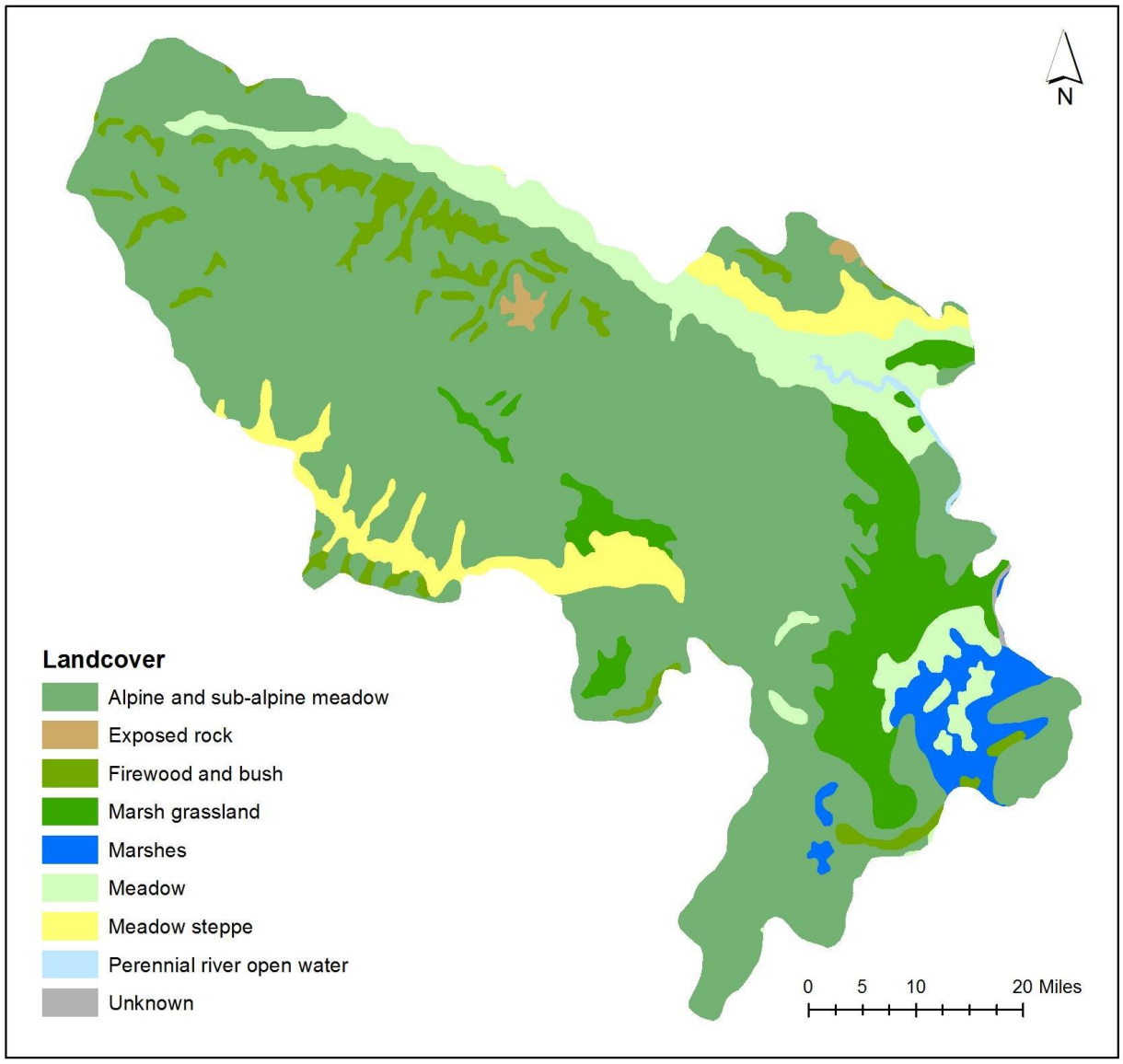

Figure 4. Land Cover of Machu County (Tibetan and Himalayan Library 2016). Map by author.

located in front of the Amne Machin range from 3500-3800 meters in elevation. Southern and eastern Machu remains relatively flat and wide with an average elevation of 3300 meters. This region also encompasses the headwaters of the Yellow River, which originate from the BayanKhar Mountain at the center of Qinghai province.

3.2 Ecology

The World Wildlife Fund has marked the Tibetan Plateau steppe as one of the Global 200 ecoregions that are key to global biodiversity conservation (Figure 2). WWF further divided this ecoregion into five terrestrial sub-regions: Southeast Tibet shrub and meadows, Tibetan Plateau alpine shrub and meadows, Central Tibetan Plateau alpine steppe, Yarlung Zambo arid steppe, and Karakoram-West Tibetan Plateau alpine steppe (Olson et al. 2001). Machu is located in the Southeast Tibet shrub and meadows ecoregion (Figure 4).

Typical to alpine meadow, local vegetation in Machu is dominated by clonal *Kobresia* sp. (Cyperaceae), *Festuca ovina*, *Poa poophagorum*, *Roegneria nutans*, *Agrostis* sp. (Poaceae), *Saussurea* sp. (Asteraceae), and *Anemone rivularis* (Ranunculaceae) (Wu et al. 2008). The 20 to 40 centimeter soil contains high organic matter, and is topped with sod (Miller 2005).

3.3 Climate

Influenced by the atmospheric circulation and plateau terrain, Machu experiences a long cold winter (<10℃), and a short spring and autumn (10~22℃). Warm season accounts for 51 days starting from July 1st to August 20th, while the cold season accounts for the remaining 314 days (Machu County Annuals, 2001). Average temperature is 1.2℃, with the highest temperature reaching 11.7℃ in July, and the lowest at-9.7 ℃ in January (Figure 5). Yao et al. (2007) observe that corresponds with the global climate change, the annual temperature in Machu has increased in a rate of 0.341℃ every ten years in the past three decades.

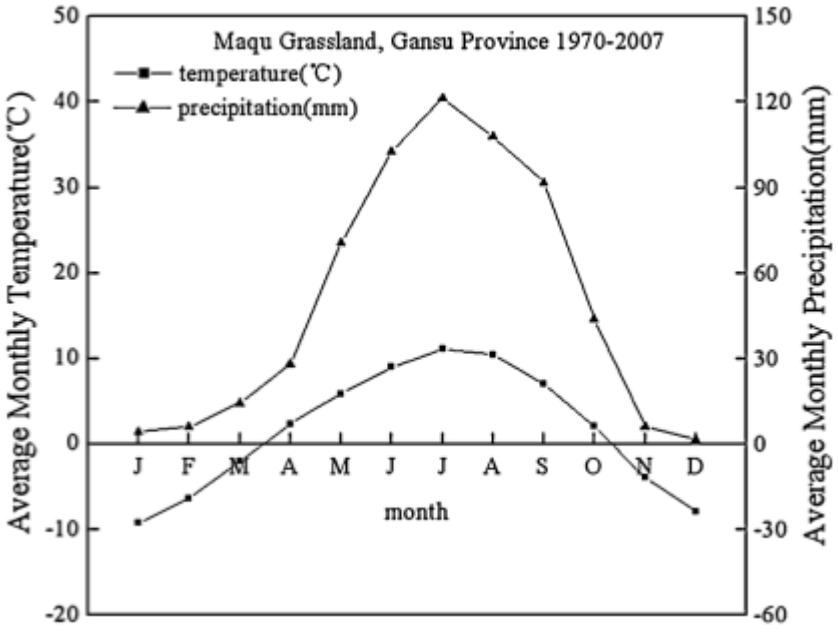

Figure 5. Average temperature and precipitation of Machu (1970-2007). Source: (Lu et al. 2014)

Since the Tibetan Plateau slides down towards the southeast, the moisture of monsoon is likely to influence Machu. As a result, this part of eastern plateau steppe receives an average of 611.9 millimeter of precipitation per year in the past 24 years. The majority of precipitation (73.1%) concentrates in the forage growth season, which accounts for an average of 525 millimeter. On the contrary, Machu only receives 1.8% of the rainfall during December to February. Yao et al. (2007) demonstrate the annual precipitation is decreasing in a rate of -.895 mm every ten years. However, even in the rainfall deficit years (1987-2000), Machu still receives 390mm average precipitation from the late spring to early autumn, which theoretically fulfills the requirement of natural forage growth (Wang 2008).

Severe and unpredictable weather has made Machu unsuitable for agriculture. Although herders usually grow 0.15-0.3 acres of barley or oats around their winter settlement as extra feed for weak animals, pastoralism still remains the economic backbone of the County. The Machu County Annals (2001) categorizes 96.34% of the land in the county as grazing grassland with extensive livestock production.

3.4 Local Economy

In 2013, the population of Machu County is 54,900, with 92.3% of whom are ethnic Tibetans. Rural population accounts for 70.7% of the total population. Overall GDP for Machu is $209 million in 2013, which is fourfold of its GDP in 2003 ($50.19 million). Primary sector (e.g., mining, grazing) contributes to $63.57 million of country's GDP in 2013. Secondary (manufacturing) and Tertiary sector (services) each generates $66.08 and $79.54 million. Gold mining and frozen meat manufacture are the two major industries in the county (Machu Statistical Yearbook 2013).

The statistical yearbook of Machu (2013) shows the county kept 523,710 horses and yaks, and 509,400 sheep. Well adapted to the severe weather conditions of alpine grassland, yaks are considered as the wealth or property of a household. Motorcycles and trucks have gradually replaced horses, which are often used for herding and moving tents. Despite a declining number of horses, some households still keep one or two for herding or even more for horse racing

competition. Herders gain an average income of $818.59 per year (Machu Statistical Yearbook 2013). They earn cash income through selling livestock (sheep, yaks) and livestock products (wool, sheep and yak skins, yak hair, and various milk products).

Other than livestock rearing, caterpillar fungus harvesting has quickly become an important income regenerating opportunity for locals in the past decade. Caterpillar fungus (*Ophiocordyceps sinensis*), also known as Yartsa Gunbu ("summer-grass, winter-worm") in Tibetan, is a high priced medicinal herb. It is often found in the alpine region of the Tibetan Plateau between the elevation of 3000m and 5000m (Shrestha 2010). *Ophiocordyceps sinensis* infects the larva of Thitarodes (*Hepialus*) caterpillar (often known as the ghost moth) after being hatched and gradually kills the larva by extracting the nutrients from it. Then a fungus grows from the inside of the larva's body. Such fungus is highly valued in Chinese medicine as a tonic, and used to treat disease related to lungs, kidneys, and erectile dysfunction.

Figure 6. Bobbi Brown 2015 foundation features Cordyceps Extract. Source: Bobbi Brown

The market price of *Ophiocordyceps sinensis* has increased by 900% between 1997 and 2008, reaching $8800 per kilogram for average quality, and $26400 per kilogram for top quality in Lhasa in 2008 (Winkler 2009). The high price was mainly driven by the increasing demand from China, Japan and other Southeastern Asian countries (Gruschke 2011). Recently, Caterpillar fungus has also entered the global cosmetic and dietary supplement market. For example, an American based cosmetic company Bobbi Brown has introduced a new foundation in the spring of 2015. This $64 foundation features *cordyceps sinensis* extract, though the website cautiously refers to it as cordyceps mushroom.

In addition to *Ophiocordyceps sinensis*, *Lamiophlomis rotata* is another heavily harvested medicinal plant in the region. *Lamiophlomis rotata* usually grows in rocky crevices and alpine

screes at an elevation higher than 3900 meter. As a plant that is used in traditional Chinese medicine to improve blood circulation and dispel blood stasis, it has also been tested to be used for treating tuberculosis, cancer and rheumatic arthritis (Liu et al. 2006).

