Keynote Presentation

Vetiver Grass, a Unique Plant, with Pan Tropical Applications that are Essential for Africa.

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Extended Abstract

Vetiver grass, *Chrysopogon zizanioides,* is an ancient plant with its center of origin in south Asia. The non-fertile partially domesticated plant was disseminated around the tropics and semi tropics by the colonial powers and indentured labor mainly for its aromatic oil located in the plants roots. Virtually every exotic perfume contains oil of Vetiver.

There is another Vetiver grass, *Chrysopogon nigritana*, indigenous to Africa; however it is a fertile grass (potentially invasive) that has proven to be less robust than *C. zizanioides*. This grass has its origins in the Zambezi and Niger floodplains.

Although indigenous people of south India and some African countries have used Vetiver for medicinal and other uses for centuries, it was not identified as a useful soil conservation plant until about the 1930's, and even then it was relegated to the background in favor of engineered contour bunds and water ways. In the 1980's John Greenfield and I, working for the World Bank in India, reintroduced the Vetiver hedgerow concept as a long lasting and very effective measure for the conservation of on farm soil and water. Since then we have come a long way and the Vetiver System, as it is now known has many different applications that extends far beyond the original soil and water application.

A Unique Plant

Unlike many other plants, Vetiver when planted as a narrow hedgerow on the contour will form a very dense and self-regenerating hedge that acts as a barrier to down slope movement of rain water, spreading it out and slowing it down so that erosion sediment is retained (up to 90%) behind the hedge barrier. Over time natural terraces are created as part of the hedgerow, this results in further reduction in runoff reduction, and less erosion. In addition because of the uniqueness of the plant's deeply penetrating roots water runoff is significantly reduced (by as much as 70%) and aquifer recharge occurs that results in better stream flow and higher ground water tables.

These characteristics are significant, but when one learns that the plant will grow under almost any soil and climate conditions its usefulness is compounded many times. Vetiver will tolerate: soils with pH ranging from 3 to 11; extreme temperature -15º C to 55ºC; drought and complete submergence for months; most heavy metals; high levels of nitrates and phosphates; fire; infertile soils; insects and pests; and overgrazing and general abuse. Most importantly because of its sterility and lack of rhizomes it is **not invasive**. In addition Vetiver's average root tensile strength is 75 MPa, equivalent to 1/6

of mild steel, and when planted on slopes it will improve the shear strength of soil by as much as 40%.

Applications

Thus we have a plant that when planted in the correct configuration can be used over a wide range of applications that include soil and water conservation in agriculture; slope stabilization of important infrastructure (roads, railways, canals, drains, building sites); pollution control relating to the prevention and improvement of contaminated water and land; and the mitigation of potential disasters caused by extreme rainfall events. Apart from these major uses Vetiver grass has other community orientated uses including, medicinal, handicrafts, thatch, forage, mattress filler, mulch, fuel, and for social events.

The Vetiver System's many application components have been extensively researched by many institutions, and most of this work has been documented by the Vetiver Network International on its website at http://www.vetiver.org (see attached summary of links).

Some key centers for research include: India (aromatic oils and soil and water conservation); Thailand (soil and water conservation; slope stabilization, wastewater treatment, mine rehabilitation and other uses including handicrafts); Malaysia (the Vetiver plant and its management); China (slope stabilization and pollution control); Vietnam (disaster mitigation); and Australia (phytoremediation, and flood control).

Although more research is always useful, in the case of the Vetiver System, where research has been extensive, we are confident that so long as the correct Vetiver cultivar (originally from south India) is used, and the plant is correctly applied, the expected results will be obtained. Failure is generally the fault of the user and not the technology.

The Vetiver System and Africa

Climate change, expanding populations, accelerating food crisis, declining land and water resources, water related health problems, and now serious world wide economic recession, will together create an enormous challenge for Africa's political and community leaders. Unless measures are taken and taken quickly the future for most people on the African continent will be worse than bleak – in one word – disastrous!

