An assessment of the implications of alternative scales of communal land tenure formalization in pastoral systems

Trinity S. Senda[a,b,*], Lance W. Robinson[a], Charles K.K. Gachene[b], Geoffrey Kironchi[b], Jaldesa Doyo[c]

[a] International Livestock Research Institute. P.O Box 30709 Nairobi, 00100, Kenya
[b] University of Nairobi, Department of Land Resource Management and Agricultural Technology. P.O Box, 29053, Nairobi, 00625 Kenya
[c] Yabelo Pastoral and Dryland Agricultural Research Institute. P.O Box 85, Yabelo, Ethiopia

ARTICLE INFO

ABSTRACT

Pastoralism faces diverse challenges, that include, among others, land tenure insecurity, that has necessitated the need to formalize land rights. Some governments have started regularizing rights for privately owned land, but this is complex to implement in pastoral areas where resources are used and managed collectively. Our aim was to assess how the scale of communal land tenure recognition in pastoralist systems may affect tradeoffs among objectives such as tenure security, flexibility, mobility, and reduction of conflicts. We used a participatory scenario-building approach to investigate alternative scenarios of land tenure recognition in southern Ethiopia where a new communal land tenure system is in the early stages of implementation. Through key informant interviews, focus group discussions, and a workshop, respondents analyzed the likely outcomes of communal land tenure recognition at different scales. Our findings suggest that there is a good chance of success when the tenure policy is embedded onto customary structures. All scales have some shortcomings, but Reera seems best, yet pastoralists preferred the Dheeda which despite its challenges, is the best for maintaining flexible mobility. There are multiple uncertainties and complexities, which suggest the for multi-pronged approaches and various support mechanisms when implementing a formal land tenure system in these areas.

1. Introduction

Pastoralist livelihoods are under threat from a variety of challenges, among them the fragmentation and loss of grazing land to other uses (Clavijo et al., 2005; Desta and Coppock, 2004; Schmidt and Pearson, 2016; Tessema et al., 2014). Other challenges include unplanned settlement, expansion of cropping into rangelands, drought and bush encroachment, all of which can disrupt traditional grazing patterns (Abebe et al., 2012; Greiner et al., 2013). These factors undermine productivity and increase vulnerability to drought and other shocks and stresses. They also contribute to conflicts among communities and among land use options (Greiner et al., 2013; Reid et al., 2005).

Insecure collective tenure has compounded these challenges and has been a key driver of rangeland fragmentation (Behnke, 2008). There is preemptive panic land grabbing by pastoralists themselves in reaction to land losses through reallocation to other uses by the governments. Vulnerability of pastoralists is increasing and hence there is an urgent need to secure their rights. There is growing recognition of the need to start realigning land use and land rights policies in such a way that

ensures collective tenure security and sustainability of these land-livestock based livelihoods. Over recent years, securing land rights has become an issue of global concern as it has implications for poverty reduction, economic development, peace keeping and environmental care (Rakotonarivo et al., 2018; UN-Habitat, 2018). The need for secure land rights has attracted increasing attention in the world development agenda and is strongly backed by some of the most influential institutions such as the World Bank and the International Monetary Fund (Benjaminsen et al., 2009; Greiner, 2017). Over 70 % of the world population still does not have registered land rights (UN-HABITAT, IIRR, 2011). The Food and Agriculture Organization of the United Nations (FAO) has also taken some strides in supporting responsible tenure governance. The organization has come up with voluntary guidelines for tenure governance (VGGT) that are intended to contribute to national and global efforts to eradicate extreme poverty and hunger by recognizing the importance of land development and promoting tenure security and equitable access to land (FAO, 2012). These guidelines also emphasize the need to legitimize and protect the tenure rights of citizens (Davies et al., 2016). The Africa Union (AU) has

---

developed the Framework and Guidelines on Land Policy that urges governments to pay attention to the land administration issues and gives guidelines on how these can be implemented (United Nations. Economic Commission for Africa, 2011) It is against this background that some countries are moving towards this direction and working on legitimizing the customary land rights and implementing various land tenure reforms (Greiner., 2017). Some governments have been overwhelmed by these calls and have been compelled to move fast to implement these policies with minimum consideration of the aftermath, and only to come back years later, trying to reverse the consequences through time consuming and costly processes (Asiama et al., 2017; Benjaminsen et al., 2009).

The lack of secure tenure for pastoralists in developing countries contributes to land fragmentation and other challenges mentioned above. However, crafting frameworks to provide secure tenure for pastoralist rangelands is challenging. Traditional pastoralist governance regimes are seldom understood or even recognized by national governments and are not easily harmonized with conventional land tenure systems implemented by modern states. Policies to secure tenure and strengthen governance often overlook the need for flexibility and, in the process, undermine it. Reconciling the conflicting, and seemingly incompatible, needs of secure tenure on the one hand, and mobility and flexibility on the other, is the "paradox of pastoral land tenure" (Fernández-Giménez, 2002). Fernández-Giménez, (2002 suggests that to avoid the problem of boundary demarcation there is need to focus on customary rangeland management institutions rather than the formalized system. While in many countries progress has been made in formalizing property rights for privately owned land, the recognition of communal property rights is lagging. This has mainly been due to the numerous complexities that are involved in common pool resource use and management, which complicates effective policy formulation.

There are advances in putting together an operational legal and institutional framework, but a lot still needs to be done to develop a functional spatial framework. Where progress has been made in recognizing communal property rights, policies have been informed in some measure by the scholarship on commons based on the work of Elinor Ostrom, including the oft-cited design principles for effective governance of commons. Among these principles are recognition by authorities of the rights of communities to manage the commons, and the need for clear territorial and social group boundaries in order to group members to be able to exclude unentitled parties and prevent free riding (Ostrom, 1990).

There remains a question of how to structure the land rights formalization programs where land is communally owned, and for such systems as pastoral systems that display some unique governance mechanisms. Such critical questions as how policies can therefore be drafted in such a way that they and serve multiple objectives including ensuring secure tenure without undermining the need for seasonal mobility remain. Scholarly work on pastoral systems, however, argues that these pastoralist systems often do not conform to the principles of mainstream commons theories (Behnke, 2008; Moritz et al., 2018; Robinson, 2019). Resource use in these systems is driven by the temporal and spatial variability of forage and water across the landscape thereby necessitating the need for free and flexible mobility (Behnke et al., 2011; Brottem et al., 2014; Molnar, 2014). Pastoralists move with livestock between seasons in search for feed and water to sustain livestock throughout the year (Wario et al., 2016; Xiao et al., 2015). This is strategically done by assessing the condition of both their livestock and different pastures. Mobility is a key livestock drought survival strategy to minimize drought related livestock losses. Traditional pastoralist institutions, management practices and social fabric are adapted to the spatio-temporal variability in rainfall and forage and to this mobile livelihood pattern. For instance, the boundaries of rangeland and community territories are often flexible and porous. Some pastoral resource governance systems are "open property regimes" with rules made in such a way that allows free and flexible mobility (Moritz, 2016). In such

systems, *open access* does not mean the absence of rules and tragedy of the commons, as usually understood in the literature on commons but, instead refers to the pastoralists' right of open access to common pool grazing resources (Moritz, 2016). One of the characteristics of open property regimes is that there are no territorial boundaries and the areas are usually large (Moritz, 2016). Moritz et al., (2018), further reiterates that in many open access systems, use of common-pool resources seems to be sustainable over the long term-emergent sustainability. Robinson (2019) argues that some pastoral systems are neither conventional commons nor open property regimes but are systems in which there is a gradation in clarity and strength of boundaries and property rights over different resources, and in which social processes and governance mechanisms other than conventional land tenure institutions play a stronger role in governance. In these "complex mosaic regimes", claims, rights to use, and the authority of different governance institutions overlap.

