

PAST ACHIEVEMENTS AND FUTURE DIRECTION OF THE VETIVER NETWORK INTERNATIONAL (TVNI)

Richard G Grimshaw O.B.E.
Director and Founder of TVNI
Email: <dickgrimshaw@Vetiver.org>

History and Achievements

Vetiver Grass Technology (VGT) for erosion control is not a new. Vetiver was used for erosion control, bank and channel stabilization for centuries in India. The British colonial agricultural services promoted Vetiver hedgerows for erosion control in the 1930s, particularly in the Caribbean and Mauritius. In the 1950s the Fiji Sugar Corporation used similar hedgerows extensively to protect sugar cane fields on steep slopes - some were still there 30 years later despite lack of care and maintenance. During this post war period “hard” engineered systems, following patterns developed in the USA, gained ascendancy and complimented age-old terrace systems that had been used for centuries in many parts of the world. Unfortunately these systems did not always work, and they became more expensive to construct and maintain.

What changed? In the early 1980s John Greenfield from New Zealand, who had worked with the Fiji Sugar Corporation in the 1950s, joined the World Bank team in India where he introduced Vetiver hedgerows quite widely to four or five large watershed development projects. He authored a small handbook for farmers and extension workers - “Vetiver Grass – A Hedge Against Erosion”. This served as a basis to extend the technology to other tropical countries (translated and published in at least 20 languages). At the same time some Indian universities undertook research into the effectiveness of Vetiver hedgerows for soil and water conservation. In a nutshell the results showed more than 90% reduction in soil loss and up to 70% reduction in rainwater runoff. In effect Vetiver hedgerows along with contour farming cultivation virtually provided a drought proof cultivation system that was low cost, easy to learn, and one that worked.

In 1989 the US Academy of Science set up a committee, under the chairmanship of Dr. Norman Borlaug, to review the Vetiver Grass Technology (VGT) for soil and water conservation. The outcome of this review was very positive, and its findings were published in the book “Vetiver Grass – A Thin Green Line Against Erosion”. Links to these and other publications area at: <http://www.vetiver.org/g/pubs.htm>

The historical development of VGT follows a timeline that has a significant relationship to various Vetiver workshops, conferences, and individuals – summarized in Attachments 1 and 2.

For a while (from 1989) the World Bank expanded its support for VGT, and produced a newsletter – The Vetiver Information Network Newsletter (Jim Smyle, now TVNI President, was the first editor) - http://www.vetiver.org/TVN_newsletter_index.htm. These newsletters can be found at: http://www.Vetiver.org/TVN_newsletter_index.htm.

In 1988 Grimshaw visited China and introduced the technology to the red acidic soils of south China – now used in most southern provinces for various applications. Liyu Xu (Nanjing Soils Institute) and Xia Hanping (South China Institute of Botany) both played critical roles in both applying and researching VGT.

In the early 90's Dr. P.K.Yoon of the Rubber Research Institute of Malaysia undertook some seminal trials on Vetiver grass and its applications. This practical work "A Look See At Vetiver Grass in Malaysia is at:

http://www.Vetiver.org/MAL_PK.Yoon%20Look%20see/START.HTM

At about the same time the King of Thailand became interested in VGT and he set out to test and verify its uses and benefits on his research farms. Thereafter he pressed his government and the Royal Development Projects Board to start extending the technology in Thailand. Another Thai, Diti Hengchaovanich, a highways engineer working in Malaysia, together with P.K.Yoon, commissioned research into the strength of Vetiver roots and its impact on the shear strength of soil. The results were impressive. Vetiver roots had on average a tensile strength equivalent to mild steel - 65 Mpa (psi = 9427 lbs. per square inch) and improved the shear strength of soil by as much as 45%. Currently one of the leading advocates for slope stabilization using VS is Roley Nuffke of Hydromulch, South Africa – he can take great credit for its successful use for highway stabilization and mine rehabilitation in many parts of Africa. A recent online photo essay http://www.vetiver.org/Geotropism_L.pdf "Geotropism of Vetiver" by Paul Truong summarizes the progress of VS for slope stabilization.

