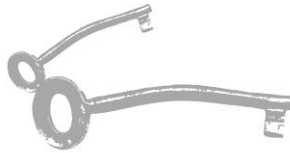


*The way to the pastures: how
to reconcile community-based pasture
management with mobility
in agro-pastoral systems
in the Naryn province of Kyrgyzstan*



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The way to the pastures: how to reconcile community-based pasture management with mobility in agro-pastoral systems in the Naryn province of Kyrgyzstan

Abstract: The new community-based pasture management introduced in Kyrgyzstan at the municipality level in 2009 intended to renew long distance transhumance, which had been significantly reduced after the end of the Soviet Union. Kyrgyzstan is characterized by a mountainous geography and a long history of agro-pastoralism. In this paper we explore how the new formal management model influences the mobility of herds and households at the local level. The conceptual framework used for the analysis is based on the principles for the management of common-pool resources designed by Ostrom and reviewed by Cox. Because municipalities are not homogenous, different groups of stakeholders have different interests in mobility and different access to decision-making in the newly created community-based institution. The main result of this research is that, although the formal institution responsible for pasture management does not focus on participation and representation, informal pasture management groups develop their own mechanism to lobby their interests. Mobility meets the needs of the different groups, or at least actions to prompt mobility are not conducted at the expense of any group.

Keywords: Common-pool resources, agro-pastoralism, Central Asia, governance, post-Soviet era.

El camino hacia los pastos: cómo reconciliar la gestión comunitaria de pastos con la movilidad en sistemas agro-pastorales (provincia de Naryn, Kirguistán)

Resumen: La nueva gestión comunitaria de los pastos introducida en Kirguistán a nivel municipal en 2009 buscaba renovar la trashumancia de largo recorrido, que había declinado sustancialmente tras el final de la Unión Soviética. Kirguistán se caracteriza por una geografía montañosa y una larga historia de agro-pastoralismo. En este artículo exploramos cómo el nuevo modelo formal de gestión influye sobre la movilidad del ganado y las familias a nivel local. El marco conceptual usado para el análisis se basa en los principios para la gestión de recursos comunes diseñado por Ostrom y revisado por Cox. Dado que los distintos municipios no son homogéneos, diferentes grupos sociales tienen intereses diferentes en materia de movilidad, así como diferente acceso a la toma de decisión en la nueva institución comunitaria. El principal resultado de esta investigación es que, si bien la institución formal responsable de la gestión de pastos no pone el énfasis en la participación y la representación, los grupos informales de gestión de pastos desarrollan su propio mecanismo para defender sus intereses. La movilidad satisface las necesidades de los diferentes grupos; o, cuando menos, las acciones fomentadoras de la movilidad no se desarrollan en detrimento de ninguno de los grupos.

Palabras clave: Recursos comunes, agro-pastoralismo, Asia central, gobernanza, era post-soviética.

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Introduction

In 2009, after more than 20 years of reforms following the end of the Soviet Union, Kyrgyzstan became the first country in Central Asia to implement community-based pasture management¹. Pastures are a key-resource of this mountainous country, and cover 80 per cent of its agricultural land (National Statistic Committee 2017a). Since ancient times, the inhabitants of the area of modern-day Kyrgyzstan have been involved in agropastoralism, combining livestock herding and winter fodder crop production (Fitzherbert 2006), and nowadays most of the 65 per cent of the population living in rural areas relies on this activity (National Statistic Committee 2016).

During the Soviet period, all pastures were used and accessibility for vehicles was provided by intensive work of roads and bridges construction and maintenance. After the independence in 1991, pastures remained the property of the State, contrary to cultivated land, machinery and livestock, all of which were privatized. With the dismantling of large-scale collective and state farms, households became the main production unit. The withdrawal of the State from agriculture and drop in livestock

1• The transliteration rules that have been applied are those of the ISO: 9 1995, except in the case of proper nouns that already exist in English.

numbers led to the shrinking of transhumance distance and part of remote pastures for summer grazing became unused (Farrington 2005; Steimann 2011). The management model for pastures, inherited from a set-up dominated by large-scale collective and State farms, appeared to be inefficient to deal with a large number of small-sized production units. Moreover, the management of pastures was fragmented amongst provinces, districts, and rural municipalities, which was considered by international organizations (IOs) as one of the reasons of the reduction of migration routes.

Nowadays, agropastoralist households generally own multi-species flocks and land for winter fodder, crops and potatoes. Seasonal transhumances to pastures located at different altitudes and with varied sun exposition are undertaken to make better use of available grassland. Mobility is a pillar of agropastoral systems, being at the same time a practice and an object of management. However, in Kyrgyzstan, seasonal migration does not involve all livestock-owning rural inhabitants, and stakeholder groups are divided according to their specialization within agropastoral functions. Pastures are considered a common-pool resource in Kyrgyzstan, as their privatization would represent high costs in terms of control and exclusion measures, in comparison to the benefit of low density livestock keeping on pastures.

IOs launched pilot projects to test community-based pasture management as it was seen as an opportunity to reunite pasture management, despite later research which shown that the former management model had little impact on the mobility of herders (Crewett 2012). The community-based pasture management was then upscaled to a national level with the adoption of the Law On Pastures (2009) (World Bank 2006; Bussler 2010), which was designed by the Department of Pastures under the Ministry of Agriculture and Melioration and the World Bank, then legally adopted by the Parliament (Crewett 2015).

Since then, pasture stewardship is in the hands of municipalities, which transfer the responsibility to Pasture User Unions (PUU). PUU gather all individuals and enterprises whose activities are related to pastures. The members of the union then elect the members of the executive organ, the Pasture Committee (PC), most often composed of a head and an accountant. They are in charge of translating the priorities of the PUU into a pasture use plan and pasture management plan and are responsible for their implementation.

This paper aims at building on the extensive literature existing on the question of factors of migration of agropastoralists in Kyrgyzstan to better understand the effects of community-based management on mobility.

Community-based pasture management and herd mobility: a conceptual framework

Pasture management: adapting the framework for common-pool resources

This management model was inspired by the school of New Institutional Economics, and especially by Elinor Ostrom (1990), who defined design principles for the management of common-pool resources. This framework describes management in relation to interactions between components of socio-ecological systems and was reviewed by Cox *et al.* (2010). The two main dimensions are the coordination between all stakeholders, from resource-users to governmental and higher-level structures (design principles 3, 7 and 8), and the constant feedback between use and the state of the natural resource (design principles 1A, 1B, 2A, 2B, 4, 5 and 6), in order to dynamically adapt patterns of use. Since then, extensive research has aimed at refining these frameworks and including them in a diagnosis approach (Ostrom 2007). The third design principle, related to collective-choice arrangements, states that common-pool resource management is more likely to be robust if stakeholders affected by the management are able to take part in it. However, Cox *et al.* (2010) highlighted the risk of a top-down application of that community-based approach, suggesting that it could lead to formal implementation but with only little involvement from local users. Ostrom also warned against the oversimplification of a property-rights regime to create a 'panacea' (Ostrom and Cox 2010). In agropastoral socio-ecological systems risk of top-down implementation and weak participation of users is even higher as they are highly mobile. Thus, a crucial issue for newly created community-based pasture management is to define users' own decision-making mechanisms which are needed to achieve a more sustainable pasture use.

The elaboration of the legal set-up for community-based pasture management: the role of international organizations and support from government

In Kyrgyzstan, experts supported this new management model as a lever to access remote pastures and thus it was key to solving issues of serious pasture degra-

dation occurring close to villages because of overgrazing (World Bank 2006; International Fund for Agricultural Development 2012). They assumed that community-based pasture management would be by nature democratic by bringing equal benefits to all stakeholders and would lead to a more sustainable use of the resource through a more even allocation of livestock over rangelands. During the 2000s, IOs built a discourse on the major threat of degraded pastures on livestock productivity because of reduced flock mobility based on data from the governmental agency responsible for land assessment (Fitzherbert 2006; Committee on Environmental Policy 2000; World Bank 2006). However, as underlined by Robinson (2012, 2016), the quality of the data provided by the governmental agency is questionable as figures are sometimes contradictory, the methodology not explained, and triangulation with other academic research lacking. The existing sources from the governmental agency provide little evidence on the importance of grazing as a key factor causing degradation of vegetation cover and, in turn, its impact on livestock fattening. The methodology used to measure degradation is a controversial issue not only at national level, but even in international academic circles. In the case of Kyrgyzstan, this confusion is accentuated by the major discrepancy of opinion on the causes of degradation between local pasture users, who see climate as the main factor, and experts, who show that grazing practices are predominantly responsible (Levine *et al.* 2017). The legal mechanism developed to overcome the assumed misuse of pasturelands is based on the elaboration and implementation of pasture plans for use and management by the community-based institutions, and locally funded by pasture use fees. By implementing these measures, the objective is to drive flocks to remote pastures for more even grazing and better productivity.

