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Perspectives on enclosures in pastoralist drylands: From contradictory evidence to the formulation of innovative land management strategies

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ABSTRACT

Drylands in Sub-Saharan Africa are subject to rapid and enduring population increase, agricultural expansion, land large-scale infrastructure developments, as well as climate change, affecting some 265 million pastoralists and agro-pastoralists. These changes are promoting a transition from traditional pastoralist ways of life characterized by seasonal mobility, towards more sedentary livelihoods based on more intensive and commercial uses of land-based resources. As part of of this ongoing transition, establishment of enclosures on pastoralist commons is emerging as a default, but highly contested, development pathway. Based on a review of the current enclosure debate across the natural, economic, and social sciences, with a geographical focus on the East African drylands, we discuss the potential and limitations of enclosures as land management tool, and propose a conceptual framework for how enclosures can act as an integral part of sustainable pastoralist land use. Such a framework constitute an important piece of the puzzle for more productively linking the urgent need of innovative ways of managing pastoralist rangelands, to the present international and national commitments to restoration of degraded lands.

1. Introduction

One-third of the human population and half of all the world's livestock live on drylands (arid, semi-arid, or dry sub-humid land), which constitute around 40% of the total global land area (Maestre, Salguero-Gomez & Quoro, 2012). In Sub-Saharan Africa (SSA), some 240 million agro-pastoralists and 25 million pastoralists have livestock as their primary source of income, mainly based on pastoralist land-use strategies on lands that are commonly under communal or common property rights-based tenure systems (Lane, 2013; Neely, Bunning & Wilkes, 2009). Although often referred to as 'traditional', pastoralist systems in Africa south of the Sahara are highly dynamic and currently confronted by and undergoing rapid changes. The population in SSA is expected to double by 2050 and then double again by 2100 (UN, 2017), and population increase is very rapid also in drylands (Fig. 1). In Kenya for example, all counties (except for the capital Nairobi) experienced a doubling or more of their populations between 1999 and 2019 were dryland counties (KHPC, 2019). Other important changes include climate variability and climate change, accelerated national and international demand for livestock products, and increasing pressure from competing modes of land use in the form of urbanization, large-scale infrastructure projects and expanding crop agriculture (Aalders et al., 2021; Catley, Lind & Scoones, 2013; Korf, Hagmann & Emmenegger, 2015; McDermott et al., 2010; Thornton, 2010).

Together, these changes are promoting a transition of pastoralist ways of life towards more sedentary livestock management strategies, more intensive and commercial use of land-based resources, and increasing privatization of land (Greiner, 2017; Korf, Hagmann & Emmenegger, 2015; McDermott et al., 2010). While there is general agreement regarding the characteristics and direction of the transition, the literature on the future of pastoralism in East Africa is highly polarized in terms of whether this transition is desirable and sustainable or not (Beyene, 2014; Catley, Lind & Scoones, 2013; Greiner, Alvarez & Becker, 2013). An increasingly common, but highly contested feature of the transition is the establishment of enclosures on pastoralist commons. On one hand, the enclosing of communal land is associated with land

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grabbing, elite capture of common resources, social as well as nature conservation conflicts, and a general process of fragmentation and privatization of pastoralist land (Hall, Scoones & Tsikata, 2015; Lind et al., 2016; Unks et al., 2019; Veldhuis et al., 2019; Weldemichel & Lein, 2019;). On the opposite side of the debate, the practice of enclosing communal land is seen as an important management tool for sustainable intensification[1] of drylands (Catley, Lind & Scoones, 2013; McDermott et al., 2010; Verdoodt, Mureithi & Van Ranst, 2010). Some scholars even claim that the expansion of enclosure systems constitute a "default development" in contexts where land resources are under increasing population density and pressure (e.g. Woodhouse, 2003).

Portraying enclosure management as either the working of political and economic structures that threaten to further marginalize and dispossess pastoralist communities, or as a panacea solution for sustainable land intensification, severely limits the space for identifying and developing enclosure management strategies that can contribute to both landscape restoration and sustainable livelihoods. In this paper, we argue for and seek to demonstrate that such a space is necessary in order to generate alternative ways of thinking about enclosure management that can guide strategies towards sustainable pastoralist land management.