3.5 Tribal Organization

Tribal Organization before 1950

When speaking of the Tibetan Plateau broadly before the "peaceful liberation" in 1951, the literature often refers to the monastic lords and aristocratic elites as the ones who controlled the land (Sheehy, Miller, and Johnson 2006). Historically, the majority of the 20 main tribes in Kanlho Tibetan Prefecture, where my study area Machu County is located, were subordinated either to certain native chieftains (*Tusi* C.) or to monasteries. Despite the fact that the term *tribe (buluo C., tsowa T.)* is avoided in official Chinese government publications because of its "feudal and primitive" implication, locals and anthropologists commonly use the term (*tsowa*).

Tusi systems are military colonies set up by the central Manchu government to control minority regions in Amdo and Eastern Kham in the early 18th century (Goldstein 1994). Developed in Kublai Khan's Yuan dynasty and later modified in Ming dynasty, the imperial governments use the *Tusi* system as an efficient strategy to pacify the unruly ethnic groups on the borderlands that are currently at southwestern China (Chang 2013). Assigning hereditary local elites as rulers, the *Tusi* system granted considerable autonomy to local leaders. *Tusi* possessed "absolute legislative, judicial, administrative, and military power" within his territory in exchange of tributes and taxes to the officials and regional warlords (Olson 1998, 52). Robert B. Ekvall, an American missionary-anthropologist observed in Gansu in 1938 "the Tibetans enjoyed almost complete independence and varying degrees of prestige" (Ekvall 1939, 6). Ekvall was referring to the Choni Price, a local *Tusi* (or as Ekvall states "viceroy") whose family ruled northern Kanlho for over 500 years. Choni *Tusi* also managed to obtain religious power by controlling Choni Gelug monastery. Nevertheless, just as the Choni monastery was destroyed later in Cultural Revolution, the political system of *Tusi* was also abolished in mid-1950s (Olson 1998).

Other than belonging to the *Tusi*, other tribes were "quasi-ruled" by the ecclesiastical monastery Labrang, one of the six major lamaseries of the Gelug school of Tibetan Buddhism constructed

in 1709 (Ekvall 1939; 11). According to the level of affiliation, tribes could be divided into *Lha-sde* and *Mi-sde*. *Lha-sde*, or the *holy tribes* referred to the large tracts of land and *mi ser* was offered as tributes by local kings to Labrang (The Tibetan & Himalayan Library 2016). Labrang assigned tribal heads to these monasterial manors. Ngulra and Dzoge Nyima in northern Machu were two of the eight *Lha-sde* tribes that were directly subordinated to Labrang monastery (Chang 2013).

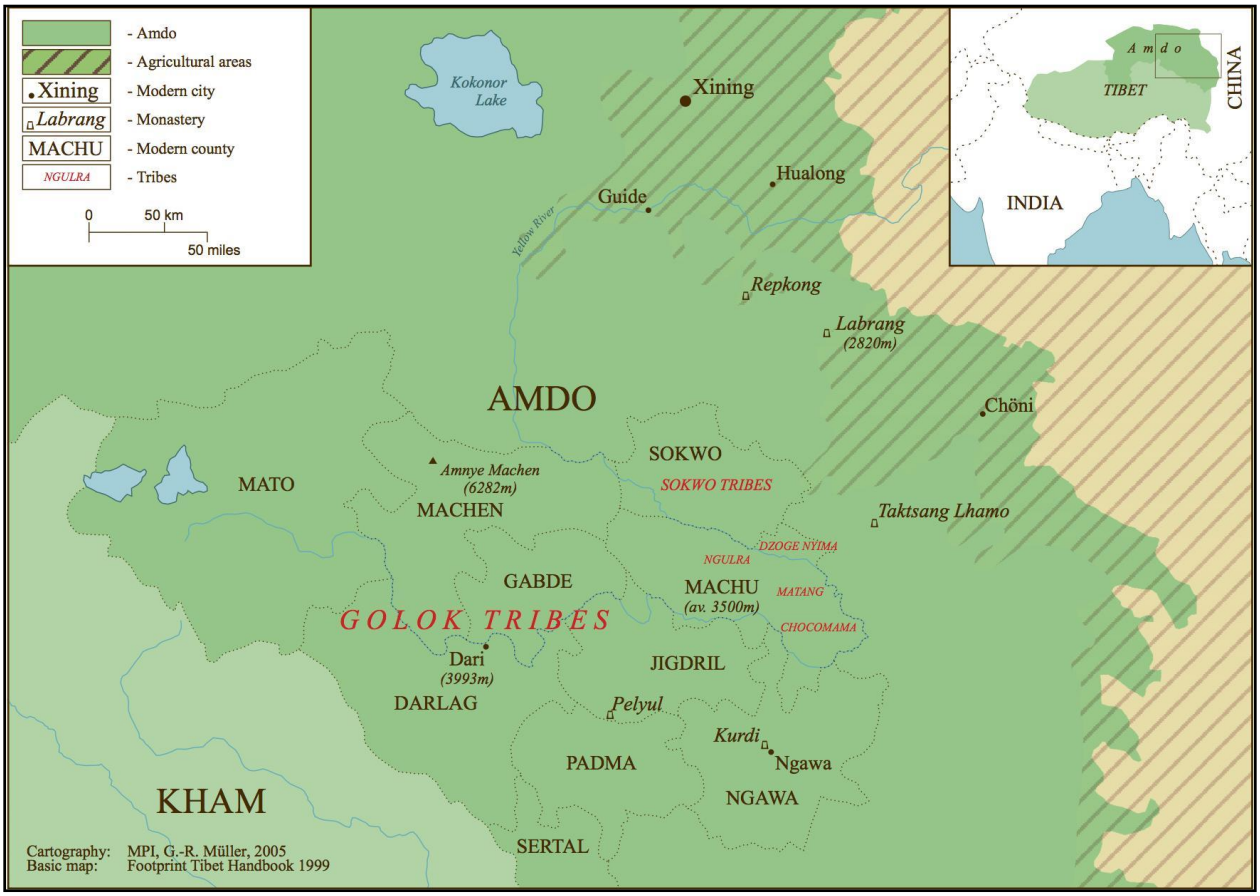

Figure 7. Location of Machu, Amdo and Labrang. Map by G.R Muller (Pirie 2005). Chocomama is a different transliteration of my study area Khro-Kho Manrima.

Comparatively, the Khro Kho tribe in southern Machu was *Mi-sde* (secular, government owned manor) of Labrang monastery (The Tibetan & Himalayan Library 2016). Khro-Kho became the *Mi-sde* of Labrang in Qing Dynasty. Labrang did not seek dominion over its *Mi-sde* tribes, but handled tribal affairs to its headmen. Contrary to *Lha-sde* where Labrang appointed the headmen directly, the headmen of Khro Kho were hereditary (Yang 2015). A headman remained the most

powerful ruler in the tribe, who decided the usage and allocation of pasture (Ekvall 1939; Yang 2015). Khro-Kho was subdivided into four sub-tribes: Manrima, Awanchang, Cairima, and Naierma. The headman then assigned leaders to each sub tribe.

Drokpa and encampments

During Ekvall's 1938 visit to the Gansu-Tibet border, he used a dichotomous category to describe nomadic and settled Tibetans in the region. Based on the place they inhabited, there are "nomadic *drok-pa* (*drok*-open country, steppe, free form forest and not precipitous; *pa*- a particle signifying relationship or participation) and *rong-pa* (*rong*-valley, and, by later usage, cultivated valley)" (Ekvall 1939, 69). *Rongpa*, or settled farmers often inhabit on the lower elevation agricultural regions, while the nomadic Tibetans live on the alpine plateau pastures (Figure 7).

The encampment, or *ruskor* (*ru*-clan, also means bone; *skor*-circle), is the basic unit of Tibetan *drokpa* herding society (Cencetti 2011). Members of an encampment are often related by blood and have a moral obligation of mutual support (Chang 2013). Ekvall observed "the smallest encampment I was ever in comprised only five tents, while the largest numbered eighty" (1939, 74). Different encampments migrated in an organized and regular way within their own tribal boundary to obtain the optimum resources at different times of the year and to cope with extreme weathers. A number of encampments constituted a tribe, or *tsowa*, whose members often are descendants of the same ancestor (Figure 8). *Tsowa* then further forms confederacies.

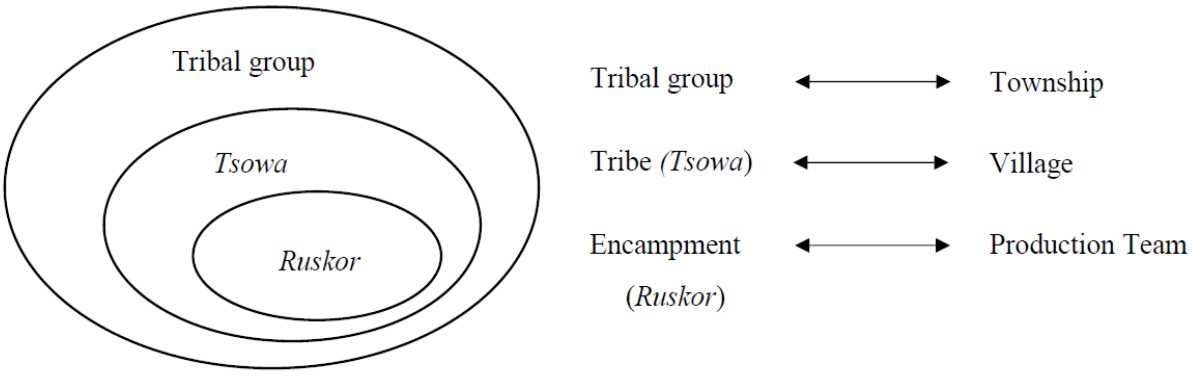

Figure 8. Labrang pastoral *Lha-sde* tribe structure and its equivalent to current day administrative units
Source:(Chang 2013, 91)

After 1958, the Chinese government developed new administrative units (i.e., people's commune, *xiang* C., equivalent to township) and mapped on the original tribal boundaries. Out of the nine *xiangs* in Machu, five were still present and named after the local tribes, and two were combined into one *xiang* while one tribe was divided into two (Pirie 2005). Matang, a previous state owned horse farm built in the Mao era, was also created as a new *xiang.* During the Cultural Revolution, the government changed some of the sub-tribal names into Chinese with Maoist political rhetoric (e.g., *Hongxin* red star; *Wuxin* five stars). My respondents used their tribal names in Tibetan and administrative names in Mandarin interchangeably.

Chapter 4: Methods

In this study, I used semi-structured interviews and participant observation, and triangulated with the secondary data I retrieved from the local government of Machu. From July to August 2015, I conducted semi-structured interviews of 43 households in Khro-Kho tribe and Matang in Machu County. I conducted most of interviews on or close to herders' summer pasture, and some were conducted on the places they seek for alternative livelihoods. The structured part of the interviews covered demographic data, livestock composition, land entitlement, and coping strategies. The interviews then extended to herders' own perceptions regarding the changing policies and environment. My intention is not to generalize the Amdo or Tibetan herders through this study, but instead to show the experiences and perceptions of different individual herders. I asked how the specific environment and local knowledge have shaped the coping mechanisms in this geographic setting. Therefore, this study is an intensive and detailed analysis on personal experiences and narratives.

