



## **Institutional capacity building and co-design of novel management practice unlock greater potential in communal grazing lands in Sub-Saharan Africa**

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### **Abstract**

In communal grazing lands in Sub-Saharan Africa, two immediate problems face pastoralists and other users of communal lands: (1) weak local institutional oversight of common pool resources in grazing lands; and (2) inadequate evidence for the cost-effectiveness of various grazing management and restoration practices, especially in arid and other non-equilibrium rangelands. In this synthesis of local capacity development and restoration work across multiple systems and locations, it is shown that there are significant commonalities in terms of how progress may be achieved, as well as a number of important differences. Specifically, shared commonalities include: capacity building of grazing management institutions improves local oversight; local or ‘traditional’ knowledge may be generally sufficient for grazing management, though can improve with appropriate integration of global or ‘expert’ knowledge; local knowledge may be generally insufficient for restoration, but has a strong role to play; implementing new grazing management or restoration practices requires fitting to local systems, plans, and goals; this fitting can be accomplished through pastoralist–expert co-design of grazing and restoration practices; and, as decades of development experience have shown, new grazing management or restoration practices that fit local conditions poorly are generally ineffective or unsustainable. Differences among systems and locations include aridity and associated equilibrium (more humid rangelands are less variable) and non-equilibrium (more arid rangelands are more variable) ecosystem behavior; degree of privatization; livelihood priorities (crops, livestock, or both) and management goals; scale of grazing lands and their institutions, and processes and rate of capacity development; degree of previous degradation and rate of change in range condition; and the technical practices applied. Not only are these commonalities and divergences useful for improving environmental performance including carbon storage, they are essential to supporting local pastoralist institutions to enhance resilient livelihoods.

### **Introduction**

Communal grazing lands in Sub-Saharan Africa face two immediate challenges—the strength of local institutional oversight, and inadequate evidence for the cost-effectiveness of management practices. Local institutions responsible for management of common pool resources in grazing lands have become weakened (Reid et al. 2014) in many pastoralist rangelands around the world, partly due to weak security of land tenure, lack of investment and support, and policies that are inadequate or ill-fitting in communal rangelands. Where cohesive communal management does not exist at local level, weak oversight allows for chaotic and disorganized grazing patterns, a

significant driver of rangeland degradation in combination with climate change-induced volatility in rainfall. Meanwhile, evidence for the relative cost-effectiveness of various grazing and restoration practices is generally inadequate (Mudau et al. 2022) or even absent, and most especially so in arid rangelands. While pastoralist local knowledge on grazing management is generally strong, local knowledge on restoration is often less developed and effective in addressing new challenges linked to climate change and other pressures upon rangeland systems. Experience in local capacity development, and in restoration co-design, across multiple systems and locations shows several commonalities among rangelands, as well as important differences that are often associated with variation in aridity.

## **Results**

### ***Commonalities among rangelands and regions***

Capacity building of local institutions can significantly improve oversight of grazing management. Improvement in local institutional capacity to manage rangelands is a commonly noted initial result of CBRM approaches, time and again, from southern (Coppock et al. 2022) and East Africa (Reid et al. 2021, Waweru et al. 2021) to central Asia (Ulambayar and Fernández-Giménez 2019). Neither good nor poor management should be assumed, as in practice, rangelands with poorly functioning local institutions can be as common as those functioning well, generally speaking. The goal of practitioners supporting community range management should be helping local institutions to progressively and sequentially develop and intensify their system toward optimal livestock production and environmental performance. Introducing new grazing management or restoration practices requires fitting into local systems, plans, and goals (Bayer and Waters-Bayer 1989), and producer–practitioner–researcher co-design of grazing (Sircely and Seidou 2018) and restoration (Sircely and Seidou 2018, Sircely et al. 2022) practices can accomplish this fitting.