2. Enclosures from a critical perspective

Numerous case studies have highlighted, documented, and anticipated negative consequences of increasing sedentarization, commodification, and privatization in general, and of enclosing communal land in particular (e.g., Beyene & Korf, 2008; Gavin, 2009; Mwangi & Dohrn, 2008). This is a body of literature that tends to approach enclosures with an emphasis on their political nature (in terms of driving forces behind their establishment as well as their unequal outcomes within and across pastoralist communities). According to Gebeye (2016), sedentarization has to date mostly led to disappointing outcomes. For example, compared to unsettled pastoralists, sedentary pastoralists have been showed to be poorer, more malnourished, unhealthier, and marginalized. In line with this general argument, Greiner et al. (2013) report that increasing sedentarization among Pokots in Kenya has generated land shortages and changing land tenure systems, which in turn have aggravated livelihood inequalities and internal conflicts. As the enclosure of communal land impedes the mobile way of life that underpins pastoralist economies, Korf et al. (2015) put their spotlight on the emerging intra-generational conflict between a younger generation with a preference for a more sedentary lifestyle and the older generation fearing disruption of culture and tradition.

Critical interrogations of commodification and intensification as central features of changing pastoralist systems have pointed out an ongoing rush for acquisition of pastoralist land as part of a broader process of nature commodification and monetarization in previously peripheral regions in southern Africa (Abbink, 2011; Lavers, 2012). Regassa, Klute and Detona (2017) report an ongoing infiltration of a utilitarian approach to land use that severely alters pastoralists' perception of themselves and their relationship to nature. Taking the cue from this report, enclosures should therefore not only be viewed as material demarcations of property, but also understood in terms of how they reinforce a commodifying perspective on human-nature relations (Korf et al., 2015). A substantial proportion of the literature on commodification and commercialization of pastoralist land focuses on enclosures in the form of wildlife conservation areas. Butt and Turner (2012) and Greiner (2012) point out that although wildlife conservation may offer substantial economic opportunities for pastoralist communities through revenues from tourism, there are also frequent examples of how the enclosing of land for the purpose of nature conservation cause conflicts. Such conflicts revolve around tensions between the needs of pastoralist communities, conservation requirements, and the interests of the tourist industry, as well as resurgent violent conflicts over disputed borderlands. On a substantially different note, Greiner and Mwaka (2016) as well as Aalders et al. (2021) interprets ongoing processes of land commodification as driven by attempts to reap the benefits of anticipated infrastructure investments in the region. In terms of outcomes, they especially point at emerging land conflicts arising from

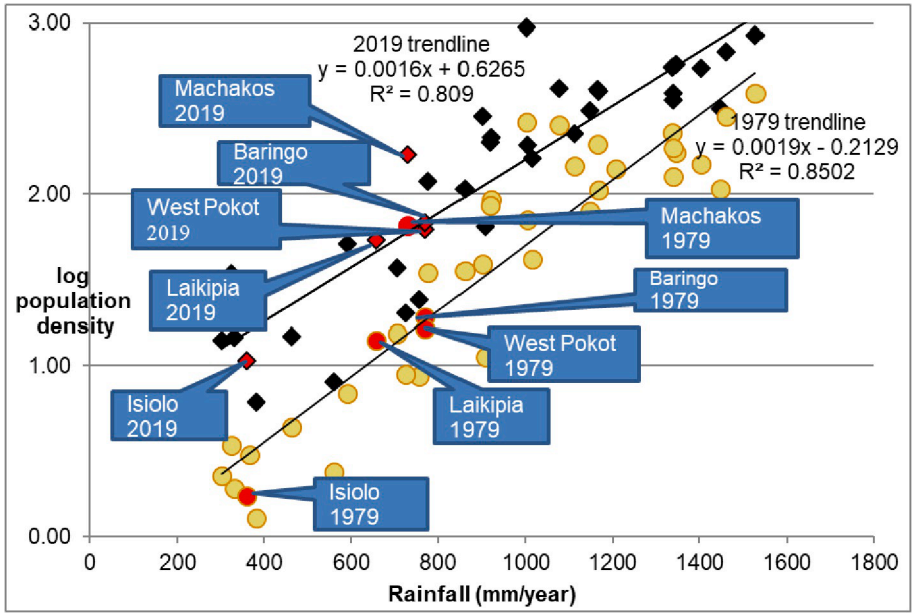

Fig. 1. Log population density (inhabitants/km^2) vs. annual precipitation for 1979 (circles) and 2019 (diamonds) for Kenya counties (Nairobi and Mombasa excluded), with some dryland counties highlighted in red (KNBS 2009 and KPHC 2019). Note that y-axis is logarithmic (i.e. pop density 1 = 10 inhabitants/km^2, 2 = 100 inhabitants/km^2 and 3 = 1000 inhabitants/km^2) and that West Pokot and Baringo in 2019 are close to where Machakos was in 1979 (cf. Tiffen et al., 1994). .
Adapted from Nyberg et al. (2015)

the process, and as Greiner and Mwaka (2016) notes: a highly visible material feature of land intensification across drylands is the increasing use of fences to enclose land that used to be a communal resource (Greiner & Mwaka, 2016).

