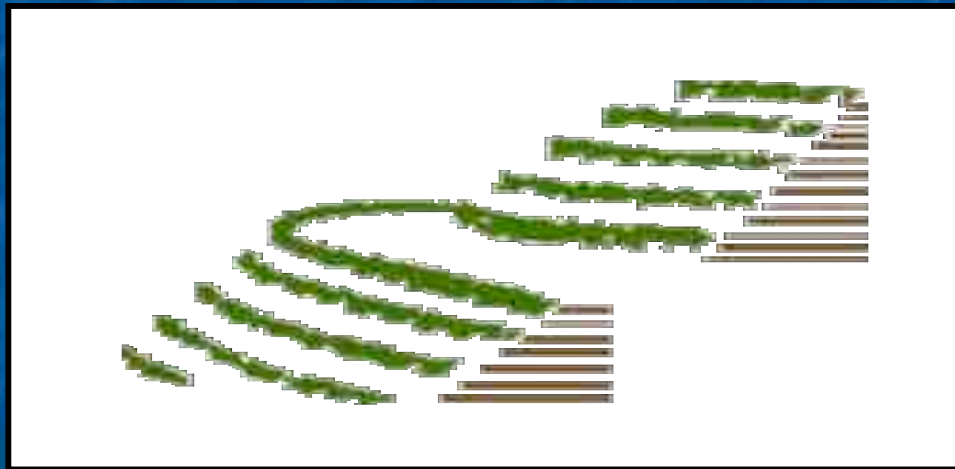



# THE USE OF VETIVER SYSTEM IN AFRICA



VETIVERIA ZIZANIODES

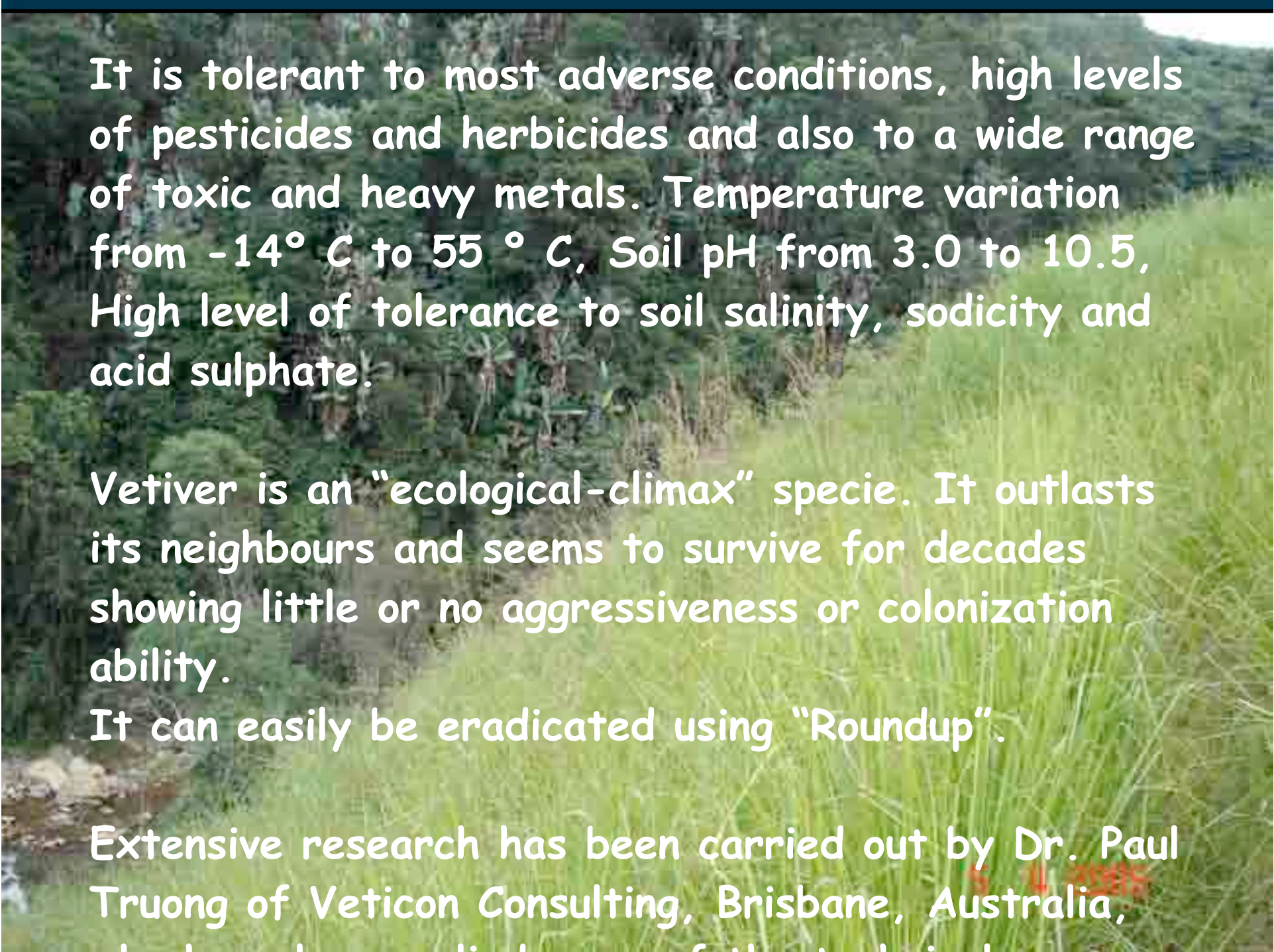


**The Vetiver System or Vetiver Grass Hedge Row technique (VGHR) as it is often referred to, is based on the use of Vetiver grass (*Vetiveria zizanioides*) for a wide range of applications, namely soil erosion & sediment control, land reclamation and waste water treatment.**

**The VS/VGHR was first developed by the World Bank for soil and water conservation and is now being widely used in over 100 countries.**

**The plant is sterile, non invasive, flowers, but sets no seeds hence it has no weed potential.**

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It is tolerant to most adverse conditions, high levels of pesticides and herbicides and also to a wide range of toxic and heavy metals. Temperature variation from  $-14^{\circ}\text{C}$  to  $55^{\circ}\text{C}$ , Soil pH from 3.0 to 10.5, High level of tolerance to soil salinity, sodicity and acid sulphate.

