



Pathways and challenges toward a socio-ecological transformation

*of landscapes, livestock and livelihoods in
the East African drylands*

**Field Report: Practical training on restoring degraded drylands for fodder production
in Lokirama, Turkana County and Chepareria, West Pokot County, Kenya**



Reported by

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1. Background Information

High level of poverty is a great challenge in Kenya's arid and semi-arid lands. These areas have had an increasing demand for more funding during emergencies as a result of frequent droughts due to climate change and variability coupled with population increase. Pastoralism and agro-pastoralism, the main livelihood systems, have continued to bear the brunt of drought-related stresses and shocks among other challenges. The main challenge to pastoral livestock production has been feed shortage during dry seasons and drought, which has threatened pastoral livelihoods and securities due to increased livestock mortality from starvation. Ensuring reliable feed supply through the year is therefore critical. This requires communities to capitalize on favourable seasons and as much as possible initiate rainwater harvesting (and irrigation where possible) to produce enough forage, harvest and conserve for use in dry seasons to sustain the livestock until the situation returns to normalcy. Producing fodder can also be used for income generation such as fattening livestock for sale at better prices hence benefiting the rural poor livestock keepers.

Land degradation in arid and semi-arid areas manifests in forms of impoverishment and depletion of vegetative cover, wind and water erosion, salinization and deterioration of physical, chemical and biological soil properties leading to loss of biological and economic productivity. Land degradation challenges can be addressed through the restoration of degraded land through the installation of water harvesting structures and reseeded with suitable and palatable range grasses. This practice can reduce soil erosion, improve in-situ water conservation and ensure the availability of safe, high-quality fodder.

Turkana and West Pokot Counties are among the ASAL counties that face severe challenges of feed for livestock, especially with the increasing frequencies of droughts. The use of technology in the production, conservation and utilization of feed is the way to go in ensuring the sustainability of livestock production in ASAL counties in Kenya. The county requires urgent measures for increased animal feed production and access throughout the seasons. This can be achieved through sustainable rangeland management and production and conservation of feed resources to bridge the feed deficit seasons.

¹ Cover photo

1 The Livestock Café site in Chepareria in an initial severely degraded state. Photo by S, Mureithi

The grass reseeding practice with the integration of forage legumes in the Livestock Cafés will enhance the restoration degraded areas. In addition, it presents an opportunity to provide quality and quantity forage for the livestock and a source of income for the local communities earned from selling the extra hay from restored areas and other fodder value chain products such as grass seed. This will also ensure supply forage to the livestock throughout the year thus alleviating the feed scarcity problem.

2. Objectives/Aim of the Field Visit

The overall goal of the field training was to equip the pastoralist community in Lokirama and Chepareria with practical knowledge on pasture production for niche markets (them being the primary market) through demonstrations and interactive sessions. The Livestock Cafés at Lochor Angakalio and Chepukat village in Lokirama and Chepareria, respectively, will act as demonstration sites in fodder production and will also be used for further training on husbandry, harvesting, conservation and utilization of fodder. The trained community members will also be bulking grass seeds which will allow out-scaling of this activity and showcase the potential of fodder production as a climate-smart business that can help the pastoral and agro-pastoral communities to increase both land and livelihood resilience against climate change.

The specific objectives were;

- i. To train pastoralist and agro-pastoralist communities on degraded rangeland restoration for fodder production.
- ii. To train and demonstrate the seedbed preparation through the installation of water harvesting structures in Lokirama Livestock Café site.
- iii. To train and demonstrate on reseeding degraded rangeland using selected rangeland grasses and fodder legumes at the Livestock Cafés.
- iv. To set up the experimental plots in Lokirama and Chepareria Livestock Café sites.

3. Description of Activities

On the 5th of May 2022 Dr. Stephen Mureithi, the Kenyan Country Coordinator and Margeret Nyaga, objective 2 PhD student left Nairobi for Kitale. They were joined by Mr. William Makokha, the Kenyan local liaison person and they together travelled to Moroto, Uganda on the 6th of May 2022.

3.1 Training and demonstration on the restoration of degraded rangeland for fodder production in Lokiriama Livestock Café site (7/5/2022-10/5/202)

The project team started the fieldwork activities in Lokiriama Livestock Café with a brief meeting with the community members on how they will be engaged in the various activities at the Livestock Café. This was followed by intensive practical training on the restoration of degraded rangeland for fodder production.

