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SIMPLE METHODS OF PREVENTING SOIL EROSION AND CONSERVING WATER

The loss of valuable topsoil due to wind and water erosion in the tropical lands of Africa is one of the greatest problems that the continent is facing, but many people do not realize it. Equally, the need to conserve and make full use of scarce rainfall in the semi-arid areas is yet to be fully understood.

Erosion is caused by the downward movement of water on sloping land, and can happen on slopes as little as one half percent, or a 10 cm drop in a 20 metre length. The amount of erosion that occurs depends on

- The quantity of water moving
- The speed of the water
- The state of the soil surface and the type of soil

The same factors affect the ability of the soil to absorb the water.

Therefore, these are the three factors that we need to influence in order to prevent erosion and conserve water in the soil.

The quality of water is affected by the amount of rainfall that falls in a given time and by the area over which it collects. We cannot influence the rainfall but we can reduce the area over which it collects by making barriers of some sort across the slope.

The speed at which the water travels over the soil is affected by the slope of the land and by the length of that slope. Again we cannot change the slope except by bench terracing the land, a process, which takes a long time. We can, however, control the length of the slope by making barriers at regular intervals.

The third factor is the state of the soil and soil type. We cannot change the soil type, although we can improve it by composting etc. We can, however, influence the state of the surface by cultivation and or the amount of vegetative cover that we leave or put on the land, but this can be discussed in another article. Putting barriers across the slope at intervals, therefore, seems to be the easiest way to reduce erosion and increase water retention.

The next questions are "what sort of barriers" and how "across the slope?" The barriers can be in the form of a simple plough line, a line of planted vegetation, a wall called a "bund" or any other available material.

In arid and semi-arid areas the need is to increase infiltration of water into the soil, which is being cultivated, often by collecting and distributing water from outside the cultivated areas. In this case the barriers may be permeable loose stone bunds or vegetation banks or "staggered" earth bunds.

Whatever method of bunding is used it is very important that the bunds are constructed accurately on the contour, or to a specific gradient. Depending on the type of bund constructed it is possible

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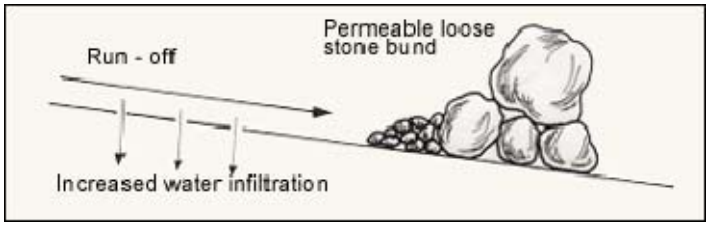
to do some "straightening" out of the line after it is first marked, but this needs careful thought. It is not good enough to line up bunds "by eye" as this can often lead to worse problems.



Where bunds are constructed independently on small adjoining farms, the bunds on the farm boundaries need to be turned up so that surplus water does not run down the boundary and cause erosion.

Marking the contour

A contour is an imaginary line, which joins up places of the same height. There are three simple ways of accurately marking out a contour line on the ground, which can be done by farmers themselves after a short training session at little cost.

These are:

1. Using the water level technique with a length of clear plastic tube attached to two poles
2. Using a small line level suspended on a string between two poles
3. Using a simply constructed "a" frame and plumb bob or weight on a string.

For making level contours, the water level technique is probably the easiest and quickest method. The line level, however, can have many other uses such as laying out a gradient or for measuring the vertical distance or interval between two points. The 'A'frame is not so accurate and has more limited uses.

Water level

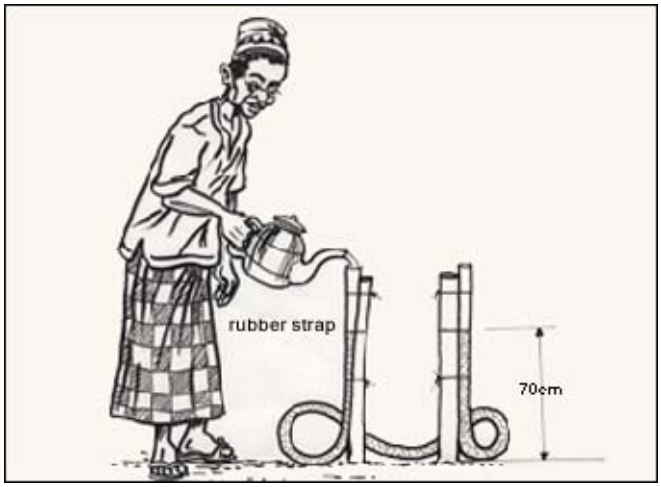
(Peter Wright for Burkina Faso)

Components

1. One length of clear plastic tube, 6-10 mm inside diameter and about 12 metres long.
2. Two poles about 1.5 m long (which can be given a "foot" as in line level).
3. Two rubber straps to mark the water level in the tube.
4. One or two litres of water.

Construction

1. Uncoil the tube and lay it on the ground
2. Fill the tube with water.
3. Remove any air bubbles.
4. Tie each end of the tube to one of the poles. Then place both poles together on a hard smooth surface. Add or remove water as necessary to ensure that the water levels are about 0.5m below the tube ends.
5. Attach a rubber strap to each tube so that it marks the position of the water level.



