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**Land Tenure and the Sustainability of Pastoral Productive Systems: A
Comparative Institutional Analysis of the Andean Altiplano and the
East African Savannah**

Gerardo Damonte, Timothy Njagi, Lilian Kirimi, Manuel Glave and Sandra Rodriguez

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By

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Tegemeo Institute

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Executive Summary

Pastoralism is the main production system practised in rangelands and drylands, providing livelihoods to an estimated 500 million people globally. Alternative land production systems are not feasible in these areas due to harsh weather and climatic conditions. Nowadays pastoral communities face challenges to accessing land and mounting pressure on their livelihoods due to misconceptions about pastoralism and global trends including population growth and climate change.

This paper analyses the correlation between pastoral land tenure systems and the sustainability of pastoralism as a production system. We compare two regions in particular - the Andean *Altiplano* and the Kenyan Savannah – where we identify five types of collective land regime. We explore how these land tenure systems have changed over time and analyse the impacts on the sustainability of pastoralism within these very different ecological, social and cultural environments. We use a comparative case study approach to our analysis because it provides the possibility of isolating causal mechanisms for individual cases as well as constructing valid generalisations beyond the study areas.

We find that collective land tenure is positively correlated with the sustainability of pastoral production systems. In contrast, individualisation of land tenure discourages these practices despite the fact that public policy in Kenya and the Andean region has favoured this process over recent years, thereby threatening the very survival of pastoral communities.

We therefore recommend that public policy should be re-oriented to help pastoralist communities maintain collective land tenure regimes. In particular, we recommend policies aimed at strengthening community governance mechanisms to effectively manage land and supporting collective action among herders to improve access to markets and their trading power.

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Acronyms

CAPS	Cooperativas Agrícolas de Producción (Agricultural Production Cooperatives)
CCL	Collective-Choice Level Rights
CLA	Community Land Association
MASL	Metres Above Sea Level
NGO	Non-Governmental Organisation
OL	Operational Level Rights
SAIS	Sociedades Agrícolas de Interés Social (Agricultural Societies of Social Interest)
USAID	United States Agency for International Development
WISP	World Initiative for Sustainable Pastoralism

1. Introduction

Pastoralism is an extensive form of livestock production that constitutes the main production system found in rangelands and drylands worldwide. It is practised by an estimated 500 million people globally, a large majority of whom live in developing countries (WISP 2014). Rangelands and drylands cover approximately 40% of the world's total land surface (United Nations 2011) and are characterised by low and irregular rainfall coupled with either extremely high or low temperatures. While these areas are generally unsuitable for rain-fed crop production, they are more amenable to livestock production and especially extensive pastoral systems which use low levels of inputs, such as labour and capital, relative to the pasture land area.

Various studies indicate that pastoral societies around the world are facing more pressures on their livelihoods than ever before (Blench 2001; Fraktin and Mearns 2003; Salzman 2004; Fraktin 2005; WISP 2014). First, pastoralism is regarded as outdated, unproductive and environmentally destructive. Despite evidence to the contrary, these beliefs have persisted particularly in sub-Saharan Africa where policies have sought to transform pastoralism into sedentary and intensified production systems, which use high levels of inputs and are believed to enhance market-led development. Second, pastoral communities face pressure from population growth, climate variability and change as well as land grabs (WISP 2014). Increasing population has led to a decline in land available for pastoralists since animal herds have remained largely unchanged. The same effect has been felt as a result of the fragmentation of rangelands, which has seriously complicated the sustainable management of dryland resources (Fratkin and Mearns 2003; Scoones 1995 and 1996; Lane 1997). Land grabs by international companies and foreign governments have occurred based on the assumption that pastoral lands are largely underutilised, and due to a lack of protection of and low investment in pastoral land (Cotula et al. 2009).

Within this scenario, governments have developed policies intended to support other more intensive or supposedly more profitable uses of rangelands. On the one hand, some policies have promoted the individualisation, registration and titling of commonly used pastoral land in order to develop more intensive agricultural or cattle raising activities. On the other hand, governments, private sector and other actors have promoted changes in land use in pastoral areas to large-scale agricultural developments and public sector investments, mineral extraction and other uses considered profitable. However, these policies have not produced the expected results since rangelands are unsuitable for intensive production and the introduction of alternative land uses has sometimes led to displacement of the local population and environmental degradation (Lawry 1990;

Fratkin 1997).

Recent literature shows that pastoral communities are able to make efficient use of the limited resources provided by dryland ecosystems by developing extensive systems of production. They adapt their productive activities to the high climate variability and uncertainty of rangelands. Thus, pastoral production systems are proving to be not only the most suitable for rangelands but also the more sustainable (Fratkin and Roth 2005; Xiaogang 2009). Key to understanding how the sustainability of pastoral systems can be strengthened is a clearer explication of how pastoral communities manage and use land through a number of different tenure regimes. To date, this question not been studied in enough detail.

Several types of collective land tenure exist in which collective rights over land are assigned to nuclear families, extended families or communities. We contend that the existence of these collective rights is fundamental to enable sustainable production practices amongst pastoral societies. However, development policies have tended to promote the individualisation of land rights, based on the belief that this will automatically lead to improved market development. Yet these policies are actually undermining the capacity of pastoral communities to maintain their livelihoods. Thus, a policy change is urgently required to support collective production systems and promote the sustainable use of drylands and rangelands in Latin America, sub-Saharan Africa and beyond.

To develop our argument, we compare two very different pastoral areas in the world – the Peruvian *Altiplano* and the Kenyan Savannah – in order to assess the extent to which the relationship between collective land tenure regimes and sustainability can be established in different environments and social contexts. Pastoral communities in Peru and Kenya inhabit environments that differ significantly both in terms of climate and the type of animals they keep. The rangelands in the Andean *Altiplano* are located in high altitude zones (3500 masl) and are characterised by long dry periods, irregular rainfall and low temperatures (Damonte et al. 2016). In contrast, the Kenyan Savannah is located low altitude areas and is characterised by irregular rainfall and high temperatures. Due to the differences in ecological environments, the types of animals kept by pastoralists also differ between the two regions. While in the Peruvian *Altiplano* pastoral communities herd alpacas, llamas and sheep, in the Kenyan Savannah cattle, sheep and goats constitute the main livestock breeds. If we are able to establish that collective land tenure regimes lead to greater sustainability in two such different environments, our confidence in the credibility of this relationship will be greater. The overall objective is to draw out lessons for strengthening the

sustainability of pastoral productive systems across the world.

This paper is divided into four sections. In the following section we describe the data collection and analysis processes before presenting a brief history of pastoral activities in the Peruvian *Altiplano* and Kenyan Savannah in Chapter 3, in order to contextualise our study. In Chapter 4 we introduce the concept of land tenure regimes and present taxonomy of those found in our case studies. In Chapter 5 we explain the connections between land tenure regimes and the sustainability of pastoral production practices in Kenya and Peru. We then compare, drawing on our case studies, collective and individual land tenure regimes as enablers of such sustainable practices. Finally, we summarise our findings and provide some conclusions and policy recommendations.

