Two milker heifers to a pen (Rick Kamugisha)

Modern Intensive Livestock Management. (Uganda)

Gwoko dyang cak

DESCRIPTION

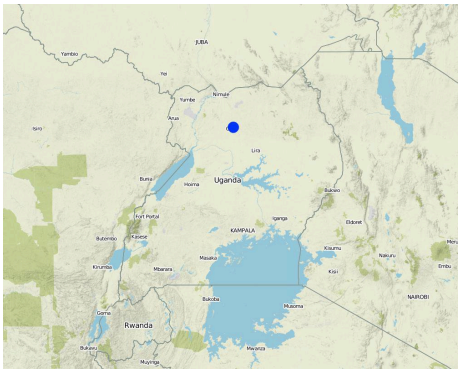
Intensive zero-grazing of hybrid dairy Hybrid (Holstein Friesian) cattle to produce a constant high yield of milk all-year around.

The productivity of modern intensive livestock management systems in northern Uganda is highly constrained by increasing household land shortage, poor quality pastures and rampant spread of livestock pests and diseases. Thus a large number of improved cattle are reared in closed systems where they are fed, treated and supervised. Some bulk feeds are grown on the same farm and the manure from the livestock housing units is used to improve soil fertility and crop yields of the same farm.

Improved breeds of cattle (75% Friesian and 25% local) are reared in paddocked land area of an average in 8 hectares, within which the animals are fed, watered and managed with medication. Approximately 25% of this land area is devoted to livestock structures, in which up to 64 Friesians are kept. The rest of the land is planted with improved pastures as well as other crops such as maize (Zea mays), cowpeas (Vigna unguiculata), fruit trees and vegetables. Manure is collected daily from an assembly point and applied to the crops. Improved pastures are also used for silage. The system further provides manure, which is valuable for soil fertility improvement in crop fields. Moreover, the confinement of the livestock system helps to reduce conflicts experienced in traditional free range grazing areas.

The approach and materials used in this intensive dairy cattle rearing system in northern Uganda closely follows specification for dairy cattle barns in New Zealand (www.simpleshelter.co.nz/). When properly implemented, the financial returns are substantial in the long term. However, establishment costs are relatively high for most average smallholder farmers in northern Uganda. The sustainable land management (SLM) benefits from this system justify its adoption, although carbon balance needs to be independently assessed.

LOCATION



Location: Gulu district, Northern region, Uganda

No. of Technology sites analysed: single site

Geo-reference of selected sites
- 32.34978, 2.80554

Spread of the Technology: applied at specific points/ concentrated on a small area

In a permanently protected area?:

Date of implementation: 2007; 10-50 years ago

Type of introduction
- [x] through land users' innovation
- [ ] as part of a traditional system (> 50 years)
- [ ] during experiments/ research
- [x] through projects/ external interventions

Pens are built with steel rather than wooden elements. (Charles-Lwanga Malingu)

For hay and silage, maize and cowpeas are intercropped 3 times a year on 15 acres. (Charles-Lwanga Malingu)

CLASSIFICATION OF THE TECHNOLOGY

Main purpose

- [x] improve production
- [x] reduce, prevent, restore land degradation
- [x] conserve ecosystem
- [ ] protect a watershed/ downstream areas – in combination with other Technologies
- [ ] preserve/ improve biodiversity
- [ ] reduce risk of disasters
- [ ] adapt to climate change/ extremes and its impacts
- [ ] mitigate climate change and its impacts
- [x] create beneficial economic impact
- [ ] create beneficial social impact

Land use

Cropland

- Annual cropping: cereals - maize, fodder crops - other, vegetables
- Tree and shrub cropping: fruits, other

Number of growing seasons per year: 3

Grazing land

- Cut-and-carry/ zero grazing
- Improved pastures

Animal type: cattle - dairy, 75% Friesian and 25% local

Species	Count
cattle - dairy	64

Water supply

- [x] rainfed
- [ ] mixed rainfed-irrigated
- [ ] full irrigation

Purpose related to land degradation

- [x] prevent land degradation
- [x] reduce land degradation
- [ ] restore/ rehabilitate severely degraded land
- [ ] adapt to land degradation
- [ ] not applicable