The training aimed to provide the project beneficiaries with technical and practical knowledge in land preparation and reseeding technologies. The training covered the importance of pasture production for the market, pasture species selection criteria, selection of sites and niche areas for pasture production, and land preparation technologies for onsite water harvesting for pastures and fodder production in Day 1. During the subsequent days, the training involved practical and demonstrations at the Livestock Café site at Lochor Angakalalio village. The over 60 community participants (17 men and 43 women) were trained on making water harvesting structures (Range Pits, Semi-Circular water pans and retention ditches) and reseeding with both selected rangeland grasses and legumes. The trainers (Table 1) collaborated with the extension officer from the ministry of agriculture, area leaders, group leaders and group members in the implementation of the activities. The community members were very eager to learn the different techniques demonstrated to them.

Table 1: The location, date, names of people present

Name(s)	Dr. Stephen Mureithi			Researcher, University of Nairobi		
	William Makokha			Triple L		
	Margeret Nyaga			PhD Student, University of Nairobi		
	Mercy Leting			Agricultural and Livestock Officers, Ministry of Agriculture, Livestock and Fisheries, Chepareria Office		
	Stanslaus Juma					
	Henry Losiwa					
Dates of Assignment	Start Date	05/05/22	End Date	22/05/22	Duratio n (Days)	18
Destination Counties	West Pokot and Turkana Counties, Kenya					
Wards /Sub County	Chepareria and Lokiriama Wards					

The training was led by Dr. Stephen Mureithi, a Rangeland Ecologist, William Makokha, Local Project Liaison person and Margeret Nyaga, Obj 2 PhD student. Also present were Area Chief (Sammy Tioko), Lokiriama Location.

The training started at 9.00 a.m. with a prayer led by a community member followed by an introduction of the training team to the participants. Dr. Mureithi asked the eldest participant to narrate how the area was about 40—50 years ago in terms of grass cover, trees, livestock and human population and climate (rainfall). The lady narrated that when she was younger, Lokangae plains were covered with lush grass, there was wildlife, and livestock body conditions used to be good throughout the year. Nowadays, there is no wildlife, and livestock have to be migrated during the dry season to the hills and far places in Uganda where there are conflicts at times. She also said that the rainfall was predictable and reliable then compared to today. In addition, in the past, there were only scattered indigenous trees, but today *Acacia reficiens* has encroached most bare areas.

Dr. Mureithi showed the participants a photo of bare land, and asked them what could have led to the situation of 'Arwo' meaning bare land in Turkana. This led to a lively open discussion. He then introduced them to rangeland rehabilitation techniques using a series of photos. The Area Chief interpreted to the participants to ensure that the message was well communicated. The participants were taken through a designed pasture production manual that was developed into a skill development course. This was delivered in different sub-modules:

Sub-Module 1: Pasture production and reseedling

The participants were taught how to select the reseedling area. They were informed on the factors considered in selecting the reseedling areas, including climatic factors, edaphic factors and topography. Here the emphasis was on the sites that support quick establishment as well as proper timing for reseedling to increase germination, establishment, biomass yield and seed yield. Participants were also taken through the types of important pasture types including grasses, fodder trees, and legumes in rangelands and their significance.

Sub-Module 2: Selection of range forage and desirable characteristics

The participants were taken through qualities of good forage to consider depending on the management objectives; biomass production, seed production or soil conservation. The factors considered in the selection of forage species that the participants were trained on included: tolerance to heavy grazing; high nutritive value; drought tolerance, high palatability; tolerance

to salinity; high seed production and ease of harvest; high biomass production; tolerance to fire; persistence and rapid regeneration; adaptability to a wide range of soils; compatibility with legumes.

Sub-Module 3: Common range grass species used for reseeded

Participants were introduced to a combination of species that are locally adapted to the drylands of Kenya which are more suitable for reseeded and pasture establishment. The trainers showed the type of grasses and their characteristics in the field using a herbarium of several key grass species and fodder trees for practical demonstration. The species which tend to do well in the drylands that participants were trained on included: *Digitaria Macroblephara*, *Cenchrus ciliaris* (African foxtail), *Themeda triandra* (Red oat grass), *Cynodon dactylon* (Star grass), *Chloris roxburghiana* (African Horsetail), *Panicum maximum* (True guinea), *Enteropogon macrostachyus* (Bush ryegrass), *Bothriochloa insculpta* (sweet pitted), *Eragrostis superba* (Maasai love grass).