Yet among the choices to be made in crafting a communal land tenure framework is how the "communities" are to be defined and delineated, and at what scale communal territories are to be recognized. This paper therefore explores how pastoral communities are to be defined and delineated, and at what scale communal territories are to be recognized viz a vis the tradeoffs among objectives such as tenure security, flexibility and mobility, and reduction in conflicts. We used a participatory scenario-building approach to investigate alternative scenarios of land tenure recognition in a pastoral system in southern Ethiopia where a new communal land tenure system is now in the early stages of implementation.

The new framework is being piloted by the Department of Rural Land Administration and Use, in collaboration with the USAID's Land Administration to Nurture Development (LAND) programme. The expectation is that the land rights formalization, commonly known as "land certification" in Ethiopia, will bring about positive change in reversing and stopping the current challenges in pastoral areas. In focus group discussions, a workshop, and key informant interviews, respondents analyzed the likely outcomes of communal land tenure recognition at different scales. Our findings show that customary structures are a far better option for implementing communal land certification than land units based on administrative boundaries, and that effects on mobility is the main criteria for assessing tenure reforms in pastoral areas. Yet, even among the different types of traditionally defined rangeland territories, none of them constitute an ideal choice to become the "community" in this communal tenure system. The objectives for a formal land tenure system in pastoral areas will not be achieved solely by allocating clearly defined property rights over clearly defined territories to clearly defined social groups, as might be inferred from a simplistic reading of commons scholarship. Instead, there is a need for a multi-pronged approach and various development and support mechanisms. Every option for delineating communities in Ethiopia's new communal land rights system has its strengths but also drawbacks.

1.1. Literature review on land policies from a Global, Africa-wide and Ethiopian perspectives

1.1.1. Global land policy initiatives

Land governance underpins the core components of the 2030 global agenda as mentioned by the World Bank Land Governance and Assessment Framework (LGAF), (World Bank, 2011). This framework was set up to develop analytical framework for assessing the state of the land governance at both national and sub national levels and to serve as a basis for dialogue for policy issues with respect to land governance. Rapid changes taking place on the global space, including population growth, climate change and the increased demand for food and raw materials are putting pressure on the land resources and this is happening at a time when there are no clear land rights for some communities hence fueling high levels of tenure insecurity and conflicts

(Deinlnger and Binswanger, 1999). The LGAF thus seeks to give guidance for countries on a much coarser scale on how to identify and implement priority reforms in the land sector. Secure tenure is a cornerstone for agriculture and food security as shown by some studies where it was found to improve investment in better farming methods such as mechanization of agriculture and intensification (Deininger et al., 2008). The world bank continues to make efforts to engage with partners of the "Land 2030 Global Initiative" to enhance the commitment of countries to mobilize resources to achieve the set targets of securing land rights by 2030 (UN, 2013). Most of these efforts are to bring countries in Africa, Asia, Eastern Europe and Central Asia, Latin America, and the Middle East up to speed with the issue of improving land tenure security (Deinlnger and Binswanger, 1999). To support this global initiative there has been several other support structures such as the International Land coalition, Voluntary Guidelines on the Responsible governance of tenure by FAO. The Africa land governance framework is one such structure that feeds into the goals of the Land 2030 Initiative (FAO, 2012).

There has of late been a greater push by many other international organizations for strengthening land rights. Some examples include the International Land coalition (ILC) a global alliance of over 200 member organizations, working together to put people at the center of land governance. As part of their strategy they seek to ensure that indigenous communities such as pastoralists have secure tenure rights and are included in decision making about tenure to prevent and remedy land grabbing. . In 2012, FAO developed the guidelines for the governance of tenure to serve as reference to the guide the governance of tenure in a way that ensures food security for all. The guidelines also acknowledge the importance of land as the main livelihood stage for the rural poor and that their livelihoods are based on secure and equitable access to resources (FAO, 2012). It advises governments to include these guidelines as they implement the governance of tenure and natural resources (Davies et al., 2016).

1.1.2. Land policies: Africa

The African Union (AU) developed the framework and guidelines on land policy in Africa to strengthen land rights, enhance productivity and secure livelihoods. The rate of implementing the land policy in most African states has however remained slow. Some of the challenges owing to this slow progress have been assessed by the Land Policy Initiative (LPI) that put up a framework that will enhance and speed up the implementation process (United Nations. Economic Commission for Africa, 2011). The context of the land policy in Africa as presented by the consultative workshops for the five regions of Africa held by the Africa Union-EU Commission for Africa and African Development bank (AU-ECA-AfDB) consortium in 2011 highlighted common problems regarding land, governance and access. Most of the land was shown to be under communal ownership and governed by customary institutions and management programs. Levels of insecurity of tenure was also shown to be very high. The tenure insecurity was said to exacerbated by increasing human population, reallocations and expropriation for mining, irrigation and public works (Tura, 2018). Methods of securing tenure and people's rights in the context of legal pluralism was also said to be an issue and there are increases in land related conflicts (Deininger et al., 2008). In East Africa for example, land fragmentation was said to be responsible for the reduction in carrying capacities and the decline in both domestic and wild animal populations (Desta and Coppock, 2004; Galvin et al., 2004). Most of the countries have made some strides in trying to curb these land administration and rights for different user groups, and to contribute to sustainable natural resource management. There are various efforts to protect the commons, integrate the customary systems into the new institutional framework, harmonize gender and community based natural resources management policies.

1.1.3. The Ethiopian case: the history of land policies in Ethiopia

In Ethiopia land is a public property and has been administered by the government since the 1975 land reform (Samuel, 2006). Before this reform took place the kinship and private tenure systems were the most common. The kinship system allowed access to land by all descendants of a common ancestor. This system reduced landlessness but encouraged land fragmentation. Private tenure was the most dominant system during the last days of the Imperial regime, largely created by means of land granting by the Crown to the members of the army who were loyal to the regime (Ambaye, 2012). Between 1974 and 1991 (the Derg period), there were radical changes in the policies that saw the end of the tenant-landlord relationships (Ambaye, 2012; Bruce et al., 1994). This reform was set to alter agrarian relations, increase agricultural production, distribute land and increase rural incomes and allow growth in the agriculture sector. Since that time the right to own land was vested on the State, allowing farmers to access land through state mandated associations (Deininger et al., 2007). Land was allocated according to the number of household members. The Ethiopian government came up with the Rural Land Policy and Ethiopia's Agricultural Development Led Industrialization policy (ADLI) in 1994-95 focusing on increasing productivity in the smallholder sector through provision of key cropping inputs, access to credit and growth in infrastructure (Little and Behnke, 2010; Tsegaye et al., 2010). The poverty reduction strategy paper in Ethiopia in relation to land policy was developed to assess the poverty levels in the country and what the possible causes were. Significant increases in poverty levels were noted with the unavailability of land and declining soil fertility being cited as the major causes (Deininger et al., 2007). The issue of land tenure was however not considered at great length as the focus of that time was achieving the objectives of the ADLI. Some authors argue that strengthening agricultural production alone would not solve the problems of poverty in Ethiopia if there is still a lot of tenure insecurity which is somehow related to the land policy (Little and Behnke, 2010; Samuel., 2006; Tesfaye, 2004). The federal constitution of 1995 favored the public ownership of land. Control of land administration was taken away from regional governments and put directly under the responsibility of political bodies rather than technical ministries. The problems with that land tenure system was that most people are remained landless. That system also did not guarantee security of tenure and because of that there are no incentives in investing in good land management (Oba, 2012). This has caused environmental degradation, reduced productivity and looming poverty.

