

Vetiver Demonstration Report. Swaziland

Progress Report to August 2001. All Sites.

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After one year of the active promotion of vetiver grass systems we are reviewing our experiences to ensure more effective promotion in the coming season.

SFDF conducted eight demonstrations during the 2000-2001 season (attended by 358 people including representatives from 18 organisations). Commercial South African Companies, commissioned by the Ministry of Works, also conducted two demonstrations of highway embankment stabilisation.

SFDF demonstration sites covered erosion and siltation control in flow-lines, rehabilitation of a severely eroded area, nursery planting and orchard erosion control. Most of the demonstration sites were well monitored throughout the season. Although it is early to assess the effectiveness of the plantings, a number of lessons have been learnt:

1. It is important to follow the guidelines for planting; 2-3 slips per station, 10cms between planting stations (preferred to 15cm), watering, weeding and gap filling.
2. Community management of newly planted hedges is often minimal without supervision. This reinforces the need to ensure that hedges are planted properly as this will reduce management needs, particularly gap filling.
3. Always fertilise to ensure fast development.
4. Vetiver hedges need to be protected from livestock, at least until the hedge is fully developed.
5. The application of VGS to challenging sites like, flow lines, spillways and extremely poor soils needs careful planning and management.
6. Vetiver does not combine well with fast growing tall species.

We have not managed to secure adequate funding for the Swaziland Vetiver Network but in the coming season we hope to continue monitoring the demonstration sites, expand nursery production and conduct further demonstrations, particularly in the more conventional applications. We also hope to organise a tour of demonstration sites for participants and interested parties late in the coming season. Swaziland Vetiverites are encouraged to join the Southern Africa Vetiver Network and an application form is enclosed.

Demonstrations conducted

Dvokodvweni Community Dam – Malindza.

Siltation control at a small community dam with a large catchment area and long steep stream. The planted areas are protected from cattle.

Two double lines of vetiver were planted across the flow line on 7th Sept.

Establishment was good even in seasonally water-logged areas. By mid October vetiver growth was being inhibited by weed growth, by late November weed growth was smothering the vetiver. From late September to late April water flowed in the stream and incident related flow was deeper than 50cm. In the main flow line vetiver was buried and washed away. Canopy thinning of trees shading lower line was necessary. Weeding was very difficult once vetiver had been smothered, especially in water logged areas. The hedges responded well to weeding and canopy thinning in January.

The portions in the flow line, washed away or buried by incident related flow, were replanted and a third hedge planted near the waterline in March. The flow lines were planted with pre-planted vetiver in poly-bags and strips protected by hessian sand-bags. The sand-bags were not adequately tied into the banks and flow from a late storm went around the protective sand bags washing out vetiver. Within 10 weeks the wet bottoms of the hessian sacks had decomposed to such an extent that they could not be moved.

The 3rd hedge near the waterline was originally planned for but delayed by community plans to physically remove the sand and silt deposits from the area. The physical removal was too expensive. The hedge is not developing well because of competition, primarily from self-sewn bulrush (*Typha latifolia*) which is well established in places.

On May 5th a 1.5m concrete sill was constructed to protect the flow line in the uppermost sill and vetiver strips planted behind.

By mid August the dam water levels was over 1.5m below full supply level and with little winter rain, the area was very dry. There had been considerable grazing by livestock. The dam fencing had been damaged by incident related flow early last season but had only recently been repaired. All vetiver had survived. Later plantings were not thriving but will survive till the next rains.

The main lessons:

- Weeds must be controlled during early development.
- Shading must be controlled.
- Planting into temporarily waterlogged areas, even with shallow standing water, can be effective.

- Flow lines should be planted at the end of the season when the possibility of incident related flow damage is minimised. The hedge will develop using residual moisture and be established by the following season.
- Flow-lines should be planted with pre-planted vetiver to ensure quick anchorage and growth. Strips were particularly effective.
- Flow-line plantings where the is incident related flow should be protected by stones, stone checks, sand bags or concrete depending upon the severity of flow (see later note of flow estimations).
- Hessian sacks are not appropriate for use as sand bags.
- Protective structures must be tied into the banks to avoid flow being diverted around the structure.
- Dam sites should be planted at the earliest opportunity to minimise competition with self-sewn colonisers.
- Vetiver might not be suitable for concentrated incident related flow and streams which flow for long periods.
- Vetiver is not a quick fix solution. Careful monitoring and adaptation is required at challenging sites.