The intimate relationship between enclosures and privatization is

[1] In this paper, we define sustainable intensification broadly, as diverse ways of increasing economic output, typically from very low levels, without causing negative effects on the environment and other ecosystem services.

frequently described in the literature. For example, Kay (2016) notes that privatization and enclosures are central themes of neoliberal policy-making, and Hall et al. (2015) conclude that despite enormous differences between different cases, a common thread in the establishment of enclosures in East Africa is that it constitutes a first step towards privatization of land rights and social differentiation. In most studies examining the privatization of pastoralist land, changing land tenure dynamics are the main focus. Evidence from numerous case studies across East Africa and beyond convincingly show that poor and marginalized groups tend to lose out when communal tenure is transformed into private property (Greiner, 2017; Lane, 2013; Lind et al., 2016; Nyberg et al., 2015; Weldemichel & Lein, 2019). For example, Galvin, Reid, Behnke and Hobbs (2008) emphasizes the importance of reciprocal rights to common pool resources among pastoralist groups in East Africa. They argue that the ongoing systematic move towards private tenure is resulting in loss of access to dry season refuge areas for many pastoralist communities. In an analysis of the implications of privatization for (re)distribution of land rights, Boone (2019) concludes that privatization tends to generate significant benefits for individuals and households that are already well off, while it tends to expose the poor and vulnerable to high risks of loss of property. Taking this argument even further, Hall et al. (2015) suggest that the processes of privatization and individualization nearly always undermine the tenure security of smallholders.

3. The potential of enclosure management

In contrast to the criticism described above, enclosure of communal land is by others seen as a potential for improvement of pastures for increased productivity in livestock-based agro-pastoral systems, driven by increased demand for livestock products (Catley et al., 2013; Delgado, Rosegrant and Meijer, 2001; McDermott et al., 2010; Nyberg et al., 2015; Thornton, 2010; Wairore, Mureithi, Wasonga & Verdoodt et al., 2010; Woodhouse, 2003). Studies primarily based in the natural and economic sciences show that enclosures can both contribute to restoration of degraded rangelands (Beyene, 2009; Burian et al., 2019; Verdoodt et al., 2010), and if managed properly, enhance livestock productivity through increased access to quality pastures, (Mureithi et al., 2016). Enclosures as a means to restore degraded land have been widely used in e.g. Ethiopia and Kenya (Beyene, 2009; Nyssen et al., 2015; Nyberg et al 2019). In both countries, enclosures contributes to the African Forest Landscape Restoration Initiative (AFR100) linked to the Bonn Challenge, the African Resilient Landscapes Initiative (ARLI), the African Union Agenda 2063 and the Sustainable Development Goals[2].

Use and establishment of private and communal enclosures (including revitalization of traditional communal enclosures) initiated pastoralist communities by in order to increase livestock live weight before sales has been documented across East Africa (Barrow, 2014; Benkhe, 1986; Mureithi, Verdood & Van Ranst, 2010). Furthermore, the sale of hay from enclosures has in some cases become a viable income-generating activity for households and communities (Benkhe, 1986; Beyene, 2009; Mureithi et al., 2010; Wairore et al., 2016). While management practices in pastoralist drylands using enclosures often centers on active fodder production and preservation, it has also been seen as enabling a combination of livestock and agricultural production. Such diversification tend to reduce the risks associated with high dependency on livestock and enhances adaptation to, and utilization of, different and varying market niches in order to create flexibility and system resilience. Adding to the potential of enclosure management, numerous studies from a wide range of contexts also report positive ecological effects inside enclosures. Such effects include increased soil carbon, nitrogen and phosphorus (Hailu, 2016; Mureithi et al., 2016; Oduor et al., 2018; Yayneshet et al., 2015), increased natural regeneration of trees and grasses (Le Houerou, 2000; Verdoodt et al., 2010), reduced erosion, and improved water infiltration into the soil (Descheemaeker et al., 2009). This ensures the long-term productivity (for food and feed) of the land and can therefore potentially increase food security (Nyberg et al., 2019; Lal, 2004). Furthermore, and in contrast to portrays of enclosures in the form of community conservancies as contentious 'green grabbing' of pastoralist commons (e.g. Bersaglio & Cleaver, 2018), comparative reviews of socio-ecological outcomes of community conservancies across Africa reveals a mixture of positive and negative social consequences and overwhelmingly positive ecological impacts (Galvin, Beeton & Luizza, 2018).