2. Methodology

We have used a comparative case study methodology in our analysis. This method is suitable because it allows us to examine intervening variables in individual cases on which causal mechanisms may have worked. It also allows us to construct valid generalisations through establishing causal relationships and intervening factors, thereby allowing us to draw out lessons that apply beyond the specific case studies (Bennet 2004; Bennet and Elman 2006). In addition, case study analysis is suitable when there are more variables of interest than data points, so one result relies on multiple sources of evidence and is obtained by triangulating data (Yin 2003; Stake 1995). In doing so, we are able to analyse the links between land tenure regimes and sustainability from different sets of data and in relation to specific environmental conditions. In our approach, we follow a two-step strategy where we first analyse each case individually in order to understand it in its own context, and we then carry out a comparative analysis between cases.

Our case studies represent different collective land tenure regimes existing among pastoral communities. We classify these regimes according to how community members exercise their different rights over land, and the basis over which those rights are held. Based on this classification we analyse how collective land tenure regimes have changed over time and in space (different collective land regimes existing in the same time period).

Since working with just once case study lead to biased results (Collier 1993; Flyvbjerg 2006; Seawright and Gerring 2008), we have selected to compare two case studies representing two very different contexts, specifically the Andean *Altiplano* and the Kenyan Savannah. This comparative approach -across different spatial and temporal frames- enables us to minimise this bias.

In Peru we focus our analysis on the pastoral communities and families living in the highlands of Caylloma province located in the southern Andean region of Arequipa. Caylloma province was selected for three reasons. First, Caylloma has a long history of pastoral production and links with the wool export market. It is, therefore, considered one of the most important regions for pastoral production in the Andean *Altiplano*. Second, the territorial characteristics of the province are not uniform and different types of land tenure regimes have existed over time and during the same period. This provides the opportunity to analyse a variety of land tenure regimes and how they coexist under different conditions. Third, some pastoral communities in Caylloma are facing problems of productive sustainability, which are common to other parts of the *Altiplano*.

In Kenya we analyse four pastoral communities residing in different locations across the country, each with different types of land tenure regime. The first is the Kiina community found in Isiolo County. The Kiina community has a long history of pastoral production under a communal system. They own their territory jointly and use it communally according to customary laws and systems which have been maintained over several decades. The second is Ipolei group ranch located in Laikipia County. This pastoral community exercises a hybrid land tenure regime that incorporates customary and modern legal systems. Government policies in Kenya led to the introduction of group ranches, which are essentially a form of land privatisation, but land is registered to a group rather than to individuals. However, in the case of Ipolei group ranch, the community has maintained customary land use practices, ignoring the official governance rules that apply to registered group ranches. The third case is Naroosura group ranch found in Narok County. This community has now introduced individual privatisation of land, although land was previously owned communally. The last case is Mailua community found in Kajiado County. In this community, land was previously owned and used communally but it has now been fully privatised and is held by individuals. These four communities provide an opportunity to compare different land tenure regimes within Kenya and also with similar land tenure regimes in the Andean *Altiplano*.

In both regions we have selected pastoral communities where collective land tenure regimes have historically been the most common and where, in some cases, pressure for land individualisation has produced land fragmentation. These conditions enable us to analyse the impact of these processes on the sustainability of pastoral productive systems.

Large pastoral estate/ranches are not common in either study area. In Kenya, large private ranches are owned by aristocratic families who acquired the land during the colonial period. At that time, the law allowed the colonial administration to claim or bequeath land as a gift or reward. In subsequent years, ownership of these lands has been passed on through inheritance or sold to other aristocratic families. These ranches are mainly used for tourism, wildlife conservation and livestock keeping. At present, acquiring similar sizes of land is very challenging as it involves either disenfranchisement or displacement of communities, similar to land grabs (Cotula 2013). Comparative studies across very different regions are certainly important in order to learn from their similarities and differences. However, “wide” comparative studies also have their limits. In our study, the specificity of local institutions has to be found in their own history and context, so land tenure regimes in the *Altiplano* and Savannah cannot be equalized. This is why we compare land

tenure regimes' rights structure and divide them just in two groups: the regimes that maintain some collective rights over land and the individual ones.

Primary data collection was carried out in 2015. In the Andean *Altiplano*, three methods of qualitative data collection were used: non-participant observation of herders and cattle raising activities, focus group discussions in pastoral communities and structured and semi-structured interviews. Specifically, we completed data sheets specifying flock management among 16 pastoral households, conducted 17 semi-structured interviews with herders, and carried out 8 focus group discussions in Callalli (2), Caylloma (3) and Inmate (3) districts. All non-referenced information comes from these primary sources. As for secondary data, several sources such as academic papers and books, government reports, public databases and maps have been used. In the case of the Kenyan Savannah, focus group discussions comprising 15 to 20 participants were carried out in Isiolo, Laikipia, Narok, and Kajiado counties. Semi-structured questionnaires were used to collect information during focused group discussions. This was supplemented by secondary data drawn from County Statistics and Land Adjudication offices.

1. Pastoral Communities in the Peruvian *Altiplano* and Kenyan Savannah: Different Contexts, Similar Histories

Although the context and history through which pastoral societies have evolved in the *Altiplano* and Savannah are different, some similarities can be found in the way that the governments across both regions have handled pastoralist societies. In recent decades, both regions –the East African Savannah and the South American *Altiplano*- have witnessed a shift in state policy aimed at pastoral communities from those that supported pastoral production and state-sponsored forms of association to liberal policies promoting land individualisation and market development.

1.1 Pastoralism in the South American Altiplano

In South America, pastoralism is concentrated in the semi-arid Andean region known as the *Altiplano*, which reaches over 3,500 masl. Although this territory is far from uniform, two major zones can be distinguished: the Central Andes which include the central and southern Peruvian highlands as well as the Bolivian highlands; and the Southern Andes which stretch over northern Chile into the north-west Argentina.

Pastoralism in this region was virtually ignored until the 1960s, as it was believed that this production system could only be found in the ‘Old World’. However, historical and archaeological research demonstrated that contemporary pastoralism was an echo of a native culture tightly linked with camelid herding, and that actually the Andean highlands were one of the most important centres of mammal domestication in the world (Browman 1989). Native people of the Andes domesticated the wild vicuña and guanaco and subsequently developed the llama and alpaca from these species through selective breeding around 5,000 to 7,000 years ago.

With the incorporation of the Andes into the Spanish empire, the territories where pastoralists lived turned into the very centre of economic and political activity, while pastoralist population became indispensable economic agents (Gil 2009). It was in the *Altiplano* where the main economic activity of the *conquistadores*, mining, was carried out. Here, the herding population provided an essential source of labour and herders’ caravans provided the principal means of transportation until the 20th century.

The early republican period was characterised by the expansion of private estates known as “*haciendas*” in former indigenous territories. In the southern Peruvian highlands and the Bolivian

Altiplano, this expansion was driven by the steadily growing importance of alpaca fibre for the export market, which emerged for the first time during the 1830s.

