Restoring Rangelands for Nutrition and Health for Humans and Livestock

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Abstract

Drylands cover 40% of the global land area and host 2 billion people, of which 90% live in low- or middle-income countries. Drylands often face severe land degradation, low agricultural productivity, rapid population growth, widespread poverty, and poor health. Governance structures and institutions are often eroded. Livestock-based livelihoods, largely depending on seasonal migration are common. Pastoralist communities and their land are highly vulnerable to climate shocks, while there are also changes in land tenure, insecurity/conflicts and rapid infrastructure development. Drylands Transform is an interdisciplinary research project revolving around the UN Sustainable Development Goals (SDGs). The project aim is to contribute new knowledge to a transformative change and sustainable development of drylands in East Africa to help escape the ongoing negative spiral of land, livestock and livelihood degradation. We investigate the links between land health, livelihoods, human well-being, and land management and governance with several study sites along the Kenya-Uganda border. Through strong stakeholder engagement we will explore challenges and pathways towards a social-ecological transformation in these drylands. The entry point is the urgent need to identify and enhance synergies between food and nutrition security (SDG2), land and ecosystem health (SDG15) and governance and justice (SDG16) for sustainable dryland development, aiming to improve health and equity (SDGs 3 and 5), while minimizing trade-offs between agricultural productivity, natural resources management and climate change. We are using innovative field research approaches focusing on livelihood improvement through rangeland (grazing areas) restoration and governance interventions. We will present results from the initial work to assess land health using the Land Degradation Surveillance Framework and explore the links with human health and well-being through household survey data. We will also show how we will co-develop sustainable dryland management options (e.g., field experiments with fodder grasses and shrubs) with local communities and set-up knowledge sharing hubs.

Introduction

Drylands - including hyper-arid, arid, semi-arid and dry sub-humid areas - cover about 40% of the Earth's land surface and are expected to expand in the face of climate change. More than 2 billion people inhabits dryland areas, about 90% of them in low- and middle-income countries (Safriel et al. 2005) and about 50% of the world's livestock resided there. Drylands are among the most vulnerable regions globally as they face enduring political and economic marginalization, poverty, inequity, food and nutrition insecurity, land and ecosystem degradation, and frequent conflicts. Climate change is projected to exacerbate dryland degradation, cause reductions in crop and livestock productivity and reduce biodiversity, which will have major negative impacts on food security and livelihoods of dryland people. Most of the northern Kenyan rangelands (approx. 4.5 million ha) are currently degraded (Mureithi et al. 2015). Demand for food, especially milk and meat, is projected to double by 2050, and there is untapped potential to enhance dryland food production and productivity through diversification and sustainable intensification. Interrelated stressors of climate change, natural disasters, violent conflicts and displacement pose a heavy burden on communities and threaten economic and sustainable development in East Africa (Lindvall et al. 2020). Land health is closely related to livestock health and production and to livelihood options affecting human health and nutrition (FAO 2018). Animal-source foods are nutrient-dense, including both high-quality protein and some essential micronutrients which are more difficult to obtain from plant-based foods. Improved livestock management practices with better feed quality and quantity are necessary mitigation options for reducing GHG emissions per livestock product (meat and milk) (FAO 2018). The project will investigate the links between land health, livestock-based livelihoods, human well-being, land management and governance. It will contribute with new knowledge for transformative change and sustainable development of rangelands in the drylands of East Africa

(Fig. 1). Through strong stakeholder engagement in interdisciplinary research, the challenges, and pathways towards a social-ecological transformation in drylands are explored with the aim to optimize synergies among the sustainable development goals (SDGs) while minimizing the trade-offs. Innovative field research approaches will be used, focusing on livelihood improvement through rangeland restoration and governance interventions in the border region between Kenya and Uganda. The entry point of Drylands Transform is the urgent need to identify and enhance synergies between food and nutrition security (SDG2), land and ecosystem health (SDG15) and governance and justice (SDG16) for sustainable dryland development, aiming to improve health and equity (SDGs3 and 5) while minimizing trade-offs between agricultural productivity (SDG2), natural resources management (SDG15) and climate change (SDG13).