However, the introduction of enclosures in pastoralist drylands should not automatically be interpreted as a step towards the abandonment of pastoralism in favor of crop production or tourist based wildlife conservation. For example, detailed studies of enclosure management in northwestern Kenya shows that livelihoods continue to be centered on livestock, with 70% of farm income deriving from a more commercialized livestock production (Mureithi et al., 2016; Nyberg et al., 2015; Wairore et al., 2016). Furthermore, enclosure management does not necessarily represent an externally driven novelty that threatens to change customary land tenure and land-use practices. In many cases, the transition towards more sedentary, livestock-based agro-pastoralism brought about by the introduction of enclosures is driven by indigenous needs and priorities, and is perceived as positive by local populations (Burian et al., 2019; Muricho, Otieno, Oluoch-Kosura & Jirström, 2018; Wairore et al., 2016). In such cases, new reciprocal and/or commercial ways of distributing grazing rights have emerged and the need for risky seasonal migration has been reduced (Wairore et al., 2016). In addition, enclosures form part of traditional herd management strategies among some pastoral communities, (Abate, 2016). It has also been shown that enclosure management, even if introduced as an externally driven novelty, can be based on a locally accepted and legitimate governance process with a capacity to sustain an indigenous expansion of enclosures (Burian et al 2019; Løvschal et al., 2017; Greiner, 2017; Nyberg et al., 2015; Woodhouse, 2003; Benkhe, 1986). While customary practices and knowledge are important in pastoralist systems, it does not encompass all the knowledge needed for sustainable management of drylands under new and changing conditions. In fact, we claim that one of the reasons why enclosures in some cases have led to negative rather than positive consequences is the lack of appropriate new knowledge and practices to support emerging livestock-based agro-pastoralist systems (Beyene, 2016). For example, sustainable intensification of pastoralist drylands may require improved and active fodder production and preservation, periodic resting of grazing areas, improved herd structures and gene pools, better animal health care, value adding and improved market infrastructure. There is also a need for knowledge on how improved management of pastoralist land-use systems can utilize different and varying market niches in order to create flexibility. Another puzzle that requires new knowledge is in terms of land governance, e.g. the design of land tenure institutions with a capacity to ensure an inclusive and just introduction and management of enclosures.

4. Opening up the enclosure debate: Devising innovative and sustainable land management strategies

A general conclusion that can be drawn from the two sides of the debate is that enclosures by no means is a panacea solution for all drylands. However, as the use of enclosures in many drylands are increasingly perceived as a 'default development' in response to external forces of change, and as its use can lead to both positive and negative outcomes for different land users, it is important to discuss their specific occurrence, location and management. In the following we argue that there are possible middle ground management strategies that can include the

[2] Kenya is committed to restoration of 5.1 million hectares of degraded land while Ethiopia's commitment is 15 million hectares.

use of enclosures in parts of the landscape whilst other parts are open for more mobile livestock management; and that there are potential synergies between the two landscape management strategies. Taking our inspiration from recent conceptual and theoretical insights on dryland governance, management and use, as well as more concrete, local examples and experiences of dryland enclosures, we argue that such a position can be established based on three fundamental elements: situating enclosures within a broad system perspective; paying more attention to the political and institutional dynamics of pastoralist land tenure in general and enclosure management in particular; and linking enclosure management more closely to international initiatives for restoration of degraded landscapes. Based on these elements, we then outline a concrete and spatially visualized framework for sustainable enclosure management in the context of degraded pastoralist landscapes.

4.1. *Towards a systems perspective on enclosure management*

Examples of local, pastoralist initiatives across East Africa indicates that it is primarily in severely degraded landscapes that enclosures can lead to increased biodiversity and natural regeneration, reduced erosion, increased levels of soil carbon and nutrients, and improved soil water conditions (Oduor et al., 2018; Nyberg et al., 2015; Descheemaeker et al., 2009). Also, it is in the context of restoration of degraded drylands where positive ecological outcomes tend to emerge in parallel with positive socio-economic developments (Burian et al., 2019; Kigomo and Muturi 2013; Muricho et al., 2019; Nyberg et al., 2019; Wairore et al., 2016; Beyene, 2009; Yayneshet et al., 2015). However, it is when enclosures dominate a dryland landscape, rather than comprising occasional islands in a landscape dominated by communal grazing rights, that they severely restrict livestock mobility and associated traditional ways of life. Furthermore, at some point, landscape fragmentation will in itself have negative effects on biodiversity and agricultural production, as agricultural units will become too small to be ecologically or economically viable (Hobbs et al., 2008). Continued fragmentation after this stage would be unsustainable, lead to land degradation, and increase poverty.