The complexity of factors leading to long distance migrations

In her research also conducted in the Naryn province in 2009, Crewett (2012) found out that pasture quality was only one of the factors in the decision-making on the use of summer pastures. Instead, stakeholders highlighted the role of other social-economic factors such as the decay of access infrastructure, the lack of access to services, the high costs for transhumance and "the breakdown of formal and informal enforcement mechanisms for long-distance migration" (Crewett 2012: 272). She underlined as well that in the framework of the new management model, the simplification of administrative processes would not automatically increase the distance of transhumance. It was difficult to enforce long-distance migration without operational

sanction mechanisms. Shigaeva *et al.* (2016) conducted research in functioning PCs and investigated how the newly adopted Law On Pastures and the PC influence the capacity of local users to build their own governance mechanisms through the lens of the design principles for common-pool resource. They found out that mobility didn't increase much as a large share of flocks still grazed all-year long close to the villages. Moreover, their findings related to decision-making show that agropastoralists moving to remote pastures are absent from the PC, also confirmed by recent research from Isaeva and Shigaeva (2017) which highlights the differences in the involvement of groups migrating to summer pastures in the PCs. Building on their results about the difficulties to achieve collective-choice arrangements in the new legal framework, I investigate how this concept of community-based natural resource management interacts with mobility, one of the essential features of an agropastoral system. The impacts on the capacity of nomadic pasture user to take part in the management, and the effects of community-based pasture management on the mobility of pasture users are analysed. First, I question the patterns for decision-making in the Community-Based Pasture Management. As found by Quinn (2007), the third design principle on the involvement of users in decision-making needs to be adapted in specific context of agropastoralism in semi-arid environment when resource users are scattered and moving on a large territory. By doing such, specific attention is paid to considering design principles as interacting, rather than isolated, components (Baggio *et al.* 2016). However, the sixth design principle, related to conflicts is not tackled here as it would require a separate publication as conflicts involving PCs involve a large variety of stakeholders which are responsible of tasks at different levels (see Steimann 2012; Mestre *et al.* 2013; and Murzakulova and Mestre 2016). Second, I research how the renovation of infrastructures allowing access to remote pastures, meant to regulate the grazing load on pastures can actually support the community-based pasture management.

Methodology and research area

Extensive research on governance of common-pool resources shows the complementarity between large-scale statistical analysis of coded cases, comparative analysis and in-depth case studies (Poteete *et al.* 2010). Results presented in this chapter are based on data collected between 2012 and 2016 using the method of multiple embed-

ded case studies (Yin 2011), which considers dynamics occurring at different levels and their interactions, and also includes qualitative comparison (table 1). The main case study level is however the rural municipality to investigate how formal rules interact with practice. Altyn², Emgek-Talaa and Žerge-Tal were selected as they present diverse situations in terms of proximity to the main provincial town, access to alternative income generating activities and external support. The municipalities are located in the Naryn province which has the lowest population density and the highest part of mountain areas amongst all provinces of the country (see appendix 2).

Data was collected through semi-structured interviews with officials and members of households involved in agropastoral activities, participatory observation in households, in non-governmental organisations (NGOs) and in IOs, and review of academic and project literature. Qualitative analysis of interviews was conducted using Sonal, a software specifically designed for this purpose, and which allows for thematic analysis, with inductive and deductive coding (Albert 2009).

Table 1.
Stakeholders and their activities at different levels

Level of actions	Case studies	Stakeholders and their role in the pasture management system
National	Kyrgyzstan	Pasture Department under the Ministry of Agriculture and Melioration: Development and implementation of the legal framework National Parliament: Adoption of legal framework IOs and NGOs: Elaboration of development projects
Provincial and district	Naryn province, Naryn and Ak-Talaa districts	Local branches of the Pasture Department: Support to PUUs and PCs
Rural municipalities	Altyn, Emgek-Talaa and Žerge-Tal	PUUs and PCs: Development and implementation of management plans
Farms	In each village and on summer pastures	Households: agropastoral production

- 2• Because a large share of inhabitants of this rural municipality are involved in unformal mining activities, the name of the rural municipality, villages composing it and pastures are anonymized, in order not to harm the inhabitants.

Specific attention was paid to conduct semi-structured interviews with the different stakeholder groups at a local level. Forty-four interviews were conducted with non-transhumant households and 43 with transhumant households. Four members of PCs were also interviewed (eight interviews), as well as the three heads of rural municipalities (five interviews). Some respondents were interviewed several times, at different seasons and in different locations. At a national level, 18 interviews were carried out with specialists and managers from governmental, NGOs and IOs.

Legal framework of pasture management and agropastoral systems

Missions and mechanisms provided by the Law on Pastures (2009)

In 2009, the reform on pasture management introduced both PUUs, and their executive body, Pasture Committees (PCs), at a rural municipality level. PUU members are all legal and actual persons whose activity is related to land under the legal category of "Pastures" of municipalities' land³. Members of the PUU are elected to serve as the head of the PC and, in some cases, as accountant, secretary or to perform other duties defined locally.

According to law, PCs has to develop plans for use and management in order to anticipate users' needs and to fulfil the requirements in terms of measures and infrastructure. These plans should contain all the information to ensure a sustainable use of pastures, something that includes quality monitoring, maps showing borders, infrastructure and defining carrying capacity for each plot, and yearly use plans. Their vision takes into account borders of pastures as rigid.

PCs are also in charge of creating a provisional budget. The price of pasture use for each livestock head is calculated by dividing the planned expenses by the number of animals grazing on the territory under the PCs' responsibility.

3• Most pasture lands are under the responsibility of rural municipalities, although a share is under the administration of Forestry Management Units (FMU), and do not fall under the law on community-based pasture management.

Altyn, Emgek-Talaa and Žerge-Tal: three shades of agropastoralism

The territories of Altyn, Emgek-Talaa and Žerge-Tal are under the responsibility of respective municipalities (*ajyl ajmak*). Each rural municipality forms an agropastoralism system: with villages, arable land, and pastures at different altitudes. Altyn counts two villages, Altyn and Village B, the latter has no independent administrative existence. Emgek-Talaa counts three villages and Žerge-Tal two.

Inhabitants of these three rural municipalities rely on agropastoralism although each municipality has its own specific characteristics (table 2). They are located at an altitude of 2,400m above sea level for Altyn, and between 1,820m and 2,100m for Žerge-Tal and Emgek-Talaa respectively. The climate of all three rural municipalities is characterized by extreme temperatures and semi-aridity.

The villages belonging to one rural municipality are generally located within a maximum distance of 15 km from each other. Each village has its own migration routes and summer pastures (see appendix 3). For example, in the rural municipality of Emgek-Talaa, the inhabitants of the Emgek-Talaa village take their flocks to the summer pastures close to Lake Song-Kul, while inhabitants of Ak-Talaa village go to the summer pastures in the Pasture A high altitude valley. The summer pastures of the two villages are located at a distance of around 60 km from each other as the crow flies.

The Altyn and Emgek-Talaa municipalities are located 15 km and 35 km respectively to Naryn, the province's main regional centre, something that allows for better opportunities for alternative income generating activities. However, Žerge-Tal is much more remote, located 210 km from Naryn. Its remoteness decreases the opportunity that local inhabitants have for employment or business activities. Žerge-Tal is also the village where labour migration outflows have the most effect. In Altyn livestock remains the pillar of livelihoods even though inhabitants are actively involved in mining activities, as in other villages around Kyrgyzstan (Mestre 2017). Transhumance takes up to two days by foot or horseback, only women, children and the gear are brought by truck.