1.1.4. a Land use policy and registration in Ethiopia

Ethiopia has a central government overlooking a population of close to 100 million found in nine regional states and two independent cities (Samuel, 2006). The economy is faced with challenges like expansion of cropping into rangelands and invasive species that are lowering their productivity (Gebremeskel et al., 2016). Not much land use planning is done and if not considered now, the country's natural resources may be depleted and livelihoods of those depending on them affected. Most of the land use planning that has been done before was mainly focused on the river basin development, forest planning and regional land use, with very little integration among these (Samuel, 2006). The government envisages the land use policy will be ready for use in its third Growth and Transformation Plan for the period 2020–2025 (Deininger et al., 2007). For these reasons the government has taken major steps in issuing a national land use policy and a national integrated land use policy. In as much as land is legally owned by the State in Ethiopia, on a day to day basis grazing lands function as communal property which clan members can access within their boundaries. The past few years, pastoralists have been faced new challenges which call for land use planning and tenure reforms in these areas. The government piloted a participatory district level land use planning in some of these pastoral areas (Woreda Land Use Planning-WLUP) as a way of implementing the land use policy (Gebremeskel et al., 2016).

1.1.5. b Land certification

The constitution in 1994, declares in Article 40 that "Ethiopian pastoralists have a right to free land for grazing and cultivation as well as the right not to be displaced from their own lands" (Ambaye., 2012). The Ethiopian government has over the years seen a great need to give attention to pastoralism as it is of economic importance to the nation. It has started the process of land certification to improve tenure security in the farmlands and continues to seek ways of how this certification can be implemented in pastoral settings (Beyene, 2016). The nature and complexity of the lowland pastoral areas however need a different approach from the usual land use planning in sedentary systems. The land registration and administration (also known as land certification) policy has been going on over the past ten to fifteen years and has been rolled out successfully in the agricultural areas in the highland parts of the country (Deininger et al., 2007). Not much has been done in registering and certifying pastoral rangelands and pastoralists have continued to lose land to other large-scale projects with no compensation (Ambaye., 2012; Tura., 2018).

One of the main objectives of the Ethiopian land certification is to secure land rights for the pastoralists as enshrined in the constitution (Ambaye, 2012; Samuel, 2006). Other problems such as bush encroachment and land degradation due to inappropriate grazing practices have increased over the past years as the pastoralists have not been motivated to invest in rangeland management. The certification is thus expected to directly and indirectly address some of these problems. One of the big hurdles for decision makers with regards to certifying communal rangelands in Ethiopia has been the scale of demarcation. This is because the legal framework for land certification was originally developed with the farmland in mind (Samuel, 2006) and offers no clear guidance on how large the communal territories should be. Land governance in the Borana zone is such that there are different units of formal and customary administration that Borana rangelands are subjected to. There is the Borana customary governance system (the *Gada system*) and the government administration systems. The *Gada* system (headed by *Aba Gada*-Borana leader) divides the rangeland into five grazing units called Dheedas (Dirre, Golbo, Malbe, Woyama and Gomole) based on the landscape characteristics in each (Wario et al., 2015). These Dheedas are subdivided into smaller grazing units called Reeras. On the other hand, the government administration divides the Borana area into administrative units called Woredas (districts) which are further subdivided into Kebeles (villages), and these administrative units overlap with the *Gada* system territories, having different boundaries.

2. Methodology

2.1. Site description

The Borana zone of Southern Ethiopia is an ideal setting for this kind of study as it is going through a process of regularizing communal land rights for pastoralists. The Government of Ethiopia, with support from the United States Agency for International Development, has begun a process of regularizing land ownership by putting up new tenure arrangements (Cotula et al., 2004; Kuusaana and Bukari, 2015). The study was conducted in Dirre (03° 55′ 37″ N, 04° 46′ 24″ N, and 037° 58′ 10″ E, 039° 05′ 05″ E) which is one of the five grazing units (Dheedas) of the Borana zone in Ethiopia. The vegetation in Dirre is mixed savanna dominated by perennial grasses namely *Cenchrus, Pennisetum, and Chrysopogon spp,* and woody plants like *Acacia* and *Commiphora spp* (Liao, 2014). It stands at an altitude of 1723 m above sea level, with average temperatures ranging between 19 and 24 degrees Celsius. Rainfall is bimodal, and the annual average varies between 350 mm and 900 mm with a variability of between 21 % and 68 %, the least received in August and the highest in April (Deke, 2016; Liao., 2014, Homann et al., 2008).

2.2. Data collection and processing

We employed a participatory scenario-based approach in the data collection. This involved key informant interviews with the different stakeholders who work on pastoral systems, land administration, and land rights issues to get an understanding of the objectives of the new communal land certification framework in pastoral areas. These stakeholders were involved at different stages, between November 2017 and May 2018. The Department of Rural Land Administration and Use (RLAU), NGOs and the Zonal Pastoralist Development Office (PDO) were key in providing the background information that helped inform the checklist to be used for the focus group discussions. Other stakeholders included different Federal government ministries, regional government of Oromia and the Borana zonal administration, research institutes, Dheeda traditional leadership and elders to get an in-depth understanding of the implementation plans and the perceived implications on pastoral system facets. Focus group discussions were conducted in Dirre Dheeda with pastoralists from five out of the five sub grazing units (Reeras), namely Dubluk, Web, Melbana, Soda and Romso. On average each focus group discussions had 12–15 participants of different ages and both genders.

The focus group discussions were guided by the key research questions that sought to understand the future of pastoralism under different certification regimes in thirty years to come. The key facets and challenges of the system were identified with the key informants and through the focus group discussions. The current status of each facet was assessed and used as the basis for making a decision about its state in the future. The different possible certification scales (Reera, Dheeda, Kebele and Woreda) and a non-certification option were used as the different possible pathways to the future of pastoralism. The magnitude and direction of change for each facet were estimated by the participants. Visioning was used to create scenarios of how the future would look like under different pathways, and the rationale for the future state for each facet was discussed. This helped to visualize the unforeseen possibilities in the future and the likely tradeoffs involved. The process incorporated to every degree possible the alternative perspectives of different participants. Nevertheless, it emerged that there was broad consensus among the focus group discussions. The emergent issues were further discussed in a multi stakeholder workshop that brought together representatives of the pastoralists from the five Reeras, local government and non-governmental organizations and the local research institute. The aim of the workshop was to collate and validate the ideas from previous key informant and focus group engagements. The stakeholders also identified key uncertainties that has a bearing on the successful implementation of the land certification policy.

The participants also listed the most important criteria to pursue to achieve the goals of certification and then performed a scoring to assess how each of these would be met at different scales of certification. This was then used to choose the most preferred certification scale using the pairwise ranking in the Analytical Hierarchical Process (AHP) method developed by Thomas Saaty in the early 1980s. This method performs pairwise ranking by generating ratio data (Yatsalo et al., 2015) and it captures both objective and subjective aspects of the decision-making process, checks for consistency and hence reduces the element of bias. Eight reasons why certification is needed as discussed in the groups were used as the criteria in an AHP approach to decide which certification scale option is the most preferred. The AHP is a component of the multi criteria decision analysis (MCDA) as described by (Dodgson et al., 2009; Kiker et al., 2005; Yatsalo et al., 2015. The MCDA uses a set of evaluation criteria, and in this case, it was the rangeland health, livestock mobility, customary institutions, conflict reduction, ease of communication, control cropping in rangelands, tenure security and community-based rangeland management (CBRM) as mentioned by the stakeholders. These were used to assess which certification option achieved the most desirable trade off by generating weights for each

Table 1
The expected outcomes of the facets of pastoralism under different scales of certification as mentioned by the respondents.