Degradation addressed

soil erosion by water - Wt: loss of topsoil/ surface erosion

soil erosion by wind -

chemical soil deterioration - Cn: fertility decline and reduced organic matter content (not caused by erosion)

physical soil deterioration - Pc: compaction, Pu: loss of bio-productive function due to other activities

biological degradation - Bc: reduction of vegetation cover

water degradation - Ha: aridification

SLM group

- integrated crop-livestock management
- integrated soil fertility management

SLM measures

agronomic measures - A1: Vegetation/ soil cover, A2: Organic matter/ soil fertility

vegetative measures - V4: Replacement or removal of alien/ invasive species

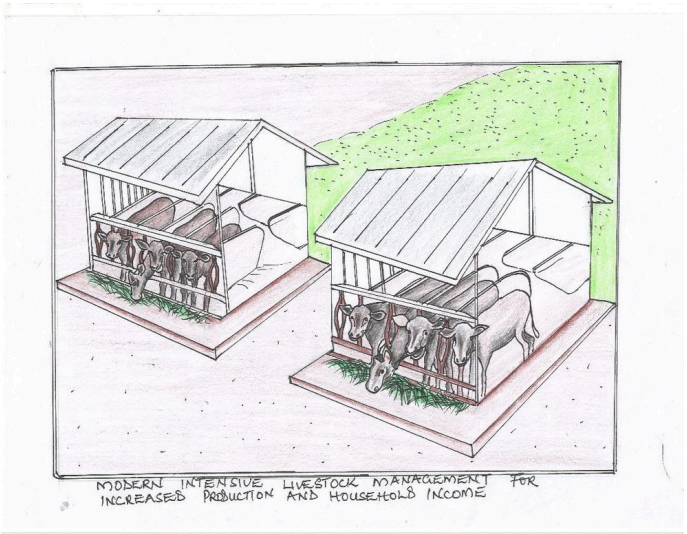
structural measures - S9: Shelters for plants and animals

management measures - M2: Change of management/ intensity level, M4: Major change in timing of activities, M6: Waste management (recycling, re-use or reduce)

TECHNICAL DRAWING

Technical specifications

None



Author: Kaheru

ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs

- Costs are calculated: per Technology unit (unit: **Livestock Unit (LU)** volume, length: **1 Heifer**)
- Currency used for cost calculation: **UGX**
- Exchange rate (to USD): 1 USD = 3400.0 UGX
- Average wage cost of hired labour per day: 5000

Most important factors affecting the costs

Labour and equipment takes most of the costs. Labour and equipment maintenance is routine monthly.

Establishment activities

1. Find and buy land (Timing/ frequency: Anytime, before establishment)
2. Survey land to get map especially for gradient and soils (Timing/ frequency: Anytime, before harvesting)
3. Remove all tree cover and stumps (Timing/ frequency: Dry season)
4. Disc Ploughing (Timing/ frequency: Dry season)
5. Plant Maize (Timing/ frequency: Rainy season)
6. Build silage bunker (Timing/ frequency: Anytime)
7. Construct Animal Barns (Timing/ frequency: Anytime)
8. Identify water source (Timing/ frequency: anytime)
9. Construct and fill water storage tanks (Timing/ frequency: Just before stocking)
10. Procure and stock in-calf cows (Timing/ frequency: After harvest of first crop of maize)

Establishment inputs and costs (per Livestock Unit (LU))

Specify input	Unit	Quantity	Costs per Unit (UGX)	Total costs per input (UGX)	% of costs borne by land users
Labour					
Procure stock	Pieces	10.0	200000.0	2000000.0	100.0
Survey and map land	Pieces	1.0	23000000.0	23000000.0	100.0
Slash, cut trees, remove stumps	Person-days	60.0	5000.0	300000.0	100.0
Equipment					
Plant maize	Person-days	10.0	5000.0	50000.0	100.0
Weed maize	Person-days	20.0	5000.0	100000.0	100.0
Cut maize to make silage	Person-days	20.0	500.0	10000.0	100.0
Tractor, pump, water tank, piping	Pieces	1.0	7500000.0	7500000.0	100.0
Plant material					
Maize seed	Kg	325.0	5000.0	1625000.0	100.0
Fertilizers and biocides					
NPK fertilizers	Kg	1500.0	3000.0	4500000.0	100.0

Construction material					
Prefabs, roofing, bricks, sand, cement and construction costs	Pieces	1.0	5000.0	5000.0	
Total costs for establishment of the Technology				**39'090'000.0**	
Total costs for establishment of the Technology in USD				*11'497.06*	

