



VETIVAR HEDGES AND SISAL

HALT SOIL EROSION, IMPROVE SOIL AND WATER CONSERVATION

These technical guidelines were prepared to guide the conservation of natural resources with a special focus on vetiver grass and sisal. These have been produced with extension workers in mind. These include such people who are in the fields of agriculture, forestry, permaculture and community-based natural resources management. The guidelines are also useful in schools conservation clubs. Most of the content is from development organisations' long experience in the area of natural resources management based on indigenous knowledge systems from Zimbabwe's Eastern High lands.

High population growth rates, immigration and deliberate policies to move people to marginal lands in Zimbabwe has often led to over-exploitation of natural resources. Biodiversity has been eroded and the capacity of natural resources to provide products and services that have been provided before has been reduced.

Excessive pressure on natural resources has resulted in a lot of challenges. For example, there has been a reduction of the average land holding size, which coupled with the inappropriate agricultural practices and land use patterns, has continually and inevitably led to the deterioration of soils and reduced crop productivity.

Modern agricultural techniques have been characterized by numerous environmental, social and economic problems. The high external input agriculture, mostly monoculture, practiced in most Zimbabwean communal lands bears testimony to this. The heavy reliance on agro-chemicals, fertilizers and supplementary irrigation which coupled with the low financial disposition of smallholder farmers has resulted in the reduction of per capita agricultural yield.



Soil improvement in Zimbabwe.

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Fertility replenishment has remained low due to the prohibitive prices while rotations have been restricted by limited holding size. Crop residues have been routinely harvested for fodder; meaning crop fields are inherently mined of nutrients.

Given these and many other related problems, the need for change of land - use and natural resources utilization patterns in the rural areas has never been more crucial. Of paramount importance therefore, is ensuring that these resources are not over-exploited and where this has already occurred, prevention measures are taken against further excessive resource exploitation. The quest for a permanently sustainable form of agriculture in which the lands use system provides for multiple outputs and inter-linked components in an open system.

This is where these technical guidelines come in. The guidelines, therefore, are a product of extensive work. Practical Action Southern Africa and its partners hope that these technical guidelines shall serve as a true reflection of the use of vetiver and sisal in rural areas in Zimbabwe. We also believe that it will go a long way in imparting skills for managing and using vetiver grass and sisal.

The partners in the Improving the Livelihood Options of the Vulnerable Rural Poor Communities in Semi - Arid Areas of Zimbabwe Project are grateful to the European Commission's Zimbabwe Delegation for providing financial resources to produce this document. Without their support, the publication of the guidelines would not have taken place. The partners are also grateful to all those people who are too numerous to mention - for their unwavering support and contribution to the process.