From 1995 to now steady gains have been made in broadening the application of the technology. Paul Truong and his colleagues in Australia, Xia Hanping of China, and scientists in Thailand and Vietnam expanded research into Vetiver's tolerance to and uptake of heavy metals. VS applications for: stabilizing landfills and dealing with leachate effluent (Australia, China, Thailand, USA and Mexico); mitigating and stabilizing mining wastes and sites (Australia, CAR, China, India, South Africa and Venezuela); processing wastewater from homes and sewage processing plants (Australia, Indonesia, India, Nepal, Peru, Thailand, Vietnam), were initiated with a good deal of success.

Bi-product use of Vetiver is of increasing importance and interest, as research and demonstration showed its potential as a forage (Australia, China, India and Vietnam); mulch (China, Ethiopia, India, Vietnam); biofuel (Dominican Republic, Haiti); and a material source for handicrafts (China, India, Thailand, Venezuela) – it should be noted that Thailand pioneered this Vetiver based handicraft industry and provided Thai technical help to teach others. As farmers started to see the potential use of bi-products their interest grew in the use of Vetiver for erosion control (Ethiopia, China, Haiti, Indonesia, India, Kenya, Malawi, Madagascar, Philippines, Tanzania, Thailand, Zambia, Zimbabwe, South Africa, Venezuela, and others). Most importantly small farmers have shown that they can produce Vetiver as a high quality commercial crop - Vetiver plant material - for sale for commercial/development applications of VS.

Over the past 30 years the Vetiver System - VS - (the generic name for all the different VGT applications) has grown and is used today in its many forms in most tropical and

semi tropical countries as well as niche areas in more arid regions (Mediterranean, California, Kuwait, Iran and Turkey).

In summary by 2015 some 30 years after the World Bank/Greenfield initiative in India VGT has proven to have great potential for a number of important applications involving agriculture, infrastructure, land rehabilitation, pollution control, mining, health and various other social and economic uses. It is an environmental technology that has significant cross sector implications with the potential of one application driving another. See Attachment 3 shows cross sector relationships between Vetiver applications and grower/user benefits

How did we get there?

After retiring from the World Bank Dick Grimshaw founded a nonprofit organization (NGO) to solely focus on VGT. The Vetiver Network, later renamed - The Vetiver Network International (TVNI) - was registered as a Virginia, USA, company with 501 3 c tax-free status in 1995.

Getting information out to the public was first priority: first through the publication, twice a year, of an extensive newsletter (each 80 pages or more) http://www.Vetiver.org/TVN_newsletter_index.htm) that documented ongoing research, feedback from field programs, and general commentary. Soon this was supplemented by a website (www.vetiver.org); eventually the newsletters were phased out and the website became the main source of VGT info for the public. In 2006 Paul Truong, Elise Pinner and Tran Tan Van authored a new Vetiver manual – “Vetiver System Applications – Technical Reference Manual”, covering all aspects of VS, and translated now in nine languages. In more recent years we have established a blog <http://vetivernetinternational.blogspot.com/> and a Facebook page <https://www.facebook.com/groups/vetivergroup/>. Vetiver Grass Facebook page has become an important place where VS users can exchange experiences and ideas. With the advent of social networking we have encouraged country networks, individuals and entrepreneurs to create their own dedicated Vetiver Facebook pages and blogs. Some of these are listed at: <http://www.vetiver.org/g/other.htm> and at the last count there were more than 20 group Vetiver sites and many more individual sites. Most of this effort has cost nothing or very little, thanks to Google and Facebook. Our manuals can be bought from Amazon.com, but all are available and downloadable electronically, at no cost, via our website. Currently we are starting to revise these manuals to include more current information.

After establishing the information transfer processes, TVNI encouraged multilateral development agencies, governments, NGOs, and the private sector to start using the technology. NGOs quickly saw the advantage of VS for soil and water conservation for small farmers as the technology does not depend on complex and costly technical support, and it was easy to introduce. (Vetiver grass, *Chrysopogon zizanioides*, was fortunately introduced to most tropical countries in colonial days for the oil of Vetiver, extracted from its roots, and thus the plant was available in most tropical countries).