Pastoralism facet	Expected outcomes without certification	Expected outcomes for certification at:			
		Reera	Dheeda	Kebele	Woreda
1. Rangeland condition	A large decline as there will be less land available for grazing and encroachment of cropping increases, more land losses to outsiders without compensation continues, no incentive to invest thereby compromising rangeland management	A huge improvement as the area is small hence stronger sense of tenure security, high motivation to invest in rangeland management, easy to communicate and mobilize the community	Easy to plan grazing into seasonal grazing zones thereby allowing other sections to regrow but a moderate improvement as the large size makes progress in range management slow.	More animals might be confined in a small area because of likely mobility restrictions resulting in a large decline in rangeland condition.	Area will be large hence less overgrazing is expected but, cut across different grazing and customary units, difficult to plan grazing and rangeland management activities so the condition will decline moderately
2. Land degradation	A huge increase as the grazing rules are broken and hard to enforce, increase in the cropping on prime land.	Impossible to divide the rangeland into different grazing zones but easy to implement CBRM hence degradation may continue but by a small margin.	A small decrease as it will be easy to plan grazing, and settlements but difficult to mobilize the community for CBRM	Small land sizes and hence overgrazing, resulting in large increases in degradation	A large increase as no one will be no one vested in controlling land degradation
3. Community Based Rangeland Management (CBRM)	Moderate decline as there is no incentive in investing on land they might lose. It will get even more difficult to mobilize people who are not motivated and insecure. Maybe only possible for NGO supported programs	Small size, which is good for managing grazing and easier to mobilize people to work, easy communication and monitoring hence a large improvement in the involvement	Easy to divide the land into seasonal grazing regimes but mobilizing people to work and to enforce rules may be harder because of the large size hence a small improvement.	Management and decisions about the land will be made by the Kebele officials seeing a large decline in CBRM	A large decline as community mobilization will be impossible as it will bring together communities from different grazing units and clans
4. Strength of customary institutions	A large weakening as the government role becomes stronger especially in decision making about land allocations and investments	Governing a smaller tenure secure group will be much easier a moderate increase in strength is likely	Community leaders will have their authority revived but difficult to bring all on board due to slow information flow hence a small increase	A huge weakening as pastoralists will feel insecure and as they will be governed by the Kebele officials.	A huge weakening as pastoralists as the government administration, which is more formal would be more in charge.
5. Tenure security	Very high tenure insecurity as there could be more land taken without compensation as already seen in other regions.	A huge strengthening as the small size makes it easy to have ownership deeply rooted within the pastoralist communities, small size also means that participation in decision making would be easier	Easier to stop outside interference, but not so much as its big size may limit the ability of locals to be directly involved in decision making hence a moderate increase	A huge decline as land related decisions will be done by the Kebele officials, risk of more land losses.	A huge decline as this will bring in people from other Woredas into same grazing regime and weak local institutions, locals no longer have a strong voice.
6. Livestock herd sizes	Productivity will go down because of decline in rangeland condition, overall numbers would eventually go down.	A moderate decline as the carrying capacity declines and there will be a need to supplement the rangeland, scale down on numbers and/or intensify production.	Free and flexible mobility and division into seasonal grazing will encourage herd growth but climate stresses will still force pastoralists to scale down a little	Pastoralists' loss of land governance power and even smaller grazing areas will cause a mild decrease in herd sizes.	Risk of thefts, conflicts and poor rangeland condition making it hard to keep a large herd but a mild decline as pastoralists are livestock people
7. Livestock species compositions	A small increase to curb the feed shortages, pastoralists will keep other livestock types, but poor rangeland will be a limiting factor	Small area size and high risk of restricted mobility would push people to scale down and or intensify but maintain current species composition	Free and flexible mobility support cattle keeping which is the main activity so this could be chance to focus more on cattle	Small land available for grazing will make it hard to diversify, scaling down is likely	Poor rangeland condition push to the keeping of other livestock types but only a small increase because of grazing access limitations
8. Livestock prices	A small increase because of less animals being available for sale, but poor body condition will minimize the price increase	Limited livestock numbers and improved quality that may push the prices up but by a small margin	There may be an improvement in rangeland condition and hence livestock quality and prices but may later stabilize as the market gets more animals	The prices may decline because of more distress sales, and as the livestock condition declines, the price will slightly go down	The prices may decline because of more distress sales, and as the livestock condition declines, the price will slightly go down
9. Livestock mobility	Small decline within the Dheeda but there may be more out-of-Dheeda movement because the rangeland would be in a bad state and herders will be forced to go far	A large decrease in mobility to try and protect the limited available grazing	No change as the seasonal grazing patterns will be revived	Small size will cause a huge increase restricted mobility.	Large size is good for mobility but high risks of conflicts and theft in new territories hence a small decline in mobility
10. Conflict incidences	A high increase in grazing related conflicts as grazing becomes less available	Conflicts may increase as there may be mobility restrictions	No change as the customary institutions get stronger and grazing rules are revived	Very high because of limited area size and restrictions.	Very high increase in conflicts as there will be stepping on other people's territories

5

Table 1 (*continued*)

Pastoralism facet	Expected outcomes without certification	Expected outcomes for certification at:			
		Reera	Dheeda	Kebele	Woreda
11. Area under cropping	Many will be pushed to go into cropping as they see their livestock die of drought. However, the area is generally not good for rainfed crop production, hence a small increase	Easy to control random cropping and settlement and with good prospects of improved rangeland and hence livestock production	May decrease lightly as some may still feel they are not benefiting from large scale certification	A small increase as there is more support for cropping to cope with a filing livestock production system	Same as for Kebele certification
12. Alternative livelihood sources	Very limited opportunities from pastoralism, high risk of land losses, high conflicts and degradation, hence a huge increase is expected	Better opportunities for intensive livestock production, but the high drought risks hence a small increase	Slow progress in livestock production but possibility of improved tenure security hence a moderate increase in people seeking alternative livelihood sources	Limited opportunities from livestock keeping hence a large increase in people seeking other livelihood sources	A huge increase in seeking alternative livelihood sources as pastoralism becomes less attractive.

criterion. The higher the weight the more important was that criteria in terms of achieving the objectives of certification. The criteria weights were then combined with the option scores to determine the overall score to be used for ranking. The overall score for a given option is the weighted sum of scores it achieved with respect to all the criteria (Yatsalo et al., 2015).

3. Findings

3.1. Future scenarios of pastoralism with or without certification

The focus group discussions identified the main facets and challenges that are key to the sustainability of pastoralism as a livelihood source. Twelve key facets of pastoral systems were identified by the stakeholders. These were discussed individually to capture their dynamics and expected outcomes thirty years from now. The focus group discussions each did separate assessments, which were then presented to a larger group in the stakeholder workshop. There was little variation among the focus group discussions in terms of the perceived magnitude and direction of change. The stakeholder workshop further refined and analyzed the focus group findings to produce a consensus on expected outcomes under different scales of communal land certification as presented in Table 1 below.

3.2. The scenario narratives

Based on the different pathways and visions of the future, the outcome of the key informant interviews, focus group discussions and the stakeholder workshop we created the following narratives of the scenarios. These narratives were largely informed by the rationale for the magnitude and direction of change for each of the pastoralist facets identified by respondents as summarized in Table 1 above.

3.2.1. No certification
"free falling system, no hope for pastoralism"

With no certification, a large decline in rangeland condition is expected because there is likely to be less land available for grazing as encroachment of cropping into rangeland and land losses to outsiders with no compensation continues. A huge increase in land degradation is expected as investment in rangeland management declines, bush encroachment increases, collapse of grazing rules continues. High tenure insecurity and more grabbing of land is expected, and rules will be eroded as customary institutions become weak. Some rangeland management activities may be driven by NGOs, and pastoralists will participate for immediate benefits such as food aid from the NGOs. The stakeholders strongly felt that a large weakening of the role and authority of customary institutions is likely to be seen while the government role becomes stronger especially in decision making about investments on the land. The huge decline in rangeland condition will cause productivity to go down as well as herd sizes which will destabilize prices as they go up because of shortage but not so much as the condition will be poor. To curb the feed shortages, pastoralists would find themselves diversifying into keeping other livestock types especially camels. This will not be a large increase as some are already into camel keeping and, in some areas, camels are also dying of drought. Camels and goats are also good users of bushes so they may increase slightly while cattle numbers may decline by a small margin. The respondents unanimously agreed that there would be more out-of-Dheeda movement because the rangeland would be in a bad state and herders will be forced to go far.