During the mid-20th century, rural areas were profoundly transformed by a wave of agrarian reforms implemented across the region. In the *Altiplano* all the countries except for Argentina launched agrarian reforms as government policy during the 1950s and 1960s. In Peru, agrarian reforms translated into the expropriation of large *haciendas* in order to transform them into enterprises with associative modes of production, known as Agricultural Societies of Social Interest (*Sociedades Agrícolas de Interés Social* or SAIS) and Agricultural Production Cooperatives (*Cooperativas Agrícolas de Producción* or CAPs). However, few state-sponsored CAPs and SAIS succeeded. The lack of effective technical and organisational support from government resulted in the dismantling of collective enterprises during the 1980s and the reorganisation of land holding. Most CAPs and SAIS fragmented into communal and family-based collective tenure regimes.

In the 1990s, a shift in the Peruvian government's approach took place with the adoption of liberal policies. The state ceased to sponsor enterprises with associative modes of production and focused instead on changing land structure to propagate and consolidate individual private property, based on the perception that this type of land tenure was the last stage of an evolutionary chain and that it would automatically lead to increased productivity. State enterprises responsible for controlling stocks and sale of wool -thereby regulating wool prices- ceased functioning and the government focused instead on promoting the formation and consolidation of herders' organisations and cooperatives in order to increase their commercial scale, and thus, their bargaining capacity with wool buying companies. Other strategies pursued by the Peruvian state and some NGOs were focused on improving livestock productivity through promoting commercial breeds and genetic improvement. It is against this backdrop that individual-based land tenure regimes and sustainability concerns have emerged in the Peruvian *Altiplano*.

1.2 *Pastoralism in the East African Savannah*

Pastoral communities in East Africa are mainly found in the arid and semi-arid lowlands and grasslands characterised by high temperatures and low rainfall. In the pre-colonial period, land was owned communally by communities within clearly established territories. These territories were respected among different communities and this provided secure rights over land use in the absence of formal systems.

With the colonisation of the East African territory, pastoral communities such as the Maasai in Kenya and Tanzania, the Turkana, Samburu and Borana in Kenya and the Karamojong, Dodoth and Teso in Uganda found themselves isolated by colonial land policies. The colonial governments effectively claimed ownership of the land through the crown land ordinances (1905 and 1915), although native communities continued to live on the land (Rutten 1992; Mugerwa 1992; Sendalo 2009). In some areas, communities were driven out of their best pasture areas, which experienced more rainfall and greater potential for crop farming, into native reserves that had been created by the colonial powers. It is estimated that the Maasai lost 60% of their land to British and German settlers in Kenya and Tanzania (Fratkin 2001). At the same time, colonial polices drove forward the establishment of individual and private land rights.

After attaining independence in the early 1960s, land policies in East Africa were oriented by the state-led development model. Tanzania embraced *Ujamaa*, or African socialism, under which all land was considered public with the President serving as trustee for the people. Customary land rights of ethnic groups and clans were transferred to the newly established and elected Village Councils, which were responsible for land allocation and management (USAID 2010). In 1985 a new government administration reversed the *Ujamaa* policy and in 1995 and 1999 new land laws were enacted and finally implemented much later in 2004. The new laws allowed for customary land to be held at the village level where the Village Council would issue rights to individuals or groups. However, if it was considered unutilised by the state, land could be re-allocated.

Uganda experienced civil strife between 1971 and 1986 which affected land polices. For example, in 1975, the Ugandan government passed a decree abolishing all previous ownership rights and declared all land as state property. All individuals occupying land under customary tenure were allowed to obtain long term leases (Government of Uganda 2013). Political stability was attained in 1986 leading to further changes in land tenure systems after the promulgation of a new constitution in 1995 and the enactment of a new Land Act in 1998. This Act re-established customary land tenure, which was mainly used in the pastoral areas, although it did not establish mechanisms for securing tenure for pastoralists (Olengurumwa 2010). A new land policy was also approved in 2013 to address challenges in implementing the 1998 Land Act. The new laws also provided for the formation of Community Land Associations (CLA) - groups that come together for the purposes of owning, holding and managing land.

After independence in Kenya, land was categorised as either government, private or trust land. Trust land comprised of community land and land located in the native reserves established by the

colonial governments. Although these lands were not formally registered, the territorial claims by communities were recognised. As trust land, the trusteeship was bestowed on local governments.¹ In 1967, the Government of Kenya enacted the Group Representative Act which paved the way for the establishment of group ranches. A group ranch is a form of land privatisation where land is registered to a group of individuals, families or communities, land area is established and the boundaries clearly marked. Ownership in group ranches was defined in terms of land size, access to land and membership to the group. This meant, for example, that offspring of individual members were not automatically recognised as owners/members of the ranch and had to be admitted to the group. Under customary systems, offspring inherited customary land by virtue of blood ties. The establishment of group ranches was gradual, starting within the Maasai community - which had signed treaties with the colonial government - before spreading to others. Other communities maintained customary ownership of their land that was not adjudicated, although their lands continued to be categorised as trust land. Hence, two forms of collective land access regime existed: group ranches and un-adjudicated trust land.

From the mid-1980s, group ranches started to collapse. This was triggered by a number of factors including governance issues and urbanisation (Rutten 1992; Ng'ethe 1993; Kimani and Pickard 1998; Veit 2011; Njeru et al. 2016). The disintegration of group ranches catalysed the individualisation of land tenure in pastoral areas. This process was backed up by the introduction of market-oriented land policies, top amongst which were land titling/registration, promoted as part of broad economic liberalisation and supported by donors including the World Bank Group. Individualisation of land tenure was seen as a means to guarantee land tenure security and, thus, improve rural livelihoods. Individualisation of land tenure also happened in trust land where local authorities allocated land to individuals without consulting the communities in those areas. Local authorities also failed to institute mechanisms to manage these lands resulting in the tragedy of commons (Government of Kenya 2004).

Further changes in land policies came in 2009 when a new land policy was approved. In 2010, a new constitution was promulgated followed by subsequent enactment of new land laws such as the 2012 Land Act, the 2012 Land Registration Act, and the 2016 Community Land Act. Critical issues facing Kenya today include stopping the alienation of community land to private and large-scale land investors, and instituting mechanisms to improve land and resource management among pastoral communities.

¹ In Kenya, these were local authorities such as County Councils. Currently, the trusteeship is held by County Governments.

2. Land Tenure Regimes in Pastoral Communities

Land tenure regimes are institutional configurations that define the relationships between people, as individuals or groups and land. These institutionalised rules and procedures reproduce rights and obligations that are acquired and followed by the people under the regime. In the case of pastoral societies, some land tenure regimes have institutional structures that are more able to support sustainable productive and social practices than others. Thus the evolution of land tenure regimes has a direct impact on the sustainability of pastoral productive systems. In this section we provide taxonomy of land tenure regimes and describe the land tenure regimes found in our study areas.

A property right is the authority to undertake particular actions relating to a specific domain – in this case land. The fact that there are a variety of property rights that can be held by the same people or groups has given rise to the concept of ‘bundle of rights’. This bundle is generally simplified by identifying use, control and transfer rights. Schlager and Ostrom (1992) identified five types of rights which individuals and communities can hold over property and resources. These five rights are divided in two levels of action – operational (OL) and collective-choice (CCL) levels (Table 1).

At the operational level, people exercise their rights to access property (i.e. pasture land) and their right to withdrawal products from it (i.e. the meat or wool of the animals herded on such pastureland). These rights frame the way people directly relate to and interact with the property. In the *Altiplano* and Savannah, many herders and households raising cattle have collective access to their common land but each household holds individual withdrawal rights, which is to say households can graze animals on common land but each has its own animals.