Maintenance activities

1. Harrowing (Timing/ frequency: Dry season)
2. Planting (Timing/ frequency: Dry season (dry planting) and wet season)
3. Harvesting (cutting stalks for silage) (Timing/ frequency: Wet season)
4. Silage making (Timing/ frequency: Wet season)
5. Vaccination (Timing/ frequency: Continuous)
6. Deworming (Timing/ frequency: Continuous)
7. Milking and milk selling (Timing/ frequency: Continuous)
8. Maintenance of machinery (Timing/ frequency: Continuous)
9. Maintenance of barns (Timing/ frequency: Continuous)

Maintenance inputs and costs (per Livestock Unit (LU))

Specify input	Unit	Quantity	Costs per Unit (UGX)	Total costs per input (UGX)	% of costs borne by land users
Labour					
persons days paid monthly	persons	50.0	150000.0	7500000.0	100.0
Fertilizers and biocides					
Vaccines monthly	1	30.0			
Other					
Servicing and mainting equipemnt monthly	1	30.0			
Total costs for maintenance of the Technology				**7'500'000.0**	
Total costs for maintenance of the Technology in USD				*2'205.88*	

NATURAL ENVIRONMENT

Average annual rainfall

- [ ] < 250 mm
- [ ] 251-500 mm
- [ ] 501-750 mm
- [ ] 751-1,000 mm
- [x] 1,001-1,500 mm
- [ ] 1,501-2,000 mm
- [ ] 2,001-3,000 mm
- [ ] 3,001-4,000 mm
- [ ] > 4,000 mm

Agro-climatic zone

- [x] humid
- [x] sub-humid
- [ ] semi-arid
- [ ] arid

Specifications on climate

Average annual rainfall in mm: 1350.0
2 seasons of rainfall.

Slope

- [ ] flat (0-2%)
- [x] gentle (3-5%)
- [ ] moderate (6-10%)
- [ ] rolling (11-15%)
- [ ] hilly (16-30%)
- [ ] steep (31-60%)
- [ ] very steep (>60%)

Landforms

- [x] plateau/plains
- [x] ridges
- [ ] mountain slopes
- [ ] hill slopes
- [ ] footslopes
- [ ] valley floors

Altitude

- [ ] 0-100 m a.s.l.
- [ ] 101-500 m a.s.l.
- [ ] 501-1,000 m a.s.l.
- [x] 1,001-1,500 m a.s.l.
- [x] 1,501-2,000 m a.s.l.
- [ ] 2,001-2,500 m a.s.l.
- [ ] 2,501-3,000 m a.s.l.
- [ ] 3,001-4,000 m a.s.l.
- [ ] > 4,000 m a.s.l.

Technology is applied in

- [ ] convex situations
- [ ] concave situations
- [x] not relevant

Soil depth

- [ ] very shallow (0-20 cm)
- [x] shallow (21-50 cm)
- [ ] moderately deep (51-80 cm)
- [x] deep (81-120 cm)
- [ ] very deep (> 120 cm)

Soil texture (topsoil)

- [ ] coarse/ light (sandy)
- [ ] medium (loamy, silty)
- [ ] fine/ heavy (clay)

Soil texture (> 20 cm below surface)

- [ ] coarse/ light (sandy)
- [x] medium (loamy, silty)
- [ ] fine/ heavy (clay)

Topsoil organic matter content

- [x] high (>3%)
- [x] medium (1-3%)
- [ ] low (<1%)

Groundwater table

- [ ] on surface
- [ ] < 5 m
- [x] 5-50 m
- [ ] > 50 m

Availability of surface water

- [ ] excess
- [ ] good
- [x] medium
- [ ] poor/ none

Water quality (untreated)

- [x] good drinking water
- [ ] poor drinking water (treatment required)
- [ ] for agricultural use only (irrigation)
- [ ] unusable

Water quality refers to:

Is salinity a problem?

- [ ] Yes
- [x] No

Occurrence of flooding

- [ ] Yes
- [x] No

Species diversity

- [ ] high
- [x] medium
- [ ] low

Habitat diversity

- [ ] high
- [x] medium
- [ ] low

CHARACTERISTICS OF LAND USERS APPLYING THE TECHNOLOGY

Market orientation
- [ ] subsistence (self-supply)
- [ ] mixed (subsistence/ commercial)
- [x] commercial/ market

Off-farm income
- [x] less than 10% of all income
- [ ] 10-50% of all income
- [ ] > 50% of all income

Relative level of wealth
- [ ] very poor
- [ ] poor
- [ ] average
- [x] rich
- [ ] very rich

Level of mechanization
- [ ] manual work
- [x] animal traction
- [x] mechanized/ motorized