Table 2.

Basic demographic information about Altyn, Emgek-Talaa and Žerge-Tal

Village	Population	Livestock no.				Pastures (ha)		Irrigated land (ha)
		Horses	Cows	Sheep and goats ^a	Total in LU ^b	Used	Unused	
Altyn	3,139	1,324	1,979	13,264	4,864	32,000	16,343	1,052
Emgek-Talaa	3,172	1,515	2,377	15,064	5,295	19,289	3,000	1,930
Žerge-Tal	2,905	1,147	1,688	10,056	3,498	40,514	3,000	1,616

Notes: ^a Data on goats and sheep are available only as aggregate data. Personal observation and interviews show that sheep form the vast majority of those numbers; ^b Livestock Units (LU) are here defined through the coefficient of the European Union. One milking cow equals one LU, one horse equals 0.8 LU and one small ruminant equals 0.1 LU. We consider that one yak is equivalent to one LU. As data categories of bovines are not available they are all counted as milking cows.

Sources: Data on pasture area and use from the Pasture Department under the Ministry in charge of Agriculture (2017), data on demography, irrigated land and livestock numbers for 2016 from the Naryn Province Statistical Committee (2017). Despite the fact that it is common practice to intentionally underreport livestock numbers, official figures indicate the overall trend (Mestre *et al.* 2013).

The surface of irrigated land and pasture varies among the rural municipalities. Emgek-Talaa and Žerge-Tal own around 0.6 ha of irrigated land per inhabitant, while this rate is only 0.3 in Altyn. Pasture area also varies considerably, with Žerge-Tal possessing 30 per cent more than the others. However, regardless of the comparatively smaller pasture area belonging to Altyn and relatively high number of livestock heads, 40 per cent of Altyn's pasture remain unused as they are located far from any village and since there is no collective initiative of inhabitants to migrate there.

The agropastoral production system is organized around small-scale production units: these are usually composed of one household. On average, one household includes seven people (Naryn Province Statistical Committee 2017). Regardless of their level of wealth, household most often own multispecies flocks of goats, sheep, cows and horses. The main livestock products are meat and dairy products. Until the beginning of the 2010s, mare milk was only for self-consumption, but it has since become fashionable in cities. A market has developed around this new taste and prices for mare milk continue to grow. Prices for wool and skins plummet after the independence and are now used for domestic needs only. The institutional pasture management is scattered, as pastures can be under the stewardship of PUUs or of Forest

Management Unit (FMU), which are also in charge of pasture management, responsible for 12.8 per cent of the total pasture area in Kyrgyzstan and 79,000 ha in the Naryn province (State Agency for the Protection of Ecosystems and Forests 2006; Steimann 2011). However, they do not fall into the new management model used by the Department of Pastures and as inhabitants of one rural municipalities can use pastures related to the PC of another municipality under certain agreement. For instance, the inhabitants of Žerge-Tal use pastures under the stewardship of the Naryn FMU and inhabitants of the neighbouring village graze on Žerge-Tal PC's land under a specific agreement.

Results

Stakeholder typology in agropastoral systems

This research found that mobility has a major impact on the capacity of stakeholders to take part in the decision-making processes implemented in the framework of community-based pasture management.

Mobility is the main differentiating factor between stakeholder groups, along with a source of income. Even though all households received livestock and arable land when collective and state farms were privatized between 1995 and 1997, specialization generally occurs in agropastoral households farms, trending towards either livestock keeping or crop cultivation. Households accordingly migrate to remote pastures or stay in the villages close to arable land. These patterns also determine their roles and relations in the agropastoral system. Regardless of variation in the area of available pastureland and the distance to the regional centre, the inhabitants of the three villages are organized into similar structures of three stakeholder groups: (1) livestock owners who stay in the villages; (2) shepherds; and (3) livestock keepers.

Although, all the stakeholder groups listed own livestock, the category of livestock owners comprises only households specialized in cultivation, mostly of fodder, crops and potatoes, for both self-consumption and selling at market (figure 1). They own most of their land and in some cases also rent land in the same area. Livestock is used as a stock as the banking system is rather untrusted. The average flock of a household is made up of three livestock units (LU), most often one cow and 20 goats

and/or sheep⁴. During summer, livestock owners delegate the care of their flocks to shepherds or large livestock keepers moving to the summer pastures. Only a portion of the milking cows remain in the lower-lying land, near the village. During the rest of the year, between October and May, when all the animals are in the lowlands, livestock owners living close by often organise common grazing of their animals. Each grazing group, *kezüü*, uses certain pastures, although the borders are flexible. The surveillance of goats and sheep is in turn taken by members of the neighbours groups, or in certain cases a person may be hired. Cows are most often left alone. Through that mechanism, the number of people involved in the actual herding is reduced and this informal group can also be used as a platform to discuss and make decisions about specific issues, such as animal health, dairy product selling, etc. From October until May a second model for livestock keeping consists of entrusting flocks to shepherds or livestock keepers living outside villages where there is more available vegetation cover per livestock head. This model is growing especially in Altyn and Emgek-Talaa because of the opportunities for secondary income generating activities. Households that have access to cash but less labour force available prefer this model since it allows them to keep their savings in the form of living animals, without having the burden of taking care of them.

Figure 1.
Houses in Žerge-Tal, most of them are owned by livestock owners,
05/07/2013



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- 4• There is a high diversity of agropastoral systems in Kyrgyzstan, with different levels of involvement in cultivation or livestock, thus, typologies based on number of livestock can provide different thresholds (e.g. Zhumanova *et al.*, 2016).

The category of livestock keepers includes households which own large-sized flocks, i.e. more than 10 LU. Their income is mostly based on the trade of living animals and dairy products. Flocks are multispecies, although there is a striking trend of increasing the proportion of cows and horses. The households' strategy focuses on managing all production tasks to reduce external costs. This translates into specific seasonal land use to make the most use of the natural vegetation cover. From October until May, households in this category live in old farms located outside of villages where there is more vegetation cover available per livestock head (figure 2). This reduces the need for winter fodder, something that is a major cost. From May until autumn, they migrate to distant pastures, stopping either at one or several stations for weeks or months. These distant farms can be located up to 30 km from the villages although few are located further than that. Two schemes exist in this category: use of the household labour force and delegation of the activities to employees. The second scheme is rare and generally only happens when the livestock owners conduct an income generating activity in a different place, such as work in administrations located in urban centres, or participate in businesses related to livestock products.

Figure 2.
Distant farm inhabited by livestock keeping household, Altyn,
25/05/2013



Shepherds form the final category of agropastoralists. They usually own small flocks, similar in size to those of livestock owners, but contrary to them, migrate to distant pastures. Their income results from the livestock grazing service they provide and livestock product sale. They can be involved in other activities on the pastures, such as hosting tourists, collecting mushrooms, and artisanal mining (Mestre 2017). When they

take care of milking cows or mares, they do not receive payment for the service but keep the milk for their own use. They most often live in villages during winter time.

Former elites from the Soviet times, such as collective or State farm directors still have important status at local level. In all the three rural communities investigated, they are part of the category of livestock owners. Modern elites formed by successful traders are also livestock owners, at the exception of one household in Emgek-Talaa and one in Žerge-Tal. Contrarily to other equally wealthy families who invested in shops or tractors, they invested in livestock which is grazed by an employee. Because of their status, these households put pressure on the PCs to avoid other shepherds or livestock keepers to graze on what they consider being their pastures. Former and current elites are also more likely not to fully pay the pasture use fees to the PCs. As they are livestock owners and mostly engaged in crop and winter production, the disbalance of lobby of interests between them and livestock keepers and shepherds is accentuated. Local elites, such as rural municipality mayors, or other district and province officials, also own livestock but do not migrate to summer pastures. They are either livestock keepers either livestock owners.

The categories of shepherds and livestock keepers represents only a small proportion of households in rural municipalities, a total of less than 20 per cent when combined. An increased number of livestock since the 2000s was followed by an increase in the share of households moving to pastures in the three rural municipalities.

