Food & Business Knowledge Platform

Factsheet final findings Applied Research Fund Call 3

Rainwater harvesting from roads for indigenous pasture production & improved rural livelihoods in Kenya (ROFIP)

Summary

This project assessed the potential of harvesting rainwater from roads for enhanced indigenous pasture production in a semi-arid environment in Kenya. The selected species were ***Cenchrus ciliaris*** (African foxtail grass), ***Eragrostis superba*** (Wilman lovegrass), ***Enteropogon macrostachyus*** (Bush ryegrass), ***Chloris roxburghiana*** (Horsetail grass), and ***Chloris gayana*** (Rhodes grass). Roads were used as a catchment, and runoff generated from rainfall episodes was diverted into reseeded pastures. Micro-catchments were also created by using ox-driven ploughs, a traditional method for seedbed preparation and rainwater harvesting *in-situ*. Using water-sensors to monitor soil moisture content, the project demonstrated that combining the diversion of runoff from roads and harvesting rainwater *in-situ* enhances and prolongs soil moisture in reseeded pastures. Consequently, this translated to higher forage yie
lds for livestock and vegetation cover (land degradation mitigation and enhanced soil health). This project demonstrated that combining rainwater harvesting and pasture reseeding enhances water retention and soil health, thus improving sustainable pasture production. However, to achieve this, it is important to involve local communities to co-design practical solutions that are socially, economically and environmentally sustainable. Furthermore, local and regional markets need to be strengthened and formalized in order to venture into the full potential of the pasture value chain.

Final research findings

Rainwater harvesting from roads enhanced production of forage grasses indigenous to African drylands. The selected grasses demonstrated a variety of attributes, suitable to address the challenge of land degradation that is contributing significantly to scarcity of forage resources for grazing herbivores. *Chloris gayana* and *E. superba* (higher biomass yields) were best suited for forage provision and seed production compared to the other grass species. *Enteropogon macrostachyus* and *C. ciliaris* demonstrated a greater potential for restoring and rejuvenating denuded rangelands. *Chloris roxburghiana* was consistently ranked the lowest in all the measured morphoecological characteristics. For land managers to achieve desirable outcomes, the project recommends that they should carefully select the grasses in order to maximize on the unique strengths. This should match their desired use of the land e.g. increase biomass yields, seed production to replenish depleted seed banks and/or restoration of degraded landscape by increasing vegetation cover. Considering that these grasses do not occur in isolation from each other in their native environment, long-term seeding trials using different mixture combinations to compare the morphoecological characteristics are highly recommended in subsequent projects. .

Outcomes achieved

ROFIP project farmers' – changing the mind-sets

Elizabeth M. David said: "I tell people to get the grass seeds and plant, so that they can notice the difference. One neighbouring farmer wanted to uproot the grass during the rainy season, so that he could plant crops on his farm. I explained to him the importance of planting the grass." **Richard Mwova** noted: "If I divert runoff water from the road passing next to my farm, I can direct it into dug trenches. This has led to my farm being 'evergreen' during both the dry and rainy season. Really, water harvesting can change our farms." **Kavindu Mumu** noted: "Per acre, I can get 200 bales minimum. If the season is good with more rain, I can get more, up to 500 bales of hay annually. One bale goes for KES 300 (ca. EUR 3). Most of the time we have crop failure because of the unpredictable rains. Indigenous grasses rarely fail. Plus, in comparison, sale of milk and hay fetches higher returns than maize and beans". **Jeremiah Ngaya:** "Traditionally, farmers would keep

livestock and sell them during dry spells to minimise losses and buy food. But since I started planting indigenous grasses, my livestock has enough quality forage".

Project messages to

A) Actors from private sector:

- Investment in local and indigenous seed systems in Africa.
- Integrate indigenous seeds in the formal seed market to enhance accessibility and improve seed quality.
- Investment in expanding 'green roads networks' for rainwater harvesting for pasture and agricultural production.
- Establish 'Indigenous Grass Seed' Cooperatives.

B) Civil society and practitioners organizations:

- Utilize the valuable 'wealth' of existing Indigenous Technical Knowledge (ITK) among different communities.
- Active incorporation of environmental and social needs to address inherent challenges in the society.
- Land managers should carefully select grasses in order to maximize on the unique strengths. This should match their desired use of the land e.g. increase biomass yields, seed production to replenish depleted seed banks and/or restoration of degraded landscape by increasing vegetation cover.

C) Policy makers:

- Develop seed policy and legislation, especially for 'Indigenous Grass Seeds' adapted to African drylands – it is now lacking in the formal seed systems/markets.
- Formulate policies related to rainwater harvesting and indigenous pasture production that are relevant and applicable at local –national-regional-global scale.

Knowledge products

- Pasture management with indigenous grasses and road water harvesting in arid to semi-arid lands (ASAL). Grass manual – July 2020.
- Creating Pastures in African Drylands using RoadWater Harvesting. ROFIP project webinar, 2019.
- Using RoadWater for Pasture Production: Farmer Testimonies. Documentary series (six episodes).
- The potential of road water harvesting for improved indigenous pasture production in arid and semi-arid lands (ASALs). Project report – November 2019.
- Value chain analysis of pasture production in Kitui County, Kenya. Project report – November 2019.
- The Global Database on Sustainable Land Management (SLM) - WOCAT SLM database highlighting the different SLM technologies and approaches for drylands.

Knowledge networks

- Global Arid Zone Project (GAZP) and Network – GAZP aims to bring together arid and semi-arid restoration researchers globally to pool existing data and knowledge for a deeper understanding of restoration science. The ROFIP project contributed to this global data set, primarily to assess the potential of indigenous grass reseeding for ecological restoration in African drylands.
- Soil Darkdivnet – Soil Darkdivnet is a global study investigating the links between plant traits and soil biogeochemical parameters and indices regulated by soil microbial metabolic processes, i.e. soil respiration, carbon fixation and mineralisation, at several spatial scales. The ROFIP project site contributed to this global data set to assess the potential of indigenous grass reseeding for ecological restoration through enhanced soil health.

Knowledge co-creation

The model reseeding pasture site (South Eastern Kenya University research farm) and three (3) demonstration reseeded pasture sites among local farmers in the project area (Kitui County, Kenya) provided a suitable 'nature laboratories'. This was expanded to 10 farmers (men and women) in the second project year. Over 200 farmers participated in Farmer Field Days (FFDs), exchange visits and workshops. Another 1500 farmers visited the demo-plots. Within these knowledge building activities, partners shared and learned from each other's expertise and the actual growth of the pastures planted. Individual farmers and farmer groups (women and youth) shared their indigenous knowledge on e.g. traditional methods of seedbed preparation for crop production (ox ploughing for in-situ rainwater harvesting and indigenous pastures of preference for their livestock). The project took advantage of this broad spectrum of knowledge and integrated it in the implementation of the project. Consequently, ROFIP project collaboration culminated to a 'practical set of innovative tools/knowledge' of combining water harvesting and retention measurements with grass reseeding, with a comprehensive approach to produce, conserve and control quality of grass seeds and hay, and livestock production. (This is under development with proposed collaboration with Kenya Agricultural and Livestock Research Organisation (KALRO)).

Consortium Partners

- Rise Against Poverty Worldwide - Kenya
- South Eastern Kenya University (SEKU)
- MetaMeta Research

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Project website

F&BKP Research Project page