In Fig. 2, we illustrate and expand on this trajectory through a general conceptualization of the relationship between climate, food security, landscape fragmentation, system resilience, and population density. At some early point in time (phase 1), dryland population density and landscape fragmentation was low, food security relatively stable and wildlife formed an integrated part of the landscape. In phase 2, population density and land fragmentation increase, land is severely degraded by overgrazing, and food security may decline to a critical level. In this phase, the room for- and movement of wildlife is also severely restricted. The trajectory of phase two points at system collapse and can be seen as classical example of Hardin's (1968) 'tragedy of the commons' paradigm. This 'tragedy' may provoke a system change in order to improve food security through increasing food production and to accommodate other societal developments, e.g., agricultural commodification, improved market infrastructure, and communication (phase 3). Such a trajectory resonates with Boserup's theorem of agricultural intensification as a result of increased pressure on land (Tiffen, Mortimore and Gichuki, 1994; Boserup, 1965). If population pressure and fragmentation become too high (phase 4), land production units will be too small to sustain livelihoods and the system will collapse or drastically change. However, sustainable intensification governed by transparent, legitimate, and inclusive institutions (Ostrom, 1990) may deflect the curves from a doomsday scenario (solid lines) to a alternative development scenario (dotted lines). It is within such a specific (although in many local contexts not necessarily likely) and delimited development scenario that enclosure management can have a particularly important and productive role to play.

4.2. *Acknowledging the political and institutional dynamics of dryland enclosures*

As accounted for in Section 2, a common criticism of enclosure management is the close link between enclosures and the political-economic forces that promotes privatization and commodification of pastoralist land. This link puts pastoralist land rights and land tenure at the heart of the enclosure debate (Korf et al., 2015; Mcpeak & Little, 2019), but to date there are few thorough analyses of how introduction

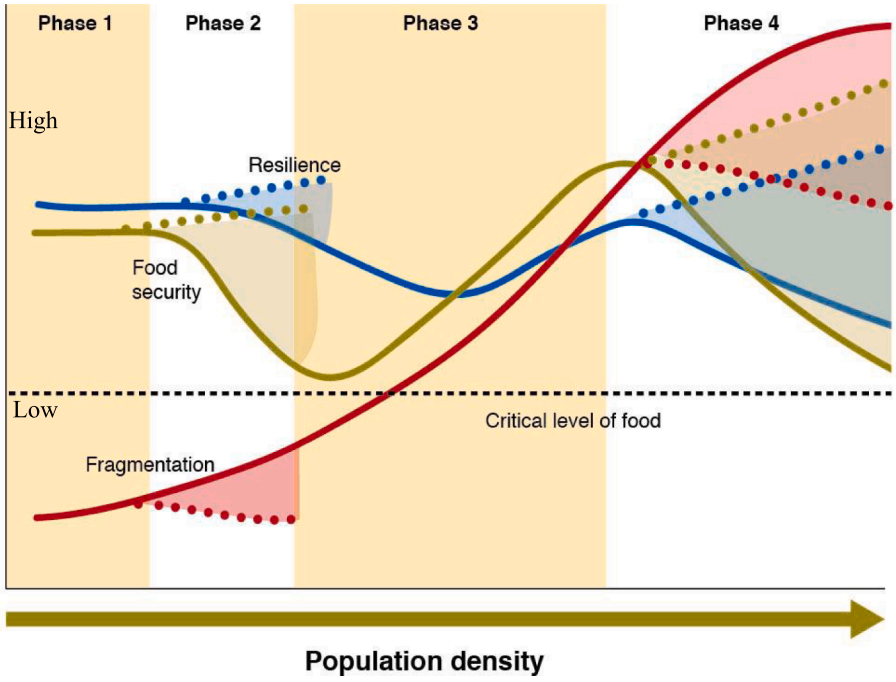

Fig. 2. Conceptual diagram of the relationship between climate, food security, landscape fragmentation, resilience, and population density (adapted from Burian et al., 2019). The X- axis is of course finite, but not likely to change in the near future. Globally, population increase is expected to level off somewhere around 2100, at a global population of around 11 billion. In Sub-Saharan Africa, the population is expected to double, to over 4 billion (UN, 2017).

