Improved fodder production on degraded pastureland

Uganda - Okubyara Obunyatsi (Runyankore)

Transformation of degraded pastureland to high quality fodder plots.

Grass and legumes are planted on degraded pasture land in fenced fodder plots within the drought prone cattle corridor of Kiruhura district. This climatic zone is characterized by short periods of intense rains followed by long dry spells. Previously, most of the pastoralists of Kiruhura led a nomadic lifestyle, moving their livestock over large areas in search of pasture and water. The combined effects of prolonged droughts and livestock movement over a defined corridor, led to increasing degradation of pastureland, reducing both the quantity and quality of pastures and worsening soil erosion. Therefore the pastoralists have settled down plant pastures instead. Grasses cultivated in the range lands of Kiruhura are Pennisetum purpureum (elephant grass), Stylosanthes guianensis (stylo), Chloris gayana. The legumes are Calliandra spp. and lablab.
The main objective of the technology is to improve the availability of quality forage and fodder for livestock during the dry season and to feed small ruminants. The other objective is to stop runoff which usually destroys crops, increase water infiltration during the rains and lessen the effect of floods. The benefits of fodder cropping include the protection of soil from erosion by increasing surface cover, improved soil fertility from the legumes, improved livestock production and consequently higher manure production.
Establishment involves digging, to loosen the soil and remove other grasses that would compete with the planted grasses. Digging is labor intensive and the land owner usually hires labor. The technology requires simple gardening tools such as the hand hoe for digging the soil, and a panga to clear invasive bushes, usually Lantana camara. In addition, irrigation may be necessary in the first 2 to 3 months even during the rainy season. Elephant grass is propagated vegetatively using cuttings planted in rows. Chloris gayana is propagated by broadcasting the seed. Lablab seeds are germinated by soaking in water and then planted directly in the prepared plot. Calliandra is first planted in nurseries before transplanting the seedlings. Because of the erratic rains, irrigating the plots in the first few months of cultivation is critical.
The plots fenced off to protect the fodder crops.

left: The planted pasture plot produces hay and seeds for distribution to other members of the community (Photo: Charles L Malingu)
right: Lablab is a protein rich fodder. Cows fed on Lablab and Calliandra increase milk yields. (Photo: Charles L Malingu)

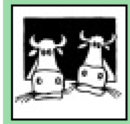
Location: Uganda
Region: Kiruhura District (Sanga)
Technology area: 0.05 km^2
Conservation measure: vegetative, management
Stage of intervention: mitigation / reduction of land degradation
Origin: Developed externally / introduced through project, recent (<10 years ago)
Land use type:
Grazing land: Intensive grazing/ fodder production
Land use:
Grazing land: Extensive grazing land (before), Grazing land: Intensive grazing/ fodder production (after)
Climate: subhumid, tropics
WOCAT database reference: T_UGA029en
Related approach: Management of dry rangelands ()
Compiled by: Wilson Bamwerinde, Kabare district Uganda
Date: 2013-12-09
Contact person: Wilson Bamwerinde, National Project Manager, K-TAMp project, Uganda, Kabale Tel: +256 772541335 E-mail: Wilson.bamwerinde@fao.org

Classification

Land use problems:

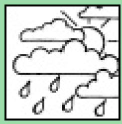
- Degradation of pasture range-lands through overgrazing; Animal movement exposes top soil to erosion. (expert's point of view)
Decrease of pasture and water during the dry season; labor to get water and good pasture is a big challenge during prolonged drought. (land user's point of view)

Land use



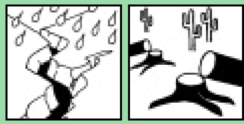
Intensive grazing/ fodder production
Grazing land: Extensive grazing land (before)
Grazing land: Intensive grazing/ fodder production (after)
intensive grazing land
rainfed

Climate



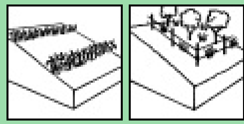
subhumid

Degradation



Soil erosion by water: loss of topsoil / surface erosion,
Biological degradation: reduction of vegetation cover

Conservation measure



vegetative: Grasses and perennial herbaceous plants
management: Change of management / intensity level

Stage of intervention

- ☐ Prevention
- ■ Mitigation / Reduction
- ☐ Rehabilitation

Origin

- ☐ Land users initiative
- ☐ Experiments / Research
- ■ Externally introduced: recent (<10 years ago)

Level of technical knowledge

- Agricultural advisor
- Land user

Main causes of land degradation:
Direct causes - Human induced: deforestation / removal of natural vegetation (incl. forest fires), overgrazing
Direct causes - Natural: change of seasonal rainfall, droughts

Main technical functions:
- control of dispersed runoff: impede / retard
- improvement of ground cover
- increase in nutrient availability (supply, recycling,…)
- promotion of vegetation species and varieties (quality, eg palatable fodder)

Secondary technical functions:
- control of raindrop splash
- increase of infiltration
- increase / maintain water stored in soil
- increase of biomass (quantity)

Environment

Natural Environment

Average annual rainfall (mm)

- ☐ > 4000 mm
- ☐ 3000-4000 mm
- ☐ 2000-3000 mm
- ☐ 1500-2000 mm
- ☐ 1000-1500 mm
- ■ 750-1000 mm
- ☐ 500-750 mm
- ☐ 250-500 mm
- ☐ < 250 mm

Altitude (m a.s.l.)