Conflicts might increase but, moderately as more land will be degraded and not attractive for livestock rearing or cropping. It is envisaged that that there would be a small increase in the land under cropping as the pastoralists lose livestock to drought related deaths. However, the area is generally not good for rainfed crop production, so

this might not increase significantly. The observations by the respondents were that some people were already beginning to move to the cities in search of alternative livelihood sources, and this is expected to increase.

3.2.2. Certification at the scale of customary territories
"hope for pastoralism"

The hope to continue pastoralism with certification being implemented according to the Borana customary structures seems to be restored. There are still however tradeoffs between the two customary scales in meeting the overall multiple objectives of the land certification.

3.2.3. (a) Reera scale
"secure tenure, major changes, modern livestock production"

The participants from the focus group discussions and the stakeholder workshop strongly agreed that Reera level certification offers an opportunity for a stronger sense of tenure security because of its smaller size as compared to the Dheeda or Woreda. Participants suggested that this would in turn make it easy to mobilize the community to invest in rangeland management activities, leading to a huge improvement in rangeland conditions as compared to business as usual. It will also be easier to control cropping and unplanned settlements in the rangeland. The strength of the Borana-wide customary institutions may not increase much as there might be fragmentation of the rangeland and the social fabric. Mobility is highly likely to be restricted as the community protects their rangeland from outsiders and in turn get restricted too. There may be need for long negotiation processes before animals are moved and this may contribute to some conflicts as not all Reeras are endowed with all the necessary resources such as water pans and other sources. The small size of the Reera will make it difficult to divide the rangeland into seasonal grazing zones.

For these reasons, some degradation may still occur but at levels much slower than when there is no certification. Small grazing area at Reera will force the pastoralists to either scale down the livestock numbers, supplement feeding or venture into more intensive means of livestock production like pen fattening. Proper land use planning will be necessary to allow more productive use of the limited land resources. There will be good prospects of making a living from intensive livestock production, but the drought related risks may still make it unattractive to many hence a small increase in people seeking alternative livelihood sources like employment in the cities may be experienced.

3.2.3. (b) Dheeda scale
"free and flexible mobility"

With Dheeda level certification, the respondents emphasized that its large size makes it easy to plan grazing into seasonal grazing zones, thereby allowing other sections of the rangeland to regrow. This, together with ease of control of settlements will also translate to moderate improvement in rangeland conditions. A small increase in the strength of customary institutions is expected as the community leaders will have more authority but there is a risk of slow information flow and it could either take time to make decisions or the process may not be inclusive enough. However, its large size may make community mobilization difficult hence the small progress in rangeland management activities and some degradation may still continue. On the other hand, a medium increase in tenure security may occur at as it would be easier to stop outside interference, but not so much as its big size may limit the ability of locals to be directly involved in decision making, the system could be prone to external manipulation. A small decrease may occur in livestock species composition to spread the risks associated with drought, some may start keeping more camels and small stock. Mobility will be free and flexible because of the large size of the Dheeda which would be ideal for herd growth, but this will be kept in check by

drought. Conflicts within the Dheeda may be less as movements will be planned, but conflicts outside the Dheeda may continue. A moderate increase may occur in people seeking to alternative livelihood sources like moving to the cities as there may still be drought related challenges that slow progress in livestock production.

3.2.4. Formal scale certification (Woreda and Kebele)
"customary system collapse"

It was unanimously agreed by the participants that certification according to the formal structures will present a unique scenario. For example, the Woreda is large but cuts across different grazing and customary units, thereby making the pastoralists feel more insecure about ownership and access, so that there will be a disincentive for investing in rangeland management. People may be forced to even do cropping to try and cope with limited options and because the area will be small particularly at Kebele, high levels of degradation will occur. A large decline in the strength of customary institutions is expected because decisions on land management will be made by the Kebele officials and pastoralists will feel they are not in charge anymore. Community mobilization will be impossible at Woreda level as it will bring together communities from different grazing units, clans and traditional leadership. Some of these communities are already in land related conflicts. It was widely agreed that this would be a "chaotic," scenario and the whole customary system would crumble. The land users highlighted that they would feel completely excluded as most decisions including conflict resolution will be handled by the formal government administration. High risks of conflicts and livestock theft in new territories, but the large size (at Woreda) may still facilitate more flexible mobility. The government at Kebeles and Woreda are providing more extension support for cropping and with limited options pastoralists may want to diversify into cropping. The unsuitability of the area for cropping production could still be a reason why a small increase is expected. With the livelihood options in the pastoral areas becoming more limited under this certification regime and livestock production being difficult there will be a huge increase in people seeking alternative livelihood options like moving to the cities or venturing into construction businesses.

3.3. Some key uncertainties to consider

During the stakeholders' workshop, focus group discussions on the likely outcomes under different scales of certification, the issue of uncertainties came up many times. These were said to be the likely setbacks or "fears" that could derail the success of the land rights formalization programme regardless of the scale of implementation. The respondents repeatedly emphasized that these should not be overlooked in planning but be treated as important red flags, that the policy implementation should be on the lookout for. The respondents were not sure how these would pan out or how exactly their implications on the certification would be and hence were described as uncertainties. The key uncertainties identified are presented in Table 2 below.

### 3.4. The preferred scale of certification

The criteria to decide on which certification method was most preferred was based on the eight criteria identified by respondents as the main reasons why certification was needed. These were identified as the need for good rangeland health, ability of invest in CBRM activities, stronger tenure security, stronger customary institutions, reduction of conflicts, free and flexible mobility, ease of communication and to control cropping in rangelands. The ranking of each criterion using the AHP was based on the likelihood of the scale being able to meet the objectives of certification.

The Reera scale certification appears to be the most preferred based on the eight criteria as shown in Fig. 1 above, having scored highest in

Table 2

Key uncertainties as mentioned by the participants in the focus group discussions.

Key uncertainties
Increasing human population which may also mean overall increase in livestock numbers and hence degradation and this may stimulate conflicts
Climate change and variability: pastoralists acknowledge that the climate is changing and if this trend continues, the traditional grazing management rules may fail to be compatible with the new certification regime and there may be a need for a review.
Ageing pastoralist population: youths are more towards education, moving to the city and with limited interest in herding animals.
Culture loss and weakening of customary institutions
Urbanization: there is an upward trend in the development of small shopping centers in the pastoral areas into urban areas and these may continue to grow into the rangelands
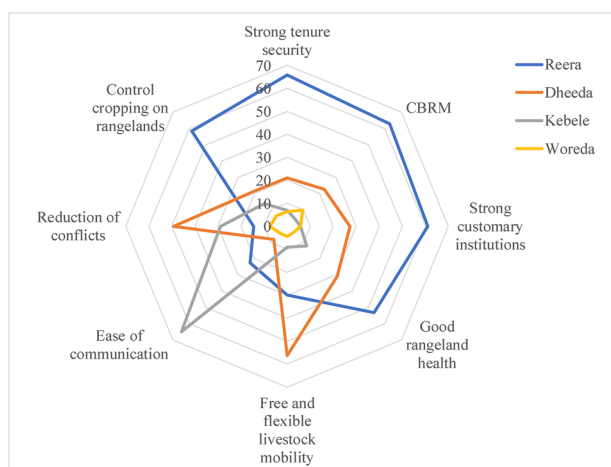
Fig. 1. The tradeoffs among different scales of certification for the main criteria.

most of the selected criteria. However, because of it being smaller than the Dheeda, it scored lower for facilitating flexible mobility. The government structures (Kebele and Woreda) are not preferred for many reasons as discussed in the previous section and have the lowest scores under most criteria except the ease of communication at Kebele level. Despite the Reera scoring high in most of the criteria, the pastoralists still chose Dheeda level certification as it offers a good chance of free and flexible mobility which is what they said matter the most for the sustainability of pastoralism as a livelihood source.