Interactions between stakeholder categories are framed by their relationship according to their agropastoral activities. A major event at local level is the *tülöö*, a celebration which takes place before flocks are sent to spring and summer pastures. It has two objectives: first, to pray collectively for a favourable season which will bring prosperity, and second, to discuss the dates of departure of the flocks and the price of the livestock grazing service. On this occasion, households are clearly divided into the groups of service providers (shepherds and livestock keepers) and service purchasers (livestock owners). The social and spatial proximity between households that undertake transhumance also creates specific relationships which are pursued when they are back in the winter villages.

This typology is rather dynamic. Households can switch their activity as a strategy, based on their needs and ambitions. For example, during a specific year, a household of livestock owners can decide to bring their own flock and the flocks of other livestock owners to the summer pastures despite having never done it before. This way the household saves the money they would have paid a shepherd or livestock keeper, and also earn money in the process. However, considerable preparation is needed in

order to find clients willing to entrust them with their animals and to find a spot to pitch their tent or yurt on pastures. Households such as these that want to start moving to distant pastures can make an agreement with a group of shepherds to share a yurt and tent pitching area. This point is particularly crucial because it has to be accessible by truck for all the necessary facilities for the household and animal care to be brought in at the beginning of the season (figure 3). Accessibility by car is also an asset since it enhances the chances of having traders coming to buy dairy products, as well as making it possible to go down to the villages in case of emergency. Clean water also needs to be at easily accessible. The site is assessed in terms of flock movements, in order not to cross the paths of other flocks and to thus avoid the risk of mixing different flocks. Sites that offer a wide view over pastures are preferred as they offer the opportunity to watch the flocks without needing to go to them.

Figure 3.
Installation of a yurt for a young couple of shepherds, moving to the summer pastures for the first time, with the truck which was used to carry the gear. Intermediate pastures of Ylajluu Suu, Emgek-Talaa, 26/04/2015



Although clans exist in Kyrgyzstan, this research did not find that they have crucial impact neither on formal and informal pasture management. Clans are not perceived at local level as a determining factor of pasture use rights. There is a common

understanding that all the current pasture users from the municipalities are the descendants of agropastoralists who used to be nomads before the Soviet Union in the area. Thus, the right of households to migrate to summer pasture is not based on clan identity. Jacquesson (2010) warns against stereotypes on the relationship between kinship and pasture use, which last until nowadays and were rooted in Tsarist Empire. Policies at that time were focused on the allocation of pastures and ignored the crucial role of coordination of flexible migrations, essential to sustainable use of pastures. They lead to erroneous statements on the capacity of so-called traditional groups to use natural resources in a sustainable way.

Most often, households benefiting from the construction work carried by pasture contribute in the form of labour force. This collective work allows cost reductions. In the same way, external resources for construction planning are used only when NGOs are funding larger infrastructure. NGOs usually have building engineers in their staff for planning and designing complex infrastructure work.

Mobility as an obstacle to participation in pasture management

The seasonal migration of shepherds and livestock keepers hinders their opportunity to be part of the management institutions which are centred around the villages.

According to law, PC members should be elected by PUU members and are also PUU members themselves. However, practice shows that they are most often appointed by the head of rural municipalities, and that PUU are in practice not an independent institution, and furthermore, its functions are barely known amongst pasture users (Crewett 2015). However, as PCs need to provide records of PUU meetings to approve management plans, they make use of already existing meetings, such as informal meetings, e.g. the *tülöö*, or formally organized sessions of the municipal council, even though these are not attended by all pasture users as a PUU meeting is obliged to be. As a result, not only are the members of the PCs not chosen by pasture users, but the rural municipality heads appoint the PC head from among livestock owners, those living close to the rural municipality administration headquarters. They also prefer young men involved in secondary income generating activities as they are perceived as being more active and innovative. Although not always the case PC heads can be part of the local elites. Crewett (2015) has also reported similar cases: in 2009, in a rural municipality in the Naryn province, the PC was created exclusively from the

owners of large flocks, although it was not specified if the PC members were from migrating households.

Thus, through using their dominant position to influence the composition of the PC, heads of rural municipalities introduce a bias in the pasture management system by reflecting their own functioning patterns, focused around villages and arable lands. Moreover, I found that offices used by PCs were given to them by the rural administration and are located in the centre of the villages. Because of their land use schemes, which are based on mobility and the use of pastures at the margins, shepherds and livestock owners have less access to decision-making institutions.

The implementation of the community-based pasture management model faces difficulties regarding the inclusion of different stakeholder groups in the PUUs and PCs. The different schemes of land use, and the scattered locations of the stakeholder groups (livestock owners, livestock keepers and shepherds) mean that not all groups have the same access to the PC as a platform for decision-making. First, shepherds and livestock keepers are personally less likely to be the head of a PC or to have a member of their stakeholder group in this position, and second, often receive only minimal information about meetings and measures because of their geographical location which also leads to less close-knit relations with livestock owners. Despite this, however, informal groups can still play a role by designing and implementing new participation mechanisms.

Informal groups mobilize to overcome marginalisation caused by migration patterns

Despite the weak measures intended to actively integrate all stakeholders into the decision-making process, the mechanism is flexible enough to allow universal participation, when driven by marginalized groups such as livestock keepers living outside of the main villages (Mestre 2017). By using the power that they have as a well-connected informal group, livestock keepers act as a lobby to defend their interests regarding pasture management and also to control the allocation of the budget they contributed to in the form of pasture use payments. Informal groups can thus impact PC decision-making as it is a rather new and weak institution. PC heads often either leave or are dismissed by the head of the rural municipality if complaints arise from stakeholders of any groups. Thus, PC heads are forced to take the needs of shepherds and livestock keepers into account. Livestock keepers and shepherds are also able to act

as a control body through involving authority stakeholders, such as policemen, to check that money collected from pasture users and allocated by projects is not misused. They are able to mobilize to lobby their interests when major issues arise (Mestre 2017).

Mobility: a common interest in agropastoral communities

The seasonal transfer of flocks is the core component of agropastoral systems, since shifting to areas where the vegetal cover can bring most nutrients to the flocks allows livestock to be fattened at low cost. Migration to remote pastures from late spring to autumn also leaves time for cultivation work on open fields that would otherwise be at risk of destruction by flocks. After 1991, the investment in pastoral infrastructure and livestock numbers fell off, leading to a decrease in agropastoral mobility. Since the 2000s, herds recovered but long-distance transhumance were slow to take off again. While under a previous pasture management system in Kyrgyzstan (2002–2009) most pasture users did not pay the pasture rent (Steimann 2011), since 2009 the PCs are in charge of collecting pasture use fees from households. My research showed that this task appeared to be very sensitive for PC heads, as the sanctions anticipated by law in case of non-compliance with PC decision need to go through a procedure which is very time-consuming and can trigger conflicts, which are not beneficial to PC heads as it could be easily used as groups for dismissal. Thus, the collection of the pasture use fee depends on the support from households.

During the first years of their existence, PCs mostly relied on grants and technical support from NGOs and IOs, to create plans according to the law and renovate infrastructure such as roads, bridges and to a minor extend boom barriers. Most pasture users did not pay the pasture use fee because of concerns that their contribution would be diverted away from pasture management. They also did not consider PUUs and PCs as potentially efficient institutions because of their lack means in terms of capacity of the staff and machinery (Dörre 2015). PC heads followed the strategy initiated by NGOs and IOs towards vehicle infrastructure and pursued them after the end of the financial support (figure 4).

Figure 4.

Renovation work conducted by the PC of Žerge-Tal on the road leading to the remote pasture of ŋong Ta (built during the Soviet period), 20/08/2013



With the results of their actions now visible for all to see, PCs can hardly be accused of misusing public funds, as could be the case if money went towards the purchase of computers or cars for PC. They also gained legitimacy as they demonstrated their capacity to pasture users.

The renovation of communication routes to remote pastures combines the interests of all stakeholder groups, or at least, no stakeholder group is disadvantaged by these measures. This infrastructure creates better connections between the different areas of the agropastoral production system and thus plays an important role for all stakeholders at social and economic level (table 3).

