Fabrication of chain-link fence by land user (Franziska Kaguembèga-Müller)

Assisted Natural Regeneration of Degraded Land (Burkina Faso)

DESCRIPTION

Fenced 3 ha plots are set aside to allow for natural regeneration of highly diverse forests.

Assisted natural regeneration, as promoted by newTree in Burkina Faso, starts with enclosing 3 ha of degraded land with a solid fence. Fence materials (iron posts and galvanic wire) are externally sponsored and locally assembled and installed. Along the fence a dense living hedge of thorny trees (local tree species: e.g. Acacia nilotica, A. senegal, Prosopis sp, Ziziphus mauritiana) is planted. A strip of 10 m along the hedge is dedicated to agriculture. This area is equivalent to approximately 10% of the protected area. The rest is dedicated to natural regeneration of the local forest. Once protected, natural vegetation rich in endogenous species can actively regenerate. Annual vegetation species inventories are made to monitor the biomass, biodiversity and the growth rate of the trees. The forest reaches a tree density of approximately 500 trees per hectare and consists of around 120 local species. Some enrichment planting of rare species enhances the allotments. The protected area is of paramount importance for biodiversity conservation. Management activities in the protected area includes (1) seeding / planting of improved fodder species; and (2) establishing stone lines and half-moons (demi-lunes) for soil erosion control and water harvesting, (3) installing bee hives for honey production; and (4) fodder production: the grass is cut, tied and carried to feed livestock outside the regeneration area. Property rights for the protected area are clearly established through a contractual agreement that includes/respects traditional and government land rights. The local land users select the area, provide all labour inputs and ensure the long-term management of the sites according to mutually agreed goals. Training is provided to enhance income generating activities – ranging from beekeeping and the production of high-value vegetable crops to the processing of non timber forestry products – and to promote the use of fuel-efficient cooking stoves.

LOCATION

Location: Soum Province, Burkina Faso

No. of Technology sites analysed:

Geo-reference of selected sites
- n.a.

Spread of the Technology:

In a permanently protected area?:

Date of implementation: less than 10 years ago (recently)

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

Dense vegetation cover in the protected area behind the fence (Franziska Kaguembèga-Müller)

The components of the system (from right to left): Metal fence, living hedge (recently planted seedlings), agricultural zone with SLM measures (e.g. agroforestry), forest regeneration area (Franziska Kaguembèga-Müller)

CLASSIFICATION OF THE TECHNOLOGY

Main purpose

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

Land use

Land use mixed within the same land unit: Yes - Agroforestry

Cropland

- Annual cropping

Forest/ woodlands Tree types: Acacia nilotica, Acacia senegal, Ziziphus mauritiana
Products and services: Timber, Fuelwood, Fruits and nuts, Other forest products, Grazing/ browsing, Nature conservation/ protection

Water supply

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

Purpose related to land degradation

- [ ] prevent land degradation
- [ ] reduce land degradation
- [x] 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 - Et: loss of topsoil

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

physical soil deterioration - Pk: slaking and crusting

biological degradation - Bc: reduction of vegetation cover, Bq: quantity/ biomass decline, Bs: quality and species composition/ diversity decline

water degradation - Ha: aridification

SLM group

- area closure (stop use, support restoration)