4. Discussion

Our overall aim was to understand how communal land rights formalization at different scales would unfold and what the implications for pastoral land governance and livelihoods would be. Several issues emerged from the participatory scenario development process. Firstly, there is clearly a shared vision about the objectives of the certification policy among the stakeholders. Both the NGOs and the government (Federal and Regional) emphasized the biggest reason for certification as being the need to secure the rights of pastoralists as enshrined in the constitution. This is expected to be useful in the event of major developments going on the land, as pastoralists can be compensated. The findings however suggest grave shortcomings for certifying the land using the formal administrative (Kebele and Woreda) boundaries as compared to the customary territories (Reera and Dheeda). The respondents in our research overwhelmingly agreed that using the administrative units to create the "communities" for communal land certification would present challenges for almost all the important

criteria mentioned above, particularly tenure security, livestock mobility and conflict. The Dheeda level, however, has its own unique challenges: its huge size makes it attractive for mobility, but not tenure security and investment in community-based rangeland management. One elder from Dubluk Reera said,

"dao fago dhamoch hin dho wit"

meaning "*a coat kept far away will not keep you from shivering*". He was explaining that a certificate given at Dheeda level and kept by the head of the Dheeda will not make them feel very secure as the large size of the dheeda will limit them from relating closely with it. So, based on the eight criteria, Reera would seem the best.

Yet, the pastoralists who participated in our research strongly prefer the Dheeda as the unit for communal land certification, despite them having scored it relatively lower than Reera for most of the criteria. This is not a question of irrelevant criteria being used in the scoring—the eight criteria were derived from the participants' own listing and were acknowledged by them as being important. Certification at the Dheeda level, however, scored highest on two criteria: *free and flexible livestock mobility* and *reduction of conflicts*. Even certification at the Reera level was not preferred despite it being based, like the dheeda, on one of the traditional territorial demarcations, and despite it being seen as having the best chance to establish secure communal tenure, facilitate effective rangeland management systems, and contribute to improved rangeland conditions. Instead, the need for livestock mobility trumps all other concerns. For pastoralists, inasmuch as secure tenure is very important, it is clear that a desirable and sustainable tenure system for them is one that is implemented at a scale that allows flexibility and freedom of movement in times of feed and water scarcity. As the piloting of communal land certification based on dheedas moves forward in Borana Zone, the results of the scoring suggest that some challenges can be expected. The Dheeda is a very large scale at which to implement rules on grazing and other natural resource management interventions becomes a challenge. The vast extent of dheedas—the smallest being Golbo at 307,248 ha. in area—imply that it is not the ideal level at which to address problems of exclusion and free-riding. The fact that the participants scored the smaller Reera as being superior to the Dheeda on five out of the eight criteria indicates that they are completely aware of these challenges. Even the matter of whose name should appear on the dheeda land certificate is unclear, as there has not been a strong, clearly defined, and formally constituted management institution at this level.

The tradeoffs among the various criteria, and particularly between flexible mobility and secure tenure, provides another example of the "paradox of pastoral tenure" (Fernández-Giménez, 2002). Policymakers seeking to design land governance systems will seldom be able to choose an option which optimizes all criteria but must craft arrangements that provide the most suitable tradeoffs among different objectives, including the establishment of secure tenure, maintaining the flexibility inherent in traditional pastoralist systems, and others. The social relations, livelihood dynamics and ecological implications that can be expected with formalization of communal land tenure over different kinds of territories show that effective tenure implementation in these areas is not just about getting the scale right. Clearly it is important to take the scale into consideration when formulating policies, and to understand the scale challenges (Cash et al., 2006), but in pastoral systems there is no single best fit that will simultaneously achieve all objectives (Robinson et al., 2017). These considerations, and the fact that for our pastoralist respondents, mobility, flexibility and access supersede other objectives, echo literature which has questioned the applicability of Ostrom's first design principle to pastoral systems (e.g., Robinson et al., 2017): that is to say, the array of objectives for a formal land tenure system in pastoral areas will not be achieved solely by allocating clearly defined property rights over clearly defined territories to clearly defined social groups, as might be inferred from a simplistic reading of commons scholarship.

The question of how the paradox of pastoral tenure can be resolved—how property rights can be secured without undermining mobility and flexibility—therefore, still remains. While our research made no attempt to determine if current land governance arrangements in southern Ethiopia correspond to one or more of the models of property regimes proposed in recent scholarship—open property regimes or complex mosaic regimes—viewing our case study through the lens of this scholarship offers some clues. An overarching implication of considering the Borana land certification process in this way is that a multi-pronged approach and various support mechanisms will be needed. In some pastoralist settings, including the traditional system of the Borana, it has been argued that the land and resource governance arrangements which have emerged are not conventional commons but rather are complex mosaics characterized by unbundled and often overlapping rights, and a reliance on a variety of governance mechanisms in addition to property rights (Robinson, 2019). The *complex mosaic regime* model suggests that overlapping claims over resources, and high levels of spatial heterogeneity in resources make the need for mobility and access to key resources found in territories belonging to other communities at certain times inevitable. Effective implementation of contemporary formal governance systems, therefore, may need to similarly rely on an array of institutions and strategies—operating at different levels and across levels—in addition to certification. Land use planning and deliberative forums that operate across dheeda boundaries could be effective complements to certification. At the same time, the emphasis placed by our participants on free mobility and easy access for pastures is consistent with the description of norms in open property regimes (Moritz, 2016). It has been shown that under the right conditions, open property regimes can result in "emergent sustainability", a situation in which open access does not lead to a tragedy of overuse (Behnke et al., 2016; Moritz et al., 2018) Implementation of communal land certification could be done in such a way as to ensure that dheeda boundaries to not become hard borders, while at the same time other policies and programs try to nurture the preconditions for emergent sustainability: e.g., (Behnke et al., 2016; Moritz et al., 2013, 2018)

5. Conclusion

One of the implications of our findings is that effective communal land governance is driven by a complex mix of community dynamics, social relations, and the biophysical characteristics of the landscape. It is certainly not just about getting the scale right as no single scale meets all the criteria. Secondly, we see through the scenarios that there is need for further development and policy interventions to facilitate sustainable communal land rights formalization. Thirdly, it is important to note that all this is taking place in a world of high uncertainties and these need to be taken into consideration when planning and implementing a new land tenure policy. Finally, there is clearly a need for a more inclusive approach in the planning process instead of basing the arguments about tenure on one theory.

More broadly, the reality is that many African countries have challenges related to land access and ownership and it causes a lot of problems such as degradation, conflicts and declining livelihoods. There are different solutions to tackle these land issues, with different implementation plans, for example the Fast Track Land Reform (FRLR) in Zimbabwe, the land expropriation policy in South Africa, the Village Land Use Planning in Tanzania and the Kenya county spatial planning among others. The world is taking the direction of more improved transparency and accountability in different facets for sustainable development and food productivity, as seen by many calls for responsible governance and approaches to land reform (Asiama et al., 2017).

From our work we suggest some learning points for many other countries that are faced with similar tenure challenges and are seeking to begin the process of regularizing land rights and strengthen customary land governance structures. Our findings show that customary structures are a far better option for implementing communal land certification than land units based on administrative boundaries, and that effects on mobility is the main criteria for assessing tenure reforms in pastoral areas. Yet, even among the different types of traditionally defined rangeland territories, none of them constitute an ideal choice to become the "community" in this communal tenure system. The objectives for a formal land tenure system in pastoral areas will not be achieved solely by allocating clearly defined property rights over clearly defined territories to clearly defined social groups, as might be inferred from a simplistic reading of commons scholarship. Instead, there is a need for a multi-pronged approach and various development and support mechanisms.