As city life becomes impossible people will move back to already overcrowded rural areas (already happening in China) thus exacerbating current demand for diminishing resources. Unless rural Africa can reduce soil erosion and loss infertility, and improve rainfall retention there will be catastrophe. There are many interventions possible, but one of the best that is already used in some parts of Africa is the Vetiver System. Why? **It is low cost, easy to apply, and it works**. In addition it is **multifunctional and can be relatively quickly applied and up-scaled**. As will be discussed in this workshop this multifunctionality is well proven as in Mettu District, Ethiopia, where soil erosion has been halted, groundwater and wetlands have been regenerated, and crop yields have improved significantly (by 50%). Vetiver grass has become an important **community asset**. When applied to other sectors such as roads, wastewater treatment, flood control, and land reclamation, Vetiver not only results in

economic savings but also provides a potential source of employment and income for private sector plant propagation and application.

If the technology has such potential why is it not being used more??

Recently the Vetiver Network International carried out a small survey. Here is a summary of the feedback ranked in order of importance:

1**. Lack of knowledge and technology dissemination**: This covers a wide range including ignorance of the technology by administrators, policy makers and planners, uninformed technical professionals and lack of profession endorsement, teaching and learning limitations in universities and schools, limited press coverage, absence of mass marketing, lack of publications (language barriers), and not using modern marketing tools.

2. **Leadership**: New technology introduction requires farsighted leadership with vision and commitment. A committed lead organization is required. Good NGOs and private sector companies can often do this best. Commitment is rarely found in government organizations.

3**. Corruption**: Not always, but generally VS is seen as a low cost technology that does not attract high budget allocations, and therefore the opportunities and attractiveness for corrupt practices are much less than for high cost alternatives.

4. **Technology**: Majority of solutions have in the past an engineering base. Most engineers have not been trained in bio-engineering solutions, particularly those that are low cost. Low cost biological solutions are often seen as too simple and as such are unattractive. Again applying low cost solutions result in lower fees for designers and executing contractors. Many higher cost engineering solutions do not always last long and have to be replaced. – that is good for business! Or as quoted in China "if the slope stabilization does not fail then what shall we eat"!

5. **Specifications**: Engineers in particular like clear specifications. Specifications and standards should be followed – bad application generally results in failure and detracts potential users. Site specificity is important. Often rather general standards are given and followed, and if not properly supervised and fine-tuned can lead to failure.

6**. Multipurpose use**: Two sides to this one. For some potential user groups such as railway and highway engineers it is best to have narrowly focused workshops and training on the application at hand. For other users such as farmers and rural planners there is a need to look at the wider aspects and the multi benefits that are possible from VS. In other words sometime the focus and the message are not right.

7**. Plant Propagation**: Because Vetiver has to be vegetatively propagated an upfront investment and lead-time is required. This can be a detraction. However there are plenty of demonstrations showing that small farmer private nurseries can be quickly established if there is a guaranteed market.

8. **Invasive species and native plant syndrome**: This is more of a problem in developed countries. Sometimes deliberate miscasting of Vetiver as an invasive species (this has quieted in recent years). Many government projects in the US and Australia will only use native plants. Also entrenched vested interests in other more "profitable" technology work hard to keep VS out and the "invasive" slur is a handy tool to frighten

unaware decision makers.

9. **Research**: Some research has been very adequate, in some cases government research staff have shown little interest – conflicting agendas, jealousy, scientists without vision, research lagging behind field developments.

10. **Silver bullet**: Overselling technology, this can be a problem. But generally occurs when the recipient is looking for problems. VS will do many things, but is sometimes deliberately misapplied in the hope of failure – then the silver bullet has failed. However there are cases where Vetiver has been used in very marginal climatic areas (arid) with poor results. (Note: the terminology – magic grass, wonder grass– were not invented by TVNI)

11. **High profile demonstrations and projects**: In some countries the lack of large scale examples can result in lowering of potential user interest.

