VETIVER GRASS TECHNOLOGY NETWORKING AND ITS IMPACT ON THE ENVIRONMENT

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Abstract

Networking has proven to be a very effective, low cost, worldwide approach for the dissemination and exchange of information about vetiver grass technology (VGT). As a result over the past decade tens of thousands of users have applied VGT as a solution to a wide range of environmental problems. VGT has had, among others, significant impact in improving soil and water conservation, stabilizing manmade (engineered) slopes, rehabilitating land, including mines, wasteland and ravines, preventing floods and recharging groundwater.

VGT networking was initiated by the author in 1989 through the Vetiver Information Network (VIN) established under the Asian Region Agricultural Technical Division (ASTAG) of the World Bank. Initially networking was based on a biannual newsletter providing feedback from the field on research and development efforts relating to VGT. Over the next few years ASTAG staff, working mainly in Asia, took the opportunity to introduce VGT as a component (albeit minor) of agricultural and rural development projects funded by the World Bank. Thus it was possible to establish a basis for field development and feedback. At the same time VIN announced an award program (US$30 000), which was personally supported by His Majesty the King of Thailand in the form of the King of Thailand Vetiver Award, for effective VGT-related research. This provided an incentive for participating in the network and for some excellent vetiver research in Australia, India, Malaysia and Thailand. VIN also published a handbook, *Vetiver grass: a hedge against erosion*, commonly known as the Green Book, and produced some videotapes and slides for distribution. In 1995 The Vetiver Network (TVN) was established as an independent non-profit organization, with grant funding from the Royal Danish Government, an anonymous UK trust, the World Bank and the proceeds of Monsanto's John Franz Award for Sustainability. TVN accelerated the networking process on a worldwide basis. Between 1996 and 1999 TVN helped to establish eleven new national and regional vetiver networks, and through grants to other agencies, established some catalytic vetiver initiatives in the field from which have spawned new networks in countries such as Ethiopia, Cameroon, Madagascar, Viet Nam and Tanzania. TVN took advantage of the Internet and developed its own website (www.vetiver.org) and encouraged the exchange of information via email. In addition TVN continued to put out hard-copy newsletters, videotapes and more recently CD-ROMs. TVN encouraged continued research and development initiatives, and in 1998 awarded US$50 000 to more than 30 prize winners.

Research documents that demonstrate and quantify the different applications of VGT and their effectiveness are referenced. Research relating to agronomic and socio-economic aspects is examined.

The global impact of vetiver is assessed in terms of its dissemination to users around the world and the growing interest in its broader applications. Over 800 NGOs, 800 government agencies, 1000 research stations and about 800 private individuals and commercial entities have primary access to TVN. Thousands of others are uncounted secondary or tertiary users.

Networking has proven to be successful because: it focuses on a single low-cost technology that is effective and easy to understand and use; it requires lower labour resource inputs than traditional engineered systems; it is gender positive; it has a wide range of ecological adaptation and applications in the agriculture and construction sectors; the end user comes first and feedback information is quickly sent to users; incentive awards are made to encourage participation in the network and participants are generous in sharing their information; information is delivered free to the user; VGT networking appears to be self-sustaining, and other independent vetiver networks are encouraged at regional and national levels; hard-copy information backed by Internet websites and email communication are powerful dissemination tools; and TVN is administered with minimum procedures and on a basis of trust with its partners.

Expansion of the adoption of the technology will come from three directions: the spontaneous establishment of new networks; wider inclusion of the technology into government and donor technical strategies; and the commercialization of the technology by the private sector.

TVN and its affiliates have been successful not only through their dissemination programs but also because they are all action oriented.

Introduction

Vetiver grass technology (VGT) has been used for hundreds of years by farmers in India where it was used for soil erosion control and for the demarcation of farm boundaries (Gundalpet, Karnataka). In other parts of India it was used for stabilizing rice bunds and inter-field channels (Orissa). In other countries such as the Philippines and Thailand VGT has been used traditionally for the stabilization of rice field bunds. Historically, vetiver grass was well known in many tropical countries for its aromatic and medicinal properties. Thus, as a practical farmer-based technology, it was not difficult to introduce it on a wide scale for an extended range of applications. Earlier in this century the sugar industry had recognized the value of vetiver grass for conservation purposes, and it was used in the West Indies and South Africa for this purpose. In the 1950s VGT was introduced to Fiji for soil conservation in relation to the resettlement of cane farmers on steep and erodible lands. John Greenfield, a talented New Zealand agronomist, had been responsible for the Fiji introduction. In the 1980s he worked for the World Bank in India, and it was there that Greenfield and the author started the current VGT initiative.

