

THE VETIVER SYSTEM

VETIVER GRASS

TECHNOLOGY

Technology Characteristics



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The Vetiver Network

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Background

- **Characteristics of an ideal grass for bio-engineering**
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 - **Origin & genetic characteristics**
 - **Soil conservation methods**



Characteristics of an Ideal Plant for Bio-engineering

- Its seeds should be sterile, and the plant should not produce stolons or rhizomes that could become invasive or weedy.
- Its crown should be below the soil surface so that it can resist fire and overgrazing.
- It should be capable of forming a dense, ground level permanent hedge, performing as an effective filter, preventing soil loss from runoff. (Apparently only clonal material seems to be able to grow 'into' each other to form such a hedge).
- It should be perennial and permanent, capable of surviving as a dense hedge for decades, but only growing where we plant it.



Characteristics - Continued

- It should have stiff erect stems that can withstand a water flows of at least 1 cusec (.028 cumecs) 12 inches (0.3m) deep.
- It should exhibit xerophytic and hydrophytic characteristics if it is to survive the forces of nature.
- It should have a deep penetrating root system, capable of withstanding tunneling and cracking characteristics of soils. The roots should penetrate vertically below the plant to at least three meters.
- It should be capable of growing in extreme soil types, regardless of nutrient status, pH, sodicity, acid sulphate or salinity, and toxic minerals. This includes sands, shales, gravels, even more toxic soils and mine tailings.



Characteristics - Continued

- It should be capable of developing new roots from nodes when buried by trapped sediment, and continue to grow with the new ground level, to eventually forming natural terraces.
- It should not compete with the crop plants it is protecting.
- It should be free of pests and diseases.
- It should be capable of growing in a wide range of climates -- from less than 300 mm of rainfall to over 6,000 mm -- from temperatures of -15°C to more than 55°C . It should be able to withstand long and sustained droughts (>6 months).



Characteristics - Continued

- It should be inexpensive and easy to establish as a hedge and easily maintained by the user at little cost.
- It should be easily removed when no longer required.

Vetiver grass has all these characteristics.



The Basic Vetiver Grass Technology

The Vetiver Grass Technology (VGT), in its most common form, is simply the establishment of a narrow (less than 1 meter wide) live stiff vetiver grass barrier, in the form of a hedge, across the slope of the land. When applied correctly the technology is effective on slopes from less than 1 to over 100%. A well-established vetiver grass hedge will slow down rainfall runoff, spreading it out evenly, and will trap runoff sediments to create natural terraces. In addition its massive root system will increase the shear strength of soil (thus providing improved stability of soils on steep slopes).



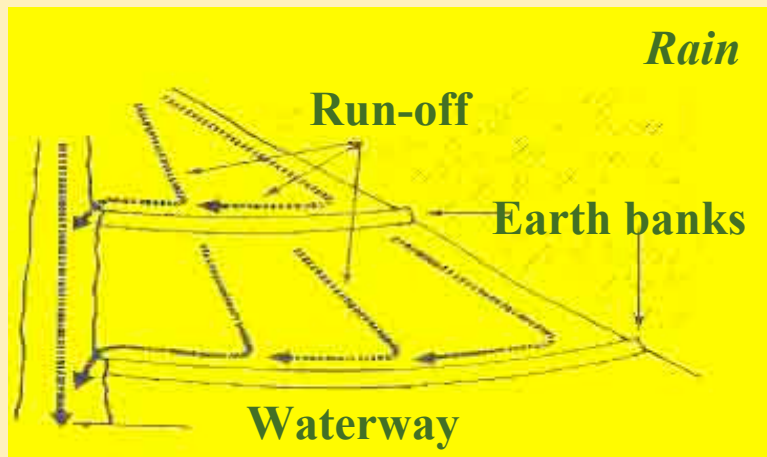
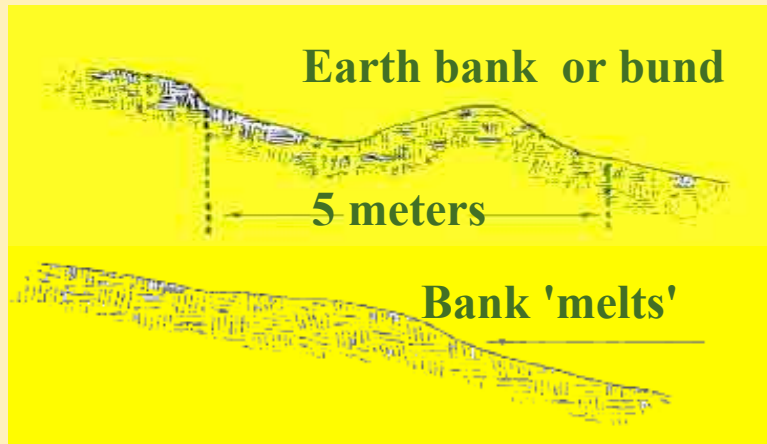
Origin and Genetic Characteristics