At the collective choice level, people have the rights of management, exclusion and alienation. People who hold these rights have the authority to define the operational level rights. The right of management authorises its holders to devise how, when and where a resource will be used. This means they have the right to devise operational level withdrawal rights. On the other hand, the right of exclusion authorises its holders to define who will access the resources i.e. devise operational level access rights. The right of alienation refers to the capacity of its holder to transfer (sell or lease) the rights of management, exclusion or both.

Table 1: Taxonomy of Bundle of Rights

Operational (OL)	Level	<i>Access (A)</i>	The right to enter a defined physical property
		<i>Withdrawal (W)</i>	The right to obtain ‘products’ from a resource

Collective-Choice Level (CCL)	<i>Management (M)</i>	The right to regulate internal use patterns and transform the resource by making improvements
	<i>Exclusion (E)</i>	The right to determine who will have access right, and how that right might be transferred
	<i>Alienation (A)</i>	The right to sell or lease either or both of the above collective-choice rights

Land tenure regimes set the rules for defining and allocating such rights. In pastoral societies, different land tenure regimes allocate these rights in different ways, as collective or individual rights, to herder families or communities. In collective tenure regimes, several or all of these rights can be held by communities, extended family (a group of households) or nuclear families (single households). Although different combinations of collective land regimes may exist, the common characteristic is that the right to land is held by a group: community or family. Thus, different categories of collective land tenure regimes exist; some with a higher degree of “communality”, as is the case where all or most rights are held by the community as a whole or by extended families, and others which are more individualised where most but not all rights are allocated to single households. On the contrary, when all rights over the land are held by a nuclear family as a single household, then the land is under individual-based land tenure regime.

In traditional pastoral societies in the African Savannah, land tenure regimes tend to be more collective in nature since all or almost all rights are held by communities or clans. Some communities, such as the Maasai, believe that land is a birth right and so it is accessible to all. On the other hand, in the *Altiplano*, it is common to find land tenure regimes where access and alienation rights to pastures are held communally but the usufruct right (i.e. the right to use the pastures) is held by individual households. In both regions collective land tenure regimes are predominant although individual-based land tenure regimes are emerging as a result of land fragmentation and privatisation of collective land. Therefore, in both the Savannah and *Altiplano*, the coexistence of different collective and individual land tenure regimes can be observed.

2.1 *Land Tenure Regimes in Pastoral Societies in the Altiplano and Savannah*

In this section we provide a taxonomy of different types of collective land tenure regimes according to the combination of types of right and their holder. In the case of the Peruvian *Altiplano* and the Kenyan Savannah, five types of collective land tenure regimes can be categorised: the communal, condominium, communal-condominium, communal-individual and individual (Table 2). It is worth

noting that when we talk about family we mean that rights are commonly held by a group of households related by kinship (most commonly extended families but sometimes nuclear families divided in different households), whereas when we refer to individual we mean that rights are held by a single nuclear household.

Table 2: Collective Land Tenure Regimes

Collective choice level rights	Operational level rights		
	Individual	Family-individual	Community
Individual	Individual		
Family		Condominium	
Community	Communal-individual	Communal-condominium	Communal

In the *Altiplano* and Savannah, land tenure regimes with collective rights predominate over individual or individual-based land tenure regimes. As Table 2 shows, in these collective land tenure regimes, all rights are held communally. In the condominium, all rights of access, management, exclusion and alienation reside within the family (or group of related households), while the withdrawal right is held by the individual household. In the communal-condominium type, management, exclusion and alienation rights are held by the community, while access rights reside within the family and the withdrawal right is held by the individual household. In the communal-individual type management, exclusion and alienation rights reside within the community, while access and withdrawal rights are held by individual households. Finally, in the individual land tenure regime, all rights are held by individual households.

Based on this typology, Table 3 below presents the land tenure regimes found in our case study communities.

Table 3: Land Tenure Regimes in the Case Study Communities

Collective-Choice Level Rights	Operational Level Rights		
	Individual	Family	Community
Individual (I)	Individual in Caylloma and Mailua		
Family (F)		Condominium in Caylloma	
Community (C)	Communal-Individual in Naroosura group	Communal- Condominium in	Communal in Caylloma's Cooperatives Ipolei group

	ranch	Caylloma	ranch and Kiina community (un-adjudicated trust land)
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Communal land tenure regimes currently exist in Caylloma Agricultural Production Cooperatives in the Peruvian *Altiplano* as well as in Ilopolei group ranch and Kiina community in the Kenyan Savannah. The distinction between Ilopolei group ranch and Kiina community is that membership and land size are defined in the case of Ilopolei community, whereas for the case of Kiina community, membership is open and land size is yet to be adjudicated.

The condominium regime is the most common in Caylloma province but it does not exist in Kenya. Under this regime family members form corporate groups that become shareholders of a specific *fundo*² and each herder holds shares in many *fundos*. Since the sibling relationship is the basis of kinship solidarity in pastoral societies, these corporate groups tend to be constituted by siblings and their first degree relatives –nuclear family condominiums- or their second degree or other relatives –extended family condominiums. In traditional condominiums, a central figure of authority exists, known in the *Altiplano* as the *kapaq kamachiq* or title-holder. This person is usually the oldest of the shareholders and is responsible for monitoring compliance with rules, defining graduated sanctions for non-compliance and mediating conflict between resource users.

On the ground condominiums are very diverse, varying in size and number of shareholders. For example, Yeny is a female herder from the district Callalli in Caylloma who has access to her father-in-law’s 150-hectare *fundo* through her husband. This *fundo* is shared by Yeny’s father-in-law (who is the title-holder) and his four sons. The father and three of the sons manage a common herd of cows, while one of the sons grazes 100 alpacas separately. From this common herd of cows, Yeny owns only 12 but she also has 30 alpacas that graze in a separate *fundo* belonging to her mother. This *fundo* is shared by the matriarch, one of her sons and Yeny herself. Together they raise a common herd of alpacas.

The communal-condomium land tenure regime is the second most common in Caylloma but it is not found in the Savannah. Under this land tenure regime, in some cases the community has the right to take decisions associated with family herd management such as setting limits on numbers of animals. In other cases, community members gain the right to use communal pastures by paying an annual rent to the community (known as “*derecho de herbaje*”), and must continually renew their

² A fundo is a form of “collective shareholding” of a piece of land. A fundo can have a formal owner – who can hold a private title - and yet the rights of access, use and even management of this fundo will not be exclusive to the owner. Instead these rights will still be shared by a (sometimes long) chain of kinship groups.

access and use rights through participation in collective tasks. The community has the power to legitimise its members' rights to use communal pastures or exclude them if it considers them to be at fault. This model is common where community institutionalism has a long historical presence. The communal-condominium only exists in formally recognised peasant communities. In Caylloma, peasant communities do not currently hold management rights. This means that they lack the authority to control or devise withdrawal practices among pastoral families. On the other hand, they do hold rights of exclusion and alienation as none of the communities authorises renting or selling land to non-members. An example to illustrate this is that of Felipe, a member (*comunero*) of the peasant community of Santa Rosa who lives within a *fundo* covering approximately 1,000 hectares. Felipe's household is one of 17 households that have access rights to this *fundo*. These households belong to four different branches of the Cayo family. This *fundo* is covered by wetlands (*oqhedaes*, as they are called in Caylloma), which makes it a perfect place to graze animals during the rainy season. Felipe's herds graze here three months of the year from January to March and during the remaining months they move to a piece of land in Talta, a neighbouring district, which Felipe rents. This piece of land in Talta is divided in two so that Felipe's herds can spend 4 months in one half and then move on to the other half.