Introduction

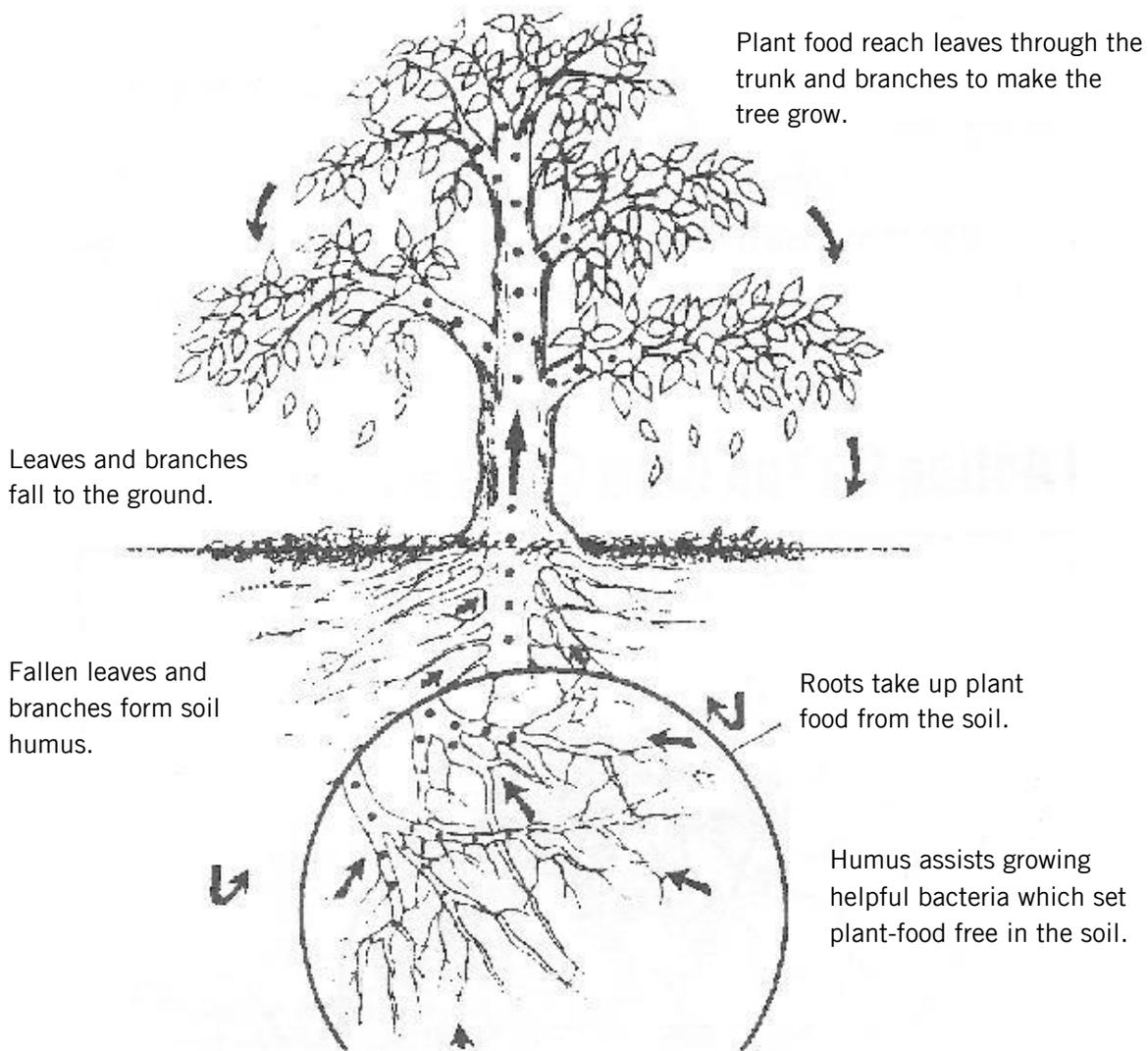
All over Southern Africa, soil erosion has increased alarmingly in recent decades, resulting in poorer harvests, more work and less food for farmers and their families. Due to the ravages of water and wind, Southern African soils - the primary resource of the region's farmers - have literally been washing away, slipping through their fingers.



A degraded landscape.

Hills are stripped bare; wells run dry because ground water levels diminish. Every year, hunger gains more territory.

Due to their physical and chemical characteristics, the majority of the region's soils cannot withstand the erosive effects of water and wind. Water erosion is caused mostly by violent downpours. When vegetation has been removed, rain-water runs off instead of seeping into the soil.



But the most challenge is caused by bad farming practices. Harmful farming practices include the following:

- Indiscriminate bush-clearing by slashing, burning or using chemical or mechanical methods strip the land bare and leave it highly susceptible to both water and wind erosion.
- The elimination of vegetative cover and litter has catastrophic effects on the protection of the soil against the shock of rains and the strength of run-off water. The removal of vegetation also prevents the building of organic matter and the improvement of the structure and porosity of the soil. Weeds serve as canopies to protect the soil and aid soil and water conservation, whereas indiscriminate removal of weeds unduly exposes the soil to erosion.
- Pre-planting tillage or cultivation also takes its toll. The making of ridges, heaps and mounds on bare soil exposes the soil to serious erosion.
- Over-grazing: This is also a serious factor. While natural and planted pastures can provide adequate cover to the soil and protect it from erosion, over-grazing and over-stocking of pastures result in the removal of vegetative cover and undue trampling of the soil by livestock. Animals' trails and footpaths invariably become channels for gully erosion.

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The elimination of vegetable cover and litter has catastrophic effects on the protection of soil.

