May 2001
Number 23

The Vetiver Network

VETIVER NEWSLETTER

A NEWS MAGAZINE PROMOTING THE VETIVER SYSTEM
HER ROYAL HIGHNESS PRINCESS MAHA CHAKRI SIRINDHORN OF THAILAND - PATRON

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VETIVER SYSTEMS – THE DISSEMINATION AND ADOPTION ISSUE

By Richard Grimshaw, Chairman - TVN

Criss Juliard in his paper *"Best Practices Establishing a National Vetiver Diffusion Program"* (see TVN Newsletter #21) asks the question, "*If Vetiver Grass Technology is so simple, inexpensive and good for the health of the soil, why isn't it promoted more broadly on a national scale in the same way vaccinations are promoted to preserve an individual's health?"*

I would add: "*Why do some farmers and engineers use the technology and others do not?".* These questions and others like them must be answered if we are to move ahead more rapidly with the application and use of Vetiver Systems as we now refer to a bundle of vetiver grass technologies.

Criss Juliard continues "*The answer is not related to the attractiveness of the technology, but to the challenge of dissemination*".

I agree. I would like to illustrate this challenge by some experiences – good and bad.

Thailand has done wonderful work in researching and demonstrating VS but it has not been used as widely as expected.

Research carried out in Thailand by Suchart Montrekusol et. al. of Chiang Mai University (titled: *Farmers' Perception and Practices in Vetiver Grass Cultivation for Soil and Water Conservation in Mae Rim District, Chiang Mai Province*) had the following observations and conclusions:

"*Most farmers applied integrated farming systems. Eighty-eight percent of the farmers accessed agricultural information through neighbors and television, while they received information on using vetiver grass for soil and water conservation from government extension workers.*

"Farmers' knowledge and understanding of soil conservation and soil fertility....(and) of soil and water conservation using vetiver grass were at a good level.

[However, at the level of practical application]... "*the problems identified included: inappropriate timing in delivery of vetiver seedlings, insufficient knowledge on vetiver grass field application, insufficient labor and equipment, and insufficient knowledge on the other uses of vetiver grass.*"

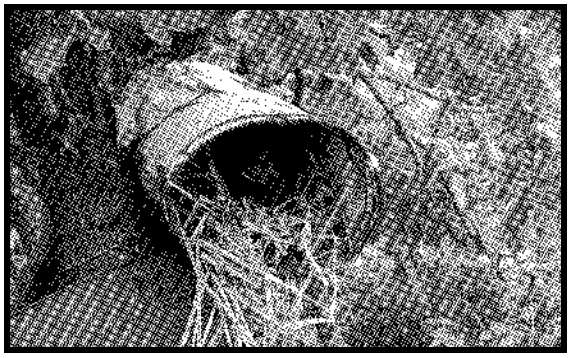

Photo 1. An alternate use for vetiver grass biomass discovered in the Eshowe area of rural KwaZulu-Natal, South Africa

Photo credit: Duncan Hay

INSIDE:

These results suggest that the government's extension program is not very effective. All of the problems identified by the farmers constitute the most basic things. Could it be perhaps that the government extension workers are not well-trained? well-supervised? not sufficiently motivated? unable to visit farmers more often to participate in solving problems? What is the problem?

Problems with the transfer of knowledge through public extension services are common in most countries. We too often see poorly organized and poorly motivated government extension services. In the case of VS, we generally encounter an almost complete lack of capacity for getting basic planting material to farmers; or ability to develop that capacity in the face of farmer demand. In many countries, the responsibility for soil conservation has been passed to specialized departments. These may or may not support VS. And, where they do, they tend to look narrowly at its use and applications and fail to promote all the other valuable aspects of the technology, including, yield increases, moisture conservation, fertility maintenance, mulching, forage, thatch, etc. They too share the inability to manage the supply of plant material.

In contrast, in Zambia, the Christian Reformed World Relief Committee (CRWRC, see http://www.crwrc.org/index.html) - has been working with VS in the Eastern Province. CRWRC describes its program below.

"The Government of Zambia introduced vetiver grass to the Eastern Province of Zambia late in 1996, so to date we have had 4 growing seasons. The initial supply was managed by Agriculture Officers of the government, but one facilitator of the Reformed Church in Zambia's Planning and Development Department (RCZPDD) received 250 splits to establish a nursery where water was available. The nursery stock grew well and since that time the program has been giving vetiver splits to farmers from the nursery every year. In this specific location farmers only receive small amounts of vetiver and are responsible for propagating and replanting their own vetiver. In other areas that RCZPDD works, facilitators now network with government officers to get farmers larger amounts of around 5,000 splits of vetiver.

"...the program often introduces farmers to vetiver alongside several other soil stabilizing and improvement techniques. Vetiver is introduced and supplied to farmers only when contour bunds are properly measured and earthen contour ridges (of about 6'' high) are constructed. In the past, farmers reported that after a rainfall surface moisture could be gone in 1 to 3 days. With contour bunds, contour planting and ridging, farmers have found that surface moisture will be present for 1 to 3 weeks. Farmers have found that having vetiver on the contour bunds stabilizes them, reduces labor intensive annual maintenance, and prevents them breaching at the time of heavy rain. We have found that if farmers plant vetiver on their contour bunds they are more likely to continue establishing contour bunds with vetiver.

Although many more farmers have implemented contour bunds than have planted vetiver, we have found that if a farmer starts with vetiver he will be convinced of it, and will continue to plant it and will give splits to others as well. Farmers who experimented with vetiver in problem areas where erosion was a clear problem found that it takes about two years to become well established, but after that there will be little erosion and the former gullies will be filled in. One farmer had a washout that was as deep as his leg. Now, four years later you can't tell there was ever a problem. This farmer is convinced, and has been giving vetiver splits to fellow farmers to help them with problem areas. Farmers generally take splits from the existing band while leaving half of it there if they have no nursery. The original line will not be weakened much. Farmers have found that drought resistance (Zambia experiences 7 1/2 to 8 consecutive months with no rain) is not a problem if new splits are planted two months before the ends of the rains. Once established lack of moisture hasn't been a problem at all.

"Farmers have found that vetiver does need a bit of maintenance. Some farmers like to cut it back to 50cm, which can be done quite easily with a very sharp sickle at the beginning of the rainy season. In some cases this is done to take out the dead shoots and to stimulate new growth, in other cases it is done so the farmer can plant closer to the vetiver. No problems were found with vetiver spreading or causing other problems. Animals were reported to eat a bit of it, which appears not to harm either plant or animal. In the event that a plant does die out farmers have waited until the next rainy season to replant.

"With vetiver becoming more available and with farmers understanding its potential we feel that contour bunds will become more permanent structure. In the past, with only earth structures contour bunds not only broke with excess water, but if they where not maintained for a year or two they virtually disappeared. With vetiver established on ridges, contour ridges will maintain themselves much better and become very permanent structures, encouraging other soil conservation and water retention techniques".

This appears to be a successful introduction of VS by an NGO, after a government agency had taken the first introductory steps. Note the NGO actively works to bring plant material to participating farmers and is also working with government agencies. I suspect that there is a "push-pull" syndrome at work.

