Progressive terraces (Ngenzi Guy (RAB/South))

Radical Terraces ( )

Amaterasi y'indinganire

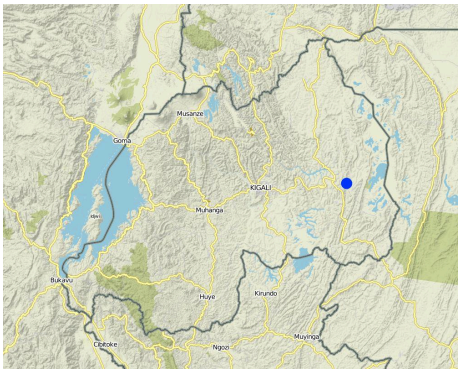
Locally referred to as 'radical terracing', the method involves earth moving operations that create reverse-slope bench terraces which have properly shaped risers stabilized with grass or trees on embankment to avoid collapse.

In Rwanda, a unique method of back-slope terracing originally introduced by missionaries growing wheat in the Northern Province in the 1970s, has been widely adopted by smallholder farmers in many parts of the country. The farmers are careful to isolate the topsoil, then they re-work the subsoil to create the required reverse-slope bench, after which the topsoil is spread over the surface. The riser is planted with short runner grass for stabilization, all within the same day. Radical terracing is usually done manually with hoes and shovels, mostly by communal group-work involving hundreds of farmers (see left photo). Thus, a hillside can be terraced in one day. Where radical terraces have been constructed, the effects have been dramatic, achieving optimum water and soil conservation on slopes exceeding 50%, while adoption rates have been quite extensive. This high adoption of radical terracing is related to the existing policies and programs such as land consolidation, land management and crop intensification programs. These policies/programs boost the use of radical terraces by providing farmers more opportunities to easily access inputs such as improved seeds and manure for increasing the productivity of constructed radical terraces. Recent studies (e.g. Fleskens, 2007, Bizoza and de Graaff 2012 and Kagabo et al. 2013) assert that radical terraces in the highlands of Rwanda are only financially viable when the opportunity cost of labour and manure are below the local market price levels and when agriculture area on these radical terraces can be substantially intensified. Ten to 30 metric tons of manure (organic) are required to restore the soil fertility of newly established radical terraces.

Purpose of the Technology: In Rwanda, radical terraces are principally designed (1) to reduce soil losses through enhanced retention and infiltration of runoff, (2) to promote permanent agriculture on steep slopes and (3) to promote land consolidation and intensive land use.

Establishment / maintenance activities and inputs: Newly established radical terraces should be protected at their risers and outlets, especially in the first or second year of the establishment. After establishing a terrace, a riser is shaped and grasses or shrubs/trees are planted soon after. Napier grass is commonly planted and is used as forage for livestock. Risers on radical terraces are seen as a new production niche of forage as a result of land shortage and a strict zero grazing policy.

Natural / human environment: Radical terraces have the potential of improving farmers' livelihoods and increasing the resilience of a degraded environment.



: Kayonza District (Eastern province), Rwanda,

:

- 30.58114, -1.92585

: (10.3 km²)

?:

: 10 ( )

(> 50)

/

✓ Government

Soil erosion controled by Progressive terraces (Ngenzi Guy (RAB/South))

Radical terraces under development by communal group work (Umuganda) (Kagabo Desire and Nganzi Guy (RAB))

- ☐
- ☑ , ,
- ☐ /
- ☐
- ☐ /
- ☐
- ☐ /
- ☐
- ☐
- ☐

- : / -
- ( ): : 2

- ☑
- ☐
- ☐

- ☐
- ☑ /
- ☐
- ☐
- ☐

- Wt: , Wo:

SLM

-

SLM

- V2: 2

- S1:

The farmers are careful to isolate the topsoil, then they re-work the subsoil to create the required reverse-slope bench, after which the topsoil is spread over the surface. The riser is planted with short runner grass for stabilization, all within the same period.