12. **Economic benefits**: Economic benefits are not always obvious to the user, particularly small farmers with limited education. Larger users need to understand the benefits and value of VS.

Most of these problems are surmountable particularly if Government, NGOs, the private sector and communities are prepared to work together.

There are a growing number of people in Africa who are demanding action. Proper expansion of the Vetiver System in Africa could be the quickest, most effective and least cost way of improving soil and water conditions for the continent.

References

VETIVER THE PLANT
The Vetiver System http://www.vetiver.org/g/archives_VS.htm
The Vetiver Plant http://www.vetiver.org/g/archives_plant.htm
Propagation and Planting of Vetiver
http://www.vetiver.org/g/archives_propagation.htm
Vetiver Plant Suppliers http://www.vetiver.org/g/plant_suppliers.htm
Bibliographical Information http://www.vetiver.org/g/archives_bibliography.htm

MISCELLANEOUS SECTION
Conferences http://www.vetiver.org/g/archives_conferences.htm
Data Base http://www.vetiver.org/g/archives_data-base.htm
Disaster Mitigation http://www.vetiver.org/g/archives_disaster-mitigation.htm
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Vetiver Suppliers and Consultants http://www.vetiver.org/g/plant_suppliers.htm

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http://www.vetiver.org/g/archives_agric_crop_prod.htm
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Medicinal and Insecticidal Uses of Vetiver
http://www.vetiver.org/g/archives_medicinal.htm
Soil and Water Conservation Applications of Vetiver
http://www.vetiver.org/g/archives_soilconservation.htm
Vetiver Plant, Agronomy and Research
http://www.vetiver.org/g/archives_plant_agronomy.htm
Propagation and Planting of Vetiver
http://www.vetiver.org/g/archives_propagation_planting.htm

INFRASTRUCTURE PROTECTION AND STABILIZATION
Slope Stabilization (Building Sites, Highways, Road and Railway Cut and Fill)
http://www.vetiver.org/g/archives_propagation_planting.htm
Slope Stabilization for Rivers, Ponds, Reservoirs, and Flood Protection
http://www.vetiver.org/g/archives_slopestabilization_rivers.htm
Slope Stabilization for Public Utilities (Pipelines, Power Lines, Water Carriers, and other Right of Ways) http://www.vetiver.org/g/archives_slopestabilization_utilities.htm

LAND REHABILITATION AND MINING
Land Rehabilitation http://www.vetiver.org/g/archives_landrehabilitation.htm
Mine and Quarry Rehabilitation
http://www.vetiver.org/g/archives_minerehabilitation.htm

LANDSCAPING
Landscaping http://www.vetiver.org/g/archives_landscaping.htm

POLLUTION AND WATER QUALITY
Landfill Stabilization and Leachate Control
http://www.vetiver.org/g/archives_landfill_leachate.htm
Pollution - Effluent Control (Water Quality Improvement)
http://www.vetiver.org/g/archives_pollution.htm

Brief Introduction to the Speaker

Dick Grimshaw graduated from London, Cambridge and The University of the West Indies in temperate and tropical agriculture. He joined the Zambian Agriculture Department in 1964, first as an extension worker then in Land Use Planning and Soil Conservation. In 1966 he joined the World Bank and was posted to Nairobi for 6 years. From Nairobi he worked on Bank financed projects in Eastern and Southern Africa and was directly involved with the Sodo Wollamo ADP, the dairy project and Sidamo coffee project – all in Ethiopia. In 1972 he started working in West Africa – notably in Nigeria where he was responsible for many agricultural projects. Following West Africa he was posted to India for five years (where he first learned about Vetiver Grass); thereafter until his retirement he was Chief of the World Bank's Agricultural Technical Division for Asia.

On retirement in 1994 he established the Vetiver Network (International) as a non-taxable foundation. Since then he has been responsible for the development of the Network that now extends to all parts of the tropics and semi tropics. He lives on the North West coast of the USA in Washington State