Another example of NGO/community success with vetiver is LASOS in Mexico. In 1995, a small local group called Suelos Agua y Semillas de Oaxaca (SASO) found a source of vetiver grass in Chiapas (a neighboring province). SASO became an NGO called LASOS, A.C. in 1997, and with the help of the Comisión Oaxaqueña de Defensa Ecologica, started a program for erosion control and soil restoration involving local farmers, **(continued on page 5)**

ANNOUNCEMENTS

TWO NEW PUBLICATIONS AVAILABLE FROM THE PACIFIC RIM VETIVER NETWORK AND THE OFFICE OF THE ROYAL DEVELOPMENT PROJECTS BOARD, THAILAND

Heineken Breweries Co. Ltd of the Netherlands donated US$50,000 to the Chaipattana Foundation of Thailand to promote the use of vetiver. In turn, the Office of the Royal Development Projects Board (ORDPBN) used the funds for training and dissemination of VS technology. From 19-30 November 2000 in Thailand, a training course was attended by 31 trainees from 15 countries. The training manual developed for the course includes basic information on the vetiver plant, propagation techniques, agricultural and non-agricultural applications, and alternative uses. The manual, *Manual of the International Training Course on The Vetiver System,* as well as a post-training report, *Report of the International Training Course on The Vetiver System* are available from the ORDPB. Please contact:

Suwanna Pasiri
The Office of the Royal Development Projects Board
78 Rajdamnern Nok Avenue
Dusit, Bangkok 10200
Thailand
Tel: (66-2) 280-6193
Fax: (66-2) 280-6206
E-mail: pasiri@mail.rdpb.go.th

VETIVER BOOKSTORE

The following items are available for sale from The Vetiver Network:

Printed Publications: US$5 each (unless otherwise noted)

Vetiver Grass - The Hedge Against Erosion (English and Spanish), 2000

Vetiver Grass - A Thin Green Line Against Erosion, National Academy of Sciences, 1993

The Vetiver Newsletter - past issues $1.00 each

CD-ROMS: US$10.00 each

Vetiver System Resources, Compiled by Dr. Paul Truong, 2000

Vetiver System Techniques, Dr. Paul Truong, 2000

Vetiver - La Barrera para Bioingenieria, Red Latinoamericana del Vetiver/Banco Mundial, 1999

Videos: US$15.00 each

Vetiver Grass - The Hedge Against Erosion (PAL and NTSC versions), 1996

Vetiver - La Barrera Contra La Erosion (NTSC), 1996

Vetiver - La Barrera Para Bioingeniería (En Protección y Estabilización de Infraestructura), (NTSC) 1999

Slide Sets: US$15.00 each

Vetiver Grass Hedgerows - A Photo Essay and Other Selected Data and Information, The Vetiver Network, 1999

The Vetiver Network accepts payment in US dollars via International Money Order, check draft from a US bank account, or cash (if feasible). Please contact TVN at: vetiver@vetiver.org, or 3601 N. 14th Street, Arlington, Virginia, 22201, USA for details. Proceeds from sale of items are used to subsidize associated mailing and production costs. v

THE VETIVER SYSTEM - A PROVEN SOLUTION

You will find enclosed with your newsletter a promotional brochure produced by The Vetiver Network. When unfolded, the brochure becomes a full color poster measuring 16.5" x 23.25" and summarizes the problems for which vetiver is applied, why vetiver is a useful plant, and summarizes the use of VS for agriculture, bio-engineering, water-related applications, bio-remediation and other uses. Production was made possible thanks to work donated by commercial artist Xi Shing Chang of South Carolina, USA and Premier Publishers of Bellingham, Washington, USA who subsidised printing costs as a donation to TVN. If you would like to request additional brochures, please contact TVN. Versions of the brochure in other languages such as French and Spanish will likely be produced in the future. v

THE VETIVER NETWORK AWARDS PROGRAM

The Vetiver Network is pleased to announce the third series of Vetiver Awards, made possible thanks to a generous grant from the William H. Donner Foundation. TVN will award a total of US$45,000 in prize money, distributed as described below. In anticipation of the Third International Conference on Vetiver, to be held in China in 2004 and whose theme will be "Vetiver and Water", one theme of the awards will be Vetiver System applications in relation to water. As always, the TVN hopes to receive many nominations for each category. The competiton for the Vetiver Awards, in years past, has brought out information that significantly increased our knowledge of vetiver's uses, applications and benefits. The deadline for nominations will be 1 October 2003. Award winners will be announced in early 2004.

Eligibility

All vetiver users are eligible, be they individuals or groups, who have shown initiative in research, or utilization or promotion of the Vetiver System. These may include farmers, technicians, NGOs, students, scientists, researchers, private companies, innovators, etc. who have produced and documented concrete, repeatable results.

Award Categories

Awards will be given in six categories:

1. Water Applications
   a) Watershed Protection/ Improvement
   b) Engineering – Natural and Constructed
   c) Quality – Pollution Control and Treatment
2. Engineering/Infrastructure Protection
3. Land Reclamation
4. Dissemination
5. Country Vetiver Award
6. Farmer/User Awards – Regional
   a) Asia
   b) Africa
   c) Latin America
   d) Other
7. Vetiver "Champion"

Award Value

Awards will range between US$500 and US$3,000 for first through third prizes.

Documentation

There is no award application form. Nominations may either be from individuals regarding their own work or be made by another person. Documentation can consist of many types of information (personal accounts, reports, articles, photographs, scientific papers, testimonials, etc.). We strongly encourage the inclusion (where relevant) of photographs and "before" and "after" photographs whenever possible. **Please be as brief and clear as possible.**

The following should be mailed to The Vetiver Network:

Name and address (phone, fax, and email if possible) of nominee

Name and address (phone, fax, and Email) of nominator (if applicable)

Project information:

Location of Project

Description of Project

Accomplishements of Project

Importance of Project

Supporting Documention (optional, but useful in determining awards)

Name and address of a reference who is familiar with the project

Award Selection

Projects will be judged on the following:

Merit: Quality of thought and methods used to accomplish the project's goals.

Relevance: Project's potential to protect/improve the environment or lower costs or improve quality of life or other noteworthy impacts.

Innovation: Originality, including using old ideas in new ways.

Application: Demonstrated usefulness of the results.

Extra credit will be given (where relevant) to those who include practical details of benefits and costs or a benefit/cost analysis or efficiency analysis (i.e., benefits/costs of Vetiver System compared to traditional or other systems).

Award Category - Details

Within these categories there are no pre-defined topics. The creativity and innovation of the user is the only constraint. The ideas listed below in each category are only illustrative to give a clearer idea of what might be interesting.

Water Applications – The theme of the International Conference on Vetiver in 2004 in China is "Vetiver and Water". Most Vetiver System applications can be thought of in terms of its relationship to and effect on water through:

a) Watershed Protection / Improvement – Use of VS for protecting and improving the quality of water through treatment of a watershed, streambanks and streamside buffers, for soil moisture and/or groundwater improvement, reduction of sedimentation, etc..

b) Engineering – The use of VS to protect and stabilize the banks and channels of natural and constructed waterways and dams.

c) Quality – Use of VS to control and treat polluted surface water, groundwater and wastewater

Bioengineering Applications – Use of VS for stabilization and protection of buildings, roadsides, railroads, bridges, industrial sites, landfills, cut-and-fill slopes, and other infrastructure or engineering applications, for slope stabilization in vulnerability/hazard reduction, etc.