Although the community of Santa Rosa does not regulate access, withdrawal or management rights, it shares exclusion and alienation rights with the corporate groups of the condominiums. This means that the community places restrictions on who can access the communal land. In order for the head of household to hold access rights to communal land, he or she must be registered as a *comunero*. If it is the case that a household is formed by spouses from different communities, one of them – usually the wife - will have to renounce their access rights to communal land in one of the communities. There is also an internal market for lease and sale of land, open only to *comuneros*. This means that only a *comunero* can rent or buy land within the community under informal arrangements. The community is the ultimate and legal owner of the land which it can sell to non-members if two thirds of the *comuneros* approve the sale.

The communal land tenure regime is very common in the Savannah and can also be found in Caylloma. The most common type of communal land tenure regime in the Kenyan Savannah, which existed during the pre-colonial period, is un-adjudicated communal land. This is land where no formal registration or titling has taken place and land boundaries are established following customary practices. A good example is the Kiina community located in Isiolo County which is mostly made up of the Borana ethnic group having settled in the area in 1972 as part of a government resettlement programme. When the community first settled in Kiina, issues of land

ownership were not clear. On the one hand, the community knew that this was their ancestral land with clear territorial boundaries. On the other hand, the government considered the land to be trust land held on behalf of the local community by local authorities who, for their part, interpreted this to mean that they owned the land and in some cases alienated it to individuals in areas such as Kiina trading centre. These individuals have now fenced off the land and restricted other members from accessing it. The community has its own land governance and management structure which operates outside of Kenya's legal framework. This structure dictates what rights exist and who holds them. During the 1900s³, this structure was developed based on the premise that land was communally owned by all community members.

To enhance land management, several households form a cluster and several clusters form a grazing community or *dheeda*. Each *dheeda* has its own grazing rules along with pasture and water management plans. For example, grazing land is used and managed differently during rainy, dry and drought seasons. This means that all rights are held collectively by the community and members have rights of access and withdrawal as per the grazing rules. However, there is no restriction on the number of animals kept by each household. These rules are also meant to exclude non-community members from accessing water and grazing lands, though this does not always happen. For instance, due to lack of enforcement of customary laws, other communities such as the Somali from the north, have come and grazed on the land claimed by Kiina during famine or drought, in total disregard of the rules and grazing patterns established by the community. This tense situation was compounded by cultural practices such as cattle rustling between communities.

In a bid to enforce community rules and deal with insecurity, pastoral communities in the northern parts of Kenya (including Kiina) came together and signed the Modogashe-Garissa Declaration in 2003. Among other things, the Declaration set out provisions that all unauthorised grazers return to their localities; that they must seek prior consent from the elders and chiefs of the localities they wish to migrate to; they must return to their home areas at the end of a drought/famine; and, carrying of firearms when grazing in foreign (non-local) areas was prohibited. This Declaration essentially recognised customary laws on land usage that had been precluded by national laws.

The second type of communal regime in the Kenyan Savannah is the group ranch, which is a defined area of land owned collectively by a group of individuals. Ownership and control of the land is granted to a group and the group acts together in accessing the land. For instance, the Ilpolei group ranch in Laikipia County was formed in 1974 with 47 members. The certificate of

³During interviews, farmers indicated that Borana community land governance systems are said to date back to about 500 years ago.

registration for the group was issued in 1977 but the group ranch was not fully incorporated until 2003⁴.

Initially only household heads were allowed to register. This was interpreted to be the entire household, although some men were not married and, therefore, represented a one-person household. Women are now registered as members if they are widowed and group membership has grown to 285 due to inclusion of the offspring of the original members as well as members who were not initially registered. The Maasai culture allows for polygamy and so wives and children of each household are also registered, with male offsprings obtaining membership after attaining 18 years of age.

After registration of the group ranch, the Ilpolei community maintained cultural land practices⁵ although upon registration group ranch rules were supposed to be used. Group ranch rules are drawn from the Group Representative Act cap 270, which sets out regulations on membership, access to land and election of leaders. However, due to cultural reasons elections have never been held⁶.

The group members have collective rights over the resources within the ranch. For instance, the group makes money from sand harvesting and a cultural centre that is run by the Twala Women Group. The revenue is shared among its members equitably; for instance, each household receives five goats each year. Part of the revenue is also used to pay teachers in the local schools within the ranch (which parents would have contributed) as well as settle medical bills especially for less wealthy households.

In the case of Caylloma, the communal regime was adopted by the enterprises established by the government during the period of agrarian reform, which aimed at creating associative forms of production, specifically Agricultural Societies of Social Interest (SAIS) and Agricultural Production Cooperatives (CAPs)⁷. In Caylloma, as in other Peruvian regions, the CAPs and SAIS were formed

⁴ Incorporation of a group ranch means formal registration as a legal entity (legal person). Before incorporation, liability of the group ranch is shouldered by the leaders and members at individual capacity.

⁵ This included no restrictions on animal numbers and the determination of settlement areas based on household size and livestock numbers.

⁶ Between 1974 and 2002, the group ranch was managed by the same committee selected in 1974 when the community elders became the group ranch leaders upon registration. Among the Maasai community, elders are never challenged.

⁷ The main difference between the two lies in their institutional design. The CAPs were formed by a number of members who had equal share of the profit. SAIS, on the other hand, employed a mixed model that could include natural or legal persons as members with distinct responsibilities and rights. For example, some peasant communities could be members of the SAIS and depending on their productive role, they could have a share of part of the profits without having to participate in productive tasks (Sánchez and Lovón 1991). Browman (1983) describes the SAIS as "a form of compromise between full-fledged co-operative like the CAP and the previous land-holding system. Highland livestock haciendas had been surrounded by semi-autonomous herding communities. The haciendas relied upon these communities for their seasonal labor needs, and in return allowed these communities to graze private livestock on part of the hacienda lands. The SAIS was a special

from the expropriation of large estates (*haciendas*) and small and medium-size plots that were not managed directly (land with absentee landlords that was worked by landless - *huaccha* – herders). For example, in Caylloma the SAIS Pusa was formed by what previously was a *hacienda* under the same name, and the peasant community of Apacheta Rajada. Unlike the *hacienda*, the peasant community was not expropriated, just annexed to the SAIS. This resulted in two different forms of land tenure and governance. While the previous full-time *hacienda* employees were incorporated as partners of the SAIS, managing a common herd and entitled to an equal distribution of the SAIS income (holding thus communal access and withdrawal rights), the peasant community continued to exist as a semi-independent entity, adjunct to the territory of the SAIS. Within the community, herders continued grazing their herds under family arrangements, and they could also gain access to graze in SAIS lands and a portion of the SAIS profit in exchange for seasonal labour. This means that access rights were held by *comunero* families, withdrawal rights were shared between household and the SAIS, while management, exclusion and alienation rights were shared between *comunero* families and the SAIS.