SLM measures

vegetative measures - V1: Tree and shrub cover

TECHNICAL DRAWING

Technical specifications

Technical knowledge required for field staff / advisors: moderate

Technical knowledge required for land users: moderate

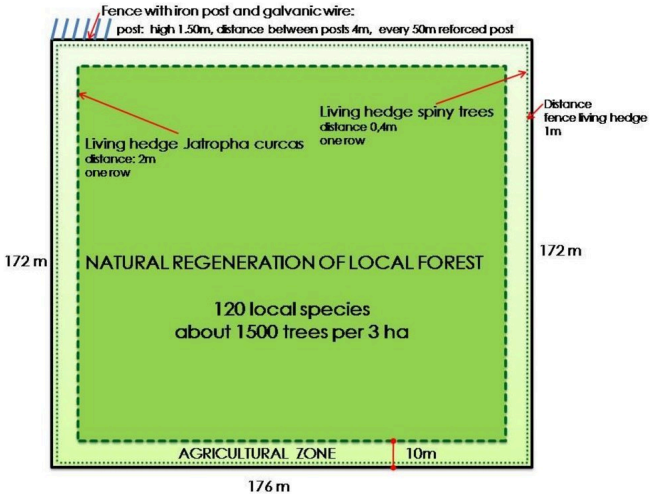
Main technical functions: control of raindrop splash, improvement of ground cover, improvement of surface structure (crusting, sealing), increase in organic matter, increase in nutrient availability (supply, recycling,...), increase of infiltration, reduction in wind speed, increase of biomass (quantity), promotion of vegetation species and varieties (quality, eg palatable fodder), spatial arrangement and diversification of land use

Secondary technical functions: increase of groundwater level / recharge of groundwater

Scattered / dispersed
Vegetative material: T : trees / shrubs

In blocks
Vegetative material: T : trees / shrubs
Number of plants per (ha): 500

Trees/ shrubs species: Acacia nilotica, A. senegal, Prosopis sp, Ziziphus mauritiana



Author: Franziska Kaguembèga-Müller

ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs

- Costs are calculated:
- Currency used for cost calculation: **n.a.**
- Exchange rate (to USD): 1 USD = n.a
- Average wage cost of hired labour per day: n.a

Most important factors affecting the costs

Labour for establishment includes: digging of planting pits/ditches, post installation, fabrication of chain-link fence materials, all plantations, stone lines, half-moons, etc. Components for fence construction are locally available.

Establishment activities

1. Select an area of 3 ha of degraded land (Timing/ frequency: None)
2. Establish a 1.5 m high fence around the selected area: install metal posts, manufacture / assemble chain-link fence materials (manually) (Timing/ frequency: None)
3. Plant a living hedge of spiny trees at a distance of 1 m to the fence, plants spaced at 0.4 m (Timing/ frequency: None)
4. Reserve a 10 m strip along the fence / hedge for improved agriculture / Plant a living hedge of Jatropha curcas to separate cropland from regeneration area (Timing/ frequency: None)
5. Seed / plant improved fodder species within protected area / Establish stone lines and half-moons for soil erosion control and water harvesting within protected area (Timing/ frequency: None)
6. Install beehives (2-10 hives per protected area) (Timing/ frequency: None)
7. Purchase protection and harvesting equipment (Timing/ frequency: None)
8. Construct fuel efficient cooking stoves (Timing/ frequency: None)

Establishment inputs and costs

Specify input	Unit	Quantity	Costs per Unit (n.a.)	Total costs per input (n.a.)	% of costs borne by land users
Labour					
Labour	ha	1.0	1300.0	1300.0	33.0
Equipment					
Tools	ha	1.0	100.0	100.0	33.0
Construction material					
Material for fence construction	ha	1.0	2900.0	2900.0	33.0
Other					
Training, seeds, compost	ha	1.0	260.0	260.0	33.0
Total costs for establishment of the Technology				**4'560.0**	
Total costs for establishment of the Technology in USD				*4'560.0*	

Maintenance activities

1. Supervise fence and protected area; repairing where necessary (Timing/ frequency: None)
2. Replant / replace dead seedlings in living hedges (Timing/ frequency: None)
3. Improved agriculture: agroforestry, water harvesting, compost application (Timing/ frequency: None)
4. Beekeeping: monthly control of beehive; yield 2-3 times per year (manually with protection equipment) (Timing/ frequency: None)
5. Improved fodder production: cut grass and tie hay with simple tying machine (once a year after rainy season) (Timing/ frequency: None)

Maintenance inputs and costs

Specify input	Unit	Quantity	Costs per Unit (n.a.)	Total costs per input (n.a.)	% of costs borne by land users
Labour					
Labour	ha	1.0	730.0	730.0	95.0
Plant material					
Seedlings	ha	1.0	40.0	40.0	95.0
Other					
Training, seeds, compost	ha	1.0	40.0	40.0	95.0
Total costs for maintenance of the Technology				**810.0**	
Total costs for maintenance of the Technology in USD				*810.0*	