Land Reclamation – The use of VS for reclamation of abandoned and polluted, toxic lands, degraded sites, gully stabilization, mine spoils and slimes stabilization and revegetation, improvement of extreme soils, etc.

Dissemination – Original publication, brochure, pamphlet, video, multimedia, etc.

Country Vetiver Award – Award given to acknowledge the best overall achievements and results of a countrywide VS program.

Farmer/User Awards – Award to acknowledge the utilization of vetiver by individuals to improve the quality of their lives through economic and environmental improvements via increased production on agricultural lands, economic/environmental improvement and/or other uses of VS such as providing mulch, fuel, artisanal uses, livestock fodder, etc. There will be awards made in each of the following regions of the world: Asia, Africa, Latin America, Other (any region outside the above)

Vetiver Champion – Open to nominations for people who have been instrumental, either in their country (region, globally) or technical area (for example, research, soil and mositure conservation, etc) in effective and dedicated promotion, investigation, improvement, etc. of the use of the vetiver system.

Please send nominations to:

The Vetiver Network
3601 N. 14th Street
Arlington, Virginia 22201
USA

Please include a self-addressed card which we can then return to you to acknowledge receipt of nomination. **v**

(continued from page 2) communities, government and non-government organizations and researchers. Originally, SASO began the project with 40 plants and there are now more than 50 nurseries growing vetiver grass throughout the state. Vetiver grass has been grown successfully in all the major soil and climate conditions of Oaxaca. Hedgerows are already beginning to form natural terraces and groups of women are cultivating vegetable gardens between the hedges. We have many other examples of this type of program, but in nearly every case success has occurred where NGOs and other agencies have worked together with farmer communities.

The CGIAR research institutes have generally not shown much interest in VS. I am not sure why (perhaps "a not invented here" problem?) and yet some individuals within these institutions have extended the technology significantly within their own area of operations. **Julio Alegre** - the ICRAF head in Peru – after visiting Kenya and seeing vetiver's potential and took the technology to Peru, he writes:

"You will not believe it but the 10 vetiver slips that I brought from Nairobi, Kenya, 5 years ago, and propagated in Yurimaguas, Peru (humid tropics) and distributed to many sites in Peru and are now used by many farmers in ecosystems from the sea level up to 4,000 m. above sea level. Most of the developments projects from the highlands (very sloping areas) are requesting the vetiveria and farmers from the tropics are supplying these material and they are getting very good economic benefits. Next phase of my research will be to combine agroforestry leguminous trees with vetiveria for double benefit, soil conservation and nutrient recycling in sloping areas of the high jungle of Peru."

The sad thing is that ICRAF headquarters in Kenya appears to take no notice of the success of their own man!

Criss Juliard, who developed a very effective vetiver program in Madagascar, summarizes what he considers the ingredients for successful VS dissemination:

"Madagascar is a best-case experience where a need to protect roads, safeguard hillsides, and improve poor agricultural soils in a particular area helped catalyze and shape a broad-based, national vetiver dissemination program. This program appears to have led to the sustainability of the technology. The Madagascar approach evolved over a three-year period and consisted of actions that: a) brought interested people and organizations together committed to vetiver, b) insured reliable and timely supply of vetiver plants to end-users, and c) applied vetiver technology according to site-specific needs. The approach was low cost, involved information campaigns, used demonstration sites for practical applications, and benefited from research and applications developed in other countries. Success can be attributed in part to close relationships with the four target groups in the vetiver communications and implementation plan: a) village associations, b) private producers, c) local elected officials, and d) professional organizations, ministries and donors. Lessons learned from the Madagascar program could prove useful to practitioners hoping to establish a broad-based and sustainable vetiver program elsewhere."

Criss Juliard is highly sensitive to environmental needs and to groups working with the environment. He has a "green thumb" and is totally committed to the technology. I believe people like him can develop VS programs anywhere they work. He is a real vetiver champion just like **Ed Balbarino** of the Philippines, **Liyu Xu** of China, **Alemu Mekonnen** of Ethiopia, and the many other committed volunteers that have made vetiver work in communities.

In recent years the engineering sector has become more interested in VS. This can be attributed to a number of factors. **Diti Hengchaovanich**, a Thai CEO of a Malaysian construction company, introduced VS to highway construction (following early demonstration by **P.K. Yoon**) for the stabilization of steep slopes on express ways in Malaysia. Hengchaovanich initiated research to better understand the tensile strength of vetiver roots and their impact on improving the shear strength of soil. This work attracted the interest of engineers particularly in Australia

and China. Demonstrations by **Paul Truong** in Australia showed the effectiveness of vetiver on extreme soils, and following a workshop for Chinese highway engineers, VS came alive in south China.

In South China, 80% of all sediment flow is estimated to be point source from construction and mining sites. Liyu Xu, China Vetiver Network Coordinator, decided to focus his attention on the key agencies responsible for this construction, primarily highway, railroad, and municipal departments. He first focussed on highway engineers - including their bosses, and is now working with railroad engineers. This approach seems to have been successful as there are now many applications of VS being used on extreme sites in South China. In parallel, the Chinese private landscaping sector has become interested in vetiver and a number of companies are getting in to the VS business. They are learning fast, and in particular are learning that the production of large quantities of plant material is essential for a successful program, and also that quality VS application is very important.

In El Salvador a commercial company, NOBS, has been very successful in promoting VS, particularly in the highway sector. Its success is a result of committed leadership, huge plant supplies, and a technology that is low cost and very effective.

So where are we in the dissemination, promotion, adoption cycle? I think we are moving along quite well, and I believe we are about to enter a phase of an accelerated use of VS.

Why?

We have now been promoting VS in one form or other for 15 years. It takes time for VS-type technologies to become accepted.

Today there are many more vetiver champions, including reputable and serious NGOs, promoting the technology. NGOs are now seen and accepted as an important component of the development effort, particularly when working with communities.

The engineers involved in construction projects are increasingly seeing the value of VS as an effective and low cost substitute for more traditional engineering methods.

The commercial sector has become involved – VS is seen to be a profitable business.

In recent years solid research results confirm and support the anecdotal information that was only available in 1985.

There are VS demonstrations in nearly every tropical and semi-tropical country.

Plant material is being multiplied at accelerated rates, people at last understand that huge quantities of plant material is required, and are prepared to do something about it.

There have been some great success stories that have attracted a lot of interest.

TVN has received more grant funds and thus able to expand the publication of information about vetiver; as too have other networks such as PRVN and SAVN, the former has been particularly active in quality information dissemination.

In conclusion, the involvement by NGOs, and more lately the commercial sector, has been very good for VS. NGOs generally have a comprehensive approach and supply leadership, advice and plant material to the communities that they work with. The commercial sector has profit motive as priority, and therefore will work hard to 'market' the technology to potential users, particularly those in the construction and engineering industries. The commercial sector will also develop large vetiver nurseries for their own needs, as well as providing a plant supply source for start up NGO operations.