In 1986 VGT was pilot tested on a number of World Bank-funded watershed projects in the lower rainfall areas of central India. At that time there was a lot of opposition from government soil conservation departments (the latter were more interested in engineered structures that created many opportunities for corrupt practices) and by some scientists who viewed VGT as a threat to their carefully crafted long-term research agendas, which focused primarily on engineered systems. Fortunately there were some officials, often the more junior ones, that supported VGT, and it is these persons who can take the credit for India's (primarily the NGO community) continuing interest in the technology.

In 1987 the author returned to the World Bank's offices in Washington DC where, in 1989, he took the opportunity to establish a worldwide Vetiver Information Network (VIN). This was the real start of an intensified effort to put VGT in front of millions of potential users. Not long after, VIN was able to draw on research results generated by, among others, Bharad and Bathkal (1991) in India and Yoon (1991) in Malaysia. Both scientists made invaluable contributions to VGT and helped turn it into a respectable technology that met scientific criteria.

Activities of the Vetiver Network

John Greenfield (1989) published a monograph that was distributed to VIN members (in that year we had 76 members who knew about and used vetiver). This was followed in March 1990 by the first formal VIN Newsletter (Newsletter #3). Since that time 17 newsletters have been published and distributed to between 3 000 to 4 000 readers. Persons in over 100 countries receive the newsletters on a regular basis. These hard-copy newsletters are the central and most important means of information transfer, and are supported by booklets, an Internet website, CD-ROMs, videos, etc.

In November 1995 the author (after his retirement from the World Bank) recreated VIN as The Vetiver Network (TVN), a non-profit charitable organization located in Virginia, USA, with start-up funds from an anonymous UK Trust. A board of directors was appointed and some funds were raised. TVN was awarded the US$100 000-worth John Franz Sustainability Award by Monsanto for the best environmental technology, and further financial support came from the Royal Danish Government and the World Bank. More than US$500 000 was raised, which allowed TVN to support NGOs and other agencies and users around the world in initiating VGT programs.

From late 1996 until today TVN has provided technical and/or funding assistance for the establishment of eleven regional and national vetiver networks, including networks for the Amhara Region of Ethiopia, China, Europe and the Mediterranean, Latin America, Madagascar, the Philippines, Southern Africa, the Pacific Rim, Thailand, Viet Nam and West Africa. Other networks have or are being developed in Cameroon, Haiti, Nigeria, the Seychelles and Tanzania. No matter at what stage of development, these networks are operating; all are administered by dedicated persons who strongly believe in the potential of VGT. These networks do more than just disseminate information: they actively support collaborative field initiatives with communities, government agencies, NGOs and private-sector enterprises. These networks and those yet to be developed will in the long term be the prime movers of the technology. Some, such as the Latin America Vetiver Network (LAVN), the China Vetiver Network (CVN) and the Philippines Vetiver Network (VETINETPHIL), have already taken on such roles and are having an important effect on the accelerated adoption rates occurring in their areas of influence. The Pacific Rim Vetiver Network (PRVN), administered by the Office of the Royal Development Projects Board (ORDPB) of Thailand, with the personal support of His Majesty the King of Thailand, has done an excellent job in disseminating VGT information. I would like to give special mention to the recent publication by PRVN of two papers on the environment and engineering that were written by Truong and Baker (1998) and Hengchaovanich (1998) respectively, both of which have had an important impact on the recipients.

I would also like to recognize Dr Sumet Tantivejkul (at that time Secretary-General of ORDPB) and the officers of the Lands Department, who, under His Majesty's guidance, undertook an extensive program of VGT research and development (ORDPB 1996) that culminated in the First International Conference on Vetiver (IVC-1), which was held at Chiang Rai in 1996. This R&D laid the foundation for wider adoption of the technology in Thailand and elsewhere in the world. The Thai government has been generous in supporting VGT not only in words but also in funds, and has welcomed numerous overseas guests for visits and training in VGT. Contrary to common perception it was RDPB that coined the description of vetiver grass as "the miracle grass", not TVN.

TVN has provided small grants (of about US$10 000 each) to about 20 agencies (including NGOs) for the development of local vetiver field initiatives. Most have proven successful, including the mini-grant programs administered through CVN and VETINETPHIL. Small grants to NGOs in Ethiopia have led to literally tens of thousands of Ethiopian farmers learning about VGT. In that country, one man in particular, Alemu Mekonnen, has been responsible for the dissemination of the technology.