Table 3.

The economic and social stakes of stakeholder groups related to the mobility of private shepherds and livestock owners with the flocks

	Stakeholder groups affected by mobility		
	Shepherds	Livestock keepers	Livestock owners
Economic interests of enhanced mobility and accessibility	<ul style="list-style-type: none"> • To reduce the transportation cost for family members and all necessary material, which would be passed on the price of livestock keeping service. • To communicate with livestock owners when there are some needs in salt and veterinary drugs. • To ask livestock owners to check causalities on animals and assess the liability of the shepherd or livestock keeper in charge. 		
	<ul style="list-style-type: none"> • To sell or barter dairy products and other products collected on the pastures (mushrooms, medicinal and aromatic plants). • To go down to the lowland to make hay, and thus save money on hired labour force to fulfil that task. 	<ul style="list-style-type: none"> • To avoid fields destruction by flocks getting down to early. • To easily withdraw animals for cash or meat needs. 	
Social interests of enhanced mobility and accessibility	<ul style="list-style-type: none"> • To maintain close ties with those who stayed in the settlements. • To go down to the settlement easily in case of health issues. 		

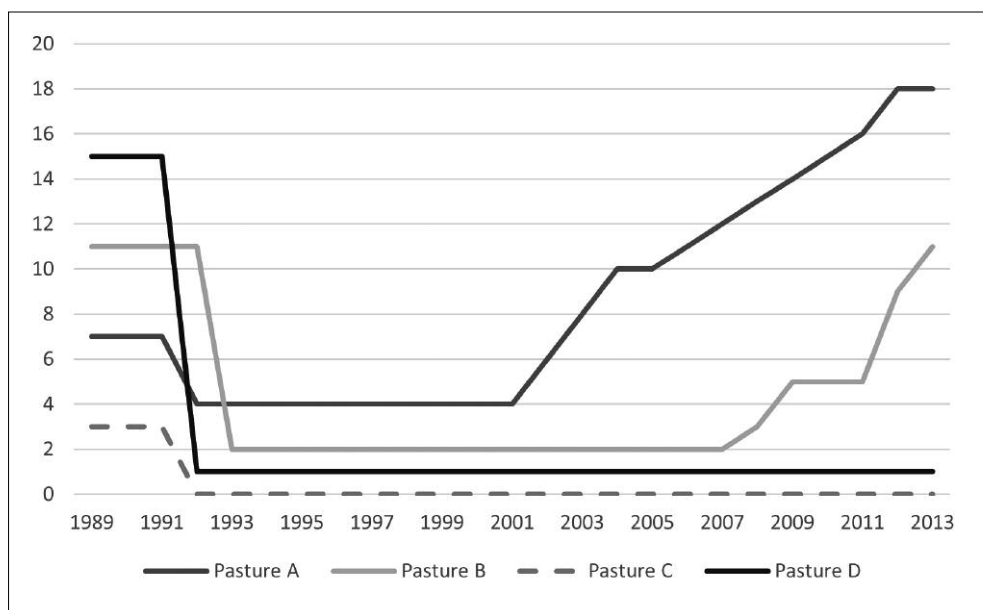
Since the dismantling of collective and State farms, households themselves bear the costs related to transhumance. Improved road infrastructure allows access to pastures with light vehicles, which is much less costly than the heavy trucks needed when roads and bridges are in poor condition. Thanks to the more frequent transportation between villages in lowlands and high-altitude pastures that improved infrastructures offer, traders can also access pasture areas more easily. Altyn's and Emgek-Talaa's summer pastures, which are located closer to Naryn city and to the main road leading to the capital of the country, are visited by traders every three days who buy or barter dairy products. Better infrastructure makes livestock transfer to the pastures less dependent on weather conditions and encourages livestock keepers and shepherd to leave for summer pastures earlier and to return to villages. Repair of roads is sometimes accompanied by the installation of boom barriers used as check-

points to count animals and above all to limit the spontaneous return of animals to the village in autumn. This results in a lowered risk of damage to crop cultivation fields, something which mostly benefits the livestock owners, although they are not direct users of the infrastructure.

Since Soviet times, size of herds being grazed on summer pastures only slightly varied. If it used to be 400-600 of sheep from the collective or State farm per hired shepherd, it is now around 400-700 of sheep from different owners per shepherd or livestock keeper household. This size is considered as being optimal in terms of efficiency, larger herds tending to split, which requires more work to conduct them. In the three rural municipalities of my research, respondents all reported that the number of livestock keepers and shepherds going to remote pastures has been increasing since 2000. This results first in an increased concentration of livestock keepers and shepherds on the most accessible locations, and later in the installation of new households on pastures that are located close to the most heavily populated pastures and to pastures where trade networks and transportation are most likely to be available. Through this strategy, households can - with minimal efforts - benefit from the advantages that come from a high concentration of livestock keepers and shepherds, and at the same time, have access to more vegetation cover.

For example, Altyn rural municipality counts four summer pastures (figure 5). The summer Pasture A is easily accessible by car, which makes it the most attractive. On the contrary, pastures which are located in completely different areas than the more populated pastures, or separated by high mountain passes or large rivers, are not back in use since the Soviet times. This is for instance the case of Pasture D of Altyn, located at more than 150km from other pastures of the municipality of Altyn. It was intensively used during Soviet Union by 15 shepherds. For their stay, they benefited from support such as product delivery, regular medical checks on-site and cultural events on the pastures such as mobile cinema and theatre. Nowadays, only one family grazes there. Pasture C, although neighbouring the Pasture A which counts the highest concentration of flocks, is hardly accessible because of the poor condition of the road crossing a pass. The summer pastures of Emgek-Talaa are less fragmented: inhabitants of Ak-Talaa village use a portion of Pasture A, and inhabitants of Emgek-Talaa go to Keng-Suu, thus the increase of shepherds and livestock keepers is more balanced among the two summer pastures. In Žerge-Tal, all summer pastures are geographically adjacent but are divided by a mountain range and a river. Appropriate infrastructure to connect the plots was built during Soviet times but is damaged.

Figure 5.
Changes in numbers of livestock keepers and shepherds, each with a herd of 400-700 sheep on the summer pastures of Altyn.



Source: Mestre (2017).

In addition to the question of accessibility, shepherds and livestock keepers underline the need to create a critical mass of households willing to move there in order to share transportation costs and to support each other socially.

Animal health, although crucial for agropastoral activities, is not tackled by collective action. Prevention and treatment measures are implemented by households as veterinary services are weak. Since 2016, PCs are legally responsible for animal health but, at the moment, they did not start working in this field because of lack of both knowledge and finance.

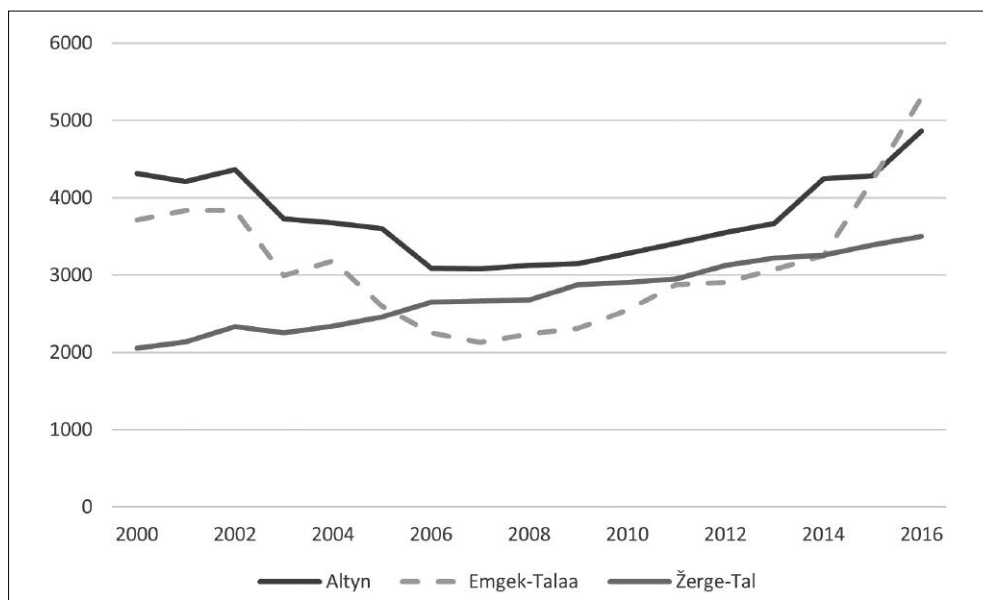
Other tasks related to management and pasture use planning, and also to the calculation of carrying capacity are not implemented by the PCs themselves, contrarily to the expectations of the initiators of the law (Egemberdiev 2010). However, until now the Pasture Department and organizations responsible for the implementation of the new management model were unable to agree on the methodology for assessing car-