In parallel to developing actual applications in the field it was important to encourage research at national level. This was achieved: through the efforts of individuals who saw

the benefit of VS and were in a position to encourage local universities and institutions to take up Vetiver research; by including Vetiver research in development project funding; by TVNI research grants; the establishment of TVNI Awards program that awarded cash prizes of up to US\$5,000 (totaling USA\$40,000) every four or five years for various categories of research - the latter was a useful carrot; and encouraging graduate students to undertake research in Vetiver for their PhD thesis. His Majesty the King of Thailand established “The King of Thailand Awards” for outstanding proficiency in Vetiver. Valued at \$10,000, the awards are made at the time of International Vetiver Conferences that have always been attended by TVNI Patron - Her Royal Highness Princess Maha Chakri Sirindhorn of Thailand - representing her father, the King.

The main centers of research have been in India (agricultural universities), China (primarily the South China Institute of Botany), Australia (University of Southern Queensland), Vietnam (Cantho University), Thailand (universities and government research centers), Malaysia (Rubber Research Institute), and other research centers in Kenya, Kuwait, Ethiopia, Nigeria, and The Netherlands. More recently as the technology has spread to the Americas, research has been carried out in Costa Rica, Honduras, Guatemala, Venezuela, Chile, Brazil, Colombia and the USA. Additionally there has been a lot of practical experimentation by users that have led to the use of modified applications and techniques. A recent study and report by USDA/NRCS in Hawaii titled “Sunshine Vetiver – Plant Guide” was very positive, and importantly confirmed Vetiver’s non-invasive characteristics. http://www.Vetiver.org/USA-USDA-NRCS_Sunshine.pdf . Most of these studies are documented on TVNI’s website. And at the latter’s associated library at: https://www.zotero.org/groups/Vetiver_network_international

TVNI has used the venue of Vetiver specific workshops and conferences to bring to the to the public the results and impact of the activities mentioned in the preceding paragraphs. These gatherings have often jump started regional expansion of Vetiver and have been held in all the main regions including Central and South America, South and East Asia, Africa and the Middle East. It should be noted that the Thai Royal foundation – “The Chaipattana Foundation” has financially supported all the International Vetiver Conferences (ICVs) that have been held every four or five years. The first two were held in Thailand (1966 and 2000), the third in China (2003), the fourth in Venezuela (2006), and the last in India (2011), and now this one in Vietnam (2015). The complete proceedings for these conferences (and workshops) are at: <http://www.Vetiver.org/g/conferences.htm>.

TVNI manages a certification program that certifies an individual’s technical capability in specific aspects of VS. The certified people are listed on our website. This certification process is a start towards professional recognition and will soon be upgraded.

Lessons Learned

Some interesting facts and lessons have emerged from TVNI’s various initiatives, these include amongst others:

- VGT characteristics and applications are scientifically well supported and verified under different climatic and ecological conditions.
- The adequate availability of Vetiver plant material is a prerequisite to any VS program however big or small. The demand for plant material will increase substantially and it needs to be propagated near the application site. Small farmers can be easily taught to produce high quality Vetiver plant material often providing a substantial increase in income.
- The main VS applications relate to soil and water conservation (including groundwater recharge and flood control), contaminated land and water remediation (including pollution control and waste water treatment), and slope stabilization associated with infrastructure and natural systems such as riverbanks and gullies.
- There are many interesting bi-products of Vetiver that are being used, tested and developed.
- Small farmers have been slow to use VS for erosion control for many reasons; this reluctance could be reduced through wider dissemination of information, better training at community level, and a better appreciation of the many applications and uses of Vetiver.
- VS should not be a technology confined only to agricultural and soil conservation staff and engineers. In many countries soil conservation is the responsibility of national and provincial conservation departments who have a focus on “hard” engineering, and often have narrow interests that do not include the wider aspects of farming and the community development.
- When VS is applied for infrastructure – slope stabilization or waste and water remediation - it is important that proper technical verifiable specifications are clearly established.
- The private sector has a major role to play in extending the technology and encouraging government policy makers and agencies to use it.
- Workshops and conferences are important for furthering the technology, and should be continued.
- The Internet has been and will continue to be critical to the success of VS in providing information on the technology and for providing the means for social networking and interaction.
- The 100% volunteer culture of TVNI and its associates has helped assure a common trust amongst users that has resulted in an unprecedented sharing of information and experience that to my knowledge has not been duplicated.