Although most of the grants have been very small, there have been a number of very useful spin-offs including feedback on performance and farmers' perceptions of the technology, catalytic impact on surrounding areas, and often the spawning of fledgling networks that involve other agencies and NGOs. For example, Ngwainmbi Simon of Cameroon, with some support of TVN, established a small vetiver-focused project (BERUDEP) and then, together with other NGOs and government agencies, established a Cameroon Vetiver Network. An interesting aspect of TVN grant funds is that most of the groups that TVN supported would never had the opportunity to receive a grant from a foreign or even a local donor. Most proved very able and committed when a TVN grant was made with the clear objective of the promotion of a single technology, in this case VGT.

TVN has granted funds to a group of Australian researchers, under the coordination of Paul Truong, to undertake some small but useful experiments relating to VGT. The approach has leveraged other funds and personnel to support the modest input of TVN. TVN has made available a few travel grants that have enabled some of the best vetiver resource persons to attend key workshops designed to accelerate the adoption of the technology in other sectors. This has been particularly true in the engineering sector where Paul Truong (Australia) and Diti Hengchaovanich (Thailand) have been very instrumental in convincing engineers in Australia, China, Madagascar, Malaysia, the Philippines, Thailand, Viet Nam and South Africa of the merits of using VGT. Madagascar is a good example of how experienced personnel were able to convince many engineers and environmentalists of the value of the technology. As a result, within two years of the initial approach the Madagascar Society of Engineers has formally adopted the technology as an important input in the design and construction of engineered earth works, and the adoption rates for a range of VGT applications are accelerating.

TVN has awarded US$80 000 as prize money to more than 60 persons who have undertaken useful research and development of VGT. These awards, although not large, have provided both incentives and recognition to vetiver supporters around the world. Not only have many of these persons produced important scientific verification of the potential of vetiver, but they have also provided feedback of actual development programs. These TVN awards have been made in conjunction with the King of Thailand Vetiver Award, which is funded personally by His Majesty the King of Thailand.

Finally TVN has made it central to its strategy to assure a steady stream of hard-copy newsletters, handbooks, CD-ROMs, videos, slides, and copies of papers to whoever requests the information. Most are provided at no cost and all are technically focussed on VGT. The most successful publication, and most widely distributed, is John Greenfield's handbook, *Vetiver grass – the hedge against erosion*[1]. This practical field guide has gone through three editions and over 100 000 copies have been circulated in English, Spanish and Portuguese. In addition many thousands of copies have been translated by various agencies into other languages, including Mandarin, Hindi, Nepali, Gujarati, Sheshewa (Malawi), Zulu, Swazi, French, Malagasy and Pidgin. Just recently TVN has learned that the World Bank-funded agricultural research and development project in Ethiopia will publish the handbook in three of the country's most important languages. Copies are also available on the Internet at TVN's ftp site: ftp://www.vetiver.org in French, English or Spanish. Two other publications have received wide distribution: the National Research Council's review of the technology under the chairmanship of Nobel Prize winner Norman Borlaug – *Vetiver grass – a thin green line against erosion* – and the World Bank's technical paper No 273, "Vetiver grass for soil and water conservation, land rehabilitation and embankment stabilization", edited by Richard Grimshaw and Larisa Helfer.

Accomplishments

It is not easy to quantify the results of TVN activities since like in most other non-profit organizations funds for monitoring and evaluation are not given the highest priority. However this does not mean that monitoring and evaluation are neglected, but that results are gathered in the form of feedback from individuals and agencies involved with programs. Ultimately success can be measured in user demand for vetiver plant material – and currently, in every country where the technology is being used, demand is greater than supply.

Effectiveness of Vetiver Grass Technology Based on Research and Field Experience

Soil and water conservation: TVN has received a mass of information indicating that VGT is one of the most effective means of reducing soil and water erosion. Bharad and Bathkal (1991), Lodha (1998), Sastry ((1995), Subudhi et al. (1998), Pawar (1998), Howeler (1996), Suyamto (1999), Dreyer (1997) Rodriguez (1993), Nehmdahl (1999), Robert (1993), Tung and Fatima (1991), Truong and Baker (1996a), ORDPB (1994), Chomchalow and Henle (1998), China Vetiver Network (1997), Simon (1998), Shelton (1996, 1998), Allison (1998), Truong (1996), Yoon (1996), Grimshaw (1996, 1997a), Juliard (1997), and Xu (1997), among others, have consistently shown that soil losses can be reduced by as much as 90 % and runoff losses by up to 70 % when vetiver hedgerows are planted across cultivated slopes. These results can be sustained year after year as long as the hedgerows are maintained.

Crop yields: Experimental work in India by Bharad and Bathkal (1991) (semi tropics) and by Howeler (1996) (wet tropics) have demonstrated that crop yields have significantly improved when VGT is used for soil and moisture conservation. Rao et al. (1998) investigated the effect of VGT on alfisols in South India, which showed significant increases in crop yields, increased soil moisture, reduced runoff and reduced soil losses.