Aim and research framework

The overall goal is to contribute knowledge and actions to realize the SDGs in East African drylands, which are one of the most vulnerable socioecological environments globally. The main objective is to investigate the interlinkage between land health, livelihoods (transhumance and non-transhumance pastoralists, agro-pastoralists, and crop farmers), human well-being and land governance mechanisms. Specific objectives are to:

1. Assess land health at the landscape scale and explore the links with human well-being

2. Test options to restore rangelands by engaging local communities, and develop platforms to share knowledge and scale interventions that promote resilience and productivity ("livestock cafés")

3. Understand the impact of climate variability on livelihood strategies and resilience

4. Identify innovative land governance mechanisms and practices that effectively address livestock keepers' dependence on both flexible and secure rights to land

5. Synthesize and scale-up key research findings in relation to objectives 1–4 through the design and evaluation of alternative scenarios for sustainable dryland transformation in East Africa in conjunction with dissemination and stakeholder communication.
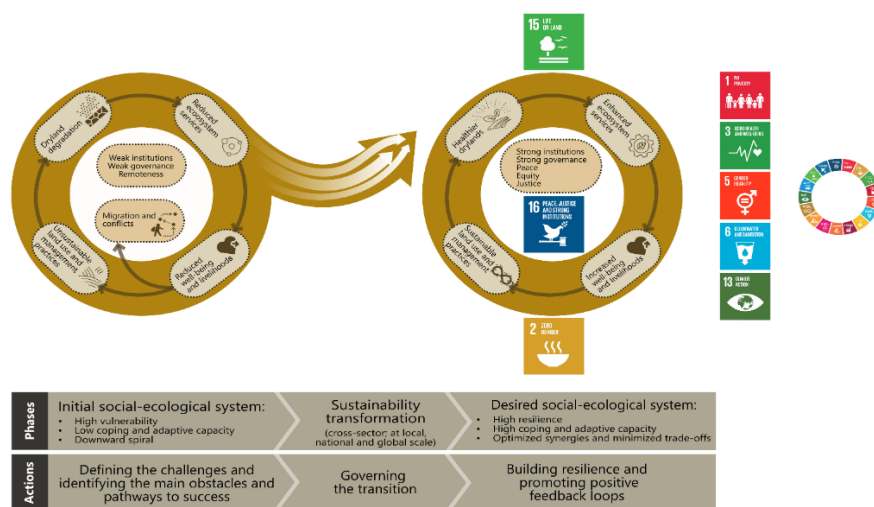

Figure 1. Conceptual framework of the Drylands Transform research project with the full name 'Achieving the SDGs in East African drylands: Pathways and challenges towards a social-ecological transformation of landscapes, livestock and livelihoods (Formas 2020-2024)'.

Study sites and methodology

The geographical focus will be the Karamoja cluster – the cross-boundary area between Uganda, Kenya, South Sudan, and Ethiopia. The fieldwork will be conducted in four study sites, Chepareria (West Pokot County) and Lokiriama-Lorengkipi (Turkana County) in Kenya, and Matany (Napak District) and Rupa (Moroto District) in Uganda, providing variation in livelihood strategies, rangeland management strategies and climate. Chepareria and Matany are dominated by agro-pastoralist communities, whereas Lokiriama-Lorengkippi and Rupa are dominated by pastoralists. Wooded savannah, characteristic for the landscape in this region, is a fragile ecosystem where any changes in the balance can easily lead to degradation. Communities in the region have adapted to pasture and/or water scarcity by relying on flexible migration strategies and a balanced composition of the herd.

In the project we are combining complementary methods:

1. The Land Degradation Surveillance Framework is used to assess land health at the landscape scale (Vågen and Winowiecki 2018; Vågen et al. 2018) across the four sites, each 10x10 km in size. In addition, household data on diet, health and livelihood parameters will be collected to explore the links between land health and human well-being.

2. Sustainable rangeland management and restoration options are co-developed with local communities by setting up knowledge sharing hubs (livestock cafés) to test how fodder and livestock production can be enhanced to maintain, or gain resilience (Fig. 2).

3. Resilience to environmental hazards is explored with local households and focus groups to assess with quantitative and qualitative methods the role of drought and flood occurrences for human health and well-being (children, women, men) using dietary diversity and child undernutrition among other indicators.

4. Innovative land governance mechanisms and practices will be identified that effectively address pastoral and agro-pastorals' dependence on both flexible and secure rights to land. Desk-studies are combined with interviews and focus groups discussions including different stakeholders.