Not all government vetiver initiatives have been a failure, the more successful (e.g. Malawi, Ethiopia) are those linked to comprehensive development projects that provide both the technical advice and plant material to farmers, and where government policy makers and senior field staff are convinced of VS as a solution. Stand alone extension services (such as Training & Visit system) that provide advice but no inputs have generally not been very successful (India, Indonesia and Thailand). The best vetiver programs will be those that link government agencies, NGO's and the commercial sector with the users that they serve, backed by an initial supply of plant material and good easily accessible demonstrations. v

VETIVER RESEARCH PROGRAM UPDATE

The Vetiver Research Program, sponsored by the William H. Donner Foundation, has now received about 25 pre-proposals. Of these, the Research Committee has considered 13 of them of potential interest for financing and requested full proposals. The pre-proposals of interest have come from researchers in China, Nigeria, Indonesia, India, Nepal, Vietnam, Peru, Mexico, and Ethiopia. The topics which they cover include such things as vetiver's application for controlling erosion and stabilizing riverbanks along the Mekong River, investigating the contribution of vetiver to improved water quality and quantity in domestic wells in Ethiopia, purification of industrial wastewater and treating acid mine drainage in China, and reducing sediment and pesticide movement from agricultural lands in Indonesia.

The William H. Donner Foundation has been informed that the program is going well. Indeed we here at TVN are hoping to continue to receive more pre-proposals from you as, once the US$45,000 is committed, we will use the additional requests for research funding to approach possible financiers in order that we may continue and expand the research program.v

LETTERS

INDONESIA

Correspondence from March 2001 between David Booth of the East Bali Poverty Project (Ekoturin Foundation) and Norm van't Hoff of Terracapita located in Bali.

Hi David,

My name's Norm van't Hoff, I'm developing a company here to commercialise Permaculture and sustainable development principles. I also work with Petra on IDEP projects.

I've presently got a couple of clients interested in using vetiver for erosion control and wonder if you can supply the stock?

I need to know about minimum quantities and price and availability. If you can supply the plants, I think I can move fairly quickly on this. I'd like to catch the end of the wet season if possible. …

Hi Norm,

Sorry for my delay but we've been exceedingly busy opening our Charity Cafe in Lodtunduh. You must drop in & see our photo display of all our projects in progress, including the vetiver. With regards to availability of vetiver, we should have some available within about a month, from the 500,000 shoots we planted in December. However, I'd be grateful if you could indicate how much you need.

From our experience since planting our first batch in March 2000, providing there is a few days rain after planting, the vetiver will fare very well. We have surprised ourselves and many others by the amazing growth of most of what we planted last year directly into the sandy volcanic soil. I did in fact plant about 1,000 vetiver slips in my garden here in Dalung in December 2000, and some of that already has up to 20 shoots that can be split. It has grown at a staggering average of 3cm/day! v

MADAGASCAR

Mark Freudenberger, LDI/Chemonics International, December 2000.

Here is a report of a major railroad rehabilitation program in Madagascar, damaged through cyclones that has been corrected through vetiver technology. Engineering and design were done by two Thai engineers, **Dr. Uthai** and **Dr. Diti,** lent to Madagascar through the kindness of the Office of the Royal Development Projects Board.

The rehabilitation of a 162 km railroad recently included a major effort to plant and promote vetiver grass to stabilize extremely steep embankments that often blocked the railroad during heavy rains. The following is an excerpt from a report from the field.

The vetiver bio-engineering program [in Madagascar] is moving full force ahead at the beginning of this rainy season. Sixty thousand vetiver plants have been shipped from a private multiplication farm to plant on the 10 steep "danger zones" over the next couple of weeks by the railroad company. Farmers are planting the other several hundred thousand plants very actively. The hillside planting is so visible that passing travelers are commenting that villagers are planting this "strange new grass" in an orderly fashion. The community component is moving full force ahead with the 85 farmers – they are planting fruit trees, pepper, coffee, citrus to ensure that they have a stake in the maintaining the steep hills green and free from bush fires for land clearing and erosion. v

TAIWAN

Letter to Richard Grimshaw from Yue-Wen Wang, Assistant Professor, Dept. of Agronomy, National Taiwan University, Taipei, Taiwan:

Although Taiwan is a small island, transportation still contributes quite significantly to the cost of vetiver. I have coordinated a group of people to set up nurseries around the island to facilitate transportation. At this moment, there are two nurseries capable of commercial production in the southern part of the island about 3-hours drive from each other. There will be another nursery on the eastern part of island opening up in the spring.

In the past two years, I have been busy promoting the use of vetiver through several channels, including government officers and contractors. In the last three months, with the assistance from a engineering consulting company, I gave four seminars to groups of engineers and landscape designers from several major consulting companies to try to get the vetiver into their design from the very beginning. Those attending were very interested, but skeptical just as I was before visiting projects on field trips in the Philippines and Thailand. I knew this would happen and anticipated their skepticism by setting up field demonstrations which included one in the northern part of island along a highway in a mountainous area which performed well. Another demonstration site in a mudstone dominant area will be established in the spring. People dealing with vegetative ground cover in mudstone areas have exhausted all their skill and knowledge trying to establish plantings. The high pH (9.5) and terrible soil structure has defeated them and the size of the affected area has doubled in the past ten years to 200,000 acres. Mud slides after every storm (including small ones) are anticipated which has gotten the full attention of the government and citizens. I expect to convince people with less breath once the demonstration has been established. Since the site is yet to set up, I would very happy to get any recommendations from you.

[Dick responds, *I would add that what I have seen recently in Fujian is that you need to liberally fertilize vetiver on infertile and bad soils. Paul Truong can give you the best advice. You have done a grand job, and I hope that these demonstrations will really get the interest up of the local contractors and others. It takes time to get people to realize just how unique vetiver grass is. There is no other grass like it!!*] v

SAVN PROGRESS REPORT, JULY 1999 – AUGUST 2000

Duncan Hay, Institute of Natural Resources, SAVN Coordinator, Scottsville, South Africa.

The Southern Africa Vetiver Network (SAVN) provides a valuable service to a broad range of stakeholders with a common interest in reducing and reversing the devastating effects of soil erosion and reduced water quality in our region. We promote and provide advice, demonstration and support on a technology that works and that is simple, affordable, replicable, enduring, has diverse applications and uses, and is environmentally friendly.

As occurred last year the majority of funding (the exceptions being the sponsorship from the Thai Government to assist two participants to attend the International Conference on Vetiver, and a publication grant from the German Development Service) for the reporting period was generated within South Africa. All these funders have a direct interest in improved soil conservation in the SADC region.

It is encouraging to note increased interest in and support for Vetiver Grass Technology (VGT) by the South African Government, particularly by the National Department of Agriculture.

Preface and Acknowledgements

Various agencies have allocated funds and other resources for specific and general activities carried out by the Southern African Vetiver Network since its inception. Their contributions are acknowledged with considerable gratitude. These are as follows: Anglican Diocese of Pretoria, Eastern Transvaal; Anglo-American and de Beers Chairman's Fund; British High Commission; The Development Section; David Brown (an individual); EcoLink; Institute of Natural Resources; Nedcor Community Development Fund; The Vetiver Network (International); Voluntary Service Overseas (VSO); Total South Africa; The Government of Thailand; The German Development Service (BED).

Since July 1999 a further two funders have made significant contributions which I would like to highlight. As part of the National Landcare Programme the Department of Agriculture has allocated a minimum of R 800,000 for specific project activities including the establishment of provincial networks in Mpumalanga, KwaZulu-Natal and the Eastern Cape Province; The Tony and Lisette Lewis Foundation has allocated R 150,000 to assist in the running of the Network and to fund the publication of a number of booklets and manuals.