Forestry development: Vetiver has been used successfully in southern India on the Maheshswaram watershed development project in conjunction with eucalyptus plantations. In South China, Liao et al. (1996) undertook some trials with eucalyptus, stylosanthes and vetiver. It was found that vetiver reduced soil and water loss (by respectively 54 and 18% over the control plot) better than did

stylosanthes. Five-year-old eucalyptus on average had a 15.9% increase in diameter at breast height compared to the control. Plantation tree species such as eucalyptus and teak have very little undergrowth and the soil is generally unprotected. We often find large amounts of sheet erosion under these conditions. VGT has a positive role in mitigating this problem. Foresters might want to consider new planting designs to accommodate VGT.

Stabilizing engineered structures: Tantum (1993), Truong (1999b), Yoon (1996), Xia et al. (1999), and others have demonstrated the effectiveness of VGT for embankment stabilization. Hengchaovanich and Nilaweera (1996), in a very important paper, demonstrated its stabilization impact on highway embankments. They quantified the properties and tensile strength of the root system of vetiver grass, and its impact on the shear strength of soils. They found that the average root strength was one sixth of mild steel. This paper has been well received by engineers as it was something they understood and their interest and response has generally been positive.

Pollution control: Truong (1998) and Xia et al. (1998) have quantified the effectiveness of vetiver in reducing the dangers of polluting substances and heavy metals, and its use in mitigating environmental problems relating to municipal trash dumps, industrial waste sites and mine tailings. Non-quantifiable results from the field have clearly demonstrated how VGT can be used as effective streamside buffer strips against surplus nitrate and phosphate runoff from agricultural lands. Truong's work demonstrated that vetiver grass is more tolerant than most other plants to heavy metals, and thus will survive high levels of toxicity.

Improving groundwater: Although no detailed experiment has been carried out, there is good evidence that VGT improves groundwater recharge. This is expected since rainfall runoff is reduced where VGT is applied. There is mounting evidence (Kemper 1999) that the root structure of grasses like vetiver have the capability of punching through hard pans, etc. Thus the downward movement of water is increased. Measurements of water levels in wells in Mysore and Orissa (India) have shown that when associated with vetiver grass hedgerows water levels are higher than those that are not.

Flood control: Dalton et al. (1996) and Dalton (1997) demonstrated the effectiveness of vetiver grass hedgerows in the reduction of flood damage to cultivated lands on the Darling Downs of Queensland. Quantifiable data was developed for the dynamics of reduced erosion losses and effect of the hedgerows on the standing crops and farm management practices.

Land rehabilitation: Field observations have shown that VGT can be used for the rehabilitation of extremely degraded soils. Use of VGT on India's *ussar* (saline) lands of Uttar Pradesh (National Research Council 1993) resulted in the eventual reforestation of large areas of wasted land. In India's Orissa state, VGT was used (Kumar 1996)) as the key technology for watershed management programs. In Fiji, India and Australia for example, VGT application has resulted in the prevention and rehabilitation of gullies. VGT is used frequently by mining companies (Berry 1996) to rehabilitate tailings and other polluting sources related to the mining industry. Truong and Baker (1996b) and Truong (1999b) has carried out a series of practical research programs in Australia, all of which are leading to a clearer understanding of this important use of the technology.

Disaster mitigation: Following the aftermath of Hurricane Mitch in 1998, Thurow and Smith (1999) found that where vetiver hedgerows had been planted in Honduras very little damage had occurred. In El Salvador, Miranda (1999) reported only three cases of VGT failure on highways that had been protected by vetiver, and these occurred where the contractors had not adhered to the engineering design standards. Prior to Hurricane Mitch, Balabrino (1997a) cited the usefulness of VGT for preventing cyclone damage to crop fields in the Philippines.

Other applications: Labat (1996) of Zimbabwe has used vetiver for thatching of houses. Note that, if proper thatching techniques are employed, vetiver thatch will last forever. Mekonnen (1998) of Ethiopia writes to say how important vetiver is for thatching the traditional *tulkul*, where most other grasses are often impossible to find. The main commercial use of vetiver is for its aromatic oil – an essential ingredient for the perfume industry. Other uses include handicrafts, medicines, floor mats, and privacy fences.