Location: Nyamirama. Kayonza/West/Rwanda

Date: 2013

Technical knowledge required for field staff / advisors: high (Special training should be provided to field staff to be able to make an adequate design)

Technical knowledge required for land users: moderate (Land users are required to only implement the technology under the supervision of field staff)

Main technical functions: control of concentrated runoff: retain / trap

Secondary technical functions: control of concentrated runoff: impede / retard, reduction of slope angle, reduction of slope length, increase of infiltration

Aligned: -contour
Vegetative material: G : grass
Number of plants per (ha): 2000
Vertical interval between rows / strips / blocks (m): 1
Spacing between rows / strips / blocks (m): 4
Vertical interval within rows / strips / blocks (m): 0.2
Width within rows / strips / blocks (m): 0.2

Grass species: Pennisetum

Slope (which determines the spacing indicated above): 35%

If the original slope has changed as a result of the Technology, the slope today is (see figure below): 0%

Gradient along the rows / strips: 0%

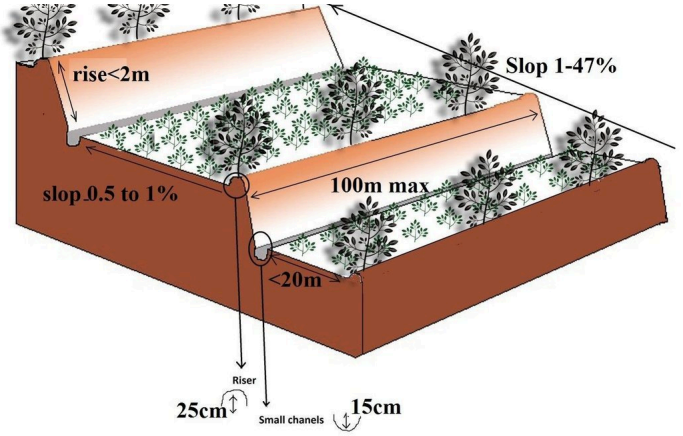
Terrace: bench level
Vertical interval between structures (m): 2
Spacing between structures (m): 4

Slope (which determines the spacing indicated above): 20-50%

If the original slope has changed as a result of the Technology, the slope today is: 0%

Lateral gradient along the structure: 0%

Vegetation is used for stabilisation of structures.



Author: Kagabo Desire and Ngenzi Guy, RAB, 5016 Kigali

- Factors that affect the cost are labor, soil structure and slope
- **Rwandan francs**
- ( ) 1 USD = 640.0 Rwandan francs
- 1000

1. Cuttings of grasses (/ : Rain season)
2. Transport of grass cuttings (/ : Rain season)
3. Planting of grass cuttings (/ : Rain season)
4. Land surveying (slope determination, soil structure and texture analysis) (/ : any time)
5. Construction of bunds (risers) with soil from upper and lower sides (/ : dry season)
6. Level terraces bed (surface soil moved from upper to lower part of terraces) (/ : dry season)
7. cutting subsurface soil, leveling and refilling surface soil (/ : dry season)
8. Make lips on edges of terraces (/ : dry season)
9. Compact risers (/ : dry season)
10. Plant grasses including agro-forestery trees. (/ : rainy season)
11. Input/ application of farmyard manure and liming (/ : rainy season)

			(Rwandan francs)	(Rwandan francs)	%
Cuttings of grasses	persons/day/ha	2,0	1000,0	2000,0	60,0
Transport of grass cuttings	persons/day/ha	10,0	1000,0	10000,0	
Planting of grass cuttings	persons/day/ha	20,0	1000,0	20000,0	100,0
Land surveying (slope determination, soil structure and texture	persons/day/ha	6,0	20000,0	120000,0	
Lime	kg/ha	2500,0	40,0	100000,0	
Famyard manure	kg/ha	30000,0	5,0	150000,0	
Mineral fertilizers	kg/ha	300,0	500,0	150000,0	
Labour: Construction of bunds	persons/day/ha	100,0	1000,0	100000,0	
Labour: Level terraces bed	persons/day/ha	250,0	1000,0	250000,0	
Labour: Cutting subsurface soil	persons/day/ha	250,0	1000,0	250000,0	
Labour: Make lips on edges of terraces	persons/day/ha	10,0	1000,0	10000,0	
Labour: Compact risers	persons/day/ha	50,0	1000,0	50000,0	
Labour: Plant grasses including agro-forestery trees	persons/day/ha	50,0	1000,0	50000,0	
				1'262'000.0	
				1'971.88	

1. Weeding (/ : Before crop planting/each cropping season)
2. Manure application (/ : Before crop planting/annually)
3. Grass streaming (/ : Throughout the year)
4. Cleaning of channels and drains (/ : through out the year)
5. Regular repair of destroyed risers (/ : through the year)

			(Rwandan francs)	(Rwandan francs)	%
Weeding	persons/day/ha	5,0	1000,0	5000,0	100,0
Manure application	persons/day/ha	10,0	1000,0	10000,0	100,0
Grass streaming	persons/day/ha	2,0	1000,0	2000,0	100,0
Cleaning of channels and drains	persons/day/ha	10,0	300,0	3000,0	100,0
Labour: Regular repair of destroyed risers	persons/day/ha	6,0	333,3333	2000,0	100,0
				22'000.0	
				34.38	

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

1000-1500 mm: September - December

1500-2000 mm: February - June
Thermal climate class: tropics. All months are above 18 degree C.