The communal-individual land tenure regime can be found in the Savannah but not in the *Altiplano*. Exclusion and alienation rights reside with the community, while access and withdrawal rights are held by individual households. An example is Naroosura group ranch located Narok County. The ranch was formed in 1972 by 676 members of the Maasai with the aim of protecting customary land from being claimed by non-Maasai individuals and groups. At the time of formation, the ranch covered 162,000 ha. Membership of the group has grown gradually and constituted about 6,000 members in 2015.

Pastoralism was the main economic activity of the group ranch although from the mid- 1980s a small number of members started irrigated crop farming mainly along river banks. In the 1990s, due to increasing population and drought, the community started shifting from large stock (cattle) to small stock (sheep and goats). This is because sheep and goats mature faster and require less pasture. Later, the group ranch adopted improved breeds of sheep and cattle.

Even before the group ranch sub-division was officially initiated, some individual members, especially the elite and those with connections to ranch leaders, started fencing off land for individual use, thereby preventing other members from accessing the land. The sub-division process has taken a long time due to disagreement among members and consensus was only reached in

kind of cooperative to join these two disparate groups, with a governing council formed by representatives from the surrounding communities, the full-time herding employees (the former *hacienda* employees) or socios, and the government technicians and managerial personnel at the SAIS."

2014. Under this arrangement, each registered member will get 2 ha of arable land and 16 ha of drylands. Since the sub-division process is on-going, parts of the ranch are still accessed communally for grazing. However, some sections of the ranch are used by individuals who preclude other members from accessing that part of the land.

Finally, in both regions individual-based land tenure regimes have emerged over the last few decades as a result of the convergence of a series of factors including government policies, population growth, urbanisation, access to markets for livestock products and alternative uses of land previously used by pastoralists. For instance, in Mailua community in Kajiado County in Kenya, the Mailua group ranch was started in 1974 and incorporated in 1977 with 1,026 members. At that time, members grazed their animals on communal lands and there was no limit on the number of animals a household could keep. When the ranch was subdivided in 1989, each household was allocated an equal share of 60 ha. No communal grazing areas are left and each household has to manage its livestock within its parcel of land. Households with large number of animals have been forced to reduce their herds (the average number was 150 cattle in the 1970s and 80s compared to 20 currently). In this individual-based regime, a single household holds exclusive operational and collective-choice level rights, such that land under this tenure regime can no longer be considered a common-pool resource but rather private individualised land, irrespective of whether the owner has a title or not.

As we have seen from the case studies, there are several customary and non-customary types of communal based land tenure regimes where at least some rights are held collectively. These range from regimes where all rights are held communally to those where some or all rights are restricted to families. In this context, the individual-based land tenure regime appears to have emerged as a result of several external pressures that have led to land fragmentation and individualisation in both regions. Interestingly enough, despite all these pressures, individual land tenure regimes are still uncommon. In the following section, we argue that collective land tenure regimes are resilient because they provide the institutional basis for more sustainable pastoral production than individualised regimes.

3. Pastoralism and Sustainable Production Practices

In this section, we establish the relationship between land tenure regimes and productive sustainability and analyse how collective land tenure regimes support some sustainable productive strategies that individual-based land tenure regimes do not.

3.1 Pastoralism Sustainability and Land Tenure Regimes

Various studies identify the features of pastoralism which help strengthen its sustainability as an extensive livestock production system, including how pastoral practices have adapted to utilise rangeland resources with utmost efficiency (Clay 2004). Sustainability of pastoral productive systems refers to their ability to reproduce, cope and recover from stress and shocks and to provide opportunities for the next generation (Chambers and Conway 1992). For pastoralists, this implies “maintaining livestock productivity, defending their rights and access to water and grazing resources, and ensuring political and economic security” (Fratkin and Mearns 2003). The main adaptive feature of pastoralism has been the development of management strategies able to deal with the variability and uncertainty of drylands.

It is now accepted that many rangeland ecosystems do not follow equilibrium dynamics and are instead characterised by high levels of spatial and temporal variability and uncertainty in biomass production (Lukomska 2010). This means that in rangeland ecosystems fodder availability fluctuates widely over time and space (Scoones 1995). Thus, most studies conclude that because of their environmental characteristics, rangeland ecosystems are ill-suited for intensive management systems. In the same environments, pastoral communities have developed a combination of sustainable production strategies.

In order to maximise the sustainable use of the limited and highly variable resources available in dryland ecosystems, pastoral societies have developed an opportunistic management approach whereby productive opportunities and threats are constantly evaluated (Scoones 1995). Scoones defines these as “tracking strategies” which involve the matching of available feed supply with animal numbers at a particular site. This type of management is highly flexible and responsive to an equally variable and uncertain environment.

Moreover, development and maintenance of sustainable pastoral production systems and strategies requires institutional arrangements that guarantee physical and political access to a wide variety of

resources for community or family members. Indeed, pastoral communities have a set of traditional institutions such as social rules and norms that govern their society and livelihoods. They regulate use and conservation of natural resources, manage risks and promote collective action for mutual benefits (Rota and Sperandini 2009). These include rules that govern tenure sharing arrangements between pastoral communities and their neighbours.

Land tenure regimes are the central institutional axis for the sustainability of productive pastoral systems since they allocate the rights over the land. As McCarthy et al. (2000) assert, a common trend among traditional pastoral societies around the world is that grasslands tend to be treated as common-pool resources that are accessed, used and controlled collectively. Thus, the allocation of rights will determine the ways pastoral communities can access, use and control common resources. In the case of individual-based land tenure regime, management choices reside in each individual person or household.

In short, pastoral communities have been able to develop productive strategies adapted to dryland ecosystems, which allow them to maximise production and also avoid ecosystem damage. Hence, they have developed sustainable productive strategies for drylands and rangelands (Manzano and Agarwal 2015; Rota and Sperandini 2009). We posit that land tenure regimes enable the development and maintenance of such strategies.

However, depending on external and internal factors, some land tenure regimes better support sustainable production practices than others. In the next section, we compare the collective and individual-based land tenure regimes in the *Altiplano* and the Savannah in order to establish the extent to which they provide the institutional basis for the reproduction of sustainable productive strategies.

3.2 *Collective vs Individual Land Tenure Regimes in the Altiplano and Savannah*

Drawing on Scoones' (1995) typology of pastoralist "tracking strategies" that allow for opportunistic management, we have identified four sustainable productive strategies practised by communities in the *Altiplano* and Savannah: a) mobility and mosaic system; b) breeding strategies and herd diversification; c) split grazing and; d) herd size management. In Table 4, we show how these strategies are supported or inhibited and encouraged or enforced by collective and individual land tenure regimes in both regions. In addition, we compare the different ways of accessing resources in collective and individual land tenure regimes observed in our case studies.