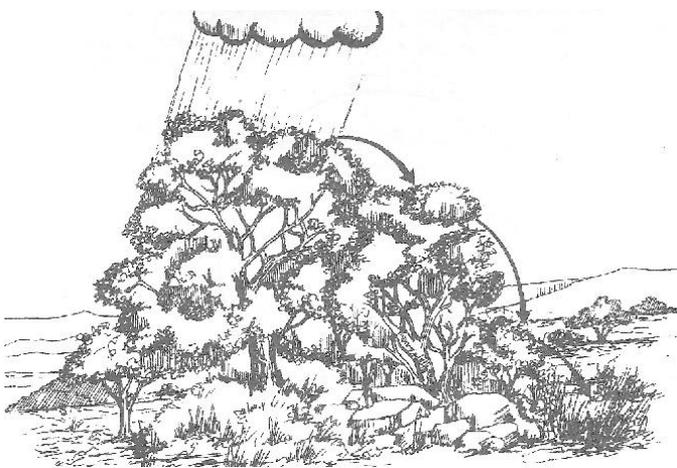
Solving the problem: Soil Conservation

Soil conservation is the maintenance of soil fertility which entails:

- Control of erosion through different interrelated actions.
- Maintenance of organic matter.
- Maintenance of soil's physical properties through addition of organic fertilizers and proper farming techniques.
- Maintenance of materials. Avoidance of toxicity.

Soil conservation is important if sustainable crop production is to be maintained. It has been established experimentally that soil erosion is minimal under agro-forestry systems.

Lowering of yields brought about by soil erosion is very substantial; if there is a decrease in organic matter and the associated nutrients of the soil. The problem of erosion control is very much linked to the problem of maintenance of soil fertility; one cannot achieve one without achieving the other.



Rainfall action on soil surface.

The success or failure of soil erosion control efforts largely depends on the approach to the problem. The first step is to carefully study the whole area affected so as to arrive at the underlying causes and identify malpractices associated with them.

Principles of soil erosion /Gully control

- (a) Remove or modify the underlying causes
- (b) Decrease the amount and speed of run-off
- (c) Safeguard the cutting head(s)
- (d) Silt the bed to provide footing for vegetation establishment (vetiver or sisal)

It is very expensive in terms of physical and financial efforts to reclaim degraded landscapes. The decision on what control structures to employ is therefore critical and should not be done

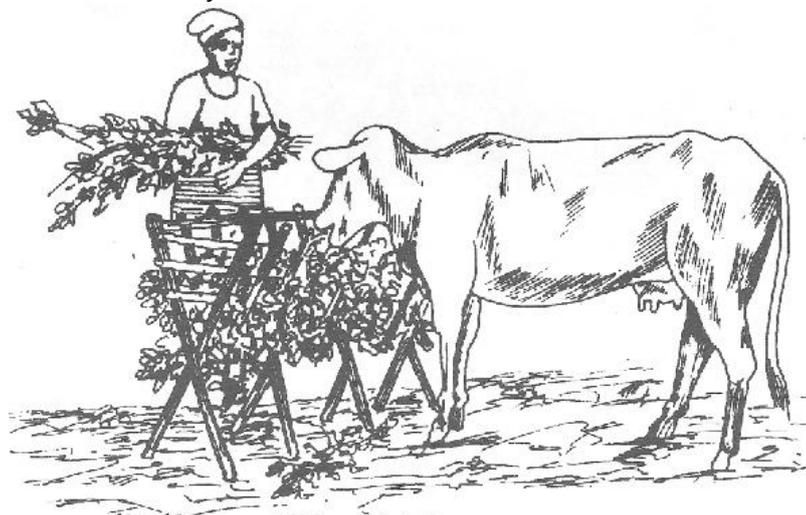
off-hand. A thorough study of the catchment area is very important before any attempt is made at reclaiming tile degraded area.



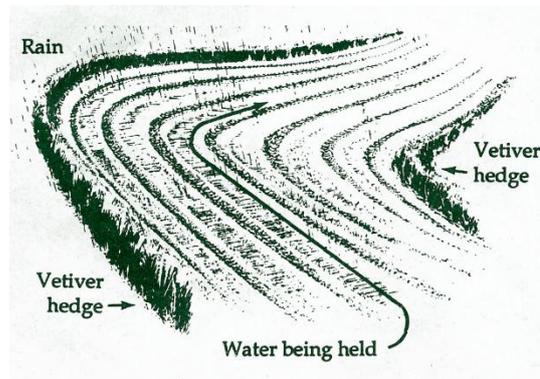
Trees planted on downward edge of terraces.

