

## MORE ADVANCED CONSERVATION FARMING FOR STEEPER SLOPES

### Contour Vegetative Strips

#### *Vetiver* Grass

Cultivation on steep slopes is common in the Zambezi and Luangwa valleys and in Eastern Province along the Malawi border. Where slopes are in excess of 3%, *Vetiver* strips planted on the contour are the most effective way of controlling erosion. *Vetiver zizanioides* is a widely adaptable, fast growing deep rooted perennial that is unpalatable to livestock. *Vetiver* forms a living barrier which arrests soil movement. After heavy rain soil builds up against the hedge of *Vetiver* grass gradually creating a natural terrace effect. Under the MAFF SSAFE Project, *Vetiver* nurseries have been established in Monze, Mumbwa, Kafue, Lusaka East, GART and at many other sites. In Malawi where ridge cultivation is predominant, farmers follow 3 steps to convert to flat CT/CF. (1) ridges are realigned if they are not on the contour; (2) *Vetiver* hedges are then planted behind each 10th to 20th ridge depending on the slope; (3) once the hedges are established farmers abandon ridging.

### The 'A' Frame for Pegging Out Contours

The easiest way to peg contours is using an A Frame. The A Frame consists of two 3 m poles (cut exactly the same length and tied together with one pole tied across them exactly 1 m from the bottom to form an A shaped frame. A string with a stone tied at its end is hung from the top. Measure across the horizontal pole and mark the exact centre with a notch. When the string hangs over the notch, each leg of the A frame marks the same level on the ground. Farmers in Malawi have successfully used the A Frame to peg out contours in the field to mark out lines for planting *Vetiver*. As a rule of thumb, 3-7% slopes (moderately steep), will require a *Vetiver* hedge every 20 metres and 8-12% slopes (steep), every 15 metres.



Pegging out 1 hectare will take 2 adults 1-2 days work. Using the A Frame farmers can learn to mark out contours themselves. Notice the pegs.

### Marking out in the Field

To do the job the following will be required:- 2 Adults, the A Frame, a flat stone for hammering in the pegs and about 250 pegs per hectare. Starting at the top of the field, level up the A frame and hammer a peg into the soil beside each foot of the A Frame. Holding one leg of the A frame firmly in its original spot, swing the other leg down the slope and back upwards until the string hangs over the notch. Hammer in a peg. Now swing the other leg down the slope and repeat the process to peg the first contour.

### *Vetiver* Nurseries

In Malawi where people have begun to recognise the value of *Vetiver*, progress has been made by contracting farmers or groups with access to water from dambos or rivers to propagate *Vetiver* and make tillers available to their neighbours. Large centralised nurseries do not work because of the high cost of transportation. A 0.1 ha nursery should receive 30 kgs of Compound D broadcast before planting. The tillers of *Vetiver* (4-5) called slips, are planted at 45 x 45 cm spacing.

## Harvesting *Vetiver* Tillers

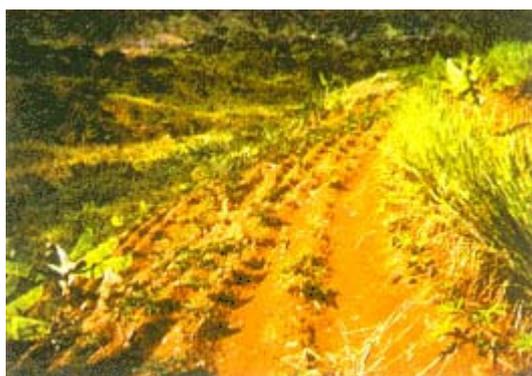
After 12 months a well maintained and watered nursery will produce 25- 40 tillers from the original 4 tillers planted at each station. To harvest, cut the leaves back to 15 cms and dig out the centre of the clump of tillers with their roots leaving 4-5 slips from the side undisturbed. These will provide the harvest for the following year. Trim the roots of the harvested tillers back to 10 cms.



A newly planted communal *Vetiver* nursery beside a dambo in Malawi. Notice the 45 x 45 cm spacing.

## Planting in the Field

Split the clumps into bunches of 4-5 tillers each (these are called slips) and plant at 15 cm spacing along the pegged contour. A well maintained nursery of 0. 1 ha, will provide 10 kms of *Vetiver* hedges.



A *Vetiver* hedge protecting soils on steep slopes in Malawi.

Bananas, man goes or legumi nous trees can be planted above the hedges to further stabilise the soil

## Planting Leguminous Trees

There are many tree species which have a number of beneficial uses for farmers and rural communities. In the Sections below we discuss the establishment and benefits of a small selection of these.