Table 4: Land Tenure Regimes and Sustainable Productive Strategies

Land Tenure Regime	Sustainable Productive Strategies			
	Mobility and mosaic grazing	Herd diversification	Split grazing	Herd size management
Collective	Supported Kenya: practised in communal lands Peru: practised in communal lands	Supported Kenya: This is increasingly being practised and pastoralists are making efforts to improve breeds Peru: widely practised	Supported Kenya: Practised in communal lands Peru: Practised in communal lands	Encouraged Kenya: Encouraged but not practised Peru: Encouraged but not practised
Individual	Inhibited Kenya: Not supported Peru: Not supported	Supported Kenya: Enforced due to limited land and pasture Peru: Constrained	Constrained Kenya: Enforced through intensification Peru: Constrained	Enforced Kenya: Enforced due to limited pasture Peru: Constrained

Now we explain each of the four strategies identified in our case studies and how their development is related to collective and individual-based land tenure regimes.

a) Mobility and Mosaic Grazing System

Mobility refers to the way herders move their animals in response to spatial and temporal variation of resource availability – mainly pastures and water (Fratkin and Mearns 2003; McGahey et al. 2014). The greater the resource variability of a pastoral area, the greater the scale of the grazing territory and regularity of movement. Mobility is organised within a mosaic system of grazing that consists of the spatial combination of intensively grazed and underutilised patches, and the temporal combination of a limited period of intensive use followed by long periods of little or no grazing at all. Mobility and rotational grazing are critical for the regeneration and maintenance of the biological diversity of rangeland ecosystems. Movement allows herders, in Scoones’ terms, to track fodder across and heterogeneous landscape, moving herds to feed-surplus areas.

Collective-based land tenure regimes in Caylloma and in the Kiina and Ipolei communities support this strategy. In the *Altiplano*, access to extensive and varied pastures means pastoral families/communities are able to move their herds according to seasonal feed availability, while performing a mosaic system of grazing. This is common practice in both family condominiums and pastoral communities in Caylloma.

In the Savannah, pastoralists who have maintained collective-based land tenure regimes also practice mobility and mosaic grazing according to grazing plans that determine how land should be utilised based on its ability to regenerate pasture. The most common practice is to assign different pasture for use during different conditions i.e. pastures for wet season, dry season, famine and drought conditions. For example, each *dheeda* in the Kiina community has its own grazing rules along with pasture and water management plans, where grazing land is used and managed differently during rainy, dry and drought seasons. When pasture is scarce during the dry seasons, members of the Ipolei group ranch drive their animals to Mount Kenya in search of pastures and also pay a fee to local private ranchers in order to graze their animals on such ranches.

Individual-based land tenure regimes inhibit mobility in both regions. Herd mobility is inhibited as land is now fragmented and common areas are not possible under individual tenure. An example is Mailua community where the land size under individuals does not support mosaic grazing. However, on large-scale ranches, such as those that neighbour Ipolei group ranch, mosaic grazing is possible and the owners allow local herders to access pasture in lean periods based on agreed terms between the ranchers and Ipolei community.

b) Breeding Strategies and Herd Diversification

Herders adopt breeding strategies that emphasise the environmental adaptation of livestock instead of production. In other words, they give preference to breeding that assures adaptive “improvements” over productive “improvements” in terms of milk or fibre. In this sense, indigenous breeds have gone through selection processes that have encouraged certain traits and adaptive responses – such as energy sparing mechanisms - and which strengthen the animals’ physiological adaptation to mobility and uncertain fodder and water availability. Moreover, herder households tend to diversify animal species to take advantage of the spatial diversity of resources within the territory they have access to. Different species have different pasture preferences and demands, as well as different patterns and scales of mobility. Variability is also found within species since individual animals also have different needs depending on their breed, sex and age. In order to take advantage of diversity, herds need to be split and grazed separately.

Collective land tenure regimes support this strategy in both regions. In Caylloma, access to a varied set of resources gives pastoral families the opportunity to diversify their herds because different species have different pasture preferences. Besides maximising the use of heterogeneous resources, herd diversification functions as a risk diversification strategy. For example, in Caylloma where two breeds of alpacas exist, the most productive is the *suri* because its fibre attains a higher value in the market, yet the most popular is the *huancaya* because it is better able to resist the lower temperatures. Scoones (1995) defines this strategy as physiological tracking of low-input animals, an approach that emphasises breeding for survival.

In the Savannah, livestock breeds are separated to maintain purity but can be mixed with other animal species. For example, a large proportion of Maasai pastoralists now raise improved breeds of sheep, mainly the Dorper sheep. The Dorper sheep is used to improve the indigenous sheep as the cost of pedigree sheep is high. The common practice is that a herder will acquire a small number of Dorper sheep then castrate all the indigenous bucks in the herd so that they do not downgrade the improved livestock.

Under individual land tenure regimes breeding strategies can be maintained in both regions but the possibility of diversifying herds differs across regions. In Caylloma herd diversification is constrained since herders do not have access to the variety of resources needed to maintain different animal species. However, in the Kenyan Savannah diversification of breeds is practised because the incentive to intensify production is higher under the individual land tenure regime. Farmers who undertake open grazing follow similar practices as the one explained earlier, while those practicing intensification such as zero grazing will separate the breeds entirely.

c) Split Grazing

Split grazing gives herders control over breeding processes and genetic improvement over time. This strategy requires sufficiently diverse pastures as well as labour resources. In the *Altiplano* herders that produce under collective-based land tenure regimes organise themselves to allocate labour tasks. In Caylloma, animals must be split into at least three flocks: female alpacas and babies; male alpacas; and, llamas - in order to control reproduction.

In the Savannah, a common practice is to first split between large and small livestock. In Kiina and Ilpolei group ranch, animals are divided into four flocks: bulls; heifers; calves, sheep and goats; and, camels. This strategy allows pastoralists to graze animals based on their feed requirements. Under individually-based land tenure regimes this strategy is limited due spatial and labour

constraints in both regions. However, in some cases when herders have enough land to support split grazing, they can hire labour though it increases their production costs.

The average land size under individual tenure in the Kenyan Savannah as exemplified by Mailua and Naroosura group ranches ranges from 16 to 60 Ha. Given the average herd population per household, although the animals may be split, technically this strategy does not provide such an advantage given that split grazing is more effective when employing other sustainable practices such as mobility and mosaic grazing.

d) Herd Size Management

This implies destocking animals through sales during drought and restocking when fodder is available after drought. Using this strategy herders avoid overgrazing in seasons where pasture is scarce and maximise their flock size during seasons when pastures are abundant. In addition, keeping large herds is a risk minimisation strategy that ensures sustainability in times of drought and during disease outbreaks.

Under collective land tenure regimes this strategy is encouraged but not enforced. In Caylloma this is optional (especially in the short-run) as other strategies can allow communities to keep large herds. In the Savannah, pastoralists are not limited regarding the number of animals they can keep. Although this can be viewed as a risk minimisation strategy, it can also lead to overgrazing over time as pastoralist and herd populations increase. For instance, in the Ilpolei group ranch there is no limit to the number of animals kept by members. However, the group is currently facing an important set back in terms of environmental degradation, partly due to the huge numbers of animals kept, which is more than the land can sustain.