Method

1. To mark out a line on the contour, always start at the highest point of your field. If there are small watercourses visible, start each line on the main watercourse and work away from it first on one side and then on the other.
2. Place one of the poles so that it marks the end of the contour whose alignment is to be determined. Take the second pole along the suspected line of the contour, moving it up and down the slope until the water level matches with the position of the rubber marker. The second pole is now standing on the same contour as the first and a peg should be driven into the ground to mark the spot.
3. The second pole now remains stationary while the first one is carried forward to look for a third point on the contour line.
4. Proceed in the same manner until a suitable length of contour has been marked out.

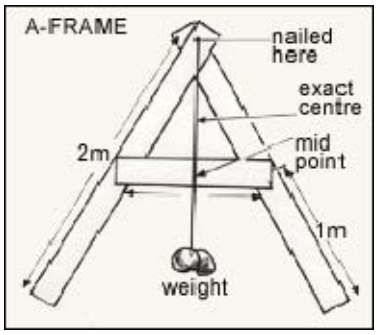
Hints

1. Work during the coolest time of the day because heat causes the tube to stretch, requiring frequent realignment of the rubber straps which mark the water level. To re-adjust repeat steps 4 and 5.
2. Raising one end of the tube much higher than the other can spill water. If this recurs repeat steps 4 and 5.

'A' Frame

(Mike Brownbridge for Zaire)

Components



1. 2 pieces of wood (approximately 5 cm by 2.5 cm) 2 meters long.
2. 1 piece of wood 1 metre long
3. 3 nails or screws (5 cm)
4. A short length of string
5. A weight (preferably plumb bob)

Construction

1. Join the two 2 m lengths of wood together at one end with a nail or screw.
2. Fix the third piece of wood at exactly the mid point of each of the two long pieces.
3. Mark the exact center of the short piece with a saw cut or paint
4. Fasten a piece of string to the top joining point of the 'A' frame and fasten the weight to the string so that it hangs below the cross bar but above the ground. (See diagram)

Method

technical note

To mark out a line on the contour, always start at the highest point of your field.

1. Push a small peg into the ground at the edge of the field and put one leg of the 'A'frame alongside the peg.
2. Next, move the other leg to the 'A' until the string hangs exactly over he painted mark. Then push a peg into the ground alongside this leg of the 'A' frame.
3. The 'A' frame is then picked up and moved so that the first side is at the second peg and the other leg is moved up and down until the string hangs centrally.
4. Continue across the field until the contour line is completed.

Line Level

(Nigel Walsh for Ethiopia)

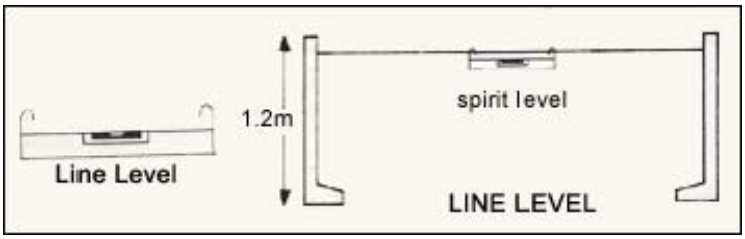
Components

1. 2 "line level sticks".
2. 10 metres of good quality string approximately 2 mm diameter.
3. Builders line level

Construction

The line level sticks should be at least 1.2 m long and made from solid pieces of wood. The edge of the sticks should be marked at 10 cm intervals. The string should be attached to both sticks at the same height.

The line level is of a type normally used by builders and masons for checking the level of masonry and consists of a metal tube 7.5 cm long, containing a spirit level and having a hook on either end, so that it can be hooked on to a string.



Method

The line level needs 3-4 people to operate: one holding each of the two sticks with the "surveyor" checking the bubble in the middle and possibly another carrying the pegs or markers. The first stick is placed upright alongside the proposed starting point of the line and second operator walks across the field until the line is tight. It is most important that the sticks are upright and the string is tight (a length of 7-8 m is best). The surveyor then places the level in the center of the string, which should be marked with a thread. He then instructs the second operator to move up or down the field until the bubble is level. He should check that both sticks are upright and the string tight. A peg is then placed to mark the spot and the first operator puts his stick against the new peg, while the second operator walks on across the field. The process is repeated until the line is completed.

This brief was written by Mike Brownbridge, Peter Wright, & Nigel Walsh for the Arid lands Information Network (ALIN) and appeared in the Baobab Journal Number 1, 1998. Baobab is published by ALIN with support from ILEIA - The Centre for learning on sustainable agriculture. ALIN and ILEIA are members of AgriCultures, a global network of organisations that share knowledge and provide information on small-scale, sustainable agriculture worldwide. Baobab is published four times a year. It is a magazine on small scale sustainable agriculture which is the East African edition of the AgriCultures Network global magazines.

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Arid Lands Information Network (ALIN) is an International NGO that facilitates information and knowledge exchange to and between extension workers or infomediaries and arid lands communities in Kenya, Uganda and Tanzania. The information exchange activities focus on small-scale sustainable agriculture, climate change adaptation, natural resources management and other livelihood issues.

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