Agronomic Research

Over the past decade researchers and users have examined many aspects of vetiver grass to try to better understand its characteristics and function. Perhaps the most exhaustive and practical evaluation was undertaken by Yoon (1991, 1993) of Malaysia. He examined most aspects, including the adaptation of vetiver to a wide range of growing conditions (soil conditions, shade, rainfall, fire tolerance, tolerance to water logging, fertilizer requirements, etc), propagation techniques and field planting applications. He developed new systems of propagation (foam rubber core growing media, as well as criteria for handling plant material in the nursery and the field, and created the first technical specifications for the engineering community. In Thailand a wide range of experiments and demonstrations were undertaken by the Royal Development Projects Board and the Lands Department that tested the effectiveness of the technology as well as developed improved systems of propagation and field applications (ORDPB 1994). The tissue culture propagation program was outstanding in both output and cost effectiveness. This program achieved a lot more than most people are aware of, and it would be worth documenting it.

CIAT scientists, Tscherning et al. (1998) carried out some useful research which mapped the root growth patterns and dynamics of vetiver grass as compared to other useful conservation grasses (lemongrass and Guatemala grass).

Two scientific investigations, one old and one new, are worth mentioning as a demonstration of how this plant captures the imagination of persons associated with it.

Xia (1998) discovered some early (1950s) investigations and trials by Chinese scientists relating to the propagation techniques of vetiver. At that time the plant had just been introduced to China for aromatic purposes, and plant multiplication was a critical issue for expanding vetiver oil supply to the perfume industry, just as it is today when VGT is introduced for the first time to a country as a bioengineering tool.

In 1998 Adams and Dafforn (1997) published their hallmark paper which set out the results of DNA testing of vetiver grass accessions collected around the world. Three important conclusions emerged from that work: much of the vetiver grass now forming the basis of the worldwide VGT initiative is of the same genotype ('Sunshine') and thus research results from one country can be quickly used by another without the need for prolonged and exhaustive testing; the predominantly used cultivar 'Sunshine' is infertile and is not invasive and therefore is not a noxious weed; and because the 'Sunshine' genotype is so prevalent we need to look for other cultivars as backup in case of a genotype failure caused by a yet-to-be-identified disease.

Socio-economic Research

Economic analysis by Yudelman et al. (1990) showed that VGT had a very robust internal rate of return. This is not surprising as the cost of establishing and maintaining VGT is low compared to engineered structures. Analysis of data from many projects confirms the economic efficiency of the technology with an internal rate of return of often more than 100 %. Ranganathan Sastry (1998) in his 1996 analysis compared the costs of VGT and those of traditional earthen structures recommended by the Soil Conservation Department of Karnataka, India.

Farmers, even those who cannot read or write, are good observers when it comes to what is happening to their soil, manure and crops. They are also very good when it comes to apportioning their precious labour resources. Feedback from a study of the DANIDA/HIMA project in Tanzania (Mgalamo and Qaraeen 1996) indicates that farmers prefer VGT to other conservation technologies because the labour input is smaller. Mekonnen (1999) writes that women in Ethiopia like the technology as it is less physically demanding than *funya juu* – the most common alternatively form of engineered terrace. In Ethiopia a woman can build about 15 m of earth terrace a day, compared to planting 200 metres of vetiver hedgerow.

Three separate reports from Tanzania (Mgalamo and Qaraeen 1996), El Salvador (NOBS 1997) and the Philippines (Balbarino 1997b) all indicate that when farmers are offered the option of three or four

different conservation barrier systems, about 80 % consistently prefer VGT and continue to use the technology in subsequent years. Comparative studies by Howeler (1996) undertaken in Viet Nam, Thailand and Indonesia showed that the majority of farmers under study found VGT to be overall the most profitable.

The economic assessment of using VGT for stabilizing earth has been neglected. Xia (1999) reports that on field trials in China's Guangdong province the cost of stabilizing highway embankments with VGT is 10 % of conventional engineered systems.

In some cases in Malaysia and El Salvador highways were continually partially destroyed due to high rainfall and difficult soil conditions. The use of VGT provided near total stability and thus reduced annual maintenance costs significantly. Under such circumstances the internal rate of return must be infinite. In Madagascar VGT has been promoted vigorously in the past two years as a technology for highway stabilization, and the results and subsequent demand for the technology speak for themselves. In Madagascar, irrigation canals stabilized with VGT have required no maintenance since their construction eight years previously.

There are many levels of costs associated with VGT, depending on nursery technology and planting methods. The least costly is dividing existing hedgerows and planting bare-rooted material as new hedges in adjacent fields. Most farmers who have a ready supply of vetiver grass use this technique. In India a single person can plant a minimum of 100 metres a day in this way. Thus on gently sloping lands (less than five %) the cost of protecting 1 ha of land is only about US$3. Costs increase when nurseries have to be maintained and it is estimated by Grimshaw (1997b) that in Madagascar costs increase to about US$4-12 per ha when plant material has to be propagated in nurseries, transported to a site and then planted. Costs further increase when containerized plants are produced and used on special high-cost sites such as highways. Containerized plants in Madagascar cost about US$0.25 each. Thus the cost per 100 linear meters of hedgerow will be in the order of US$150. This will protect about 100 m^2 of embankment, which is cheap compared to conventional systems.