of enclosures influences and alters land tenure institutions and what their implications are in terms of land rights for different socio-economic groups. There is subsequently a need to unpack the generally unspecific notion of privatization and the simplified definition of land tenure as either public/government, communal, or private, which tend to be used by both sides of the debate. Instead, we need to acknowledge and approach situated pastoralist land tenure practices as a heterogeneous and continuously changing mix of private and collective rights to natural resources (Galaty, 2016). These are local practices that actively seek to navigate and balance pastoralists need for both secure and negotiated land rights based on differential interests and agendas within and across communities in the face of external political, institutional and economic processes of change (Turner et al., 2016; Archambault & Zoomers, 2015; Herrera, Davies & Manzano Baena, 2014; Lesorogol, 2008). We therefore need to acknowledge that the role and influence of dryland enclosures on pastoralist land rights depends on the highly diverse forms of tenure regimes that govern pastoralist land use. Enclosures as a land management strategy will embody different forms, meanings and implications in contexts where drylands are governed as private or communal property or as common/public/open-access land. There are for example case-studies of similar dryland enclosure strategies introduced under highly different land tenure regimes, and where the enclosures are managed (and benefited from) either collectively on the community level, or privately on the household level (Barrow, 2014; IIR and CTA, 2013; Nyberg et al., 2015: Verdoodt et al., 2010).

Also, privatization of pastoralist land has recently been counteracted by processes that work to formalize and strengthen community land rights. For example, the Kenyan Community Land Act (2016) is envisioned to transfer formal ownership of land previously held in trust by the government to pastoralist communities. When assessing the sustainability of enclosures as a land management strategy, it is therefore important to actively and systematically relate diverse localized tenure systems to not only factors such as population increase and land commodification trends, but also ongoing reforms of the formal natural resource institutions that govern pastoralist land tenure and land use (Kameri-Mbote, Odote, Musembi & Kamande, 2013). Overall, paying closer attention to the important link between dryland enclosures and pastoralist land rights includes probing both the political as well as the institutional dynamics within which introduction, management and outcomes of dryland enclosures are situated.

4.3. Linking local enclosure management to the international call for restoration of degraded landscapes

There is increasing national and international political awareness of the need to restore degraded land. The target of the Bonn Challenge (2019) and the UN New York Declaration on Forests (2019) is to restore 150 million ha of degraded and deforested land by 2020, and 350 million ha by 2030. The target of the African Forest Landscape Restoration Initiative (AFR100) is to restore 100 million ha of degraded forest land in Africa by 2030. Globally some 210 million ha has been committed to restoration (Bonn Challenge, 2019) by December 2020, largely by countries in the Global south. These initiatives and commitments are not restricted to forest landscapes, and will include degraded dryland landscapes that in the past had higher tree densities. Enclosures, where the land is rested from degrading pressures and vegetation regenerate (natural or seeded/planted) reduce erosion, restore soil carbon and biodiversity can be instrumental in restoration efforts. After recovery, these enclosures could be periodically utilized and managed. Commonly, tree cover has over time been seriously reduced in pastoralist rangelands, but primarily by exploitation of fuelwood and commercial export of charcoal rather than by grazing per se. We emphasize and want to be clear that linking enclosure management to restoration of degraded pastoralist landscapes should not imply large-scale commercial afforestation projects, but careful restoration of indigenous tree cover. Restoration of drylands should aim at intermediate densities of trees with the purpose of enhancing mosaic and multifunctional landscapes. This as intermediate tree densities have shown to increase water infiltration and ground water recharge in African drylands, in comparison with areas with lower as well as higher tree densities (Ilstedt et al., 2016). Active management of dryland landscapes through enclosures can subsequently be a way to restore land and natural vegetation, while at the same time improving pasture production and livelihoods. Enclosures thereby have the potential to act as a tool that delivers simultaneous ecological and socio-economic benefits, which is precisely the kind of win–win solution that the global restoration agenda is seeking to support. While political awareness and commitments are not necessarily or automatically translated into action, there is currently a favorable political environment for socially legitimate and economically viable restoration initiatives.