4.1 Methodology: Semi-structured Interviews and Participant Observation

An interview is a verbal exchange as the interviewer is trying to encourage interviewees to express their understandings (Longhurst 2003). Kvale and Brinkmann (2009) point out that knowledge can be constructed through such interaction. They also argue a conversation is not with equal participants. Instead, the researchers take full control of the pace and the direction of the list of questions. Secor (2010) suggests to frame the questions by asking "What" and "How" instead of "Why." The former questions not only express the respect and curiosity towards the interviewees, but more importantly, such questions often lead to explanations rather than evaluations.

Dunn (2000) argues that structured, semi-structured, and unstructured interview can be placed in a continuum. One end of the continuum is the formal structured interview with pre-arranged questions that collects quantifiable data to "explain behavior within pre-established categories." The other end of the continuum is the open-ended unstructured interview, which attempts to "understand the complex behavior of members of society without imposing any a priori categorization" (Dunn 2000, 52). Semi-structured interview can be placed in the middle of this continuum (Fontana and Frey 1994).

Participant observation is also a commonly used tool in qualitative research. Hay (2005, 145) states that participant observation is "being a part of the spontaneity of everyday interactions where systematic understanding of 'place' can emerge." Delamont (2002, 219) proposes that the term "participant" observation means to participate enough to be able to write about the "nature of the work," which is "its pains and pleasures, smells and sounds, physical and mental stresses."

4.2 Gaining a Sense of de facto Land Tenure

Research Question 1*: How do herders manage their rangeland collectively and privately?*

In order to answer the research question, I started with a structured questionnaire that collected information on household demography (age, marital status, household composition), livestock management (livestock number and composition, livestock sold in the past year), and land entitlement (amount of land they own, collective or private management, relations between households). The full interview questions are in Appendix 2. I further transcribed and coded the data. Coded results are compared by attributes such as management pattern (collective or private), gender, economic status, and age.

I used Standard Sheep Unit to indicate the amount of livestock kept by individual households. Researchers often use Standard Sheep Unit (SSU) as a unit to calculate livestock based on the forage consumption level of different animals. In regions like Machu where herders base their traditional livelihoods almost exclusively on livestock rearing, SSU is also used to indicate herders' economic status. According to Miller (2011), a household that fails to keep 25 sheep units per person is considered living below poverty line. One standard sheep unit (SSU) represents an adult female sheep or goat. Generally speaking, one yak equals to 4 or 5 SSU (depending on its geographical location on the Tibetan Plateau), while one horse equals to 6 SSU (Miller 2001; Yan et al. 2005). In order to be consistent with other researchers in Machu, I used 1 yak to 4 SSU (Cao, Yang and Du 2012; Chen and Zhu 2014) in this study.

Table 2. The number of herders I interviewed in different township

Township	Awanchang	Cairima	Qihama	Manrima	Matang
	Khro-Kho Tribe				Previous State Ranch
Interviewees	14	9	9	6	5

4.3 Herders' Perceptions on Their Vulnerability to Natural Hazards and Water Shortage

Research Question 2*: How do herders perceive their vulnerability differently?*

According to Fontana and Frey (1994), qualitative interviews work well for investigating others' experiences, perspectives, and meanings. My research focused primarily on herders' perceptions towards environmental and institutional changes, therefore I used conversation based, informal semi-structured interviews to answer the second research question. This question examines whether herders perceive themselves have enough water resources for their livestock, and if they perceive themselves vulnerable to extreme climatic events. The questions that I asked the herders include:

- Do you have enough water in your encampment? If not, how do you solve the problem?
- In the past 10 years, are there any natural hazards that have caused major livestock losses? If so, how do you cope with them?
- How do you see the grassland quality in these years and what are the criteria that you use?

Most herders own two residences: a portable tent (either a black one made of yak hair, or a white one made of PVC) for summer, and a one-story brick construction for winter. Since I conducted the interviews in July and August, most herders were interviewed on or close to their summer pasture. I used the "convenience" sampling strategies and recruited the interviewees on site. I started the first 16 interviews by visiting different encampments, and conducted interviews inside or close to their tents. As mid-July approached, household heads often spent the daytime participating in community activities (e.g., attending religious ceremonies in the local monastery, racing horses). Therefore instead of visiting encampments, I stopped commuting herders on motorbikes and interviewed them on the roadside, or (on a rainy day) in our car in order to

ensure maximum privacy. I also interviewed herders that were pursuing alternative livelihoods in teahouse, shops, and construction sites. I intentionally kept a distance from children, or other interested passers-by, in order to create a quiet interview environment with minimum noise and distraction.

Of all the 43 herders I interviewed, only several could understand basic Mandarin. Therefore, I conducted all the interviews with the assistance of a local resident of Kanlho, who worked with Lanzhou University as their interpreter for field work for several years. My interpreter translated each of my questions to Tibetans, and then translated herders' responses in Mandarin back to me. All the interviewees were informed before the conversations that their names, personal information, and recordings are kept confidential.

4.4 Different Coping Strategies Used by Herders

Research Question 3: *What are the different coping strategies used by herders in Machu?*

Following the previous questions on how herders perceive their accessibility to key resources, and how they perceive their vulnerability toward natural hazards, the third research question asks how herders cope with the changes accordingly. This question is guided by Agrawal's framework (2010) on institutions, adaptation, and livelihoods. Since research question two has examined the communal pooling situation, this research question focuses on other coping strategies such as enhancing mobility, storage, and diversification. I asked the herders what were the traditional ways to cope with external stressors, and whether such coping strategies have changed after 2000, as herders were encouraged to manage their rangeland by individual household units. The interviews were guided by the following questions:

- Do you need to rent extra pasture? If so, tell me the reasons and how you rent it?
- Do you need to purchase forage? For how much?
- Do you have any other income (other than selling livestock and livestock products)? Can you tell me more about your experiences?
- Are you receiving any governmental subsidies or participating in any government-sponsored projects?

In addition to semi-structured interviews, I also triangulated the first-hand empirical data with the secondary data I obtained from the Bureau of Poverty Alleviation and Bureau of Animal Husbandry in Machu. The Machu County Statistical Yearbook (1990-2013) and Machu County Annals published in 2001 provided data on the changes in demography, migration, and school enrollment.

I also incorporate participant observations into the whole fieldwork process. I observed herders' daily life and herding activities, and experienced events and social interactions. By overlapping the interview information and my observations, I could better validate the statements given by the respondents and the data offered by the government. For this reason I recorded my personal thoughts and feelings through the time in Machu, since in the end it's not only the study of the locals' perceptions, but also a study of my situated knowledge, or in other words, "what I found" (Allsop et al. 2010, 217).

4.5 Limitations

One limitation of my study is that it reflects more about the male perspectives on the issues rather than females' because of the gendered division of labor. Rocheleau et al. (1996) demonstrate the division of labor in a household often produces differing rights and responsibilities, thus different strategies and decisions. In the case of Machu, or more generally Amdo region of China, there is a clear gendered division of labor in Tibetan households. Women are responsible for "in-tent" works such as milking yaks, making butters, drying yak dung and preparing food. Men are often in charge of herding and moving livestock to different pastures (in fact, men's responsibility to rotate grazing has been partially taken away as the land became privatized). This strong division of labor has determined that the majority of my interviewees are males since they possess the knowledge of herding. I tried to interview women first, some of whom confessed that they had limited understanding of the pastoral sector. They suggested that I interview their husbands. I managed to interview seven women that either self-identified as the household heads or claimed to know the knowledge of herding.

Another challenge for this study is the lack of secondary data before the 20th century. Nomadic societies usually left fewer transcripts compared to the agricultural civilizations. Machu's

complex geography and landform, and its unique location on the borderlands between Tibet and China also make it hard to access and written by outsiders.

Finally, as an interviewer and observer, I am conscious of the power-relationships among the herders, considering their class, social status, economic status, age, gender and ethnicity may influence their responses. I am also aware of my positionality that I am a Han female university student with the help of an interpreter to overcome the language barriers.

Chapter 5: Results

This chapter focuses on the finding based on my summer interviews and observation in Machu, China. Section 5.1 shows the comparison between de jure tenure (by law) and de facto tenure (in reality) in Machu, it also explains the existed regulations and social organization within the current tenure system. Section 5.2 further investigates the geographic variation of herders' perceptions toward exposure to climatic hazard and water shortage. Section 5.3 and 5.4 outlines the new strategies that herders have developed to cope with the external stressors.

5.1 Research Question 1: De jure Tenure vs. de facto Tenure in Machu

Research Question 1: *How do herders manage their rangeland collectively and privately?*

Because of the change in land use and land tenure, pastures around the world are becoming increasingly fragmentized (Galvin 2009; Sayre et al. 2013). The rights to access to pasture and water are progressively becoming formalized. High elevation and severe weather have protected the steppe on the Tibetan Plateau from the encroachment of agricultural activities. Instead, land tenure change becomes the primary reason for the increasing fragmentation of the steppe as well as the decreasing mobility of livestock (Table 3). This section shows the differences between de facto tenure (what law allowed) and de jure tenure (what is in reality) in Machu.

Table 3. Major changes in grassland policy and tenure since 1959. Made by Author

Period		Events	De jure tenure	De facto tenure
Pre-Collective	Before 1958			Tribe
Collective	1959-1980	Nationalization Land Collectivization	People's commune	Tribe
Post-Collective	1980 1984 1985	Commune dissolved Livestock privatization Livestock market Liberalization	Household	Tribe
	1997-now	Contract to individuals (1997-2003)	Single household	Encampment/ Individuals/ Tribe

5.1.1 De jure Tenure

The Collective Era (1958-1983)

After the implementation of land reform in China started in 1950, the social structure and land tenure in pastoral communities on the Tibetan Plateau changed radically. Pastures were no longer owned by landlords or Monasteries, but instead were nationalized. Although nationalization of grassland was not made into a law until 1982, the government established communes in the 1950s and 1960s and declared pastures as collectively owned property (Ho 2000; Bauer 2005). Other than pastures, livestock, labors, and materials all became properties of the people's commune. The commune assigned herding tasks to each production teams. During the interviews, the elderly herders recalled one "pastoral worker" needed to herd approximately 120 yaks for the commune in the collective era. The commune also built stone and sod walls to demarcate the territory between seasonal pastures within each tribe (Figure 9). These sod walls can be seen as the earliest form of fences. However, these sod walls are not exclusive as the modern barbed wire, as Sheehy, Miller and Johnson (2006) record that the *de facto* geographic extents of the nomadic pastoral boundaries have not been reduced and still corresponded with the tribal boundary in the collective era.

Post-Collective Era (1983-present)

The dissolution of the communes in the 1980s symbolized a coda of a collective period that lacked of motivation and responsibility. Along with the dismantlement of the communes, livestock were privatized and allocated back to herders. Numbers of livestock a household received highly depended on the amount of livestock the commune (tribe) owned at the time. For example, one respondent claimed receiving 1 yak, 10 sheep and 1 horse in the 1980s in Cairima, while another one in Awanchang stated he received 9 yaks, 14 sheep and 1 horses. This privatization of livestock in the earlier 1980s was influenced by the Household Responsibility System, a model that was considered by literature as a success in the agricultural sector of China. The Household Responsibility System, often seen as the end of the Maoist collective economy, guaranteed farmers and herders with complete responsibility to manage their land. The local government of Machu liberalized its livestock market in 1985, and started to contract the land to individual households in 1995 (Dalintai et al, 2012). According to my interviewees, the contract process happened between 1997 and 2000, with local officials measuring and defining the

boundaries. I observed most of the herders I talked with have fenced their encampment pastures (Figure 10).

Figure 9. Abandoned Stone and sod walls as seasonal pasture boundaries built in the Collective era.

Figure 10. Modern barbed wire fences.