Vetiver is an "ecological-climax" specie. It outlasts its neighbours and seems to survive for decades showing little or no aggressiveness or colonization ability.

It can easily be eradicated using "Roundup".


Extensive research has been carried out by Dr. Paul Truong of Veticon Consulting, Brisbane, Australia,

## MORPHOLOGICAL CHARACTERISTICS

Dense hedges when planted closely together



## MORPHOLOGICAL CHARACTERISTICS



Stiff & Erect stems on inclines of 45°

## SPECIAL MORPHOLOGICAL CHARACTERISTICS



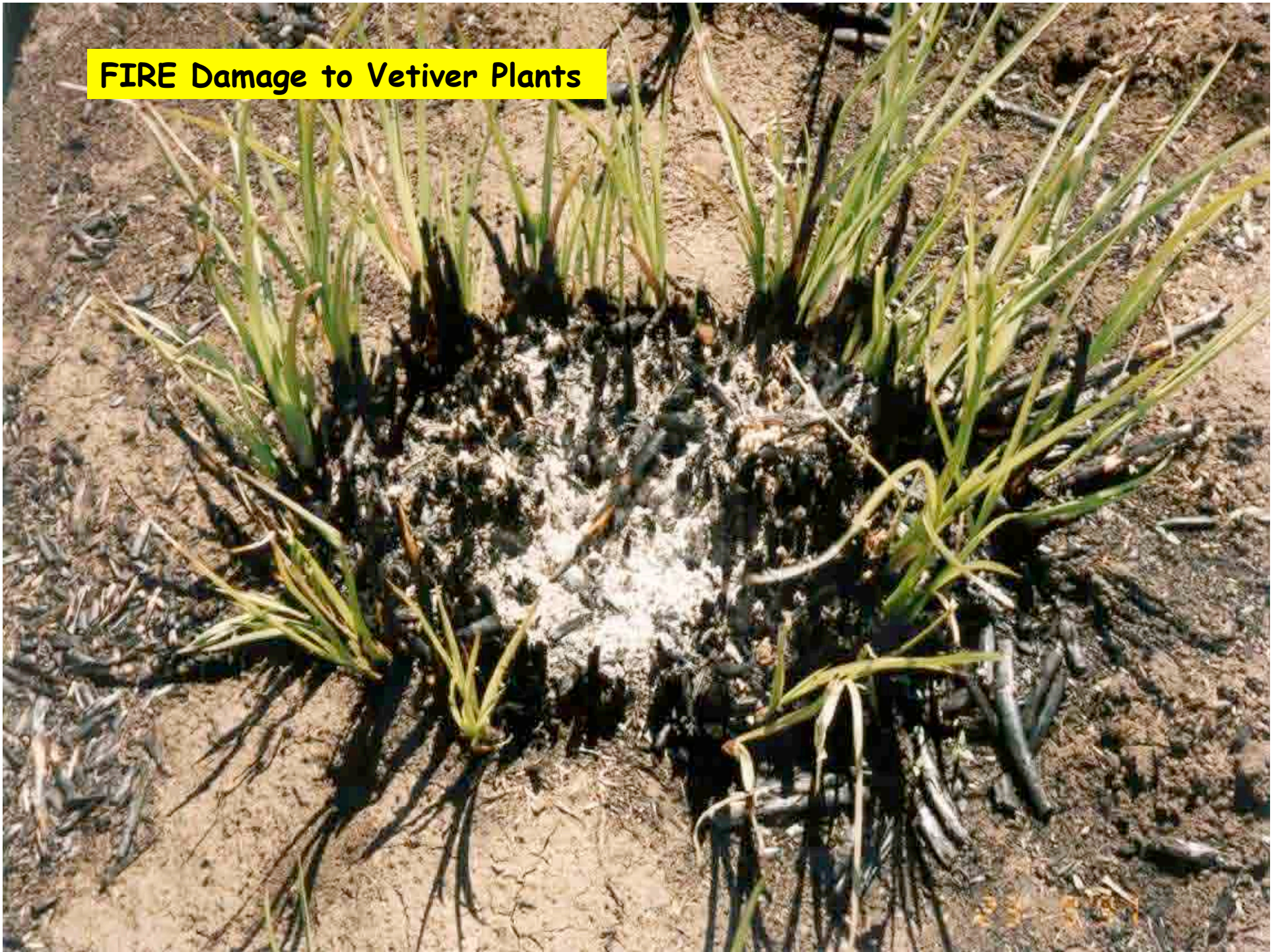
The mean design tensile strength of Vetiver roots is  $\pm 75$  Mpa - one sixth of mild steel