*Vetiver* hedges can be strengthened by planting leguminous trees including *Senna spectabilis*, *Leucaena leucocephala*, and *Gliricidia sepium*. *Senna Spectabilis* is the best tree to grow where livestock are common as it is not palatable to them. It also provides the most fuel wood. These species can be direct planted at the onset of the rains. Plant 4-5 seeds at 40 cm spacing in a row 50 cms above the *Vetiver* hedge. *Senna* because of it size should be planted 1 metre apart. The trees can be pruned at the beginning of the second season if they are higher than 1 metre. Prune with an upward slanting cut at 40 cms from the ground. The prunings can be fed to livestock, (*Gliricidia* prunings should be wilted first), or used for green manure or fuelwood. During the growing season prune the trees whenever the shading becomes a risk and distribute the prunings along the crop rows to help reduce weeds and increase available nutrients.

## Rehabilitating Degraded Land with *Tephrosia*

### Soil Degradation

In Zimbabwe 27% of communal farming land is already totally degraded because of inappropriate farming methods. The situation in Malawi is worse. In Zambia we are heading in the same direction. Degraded soils will not respond to improved seeds, fertiliser or good management. Furthermore, as yields decline, farmers will allocate more of their land to maize in an attempt to satisfy their basic food

requirement. This tendency towards monocropping will further reduce their yields and in drought years total crop losses will occur. The recent migration of farmers from Southern Province to Mumbwa, Kabwe and Muntonchi is evidence of this.

### ***Tephrosia's* Properties**

*Tephrosia vogelii* is a legume that can be used to effectively rehabilitate degraded soils. It is very common legume in Zambia and contains a complex of chemicals including tephrosin which have strong insecticidal and acaricidal properties. In Zambia it is often used to kill fish. *Tephrosia* is a small shrub which grows to a height of about 3 metres. It is not palatable to livestock and has a life span of 3 to 4 years. *Tephrosia* can be undersown to the last maize crop before the farm is to be abandoned or sown in land that has already been abandoned to bring its soil back to life. *Tephrosia* has an aggressive tap root that breaks pans and improves soil structure. Over a period of 2 seasons it also fixes 80 units of nitrogen which is equivalent to 3.5 bags of Urea/ha. There is considerable interest in *Tephrosia's* insecticidal and acaricidal properties and the opportunity for farmers to earn cash from the sale of seed is promising. *Tephrosia* is susceptible to nematodes.



*Tephrosia* is direct planted. Dig holes in 90 cm rows at 45 cm spacing in the row. Backfill and plant 3 seeds in each hole at a depth of 3 cms. After the second season from planting cut down the shrubs at ground level before the onset of the next rains. Woody material can be used for fire wood or tobacco ties. Cultivation can now be resumed with restored fertility. If degradation is extreme leave the *Tephrosia* for 3 seasons.

### **Planting *Faidherbia***

#### **Properties**

*Faidherbia alba* or Msangu is a majestic deciduous tree growing to a height of 25 metres. It has many uses. Unlike most trees it sheds its leaves during the rains. The leaves are nutrient rich and improve soil fertility allowing cultivation beneath the branch canopy with good benefits to crop yields. Branches are used for fuelwood, canoes, pestles and mortars and pods and leaves are excellent fodder. In times of famine, people can eat the seeds after repeated boiling; flowers attract bees for honey, and the hollow trunk and branches are good for bee hives. Bark is boiled and drunk to cure diarrhoea.



*Faidherbia alba* - notice vigour of the maize crop growing under the canopy and the absence of leaves on the tree. Maize yields are generally 50-200% higher under the canopy.

### **Raising *Faidherbia* Seedlings**

*Faidherbia* has a very fast growing tap root. Raising seedlings in poly pots in a nursery does not work because the root quickly penetrates the soil, and when the pots are moved the tap root is damaged and

this stunts growth when they are transplanted. An alternative way is to raise the seedlings on a wire mesh above the ground. This is expensive however and in Malawi good results have been achieved by direct planting in the field at the onset of the rains. Seeds have to be treated before sowing. This is done by clipping 2mm off one end of the seed with a nail clipper or sharp knife. 3-4 seed are then sown in a well prepared planting station. Once the seeds germinate place a thorny branch over the growing seedlings to keep livestock away.



Faidherbia seedling. In the first year the seedlings must be kept free of weed competition. Mulching around the base to radius of 0.5 m will suppress weeds and retain moisture. The aim is to establish about 40 trees per hectare.



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