- **Native of India**
- **Promoted in the 1980's by World Bank for soil conservation**
- **Southern India, sterile, genotype used in more than 120 countries**
- **DNA typing shows conformity of principal genotypes globally**

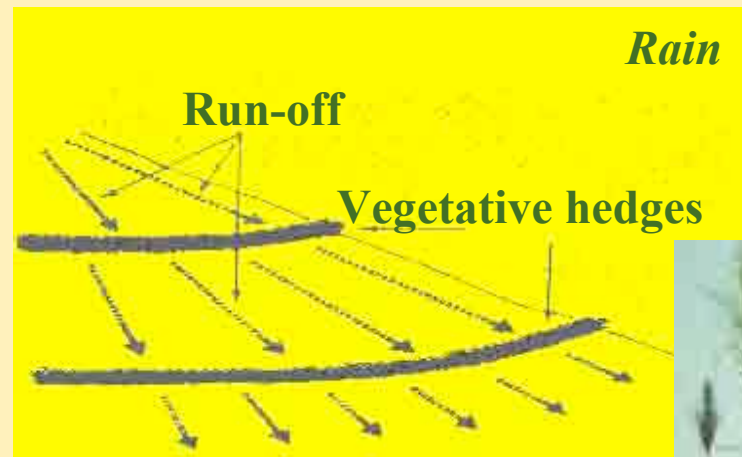
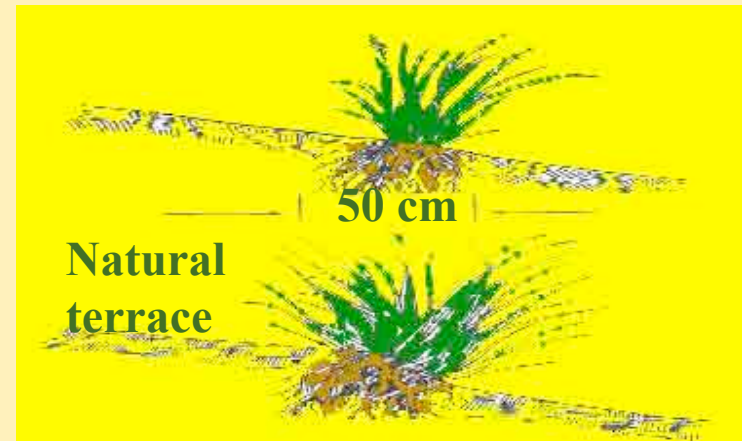


Soil Conservation Methods

CONSTRUCTED



VEGETATIVE



Morphological characteristics

- **Erect and stiff stems**
- **Deep, dense and penetrating root system**



Erect and Stiff Stems



Vetiver

2m tall hedgerow



Deep, Dense and Penetrating Root System



**One year
plants**

**3m deep
roots**



Physiological Characteristics -1

- **Soil conservation**
- **Resilient to strong water flows**
- **Hedgerow barrier**
- **Nutrient filtration**