What Next for the Vetiver System

At this time of: climate change and the associated extreme weather conditions; a world population expansion that can hardly feed itself and one that is using its land and water resources at an unprecedented rate; deteriorating quality of natural resources both in land and water; ever increasing costs of stabilizing and maintaining infrastructure; and continuing rural poverty and food insecurity, VS offers a well tested solution that can be applied over a wide range of conditions to help mitigate some of these problems.

In discussions with public, institutional, private sector entities, and communities we should highlight and pursue the following:

Agriculture:

- VS should be a key on-farm component (specially in the small farm environment) in addressing food security and long term land and fertility preservation. High yielding seeds and fertilizer are not enough, soil erosion and moisture conservation must be addressed, if the full benefits of genetic and cultural improvements of the former are to be achieved.
- The world's net increase in irrigable land will in the future be zero or negative, and therefore any major increases in food production will have to come from rainfed farming. VS conserves and improves soil moisture, recharges groundwater, and improves quality of associated water bodies.
- Small farmers can benefit by using the many bi-products of VS, and could greatly enhance their incomes if VS were to be widely used for infrastructure slope stabilization and for pollution control, with farmers and communities providing the necessary plant material.
- International and national development banks and other organizations such as the World Food Program, as well as the large food and health focused charitable organizations should, where relevant, expand their inclusion of VGT in their projects and programs.

Infrastructure:

- VS has been tested under practically every conceivable condition for slope stabilization (roads, railways, canals, drains, building construction sites, and levees). The applications are well documented. It is generally recognized that VS is significantly less costly (as much as 90% less) and often more effective than most other technologies. There is no reason why it should not be applied widely. In addition its use for slope protection would impact significantly on rural communities if the latter were contracted to supply the plant material, and of course those same communities should be paid to plant it. VS should be included in all designs where it could be appropriately be used.

Contaminated land and water:

- VS should be considered in design of industrial and urban scale wastewater treatment plants, landfills, and mine reclamation.
- VS is appropriate for treating black and grey water effluent from individual and communal units. In doing so smell and disease would also be reduced.
- Note that where they exist, many large scale, high tech conventional systems, fail because of the lack of maintenance and poor operation. The need is so great that even if successful the majority of the rural and urban populations are unlikely to be serviced in the foreseeable future. VGT based systems could be introduced widely if the effort was made to include them as part of national policy.

Land Rehabilitation:

- VS should be used for rehabilitating degraded lands, stabilizing gullies, and prevention of further degradation. VS could be used in association with reforestation projects providing: greatly enhancing tree growth and survival in the early years; and protection against erosion.

Vetiver bi-products:

- If used on large scale for the above applications there would be significant bi-products that could be utilized for: fuel, mulch, thatch, building materials (fiber board), paper, handicraft material source, and many other applications. All would provide additional income and cost savings to current alternatives. In addition large-scale use of VS will reduce destruction of forests and will increase the sequestering of atmospheric carbon.

What Next for The Vetiver Network International

The Vetiver System has become “main streamed” and is sufficiently well known to survive and expand, albeit slowly even without formal support from TVNI. TVNI has deliberately over the years put effort into getting others to take the VS lead in their communities; TVNI has no paid staff, no field offices or representatives (except for users in the field), and no rules of operation. In other words with minimal TVNI input, networks, at whatever level, and users make the decisions – even if we wished differently, we could not do otherwise!

This does not mean that TVNI should be diminished. There are still some interesting areas to explore, and TVNI can add much to this exploration. Currently under consideration are:

- (1) The development of an online training program in Vetiver technology. This initiative by Daniel Londono of Colombia may have important future impact. It is proposed to develop a series of training modules that make use of TVNI’s extensive “online library”. Those who participate will follow an online course that steers the student to appropriate documentation that when read and understood will assure a better understanding of Vetiver System applications. The student will have to pass an online exam, and on satisfactory completion will be certified as proficient. It is expected that this training will attract many potential Vetiver users, and should greatly improve the application process and the quality of application.
- (2) We need to give careful consideration to expanding Vetiver research. More research should be undertaken in areas that could compliment other mitigation actions relating to the use of our natural resources. For example: the use of Vetiver for energy both as a biofuel and as a feedstock for steam generation; the use of Vetiver for groundwater recharge and flood abatement; and Vetiver as a carbon sequester. We need research to better understand the interaction of Vetiver roots with soil organisms; and more as to the critical limits of VS for steep slope stability. These are but a few of many topics that need investigation.
- (3) As part of an expanding research program is the need to critically look at use of some of the other varieties and cultivars of Vetiver. Some of these are fertile, but have been shown to be in some cases, as effective as the non-fertile Vetiver that TVNI has promoted widely. Many African countries have *Chrysopogon nigritana* as a native variety. Generally it is not seen as an invasive weed. Much of the Vetiver research in Nigeria was based on *C. nigritana* with some impressive results both for erosion control and wastewater treatment. This research needs reviewing and expanding where necessary. Linked to this there is a great need to better identify (DNA testing) what variety/cultivar of Vetiver is

actually being used, and isolate those “plants” that have superior quality with regard to location and application for further investigation.

The past 30 years has truly been an interesting and challenging period of understanding this unique grass and seeing its wide application. I am sure we only know a small part of the story of VGT’s use – there are a lot of people using it now, and the world needs VGT as part of its survival kit.

Thank you

February 2 2015

ATTACHMENT 1

Vetiver Conferences and Workshops involving directly TVN funds, staff and associates. 1989 - 2015

Conference/ Workshop	Primary local institutions - initiators	Key Introductions	Impact
China – Jiangxi Fujian Workshop - 1989	World Bank Red Soils Project – R. Grimshaw	Introduction of Vetiver Technology to South China agriculture	Initiation of major vetiver initiative in China
Malaysia – International Workshop 1990	Rubber Research Institute of Malaysia – P.K.Yoon and R.Grimshaw	Vetiver basics, plant characteristics, erosion control, road stabilization	Initiation of use of vetiver in tropical plantations and research on tensile strength of vetiver grass roots, initiation of vetiver research in Australia.
Thailand – Workshop 1993	Thailand Land Development Department – Yoon, Grimshaw	Vetiver Basics and erosion control	Resulted in the start of a wide ranging vetiver research program in Thailand
1st International Vetiver Conference – Thailand. 1996	Royal Development Projects Department. The Chaipattana Foundation – HM King of Thailand	Vetiver Basics, erosion control, highway stabilization	Tensile strength of vetiver roots established leading to serious initiative in the use of vetiver for major highway stabilization in SE Asia. Initiation of Australian research on vetiver and heavy metals
Vetiver workshop – South Africa - 1996	Land Resources Institute, University of Petermaritzburg Grimshaw Truong Tantum	Vetiver Basics, erosion control, highway stabilization, mine stabilization	Establishment of Southern Africa Vetiver Network and initiation of soil erosion control programs in southern Africa (South Africa, Malawi, Zambia, Zimbabwe)
China Vetiver workshop - 1997	China Vetiver Network	Vetiver Basics, erosion control,	Confirmed a wide range of vetiver

	Fujian Workshop for South China Grimshaw	highway stabilization, salt water embankment stabilization, wind erosion	applications in China and expansion into Guangzhou Province
Madagascar Vetiver Workshop -1997	USAID – CAP project Madagascar – Criss Juliard Grimshaw	Vetiver Basics, erosion control, highway and road stabilization, irrigation and drainage stabilization	Created keen interest in vetiver applications in Madagascar leading to road and railroad stabilization programs
China Highway Vetiver Workshop - 1998	China Vetiver Network – Grimshaw Truong	Special workshop for highway engineers	Expanded highway applications in south China, leading to railroad stabilization
International Erosion Control conference Philippines 1999	International Erosion Control Association – P. Truong	Significant focus on vetiver	Expanded use of vetiver in Philippines and Indonesia
Vetiver Workshop Indonesia 1999	Philippines Vetiver Network – Ed Balbarino	Vetiver Basics, erosion control, highway and road stabilization,	Development of vetiver for poverty projects in East Bali and mining industry
Central America Vetiver Workshop 1999	Post Hurricane Mitch. Latin America Vetiver Network and World Bank. Smyle	Highway stabilization and Disaster mitigation	Expanded private sector involvement in all Central American countries
2 nd International Vetiver Conference – Thailand 2000	Royal Development Projects Board. The Chaipattana Foundation – HM King of Thailand	Vetiver Basics, erosion control, highway and road stabilization, river bank stabilization, pollution control, handicrafts and other uses	Resulted in expanded programs in China and SE Asia. Initiation of Vetiver Systems in Vietnam. Research into water quality improvement using vetiver
3rd International Vetiver Conference – Guangzhou China -2003	South China Institute of Botany, China Academy of Science, Guangzhou Academy of Science The Chaipattana Foundation	Wide range of vetiver applications, special focus on greening, municipal waste treatment and pollution control	Led to increased research in water quality improvement, sea dike and river bank stabilization, sand dune stabilization. Development of MEDLI criteria for wastewater treatment
Vetiver Workshop - The Democratic	USAID/TVN CLIFS Project, Dale	Range of applications – road	Initiation of a vetiver demonstration