A special mention of appreciation must go to Dick Grimshaw of TVN, Mark Dafforn of the National Academy of Sciences (USA), and Paul Truong of the Queensland Government (Australia). Their willingness to impart of their considerable knowledge on Vetiver has allowed us, in turn, to effectively service network participants in Southern Africa. Finally, a special thanks to Jane Zimmermann for her fund-raising efforts in an increasingly difficult economic climate.

SAVN is hosted by the Institute of Natural Resources in Pietermaritzburg. There are five other proposed or existing networks covering different regions in Southern Africa: Mpumalanga/Northern Province, Tanzania, KwaZulu-Natal, Eastern Cape and Swaziland. Each of these networks is autonomous but receives support (technical, information etc) from SAVN.

SAVN has a network of 630 individuals and organisations (an increase from 450 in July 1999) located in Kenya, Malawi, Tanzania, Zambia, Zimbabwe, Namibia, Botswana, Lesotho, Swaziland, Mozambique and South Africa. Of these Malawi, Zambia, Zimbabwe and South Africa have good representation. There are two other functional networks in the SADC region. The Mpumalanga Vetiver Programme (MVP) based at Nelspruit covering Northern Province and Mpumalanga, and providing support into Swaziland and Mozambique and the recently established Tanzania Vetiver Network (TZVN) operating out of Dar es Salaam.

Information Dissemination

During the reporting period, meetings and/or presentations were held with a diverse range of organisations and institutions in the public, private and civil society sectors. The network has a comprehensive website (www.inr.unp.ac.za/vetiver) linked to the international site (www.vetiver.org). It contains technical information on vetiver grass including the World Bank "green book". the SAVN newsletters, a database of SAVN members, and various reports. Seven newsletters have been compiled and distributed since the inception of the Network. The response to these newsletters has been positive and reinforces our view that they are central to information dissemination in a region where access to electronic communication is limited. The World Bank "green book" and the EcoLink booklet are out of print and stocks have run out. SAVN is currently reprinting and copies will be available in the near future. SAVN has produced two documents - Technical Specifications (a simple technical specification fact sheet for general distribution) and a photographic field manual is being developed. Formal publication will take place towards the end of the year (dependent on funding). SAVN has copied the vetiver video and it is available for a nominal fee.

Nurseries

The Network has supported the establishment of a number of nurseries (largely community-based) in KwaZulu-Natal and Mpumalanga. Large nurseries were 'discovered' at Bathurst and Tsolo in the Eastern Cape which will greatly assist in market supply in this province. Two other nurseries (at Bisho and Queenstown) will be planted this year. The erratic distribution of stock throughout the region remains problematic. Network

members are encouraged to promote nursery development and to report to the co-ordinator where stocks of grass might be accessed.

Training

As part of its small-scale agricultural training course the INR training farm, Nansindlela, has a module on vetiver grass technology.

Research and Conferences

The Network received several distinct genetic varieties of vetiver from **Dr. Robert P. Adams**, Director of the Plant Biotechnology Center at Baylor University in the United States. Despite spending seven days dehydrating in various aircraft holds most of the plants survived. Now that the plants have grown out it is the intention to carry out research on the relative ability of these plants perform in cooler climates. It is planned to establish 3 plots: one coastal, one at about 3000 feet altitude and one at about 5000 feet and look at relative performance of the genetic types within the plots and between the plots. We will try and locate sites with similar rainfall and soil characteristics with the only major difference being temperature.

In January 2000 four representatives from South Africa were invited to and attended the Second International Conference on Vetiver in Thailand. The conference provided a tremendous learning experience for these representatives in areas ranging from rehabilitation to vetiver-based craftwork production.

Future Activities

The following activities will take priority in 2000 and 2001:

- Continued recruitment into the network;
- Dissemination of information on a regular basis and on request;
- Support the establishment of other networks within the SADC region;
- Increase the supply of grass stocks through the promotion of nursery establishment;
- Identification and training of small scale contractors/growers to establish nurseries and apply the technology;
- Contextualise vetiver as a fundamental part of the national Landcare initiative; and
- Raise further funding for network and project activities. v

E-News From Latin America

Brazil Vetiver Network Starts E-Discussion group:

The RBVN (Brazil Vetiver Network) has initiated an idea exchange for vetiver–related topics in Brazil (in Portuguese). To visit the site, go to the RBVN homepage at:

www.brasilvetiver.00page.com

Suggested topics include: soil and water conservation; recuperation of degraded areas, slope stabilization, vegetative hedge technology, vetiver technology for agriculture, mining, and bio-entineering. Contact coordinator Rogerio Lima at <brasilvetiver@hotmail.com>. Please note that the Brasil homepage now has a new location at: brasilvetiver.00page.com v

Ecuador Premiers Homepage

Piet Sabbe, coordinator of the Ecuador Vetiver Network (Ecuativer) has developed a homepage which can be found at: www.ecuativer.com. Also there is a new email address for Ecautiver at: <info@ecuativer.com> v

LAVN Premiers New Newsletter

Boletín Vetiver No. 9 has recently been published by the new coordinator, Dr. Oscar Rodriguez in Venezeula. The 24-page newsletter includes translation of some documents previously unavailable in Spanish. These include: Vetiver Technology for Mine Rehabilitation, Application of Vetiver for Phytoremediation by Paul Truong, and Handicrafts with Vetiver in Thailand. Also a series of articles from Nicaragua are presented summarizing vetiver's use in soil and water conservation and bioengineering. The newsletter is available in PDF format via the TVN homepage or request a copy directly from Dr. Rodriguez: red_vetiver@hotmail.com v

Headlines from TVN's Homepage

The TVN Homepage (www.vetiver.org) has recently undergone some changes in appearance thanks to Dick Grimshaw, TVNs webmaster. Some headlines you'll find at the site include:

China Policy to Regreen Highways, Railroads and Other Construction Sites

Increased Use of Vetiver and a New National Network in the Mediterranean Area (EMVN Newsletter #5)

Application of Vetiver Systems to Hillsides and River Crossings in Madagascar

Vetiver and Wildlife Protection in Africa

***Vetiveria nigritana* and its use in Senegal**

Soil Conservation Practices in the Caribbean Archipelago

Vietnam: Mekong River Banks Heavily Eroded by River Boat Traffic - a Pictorial Essay

Log onto TVN's Homepage for more on these topics and other information. v

INSPIRING DONOR/PARTICIPANT EXPERIENCE IN EL SALVADOR

By Walt Dennig – California, USA

The following is a piece submitted by Walt Dennig of Santa Cruz, California, USA describing his experiences as a volunteer in a project in El Salvador. We'd like to hear from others who might have had similar experiences as volunteers working with vetiver in other countries. See TVN Homepage (http://www.vetiver.org/ELS_soilcon.htm) for an interview with Walt.

The Philosophy

Problems can be solved by many different types of approaches. Soil erosion control and water conservation, although a global problem, are, in the end, solved at a very low level (planting one tiller at a time). There are many organizations involved in both soil erosion control and water conservation; some are global and others are tiny. I think there is room for the individual donor/participant. For most of my life, I have supported large organizations, solving large problems on a grand scale. I've realized that much of the support is eaten up by an inflated bureaucracy. This has always annoyed me and I've wanted to donate at the ground level. So this is the form that I currently employ.