Soil Conservation



Young
Vetiver
trapping
gravel



Resilient to Strong Water Flows

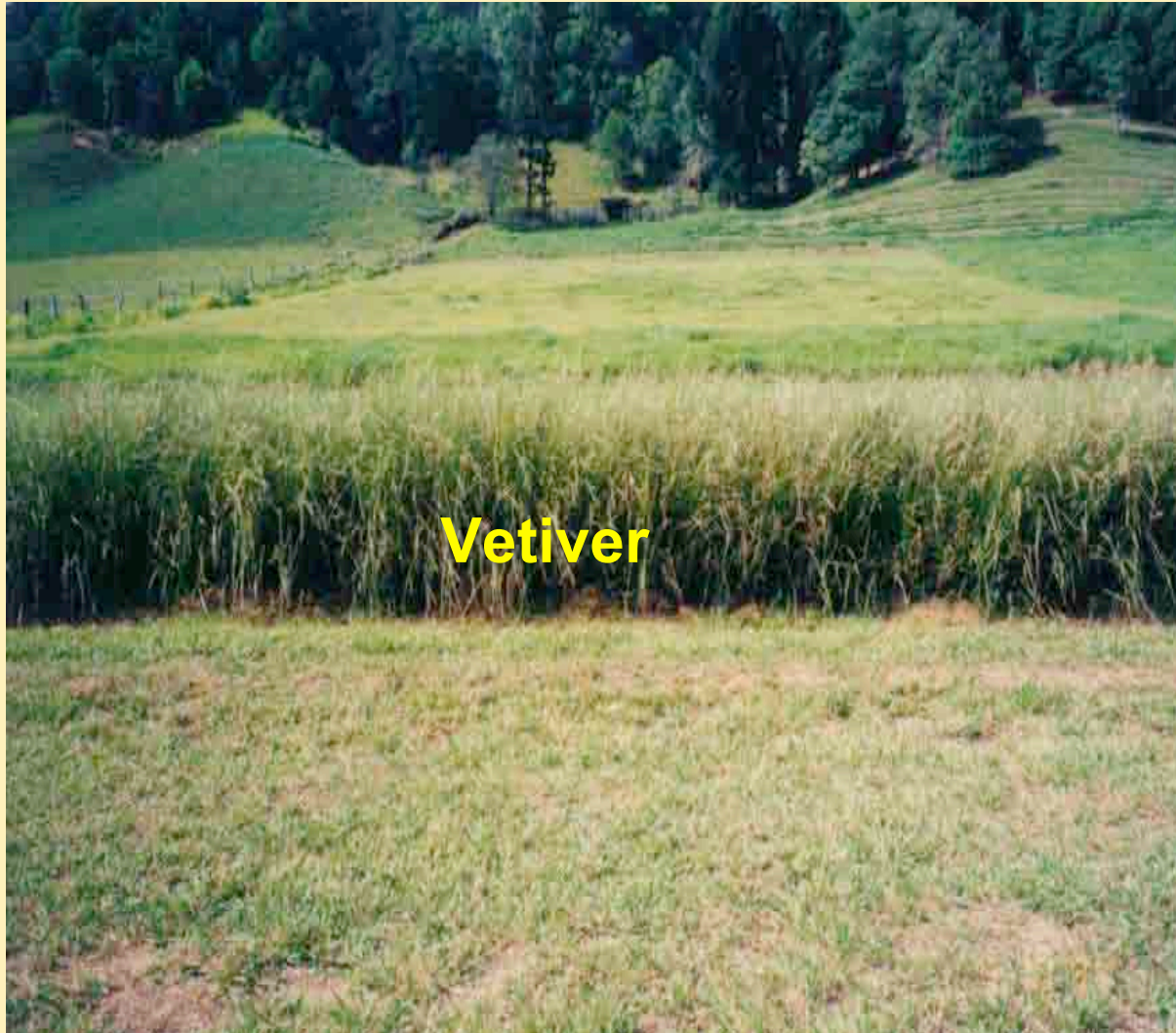


Other grass

Vetiver



Hedgerow Barrier



Nutrient Filtration



Physiological Characteristics - 2

Tolerant to:

- Cold and hot weather
- Fire
- Water logging, inundation
- Salinity
- Acidity/Alkalinity
- Aluminium and Manganese
- Heavy metals
- Herbicides/Pesticides