5.1.2 De facto Tenure

By 2003, Machu government announced 96% of the pastures were officially contracted to individuals (Cao, Yang and Du 2012). However, my fieldwork results in Khro-Kho indicate that multiple tenure regimes coexisted. Herders favor a collective property right and manage their grassland as units of kin-based encampments. The size of these encampments I visited ranged from two households to thirty households. This section analyzes the characteristics of the different de facto tenure systems existed in the study area.

Multiple de facto Tenure Coexisted

Three types of de facto tenure existed among my interviewees: herding individually (10), herding in a collective encampment (30) and herding one season in an encampment and another season in a tribe (3) (Figure 11). Thirty-three of 43 herders that I interviewed were herding collectively as different encampments (Figure 12). Among the 38 interviews I conducted in Khro-Kho, three herders rented their pastures out, and only two were herding as individual households (Figure 13). On the contrary, all five herders that I interviewed in Matang managed their pastures as individual households. It is worth to mention that four of five herders in Matang held over 800 SSU, which made them the relatively wealthier families that I interviewed.

Among the 33 interviewees that herding collectively in Khro-Kho, three of whom still share either a common summer pasture or a winter one with their original tribe members. Three of them reported they are dissatisfied with sharing pastures with large numbers of households, even though that's the traditional pattern of herding. According to one herder (25, Cairima), "*Free grazing is terrible*" since there is no restriction or regulations over the 200 households that share the common resource with him. According to this herder, wealthiest households in his tribe can hold over 1800 SSU while the poorest families can only afford for 120 SSU. Another herder (67, Qihama) who shared winter pasture with 65 households said he "*truly don't think it's a good idea, because it's hard to negotiate anything*."

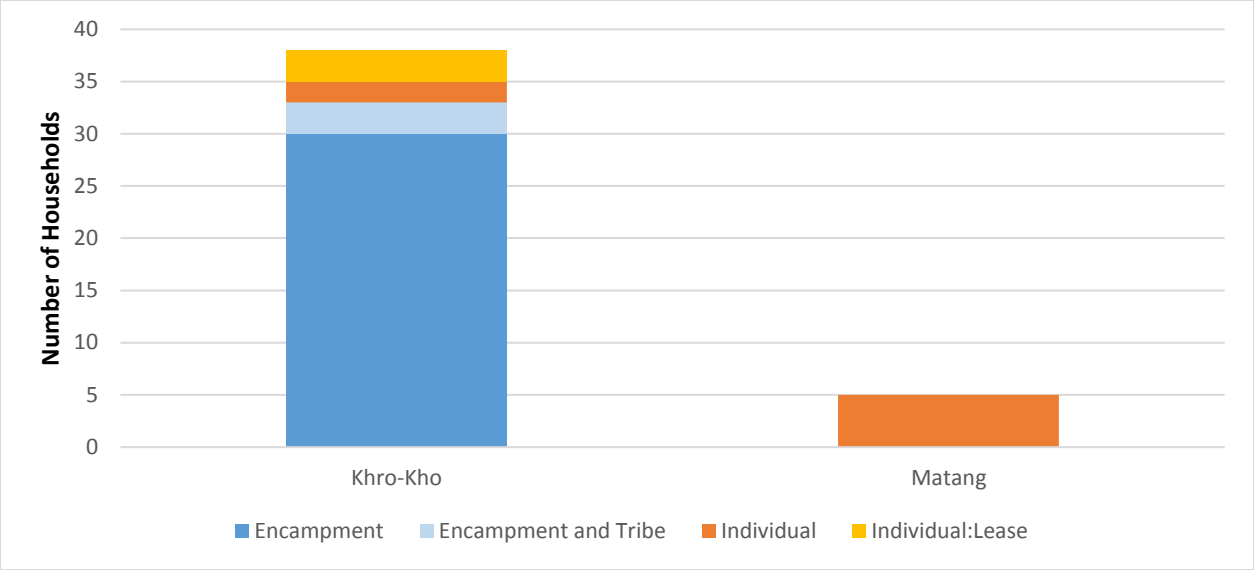

Figure 11. de facto tenure among the 43 interviewees

Secured External Boundary

As discussed in the chapter three, an efficient management unit in Khro-Kho has reduced from a tribe to an encampment. I observed that most households fenced the pasture owned by their encampments by barbed wire. The amount of land owned per person depended on the amount of land the tribe originally owned before 1980s. The number ranged from 15 acres to 58 acres per person in different encampments. Since the pastures were allocated in 1997-2000, individuals that did not reached 18 year old by 2000 could receive half of the amount, while children born after 2000 were not entitled to any pasture.

Internal-Regulation

The 33 encampments I interviewed in Khro-Kho all set hypothetical carrying capacities for their pasture. Although local government required a carrying capacity of 8 yaks per person, all encampments that I interviewed set their limitation between 17 to 20 yaks per person for an adult. This number translates to 68 to 80 sheep (SSU) per person, or approximately 100 yaks or 400 sheep for a household with five persons. For some encampments with members settling or working in town, other households were allowed to keep 8 to10 yaks per child (under age 18) by compensating the migrated households. Herders who migrated to or worked temporarily at town would receive 100-150 RMB ($ 15-22) per yak for other encampment members that used their

pasture every year. Therefore, if it was for a five people household in an encampment with a limit of 20 yaks/person, the household would receive 10000-15000 RMB ($1497-2245) a year as a compensation. Encampment heads were responsible for the allocation of pastures. Encampment members gathered, discussed, and decided the regulations. After a regulation was set, a household could either choose to graze under the limit, or leave the encampment and graze independently if they were unsatisfied with the community rules. As they left the encampment, they were also freed from following any of the community rules and restrictions.

Figure 12. Two traditional black yak hair tents from an encampment near the Yellow River.

Figure 13. An individual household.

5.2 Research Question 2: Herders' Perceived Vulnerability

Research Question 2: *How do herders perceive their vulnerability differently?*

As discussed in Chapter 2, vulnerability refers to the degree that certain social system is likely to experience harm when exposed to perturbation (Turner et al. 2003). This section investigates whether herders perceive themselves as vulnerable to natural hazards and resource shortage. Since pastoral economy highly depended on livestock production, I used livestock losses as an indicator of household vulnerability to natural hazards. Herders who lose a large percentage of their livestock in severe winter may fall below poverty level the next year. One example is the rapid increase of poverty rate after a severe winter in Nagqu prefecture in TAR recorded by Sheehy, Miller and Johnson (2006). After the winter in 1997-1998 in Nagqu, an extra of 20% of its 3400,000 population dropped below poverty line. Miller (2001) proposes that the break off point of poverty is 25 sheep units per person in Tibet. Therefore, for evaluating herders' perceived vulnerability, I asked if they had faced any water shortage, or lost any livestock in the past 10 years because of extreme climatic weather.

Topography related livestock losses

Different from my anticipation, my respondents attributed their livestock losses to certain topography rather than to hazards (Figure 14). Six herders attributed their livestock losses to the amount of shady slopes that were located on their pasture. Herders reported shady slope receives less radiation, encourages snow accumulation, and reduces the amount of forage available for livestock. One herder (43, Qihama) recalled in 2012 blizzard, he lost over 30 yaks because his *"winter pasture is located on a shady slope, where snow is unable to melt*." Another herder (31, Awangchang) said including him, 15 households from his encampment lost 100 yaks in 2013 because "*the pasture we rented has large acres of shady slope, [and] when the snow started to accumulate, it is just impossible to keep the yaks*." Herders that have larger amount of land manage to graze on their shady slopes in the summer, and save the grass their on their sunny slopes for winter to reduce the risk. However, poorer herders do not have enough land to circulate.

Similarly, herders living near a marsh were discontent with the location of their pasture. Proximity to a marsh leads to a higher risk of a parasitic disease, *fascioliasis hepatica.* *Fascioliasis*, also known as sheep liver fluke, causes weight loss and death of livestock. Again, better off encampments can afford to fence the marsh to prevent yaks from entering, other encampment can only rely on frequently purchasing veterinary drugs.

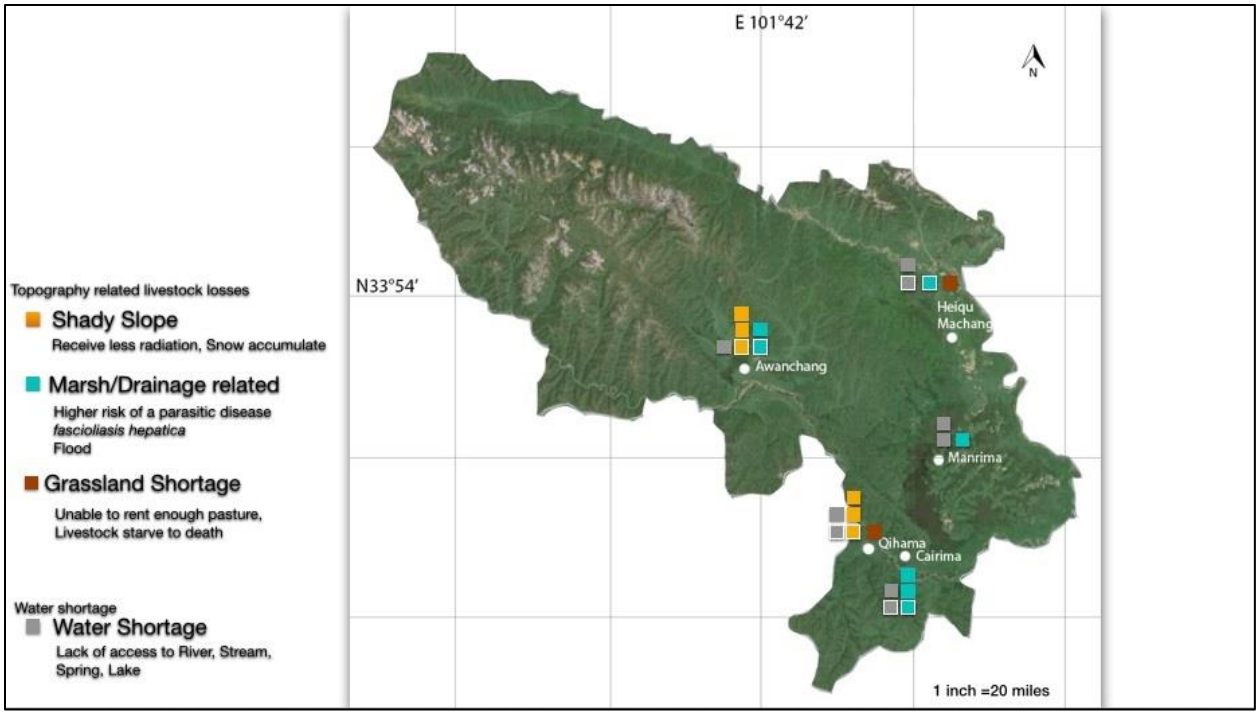

Figure 14. Topographic related livestock losses relate to hazard. White box indicates the same response from a single household. Map by author

High spatial and temporal variability of precipitation and water resources

Nine herders that I interviewed reported different levels of water scarcity. Although Machu receives an average of 525 millimeter rainfall in forage growth season, encampments still face water shortage if not proximate to streams or rivers, especially on higher elevation summer pasture (Figure 15). One respondent (48, Cairima) described how his encampment struggled with water for both themselves and livestock:

> When there is no rain, we have no water. I pay 300 RMB ($50) to the nearest tent circle each month, and carry water with 50 kg buckets. That water is for the daily use of our family… [For livestock] our encampment (7 households) has to rent pasture for 3 months this year to solve the water shortage problem... I do not blame the government, [since] the

location of our pastures were selected by drawing lots, I only blame myself on my bad luck.