Sedentary or nomadic
- [x] Sedentary
- [ ] Semi-nomadic
- [ ] Nomadic

Individuals or groups
- [x] individual/ household
- [ ] groups/ community
- [ ] cooperative
- [ ] employee (company, government)

Gender
- [x] women
- [x] men

Age
- [ ] children
- [x] youth
- [x] middle-aged
- [ ] elderly

Area used per household
- [ ] < 0.5 ha
- [ ] 0.5-1 ha
- [ ] 1-2 ha
- [ ] 2-5 ha
- [x] 5-15 ha
- [ ] 15-50 ha
- [ ] 50-100 ha
- [ ] 100-500 ha
- [ ] 500-1,000 ha
- [ ] 1,000-10,000 ha
- [ ] > 10,000 ha

Scale
- [ ] small-scale
- [x] medium-scale
- [ ] large-scale

Land ownership
- [ ] state
- [ ] company
- [ ] communal/ village
- [ ] group
- [x] individual, not titled
- [ ] individual, titled

Land use rights
- [ ] open access (unorganized)
- [ ] communal (organized)
- [ ] leased
- [x] individual

Water use rights
- [ ] open access (unorganized)
- [ ] communal (organized)
- [ ] leased
- [x] individual

Access to services and infrastructure

	poor	good
health		✓
education		✓
technical assistance		✓
employment (e.g. off-farm)	✓	
markets		✓
energy	✓	
roads and transport	✓	
drinking water and sanitation		✓
financial services		✓

IMPACTS

Socio-economic impacts

Crop production	decreased	increased	Quantity before SLM: Subsistence Quantity after SLM: Enough to feed over 60 hybrid cows. Maize and cow peas as feed supplements.
crop quality	decreased	increased	Quantity before SLM: 0 Quantity after SLM: Bananas and fruit orchard introduced Application of manure.
fodder production	decreased	increased	Quantity before SLM: 0 Quantity after SLM: Enough for 60 cow all-year around
fodder quality	decreased	increased	Quantity before SLM: None Quantity after SLM: Feeds over 60 cows Planted maize and cow peas.
animal production	decreased	increased	Quantity before SLM: 0 Quantity after SLM: >60
risk of production failure	increased	decreased	Quantity before SLM: Dependent on rainfall availability Quantity after SLM: Managed crop and water production
product diversity	decreased	increased	Quantity before SLM: Cereals only Quantity after SLM: Mixed crop and livestock production
production area (new land under cultivation/ use)	decreased	increased	Quantity before SLM: 20 acres Quantity after SLM: 20 acres
land management	hindered	simplified	Quantity before SLM: Communal Quantity after SLM: Individual Application of animal manure from the cows
drinking water availability	decreased	increased	Quantity before SLM: 0 Quantity after SLM: Pumped from underground water.
drinking water quality	decreased	increased	Quantity before SLM: None available Quantity after SLM: Safe drinking water for humans and livestock.
water availability for livestock	decreased	increased	Quantity before SLM: None Quantity after SLM: Available

water quality for livestock	decreased ... ✓ increased	Quantity before SLM: None Quantity after SLM: Safe, clean drinking water.
expenses on agricultural inputs	increased ✓ ... decreased	Quantity before SLM: Tractors/ dairy industry tools and machinery Quantity after SLM: Hand hoe
farm income	decreased ... ✓ increased	Quantity before SLM: Subsistent Quantity after SLM: Commercial
diversity of income sources	decreased ... ✓ increased	Quantity before SLM: Subsistence Quantity after SLM: Dairy products
workload	increased ✓ ... decreased	Quantity before SLM: 20 -50 employees Quantity after SLM: Single households Enough employees employed to work on farm.
None	Decreased ... ✓ ... Increased	Quantity before SLM: No training facility for the community Quantity after SLM: Dairy farming training and extension for community

Socio-cultural impacts

food security/ self-sufficiency	reduced ... ✓ improved	Quantity before SLM: Subsistence Quantity after SLM: Surplus production
health situation	worsened ... ✓ improved	Quantity before SLM: Low Quantity after SLM: High
land use/ water rights	worsened ... ✓ improved	Quantity before SLM: None Quantity after SLM: Individual pumped water
cultural opportunities (eg spiritual, aesthetic, others)	reduced ... ✓ improved	Quantity before SLM: No training center in area Quantity after SLM: High-end veterinary training and extension facility
SLM/ land degradation knowledge	reduced ... ✓ improved	Quantity before SLM: No record Quantity after SLM: Proper records including digital research weather station