In many rangelands, local or traditional knowledge can be sufficient for reasonably sustainable pastoralist rangeland livestock production, with modest impacts on rangeland ecosystems, and high wildlife compatibility, often in spite of dramatic climatic volatility. Local or traditional knowledge is highly useful for grazing management (Reid et al. 2014, Sircely and Seidou 2018), yet appropriate and cost-effective integration of global or ‘expert’ knowledge may significantly benefit management through regenerative grazing techniques. However, it remains exceptionally difficult to prescribe grazing management practice that can deliver win-win pastoralist livelihoods and environmental conservation (Bayer and Waters-Bayer 1989, Ferguson 1990). Prior understanding of basic spatial patterns of local rangeland use through the seasons of the year is required before advising a certain community on a basic grazing plan, into which restorative or regenerative grazing techniques can be fitted (Robinson et al. 2020), as feasible given the various constraints they face. To ensure that novel grazing practices are successful, practitioners and researchers must first understand the basics of local systems, by mapping out the rangeland with pastoralists, and clarifying their formal or informal grazing plans and bylaws or other means for encouraging adherence to these grazing plans. Potentially effective and feasible means of improving the grazing plans can then be suggested by practitioners or researchers (Robinson et al. 2020). Most of the proposed options are likely to be rejected by pastoralists as infeasible. Any options that are not rejected can be considered further, or the proposed options can be modified to improve feasibility.

For rangeland restoration, local knowledge is useful—and often essential—although producer–expert co-design will generally produce better tailored, more effective, more sustainable, strategic rangeland investments. The degradation observed in most rangelands is historically a relatively new problem, one significantly attributable to erratic rainfall resulting from global climate change (Girvetz et al. 2019), along with other more recent trends such as conversion to farms or private lands that place great pressure on communal rangeland systems (Galvin et al. 2008). In rangelands, foresight for a decade or more ahead is an absolute requirement for effective restoration planning. To achieve this type of vision, the fusion of global scientific knowledge (if shallow or ‘skin-deep’) with highly local producer knowledge (yet deep over decades to millennia) may be considered fundamental. The role of researchers in producer–practitioner–researcher collaborative design infuses research with both internal and

external validity (Sircely et al. 2022). Site selection and restoration technique targeting to specific sites serve as an excellent example—pastoralists sometimes wish to pursue more “modern”, intensive techniques on severely degraded lands, at high cost per area and with a moderate or higher risk of failure. Alternatively, the same resources might be better invested in the restoration of much larger areas, through less intensive or more passive techniques in lands only moderately degraded, at low cost per area and with a low risk of failure. Benefit:cost analyses are desperately needed to quantify the cost-effectiveness of various restoration techniques across gradients of contextual factors in rangelands, especially aridity. Development of low-cost, ‘light-touch’, ecosystem-based techniques, enabling feasible restoration of very large rangeland areas, is needed to provide alternatives to costly measures with mixed success rates (Mudau et al. 2022). For restoration, experience shows that producer–practitioner–researcher co-design and testing of restoration techniques, combined with support on restoration planning, is an effective strategy to identify, plan, and implement rangeland restoration at scale.

### ***Differences among rangelands linked to aridity***

In arid desert and semi-desert zones (e.g., < 350 mm/yr in the tropics), an individual rangeland (or ‘rangeland unit’ managed by a particular local rangeland management institution) will generally be much larger than in semi-arid zones (in turn larger than in humid climates), much like private ranches. As a result, pastoralist institutions that oversee rangeland management operate at vastly different spatial scales, from < 100 km<sup>2</sup> in wetter semi-arid climates to > 5,000 km<sup>2</sup> in the most arid zones in East Africa, for example. As aridity increases, livelihood alternatives to livestock become much more limited, with rainfed cropping infeasible in arid areas and access to markets and services severely restricted by the remoteness of many desert areas. As livelihood priorities shift toward livestock, so too do land management objectives. In semi-arid regions, where rainfed cropping and non-mobile livestock production are often feasible, the rate and degree of privatization of communal land are often much greater than in arid zones. Each of these factors contributes to the lower populations in arid regions, as well as lower livestock densities. As scale increases, so too do transport and transaction costs for local institutions, along with the need for local institutions to communicate and coordinate with lower-level sub-units of a rangeland covering a vast area. These social constraints combine with the fundamental control of low and variable rainfall to determine the feasibility and cost-effectiveness of various rangeland management options along the gradient from semi-arid to arid rangelands.