Frost Tolerance



**-14°C
killed top
growth**



**Full
recovery
3 months
later**



Fire Tolerance



**Vetiver can
be burnt**



**Good
recovery
5 months
later**



Water Logging Tolerance



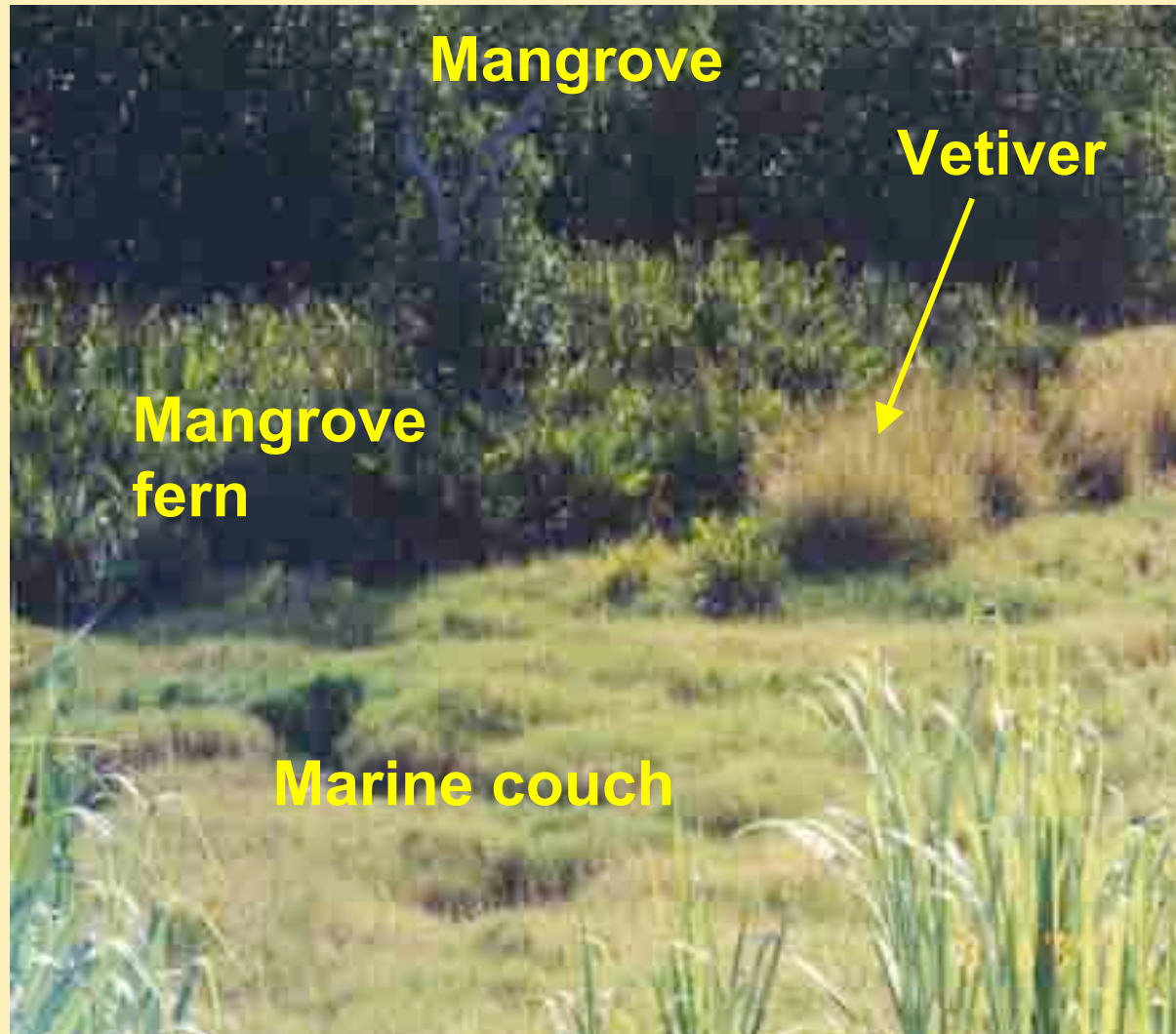
Salt Tolerance - 1

Saline threshold level is at $EC_e=8 \text{ dsm}^{-1}$, and vetiver can
at 47.5 dsm^{-1} under dryland salinity conditions

Half sea water



Salt Tolerance - 2



Mangrove stands

Fiji



Acid Soil Tolerance



Erodible
acid sulfate
soil
Costal
Queensland



One
year
later



Two
years
later



Herbicide Tolerance



REFERENCES

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- **Vetiver Grass - An Essential Grass for the Conservation of Planet Earth. John C. Greenfield**
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