5. Alternative scenarios for sustainable dryland transformation in East Africa will be co-designed and evaluated with local and regional stakeholder groups to explore concrete, alternative pathways towards realising the SDGs by optimizing synergies while minimizing (negotiating) trade-offs.
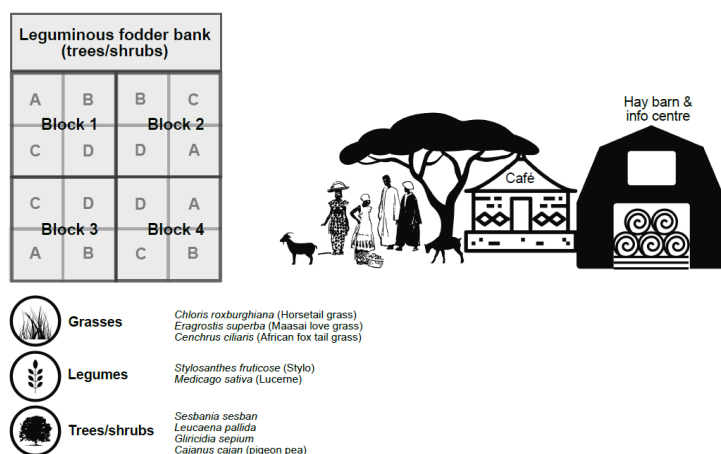

Figure 2. Livestock Cafés as local knowledge-hubs to support dialogues and trainings on enhancing land, livestock and human health. Experiments with grasses and legumes and other research activities will be set up at four sites.

Preliminary results and plans ahead

The current transformations in drylands are driven by population increase, climate change, agricultural commodification, infrastructure development and a general strive for improved livelihoods. To provide good livelihood conditions for more people under more dire conditions, production of food, goods and value needs to be enhanced and diversified through transformations that are economically and environmentally sustainable. Here, we will give some examples of results from our previous work to illustrate possibly options for drylands development. Improved fodder production units, with perennial grasses and legumes and fodder trees, fortnight kraaling and temporary protection from free grazing are examples of intensification. These practices may be carried out in private enclosures (e.g., Nyberg et al. 2015; 2019) such as communal/group enclosures for livestock fattening (Mureithi et al 2015) or in traditional systems where certain areas are temporarily protected from grazing (Mureithi et al 2010). Whilst the first two may come into conflict with traditional land tenure systems and livestock migration pathways, drivers mentioned above seriously threatened by the latter. In this situation, land tenure and policies, as well as the function of traditional management and regulatory systems are of fundamental importance for sustainable dryland development. In an area in West Pokot, Kenya, where the population has quadrupled over the last 40 years and the use of private enclosures have become the norm, people perceived that their livelihoods have improved over the years (Muricho et al. 2018a; Burian et al. 2019). Majority of the farmers (80%) have livestock management as the prime motivation for enclosing their land, the need for long distance livestock migration has decreased and agricultural production has diversified (Wairore et al. 2015; Karmebäck et al. 2015; Burian et al. 2019). Food and nutritional security improved when the agricultural production was diversified with fruits and vegetables (Bostedt et al. 2016). Soil health

improved (Odour et al. 2018; Nyberg et al. 2015) and erosion decreased (Burian et al. 2019). However, most diversification and intensification were livestock-related through e.g., herd diversification and inclusion of improved breeds, enclosures protected from free grazing, increased milk production (Wairore et al. 2015) and a poultry boom (Karmebäck et al. 2015). More than 40% of the family income comes from livestock sales and another 30% was derived from livestock management, e.g., sale of milk, hides and eggs, or contractual leasing out of enclosed grazing land and sale of hay (Wairore et al. 2015). Livestock management is the mainstay of livelihoods in this area and people still define themselves as pastoralists. Traditional knowledge systems and practices are however crucial to develop sustainable options to enhance productivity, especially when introducing modern evidence based technologies (Muricho et al. 2018b).

There are large knowledge gaps on how to support transformation towards sustainable and enhanced production in drylands. We need to assess the present land health status, including production potential, fodder status and seasonality. We will do that with the Land Degradation Surveillance Framework, which will enable comparison with > 300 other sites across Africa. In the Livestock Cafés, we will experimentally study different restoration and management options like different fodder grass production, hay and grass preservation and supplementary feed production in the form of nitrogen fixing tree species. Livestock Cafés will also be demonstration centers for co-development of dryland transformation pathways. This will include more resilient and diversified diets for human health and well-being. In local and regional multi-stakeholder platforms, governance options and alternative scenarios for sustainable dryland transformation will be explored.

Acknowledgements

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