Sub-Module 4: Land preparation for pasture establishment

In this module, participants were trained on how to prepare land into a suitable seedbed for grass pastures and legumes establishment. Good land preparation for reseeded or pasture establishment is very critical for the success of sward establishment. Pasture establishment under rainfed systems requires proper timing where land preparation and planting are done on time before the rains.

Due to scarcity of water in the drylands and rampant soil erosion, participants were trained on how to harvest rainwater through different methods. Some of the methods the participants were trained on included; trapezoidal bunds, contour bunds, on-farm micro-catchments, Zai pits, range pits (half-moons) and ripping. These technologies not only allow the good establishment of grasses but also increase water use efficiency and soil moisture conservation in arid and semi-arid areas.

Sub-Module 5: Pasture establishment

Pasture seeds are too small for most rangeland species and their planting requires careful placement and cover of the seeds to enhance germination. In this module, therefore, the

participants were trained on several methods of seed placement as practicable to the prepared land. The methods demonstrated in the training included:

- Broadcasting
- Oversowing
- Vegetative propagation

The community members were able to understand what each method entails and how and when to use based on the prevailing land conditions. The trainers led the community to a practical demonstration of seed broadcasting and sowing on the range pits that they had installed at the Livestock Café site.



Fig. 1: a) Marking of the half-moon water harvesting structures, b) Dr Mureithi demonstrating how to install the range pits for rainwater harvesting, and c) Community members digging the range pits (half-moons) as demonstrated. Photos by M Nyaga.

3.2 Treatments, experimental design and layout in Lokiriama and Chepareria

Within the Livestock Café, an area was set aside for the doctoral research experimentation layout as follows:

- ✓ There were a total of four treatments which were replicated four times giving a total of 16 plots.
- ✓ The spacing between plots and blocks was 2m and 5m, respectively.
- ✓ Each plot measured 20 by 20m

Treatments

- ✓ There were four treatments with reseeding (different rangeland grasses, *Cenchrus ciliaris* and *Eragrostis superba*) being uniform since the aim of the study is to restore degraded lands and to enhance the availability of forage in the drylands.
- ✓ The treatments are as follows;
 - Treatment 1: Reseeding +Legumes
 - Treatment 2: Reseeding +Legumes+ Manure
 - Treatment 3: Reseeding +Manure
 - Treatment 4: Reseeding
 - Treatment 5: Control (No intervention plots)
- ✓ Random numbers were generated representing the four treatments per block which were then randomized into the experimental plots.
- ✓ The rangeland grasses used in combination as a reseeding treatment were;
 - *Cenchrus ciliaris*
 - *Eragrostis superba*
- ✓ The legumes were;
 - *Crotalaria juncea*
 - *Clitoria ternatea*
 - *Macroptilium atropurpureum* (Siratro)
 - *Neonotonia wightii*
- ✓ Manure application was considered at a rate of 3 tons/ha thus one plot of 20 by 20m would take 120kgs of manure.
- ✓ The main method of land preparation was ripping and the method of planting was broadcasting

✓ The planting dates were;

- Lokiriyama site: 10/5/2022, rainfall onset after planting 24/5/2022
- Chepareria site: 13/5/2022, rainfall onset after planting was on 22/5/2022



Fig. 2. Experimental layout



*Fig. 3. The experimental design and layout on the ground at Lokiriama Livestock Café site
(Drone Photo by S Mureithi).*



*Fig. 4. A ripped plot broadcasted with grass and legume seeds in Chepareria Livestock Café
Annex (Photo by M Nyaga)*



Figure 5: Broadcasting grasses and legumes seeds in the different experimental plots in Lokiriama (Photo by M Nyaga)



Fig. 6. The Lokiriama Livestock Café site installed water harvesting structures and reseeded with grasses and legumes (Drone Photo by S Mureithi).

4. Feedback from stakeholders (trainees, county government, partners) during the field activity

The pasture production training participants were very happy with the Drylands Transform Project's focus on the restoration of degraded rangelands for fodder production, noting that livestock was the main livelihood source in the County which is currently plagued by feed shortages due to frequent droughts. The trainees were happy to work with the project team and pledged to ensure the success of all the interventions. They pledged to continue learning and implementing the remaining activities at the Livestock café. They were also very happy to have received the training in a participatory manner, with demonstrations at the Livestock café site. The provision of pasture and legume seeds was also thankfully received by the community noting that the Livestock café site will be a source of seeds in future.