4.4. Towards a concrete and spatial framework for enclosure management

In this section of the paper, we build on the three elements of our proposed middle-ground position (which in turn draws on experiences and insights from enclosure management among pastoralist communities across the East African region) in order to outline a concrete and spatial framework for enclosure management within pastoralist landscapes. The purpose of the framework is to embrace the potential of enclosure management, while at the same time acknowledging and taking seriously the potential negative outcomes that previous experiences and studies have high lightened. The framework makes visible the possibility of an intentional and systematically designed co-existence of both extensive pastoral- and more intensive agro-pastoral land use strategies, as well as between diverse pastoralist land tenure practices. In our spatial visualization (which has been fictively situated within one of Kenya's dryland counties for geographical and scale reference), the landscape in area (A) is dominated by enclosures on privatized land (small squares). Here, the community has agreed that enclosures will bring a number of socio-economic and ecological benefits compared with traditional livestock keeping on communal land (Nyberg et al., 2019; Wairore et al., 2016; Muricho et al., 2019; Burian et al., 2019). However, in times of extreme drought, the enclosed grazing areas are not enough and they need to be able to move their livestock to more distant dry season grazing areas. Thus, during years with very low precipitation, intensification and commercialization of livestock and agricultural production is only sustainable if complemented by availability of alternative grazing areas under communal tenure. Fig. 3 therefore depicts a landscape that accommodates the need for grazing corridors (light green lines) and traditional dry season grazing areas (dark green areas).

The least or last claimed areas of land in a landscape are likely to be the most degraded land, often under communal or open access land tenure. These areas could be nuclei (red dots in Fig. 3) in collective restoration efforts and networks of grazing corridors (Greiner & Mwaka, 2016; Turner et al., 2016), with both water and feed resources available, and that lead to traditional dry-season grazing refugia. The grazing corridors thus provide a passage for moving livestock during years of low precipitation in a way that don't provoke conflicts over grazing or mobility rights. The use of restored sites and grazing corridors would have to be regulated, and they would have to be used only for grazing in extreme years, combined with alternative income-generating activities such as for example wood, honey, and gum arabica. As acknowledged in Chapter 1, population increase is dramatic even in areas with low precipitation, i.e. areas such as (B) and (C). As severely degraded sites (marked as restoration hotspots) are more frequent in drier areas, restoration through enclosures and grazing corridors are therefore most important there. If combined with watering points/dams, they would add substantial value in B and C as well as for farmers/herders in A. For example, grass resources can once restored be utilized for hay/silage in non-emergency years and thereby improving resilience. However,

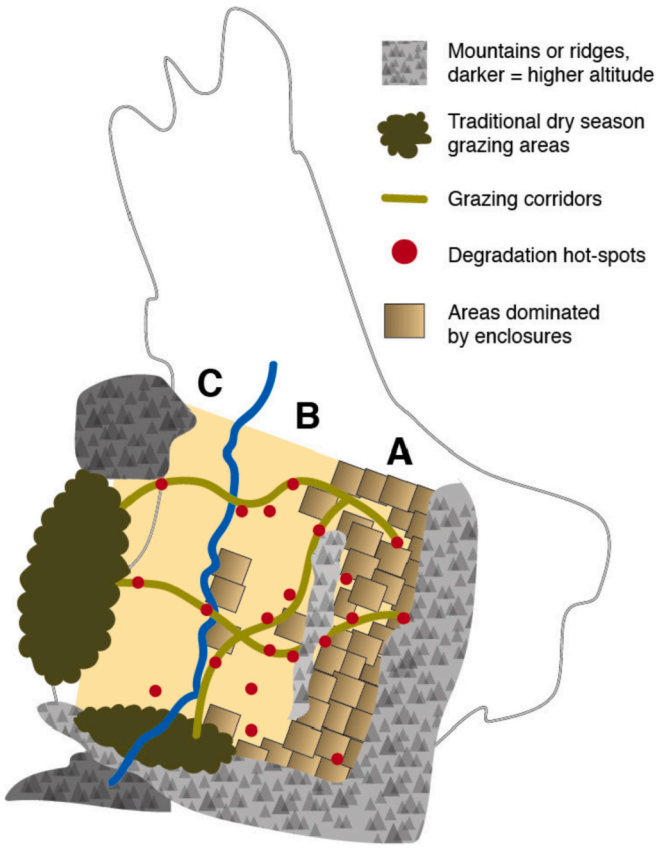

Fig. 3. Conceptual figure of suggested systematic co-existence between pastoral and agro-pastoral strategies, and between different land use and land tenure systems, where: areas with small squares are dominated by enclosures; red dots are degradation hot-spots, i.e., areas where restoration efforts would start; light green lines are grazing corridors; dark green areas are traditional dry season grazing areas; and grey areas are mountains or ridges (the darker the shade, the higher the altitude). For geographical and scale reference, the contours of West Pokot County, Kenya, is inserted in the background.