Under individual land tenure regimes this strategy is compulsory in both regions because a household can only keep the number of animals that can be sustained on its land. Those pastoralists with small land sizes or located in very arid conditions have to reduce the number of animals significantly which negatively affects their household economy. For instance, after the sub-division of the Mailua group ranch, the pastoralists were forced to reduce their herds to a number that each household could manage within its own parcel of land. In the 1970s and 80s when the land was used collectively, the average number of cattle per household was 150. However, this has currently reduced to 20, mainly as a result of land sub-division.

In terms of access to resources, a comparison shows that under collective-based land tenure regimes, a group of pastoral families can share access to an area of land that can be used

extensively, and a variety of resources distributed unequally across the territory, such as wetlands in the *Altiplano*. On the other hand, under individual land tenure regimes herders have limited access to a variety of resources. Indeed, only some plots will have access to key resources, such as wetlands or water sources. This difference is closely related to the fact that in our case studies most individual tenure regimes have resulted from fragmentation of larger land units previously held under collective land tenure regimes. Hence, the individual units have lost access to some resources and this creates constraints for the sustainability of productive strategies.

There is a clear interplay between land tenure regimes and the sustainability of productive strategies. Under collective land tenure regimes, pastoral communities have developed strategies that enable them to maximise production while maintaining local ecosystems. However, the same strategies cannot be sustained within individual-based regimes. Thus changes in land tenure regimes trigger changes in production practices and vice versa. In our case studies, land tenure changes from collective-based to individual-based regimes have inhibited and constrained some productive strategies, thereby threatening the sustainability of pastoralism in both regions.

This comparison across regions shows us that there is a strong link between land tenure regimes, environmental constraints and sustainable production practices in pastoral communities regardless of their social, cultural and economic differences. This comparison demonstrates that we should focus on studying land tenure regimes as enablers of sustainable practices; that is, we should understand production and sustainability by analysing local institutions. As is the case in Peru and Kenya, national land policies that encourage land individualisation are threatening the local institutions that support sustainable practices in pastoral territories.

4. Conclusions and Policy Recommendations

In this study, we analysed the relationship between land tenure and the sustainability of pastoral production systems. We employed a comparative approach using case studies in the Andean *Altiplano* and the Kenya Savannah. This comparison was important because although the context in the two study areas differs, challenges to the sustainability of pastoral systems are similar.

We find that there is a strong link between land tenure regimes and the maintenance of sustainable production practices. This correlation has been influenced by intervening factors such as ecosystems and local institutions for land management. In spite of the significant cultural, economic and historical differences between pastoral communities in the *Altiplano* and Savannah, we find that the influence of collective land regimes on the sustainability of pastoral systems is comparable. Thus, our analysis suggests that policy makers should pay more attention to environmental constraints as well as local or community mechanisms for land management when designing and promoting policies for sustainable development.

In our study areas, it is very difficult to establish large-scale private ranches such as those found in the United States of America or Australia because this would involve disenfranchising or displacing pastoral communities. Although privatisation of land tenure is taking place, the land sizes under these new regimes are inadequate for pastoralism because they constrain sustainable practices. In contrast, collective land tenure regimes enable sustainable productive strategies such as livestock mobility and diversification to avoid overgrazing and manage productive risks. Family-based condominiums and communities in Caylloma establish the rules and procedures that enable adequate land management. Likewise in the Savannah, collective-based land tenure regimes, such as those operated by Kiina community and Ilpolei group ranch, enable pastoralists to employ sustainable practices including mobility, mosaic grazing, livestock diversification and split grazing practices.

These examples support Ostrom's argument about the importance of local institutions for the sustainable management of commons resources. Collective based land tenure regimes as local institutions establish the rules and procedures that guide sustainable land management. In this sense, collective-based land tenure regimes in the *Altiplano* and the Savannah constitute local customary institutions (Homewood et al. 2009; Hundie 2006; Lesorogol 2003) that avoid Hardin's 'tragedy of the commons', a situation where every individual tries to reap the greatest benefit from a given

common resource harming other people's access and hence leading to depletion (Hardin 1968). However, institutions must be able to enforce the rules and punish those who deviate from them.

Collective land tenure regimes enhance productivity by enabling productive strategies to be adapted to arid areas and rangelands where most pastoral communities live. Collective-based land regimes in the *Altiplano* and Savannah promote extensive systems of production, which are more suitable for most dry regions and rangelands. In the case of Kenya, the costs of transforming the drylands to enable a more intensive system of production are prohibitive. As such, promoting sustainable pastoralism is consistent with improving livelihoods for these communities.

More restricted or individualised land tenure regimes are not able to support most sustainable productive strategies. Thus, we observe that the evolution from collective to more restricted and individual-based land tenure regimes in the communities of Caylloma and in group ranches such as Mailua is threatening the sustainability of pastoral productive regimes. In the last decade, the Peruvian and Kenyan governments have implemented land policies promoting land individualisation, which as our study shows, have led to land fragmentation and unsustainable production. Although land tenure regimes by themselves do not guarantee the sustainability of pastoral production system, this study concludes that land tenure regimes constitute an enabler for the adoption of productive practices. This conclusion can be generalised in areas or regions where vast lands are owned communally and alternative land use is not viable, for example in arid or semi-arid lands that are unsuitable for cropping.

Based on the findings of this study, general policy recommendations can be made to enhance collective-based land tenure regimes and prevent land individualisation with the aim of ensuring greater sustainability of pastoral practices and pastoralism. In particular, we suggest:

- a) Strengthening local and customary institutions for land management and governance through the recognition of collective land access rights. In the *Altiplano* this implies the recognition and formal regulation of the condominium and other collective-based land tenure regimes. The Bolivian government has recognised collective land access rights in the *Altiplano* through the creation of indigenous autonomies with territorial rights. The Peruvian and Chilean Aymara communities and the Argentinian Quechua communities that live in the *Altiplano* are demanding official recognition of collective rights over land. It is important to develop a discussion around how to recognise customary collective rights in the region. In Kenya, formal recognition of customary rules in the country's legal system will strengthen the enforcement of customary laws pertaining to land and resource management.

- b) In Kenya, policies on land registration should focus on formalisation rather than individualisation of land tenure. For example, territorial rights can be allocated to communities in un-adjudicated pastoral land.
- c) Stimulating the formation of small and medium-sized associations of herders would increase their access to a greater quantity and diversity of pastures. This would help to support more sustainable resource management and would confer benefits in terms of increased incomes. In Peru, the Ministry of Agriculture is providing pastoral peasant communities with sufficient land, water and labour resources with loans to develop their businesses as Alpaca fibre producers. This state support should be extended to pastoral families with limited access to resources by promoting association.
- d) Promoting the continuity of sustainable pastoral management strategies, such as resource tracking, through programmes that showcase and reward such practices. In Peru, the Ministry of Environment and the Ministry of Agriculture are trying to promote sustainable pastoral production practices through new initiatives such as the National Climate Change Adaptation Programme (Programa de Adaptación al Cambio Climático, or PACC) and *Haku Wiñay* (My Productive Farm) programme⁸. Sustainable production practices of pastoralists living in dry and semi-dry ecosystems should certainly be encouraged by such programmes.

⁸ Haku Wiñay focuses on the development of productive and entrepreneurial skills to help households strengthen their income generation capacities and diversify their livelihoods, as well as to enhance food security.

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