Dr. Paul Truong

An extremely deep & massive finely structured root system

**FIRE Damage to Vetiver Plants**



**2 Months later**

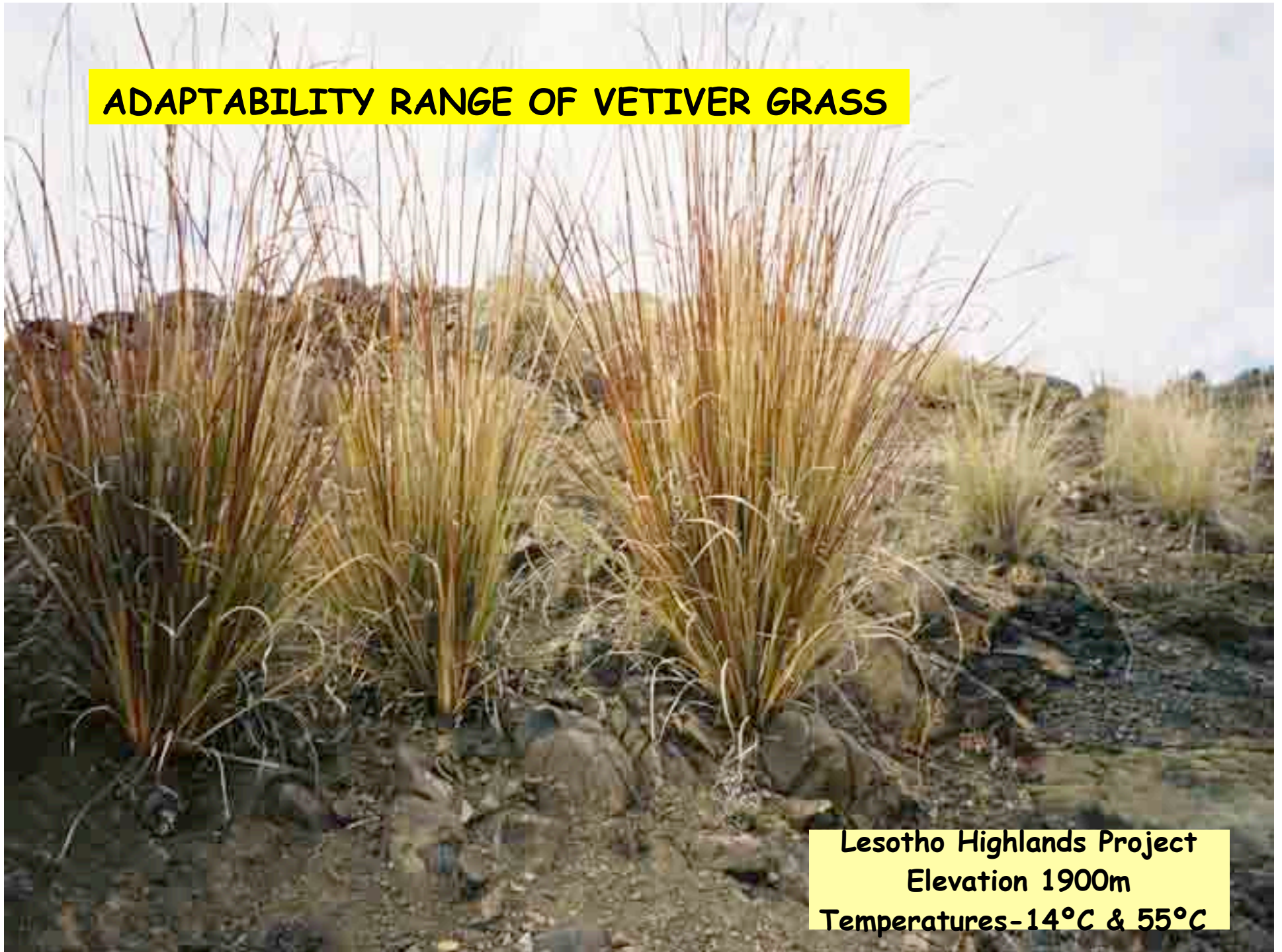




Totally recovered plant



## ADAPTABILITY RANGE OF VETIVER GRASS



Lesotho Highlands Project  
Elevation 1900m  
Temperatures -14°C & 55°C

# APPLICATIONS IN CIVIL CONSTRUCTION

## Side Slope Stabilisation using VS & Hydroseeding



# THE HYDRAULIC SEEDING MIXTURE

IS A COMBINATION OF



Selected Seed

NPK Fertilisers

Fibre Mulch

Organic Supplements

Soil Binders

Ameliorants

Water

## WHAT IS HYDRAULIC SEEDING ?

- " Hydraulic Seeding " or " Hydroseeding " is a mechanised dryland application process used in the establishment of vegetation on large, sometimes inaccessible areas where dust pollution control and environmental landscape rehabilitation are priorities.
- A mixture of selected grass seeds, fertilisers, soil binders, mulch, soil ameliorants, organic supplements and water is hydraulically sprayed onto prepared surfaces at high pressure and volume.
- The soil binders and mulch binds the surface, creating a microclimate that will permit seed germination to take place when the soils moisture and temperature conditions are favourable. Irrigation is essential in the arid regions and vegetation establishment will be visible within 3-5 days where annual grass species form part of the seed cocktail.
- A mechanised application in which vast areas can be successfully stabilised in a single operation. Areas of between two and five hectares can be completed per T 330 hydroseeding unit in a single day. The speed of this application enables an exceptionally high coverage rate to take place where dust pollution control is undertaken.

# PRE REQUISITES FOR HYDRAULIC SEEDING

- A CHEMICAL ANALYSIS of the soils to be vegetated in order to accurately determine the NPK fertiliser, ameliorant & organic matter requirements.
- AMELIORATION of Areas to be vegetated with soil amendments and organic supplements as indicated by the laboratory analytical report.
- SOIL PREPARATION by creating horizontal drills or shallow furrows in which the hydraulic seeding mixture can be contained.
- SUITABLE HYDRAULIC SEEDING EQUIPMENT that is capable of uniformly dispersing the homogenously agitated (formulated) mixture.