The Project Development

Several years ago, I travelled to Madagascar, in an attempt to set up a project in soil erosion control after having read the literature that Dick Grimshaw provided to me. I met a woman near Ranomafana whose family owned some land that could serve as a nursery and "development center". We developed the concept on paper, but after a while it got to be very complex and required the involvement of large organizations. I felt myself getting further and further away from the ground level.

Then I attended ICV-2 in Thailand in January 2000. There I happened to meet **Aldo Miranda Sol** (formerly) of NOBS Antierosion in El Salvador. We discussed my desires and he invited me to come to El Salvador. In May 2000, I visited El Salvador and Aldo hooked me up with the NOBS General Manager, **Ronaldo Chavez**. Ronaldo introduced me to NOBS' erosion control work with vetiver and also made arrangements with NGOs so I could see their work with vetiver and look for a situation that would work for me.

The organization that seemed most attractive to me was the Associación (formerly Fundación) de Amigos del Lago Ilopango (Director - **Jeannette Monterrrosa**). Since that first meeting, I have made three additional two-week trips to El Salvador. The relationship with the Amigos is very loosely knit and is more of a collaboration. They have two major funding sources and therefore two different sets of goals. I've chosen to work alongside the smaller of the two groups. The model is that extension workers promote the use of soil conservation and other agronomic measures in the villages on the near side of the lake. By the time I arrive, they have identified farmers' parcels that fit the type of involvement that suits me. We devise the plan together and I purchase the planting material from NOBS. They deliver it and the extensionists and I plant it. Occassionally, the farmers actually plant with us.

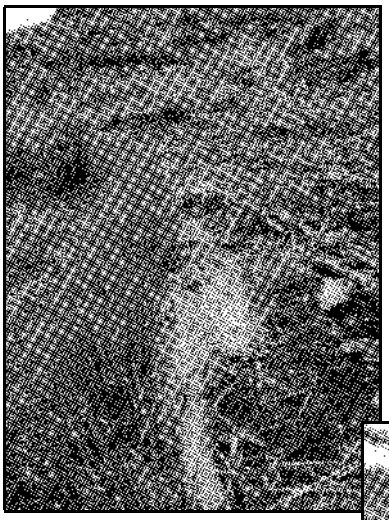

Photo 2 (left). A vetiver hedge not only filters soil particles, it can capture large quantities of debris.

Photo 3 (below). Don Alcides in his bean field with 4 vetiver hedges on the slope above him.
Photo credit: Walt Dennig

My plan is to return in 2001 for 3 separate, three-week trips during the rainy season. That's about the limit my budget will allow. My work in the USA is in residential remodeling which is fortunately lucrative enough to support my project involvement in El Salvador.

I've rented a house near the lake in San Agustin which is close to the parcels. My Spanish is limited, but improving and the people are most helpful.

During the following year, I think this paradigm of the "Individual Donor/Participant" will be established enough for me to begin then next phase. I want to continue what I'm doing and also include other individuals that participate on a one-time or intermittent basis. As this new model is developed, I'll keep you informed. v

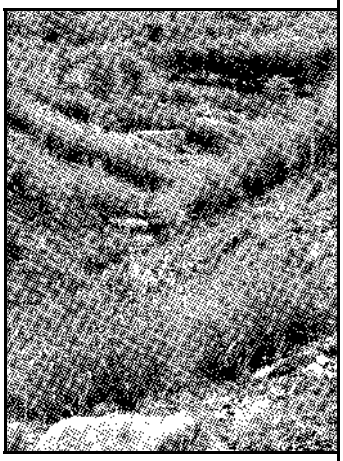

Photo 4. A ravine has been protected with multiple rows of vetiver across the slopes.
Photo credit: Walt Dennig

Experiences From Mexico

THE VETIVER GRASS SYSTEM FOR STABILISING STEEP AND UNSTABLE SITES

By Nicholas Dolphin, Coordinator – Mexico Vetiver Network, Oaxaca, Mexico

Puerto Escondido in the State of Oaxaca, southern Mexico, is a small resort on the Pacific coast, popular with international surfers and local tourists. This stretch of coast was badly damaged by Hurricane Paulina in October 1998 and again by the earthquake in September last year (1999).

We were asked to install the Vetiver grass system to protect a housing development being built above an eroding beach cliff. The most serious problems are the large areas of loose sands (which were previously protected by the natural vegetation) and slides off the cliff top.

The climate on the coast is hot and seasonally humid, with an average temperature above 26º C, receiving about 1600 to 1800mm of rainfall annually. The rainy season normally starts in mid-June with a six week break from mid-August to the end of September, and terminates in mid-October. The heavy downpours experienced from time to time cause most of the soil erosion, however exposed sands on steep slopes can slide themselves when dried out.

We were asked to protect the exposed areas and the cliff top which were experiencing alarming erosion and slides caused by the earthquake destabilization. The erosion of the cliff top was also exacerbated by a badly designed road which channeled large quantities of rainwater onto the open flat area above the cliff; the water seeping deep down behind the cliff face further destabilizes it and also causes erosion of the lip despite attempts at engineered drainage channels. The slopes involved have gradients between 45 and 85 degrees.

Large gabions filled with soil and laid horizontally along the cliff were initially utilized to halt the erosion in the steep, exposed areas. The gabions are expensive, have a relatively short lifetime and 40% of them slipped in the earthquake. Vetiver was chosen as an alternative to engineering solutions because it enhances the natural environment and because of its deep root system, resistance to drought and very poor soils, its ability to both slow and divert moving water and its long lifespan.

The planting strategy, given we had 25,000 slips initially, was to:

- Stabilize the head of the cliffs with vetiver hedgerows to provide long term protection to the substrate and to divert flowing water into already protected;
- Densely plant vetiver on selected exposed cliff-face sites using the trimmed leaves for moisture retention and mulch.

Vetiver plants rooted in bags were recommended because the soils suffering the most serious erosion and in most urgent need of protection lack organic matter. However, the first planting produced impressive results and the client requested us to increase the planting so that three types of plant material eventually were used.

Photo 5. Black polybags filled with alluvial soil yield 100% survival rates.
Photo credit: Nick Dolphin

Photo 6. Soaking plants in water for 5 to 10 days before planting encourages root formation and thus increases survival rate.
Photo credit: Nick Dolphin

Bagged plants. Black polybags, measuring 15cm by 10cm in diameter, with rich alluvial soil as substrate **(Photo 5)** We have had 100% survival rates with these plants even in sand, when planted with the rich potting soil. Root depth reached 1 meter in one month. Seventy percent of the bagged plants were planted on the cliff top, shallow slopes and the pathway, and 30% on steep slopes.

Rooted slips. Planting slips were soaked in water for between 5 and 10 days to encourage new root growth before planting **(Photo 6)**. Planting 2 or 3 slips together as a planting unit has yielded a survival rate also near 100%. Root depth reaches a meter in about 2 months and vigorous new shoots appear approximately 15 days after planting. Thirty percent of these were planted on shallow slopes and 70% on steep slopes.

Clump slips. These are clumps which were divided and planted immediately after excavation. Up to 30% of these slips failed to produce roots, particularly in sandy areas. We have estimated that the root depth will reach 1 meter after 3 to 4 months and shoots begin to appear 20 days after planting. These were planted on steep slopes and the pathway.