Republic of the Congo - 2004	Rachmeler	stabilization, gully control.	program in the Congo and the establishment of numerous multiplication nurseries
International Vetiver Workshop Vietnam – Jan 2006	Canto University, Vietnam Vetiver Network. Government of the Netherlands, Elise Pinners, Paul Truong	Disaster Mitigation. Flood and cyclone damage	Expected to lead to expanded use of vetiver for sea wall and river bank stabilization in East Asia. Production of new technical manuals relating to engineering and water
Arab Region Vetiver Workshop – Kuwait – March 2006	Kuwait Foundation for the Advancement of Science. Grimshaw, Juliard, Truong	Focus on VS applications under hot arid conditions	Expected to lead to a program of research to test vetiver under near desert conditions, including constructed wetlands, oil pollution clean up.

4 th International Vetiver Conference – Venezuela October 2006.	Latin America Vetiver Network, Polar Foundation. The Chaipattana Foundation	Theme - vetiver and people	Expected to expand vetiver on a wider base in South America – rural poverty and environmental mitigation.
Vetiver Workshop – Morocco. November 2006	The Vetiver Network - Juliard, Truong, Rachmeler and private sector	Focus on water related issues – vetiver and pollution control	Initiation of the use of vetiver in north Africa particularly in the area of pollution control
First Indian National Workshop 2008	Indian Vetiver Network, Tata Company, Grimshaw, Truong, Booth, Liyu, Chomchalow, Haridas	Vetiver Systems Environmental Protection and natural Disaster Management	Initiation of a major new all embracing initiative for India (and start of research on climate change??)
Kenya Vetiver Workshop 2009	Kenya Vetiver Network, Grimshaw, Truong, Pinners	Introduction to the Vetiver system	Resulted in expanded use of VS in Kenya and the formation of PLUS Kenya. Private sector key to change

Ethiopia Vetiver Workshop - 2009	SLUF Ethiopia, Grimshaw, Truong, Pinners, Coppin, Ndonga	Review of VS for soil and water conservation in Ethiopia	Further expansion and move to use other vetiver applications
First Latin America Vetiver Conference – Chile -2010	Chile Vetiver Network, Chaipattana Foundation, Truong, Smyle	Review of VS operations in Chile and other Latin American countries, Focus on Bio-engineering	Led to significant increase in interest and action in Latin America
Fifth International Vetiver Conference – India - 2011	India Vetiver Network, TVNI, Chaipattana Foundation	Focus on climate change	Renewed focus and interest in disaster mitigation
Second Latin America Vetiver Conference – Colombo 2013	Colombo Vetiver Network, TVNI, Truong, Grimshaw, Noffke	Bio-engineering Waste water treatment, contaminated water and land	Further expansion and interest in Latin America – community and urban renewal expansion
Philippines Vetiver Workshop - 2014	Philippines Vetiver Network, Vetiver Farms, Truong, Chomchalow	Disaster Mitigation, waste water treatment and general review of the effectiveness of vetiver	Phytoremedial action followed this workshop together with expanded interest in the Philippines
Sixth International Vetiver Conference – Vietnam - 2015	Vietnam Vetiver Network, TVNI, Chaipattana Foundation	Sustainable Development	Upscaling? Research? Community expansion?

In addition to the above there have been many in country workshops not involving TVN or its staff and associates directly

ATTACHMENT 2: Timeline showing linkage between application, country, conference/workshop, and key players.