There is a lot of site information available on the costs and benefits of VGT but it needs analysing – good opportunities for graduate student studies!

Global Impact of VGT

How does one measure the global impact of VGT? International donor agencies go to great lengths and cost to evaluate the impact of their development programs. TVN does not have this luxury; thus it is difficult for TVN to monitor its impact. However we are able to make an assessment of VGT progress since 1986, the starting year for the revival of the technology:

- In 1986 the technology was introduced to India; in the year 2000 some 138 countries know about the technology and more than 100 are using it in one form or other;
- In 1986 there were no vetiver networks; in 2000 there are at least 14 networks;
- Since 1989 TVN has produced 17 formal newsletters with an issue of about 3 000 copies per newsletter;
- The first newsletter had about five pages; the last one, No 20, had 70 pages – mostly technical information coming from the field. Other networks have produced newsletters on a biannual basis. LAVN, MVN, SAVN, PRVN, WAVN, THVN, VETNETPHIL and CVN have all produced newsletters regularly;
- Over 100 000 vetiver handbooks have been distributed since 1987;
- The TVN homepage, which was established in 1996, has received about 15 000 hits;
- Over 800 NGOs are using the technology;
- Some 800 government agents are using the technology;
- About 1 000 research stations/agencies receive the vetiver newsletter, many of them carry out vetiver research;
- We are told that in Ethiopia half a million farmers know about the technology;
- In Malawi it is government policy to promote VGT;

- In 1986 VGT was solely applied as an erosion control measure; in 2000 it was used for highway stabilization, mine-land rehabilitation, river, canal and drainage bank stabilization, seashore stabilization, windbreaks, pollution control mitigation associated with municipal trash dumps, and for housing construction site stabilization;
- In 1986 few engineers knew anything about vetiver grass; today many do, and for example in 1999 the Madagascar Society of Engineers formally recognized VGT as an important technology for road stabilization purposes;
- In 1986 VGT was associated only with government projects; today more than 800 commercial and private individuals receive the vetiver newsletter. There is an increasing involvement of the private sector in the establishment of VGT enterprises that serve the engineering sector; good examples of this can be found in Malaysia, Thailand, El Salvador, South Africa, the Philippines and China;
- VGT has become a frequent component in bilateral-funded projects in Ethiopia, Ghana, Madagascar, Malawi, Tanzania, Zimbabwe, China, India, Sri Lanka, Papua New Guinea, the Philippines, Indonesia, Honduras, Panama and Costa Rica, to name but a few;
- Apart from numerous site-oriented workshops, there have been a number of international conferences devoted to VGT, and most other conferences on soil erosion control and biological engineering include papers on VGT.

The Vetiver Network is continually receiving letters and other communications from persons mostly in countries in the tropics and semi-tropics requesting information about the technology. We receive feedback from unlikely places, which suggests that the technology is becoming quite well known and that there is a lot more going on with VGT than we really know. When the vetiver initiative was started, most scientists had either had never heard of the technology or thought that it could only be confined to the low-altitude wet tropics – the technology has indeed come a long way.

Networking – A Means of Disseminating Technology

The Vetiver Network (TVN) was one of the early organizations to network a single technology. Subsequently other vetiver networks were formed in association with TVN. Together the networking process has been successful, and it is worthwhile setting out some of the reasons for this success:

- The networks focus on VGT and not on other comparable technologies (although they acknowledge that other technologies may be effectively used in conjunction with VGT or as stand-alone technologies). One of the failures of many technology initiatives and development programs is that sometimes too many options are introduced that often prove overcomplicated both as message and for the messenger. Lower-level extension workers often feel that the delivery of one or two good messages will produce better results than multiple messages. Furthermore, VGT is an exceptionally good technology that is superior to most other comparable ones – feedback from users confirms this fact. Some bilateral donors feel that beneficiaries need to have many options to choose from. This view is only acceptable if the intended beneficiary knows what the options are. Fifteen years ago hardly anyone knew about VGT, thus there was a need for a single-technology approach in order to disseminate the VGT technical message.
- The message is technically simple, low cost and effective, when applied correctly. VGT is really a very simple technology to apply and good demonstrations quickly convince potential users. “Seeing is believing” is an important aspect of passing the message on to new users. One user wrote to TVN, “we read, we did and it worked” – what better accolade than this!
- The technology requires a much lower labour input than traditionally engineered systems, and once established needs little maintenance. On average a person can construct 15 metres of traditional terrace a day, compared to 200 metres of VGT hedgerows. This means that one hectare of land can be protected in two or three days, compared to 40 days for terracing, and therefore it is an attractive technology to resource-poor farmers.
- VGT is gender positive. For example, Ethiopian women like the technology as it is not as physically demanding as terracing, and they see plenty of useful social by-products from the grass, including thatch, weaving materials, medicinal supplies, mattress stuffing material, snake