Lubhuku Farmers Association – near Mpaka

Siltation Control and Land Rehabilitation in the catchment of a small community dam with a small catchment area and gentle flow line. The planted areas are protected from cattle.

At a demonstration on 26th October 3 hedges were planted across the flow line and protected with stones. Hedges were also planted across adjacent degraded areas into exposed sub-soils. Further hedges were later planted by the community.

Establishment was poor in the raised portions of the subsoil plantings with attack by termites common. Surprisingly even the growing leaves were attacked in places.

Establishment was good in lower, wetter areas, initially with little loss from burial or dislodgement even though significant incident related flows were experienced. Hedge development was however later restricted by burial under silt.

Plantings of vetiver clumps, poly-bags and strips in March were quick to establish.

By mid August the vetiver was suffering severe water stress, with most of the foliage desiccated. Trampling and grazing by goats, which could pass through the barbed wire fence was severe in places. Little of the vetiver planted into the subsoil survived.

The main lessons:

When planting into sub-soil (and compacted or infertile soils) vetiver should be planted into a trench of well loosened, fertilised soil to allow for infiltration by rainfall, to hasten root development and promote quick growth.

Flow lines should be planted at the end of the rainy season when the possibility of incident related flow damage is minimised. The hedge will develop using residual moisture and be established by the following season.

Flow-lines should be planted with pre-planted vetiver to ensure quick anchorage and growth. Strips and clumps were particularly effective.

Flow-line plantings where should be well protected by stones, stone checks, sand bags or concrete depending upon the severity of flow.

Mgampondo – Lavumisa area.

Siltation control in community weir. Vetiver hedges were planted above a stone check and gullies above the weir on 8th November. Establishment was good though there was some damage by grazing goats, trampling by cattle and dislodgement in the main flow line. The damaged hedges were not protected by fencing. Hedges planted into shale were slow to develop. Vetiver planted into a partially shaded flow line, where the flow was often prolonged at times, developed well.

The main lessons:

Protection from livestock trampling is necessary particularly at planting time. Fertiliser should be used in soils of low fertility.

Mkhaya Community Dam – near Gilgal.

Spillway Protection at a newly constructed community dam with a sandy spillway. The dam is fenced. The catchment is large. Approximately 12,000m³ storage capacity with a catchment area over 5km².

Four Vetiver hedges, 50 – 75m long comprising of one double line and three single lines, were planted across the full width of the spillway on Nov 9th. The vetiver was planted into germinated Rhodes grass (*Chloris gayana*) and self-sown species with minimum disturbance because of the vulnerability of the site. By early December competition from other grasses was affecting growth. There was no maintenance carried out by the community.

Vetiver planted in late September, before the Rhodes grass was sewn, did develop well.

During the heavy rains in February and March there was considerable flow down the spillway, which resulted in the formation of large gullies. Large sections of the vetiver hedges were washed away and the 1m deep sand/cement block sills

were almost undercut at several points. Erosion on these highly erosive soils was made worse by the poorly levelled spillway and spillway sills.

An effective hedge had not developed but there was evidence that flow had been channelled into gaps in the hedges, increasing localised erosion. Some erosion from turbulent flow through the hedges was also evident.

Note that vetiver hedges must not be planted within 1 vertical metre of the spillway mouth, as this will restrict flow and could contribute to the dam breaching.

The main lessons:

Spillway protection design must be adequate for expected flows. Vetiver should only be used to supplement protection.

Pre-planted vetiver should be used to speed development.

Vetiver does not compete well with Rhodes grass unless planted earlier than the Rhodes grass or it is weeded.

Vetiver hedges can develop well when planted into Couch Grass (*Cynodon dactylon*).

Even hedge formation is essential and proper maintenance is imperative.

Sithobela Dam

Siltation control above a community dam with a medium sized catchment and gentle flow-line. The protective fencing is poorly maintained.

Vetiver hedges were planted above a stone check above the dam on 23rd November.

A considerable number of gaps caused by trampling by livestock and people and grazing (the newly planted slips were pulled out) were replanted with pre-rooted vetiver on March 12th. The established vetiver was developing well.

By mid August all the vetiver had been grazed to near ground level (2-5cms) including most culms. Later plantings were surviving but seem particularly vulnerable to trampling.