# COMPONENTS OF HYDRAULIC SEEDING

The hydraulic seeding components can consist of all or any of the following components:

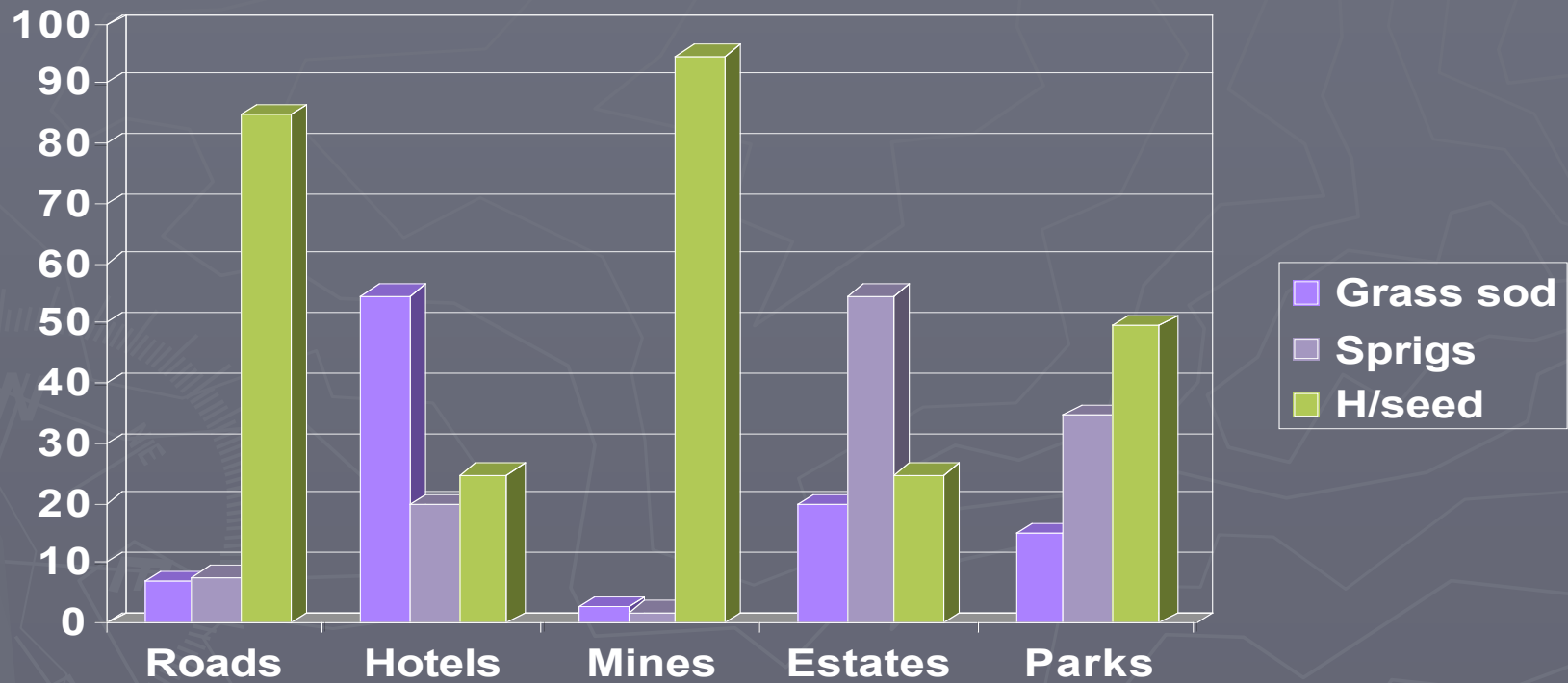
- A selected GRASS SEED mixture, consisting of annual & perennial grass species.
- A balanced NPK FERTILISER ratio as determined from a laboratory soils analysis.
- A fibre MULCH.
- An ORGANIC SUPPLEMENT usually in the form of processed chicken litter, compost or other organic matter.
- A polyacrylamide SOIL BINDER
- A soil conditioning AMELIORANT such as gypsum

# REQUIREMENTS

- \_ Knowledge of the environment & soil conditions.
- \_ An understanding of the effects of wind & soil erosion.
- \_ A sound background to erosion control techniques to support vegetation establishment.
- \_ A dedicated & professional team for the implementation of the work.
- \_ **THE CORRECT TOOLS OF THE TRADE.**