NATURAL ENVIRONMENT

Average annual rainfall
- [ ] < 250 mm
- [x] 251-500 mm
- [x] 501-750 mm
- [ ] 751-1,000 mm
- [ ] 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
- [ ] humid
- [ ] sub-humid
- [x] semi-arid
- [ ] arid

Specifications on climate
300-600 mm
Thermal climate class: tropics

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

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

Altitude
- [x] 0-100 m a.s.l.
- [ ] 101-500 m a.s.l.
- [ ] 501-1,000 m a.s.l.
- [ ] 1,001-1,500 m a.s.l.
- [ ] 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
- [ ] not relevant

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

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

Soil texture (> 20 cm below surface)
- [ ] coarse/ light (sandy)
- [ ] medium (loamy, silty)
- [ ] fine/ heavy (clay)

Topsoil organic matter content
- [ ] high (>3%)
- [ ] medium (1-3%)
- [x] low (<1%)

Groundwater table
- [ ] on surface
- [ ] < 5 m
- [ ] 5-50 m
- [ ] > 50 m

Availability of surface water
- [ ] excess
- [ ] good
- [ ] medium
- [ ] poor/ none

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

Is salinity a problem?
- [ ] Yes
- [ ] No

Occurrence of flooding
- [ ] Yes
- [ ] No

Species diversity
- [ ] high
- [ ] medium
- [ ] low

Habitat diversity
- [ ] high
- [ ] medium
- [ ] low

CHARACTERISTICS OF LAND USERS APPLYING THE TECHNOLOGY

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

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

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

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

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

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

Gender
- [ ] women
- [ ] men

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

Area used per household

Scale

Land ownership

Land use rights

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

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

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

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

Water use rights

- [ ] open access (unorganized)
- [ ] communal (organized)
- [ ] leased
- [ ] individual

Access to services and infrastructure

IMPACTS

Socio-economic impacts

Crop production	decreased	increased
fodder production	decreased	increased
fodder quality	decreased	increased
wood production	decreased	increased
farm income	decreased	increased

Socio-cultural impacts

food security/ self-sufficiency	reduced	improved
health situation	worsened	improved
SLM/ land degradation knowledge	reduced	improved
situation of socially and economically disadvantaged groups (gender, age, status, ehtnicity etc.)	worsened	improved

Ecological impacts

harvesting/ collection of water (runoff, dew, snow, etc)	reduced	improved
surface runoff	increased	decreased
evaporation	increased	decreased
soil moisture	decreased	increased
soil cover	reduced	improved
soil loss	increased	decreased
soil compaction	increased	reduced
nutrient cycling/ recharge	decreased	increased
soil organic matter/ below ground C	decreased	increased
biomass/ above ground C	decreased	increased
plant diversity	decreased	increased
beneficial species (predators, earthworms, pollinators)	decreased	increased
habitat diversity	decreased	increased
wind velocity	increased	decreased

Off-site impacts

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

CLIMATE CHANGE

Gradual climate change

annual temperature increase	not well at all	very well

Climate-related extremes (disasters)

local rainstorm	not well at all	very well
local windstorm	not well at all	very well
drought	not well at all	very well
general (river) flood	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?

- [x] 0-10%
- [ ] 11-50%
- [ ] 51-90%
- [ ] 91-100%

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

- [ ] Yes
- [ ] No

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

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

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

- None
- None

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

- High investment cost introduce income generating activities which amortise (help pay off) the initial investments and the waiting time until land users can harvest non-woody products from the forest; relocate the fence to enclose other degraded land when the living hedge is dense enough and takes over the function of protection.
- Insecurity of land rights is a constraint for implementation (government is official land owner) Conclude contractual agreements which include/respect traditional and government land rights

REFERENCES

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Full description in the WOCAT database
https://qcat.wocat.net/en/wocat/technologies/view/technologies_1358/

Linked SLM data
n.a.

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- Book project: SLM in Practice - Guidelines and Best Practices for Sub-Saharan Africa (SLM in Practice)

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