excluder, privacy hedges, and a host of other uses. Women in the Philippines like the technology as they can develop mini nurseries to produce containerized vetiver plants to sell to the commercial sector for highway stabilization purposes. They call it "cash grass".

- VGT is unique in that vetiver grass can be applied over a wide range of ecological conditions (hence a basis for wide adoption), and many environmental and economic uses – the two often combined. It is difficult for most people to believe that the grass will grow over a wide range of extreme conditions. Thus one species will do the job of many. Once planners and users are convinced of this, and promote it as such, the technology adoption rate increases rapidly.
- The end user comes first. This is a basic principle of TVN. Users are more important than government officials and scientists. TVN recognizes that the latter are useful, but we do not forget that it was, in the first place, the users who developed the technology; and it is the user who comes up with many of its refinements.
- Most of the information received is immediately fed back to users and is published in the newsletter and on the TVN website. There are no delays.
- There are no formal peer reviewers – the end user is the peer reviewer: he or she either uses the information or rejects it. So long as material received by TVN is readable and relevant, we will publish it. There are no peer reviewers to reject the material as unworthy of publication, or to reject the material because it conflicts with their own agendas. There are no supervisors who want authorship in return for publication.
- Incentives (awards) are provided to encourage active participation. The award program has been very successful. Not only does it encourage research but it also acknowledges many "small" persons in the vetiver system that work hard with little recognition. A vetiver award is often a coveted prize, even if it is just a certificate (in the future if TVN has limited funds, certificates may be the only way we can recognize worthy contributions to furthering VGT).
- Most vetiver researchers and users have been generous in sharing their information; because of the open approach taken by TVN, those involved with vetiver have been keen to provide feedback. This doesn't mean that we get all the feedback we would like: we would like a lot more from those that receive but do not give!
- In most countries there are committed individuals who make great efforts to disseminate information on VGT, organize training, etc. There are perhaps three dozen individuals around the world who have really made a difference to "moving the technology". Among them and foremost is His Majesty the King of Thailand. Others include: Ed Balbarino and Noah Manarang of the Philippines; Liyu Xu and Xia Hanping of China; Govind Bharad of India; P.K. Yoon of Malaysia; Tony Tantum and Duncan Hay of South Africa; Paul Truong of Australia; Diti Hengchaovanich and Narong Chomchalow of Thailand; Joan Miller and Jim Smyle of Costa Rica; Linus Folly of Ghana; John Greenfield and Don Miller of New Zealand; Criss Juliard, Mark Dafforn, Ken Crismier and Noel Vietmeyer of the US; Alemu Mekonnen of Ethiopia; Ngwainmbi Simon of Cameroon; Glenn Allison and Paul Zuckerman of the United Kingdom; Mike Pease of Portugal; Cornelis des Bouvries of the Netherlands; Stephen Carr of Malawi; and Jano Labat of Zimbabwe. These are but a few of the many active participants of TVN – they and others have all created change.
- Ninety-nine % of the information that is networked is delivered at no cost to the recipient, and is delivered fast. Early in its operations, TVN found that people don't like paying for new information or don't have the money or can't get the foreign exchange even if they have the money. So we have a policy that it is better to get the information out at our cost rather than not at all, or in limited amounts. Occasionally we ask people to pay or make a donation. But I am convinced that our success is partly because we have delivered good information quickly and at no cost.
- TVN has deliberately set a policy that encourages affiliated networks to take the lead at regional and national levels. Although TVN led in the beginning, we have made great efforts to devolve responsibility and fund raising to local networks. We have provided up to US$50 000 per network to assist networks get off to a reasonable start. Mostly the response has been good and the networks have done far more than we originally anticipated. TVN remains in the background as a feeder of information, and a linker of information and persons.