Manure was not used to fertilize all the plantings and the comparison between manured and unmanured plants is significant. Animal manure has increased plant growth, speed of rooting and survival rate. For bagged plants it is preferred that manure is mixed in with the substrate. For the rooted and clump slips in the sandy

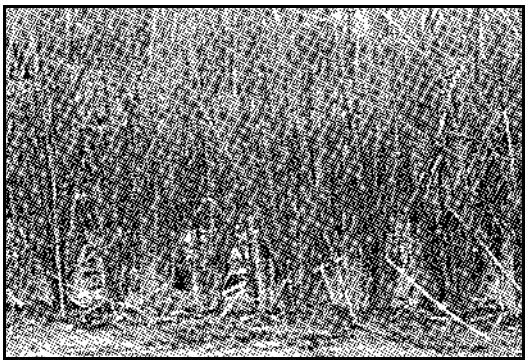

Photo 7. Six-week old hedgerow on shallow incline.

Photo credit: Nick Dolphin

areas, application of manure has reduced plant mortality from about 30% to10% and leaf growth has increased by approximately 100%.

Several planting techniques have been tried to suit the different types of terrain.

Shallow incline (0 to 5 degrees). Standard hedgerows were planted the length of the cliff top using mostly bagged plants into order to get rapid root penetration to stabilize the substrate where water accumulates behind the cliff. Thirteen to fifteen bags per meter were planted to establish an instant barrier to divert the flowing water. **Photo 7** is a close up of a hedgerow six weeks after planting. In some situations hedgerows are more closely spaced than required by the incline in order to increase root surface below ground as this is an area of potential landslide; these hedgerows are also designed to divert surface water into the already protected area on the horizon.

Medium incline (5 to 30 degrees). These areas were planted with either closely spaced contour hedgerows or dense, random planting where soils are particularly loose.

Steep incline (45 to 85 degrees). On the very unstable sand, three methods were tried: closely spaced contour hedgerows which are effective in most situations; rows supported by wooden stakes where unsupported slips washed out due to looseness of the sand and the steep gradient; and planting through felt sheets **(Photo 8)**. The idea for using felt sheets came up because the client had a large quantity of felt in sheets of white and gray, 2.5 and 3 cm in thickness. Two rows of holes were cut in each sheet with a distance of 80 cm between the pairs of rows. The felt has benefits such as reducing evaporation, suppressing weed growth (weeding is difficult on very steep slopes), and preventing surface erosion from rainfall impact. Sufficient rainfall penetrates the holes through which the vetiver is planted and through the felt itself to maintain moisture levels.

Cliff path. Stairs leading down to the beach were eroding very rapidly, the sides being mostly loose sand. The steps were reconstructed to drain the water to the side run-offs which were protected with vetiver and the steep slopes filled with close random planting of vetiver or very close hedgerows. In some places the slope was too steep and sandy for the vetiver to withstand slippage caused by moderately heavy rainfall without wood en stake retainers, upstream protection or very dense planting. The work is still in progress.

Trimming and weeding is a continuous process during the rainy season. The vetiver is trimmed and weeded on average once every two weeks. Leaves grow about 15 cm in a week. Weeds, in places guinea grass, can smother the vetiver within two weeks.

A full time team of six was trained over three days in mid-June at the onset of the rainy season. The team works six days a week on a fixed wage which means progress is slower than on piece rates but has the important advantage that the men can work at their natural rhythm and with greater care in planting slips. Following the training, twenty three days of monitoring and training in special techniques were given during the first two months. The foreman rapidly understood the Vetiver System and is doing an excellent job of planting and maintenance. Since the monitoring done at two months after planting, we have made occasional visits to sort out problems, which have been very few, and to discuss the client´s and foreman´s plans for planting new areas.

Lessons learned

Vetiver lives up to its name as an exceptional grass for stabilizing difficult sites and very poor soils. Attention to designing the site, selecting plant material and to planting and maintenance is needed to get good results.

As well as confirming requirements for the successful application of the VS, our experience with this project highlights the following:

- In difficult situations, such as unstable soils or steep slopes, experiment to get the best solution – vetiver is very versatile;
- Quality of plant material is crucial: to obtain sure and rapid results, bagged plants (when roots have extended to the bottom of the bag) or rooted slips (soaked in water inducing new roots after 5 to 10 days) are preferable;
- Manure significantly increases root and leaf growth and reduces failures in poor soils;
- Shade, whether from weeds or treesv badly affects plant growth; robust weeds can kill newly planted slips.

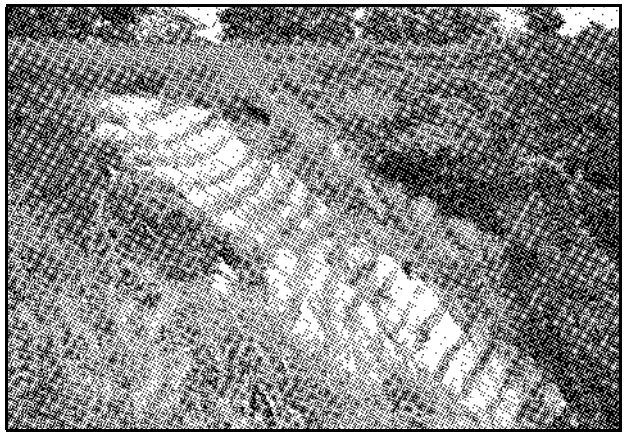

Photo 8. Felt sheets help reduce evaporation, suppresses weed growth, and protects against raindrop impact on the steep inclines.

Photo credit: Nick Dolphin

- Involve the client and the people in charge of the planting in planning and design of the site from the beginning. The success of this project is due to the enthusiasm and commitment of the client and his work team as well as the remarkable properties of vetiver grass.
- For a new client, rapid results generate enthusiasm and confidence and the willingness to experiment – it is worth spending time and money to ensure that the first demonstrations are as near 100% effective as possible.
- Training is very important to ensure careful planting and good maintenance. When training the work team of a client, as in this case, ensuring that the foreman is fully conversant with VS so that he can make his own decisions and adopts vetiver as his own project is well worth extra time in monitoring and supervision.

A core team of 6 people, including the foreman, working 6 days a week is responsible for planting and maintenance, sometimes supplemented by casual labor. The first plantings of vetiver took so well that our client decided to increase the number of plants from the originally planned 25,000 to almost 65,000 - equivalent to about 6 linear kilometers of hedgerow. By the end of this season's planting, we expect to have planted the equivalent of 10 kms of hedgerow. v

COSTA RICAN COFFEE COOPERATIVE BENEFITS WITH USE OF VETIVER

By L. Moyher, Coordinator Costa Rica Vetiver Network

At the beginning of January 2000, **Dominic Ackerman** revisited the Miramar coffee-growing zone in the province of Puntarenas, Costa Rica where several years earlier he had collaborated in conservation efforts as a Peace Corps Volunteer. His photos illustrate the Montes de Oro coffee cooperative's use of vetiver by applying it for the protection of costly infrastructure. Vetiver is used to mitigate the impact of heavy rains and to strengthen the earthen bases against the threat of rupture during earthquakes. v

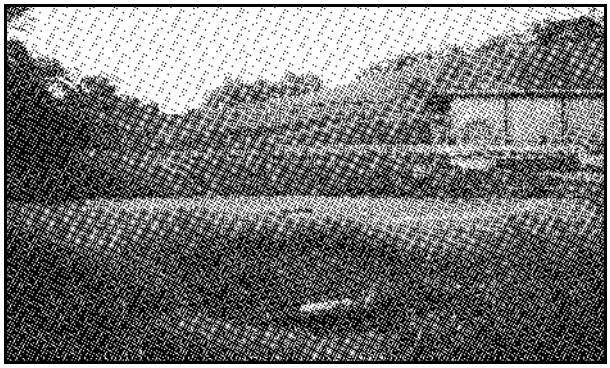

Photo 9. Transfer point showing vetiver protecting the bank from falling in on top of the pipes and keeping trash out as well.