- ☐ > 4000
- ☐ 3000-4000
- ☐ 2500-3000
- ☐ 2000-2500
- ☐ 1500-2000
- ■ 1000-1500
- ☐ 500-1000
- ☐ 100-500
- ☐ <100

Landform

- ☐ plateau / plains
- ☐ ridges
- ☐ mountain slopes
- ■ hill slopes
- ■ footslopes
- ☐ valley floors

Slope (%)

- ☐ flat
- ■ gentle
- ■ moderate
- ☐ rolling
- ☐ hilly
- ☐ steep
- ☐ very steep

Soil depth (cm)

- ☐ 0-20
- ☐ 20-50
- ■ 50-80
- ☐ 80-120
- ☐ >120

Growing season(s): 90 days (March to May), 90 days (October to December)
Soil texture: medium (loam)
Soil fertility: medium
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: medium

Soil water storage capacity: medium
Ground water table: 5 - 50 m
Availability of surface water: medium
Water quality: poor drinking water
Biodiversity: low

Tolerant of climatic extremes: seasonal rainfall increase, seasonal rainfall decrease, heavy rainfall events (intensities and amount), wind storms / dust storms, droughts / dry spells, decreasing length of growing period
If sensitive, what modifications were made / are possible: In preparation for extended drought, hay is made during the rainy season when there is abundant grass.

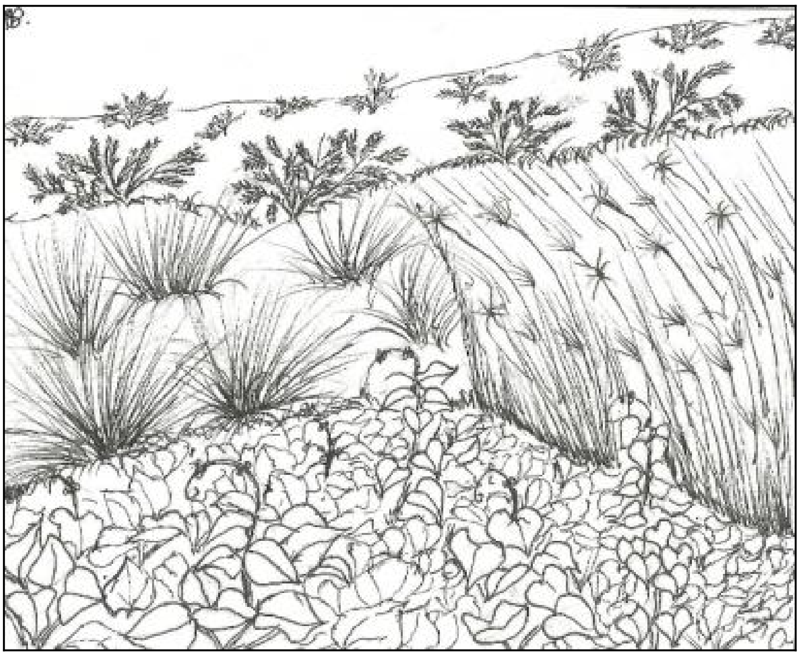
Human Environment

Grazing land per household (ha)

	<0.5
	0.5-1
	1-2
	2-5
■	5-15
	15-50
	50-100
	100-500
	500-1,000
	1,000-10,000
	>10,000

Land user: Individual / household, medium scale land users, common / average land users, mainly men
Population density: 10-50 persons/km2
Annual population growth: 2% - 3%
Land ownership: individual, not titled
Land use rights: individual
Water use rights: open access (unorganised) (Once herders started settling down land came under individual ownership. This development is only a few decades old. Water is still under open access.)
Relative level of wealth: rich, which represents 15% of the land users; 30% of the total area is owned by rich land users

Importance of off-farm income: less than 10% of all income: Most of the economy in Kiruhura district is farm-based. Almost everybody earns directly from their farm produce or labour.
Access to service and infrastructure: low: technical assistance, employment (eg off-farm), energy, roads & transport, financial services; moderate: health, market, drinking water and sanitation; high: education
Market orientation: mixed (subsistence and commercial)
Livestock density: 25-50 LU /km2



Technical drawing

Transformation of degraded pastureland to high quality fodder plots based on establishment of vegetation cover: Pennisetum purpureum (elephant grass), Stylosanthes guianensis (stylo), Chloris gayana, Calliandra and Lablab (Byonabye Proscovia)