distribution of responsibilities for management, as well arrangements for sharing of the benefits of restoration and conservation are likely to be a highly complex task and subject to contestation, therefore requiring just, transparent, and legitimate governance mechanisms and institutions. However, as insights from recent literature has showed, institutional innovation is not merely a question of design, but is an inherently political process. Subsequently, the sustainability of enclosure management and its potential benefits will be mediated by situated and negotiated land tenure- and land rights practices (Cleaver & de Koning 2015; Boone et al., 2019). Lastly, we want to point out that trees would play a crucial role in the restoration outlined in Fig. 3, as they reduce erosion and improve soil carbon, soil fertility, and soil- water regulation. In the model area depicted in Fig. 3 there are no national parks or wildlife conservancies. However, in cases where nature- and/or wild life conservation is relevant and feasible, innovative combinations of *in situ* and *ex situ* community conservation in the form of semi-enclosed conservancies and wild-life corridors could be integrated into a multifunctional landscape such as the one visualized in Fig. 3 (Galvin et al., 2018; Braverman, 2014).

The systematic differences between the three areas in Fig. 3 could easily be interpreted in terms of a development trajectory, according to which processes of intensification, commodification and privatization in A are gradually expanding across the landscape to B and C. Instead, we argue that they should be interpreted as integrated parts of a broader system and landscape perspective that is relevant to vast areas in East Africa and beyond. The features coved by our proposed framework are not new and their relevance has been demonstrated by recent case-studies in the region (e.g. Liao, 2018; Liao & Clark, 2018). Rather, its contribution rests on its ambition to act as generic concept of co-existence of extensive pastoral- and more intensive agro-pastoral strategies, which synthesizes insights and experiences from separate, situated local initiatives. Furthermore, we acknowledge that it demands an ambitious combination of collective action, conducive policies, regulations and agreements, an appropriate institutional framework, and economic investments, which together manages to provide effective links between pastoralist communities, local government administrations, and national institutions. While international restoration initiatives mentioned earlier could act as a key source of the necessary economic investment, the question of how to develop a functional governance platform remains open and are in need of innovative applied research and cross-scale governance initiatives from appropriate institutions.

5. Conclusions

This perspective paper brings some clarity to the polarized debate on whether enclosures constitute a pathway towards sustainable intensification of rangelands or not. With ongoing complex processes of biophysical, economic, and social change, there is an urgent need for new knowledge that can be used to formulate tools and strategies for sustainable development of dry rangelands. Landscape fragmentation through the use of enclosures is de-facto increasing. However, rather than acting as either staunch critics or advocates of enclosures (positions often taken depending on disciplinary background), there is a need for systematic, thorough, and innovative research on when, where, and how enclosures can and should be part of land management and restoration strategies.

We believe that enclosures can be an effective means to restore degraded drylands and improve pastoralist livelihoods, but we also acknowledge that they produce negative outcomes across and within heterogeneous pastoralist communities. Therefore, enclosure management should not be presented as a universal solution for all places and conditions, but as part of specific strategies that draws on alternative shapes and forms of enclosures, depending on the highly diverse and continuously changing political, economic, social, and ecological context of pastoralist landscapes. Where private and/or collective actions are needed for restoration efforts, it is important that they are well anchored in local knowledge and governance systems, that they resonate with provincial and national natural resource institutions, and that they justly, transparently and legitimately balance the inherent paradox of simultaneous secure and flexible land rights. Development policies that are limited to past and present conditions will not be constructive in the context of a future trajectory towards more intensive agro-pastoralist livelihood strategies for SSA drylands. Instead, ‘new’ management systems should draw on both traditional knowledge and on insights from new research. Furthermore, as real-life issues are multifaceted, new research must be multidisciplinary and must be planned and performed in close association with all the actors and sectors concerned.

Given the present positive momentum, with political awareness and commitments on restoration, ‘now’ is a good window of opportunity for restoration efforts that serves the urgent need for inclusive socio-economic development in drylands. Hence, “now” is also a good opportunity for local initiatives to document erosion hotspots, plan for grazing corridors and seek national and international funding for restoration initiatives.

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CRediT authorship contribution statement

Per Knutsson: Conceptualization, Methodology, Formal analysis, Investigation, Writing – original draft, Writing – review & editing, Project administration, Funding acquisition. **Stephen Mureithi:** Conceptualization, Methodology, Formal analysis, Investigation, Writing – original draft, Writing – review & editing, Visualization, Project administration, Funding acquisition. **Ewa Wredle:** Conceptualization, Formal analysis, Investigation, Writing – original draft, Writing – review & editing, Project administration, Funding acquisition. **Gert Nyberg:** Conceptualization, Formal analysis, Investigation, Writing – original draft, Writing – review & editing, Project administration, Funding acquisition.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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