- Networking vetiver technology appears to be self-sustaining. If TVN closed down we can be assured that adoption of VGT would continue at an increased rate, particularly in those areas that are using it widely. This says much for the technology and for the way the technology has been disseminated. However there are still many countries and sectors that do not know much about vetiver. Thus we think it is important to keep TVN operating in some form or other.
- The Internet website, CD-ROMs, etc, are powerful tools in the dissemination effort. A picture can tell a thousand words. TVN has made a point of sending out videos and slides relating to the technology and its uses. Now that CD-ROMs are so cheap (US$1 500 per thousand CDs) it is possible to send out all we know about vetiver at a very low cost. The current CD that we give away includes all 20 newsletters, important vetiver papers and articles, the vetiver database, five pictorial presentations, and the "green book" in English, French and Spanish. The Internet also provides a very good information source about VGT. The TVN website, http://www.vetiver.org, with links to other vetiver network sites, contains all we know about VGT (some 15 megabytes). More people are using it, and if only 20 % of them actually do something with what they have learned then the return to the annual cost (about US$1 000 per year) of running the website and the associated ftp site will indeed be high. As other websites with similar interests are established and interlinks are made between sites, we can expect an acceleration of hits on our site.
- Hard-copy newsletters are an essential component in disseminating information to the majority of recipients. Unfortunately we cannot do without hard-copy newsletters. Most of our participants do not have computers, and if they do, accessing the Internet can be expensive. TVN and local network newsletters are therefore essential. We find vetiver newsletters for sale, often in tattered condition, in remote book fairs in the heart of India! We find one newsletter is often circulated to 50 other readers – so hard copy is still a powerful tool.
- Internet dissemination is a powerful information tool for NGOs and other agencies that are plugged into the World Wide Web. Once these agencies have access to the information, they disseminate it to a wide audience of users. The TVN website has played a vital role in information dissemination, and will in the future become even more important as more users and potential users come online. Other NGOs which, like TVN, have limited financial resources should find the Internet hugely useful for information transfer. Along with our website, the use of email has greatly enhanced communications between the networks and between users. Network coordinators can become real communication facilitators if the system is used to its full capability.
- TVN itself is unencumbered by bureaucratic processes. TVN was fortunate to raise over half a million dollars, most of which was quickly disbursed, under simple agreements, to recipients (other vetiver networks and NGOs). Most grants were processed from start to delivery within six weeks. Much was done on trust, and most times the trust paid off in successful programs; the times when it failed were so few that it made little difference to the overall outcome. The really successful grant support was to those organizations whose leaders were already fully committed to the technology and who had a real sense of commitment to their own people and to the environment. All were volunteers in the sense that they already had personal incomes (a salaried job, pension, etc). They took on VGT because they believed in it.

Conclusions

What of the future? I see the future expansion of the technology going into three directions:

- The spontaneous establishment of new national and local vetiver networks and the expansion of existing networks without financial assistance from TVN. It is to be hoped that governments and donor agencies, including international agencies and trade organizations such as Rotary and Lions' clubs or local equivalents, will provide assistance;
- As government and other agencies become more appreciative of the value of VGT, they will include it in their technical strategies and be more active in its promotion and application. Agencies need to better appreciate the cross-sector linkages that VGT has an impact on;
- The expansion of private-sector enterprises which realize the importance of the technology and the fact that it can be applied profitably. The private sector will actively market the technology and

thus will affect a whole string of enterprises from small planting material producers to landscapers and construction companies.

The dissemination of VGT has undoubtedly been a successful initiative, and the original objectives have been exceeded by far. Rather than just being a carrier of words, the initiative has been a creator of actions. This process will continue, probably not with TVN in the prime spot, but rather through the actions of users and scientists working with better communications and in harmony in the field. The future of TVN is, and has always been, rather fluid; we change course depending on the availability of funds and the needs of users. If TVN does not receive any significant funding in the near future, it will downsize its work to an information exchange based on the Internet. The latter is almost a costless exercise.

VGT has proven a very successful technology because it is simple, low cost and effective. It is also a very exciting technology because its use seems to be boundless, and it is therefore an exciting technology to use and experiment with. It is also a technology that is available to everybody without being tied up in bureaucratic practices. In fact today its use would be more widely applied if other technologies, particularly "hard" engineering technologies, were less financially attractive to corrupt officials and profit-optimizing entrepreneurs.

Perhaps it has been a good thing that TVN has generally been poor. We have been able to identify with and better understand those that have difficulty in starting something new, and have come to realize that very small amounts of financial support placed quickly and correctly can make a difference to hundreds, even thousands of rural people. We have also learned that there are a lot of good technologies that are low cost and relatively simple, and if applied properly could make great change to people's lives. What we need is vision, dedication and commitment. The CEO of a successful company was asked how to be successful in creating change – his answer was "one has to be repetitive and boring". I know that in my work with VGT I have been both repetitive and boring, but it has been worth it.

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