Ecological impacts

water quantity	decreased ... ✓ increased	Quantity before SLM: High runoff Quantity after SLM: High retension
water quality	decreased ... ✓ increased	Quantity before SLM: None Quantity after SLM: Available drinking water
surface runoff	increased ... ✓ decreased	Quantity before SLM: No management measures Quantity after SLM: Management measures in place
soil moisture	decreased ... ✓ increased	Quantity before SLM: Low Quantity after SLM: Very high Increased ground cover ensures high soil moisture on cropland.
soil cover	reduced ... ✓ improved	Quantity before SLM: None Quantity after SLM: Planted grasses, cereals, legumes and fruit trees
nutrient cycling/ recharge	decreased ... ✓ increased	Quantity before SLM: None Quantity after SLM: Farmyard manuring
soil organic matter/ below ground C	decreased ... ✓ increased	Quantity before SLM: Not managed Quantity after SLM: Properly managed through "turning"
biomass/ above ground C	decreased ... ✓ increased	Quantity before SLM: A few crops during rainy season Quantity after SLM: Intensive fodder cropping to meet needs for dairy farming
animal diversity	decreased ... ✓ increased	Quantity before SLM: No animals Quantity after SLM: Cows on dairy farm
emission of carbon and greenhouse gases	increased ✓ ... decreased	Quantity before SLM: Dairy Farm Production Quantity after SLM: Subsistence crop production Dairy cows emit methane and mechanisation involves burning fossil fuels both of which leave a bigger carbon footprint than the is counterbalanced by the crops that are grown for forder. Good management of the plant biodiversity at the stream banks helps offset the carbon footprint somehow but may not be sufficient

Off-site impacts

impact of greenhouse gases — increased ✓ reduced

Quantity before SLM: Dairy farming
Quantity after SLM: No livestock

COST-BENEFIT ANALYSIS

Benefits compared with establishment costs

Short-term returns	very negative ✓	very positive
Long-term returns	very negative ✓	very positive

Benefits compared with maintenance costs

Short-term returns	very negative ✓	very positive
Long-term returns	very negative ✓	very positive

The technology is highly productive in the medium to longer term.

CLIMATE CHANGE

Gradual climate change

annual temperature increase	not well at all	✓ very well	
seasonal temperature increase	not well at all	✓ very well	Season: dry season
annual rainfall decrease	not well at all	✓ very well	
seasonal rainfall decrease	not well at all	✓ very well	Season: wet/ rainy season

Climate-related extremes (disasters)

local rainstorm	not well at all	✓ very well
local thunderstorm	not well at all	✓ very well
local hailstorm	not well at all	✓ very well
heatwave	not well at all	✓ very well
drought	not well at all	✓ very well
epidemic diseases	not well at all	✓ very well

Other climate-related consequences

reduced growing period	not well at all	✓ very well

ADOPTION AND ADAPTATION

Percentage of land users in the area who have adopted the Technology

- ✓ single cases/ experimental
- 1-10%
- 11-50%
- > 50%

Of all those who have adopted the Technology, how many have done so without receiving material incentives?

- ✓ 0-10%
- 11-50%
- 51-90%
- 91-100%

Number of households and/ or area covered

1

Has the Technology been modified recently to adapt to changing conditions?

- ✓ Yes
- No

Hybrids which combine high milk yield and tolerance for local weather conditions are being bred in preference to original 75 percent parent stock.

To which changing conditions?

- ✓ climatic change/ extremes
- changing markets
- labour availability (e.g. due to migration)

CONCLUSIONS AND LESSONS LEARNT

Strengths: land user's view

- Environment is controlled to create microclimate suitable to technology.
- Technology creates an isolated complete ecosystem.

Strengths: compiler's or other key resource person's view

- Once established, the technology is extremely profitable.
- Opportunities established for training extension delivery personnel through demonstration of good practices.

Weaknesses/ disadvantages/ risks: land user's viewhow to overcome

- Inputs make technology quite expensive. Calculate economic profitability carefully to maintain efficient production.

Weaknesses/ disadvantages/ risks: compiler's or other key resource person's viewhow to overcome

- Combining intensive productivity with training carries the risk of introducing animal diseases from the high flux of visitors. Disinfection basins have been placed at various points on the farm.

REFERENCES

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Full description in the WOCAT database
https://qcat.wocat.net/en/wocat/technologies/view/technologies_2143/
Video: https://player.vimeo.com/video/325824987

Linked SLM data
n.a.

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Key references
- None:

Links to relevant information which is available online
- None: None