- [ ] (0-2%)
- [ ] (3-5%)
- [ ] (6-10%)
- [ ] (11-15%)
- [ ] (16-30%)
- [x] (31-60%)
- [ ] (>60%)

- [ ] 0-100
- [ ] 101-500
- [ ] 501-1,000
- [ ] 1,001-1,500
- [x] 1,501-2,000
- [x] 2,001-2,500
- [ ] 2,501-3,000
- [ ] 3,001-4,000

> 4,000

(0-20)
(21-50)
(51-80)
(81-120)
✓ (> 120)

(
)
✓ /
✓ (,)
/ ( )

(> 20
)
/ ( )
(,)
/ ( )

(>3%)
(1-3%)
✓ (<1%)

< 5
5-50
✓ > 50

✓ /

(
)
?
/
✓
( )
( )
/

✓

SLM

✓ ( )
(/)
✓ /

✓ 10%
10-50%
50%

✓
✓

✓
/

✓ /
/
(,
)

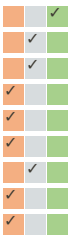
✓
✓

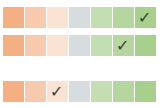
✓ < 0.5
✓ 0.5-1
1-2
2-5
5-15
15-50
50-100
100-500
500-1,000
1,000-10,000
> 10,000

✓

✓
✓

(.
)





(
/)

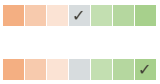
Reduce crop area

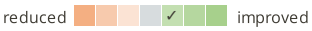
Require high quantity of FYM and mineral fertilizers

/

SLM /

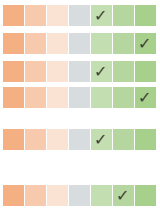
livelihood and human well-being





The technology is newly established and the soil need enough farmyard manure and inputs to re-stabilize and regain its fertility

/



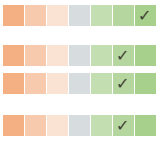
disturbance of fertile top soil

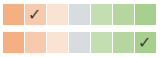
biodiversity

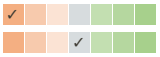
(

)

/







land slides

/

1-10%

11-50%

> 50%

?

0-10%

11-50%

51-90%

91-100%

/

150 households covering 75 percent of stated area

?

/

?

/

( )

:

- It reduces soil runoff

  How can they be sustained / enhanced? Good maintenance of structures

:

- It controls soil erosion

  How can they be sustained / enhanced? There is a need to plant grasses or trees on risers to stabilize terraces
- It increases soil water holding capacity

  How can they be sustained / enhanced? Organic manure should be added to the terrace to effectively increase the soil water holding capacity.
- It increases fodder availability as new niches for fodder production are created.

  How can they be sustained / enhanced? High value nutritive fodder should be planted (napier grass, calliadra, tripsucum, etc.) on risers
- It increases crop productivity

  How can they be sustained / enhanced? Terraces should be well maintained by providing more inputs and regular maintenance of bench struactures

/ / :

- It reduces the cropped land Farmers should be supported in accessing high value crops and inputs to maximize crop yield.

/ / :

- The establishment of radical terraces is expensive The construction of radical terraces should be subsided by the government.
- The initial soil structure is disturbed (lost of soil organic matter) Heavy investments are needed to replenish the soil fertility, especially by adding organic manure.
- The establishment of radical terraces decreases cropped land. Grow high value crops and use adequate quantity of inputs.
- With poor maintenance or poor design of radical terraces, landslides may occur. To be much more rigorous in the design and implementation/development of terraces by making sure that professionals are involved in the whole process of establishing terraces.

Editors

Desire Kagabo

David Streiff
Alexandra Gavilano

: 20 2012 : 17 2019

Desire Kagabo - SLM
Guy Ngenzi - SLM
Iwona Piechowiak - SLM

https://qcat.wocat.net/km/wocat/technologies/view/technologies_1553/

SLM

Approaches: Top down approach https://qcat.wocat.net/km/wocat/approaches/view/approaches_2465/
Approaches: Top down approach https://qcat.wocat.net/km/wocat/approaches/view/approaches_2465/

- Food and Agriculture Organization of the United Nations (FAO) -
- Rwanda Agriculture Board (Rwanda Agriculture Board) -

- The Transboundary Agro-ecosystem Management Project for the Kagera River Basin (GEF-FAO / Kagera TAMP)

- Kagera TAMp project website: http://www.fao.org/nr/kagera/en/