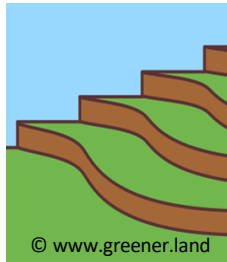


AKKAATA HOJII IRRA OOLMAA KUNUUNSA BIYYEE FI BISHAANII

DESCRIPTION (IBSA)

TERRACES (DAAGAA GAARAA)

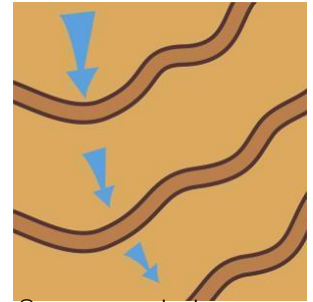
Daagaan Gaaraa bakkee lafa
Olka'oo fi Gaarreen irraatti
ijaarama. Kunis harama biyyoo fi biishaanii
hambiisa.



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CONTOUR BUNDS (DAAGAA SULULAA)

Daagaan sululaa haramaa
biyyee fi biishaanii sulula
keessaatti hamabiisa. Kan
ijaaramus sarara ol ka'iinsa
lafaa eegachuum tooraan kan
hojjaatamu dha.



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FAAYIDA

- Saffiisa biishaanii hir'isuun, biyyeen akka biishaan of keessatti qabaatu godha.
- Madda biishaanii fi biishaan lafa keessa gabbiisuu ni danda'a.
- Harama biyyeen gabbaata ni dhorka, Kun immoo biqiiltootaf faayida guddaa qaba.
- Laggeen fi haraawwan dalaalii dhan akka hin guutamnee godha.

Daagaan Gaarreen fi suluulli hojiiwwan kunuunsa biyyoo fi biishaanii biroo waliin qindoominan hojjaatamu qaba. Qindoomina hojiiwwaanii qonnaa kanneen akka kunuunsa qonnaa fi bosonaa, kunuunsa lafa deedhicha loowwaanni, tuttuqqa irraa dangeessuu fi biishaan cimmiisuun itti fayyaadamuu dabalata.

Contour trenches with strips of Napier grass,
Gatwamkiwa village, Central Province, Kenya
© Laura D'Aiatti

Construction of stone bunds, Niger © PASP, GIZ

Newly constructed bench terraces planted with hedge
rows, *Kagyera village, Kabale District, Kenya* © Kenneth
Twinamasiko



Eessatti Hojjaatamu danda'ama?

Daagaan Gaarreen, Daagaa and suluulawwan dhiqaama biyyeen fi qabiyyee biishaan dabaluu keessatti gahee guddaa qabu. Lafaa qonnaa keessaattii itti faayyadamuun hanqiina biishaan naannoo lafa goggooga tahaanii hambisuu ni dandaha.

	Daagaa Gaarreen	Suluulawwan
Dhundhula	10 - 50% = 1 - 5 m Ol ka'iinsa hiri'su	0.5 - 10% = 0.5 - 1 m Ol ka'iinsa hiri'su
Biyyee	Yaabbina biyyee 1.5 m biyyee biishaan dabaarsuu danda'uu, biyyee suphee yoo tahuu dhiise filaatama dha.	Yaabbina biyyee 0.5m irraatti, keessumma biyyee biishaan qabaachuu dandaa' u keessaatti.
Hallayyaa	Hallayyaa xixxiqqaan akka hin guddanne taasisuu qabna (<0.5 m deep). Hallayyaan (check dams) dhan hidhaamuu qaba. Suluulli xixxiqqaan akka hin guddanne taasisuun suluulli gurguuddan illee akka hin midhaamne taasisa.	