The participatory scenario building in this context was important for eliciting key considerations, preferences, and uncertainties involved. It also oriented stakeholders in viewing the implications of different scales of implementation with several lenses thereby informing the decision-making process about the important tradeoffs involved which can be used for building monitoring guidelines. Future scenarios of pastoralism are important in that they unpack critical outcomes of how the biophysical issues like rangeland health and degradation will change under different certification options. This is important as it prepares and helps both decision makers and resource users to not only look at the maximum benefits but to also strike a win-win situation between resource conservation and livelihood benefits (Basurto, 2013; Mcginnis and Ostrom, 2014).

CRediT authorship contribution statement

Trinity S. Senda: Writing - original draft, Conceptualization, Investigation, Formal analysis. **Lance W. Robinson:** Supervision, Conceptualization, Writing - review & editing. **Charles K.K. Gachene:** Writing - review & editing. **Geoffrey Kironchi:** Writing - review & editing. **Jaldesa Doyo:** Investigation, Writing - review & editing.

Declaration of Competing Interest

As the authors we declare that we have no competing interests

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.landusepol.2020.104535.

References

Abebe, A., Eik, L.O., Holand, Ø., Ådnøy, T., Tolera, A., 2012. Pastoralists' perceptions of feed scarcity and livestock poisoning in southern rangelands. Ethiopia. Trop. Anim. Health Prod. 44, 149–157. https://doi.org/10.1007/s11250-011-9902-5.

Ambaye, D.W., 2012. Land Rights in Ethiopia : ownership, equity, and liberty in land use rights. FIG Work. Week 6–10.

Asiama, K.O., Bennett, R.M., Zevenbergen, J.A., 2017. Land Consolidation for Sub-Saharan Africa' S Customary Lands – The Need for Responsible Approaches 5. pp. 39–45. https://doi.org/10.12691/ajrd-5-2-2.

Basurto, X., 2013. Linking multi-level governance to local common-pool resource theory using fuzzy-set qualitative comparative analysis: insights from twenty years of biodiversity conservation in Costa rica. Glob. Environ. Chang. 23, 573–587. https://doi.org/10.1016/j.gloenvcha.2013.02.011.

Behnke, R.H., 2008. The drivers of fragmentation in arid and semi-arid landscapes. In: Galvin, K.A., Reid, R.S., Behnke Jr.R.H., Hobbs, N.T. (Eds.), Fragmentation in Semi-Arid and Arid Landscapes Consequences for Human and Natural Systems. Springer, Dordrecht, Netherlands, pp. 305–340.

Behnke, R.H., Fernandez-Giminez, M.E., Turner, M.D., Stammler, F., 2011. Pastoral migration: mobile systems of livestock husbandry. Anim. Migr. a Synth 144–171. https://doi.org/10.1093/acprof:oso/9780199568994.003.0010.

Behnke, R., Robinson, S., Milner-Gulland, E.J., 2016. Governing open access: livestock distributions and institutional control in the Karakum Desert of Turkmenistan. Land Use Policy 52, 103–119. https://doi.org/10.1016/j.landusepol.2015.12.012.

Benjaminsen, T.A., Holden, S., Lund, C., Sjaastad, E., 2009. Formalisation of Land Rights : Some Empirical Evidence from Mali, Niger and South Africa. Land Use Policy 26 (1), 28–35. https://doi.org/10.1016/j.landusepol.2008.07.003.

Beyene, F., 2016. Land use change and determinants of land management: experience of pastoral and agro-pastoral herders in eastern Ethiopia. J. Arid Environ. 125, 56–63. https://doi.org/10.1016/j.jaridenv.2015.10.001.

Brottem, L., Turner, M.D., Butt, B., Singh, A., 2014. Biophysical variability and pastoral rights to resources: west african transhumance revisited. Hum. Ecol. 42. https://doi.org/10.1007/s10745-014-9640-1.

Bruce, J.W., Hoben, A., Rahmato, D., 1994. After The Derg: An Assessment of Rural Land Tenure Issues in Ethiopia (March). .

Cash, D.W., Adger, W.N., Berkes, F., Garden, P., Lebel, L., Olsson, P., Pritchard, L., Young, O., 2006. Scale and Cross-Scale Dynamics: Governance and Information in a Multilevel World. Ecol. Soc. 11, art8. https://doi.org/10.5751/ES-01759-110208.

Clavijo, del P.M., Nordenstahl, M., Gundel, P.E., Jobbágy, E.G., 2005. Poplar afforestation effects on grassland structure and composition in the flooding pampas. Rangel. Ecol. Manag. 58, 474–479. https://doi.org/10.2111/1551-5028(2005)58.

Cotula, L., Toulmin, C., Hesse, C., 2004. Land Tenure and Administration in Africa: Lessons of Experience and Emerging Issues. International Institute for Environment and Development, London.

Davies, P., Herrera, J., Ruiz-Mirazo, J., Mahomed-Katere, I., Hannam, E., 2016. Improving governance of pastoral lands. Implementing the voluntary guidelines on the responsible governance of tenure of Land. Fisheries and Forests in the Context of National Food Security. GOVERNANCE OF TENURE TECHNICAL GUIDE No. 6. FAO, ROME.

Deininger, K., Ali, D.A., Holden, S., Zevenbergen, J., Bank, W., Dc, W., Sciences, L., 2007. WPS4218 Rural Land Certification in Ethiopia.

Deininger, K., Ayalew, D., Tekie, A., 2008. Impacts of Land Certification on Tenure Security, Investment, and Land Markets Evidence From Ethiopia (No. 4764). World, Policy Research Working Paper.

Deinlnger, K., Binswanger, H., 1999. The evolution of the world bank's land policy: principles, experience, and future challenges. World Bank Res. Obs. 14, 247–276. https://doi.org/10.1093/wbro/14.2.247.

Deke, L.A., 2016. Soil physic-chemical properties in termite mounds and adjacent control soil in Miyo and yabello districts of Borana Zone, Southern Ethiopia. Am. J. Agric. For. 4 (4), 69. https://doi.org/10.11648/j.ajaf.20160404.11.

Desta, S., Coppock, D.L., 2004. Pastoralism under pressure: tracking system change in Southern Ethiopia. Hum. Ecol. 32, 465–486. https://doi.org/10.1023/B:HUEC.0000043516.56037.6b.

Dodgson, J.S., Spackman, M., Pearman, A., Phillips, L.D., 2009. Multi-criteria analysis. a manual, Appraisal. https://doi.org/10.1002/mcda.399.

FAO, 2012. Voluntary Guidelines on the Responsible Governance of Tenure of Land. Fisheries and Forests in the Context of Food Security, Rome. http://www.fao.org/docrep/016/i2801e/i2801e.pdf.

Fernández-Giménez, M.E., 2002. Spatial and social boundaries and the paradox of pastoral land tenure: a case study from postsocialist Mongolia. Hum. Ecol. 30, 49–78. https://doi.org/10.1023/A:1014562913014.

Galvin, Ka, Thornton, P.K., Boone, R.B., Sunderland, J., 2004. Climate variability and impacts on east African livestock herders: the Maasai of Ngorongoro Conservation Area. Tanzania. African J. Range Forage Sci. 21, 183–189. https://doi.org/10.2989/10220110409485850.

Gebremeskel, T., Flintan, F., Bormann, U., 2016. Woreda (District) participatory Land use planning in pastoral areas of Ethiopia: development, piloting and opportunities for

scaling-up paper prepared for presentation at the "2016. In: World Bank Conference on Land and Poverty" The World Bank - Washington. 2016 World Bank Conference on Land and Poverty. The World Bank-Washington DC, March 14-18, 2016.