Aridity has mixed costs and benefits for rangeland livestock production. Agro-ecologically, there are dramatic differences between wetter semi-arid savanna rangelands and arid desert and semi-desert rangelands. Low and extremely variable rainfall in arid rangelands requires people and livestock to be more mobile, enhancing the resilience of these rangelands to degradation in terms of woody encroachment and loss of grass cover, and enabling these rangelands to respond quickly to restoration. In more arid zones, non-equilibrium rangeland dynamics prevail (Ellis and Swift 1988), where extreme variability in rainfall makes prediction of spatial patterns of rainfall nearly impossible at the scales of rangeland management, and where carrying capacity rises and falls annually or seasonally depending on how much rain falls (Behnke and Scoones 1992, Campbell et al. 2006). Equilibrium rangeland dynamics, in which predictable rainfall enable more confident forecasting of carrying capacity, occur in more humid rangelands and in wetter semi-arid rangelands. Not only are non-equilibrium rangelands more variable, they are less susceptible to degradation (von Wehrden et al. 2012), and are often in a less degraded state than many semi-arid rangelands. Social factors that contribute to the lower vulnerability of arid rangelands to degradation include the the lower likelihood of receiving pastoralist visitors from elsewhere, both during the annual dry seasons and during major large-scale droughts, along with decreasing susceptibility to forcible invasion given that these areas dry out before semi-arid zones. Finally, lower rainfall and the infeasibility of rainfed cropping in most arid rangelands reduces their susceptibility to farm conversion and rangeland fragmentation, which often lead to further degradation of rangelands. Consequently, changes in rangeland condition in response to restoration or modified grazing management are generally much faster in arid than in semi-arid rangelands.

As a result, the technical practices applied by pastoralists often change with aridity—high rainfall variability often leading to more flexible, opportunistic management (Westoby et al. 1989). In arid areas, grazing management practices often become less reliant on predictable, pre-planned, prescribed resource use, and more reliant on the flexibility that allows tracking and utilization of rapidly changing resources in an opportunistic manner. Similarly, decision-making processes and the means for achieving community members' adherence to bylaws and management plans are often more flexible and less prescribed in advance, rather evolving in real-time as conditions change in these erratic environments. Restoration practices should generally differ (Sircely et al. 2022), with large arid rangelands requiring more low-cost, 'light-touch', ecosystem-reliant techniques as opposed to heavily input-reliant intensive restoration approaches that may cost more than they produce.

## Discussion

The commonalities and aridity-linked divergences noted here may be practically useful in several ways to those seeking to support pastoralists to enhance resilient livelihoods. The uses may include, but are not limited to, approaches for capacity building of local pastoralist range management institutions, as well as enhancing the environmental performance of rangeland restoration in pastoralist areas. Aridity, scale, and remoteness arguably constrain almost all aspects of land management in communal pastoralist rangelands, firstly by limiting the production of forage and browse, livestock, and other ecosystem services. In arid zones, the long distances and low population density reduce market access, increase the cost of service delivery, and create large transaction costs for local institutions responsible for coordinating grazing management. Limited livelihood options in arid rangelands leads to greater livestock-dependence. Grazing practices generally differ along this aridity gradient, becoming more flexible and opportunistic, as do decision-making and means for achieving adherence to bylaws. Restoration practices should generally differ as well, with large arid rangelands requiring more ecosystem-reliant techniques as opposed to input-reliant approaches.

Greater emphasis should be placed on conducting basic research in truly arid systems, including validation of remote sensing and ecosystem simulation models, documentation of local or traditional management goals, practices and their effects, and integration of these to bring pastoralist rangeland management into the 21<sup>st</sup> century through co-design processes. The extreme variability and context-dependency of socio-ecological dynamics in arid rangelands most especially underscores the need for action research and co-design. In the meantime, the important aridity-related differences highlighted here, as well as the commonalities among pastoralist rangelands, provide significant information that can greatly inform the design of rangeland management and restoration approaches for communal pastoralist rangelands.

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