The main lessons:

Early protection is needed from livestock.

Vuka Sidwashini F. A. near Buhleni.

Embankment and gully stabilisation at a Farmer Association Sugar Cane Scheme in association with SKPE. 11th Jan 2001.

The hedges were planted during a very hot dry spell but were well watered by the members and survival was in excess of 80%. Most of the gaps in the hedges were filled by the community. Some damage was caused to hedges when a pump house was constructed.

Mgulube Community Dam

Spillway protection at an established community dam to control erosion at the return to stream. The protective fencing is poorly maintained. Planted on 7th February 2001 into very wet soils, the survival was high but vetiver planted at the bottom of the small rills was washed away. During the winter, grazing by cattle was severe.

The main lessons:

Early protection is needed from livestock.
Plantings in areas of concentrated flow must be protected.

Mkhuhlweni Community Dam

Spillway protection at an established community dam to control erosion at the return to stream. The protective fencing is poorly maintained. On 15th March 2001 Vetiver was planted into shallow flowing water at the end of the spillway. The area was covered with bulrush (*Typha latifolia*), which had to be cleared to allow planting.

Asibemunye Farmers Association

Vetiver nursery establishment, erosion control in an orchard in association with Vus'umnotfo and Swaziland Settlement. The orchard has steep slopes and is in a high rainfall area.

Planted on 22nd March 2001, rows of vetiver are planned 2m above and 2m below each line of deciduous tree which are planted roughly along the contour with 10m between lines. Planting at the demonstration was limited to a single hedge above the first line of trees and the establishment of a small nursery where the remaining vetiver will be multiplied to plant the remaining hedges.

Mortality was low and the nursery has been well cared for though growth has been retarded by livestock entering the garden and grazing the grass.

The main lessons:

Late season planting is feasible with proper care.

Other Demonstrations

Highway Embankment Stabilisation 1

Hydromulch (Pty) Ltd, a leading South African company specialising in environmental landscaping, vegetation restoration and hydraulic seeding, with the Ministry of Works established an embankment stabilisation trial on the Manzini to Mbabane highway, 10km from Mbabane on 30th November.

Vetiver in poly bags was planted and the area hydro-seeded using a mixture which appears to be dominated by *Eragrostis teff*. The vetiver has survived but not thrived. In early winter the area was cut showing the roads maintenance does not know the vetiver requirements. All the plots, which include Kikuyu turf, Kikuyu turf strips, 2 types of mulching fabric and hydro-seeding alone, appear good especially when compared the bare control area. There was some rill formation in the hydro seeded plots, with or without vetiver. The vetiver was not planted closely enough (20cm between plants) and because of competition from the *E. teff* did not develop enough to have any effect. *E. teff* is an annual and the vetiver may develop in the coming seasons giving a more long-term effect.

The main lessons:

Vetiver does not compete well with fast growing annual grasses.

Highway Embankment Stabilisation 2

Puggs Landscaping of Nelspruit was contracted by the Ministry of Works to demonstrate embankment stabilisation on the Mbabane Ngwenya highway near Motshane. A long steep embankment was planted to vetiver in March. The distance between plants and rows was good. Bare root tillers were used (which we would not advise on a long steep embankment in a high rainfall area). There was adequate rainfall in the weeks following planting. The planting material was obviously dead when planted and there was 100% mortality.

The main lessons:

Even a professional landscaper can make a complete mess.

Notes on Livestock

Vetiver must be protected from livestock for the following reasons:

Trampling and grazing of newly planted slips will dislodge them causing gaps in the lines.

Continued heavy grazing will totally inhibit hedge formation.

Continued grazing at a lower intensity will slow hedge development.

The protection of hedges is commonly needed at the start of the season; heavily grazed hedges will not give much protection at this time even if they can develop. In areas of overgrazing vetiver will grow higher than surrounding species and be grazed in preference. Even fresh culms will be eaten by cattle.

Notes on Flow-lines

Flow calculations

Calculations of expected flow can be calculated from measurements of the catchment size, the length of stream, the elevation difference between the site and source, the rainfall, the run-off coefficient and the one day storm rainfall for a specific return period. These calculations are complex and contain many assumptions. Anecdotal evidence and physical evidence from the flow line may be used to give an indication of expected flow volumes and frequencies.