rying capacity⁵. Moreover, there is another major discrepancy between the narrative of implementing organizations which mostly support the view that grazing domestic animals is a major factor of decreased pasture productivity, and the approach of pasture users that identifies climatic effects not related to grazing practices as a major factor on pasture quality over anthropogenic effects. The development and implementation of pasture management plans and pasture use plans by PCs are thus at question. Even in the case of the Altyn PC, where an NGO supported the development of the pasture management and pasture use plans in 2010, the plans themselves were never implemented. The internal skills and knowledge of the PC are not sufficient to use the plans created with the support from the NGO to be follow up and update them as they are now outdated, and it would be difficult for the PC to find external experts, since they would be unable to financially support these.

Despite the lack of formal management plans, stakeholder groups agree that there is a need to start reusing distant and isolated pastures as the number of livestock has been rising constantly since 2004 (figure 6).

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- 5• In 2015, in one session of the Coordination Committee on Pastures which gathers IOs, NGOs, experts and governmental organization in the field of pasture management, experts raised the question of the lack of consistence between approached from different projects, however, no consensus was found yet on the methodology which should be implemented at national level (Minutes from the Coordination Committee on Pastures of the 25/05/2015, carried out by the German Technical Cooperation -GIZ-, the Ministry of Agriculture and Melioration and CAMP Alatau).

Figure 6.
Livestock growth in the three rural municipalities in LU



Source: Naryn Province Statistical Committee (2017). As mentioned, data on livestock number is not precised. Moreover, numbers of animals varied greatly since the independence. For example, in Altyn, in 2000, according to official data there was 5,685 livestock units, so only slightly lesser than today. Statistical data miss to report the livestock from inhabitants of Naryn town which is kept by shepherds and livestock keepers all-year long in Altyn.

With the work on infrastructure, the PCs have created conditions that support the mobility of livestock owners and shepherds, by improving interactions with traders, and with the villages as the mobility is increased. The situation of livestock keepers and shepherds highlights the diversity of the stakes related to their mobility. Other socio-economic measures are likely to have an impact on the willingness of migrating households to move to more distant pastures for extended periods. Although most PCs are not involved in these kinds of discussions, they do occasionally take actions around these social issues. For instance, in Žerge-Tal the PC head goes to the pasture to collect information on the number of livestock together with a doctor. Through this initiative, the PC head shows support for the households on the pastures, and it prevents households from returning to the village too early because of health issues.

Discussion and conclusions

This research shows the variety of factors influencing the decision-making around migration to pastures and the importance of the interactions between informal and formal pasture management institutions. The third design principle for successful common-property of common-pool resource states that resource users should be able to modify the operational rules which affect them. Beyond this rather simple sentence, this paper explored in one hand the impacts on the mobility of pasture users, and in the second hand, the different aspects of what participation can mean in an agropastoral system, where sedentary and migrating stakeholder groups have different interests.

My findings demonstrate that the decision to migrate or not, and the distance of migration undertaken, is still made based on a complex set of factors including economic and social, as highlighted by Crewett (2012), Liechti (2012) and also Farrington (2005), who conducted research in Naryn and Issyk-Kul provinces in the years following the dismantling of collective and state farms. Steimann (2012) found that this complex decision-making process is a strategy to cope with uncertainties in different areas. The PCs have no operational mechanisms to enforce pasture allocation and are unlikely to do so in order to avoid conflicts with pasture users. However, through the increase of pasture accessibility measures, some PCs have been able to ensure that most of the flocks go to remote pasture at dates agreed upon together with pasture users.

These results support the crucial importance of informal groups composed of shepherds and livestock keepers in the decision-making around migration (Crewett, 2012). Although at the time of the implementation of the law, informal groups were mostly active to protect their interests in small-distance grazing all year round, after the law's implementation, which resulted in the reinforcement of PC powers, especially in the form of financial means for access infrastructure purpose, these two groups began instead to lobby for their interests among different stakeholders having different roles (shepherds, livestock owners, livestock keepers) or among inhabitants of villages which compose the rural municipality. Thus, despite little actions from the PCs to ensure universal stakeholder participation and representation in decision-making processes, informal groups can influence the PC to differing degrees to push for their own interests according to their role in the agropastoral system and their geographical location. The PC structure allows for grass-roots participation because it is

seen as a weak institution. Unlike the cases presented by Shigaeva *et al.* (2016) and Isaeva and Shigaeva (2017), in this case study stakeholders show interest in PC actions, although they are not familiar with the legal set-up. This interest and their participation is strongly related to informal groups and are rarely openly presented. This may be a Soviet legacy in the way that pasture users could perceive their participation as informal groups as pressure on an administrative body, and thus reluctant to share their experiences. Despite attempts from supporting governmental organizations to include minorities in PCs (Crewett 2015), informal pasture users institutions are ignored. First, informal institutions were not considered either during the creation of the legal framework around pasture management nor during the implementation phase by supporting governmental agencies and NGOs. Furthermore, informal groups are recognized by PCs only when they raise their voices, even though their existence is well-known. Second, the development of mechanisms to create links between the informal and formal institutions would require the variety of uses of pastures to be taken into account, and to acknowledge the different groups according to the nature of resource subunits, seasonality and the dynamic character of uses. Further research could investigate the informal management of pastures as, in certain cases, informal groups have been shown to be more effective than formal institutions in managing common-pool resources (Yami *et al.* 2009).

Beside direct representation explored in this paper, indirect representation amongst different stakeholder groups, through formal and less formal mechanism should be addressed through specific data collection tools.

The creation of PCs in 2010 led to a new centralized management system run at the rural municipality level, which fails to actively and systematically engage stakeholders who have different uses over pastures. This results in a management system in which the control of operational rules defining migration are defined by non-migrating households, including local elites. Only summer pastures are seen as an object of management, despite the fact that the pasture resource system is by nature complex and includes ecosystems at different altitudes and different exposure. This results in a de facto mismatch between resource boundaries and management boundaries as described in the design principle 1B related to the knowledge of the boundaries of the resource (Cox *et al.* 2010; see Appendix 1).

The lack of involvement of different stakeholder groups creates a barrier to collective action, as the PC mostly reproduces a top-down rather than collaborative approach. As underlined by Isaeva and Shigaeva (2017), this can be explained by the persistence of a Soviet-era mindset amongst PC members and pasture users that causes the PC to be confused with an administrative institution, which it legally is not.

It also limits the capacity of the PCs to build knowledge, as the users could be a source of information on the state of the resource and its dynamics and thus create feedback loops to adapt use to the condition of the resource (design principle 4).

Moreover, it maintains the gap between the understanding of local users and experts regarding the primary cause of pasture degradation (Liechti 2012), although having shepherds or livestock keepers formally involved in data collection and monitoring can lead to building a common vision and improved monitoring of the resource (Levine *et al.* 2017). This gap in understanding is accentuated by the focus on access infrastructure. Community-based pasture management mostly works through the PC at the rural municipality level, which although enjoying formal status, is not a community of practices. The increase in the number of shepherds and livestock keepers on remote pastures and the consequent reduction of the load on pastures close to the villages do not directly result in an optimal use of the vegetal cover. At the moment, there is no evidence from PC monitoring on the level of degradation or non-degradation of the pastures accessible via newly repaired access/transport infrastructure. Thus, there is a risk that remote pastures, which have made accessible by development of transport infrastructure, will experience an increase in the concentration of livestock numbers, especially in the case that PCs do not develop pasture management plans according to the condition of the resource.