Figure 15. Trampled spring on a mountain top pasture shared by human and livestock.

Not only are water resources (rivers, streams, springs, lakes) are distributed unevenly in different encampments, they also varied temporally. Even though herders have relatively "secured" water resource this year, such resource is not guaranteed in a draught year. Another herder (58, Awangchang) in an encampment of two households in said:

> The water for our livestock comes from a rain fed stream down the valley. Currently it is enough, however in 2008 to 2010, [we experienced] an extraordinary severe draught. In the summer when the grass grow, there was a long lasting shortage of water…We use plastic bucket to rent water… [And] every two-three days, we manage to move the yaks

> to a lake in our production team. Among other encampments [in our team], we were the closest to the lake, so we could make it.

Another herder (55, Matang) also described the change in a marsh near his settlement in the past several decades:

> Our place was different in the old times; we had lots of water grass (marsh grass) at the time. However, about from 20 or 30 years ago, the lake started losing about half of its water. There is huge change in climate too. I used to ride a horse into the marsh and [because the grass was tall, you] could not see me from outside, but now I can easily drive my motor bike in the marsh everywhere in the winter. There is just no water.

Herders therefore need to solve the problem by repeated migrating on their own seasonal pastures in a short amount of time, as is indicated by one herder (29) in Cairima:

> At the time when there was absolutely no rain, we moved the herd back to our winter pasture on the bank of the yellow river. And after half a month when it rained, we moved back to summer pasture…The distance is around 20 kilometer one way, and it takes us about a day to move the herds…We moved three times last year [from higher elevation summer pasture to winter pasture].

Ironically, lower elevation dwellers that are closer to marshes are dissatisfied by receiving too much rainfall. Because of poor drainage, rainwater accumulated and flooded their pasture. One herder (27, Cairima) was worried about the encroachment of the Yellow River, since his encampment was often flooded. He said, *"We are receiving too much rain this year, I am really afraid that the flood with break our bridge*."

Although some of the respondents need to rent pasture or purchase bucket water to offset water shortage, the rest of my respondents express they have secured water resources and are quite satisfied with their pastures. Their pastures are often located in lower elevation with easy access to rivers and streams.

Still, among the 43 herders I interviewed, 22 needed to rent pasture for certain amount of months in a year. Two herders in Matang and Qihama reported to have lost 120 sheep and 100 yaks that were "starved to death." Both of them explained that they are under a shortage of forage because they were unable to rent enough pasture. Even though some of the respondents did not lose livestock, they are were still under pressure of searching for quality pastures every years.

5.3 Research Question 3: Coping Strategies-Restore Mobility and Mutability

Research Question 3: *What are the different coping strategies used by herders in Machu?*

Under the current tenure system, renting pasture has become an efficient way for herders to cope with water or forage shortage. Twenty-two of my 43 respondents reported to have rented pasture in the previous year (Figure 16). The amount of pasture herders needed to rent depends on the amount livestock they keep, precipitation, forage quality, and the price and the availability of pastures.

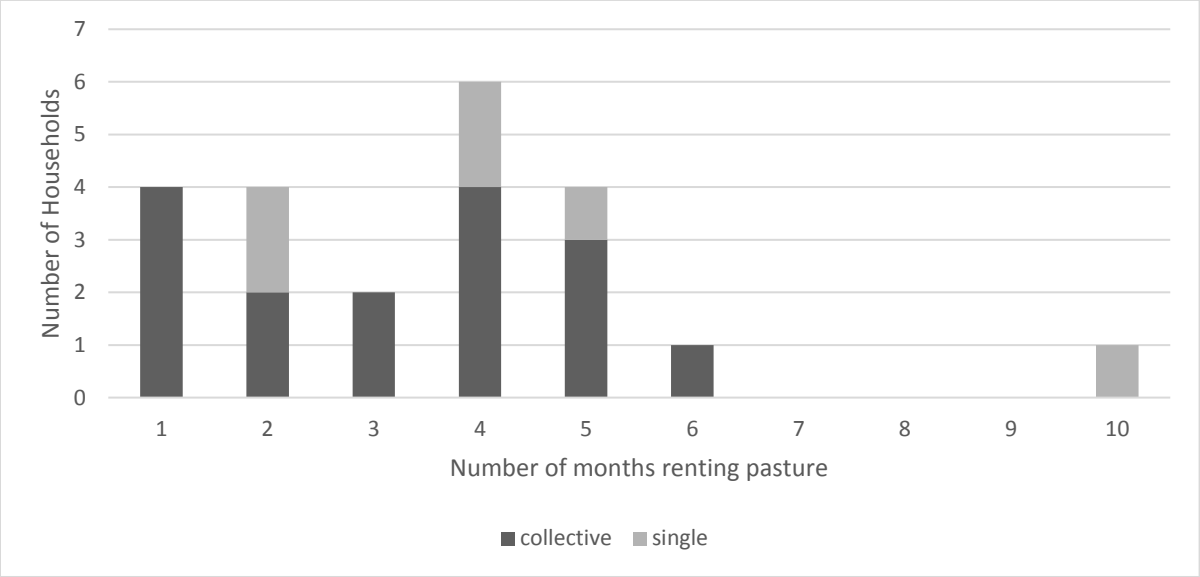

Figure 16. Number of months renting pastures in the past year by different households.

The distances of herders travelling to their rented pasture range from three hours to 1-3 days one way. Normally herders want to rent close-by pastures because it is difficult for livestock to graze along the asphalt road. One respondent replied his encampments spent three days moving their

herds to a valley in another township, because they were offered with an exceptionally low price (1000 RMB per person) for the past decade. Herders reported they paid a lower price when renting from acquaintances or from their tribal monastery (2000-3000 RMB per person); while a higher one from someone they had no relationship with. When asked how herders managed to feed their livestock on the way, their replies varied from "*relying on their friend's pasture along the way*" to "*secretly grazing on other people's pasture at night*."

5.4 Research Question 3: Coping Strategies-Alternative Livelihoods

Research Question 3: *What are the different coping strategies used by herders in Machu?*

Other than restore mobility through renting pasture, herders also cope with the risks and stresses by obtaining off-pasture income opportunities. Herders that I interviewed earn additional income by harvesting herb, participating in construction work, starting small business, and migrating outward.

Figure 17. "Strengthen the ability to improve herders' livelihoods, tighten the relationships between the party and the masses". A sign on the near Awangchang.

Herb Harvesting & Pasture leasing

Caterpillar fungus income is important to contemporary rural Tibetan economy. Caterpillar fungus income contributes to 8.5% of TAR's GDP and around 40% of its rural populations' cash income (Winkler 2009). Sulek (2011) observes herders in Golok TAP are selling off their sheep since fungus harvesting is much more lucrative than traditional herding. Since there is no educational, accessibility, or skill barriers for harvesting the fungus, the majority of households can benefit from this harvesting activity (especially the elders and children). It has become a critical mobile source of cash income for herders. Two herders reported they both earned around 20000 RMB ($3090) by collecting caterpillar fungus in the 40 days in harvesting season, which roughly equals to the price of selling five adult yaks. Five herders that I interviewed also rented their pasture and collected grassland fee in the harvesting season. However, previous study has shown herders often underreport their income through fungus collection, partly because they want to indicate their influences on grassland are insignificant (Sulek 2011). The annual grassland fee that renters pay for *Lamiophlomis rotata* (4000 RMB/200 mu) is much lower than for *Ophiocordyceps sinensis*, which reflects the market price disparity between the two herbs.

Nevertheless, because of the availability and accessibility of fungus yielding pastures, Caterpillar fungus business also indicates a "further differentiation of pastoral society" (Gruschke 2011, 236). Contrary to the abundance of fungus resource in TAR, Southern Qinghai and Sichuan, only western Machu is located in the core fungus distribution area (Winkler 2009). Caterpillar fungus resource is heavily concentrated in one township Awanchang (6 of 7 households that have fungus on their land), one of the five townships that I visited. And of the 43 herders I interviewed, only one had *Lamiophlomis rotata* on his pasture.

Construction Works

Among 43 of my interviewees, three women were working as seasonal construction workers (Figure 18). All of them are female household heads, a population that are often widowed or divorced and are economically disadvantaged if their natal family could not provide financial support. The amount of yaks they own cannot sustain their livelihood (lower than Miller's 25 SSU threshold); they often leave their livestock and pasture to their relatives' care. I interviewed

Lhamo cuo, a 33 year-old woman on a rain break on the construction sites. As a mother of two boys, she expresses how construction works can be a source of cash income:

> We have stopped herding because we do not have enough yaks. My husband is a farmer from Hezhuo. We did not hold a formal wedding, and therefore my family gave me very few yaks. I only have four [yaks] now and they are being taken care of by my brother. I also rented out my pasture. My husband is also working on this construction site. We only work about 3 months in the summer, and when the winter comes, we just stay in the house...Currently I am living in a house as a gift from the Dean of Machu People's Hospital, and the government offers our family 2000 yuan ($308) each season as a subsistence allowance.

Figure 18. Female construction workers.

Since working in this construction site requires negligible capital investments and skills, it offers these illiterate women an opportunity to gain income based on their physical strength. However, women are paid less (approx. $12) than men (approx. $18) daily become they are commonly assumed weaker than men are. My data on this topic is limited, future researches can investigate

how labor work contributes to the changing livelihoods for female household heads, especially for the older women, who are the most vulnerable among the impoverished population.

Family Owned Business

Opening a grocery store in a town is a common option for families that have some spare money. This option is for herders that have moderate SSU: they have to guarantee to have startup money and extra labor (women, elderly men) in their family to take care of the store. The owners of grocery stores also include monks or defrocked monks since they are well trained in math in the monastery.

Unsolicited Rural Out-Migration

The primary sector employment in plateau region of China has decreased steadily in the past 20 years (Fischer 2013). In recent years, intensive studies have analyzed the impact of government-led coercive resettlement and the challenges faced by resettled herders (e.g., identity crisis, reliance on governmental subsidies, language barrier, poverty, lack of alternative income opportunities) (Du 2008; Niyma 2010). However, in the context of Machu, my interviews and observation show rural-out migration is a choice, or a desperate move because of poverty or lack of grassland, rather than a coercive action. In a neighboring prefecture Yushu, unsolicited migration has also outnumbered the government's forced resettlement (Gruschke 2011). The herders I interviewed expressed the resettlement housing in town is "*good for children and the elderly*" become of its proximity to school, monastery, and hospital.

Instead, insufficient grassland is one of the major facilitators of the increasing outward migration. A common concern of my respondents is whether their children will earn a living with the limited amount of pasture (and livestock). It is a tradition that people receive fortune (e.g., livestock, pasture) as a gift from their natal family when they marry. However, for children that were born after 1997-2000, they have no pasture or only have half of the grazing permit (e.g., 10 yaks/person). Dorje, a young herder who only received 1 person's share of grassland and currently spent 6 month renting pasture in order to feed his livestock, expressed his concern:

> It has been 18 years since the Grassland Contract [has been implemented]. My children, and all the kids that are under 18 years old were not born then [to participate in the draw,

> and therefore] they have no land. So for the three of [my children], only the most well behaved and sensible one will stay with me, others have to rely on themselves. [How?] That is something I keep worrying about.