Construction (Ijaarsa)

Terraces (Daagaa Gaarreen)

- The terrain is dug out on the upslope and the excavated material is used downslope to create a level platform. The fertile topsoil should be separated and reapplied on the top of the terraces

Gaarri gad qootamun gara gadiin wal qixxeeffama. Irree Biyyee gabaataa qofatti ta'uun irraa keessa oolu qaba

- The downslope walls are best constructed of stones. They can also be made of soil, reinforced by vegetation such as vetiver grass.
Dhundhulli gara Gadi jiru dhagaan, biyyeen ykn biqitlootan uffiwamuu qaba. Kunis biyyeen akka hin midhaamne (haraamne) taasisa.
- The walls should be sturdy, well protected from erosion and should not exceed 2 m in height.
Keenyaan suluula gaaraa kan harama biyyee xiqqeessu fi dheerina isaa 2m caaluu hin qabu
Optionally, every terrace can have a drainage ditch just above the ridge that collects water and channels it to the next step. This can be helpful in preventing erosion.

Akka filaannootti Irri keessi daagaa gaaraa yaa'aa biishaan (lolaa), yoo qabaatef filaatama dha.

Contour bunds (Suluula)

- Can be built of soil and/or stones.

Dhaagaa ykn biyyee irraa hojjatamuu danda'a.

- Are often constructed parallel to an infiltration trench (ditch). The excavated soil from the trench is then placed downslope along the edge of the trench to form the bund (dyke).
Biyyeen gara olii irraa qotamuu gara gadii dhan tuulamu qaba innis harama biyyee ittiisuudhaf gargaara.
- Optional: Build crossties every few meters. These are small earth walls or excavated trenches, perpendicular to the bunds, that subdivide the system into micro catchments and prevent lateral flow along the bund which might cause erosion.

Tamsaa'ina biishaan (lolaa) xiiqqeessun akka hin heeeddummanne taasisu.

- Plant native grasses, legumes or perennials on the bunds to stabilize them. Apply mulch, especially while the plants develop roots.

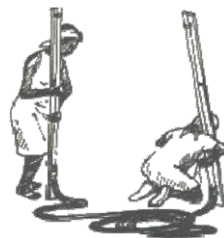
Biqilloomaa hiidda qabna kan dhiqaama biyyoo hambisaan itti fayyaadamuu. Qolaa mukaa fayyaadamun jidhiinsa biishann keessatti hambisuudhaf.

The A-Frame (Frame Qubee A)

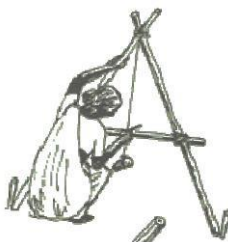
The level hose (Ujummoo dhan)