It appears that PCs understand mobility as the migration to summer pastures within clearly defined and hermetic boundaries. However, mobility should be understood more widely than this official description, as the flexibility of boundaries enhances the carrying capacity of pastures (Behnke and Scoones 1993) and is also crucial in coping with social uncertainties (Quinn 2007). Moreover, livestock and their keepers can have an impact on surrounding ecosystems: realistically this should require collaboration between neighbouring pasture management institutions. This is particularly the case when pastures managed by PCs border forest areas and rivers that are under the responsibility of the FMU, or when transhumance routes cross pastures administrated by different institutions. Livestock very often crosses the invisible lines of administrative boundaries and grazes in forests or on river banks. This can be a severe threat to forest regeneration and to the access of downstream communities to clean water (Charré 2016). It also creates tensions as the institutions have different operational rules regarding the regulation number of grazing animals (Mestre *et al.* 2013). Thus, 1A and 1B design principles should be adapted, to better take into account their flexible nature in agropastoral systems. Reinforcement of embedded management systems with actions at higher level - district and province (design

principle 8) - among PCs and FMUs would allow for better coordination and could potentially create positive outcomes as in the case of Žerge-Tal.

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References

- Alber, A. 2009. Sonal. Université F. Rabelais: Tours.
- Baggio, J., Barnett, A., Perez-Ibarra I., Brady U., Ratajczyk E., Rollins N., Rubiños C., Shin H., Yu D., Aggarwal R., *et al.* 2016. "Explaining success and failure in the commons: the configurational nature of Ostrom's institutional design principles". *International Journal of the Commons* 10(2): 417-439.
- Behnke, R.H., Scoones, I. 1993. "Rethinking range ecology: implications for rangeland management in Africa". In: *Range Ecology at Disequilibrium: New Models of Natural Variability and Pastoral Adaptation in African Savannas*, eds. R.H. Behnke, I. Scoones, C. Kerven, 1-30. London: Overseas Development Institute.
- Bussler, S. 2010. *Community Based Pasture Management in Kyrgyzstan. A Pilot Project in Naryn Region*. CAMP Alatoo, GIZ, Bishkek.
- Charré, S. 2016. "In-Kind rewards for ecosystem services". In *Investing in Sustainable Mountain Development: Opportunities, Resources and Benefits*, eds. S. Wymann von Dach, F. Bachman, A. Borsdorf, T. Kohler, M. Jurek, E. Sharma, 52-53. Bern: Centre for Development and Environment, University of Bern.
- Committee on Environmental Policy, 2000. *Environmental Performance Reviews* (Kahnert, A. and Narkevitch, I., eds). United Nations: New-York and Geneva.

- Cox, M., Arnold, G. and Villamayor Tomas, S. 2010. "A review of design principles for community-based natural resource management ". *Ecology and Society* 15(4): 1-19.
- Crewett, W. 2012. "Improving the Sustainability of Pasture Use in Kyrgyzstan". *Mountain Research and Development* 32: 267-274.
- Crewett, W. 2015. "Introducing decentralized pasture governance in Kyrgyzstan: Designing implementation rules". *Environmental Science & Policy* 53, Part B: 215-224.
- Dörre, A. 2015. "Promises and realities of community-based pasture management approaches: Observations from Kyrgyzstan". *Pastoralism: Research, Policy and Practice*, 5(1): 1-20.
- Egemberdiev, A. 2010. State Policy Implementation Of Pasture Management And Improvement, (presentation) Department of Pastures under the Ministry of Agriculture and Melioration.
- Farrington, J.D. 2005. "De-Development in Eastern Kyrgyzstan and Persistence of Semi-Nomadic Livestock Herding". *Nomadic Peoples* 9: 171-197.
- Fitzherbert, A.R. 2006. Kyrgyzstan country pasture/forage resource profile. Working Paper. FAO.
- International Fund for Agricultural Development. 2012. Livestock and Market Development Programme, Design completion report. Main report, Kyrgyz Republic.
- Isaeva, A. and Shigaeva, J. 2017. "Soviet Legacy in the Operation of Pasture Governance Institutions in Present-Day Kyrgyzstan". *Journal of Alpine Research*, 105(1): 1-15.
- Jacquesson, S. 2010. "Reforming pastoral land use in Kyrgyzstan: from clan and custom to self-government and tradition". *Central Asian Survey*, 29(1): 103-118.
- Law of the Kyrgyz Republic on Pastures [Zakon Kyrgyzskoj Respubliki O pastbi ah]. 2009.
- Levine, J., Isaeva, A., Eddy, I., Foggin, M., Gergel, S., Hagerman, S. and Zerriffi, H. 2017. "A cognitive approach to the post-Soviet Central Asian pasture puzzle: new data from Kyrgyzstan". *Regional Environmental Change* 17: 941-947.
- Liechti, K. 2012. "The Meanings of Pasture in Resource Degradation Negotiations: Evidence From Post-Socialist Rural Kyrgyzstan". *Mountain Research and Development* 32: 304-312.
- Mestre, I., Ibraimova, A. and Azhibekov B. 2013. *Conflicts over pasture resources in the Kyrgyz Republic*. CAMP Alatau, Acted, Bishkek.
- Mestre, I. 2017. When Shepherds Mine Mountains: The Impact of Artisanal Mining on Agropastoral Systems in Kyrgyzstan. Case Study of Naryn Province. *Journal of Alpine Research* 105(1): 1-18.
- Murzakulova, A. and Mestre, I. 2016. *Natural Resource Management Dynamics In Border Communities Of Kyrgyzstan And Tajikistan*. Research report. Mountain Society Research Institute, University of Central Asia, Bishkek.
- Naryn Province Statistical Committee. 2017. *Agricultural land by type at municipality level*, (unpublished): Naryn.
- Naryn Province Statistical Committee, 2017. *Number of livestock by species at municipality level* (unpublished): Naryn.

- National Statistic Committee. 2016. *islennost naselenija oblastej, rajonov, gorodov, poselkov gorodskogo tipa Kyrgyzskoj Respubliki v 2016g.* [Population of provinces, districts, cities and urban settlements of the Kyrgyz Republic, 2016]
- National Statistic Committee. 2017a. (unpublished).
- National Statistics Committee. 2017b. dataset for mapping, accessible through GIS training modules for Kyrgyzstan, <https://eba.klink.asia/dms/klink/9ca0db/download> [Accessed 1 May 2018]
- Ostrom, E. 1990. *Governing the commons: the evolution of institutions for collective action.* Cambridge University Press: Cambridge, Great Britain.
- Ostrom, E. 2007. "A diagnostic approach for going beyond panaceas". *Proceedings of the National Academy of Sciences of the United States of America* 104: 15181–15187 DOI: 10.1073/pnas.0702288104
- Ostrom, E. and Cox, M. 2010. "Moving beyond panaceas: a multi-tiered diagnostic approach for social-ecological analysis". *Environmental Conservation* 37: 451–463
- Poteete, A.R., Janssen, M.A. and Ostrom, E. 2010. *Working together: collective action, the commons, and multiple methods in practice.* Princeton, N.J., United States of America.
- Quinn, C.H., Huby, M., Kiwasila, H. and Lovett, J.C. 2007. "Design principles and common pool resource management: An institutional approach to evaluating community management in semi-arid Tanzania". *Journal of Environmental Management* 84: 100–113.
- Robinson, S., Wiedemann, C., Michel, S., Zhumabayev, Y. and Singh, N. 2012. "Pastoral Tenure in Central Asia: Theme and Variation in the Five Former Soviet Republics". In *Rangeland Stewardship in Central Asia*, ed. V. Squires, 239–274. Netherlands: Springer.
- Robinson, S. 2016. "Land Degradation in Central Asia: Evidence, Perception and Policy". In *The End of Desertification?*, eds. R. Behnke, M. Mortimore, 451–490. Heidelberg: Springer.
- Shigaeva, J., Hagerman, S., Zerriffi, H., Hergarten, C., Isaeva, A., Mamadalieva, Z. and Foggin, M. 2016. "Decentralizing Governance of Agropastoral Systems in Kyrgyzstan: An Assessment of Recent Pasture Reforms". *Mountain Research and Development* 36: 91–101.
- State Agency On Environment Protection And Forestry Under The Government Of The Kyrgyz Republic, 2006. *Kyrgyzstan, environmental and natural resources for sustainable development*, United Nations Development Programme In The Kyrgyz Republic: Bishkek.
- Steimann, B. 2011. *Making a living in uncertainty: agro-pastoral livelihoods and institutional transformations in post-socialist rural Kyrgyzstan.* Department of Geography, University of Zurich, Zurich.
- Steimann, B. 2012. "Conflicting Strategies for Contested Resources: Pastoralists' Responses to Uncertainty in Post-socialist Rural Kyrgyzstan". In *Pastoral Practices in High Asia*, ed. H. Kreuzmann, 145–160. Netherlands: Springer.
- World Bank. 2006. *Kyrgyz Republic - Livestock Sector Review: Embracing the New Challenges.* The World Bank, Bishkek.