Insufficient grassland also increases tension in the encampments, as a result households that are discontent about the encampment rules often choose to herd individually or sell off their livestock. I interviewed Tering, a young Buddhist monk who chose to resume secular life after six years of monastic life. He recently sold all his livestock and invested in a well-designed teahouse:

> ...for herders like us [who were under 18 when the grassland was allocated], we received little amount of grassland [compared to the elder siblings], and our grassland will be segmented into much smaller pieces for our next generation.
>
> If your relatives or neighbors are good enough you can still strive to have some pasture to use, if not you truly need to find a new way of living. We [our encampment] negotiated the limit of livestock several times, we did again last year and cannot reach an agreement. Among all my relatives, I have the least amount of pastures. Therefore, if there is a restriction on the livestock number, my life will be very hard. Since my sons also need to come to school in town, [I thought] "all right then, I will make the sacrifice of leaving the pasture so that you guys can graze." Currently in my encampment, richer households want to rent pasture to enlarge their livestock, poorer family cannot afford to do it…However, there is no solution for that, things can just go this way.

Nevertheless, whether rural migrants (especially the landless youth) will succeed remains questionable. Firstly, source of income is still highly concentrated in the primary sector (i.e., animal husbandry) in Machu, while leaving comparatively few local jobs in other sectors. Taking a relatively developed township Awanchang as an example, there are only 97 persons registered as being employed in sectors other than Animal Husbandry (Table 4). The other townships in Khro-Kho have fewer shops and hotels compared to Awanchang, and therefore may provide fewer job opportunities.

Table 4. Employee by sector in Awangchang Township.

	Animal Husbandry	Industry	Transportation, Postal & Telecommunication	Wholesale & Retail	Accommodation & Catering	Total
Population	3230	48	15	19	15	3327

(Source: 2013 Statistical Yearbook of Machu County.)

Secondly, whether these migrants will be employed in other nearby urban centers remains doubtful either, since they are educationally disadvantaged. Tibetan students are unlikely to compete with their Han classmates in high schools because of the design of the curriculum. Kolas and Thowsen (2005) argue the curriculum were designed for student in central China in an unfamiliar language and therefore distanced from the reality and local knowledge of Tibetan students. Machu's declining student enrollment indicates Tibetan students' increasing dropout rate after finishing primary school (Figure19). Nevertheless, I found out through my interviews that attending high school in other counties, attending technical-secondary schools, and precipitating in apprenticeship training are also options for the Tibetan youths.

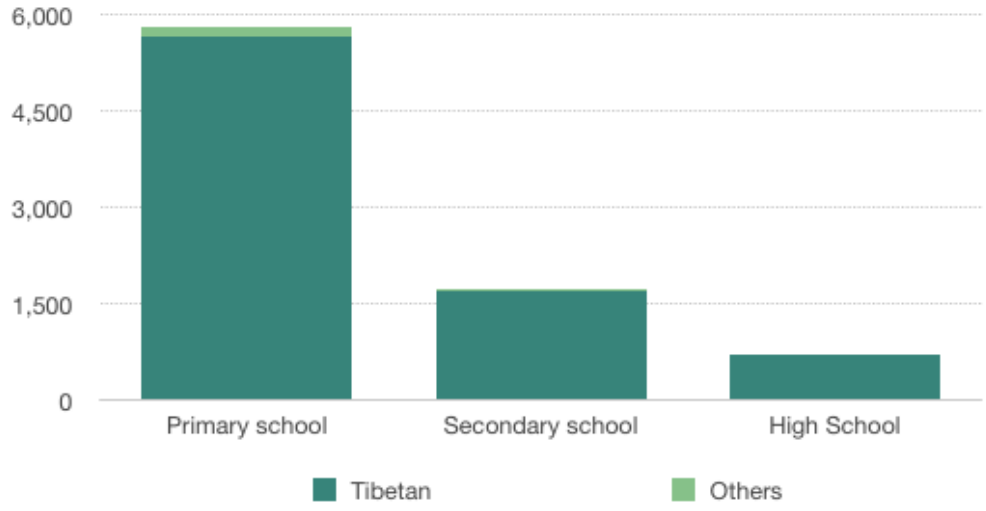

Figure 19. Tibetan students' enrollment in Machu County. Source:(Statistical Yearbook of Machu County 2013).

Tashi (50) started a new cellphone repair shop with his son last year, his response revealed the challenges for Tibetan youths in gaining an off-pasture livelihood:

> My younger son attended a technical-secondary school; however, his grade was not good. Of course, the school's education quality is not good either, so he left school. I wish my son to learn a specific skill, so I sent him to a garage to study how to repair a car, but it didn't work well and he ended up working as a security guard for a gated community in Machu for a year…Nowadays all the young people are "enjoying" their life in the teahouses. My son is also living in town now; however, he does not gamble or drink tea, or waste money. I really want my son to learn a skill, and after knowing one of my friends is repairing cellphones, I sent my son to his shop to be trained as an apprentice.

In sum, my fieldwork shows that though herding as individuals maximizes benefit, most herders prefer herding collectively in the unit of encampments. Although these herders need to follow strict regulations, they manage to avoid risks by pooling the resources communally. Nevertheless, certain encampments are disproportionately affected by the topography related to hazards and spatial-temporal distribution of water scarcity. In order to solve the water and forage shortage that are caused by fencing, herders now develop new strategies that focus on renting pastures and seeking for alternative livelihoods.

Chapter 6: Discussion

6.1 De jure vs. de facto Land Tenure in Machu

Research Question 1: *How do herders manage their rangeland collectively and privately?*

Despite the central government's continuous attempt to privatize pastures by contracting pastures to individual households, my fieldwork shows that most Khro-Kho herders chose to remain herding in the unit of kin-based encampments. Previous studies on the Tibetan Plateau refers to this strategy as "co-management" utilized by "household groups" or "multi-households" (Banks et al. 2003; Cao, Holden and Du 2011; Li, 2012).

My fieldwork shows multiple de facto tenures coexist in Machu, and the majority of the herders prefer herding as units of encampments. Before the 1980s, the functional customary de facto herding unit was a *tsowa*, or a tribe. However, herders' responses illustrate how this traditional tenure system may cause inequality under the current "uneven processes of neoliberalization on the Tibetan Plateau" (Yeh and Gaerrang 2011, 166). The communal tenure in a tribal level allows wealthier families to exploit the resources and shift the burdens to the poorer households, since the newly imposed privatization-focused grassland policies have weakened the tribal authority and its power of making effective regulations. Therefore, by herding as encampments, herders effectively exclude other un-related users from their land. By drawing a clear boundary with barbed wire, herders transform the publicly shared resources into secured properties that can be monitored and managed by kinfolks.

Researchers often see fencing on the Tibetan Plateau as a symbol of pasture fragmentation caused by the process of privatization and modernization. However, these barbed wire fences offer herders boundary protections, and eliminate grassland disputes and violent conflicts. In addition, a secured land use entitlement makes it easier to lease or rent pastures to intra-encampment members. Through an intensive ecological economic survey in Machu, Cao, Yang and Du (2012) observe that by herding collectively in an encampment, herders receive economic benefit by investing less on fences and guard dogs. Since livestock buyers favor central distributors rather than individuals, collective herders also have the advantage of selling as cooperatives. Herding collectively in an encampment also offers social and cultural benefits by

preserving the knowledge of "metrology, music, singing, dancing, arts, ritual, and horse racing (Cao, Yang and Du 2011, 158)".

Herders' responses also suggest there is a strong intra-encampment regulation. The 17-20 yaks per person limit is a result of community discussion with the participation of encampment members. Some of encampments set up a limitation a decade ago while some just set it up in recent years. Herders told me that occasionally the encampment will designated a person to count the livestock number of each household, but more often herders took oath on the amount of livestock they owned before they entered another seasonal pasture. They also revealed that by cheating on their livestock number, an individual is at risk of jeopardizing his and his families' own reputation and the sense of unity in the encampment. Therefore, social relations are still playing an important role in rural pastoral livelihoods. Herders are still relying heavily on family relations, influence, and reputation.

It is worth mentioning that there is a distinction between individual households in Matang and collective households in Khro-Kho. These differences in grassland management pattern can be explained partially by their family history. All five herders I interviewed in Matang are descendants of migrated herders from various tribes in Machu. During the collective era, their parents were recruited as "pastoral workers" to Matang, a previous state-owned ranch. Therefore, after the privatization of livestock and land in 1980s, these herders in Matang herd as individual households and have no relationships with their neighbors. These individual households do not need to follow any of the restrictions mentioned earlier. By herding individually, they do not have the obligation to follow any community rules, but they also lose the benefit of sharing resources and risks with others. Because of the lack of restriction, 4 of the 5 herders kept 800-1000SSU on their pasture, which is twice larger than herders who herd collectively in Khro-Kho (approximately 400-480 SSU for a 5-6 person household). Still, more interviews need to be conducted to see whether this is a common pattern in individual households in Machu.

In sum, the case study in Khro-Kho shows that tied by social relations, herders in secured external boundaries and those herding as encampments set up intra-encampment regulations. However, this is far from suggesting that this collective management guarantees equity. In fact, a

secured border eliminates mobility and thus the opportunities to escape from climatic hazards. The finding of my second research question shows this collective tenure can still render certain population more vulnerable to hazards and water scarcity.

6.2 Herders' Perceived Vulnerability

Research Question 2: *How do herders perceive their vulnerability differently?*

As herders secure their encampments by fences, they are also losing their mobility and flexibility. Mobility, together with mutability, is regarded by Williams as the "very essence of herding" (1996, 674). Mobility allows herders to move opportunistically across the heterogeneous landscape and search for the most nutritious forage, it also provides an opportunity for herders to move out of certain areas to avoid natural hazards or diseases (Klein et al 2012; Fernandez-Gimenez and Le Febre 2006).

My interview result shows that herders attribute their livestock losses to certain topography rather than to special climatic events. Instead of attributing their losses of yaks solely to a blizzard, herders often further explain that it is because they live in areas with shady slopes that renders them disadvantage in a snowy winter. Their responses further indicate the importance of mobility to the herders, and such loss may be avoided if they can move out of the shady slopes in a blizzard. Therefore, even though the process of contracting and allocating pastures seems fair, it renders certain encampments from accessing key resources and therefore makes them perceive themselves as more vulnerable. The herders' narratives also show that the over-simplified household contracts have not taken a cautious consideration of the spatial-temporal distribution of resources. As a result, these encampments need higher investments in veterinary drugs or purchasing water, which further stress them financially.

Livestock losses have different impacts on households. I interviewed a wealthier herder (47) in Matang who currently held 1030 SSU, and lost 400 SSU five years ago. He laughed when I asked him if it pose a problem on his livelihood, and explained it was not a pressure for him: "*It's the same as making business, one year good and one year bad, having dead yaks is completely normal for a nomad.*" However, another herder (27, Cairima) I interviewed who kept

160 SSU in a four person household (slightly above the subsistence line) said any livestock loss could be destructive to his livelihood since he could afford neither purchasing extra pastures or investing in any small business. The next section explores how herders developed coping strategies in order to avoid the negative consequences created by the external stressors.

6.3 Coping Strategies: Restore Mobility and Livelihood Diversification

Research Question 3: *What are the different coping strategies used by herders in Machu?*

Renting Pasture-Restore Mobility

Renting pasture has become the key strategy for herders to restore mobility and flexibility. On one hand, it reflects the predicament herders are facing on their fragmented landscape created by the grassland privatization policy. On the other hand, it also reveals through market exchange, how herders strive to reestablish a migration system that allows them to avoid potential loss. This corresponds with Agrawal's argument (2010) that, by enhancing mobility and communal pooling, a rural household distributes their risks across space and across other households.