Implementation activities, inputs and costs

Establishment activities

- Preparation of fodder plots (bush clearing, digging, fencing)
- Nursery establishment for Calliandra
- Planting
- Weeding
- Paddocking

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Labour	110.00	100%
Equipment		
- tools	8.00	100%
Construction material		
- wood	200.00	50%
- Fencing wire (roll)	40.00	100%
Agricultural		
- seeds	25.00	0%
- compost/manure	30.00	100%
TOTAL	**413.00**	**70.00%**

Maintenance/recurrent activities

- Weeding and fodder preparation
- Gap-filling/replanting
- Maintenance of paddocks

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US$)	% met by land user
Labour	60.00	100%
Equipment		
- tools	8.00	100%
Construction material		
- wood	100.00	100%
- Fencing wire (roll)	40.00	100%
Agricultural		
- seeds	25.00	100%
- compost/manure	30.00	100%
TOTAL	**263.00**	**100.00%**

Remarks:
Fencing the land is the most important factor in establishing the technology. The whole cattle corridor is an extended range land with a lot of livestock. Fodder plots constantly face destruction by freely roaming livestock and therefore fencing is a requirement. Paddocking also requires fencing to divide the farm into portions of pasture. Both materials and labor are costly. The calculations above were done in December 2013, for gently sloping land (< 6%), for each of 5 hectares covered by the technology.

Assessment

Impacts of the Technology

Production and socio-economic benefits

+++ increased fodder production
+++ increased fodder quality
++ increased animal production
++ reduced risk of production failure
++ increased farm income

Production and socio-economic disadvantages

++ increased expenses on agricultural inputs
++ increased labour constraints

Socio-cultural benefits

++ community institution strengthening
++ improved conservation / erosion knowledge
+ conflict mitigation

Socio-cultural disadvantages

Ecological benefits

+++ improved soil cover
++ reduced evaporation
++ reduced surface runoff
++ increased biomass above ground C
++ increased nutrient cycling recharge
++ reduced soil loss
++ reduced invasive alien species
+ reduced soil crusting / sealing
+ reduced soil compaction

Ecological disadvantages

++ increased fire risk

Off-site benefits

++ reduced damage on neighbours fields
++ reduced damage on public / private infrastructure

Off-site disadvantages

Contribution to human well-being / livelihoods

+++ Implementation of the fodder cropping technology helps to maintain small and productive herds in a short distance from the households. As a result, milk production improved significantly, thereby improving household incomes.

Benefits /costs according to land user			
	Benefits compared with costs	**short-term:**	**long-term:**
	Establishment	slightly negative	very positive
	Maintenance / recurrent	positive	very positive

Establishment costs are rather high. In the medium to longer term, the benefits are immense. Maintenance costs are reduced once the technology is established because expenditure on animal drugs goes down with decreasing parasite infestations (especially ticks) which were a result of mixing with untreated herds before.

Acceptance / adoption:

75% of land user families (15 families; 75% of area) have implemented the technology with external material support. Supply of grass and legume seeds was done for the original 15 families; 5 more families are working on the technology after seeing its results from their neighbours.
25% of land user families (5 families; 25% of area) have implemented the technology voluntary. 5 farmers have adopted the technology without getting any external help
There is moderate trend towards (growing) spontaneous adoption of the technology. 25% of the farmers who adopted the technology did so without external support.

Concluding statements

Strengths and → how to sustain/improve	Weaknesses and → how to overcome
There is enough grass and fodder for the herd during the rainy season and hay during the extended droughts. → More mobilization campaigns, grass and legume seeds and other incentives should be availed to the herders to enhance rate and extent of adoption.	Establishment costs are rather high → Benefits demonstrated by the herders who adopted the technology should convince government and commercial banks that the technology is profitable. Upon this evidence alone, these institutions should avail the herders the necessary capital.
Intensive grazing favours smaller, high productivity herds → Policy to improve herd quality should be pursued at government level	Technology is labour intensive → Productivity is even higher, therefore innovations that introduce mechanization should be encouraged (it is the normal progression of agricultural/industrial development)
Planted pasture enhances responsibility to protect and maintain grazing land by the owner, thereby improving capacity to sustain soil management benefits (increased surface cover, reduced water erosion) → Community level by-laws should be enacted to compel every herder to have some planted pastures for fodder.	There is shortage of labor to increase acreage, cut the grass and legumes from the pasture plots and prepare fodder for semi zero-grazing → Use simple machines where possible
Improved milk and other farm product yields → Introduce marketing strategies including cooperatives to ensure that the benefits go to the farmers and not marketing middle-men.	
Improved income from milk with reduced expenses on acaricides and other drugs means that household income is higher → Encourage improvement of the herd by reducing the numbers and enhancing the quality through breeding and acqusition	
Less time is spent on searching for pastures further afield. → Encourage the herder to put more acreage under planted pastures	

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