# RATIO OF VEGETATION TECHNIQUES in SOUTH AFRICA



## Suitable Hydraulic Seeding Equipment





**T330 HYDROSEEDER on a Mine Site in SOUTH AFRICA**

## Mechanical Soil Preparation



## Amelioration of Side slopes



## Hydroseeding of Vast Open Areas



## Hydraulic Seeding



# Amelioration







**Rock Staining**

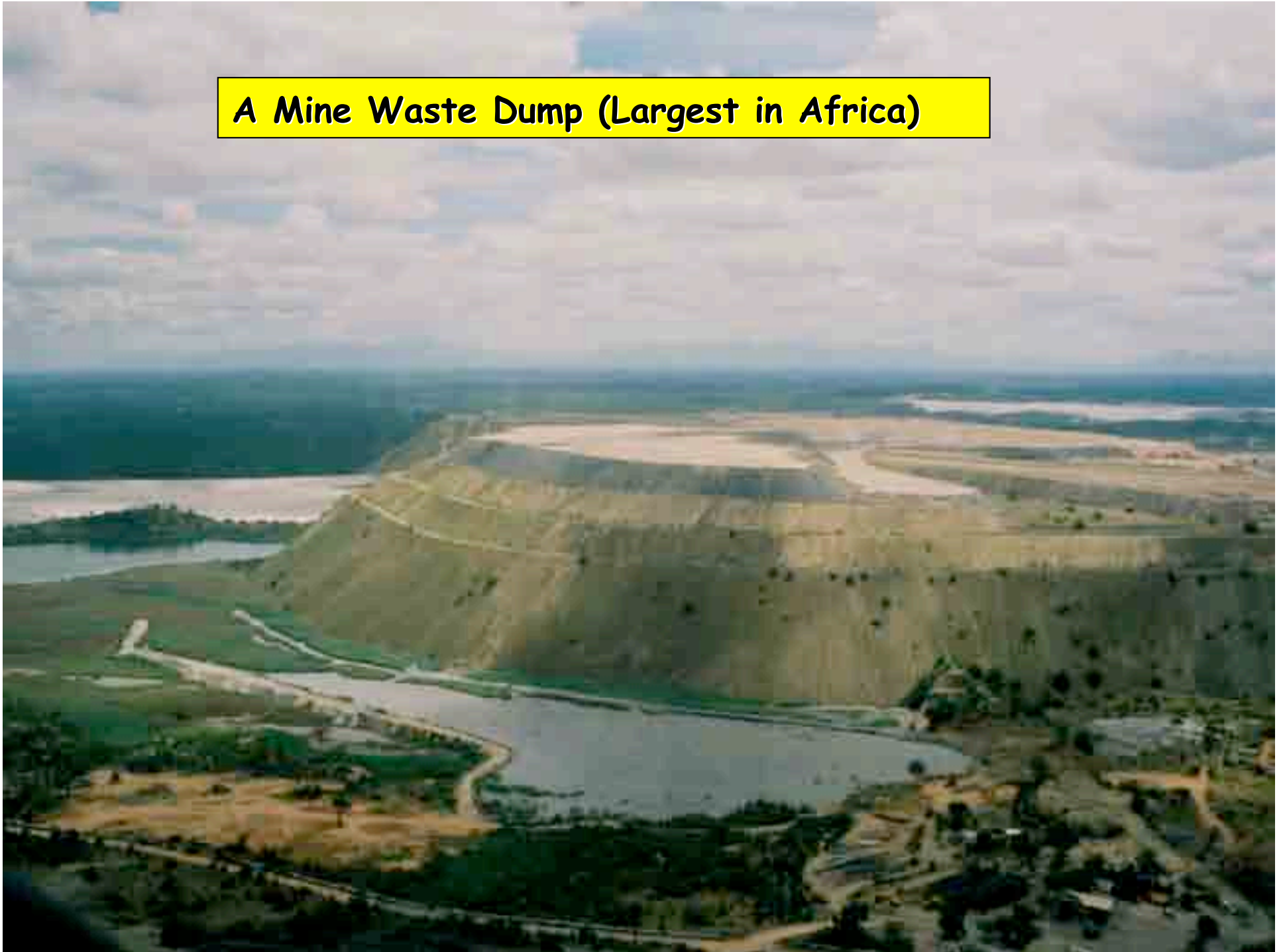
## Application of Organic Supplements



# Watering of Roadside Plants



**A Mine Waste Dump (Largest in Africa)**



# Accessing Restricted Areas



**Mulching with Bark Blower  
& Hydroseeding**



## Hydraulic Seeding & Mulching around Major Developments



**Projects To Be Reviewed  
in respect of  
Vegetation Establishment & Erosion Control  
by  
Vetiver Grass & Hydraulic Seeding**

- ◆ **New Sewer Works Project, Mbabane, Swaziland.**
- ◆ **Magoebaskloof Mountain Pass, Limpopo Province,  
Republic of South Africa**



# PROJECT DATA

## New Sewer Works, Mbabane, SWAZILAND

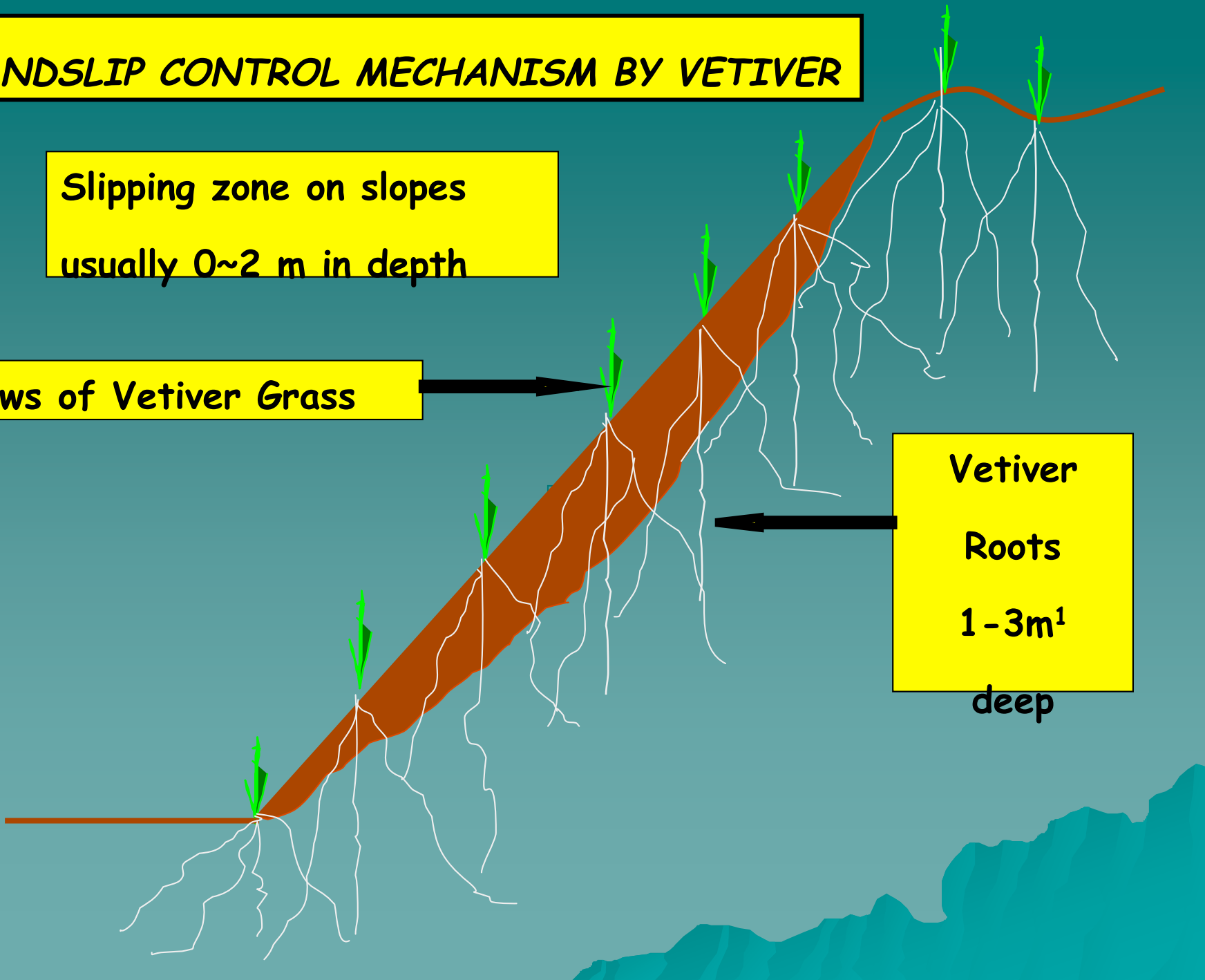
- ◆ This project involved erosion control and vegetation establishment to the side slopes and platforms and the disturbed areas where the pipeline ran through the Mcolo Forest Area.
- ◆ Contract Period - 8 months
- ◆ Distance/Area of Vetiver Grass - 45,000 m<sup>1</sup>
- ◆ Hydroseeding Area - 320,000 m<sup>2</sup>
- ◆ Elevation variation at Mcolo - 240 metres over 700 metres