Lessons learnt

- The consultation and inclusion of all the key stakeholders has made the implementation of the Livestock cafés a success.
- The use of community mobilizers, field officers and extension staff makes community mobilization easy and hence the timely implementation of the field activities.
- The participatory approach used in the selection of beneficiaries, implementation of activities and training of TOTs will ensure the sustainability of the project and increase the scale of adoption of technologies.
- Sustainability of the pasture production as a business needs support to create a market that is responsive and demand-driven production of forage. The community were informed that they are their 'first market' for the fodder they produce.

5. Conclusion and recommendations

The training was a success and forms an entry point to future activities on pasture management, harvesting, use and value addition in the future training modules. Marketing forms an important component that will speed up adoption and ensure sustainability of pasture production activities.

A business model is needed in implementing pasture production activities in the County rather than an emergency response, to increase the adoption and sustainability of fodder production. There is a need to further support the lead groups such as the one formed in Lochor Angakalio so that other groups and individual producers can learn from them.

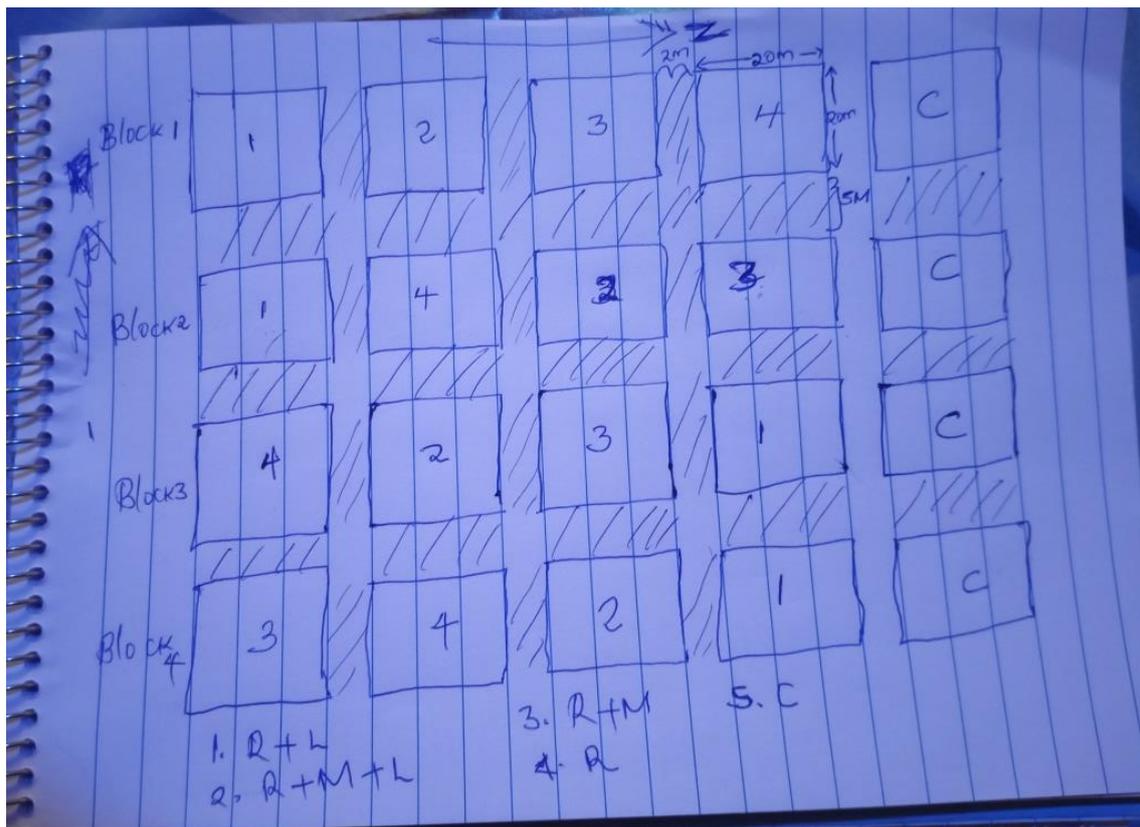
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Appendix



A sketch of the experimental design and layout for Lokiriama and Chepareria Livestock Café sites