The study should give the following information.

- (i) Size and state of the catchment area and maximum probable flood
- (ii) If there are gullies already formed, the depth, width and length of the gully
- (iii) The average fall of land and bed
- (iv) Height and width of drops at head and at any other point where structures may be necessary.



Cut branches are useful as livestock feed.



To be effective on sloping land, vetiver hedges must be continuous

The field with a gentler slope is protected by contour hedges of vetiver grass. There is no loss of soil from water run-off.

Gully control structures

Vetiver grass strips: A number of types of andropogon grass are recommended for erosion control (even sugar cane, which is in the andropogon family, would serve the purpose); but the most popular is *Vetiveria zizanioides*, commonly called vetiver grass. Planting vetiver behind stone banks, or by itself in continuous hedges along contour lines, is one of the easiest and most effective ways to prevent soil erosion,

Farmers are advised to make sure the vetiver hedge is continuous, causing rain-water to seep into the soil and offering no gaps through which run-off can flow. It usually takes two or three growing seasons for a vetiver hedge to become dense enough to withstand heavy rains and thoroughly protect the soil,

Vetiver hedges grow very thick and should be cut at 20-40 centimetres, or every two or three weeks. When young, the cut grass can be used for fodder, but it performs even better as a mulch to enrich the soil. Experts recommend piling the cuttings on the uphill side of the hedge to encourage the formation of a natural terrace that will protect against erosion for decades - even centuries.

Vetiver grass can be obtained from nurseries (large gullies protected with vetiver grass make good informal nurseries), but it also grows wild in many countries. Vetiver is propagated not by seeds but by root division, so it will not invade other crops.

Vetiver hedges should be planted at the beginning of the rainy season. Separate a clump of vetiver grass, roots and all, into handfuls called "slips". Cut off the tops of the slips so that 15 to 20 centimetres of grass remain, and plant the slips 10 to 15 centimetres apart along contour lines. If some slips die, replace them with new ones to close all gaps in the hedge. One row of slips is enough to produce a thick hedge.

Sisal

Sisal can also be used in place of vetiver grass. Rows of sisal can be established on the affected area. It can also be established in the catchment area to increase water infiltration and reduce the volume and speed of run-off. Sisal has also a dual purpose of controlling soil erosion and that of providing fibre for the production of craft material like mats, hats and bags.

Sisal and vetiver grass can be used in conjunction with mechanical soil and water



A sisal plant

conservation techniques. To successfully plant vetiver grass and sisal in the affected area, run-off must either be reduced or diverted. A storm drain or contour ridge must be put in place to divert run-off to some nearby safe discharge point such as adjoining stream or heavy bush or grass area.

While the final objective of soil erosion (gully control) is to stabilize the channel by vegetation, some gully beds can be very hostile. Having developed steep banks, vegetation cover cannot easily establish. The deeper the gully, the lower is the water table of the surrounding area. The low moisture regimes discouraging vegetation growth and the healing process can be slow.

Silting the Gully

To facilitate vegetation growth, the gully bed should be silted. This can be achieved through various ways. Where brushwood is available, staking it across the gully as checks can give satisfactory silting results.

- Stone bolsters also present cheap alternatives
- Gabions, through expensive provide other successful means of silting the channels of affected areas
- Plant vetiver grass or sisal on the silted check points within the gully or affected area.



To facilitate vegetation growth, the gully bed should be silted.

On shallow gullies, levelling of banks can be attempted. It is expensive with big gullies. Once the banks are levelled, vetiver grass or sisal can be planted to stabilize the banks. In case, the form structure to be employed and materials utilized will depend on cost and availability. Measures adopted must be modified to conform to the ensuring benefits. Reclamation work is best tackled late in the rain season when the heaviest storms are over but the ground will still be moistest. It can vary depending on the nature of work to be undertaken.



As a result of effective soil and water conservation fruit trees can be grown to supply valuable food for home consumption and marketing purposes.

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Acknowledgements

Reproduced from Practical Action Southern Africa's Improving the Livelihood Options of the Vulnerable Rural Poor Communities in Semi-Arid Areas of Zimbabwe Project for the European Union funded Enhancing the Food and Livelihood Security of Vulnerable Communities in Drought Prone Areas of Zimbabwe.

Photography: Thembinkosi Nyathi, Practical Action Southern Africa
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