Materials needed	• 2 poles about 2 meters long Poolii 2 Kan dheerina meetira 2 • 1 shorter pole about 1 meter long Poolii Gababaa meetira 1 • some string (Hidhaa (haada)) • a stone (Dhagaa)	• 2 poles about 2 meters long Poolii 2 Kan dheerina meetira 2 • Clear plastic tubing about 10-25 meters long and about 2 cm in diameter Ujummoo pilaastikii kan biishaan diyaameetiri 2cm dheerina 10-25m dheeratu. • Some string or adhesive tape (Safaartu dheerina measuring tape (2 x 1 m))
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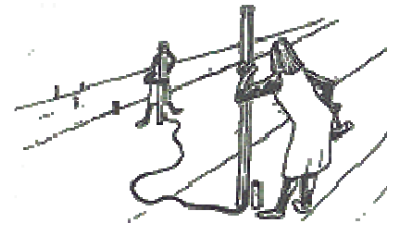
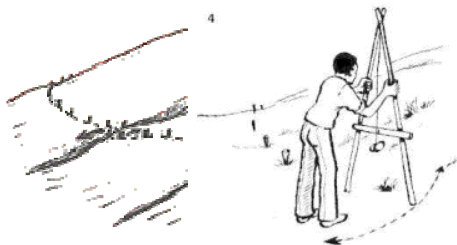
Step 1	Tie the poles very tightly together to make the shape of a letter A. Hang the stone from the top of the A-Frame, making sure the stone hangs below the cross bar. Poolii lamaan haadan waliitti hidhuu, innis Qubee “A” fakkaata. Dhaaga walqaxxamuura irraa fanniisuun akka sarara dhaabbata uumuu gochuun dha.	Tie the measurement tapes to the two poles. Tie the ends of the tubing securely to the two poles in several places so that the ends are in the middle of the measuring tape. Ujummoo keessan madaala biishaanii (water level) gamaa tokkoo fudhaachun kan gamaa biraan walqixxeessuun barbaachisaa dha.
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Step 2	Holding the frame upright, mark with two sticks exactly where the poles touch the ground. When the stone stops moving, mark where the string crosses the cross bar. Turn the A-Frame around, placing the poles in exactly the positions marked by the two sticks. Again, mark where the string crosses the cross bar. Fireemii ol dhabuu dhan bakkaa dhagaan lafa xuquu mallattoo dhan adda baasuu. Ammas walakkaa dhan bakkaa dhagaa rarra’ee mallattoon ibsuu dha	Carefully fill the tubing with clean water, making sure no air bubbles are trapped inside, until nearly full. Hold the poles side by side, with their lower ends resting on the ground, until the water level settles at the same level on each pole. Mark this level clearly on each pole. Ujummoo qulqulleessun biishaan itti naquu qabna. Biishaan guutumatti guutuu qaba, rakkoo dhiibbaa qilleensaa hir’isuf
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Step 3	Mark the level mark on the cross bar - exactly halfway between the previous two marks. If the first two marks happen to be on the same place - this is the level mark with both poles touching the ground two points of equal elevation can be found by pivoting (turning) the A frame until the string hangs right in front of the level mark. Bakkaa dhagaan rarra’ee jiruu irraa garaa bakka wal qaxxamuura dagaalee, mallattoo dhan adda baasun barbaachisaa.	When moving the poles, either use a thumb or fit plastic stopper to prevent water spilling - these should be removed before measuring. The difference between the water level and the level mark is the difference in elevation and can be read of the measuring tape. If the water levels at both ends of the tube are at level mark two points of equal elevation have been found. Yeroo sochonuu, pilaastika duuchinee qabu qabna. Kunis akka biishaan akka hin dhangalanee fi ujummoon qilleensaa hin seene godha.
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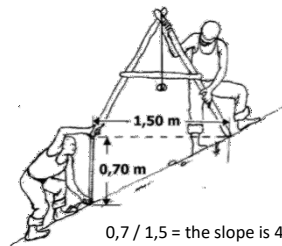


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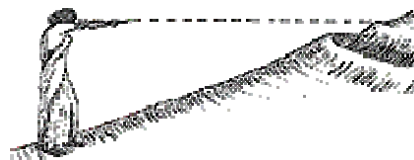
Spacing interval (Hamma Wal irraa fageenya daagaa)

Wal irraa fageenya daagaa ijaaramuu Dhundhula lafaa fi olkaa'insa sirrii galaanaa irraatti hundaa'uun hojjatama. Wal irraa fageenya Ijaarsa isaas gabaatee armaan gadii keessatti ibsamee jira.

Slope	Spacing interval
Less than 1%	20 m
1 – 2%	15 m
2 – 4%	10 m
4 – 8%	8 m
8 – 15%	6 m
More than 15%	4 m or less



0,7 / 1,5 = the slope is 47%
Measuring the terrain slope with an A-Frame



estimating the position of the next bund



marking parallel contour lines

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Water Harvesting (Biishaan roobaa cimmisuu)

Naannoo lafa gogaa (hongeen) beekkamutti hanqiinni biishaani ni mul'aata.

Biishaan cimmiisanii barbaachisaa dha

Hara nam-tolchee (Artificial ponds) ijaaru, Roobaa mana irraatti roobuu kuusuu,

Hidhaa biyyee ciraacha (Sand dams) ijaaru.

Maintenance (Suphaa)

- Repair any damage to bunds and terraces before the start of the rainy season. Breaches need to be quickly repaired.

Daagaan cabee yeroodhan suphamuu qaba. Keessumaa osoo waqxiin roobaa osoo hin gahiin.

- If you notice that bunds or terraces get damaged frequently by runoff from heavy rains you might need to construct a diversion ditch that leads water away from your scheme.

Daagaan cabuun kan hammaatuu yoo tahee, bo'ii lolaa baasuu dhaan irraa maqsuun barbaachisaa dha.

- Grass should be allowed to grow on the bunds or terrace walls. The roots help to stabilize the structure.

Marga daagaa irraatti biqilchuun, akka daagaa hin haramne gargaara.