Greiner, C., 2017. Pastoralism and land-tenure change in Kenya: the failure of customary institutions. Dev. Change 48 (1), 78–97. https://doi.org/10.1111/dech.12284.

Greiner, C., Alvarez, M., Becker, M., 2013. From cattle to corn: attributes of emerging farming systems of former pastoral nomads in east pokot. Kenya. Soc. Nat. Resour. 26 (12), 1478–1490. https://doi.org/10.1080/08941920.2013.791901.

Homann, S., Rischkowsky, B., Steinbach, J., 2008. The effect of development interventions on the use of indigenous range management strategies in the Borana Lowlands in Ethiopia. L. Degrad. Dev. 19 (4), 368–387. https://doi.org/10.1002/ldr.845.

Kiker, G.A., Bridges, À.T.S., Varghese, À.A., Thomas, P., 2005. Application of Multicriteria Decision Analysis in Environmental Decision Making 1. pp. 95–108.

Kuusaana, E.D., Bukari, K.N., 2015. Land conflicts between smallholders and Fulani pastoralists in Ghana: evidence from the Asante Akim North District (AAND). J. Rural Stud. 42, 52–62. https://doi.org/10.1016/j.jrurstud.2015.09.009.

Liao, C., 2014. Borana (Pastorlists) Ethiopia Case Study.pdf 1–31. http://www.atkinson.cornell.edu/Assets/ACSF/docs/collaborations/oxfam/Borana%20(Pastorlists)%20Ethiopia%20Case%20Study.pdf.

Little, P.D., Behnke, R., 2010. Policy Options for Pastoral Development in Ethiopia Report Number 3 Pastoral Economic Growth and Development Policy John McPeak. Development 2010 (3), 1991–2008.

McGinnis, M.D., Ostrom, E., 2014. Social-ecological system framework: initial changes and continuing challenges. Ecol. Soc. 19 (2), 30. https://doi.org/10.5751/ES-06387-190230.

Molnar, Z., 2014. Perception and management of spatio-temporal pasture heterogeneity by hungarian herders. Rangel. Ecol. Manag 67. https://doi.org/10.2111/rem-d-13-00082.1.

Moritz, M., 2016. Open property regimes. Int. J. Commons Open property regimes. Linked references are available on JSTOR for this article : 10, 688–708 . https://doi.org/10.18352/ijc.719.

Moritz, M., Scholte, P., Hamilton, I.M., Kari, S., 2013. Open access, open systems: pastoral management of common-pool resources in the Chad Basin. Hum. Ecol. 41 (3), 351–365. https://doi.org/10.1007/s10745-012-9550-z.

Moritz, M., Behnke, R., Beitl, C.M., Bird, R.B., Chiaravalloti, R.M., Clark, J.K., Crabtree, S.A., Downey, S.S., Hamilton, I.M., Phang, S.C., Scholte, P., Wilson, J.A., 2018. Emergent sustainability in open property regimes. Proc. Natl. Acad. Sci. U. S. A. 115, 12859–12867. https://doi.org/10.1073/pnas.1812028115.

Oba, G., 2012. Harnessing pastoralists' indigenous knowledge for rangeland management: three African case studies. Pastor. Res. Policy Pract. 2 (1), 1. https://doi.org/10.1186/2041-7136-2-.

Ostrom, E., 1990. The Evolution of Institutions for Collective Action 280https://doi.org/10.1017/CBO9780511807763.

Rakotonarivo, O.S., Bredahl, J., Poudyal, M., Rasoamanana, A., Hockley, N., 2018. Estimating welfare impacts where property rights are contested: methodological and policy implications. Land Use Policy 70, 71–83. https://doi.org/10.1016/j.landusepol.2017.09.051.

Reid, R., Serneels, S., Nyabenge, M., Hanson, J., 2005. The changing face of pastoral systems in grass dominated ecosystems of Eastern Africa. Grasslands of the World 19–76.

Robinson, L.W., 2019. Open property and complex mosaics: variants in tenure regimes across pastoralist social-ecological systems. Int. J. Commons 13, 1–23. https://doi.org/10.18352/ijc.903.

Robinson, L.W., Ontiri, E., Alemu, T., Moiko, S.S., 2017. Transcending landscapes: working across scales and levels in pastoralist rangeland governance. Environ. Manage. 60, 185–199. https://doi.org/10.1007/s00267-017-0870-z.

Samuel, G., 2006. Land, land policy and smallholder agriculture in Ethiopia: options and scenarios. Futur. Agric. Consort. Meet. Inst. Dev. Stud. 20-22, 14 March 2006.

Schmidt, M., Pearson, O., 2016. Pastoral livelihoods under pressure: ecological, political and socioeconomic transitions in Afar (Ethiopia). J. Arid Environ. 124. https://doi.org/10.1016/j.jaridenv.2015.07.003.

Tesfaye, T., 2004. Land scarcity, tenure change and public policy in the African case of Ethiopia : evidence on efficacy and unmet demands for Land rights. International Conference on African Development 1–24.

Tessema, W.K., Ingenbleek, P.T.M., Van Trijp, H.C.M., 2014. Pastoralism, sustainability, and marketing. A review. Agron. Sustain. Dev. 34 (1), 75–92. https://doi.org/10.1007/s13593-013-0167-4.

Tsegaye, D., Moe, S.R., Vedeld, P., Aynekulu, E., 2010. Land-use/cover dynamics in northern afar rangelands. Ethiopia. Agric. Ecosyst. Environ. 139 (1–2), 174–180. https://doi.org/10.1016/j.agee.2010.07.017.

Tura, H.A., 2018. Land use policy land rights and land grabbing in Oromia. Ethiopia. Land use policy 70, 247–255. https://doi.org/10.1016/j.landusepol.2017.10.024.

UN, 2013. A New Global Partnership: Eradicate Poverty and Transform Economies Through Sustainable Development. New York. . http://www.post2015hlp.org/wp-content/uploads/2013/05/UN-Report.pdf.

UN-Habitat, 2018. Global Experiences in Land Readjustment, Urban Legal Case Studies. http://unhabitat.org.ir/wp-content/uploads/2015/09/Urban-Legal-Case-Studies-Vol-7.pdf.

UN-HABITAT, IIRR, 2011. Handling Land, Tools for Land Governance and Secure Tenure. https://doi.org/ISO14001:2004. .

United Nations. Economic Commission for Africa, 2011. Regional Assessment Studies on Land Policy in Central. Eastern, North, Southern and West Africa : synthesis report v. pp. 60.

Wario, H.T., Roba, H.G., Kaufmann, B., 2015. Shaping the herders mental maps: participatory mapping with pastoralists to understand their grazing area differentiation and characterization. Environ. Manage. 56. https://doi.org/10.1007/s00267-015-

0532-y.

Wario, H.T., Roba, H.G., Kaufmann, B., 2016. Responding to mobility constraints: recent shifts in resource use practices and herding strategies in the Borana pastoral system, southern Ethiopia. J. Arid Environ. 127. https://doi.org/10.1016/j.jaridenv.2015.12.005.

World Bank, 2011. Land Governance Assessment Framework. Washington. http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2011/11/24/000386194_20111124011109/Rendered/PDF/

657430PUB0EPI1065724B09780821387580.pdf.

Xiao, N., Cai, S., Moritz, M., Garabed, R., Pomeroy, L.W., 2015. Spatial and temporal characteristics of pastoral mobility in the Far North Region, Cameroon: data analysis and modeling. PLoS One 10, e0131697. https://doi.org/10.1371/journal.pone.0131697.

Yatsalo, B., Didenko, V., Gritsyuk, S., Sullivan, T., 2015. Decerns: a framework for multi-criteria decision analysis. Int. J. Comput. Intell. Bioinform. Syst. Biol. 8, 467–489. https://doi.org/10.1080/18756891.2015.1023586.