# LANDSLIP CONTROL MECHANISM BY VETIVER

Slipping zone on slopes usually 0~2 m in depth

Rows of Vetiver Grass

Vetiver  
Roots  
1-3m<sup>1</sup>  
deep



## VETIVER GRASS HEDGE ROW'S SLOPE & SURFACE RUN

The figures for the surface run are based on a Vertical Interval (VI) of 1 Metre

Extracts from  
"The Hedge Against Erosion"  
World Bank,  
Washington,  
DC, USA

Degrees	Percent %	Gradient	Surface Run (m )
1	1.7	1 in 57	57.3
5	8.8	1 in 11	11.5
10	17.6	1 in 5.7	5.8
15	27.0	1 in 3.7	4.0
25	46.6	1 in 2.1	2.4
30	57.7	1 in 1.7	2.0
35	70.0	1 in 1.4	1.7
40	84.0	1 in 1.2	1.6
42	90.0	1 in 1.1	1.5
45	100.0	1 in 1.0	1.4
60	200.0	2 in 1.0	1.0

# Vetiver Planting Material



## Pre-Planting Treatment with Organics



Storage ponds filled  
with water & organics



**Preparation & planting process**



## Soil Preparation between Vetiver Rows



Hydroseeding after evidence of growth.





**Planted Material 3-6 weeks old**





**Root Growth after 6-8 weeks**

**Vegetated Side Slope - Vetiver + hydroseeding**



**Sediment Control**



**Established Side Slopes**



**Established Side Slope**



**Pipeline - Mcolo Forest  
Area Under Construction**



**Vetiver Planted Area**





**Vetiver Planted in Rocky Terrain**



**Established Pipeline Area**



**Established Vetiver in Rocky Area**



**Mcolo Forrest Area - 5 Months later**



**Mcolo Forest Area**





**Vetiver + Hydroseeded grass species**

**Mcolo Forrest - Established Side Slope**



5 11 2005

# PROJECT DATA

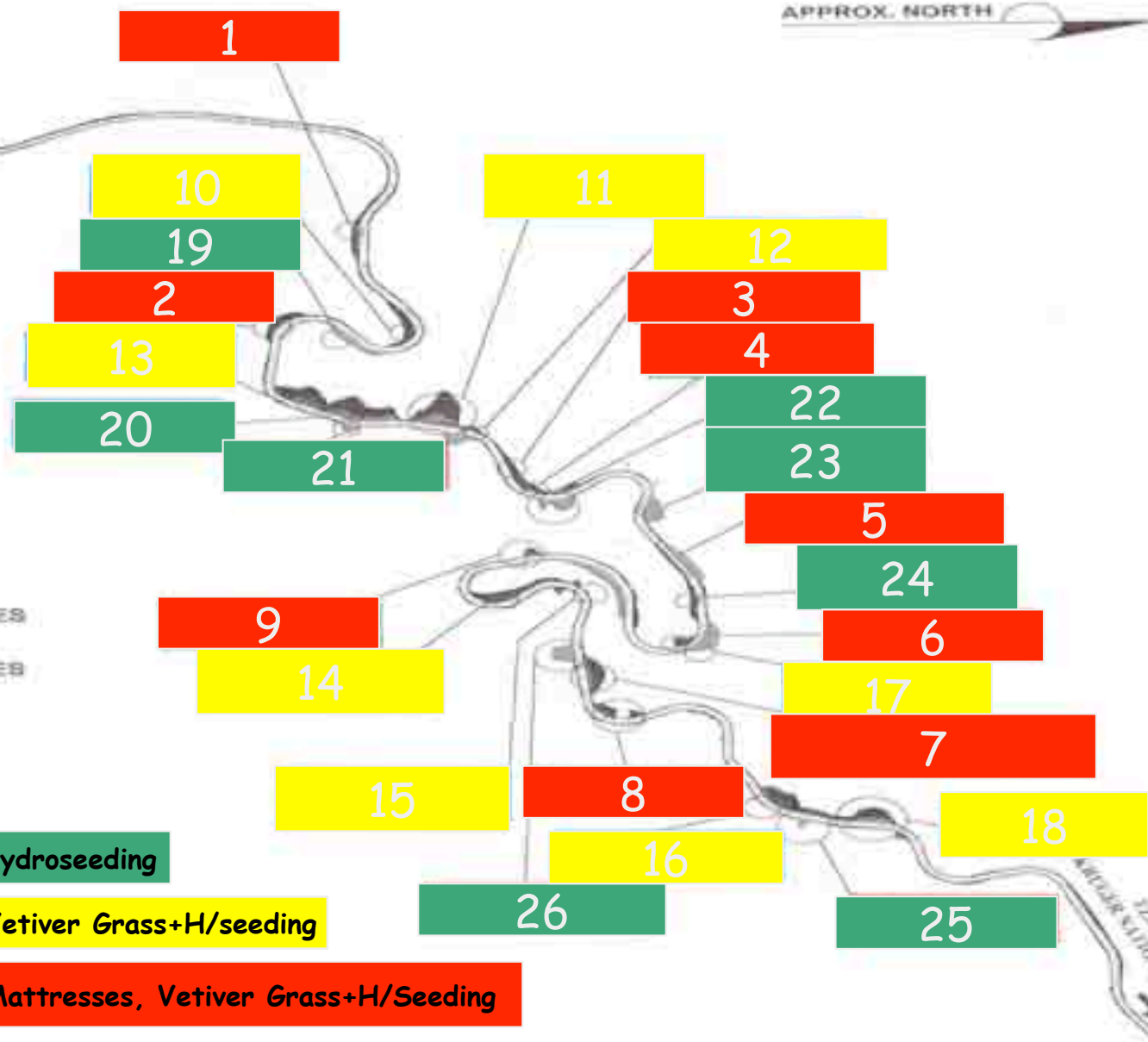
The Rehabilitation of the mountain pass after Cyclone "ELINA" deposited over 4000mm rain in under 24 hours, causing extensive damage to the existing road .