Renting pasture as a unit of encampment also provides herders with certain economic and social benefits. In Yeh and Gaerrang's (2011) case study on the emergence of renting pasture in Guoli, Qinghai province, the authors demonstrate herders are transferring the risk to their poorer labors and charging high prices to their villagers. Yeh and Gaerrang argue such behavior suggests an "influence of neoliberal social arrangement" that a monetary relation has replaced the traditional social relationship. My respondents expressed similar concerns regarding the decreasing availability and increasing price of the vacant pastures. Interestingly, my field work shows that by renting pasture from acquaintances or local monasteries as an encampment, collective herders pay less than individual herders in Matang. It seems the remaining tribal organization still provides certain social benefits for the encampments in Machu.

However, although renting pasture helps herders to restore mobility, I observe that such practice disrupts the traditional seasonal movements, because most herders now choose to rent pasture according to their prediction of when they will "run out of forage." Therefore, the traditional

summer-winter seasonal migration has been gradually replaced by migrations that are more frequent.

Livelihood Diversification-Restore flexibility

My semi-structure interview results show that livelihood diversification provides additional opportunities for herders to earn a living. Households that have surplus money or capital can start a family owned business or lease pasture for herb harvesting. Working informally in a construction site provides opportunities for women to earn extra cash, however such job is seasonal and unstable. Finally, out-migration can be a way for landless younger generations to make a living. Nevertheless, it remains uncertain whether the Tibetan youth are well trained to make a living in big cities, or whether the surrounding urban centers can provide enough jobs for them.

In sum, mobility and flexibility has been the center of my three research questions. The privatization-oriented state policy has decreased the mobility of herders, and as a result, encampments or households on shady slopes or marshes are more vulnerable to livestock losses caused by climatic events. Renting pasture is a key method of herders to restore mobility, and seeking for alternative livelihoods becomes a way to restore flexibility.

Chapter 7: Conclusion

7.1 Answer to the Research Questions

Research Question 1: *How do herders manage their rangeland collectively and privately?*
Among the sweeping social changes occurring in the past century, the nexus of kin neighborhoods remain the basic element and root of the complex social organization of Amdo society (Chang, 2013). Compared to some pastoral regions around the globe where land tenure change has led to a complete destruction of indigenous institution and culture, Machu herders adjusted their own herding range in the unit of encampment, while remaining socially connected in the unit of tribe. The case study in Machu shows different types of formal or informal community rules have guided and defined the rights and obligations of pastoralists. The strong intra-encampment regulations is an example that tribal organization still persists and has considerable influence today.

Research Question 2: *How do herders perceive their vulnerability differently?*
Even though communal pooling of resources within encampments has provided herders with higher mobility and flexibility, the fragmented landscape created by national policies still render certain populations more vulnerable to external stressors. Based on the location of their pastures, herders experience hazards and water scarcity differently. Herders that live near to marsh or shady slopes are at a higher risk of livestock losses. Because of the spatial-temporal variability of precipitation and water resources, some encampments are experiencing more severe water shortage compared to others.

Research Question 3: *What are the different coping strategies used by herders in Machu?*
Restoring mobility through renting pasture and seeking off-pasture livelihoods have become the major coping strategies for herders. The tribal organization of Khro-Kho has allowed encampments to rent pasture at a lower price from acquaintances and monasteries. Therefore, by migrating on asphalt roads and moving more frequently among rented pastures, Machu herders are reconstructing mobility through market mechanisms. Other strategies include harvesting herbs, investing in small businesses, participating in off-pasture labor work, and out-migrations.

7.2 Future Policy and Research Suggestions

I situate my study in the existing geography and pastoral livelihoods literatures in four ways: Firstly, by examining the changing land tenure and tribal authority, this study evaluates how local institutions are influenced by and responded to external interventions. Secondly, this study also links de facto tenure to the region's tribal history. Thirdly, instead of generalizing "Machu herders," this study contributes to the literature by evaluating the differentiations among different households in terms of their vulnerabilities and coping strategies. Additionally, by using semi-structured interview as a method, this study tries to deliver herders' voice - a voice that is often neglected in the decision-making process-to the readers.

This study highlights herders' self-regulation and risk aversion through communal pooling. Such collective management, although it is against national grassland law, has actually been encouraged by local Machu government in reality. Although claiming that 93% of the land has been contracted to individual households, local government of Machu does not make further efforts in dividing each encampments into smaller individual households. My interviews corresponds with the observations of Cao, Yang and Du (2011) that local governments are more willing to deliver infrastructures (e.g., wells, winter settlement houses, solar energy projects) and stipends on farmers cooperatives to concentrated households instead of individual households. Therefore, governments or poverty-alleviation NGOs in other places on the Tibetan Plateau can adopt such strategies to support collective grassland management.

In addition, this study shows that depending on their physical locations, herders may perceive vulnerability differently. Current alternative livelihoods opportunities available are restrained to age, gender, education level and economic status. Therefore, future poverty-alleviation policies should target the needs of different groups. For example, such policies can focus on providing micro-finance for small business owners, while creating different job opportunities for the illiterate women and literate but landless youths.

Future researches can examine females' perspective toward the changing environment, social institution, and division of household labor. In addition, it is also important to understand the

influences of the fluctuating market price of yak meat or mutton on herders' vulnerability and coping strategies.

Appendix 1

Important words in different transliteration

Tibetan (Wylie)	Tibetan Phonetics	English	Chinese (pinyin)	Type
A mdo	Amdo	Northern Tibet	*Anduo*	place
Kan lho		Southern Gansu	*Gannan*	place
Rma chu	Machu	Yellow River	*Huanghe*	feature
Khro-kho	Chiaoko		*Qiaokao*	tribe name
Lha-sde			*Lade*	tribe name
Smad-ma			*Manrima*	tribe name
Mtsher-ma			*Cairima*	tribe name
Sne-ma			*Naierma*	tribe name
			Qihama	tribe name
Ngulra			*Oula*	tribe name
Dzoge Nyima	Nyima		*Nima*	town/tribe name
Tsho ba	Tsowa	Tribe	*Chuowa*	kin
Ru skor	Rukor	Encampments	*Ribuguo*	object
Matang		Horse pasturage	*Ma chang*	place/tribe name
Phrul rta	Trulta	motorbike	Motuo	object
'Brog pa	drokpa	Pastoralists	*Mumin*	people
		Native Chieftain	*Tusi*	people

I reviewed literatures written by Western, Tibetan and Chinese scholars written in different time, therefore it is common for a word to have different transliteration. I prioritize using Wylie in the thesis, and annotate C. when I am using pinyin.

Appendix 2

Semi-structured Interview Questions:

Household demography:

- Age
- Location
- Marital Status
- Household Composition

Livestock management:

- Livestock number and composition
- Livestock sold in the past year

Land entitlement:

- How many *mu* (1 mu=0.16 acre) of the land is contracted to you and your household members?
- Are you herding individually or privately?
- What is your relationship with other households in the encampments (relatives, friends or others)?
- What is the limitation of livestock numbers within your encampment?

1. Do you have enough water in your encampment? If not, how do you solve the problem?
2. In the past 10 years, are there any natural hazards caused major livestock losses? If so, how do you cope with it?
3. How do you see the grassland quality in the years and what are the criteria that you use?
4. Do you need to rent extra pastures? If so, tell me the reasons and how you rent it?
5. Do you need to purchase forage? If so, for how much?
6. Do you have any other income (other than selling livestock and livestock products)? Can you tell me about your experiences?
7. Are you receiving any governmental subsidies or participating in any government-sponsored projects?

Bibliography

Adger, W.Neil. 1999. “Social vulnerability to climate change and extremes in coastal Vietnam”. *World Development* 27 (2): 249-69.

———. 2006. Vulnerability, *Global Environmental Change*, 16 (3):268-81.

Agrawal, Arun. 2010. "Local institutions and adaptation to climate change." *Social dimensions of climate change: Equity and vulnerability in a warming world*, edited by Robin Mearns and Andrew Norton, 173-197. Washington, DC: The World Bank.

Allsop Debbie, Hannah Allen, Clare, Ian Cook, Hayley Raxter, Christina Upton, and Alice Williams. 2010. Ethnography and participant observation”. In *Research Methods in Geography: A Critical Introduction*, edited by Basil Gomez and John P. Jones, 206-221. MA: John Wiley & Sons.

Banks, Tony, Camille Richard, Li Ping, and Yan Zhaoli. 2003. "Community-based grassland management in western China rationale, pilot project experience, and policy implications." *Mountain Research and Development* 23 (2): 132-140.

Bassett, Thomas J. 1986. "Fulani herd movements." *Geographical review 76 (3)*: 233-248.

Blaikie, Piers M., and Joshua SS Muldavin. 2004. "Upstream, downstream, China, India: the politics of environment in the Himalayan region." *Annals of the Association of American Geographers* 94 (3): 520-548.

Cao, Jianjun, Nicholas M. Holden, and Du Guozhen. 2011. "The effect of grazing on plant species richness on the Qinghai Plateau, Tibet." *Grass and Forage Science* 3(66): 333-336.

Cao, Jianjun., Yang Yangyang and Du Fachun. 2012 “Research on the Management Models in Pastoral Areas in Qinghai-Tibet Plateau: A Case Study of Maqu, Gansu Province.” In *Restoring community connections to the land*, edited by María Edith Fernández-Giménez, Wang Xiaoyi, Baival Batkhishig, Julia A. Klein and Robin S.Reid, Robin S. *150-165.* MA: CABI.

Chang, Lixia.常丽霞. 2013. *Zangzu muqu shengtai xiguanfa wenhua de chuancheng yu bianqian yanjiu: Yi lapulen diqu wei zhongxing*. 藏族牧区生态习惯法文化的传承与变迁研究:以拉卜楞地区为中心 [The inherence and transformation of Tibetan Ecological Customary Law: An example of Labrang region]. Beijing: Minzu chuban she.

Chen, Haiyun, and Ting Zhu. 2015."The dilemma of property rights and indigenous institutional arrangements for common resources governance in China." *Land Use Policy* 42: 800-805.

Cutter, Susan, Bryuan J. Boruff, and W. Lynn Shirley. 2003 "Social Vulnerability to Environmental Hazards", *Social Science Quarterly*, 84 (2): 242-61.

Dalintai, Batjav Batbuyan, Li Yanbo and Cao Jianjun. 2012. "The Eurasian Steppe: History of Utilization and Policies on the Rangeland", "Participatory Framework for Building Resilient Social-Ecological Pastoral Systems. In *Restoring community connections to the land*, edited by María Edith Fernández-Giménez, Wang Xiaoyi, Baival Batkhishig, Julia A. Klein and Robin S.Reid, Robin S. *51-68.* MA: CABI.

Delamont, Sara. 2002. *Fieldwork in educational settings: Methods, pitfalls and perspectives*. New York: Psychology Press.

Dong, Shikui, Lu Wen, Shiliang Liu, Xiangfeng Zhang, James P. Lassoie, Shaoliang Yi, Xiaoyan Li, Jinpeng Li, and Yuanyuan Li. 2011. Vulnerability of worldwide pastoralism to global changes and interdisciplinary strategies for sustainable pastoralism. *Ecology and Society*, 16(2): 10-32

Du, Fachun. 2012."Ecological resettlement of Tibetan herders in the Sanjiangyuan: a case study in Madoi County of Qinghai." *Nomadic Peoples* 16 (1): 116-133.

Dunn, Kevin. 2000. "Interviewing". In *Quantitative Research Methods in Human Geography*, edited by Iain Hay, 50-82. New York:Oxford University Press

Ekvall, Robert Brainerd.1939. *Cultural relations on the Kansu-Tibetan border.* Chicago: University of Chicago Press.

FAO. 2001. "Pastoralism in the New Millennium". *Animal Production and Health Paper*. Rome: Food and Agriculture Organization.

Fernandez-Gimenez, Maria E., and Sonya Le Febre. 2006. "Mobility in pastoral systems: Dynamic flux or downward trend?".*The International Journal of Sustainable Development and World Ecology* 13(5): 341-362.