- Yami, M., Vogl, C. and Hauser, M. 2009. "Comparing the Effectiveness of Informal and Formal Institutions in Sustainable Common Pool Resources Management in Sub-Saharan Africa". *Conservation and Society* 7: 153-164.
- Yin, R.K. 2011. *Qualitative research from start to finish*. Guilford Press: New York, United States of America.
- Zhumanova, M., Wrage-Mönnig, N. and Darr, D. 2016. "Farmers' Decision-making and Land Use Changes in Kyrgyz Agropastoral Systems". *Mountain Research and Development* 36: 506-517.

Appendix 1.

Design principles for Community-based Natural Resource

Management

1A. Clearly defined boundaries: Individuals or households who have rights to withdraw resource units from the common-pool resource (CPR) must be clearly defined.

1B. Clearly defined boundaries: The boundaries of the CPR must be well defined.

2A. Congruence between appropriation and provision rules and local conditions: Appropriation rules restricting time, place, technology, and/or quantity of resource units are related to local conditions.

2B. Congruence between appropriation and provision rules and local conditions: The benefits obtained by users from a CPR, as determined by appropriation rules, are proportional to the amount of inputs required in the form of labor, material, or money, as determined by provision rules.

3. Collective-choice arrangements: Most individuals affected by the operational rules can participate in modifying the operational rules.

4A. Monitoring: Monitors are present and actively audit CPR conditions and appropriator behavior.

4B. Monitoring: Monitors are accountable to or are the appropriators.

5. Graduated sanctions: Appropriators who violate operational rules are likely to be assessed graduated sanctions (depending on the seriousness and context of the offense) by other appropriators, officials accountable to these appropriators, or both.

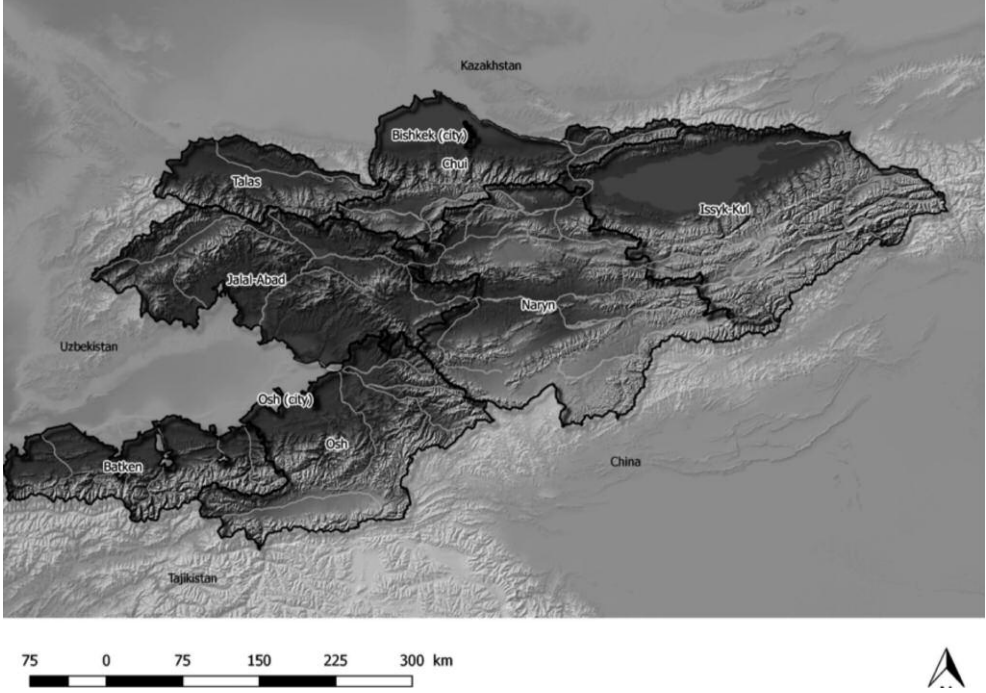
6. Conflict-resolution mechanisms: Appropriators and their officials have rapid access to low-cost local arenas to resolve conflicts among appropriators or between appropriators and officials.

7. Minimal recognition of rights to organize: The rights of appropriators to devise their own institutions are not challenged by external governmental authorities.

8. Nested enterprises: Appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organized in multiple layers of nested enterprises.

Cox, et al. 2010, p 8.

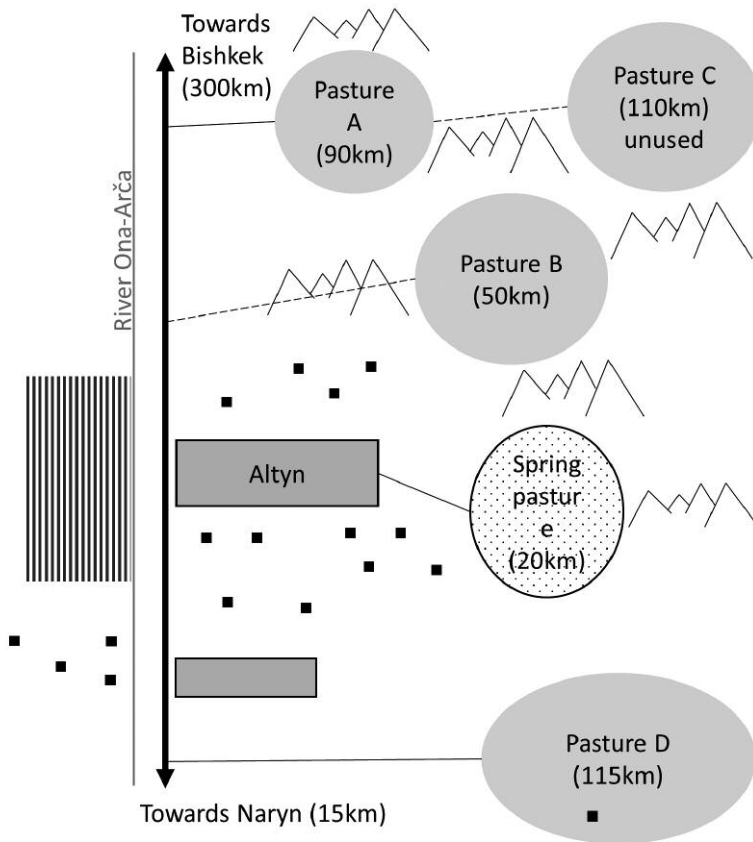
Appendix 2.
Map of provinces of Kyrgyzstan






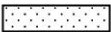



Source: Design by the author based on Bing satellite images and data-base of the National Statistic Committee (2017b).

Appendix 3.

Diagrams of the agropastoral systems in Altyn, Emgek-Talaa and Žerge-Tal



Graph legend

- | | | | |
|---|--|---|----------------|
|  | Irrigated land |  | Summer pasture |
|  | Settlements part of the municipality |  | Spring pasture |
|  | Isolated farms | | |
|  | Road suitable for all motor vehicles | | |
|  | Road suitable only for specific motor vehicles and/or certain weather conditions | | |