- ◆ Length of Project - 5,5 km
- ◆ Duration of Projects - 15 months
- ◆ Elevation difference - 550 mm
- ◆ Area of Vetiver Grass and Hydroseeding - 27,000 m<sup>2</sup>
- ◆ Area of Gabion Baskets/Mattresses,  
Vetiver Grass + H/Seeding - 4,300 m<sup>2</sup>
- ◆ Area Hydroseeding only - 26,000 m<sup>2</sup>





APPROX. NORTH

TEAENERTSBERG  
POLOKWANE



**SLOPE TYPE**

-  CUT SLOPES
-  FILL SLOPES

**RISK RATING**

-  Vetiver Grass + Hydroseeding
-  Vegetation Rolls+Vetiver Grass+H/seeding
-  Gabion Baskets/Mattresses, Vetiver Grass+H/Seeding

TEAENERTSBERG  
NATIONAL PARK



LENGTH OF PASS 5.5km  
ELEVATION DIFFERENCE ±650m

# Erosion Damage of the Magoesbaskloof Pass, South Africa

Typical Cut Slope



Typical Cut Slope



Typical Fill Slope



**The Rehabilitated  
Side Slope of the  
Mountain Pass**



**Before**

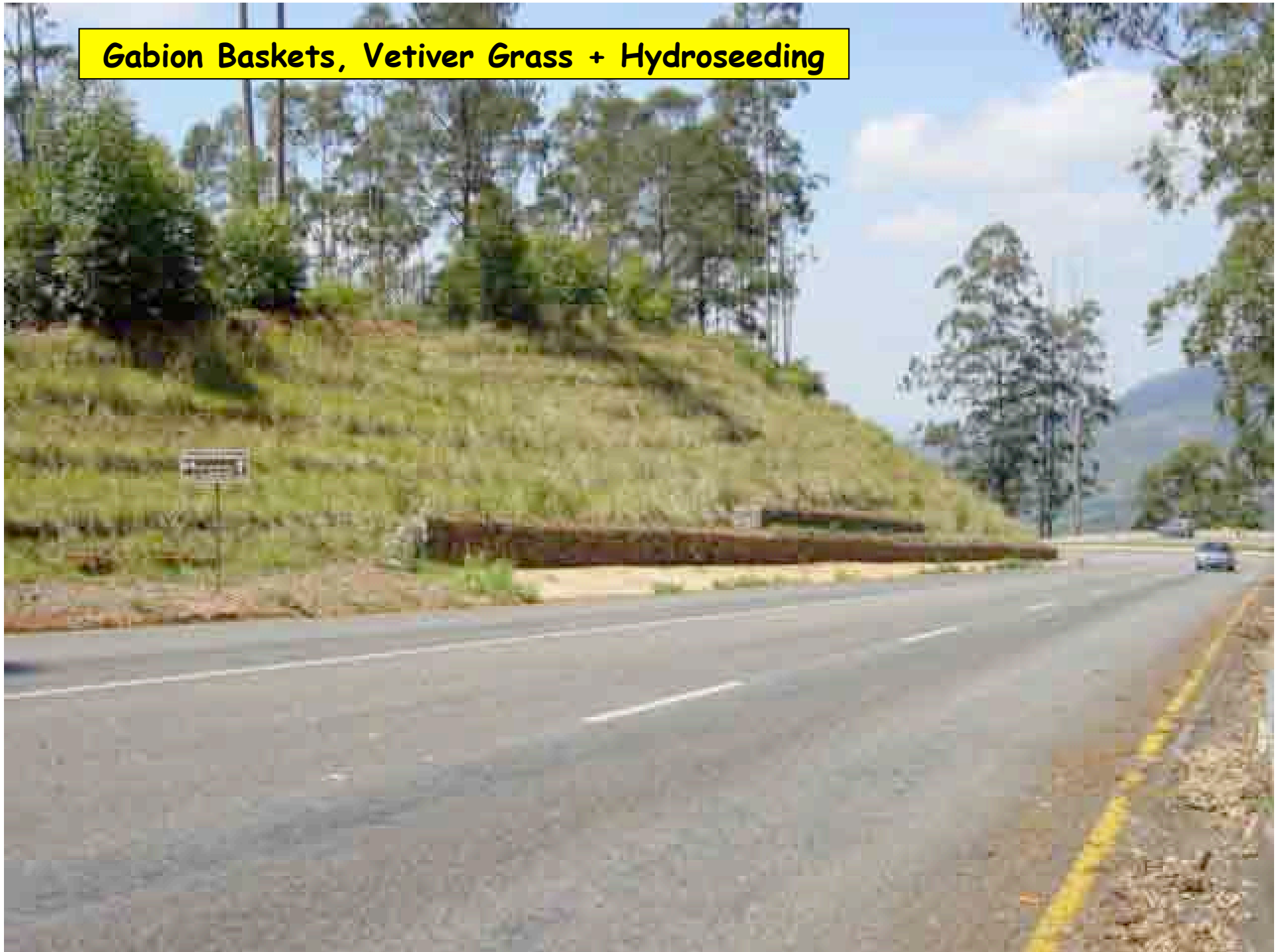


**After**

**Green Terramesh  
Re-constructed &  
Re-vegetated Fill**



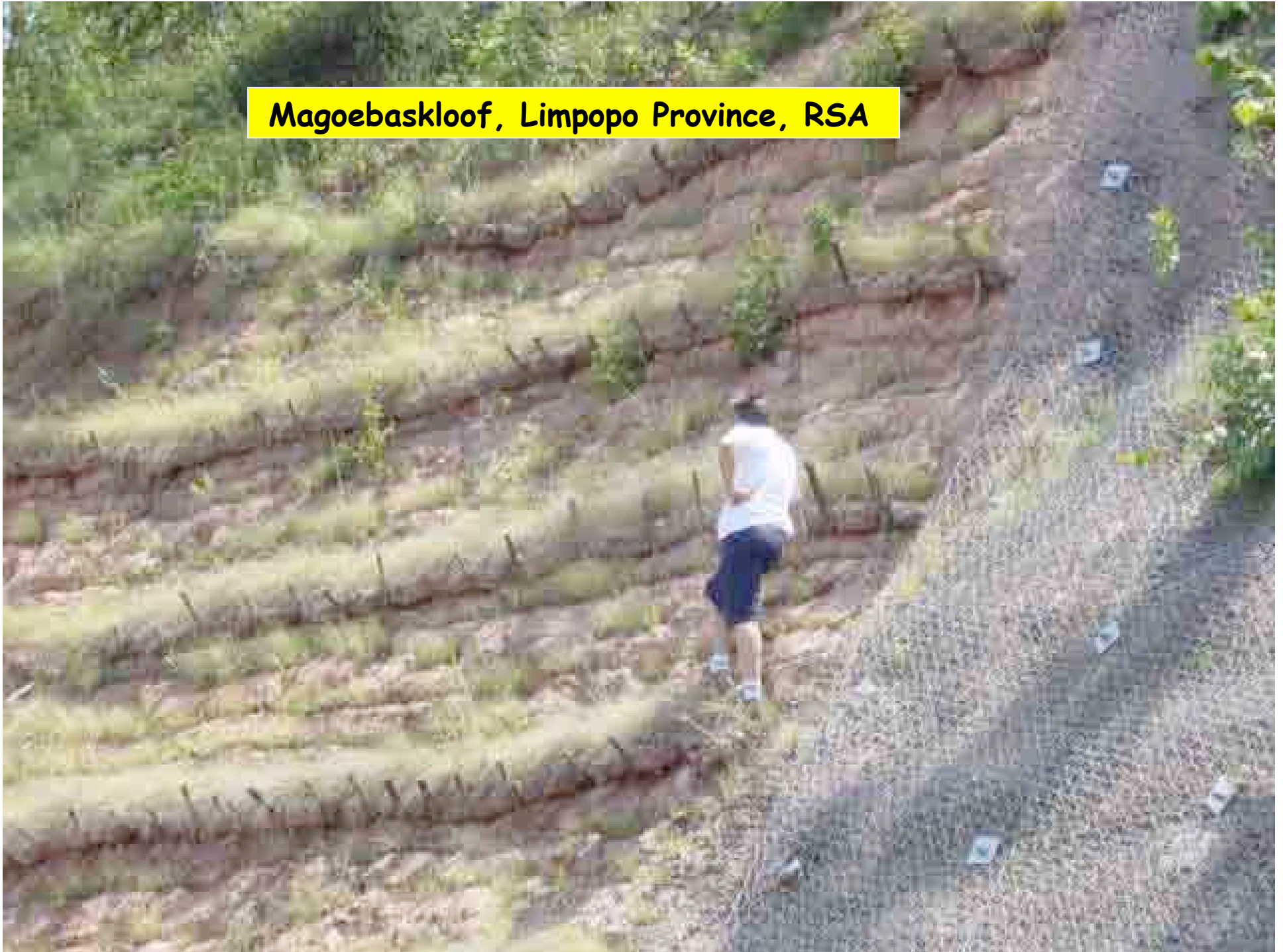
**Gabion Baskets, Vetiver Grass + Hydroseeding**



**Magoebaskloof, Northern Province, RSA**



**Magoebaskloof, Limpopo Province, RSA**



Magoebaskloof, Northern Province, RSA





## **In Conclusion**

**Vetiver grass has many wonderful applications  
and is also used in phyto-remediation,  
waste water treatment  
and  
pest management of agricultural crops.**