Fernández-Giménez, Maria E, Wang Xiaoyi, Baival Batkhishig, Julia A. Klein and Robin S.Reid, Robin S. 2012. *Restoring community connections to the land*. MA: CABI

Fischer, Andrew Martin. 2013. *The Disempowered Development of Tibet in China: a study in the economics of marginalization*. Maryland: Lexington Books.

Fontana, Andrea, and James Frey. 1994. "The Art of Science". In *The handbook of qualitative research*, ed. Norman K. Denzin and Yvonna S. Lincoln. 361-376. CA: Thousand Oaks

Frank, Andre Gunder. 1992. "The Centrality of Central Asia." *Studies in History* 8(1): 43-97.

Galvin, Kathleen A. 2009 "Transitions: pastoralists living with change." *Annual Review of Anthropology* 38: 185-198.

Goldstein, Melvyn. "Change, conflict and continuity among a community of nomadic pastoralists". In *Resistance and Reform in Tibet*, edited by Robert Barnett, and Shirin Akiner, 76-111. Bloomington: Indiana University Press.

Gruschke, Andreas. 2011. "Nomads and their Market Relations in Eastern Tibet's Yushu Region: The Impact of Caterpillar Fungus". In *Economic Spaces of Pastoral Production and Commodity Systems: Markets and Livelihoods*, ed. J. Gertel, and R. Heron, 211-230. UK: MPG Books Group

Hay, Iain. 2000. *Qualitative Research Methods in Human Geography*. South Melbourne: Oxford University Press.

Ho, Peter. 2000."China's rangelands under stress: A comparative study of pasture commons in the Ningxia Hui Autonomous Region." *Development and Change* 31 (2): 385-412.

Hutzler, C. 1999. Last of a dying breed, nomads settle down under Chinese plan. Associated Press, 7 April, quoted in Blaikie, Piers M., and Joshua SS Muldavin. 2004. "Upstream, downstream, China, India: the politics of environment in the Himalayan region." *Annals of the Association of American Geographers* 94 (3): 520-548.

Klein, Julia A., María E. Fernández-Giménez, Han Wei, Yu Changqing, Dulamsuren Dorligsuren, Du Ling, and Robin S. Reid. 2012. "Participatory Framework for Building Resilient Social-Ecological Pastoral Systems. In *Restoring community connections to the land* edited by María Edith Fernández-Giménez, Wang Xiaoyi, Baival Batkhishig, Julia A. Klein and Robin S.Reid, Robin S. *3-36.* MA: CABI.

Kolas, Ashild and Monika P. Thowsen. 2005 *On the margins of Tibet: cultural survival on the Sino-Tibetan frontier*. Washington: University of Washington Press.

Kvale, Steinar,. and Svend Brinkmann. 2009. *Interviews: Learning the craft of qualitative research interviewing*. Thousand Oaks, CA: SAGE

Li, Jin. 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.

Liu, Jimei, Li Wang, Yupeng Geng, Qingbiao Wang, Lijun Luo, and Yang Zhong. 2006. "Genetic diversity and population structure of Lamiophlomis rotata (Lamiaceae), an endemic species of Qinghai–Tibet Plateau." *Genetica* 128 (1): 385-394.

Longhurst, Robyn. 2003. "Semi-structured interviews and focus groups", in *Key methods in geography*, edited by Robyn Longhurst, 117-132. London: SAGE.

Lu, Junfeng, Zhibao Dong, Wenjin Li, and Guangyin Hu. 2014. "The effect of desertification on carbon and nitrogen status in the northeastern margin of the Qinghai-Tibetan Plateau." *Environmental earth sciences* 71 (2): 807-815.

Machu County Annals, 2001. Gansu People's publication

Machu County Statistical Report, 2013. Gansu People's Publication.

Miller, Daniel J. 1999. "Nomads of the Tibetan Plateau rangelands in western China. Part Two. Pastoral production practices." *Rangelands Archives* 21(1): 16-19.

Miller, Daniel. 2001. "Poverty among Tibetan Nomads in Western China: Profiles of Poverty and Strategies for Poverty Reduction." Paper prepared for the Tibet Development Symposium, Brandeis University, May 4-6.

Miller, Daniel J. 2005. "The Tibetan steppe". In *Grasslands of the World,* edited by Suttie, James Stephen Reynolds and Caterina Batello. 305–342. No.34. Rome: UN Food and Agriculture Organization.

Murphy, Daniel J. 2011. "Going on Otor: Disaster, mobility, and the political ecology of vulnerability in Uguumur, Mongolia". Phd Diss, University of Kentucky

Nyima, Tashi. 2011. Development Discourses on the Tibetan Plateau: Urbanization and Expropriation of Farmland in Dartsedo. *Himalaya, the Journal of the Association for Nepal and Himalayan Studies*, 30(1), 79-90.

Olson, David., Eric Dinerstein, Eric D. Wikramanayaake, Neil D. Burgess, George V. N. Powerll, Emma C. Underwood, Jennifer A. D'amico, Illanga Itoua, Holly E. Strand, John C. Morrison, Colby J. Loucks, et al. 2001. Terrestrial ecoregions of the world: a new map of life on Earth. *Bioscience* 51(11):933-938.

Olson, James Stuart. 1998. *An ethnohistorical dictionary of China*. Connecticut: Greenwood Publishing Group.

Pirie, Fernanda. 2005. "Segmentation within the State: The Reconfiguration of Tibetan Tribes in China's Reform Period". In *Nomadic Peoples* 9 (1-2): 83-102.

———. 2012. " Legal Dramas on the Amdo Grasslands: Abolition, Transformation or Survival?." *Revisiting Rituals in a Changing Tibetan World* 31: 83.

Richard, Camille. 2000. "Rangeland policies in the eastern Tibetan plateau: impacts of China's grassland law on pastoralism and the landscape." *Issues in Mountain Development* (ICIMOD) (4).

Rocheleau, Dianne, Barbara Thomas-Slayter, and Esther Wangari. 1996. "Gender and environment: A feminist political ecology perspective." *Feminist Political Ecology: Global issues and local experiences*: 3-26.

Sayre, Nathan F., Ryan RJ McAllister, Brandon T. Bestelmeyer, Mark Moritz, and Matthew D. Turner. 2013. "Earth Stewardship of rangelands: coping with ecological, economic, and political marginality." *Frontiers in Ecology and the Environment* 11 (7): 348-354.

Secor, Anna. 2010. "Social Surveys, Interviews, and Focus Groups". In *Research Method in Geography: A Critical Introduction*, edited by Basil Gomes and John Paul Jones III, 194-205. West Sussex: Wiley Blackwell.

Sheehy, Dennis P., Daniel Miller, and Douglas A. Johnson. 2006. "Transformation of traditional pastoral livestock systems on the Tibetan steppe." *Science et changements planétaires/Sécheresse* 17(1): 142-151.

Shrestha, Bhushan, Weimin Zhang, Yongjie Zhang, and Xingzhong Liu. 2010. "What is the Chinese caterpillar fungus Ophiocordyceps sinensis (Ophiocordycipitaceae)?" *Mycology* 1 (4): 228-236.

Sulek, Emilia. 2011 "Disappearing sheep: The unexpected consequences of the emergence of the caterpillar fungus economy in Golok, Qinghai, China." *Himalaya, the Journal of the Association for Nepal and Himalayan Studies* 30 (1): 9

Sutton, Mark and E.N. Anderson. 2013. *Introduction to Cultural Ecology*. Walnut Creek, CA: AltaMira.

Tibetan and Himalayan Library, "Tibetan and Himalaya Maps". Accessed 15 April, 2016 http://www.thlib.org/places/maps/collections/show.php?id=387

Tibetan and Himalayan Library, "THL reference". Accessed 12 November, 2015. http://www.thlib.org/reference/

Turner, Billie., Roger E. Kasperson, Pamela A. Matson, James J. McCarthy, Robert W. Corell, Lindsey Christensen, Noelle Eckley, Jeanne X. Kasperson, Amy Luers, Marybeth L. Martello, Colin Polsky, et al. 2003. "A framework for vulnerability analysis in sustainability science." *Proceedings of the national academy of sciences* 100 (14): 8074-8079.

Wang, Jing, Ni Guo, Tian-hu Han, and Bin Sun. 2008. "Ecological benefit assessment of grassland restoration project: a case study of Maqu and Anxi county in Gansu province." *Pratacultural Science* 12: 012.

Watts, M, 1983. "On the poverty of theory: natural hazards research in context". In *Interpretations of Calamity for the Viewpoint of Human Ecology*, edited by Kenneth Heweitt 231-262. Boston: Allen and Unwin, 1983.

Williams, Dee Mack. 1966. "The barbed walls of China: A contemporary grassland drama." *The Journal of Asian Studie*s 55 (3): 665-691.

Winkler, Daniel. 2009. "Caterpillar fungus (Ophiocordyceps sinensis) production and sustainability on the Tibetan Plateau and in the Himalayas." *Asian Medicine* 5 (2): 291-316.

Wisner, Ben., Piers Blaikie, Terry Cannon, and Ian Davis. 2004. *At risk: Natural hazards, people's vulnerability and disasters.* London: Routledge.

Wu, Gao-Lin, Wei Li, Xiao-Peng Li, and Zhi-Hua Shi. 2011. "Grazing as a mediator for maintenance of offspring diversity: sexual and clonal recruitment in alpine grassland communities. *Flora-Morphology, Distribution, Functional Ecology of Plants* 206 (3): 241-245."

Yan, Zhaoli, Ning Wu, Dorji Yeshi, and Jia Ru. "A review of rangeland privatization and its implications in the Tibetan Plateau, China". *Nomadic peoples* 9 (1): 31-51.

Yan Zhaoli, L. Guangrong, and W. Ning. "A probe into the pastoral production system in Hongyuan, eastern Qinghai-Tibetan plateau." In *Yak production in central Asian highlands. Proceeding to the third international congress on yak held in Lhasa, P.R China 4-9 September 2000*, edited by Han Jianlin, Richardn C, Hanotte O, McVeigh C and Rege J.E.O. 120-127 Nirobi, Kenya: ILRI (International Livestock Research Institute), Accessed March 10, 2016. https://www.researchgate.net/profile/Han_Jianlin/publication/239806249_Genetic_variation_of_mitochondrial_DNA_within_domestic_yak_populations/links/0a85e531fb2ffc2a61000000.pdf#page=127

Yang, Yong. 2015. *Chuantong shehui kongzhi: buluo zhengquan zuzhi yu zhidu yunzuo-yi gansu zhangqu buluo shehui wei zhongxing yanjiu*. 传统社会控制：部落政权组织与制度运作-以甘肃藏区部落社会为中心研究. [Tradition societal control: Tribal political organization and institution-a study on Gansu Tibetan Tribal Society] in Qingzang Gaoyuan Luntan [Qinghai-Tibetan Plateau Forum]

Yao, Yu-bi., Wang Rim-yuan, Yin Dong, Deng Zhen-Yong, Zhang Xiu-yun and Li Xia. "The causes of grassland degradation and corresponding prevention strategies: a case study in Maqu county." *Resources Science* 29 (4): 127-133.

Yeh, Emily T. "Tibetan range wars: spatial politics and authority on the grasslands of Amdo." *Development and Change* 34 (3): 499-523.

———. 2009."Greening western China: A critical view". *Geoforum* 40 (5): 884-894.

Yeh, E., and Gaerrang, 2011. "Tibetan pastoralism in neo-liberalising China: continuity and change in Gouli". *Area* 43 (2): 165-172.