Photo credit: Dominic Ackerman

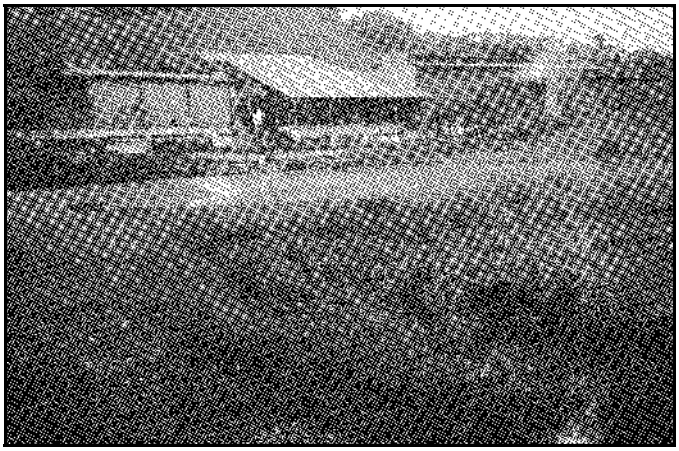

Photo 10. Overview of Montes de Oro coffee mill with early water treatment pond. Vetiver surrounds the area where the pipes transfer water to next pond.

Photo credit: Dominic Ackerman

INTRODUCTION OF VETIVER GRASS FOR CONTOUR FARMING AND ROADSIDE STABILIZATION IN NGIE, CAMEROON

The following article is based on a report submitted to The Vetiver Network in November 2000 by Elise Pinners, Joe Agba, Victor Njei, and Pascal Bokkers, Netherlands Development Organisation (SNV)

The Ngie Integrated Rural Development Project (NIRDP) implemented by (Netherlands Development Organization (SNV), has been working to introduce new and innovative farming systems to an area of Northwest Cameroon. The focus of NIRDP is on productive sectors such as agriculture, livestock, marketing and road maintenance and through this project has introduced the Vetiver System (VS) for both contour farming and roadside stabilization.

Ngie subdivision is part of Momo division, NorthWest Province, Cameroon. The altitude varies from 500 to 2000 meters with steep slopes which sometimes reach above 50%. Annual average rainfall is between 2500-3000 mm. The soils have developed from granite and are often rocky. Soil fertility is variable, ranging from poor to medium, depending on the type of soil fertility management that is practised. Low organic matter content and high rainfall often lead to nitrogen shortages and phosphate is often insufficient.

Participatory Rural Appraisals (PRAs) in 1997 and 1998 in the villages of Ajei and Tinechung identified soil erosion among its problems, as well as conflicts arising from forraging livestock encroaching on farms which caused considerable damage. Additionally the Ngie road was of significant concern due to its poor state and was often inaccessible for days at a time.

To illustrate options available to the farmers to address

Photo 11. Vetiver multiplication training session in Ngie, Cameroon. Suppliers of vetiver grass are required to attend the training prior to getting started.

Photo credit: Elise Pinners

the problems identified in the PRAs, farmer exchange visits were organized. Once farmers were aware of some of the innovative options open to them via the exchange visits, land-use planning workshops were organized to analyze land-use problems identified in the PRA and to develop action plans. These workshops were attended by local chiefs, administrative officials, and farmers (mostly women). The action plans identified the following activities for implementation: Paddock Farming (known as the Night Paddock Manuring Farming System); improvement of pasture management and fodder production; and soil conservation/contour farming using VS (vetiver was demonstrated as one of the options shown for use in contour farming and roadside stabilization by **Simon Ngwaimbi** – Coordinator of the Cameroon Vetiver Network and BERUDEP (Belo Farmers Union). The action plans were initiated via follow-up exchange visits and farmer-to-farmer training given by farmers in other areas already involved in the identified activities.

Multiplication Nurseries

Vetiver nurseries were established using plant material provided by a farmer working in the Belo region. Women farmers were chosen to be coordinators of the vetiver multiplication training which was given by farmers from BERUDEP. Training was initiated for group nurseries to provide material for contour farming and it was determined that demonstration sites should be set up along the Ngie road which was undergoing rehabilitation.

Contracts were drawn up involving the road contractor, CIPCRE (an NGO promoting farmer innovators), BERUDEP, village road maintenance committees and vetiver suppliers. Preference was given to women suppliers, because women generally contribute more of their labor to road maintenance than men, and this job was to be well paid. Women also may have greater interest in using vetiver for soil conservation, as they farm most food crops.

Speed of vetiver multiplication was not as rapid as expected because vetiver was sometimes inter-cropped with food crops, received insufficient manure application for fertilizing or was planted in shade. Currently, there are 5 nurseries in Tinechung, and 3 nurseries in Ajei.

The vetiver suppliers contracted to supply plants for the Ngie road, have also started their own private nurseries since the nursery sites belong to their road maintenance committee (RMC). Demand for planting material is growing and there is growing interest in producing vetiver, if not for the road, then for themselves on-farm or for other farmers. Prices charged are negotiated. At this stage there are 6 RMC nurseries and at least 6 small private nurseries in the villages along the road.

Contour Farming

In Tinechung, only 4 farmers have planted a vetiver hedge on their farm due to a lack of available planting material. The impact has yet to be evaluated with the farmers themselves, although additional farmers expect to be planting in March 2001 with the start of the next rainy season.

While waiting for an ample supply of vetiver in Tinechung, some women have experimented and concluded that the yield of beans growing along contour beds was higher than those from beds planted down the slope. The yield differences were obvious which has convinced other farmers to propose a 'by-law' that would oblige all farmers to farm along contours.

Roadside Stabilization

Pilot demonstration sites included unstable roadside walls with a high risk of collapsing (i.e. landslides) and culverts. Village road maintenance committees appointed vetiver suppliers that were to be contracted and paid for every clump produced which increased the status of vetiver as a valuable plant. CIPCRE sub-contracted the vetiver suppliers, organised training involving the farmer from BERUDEP, followed-up in the nurseries, and finally the planting on demonstration sites, all this in close collaboration with NIRDP. It was required that all vetiver suppliers contracted attend the vetiver multiplication training where they also learned of vetiver's other uses for on-farm soil

Photo 12. A newly planted nursery in Etwii in NorthWest Province of Cameroon.

Photo credit: Elise Pinners

conservation and use of the roots in storage of beans and maize to repel insects.

In September 2000, vetiver was planted on the side of the main bridge, and around a dozen culverts. Since the road rehabilitation was not yet completed, the technicians were hesitant to plant vetiver on roadsides as well. Unfortunately, the soil on the sides of the culverts sides had not been compacted prior to the arrival of the rainy season. As a result, soil and the newly planted vetiver were washed away by heavy rains.

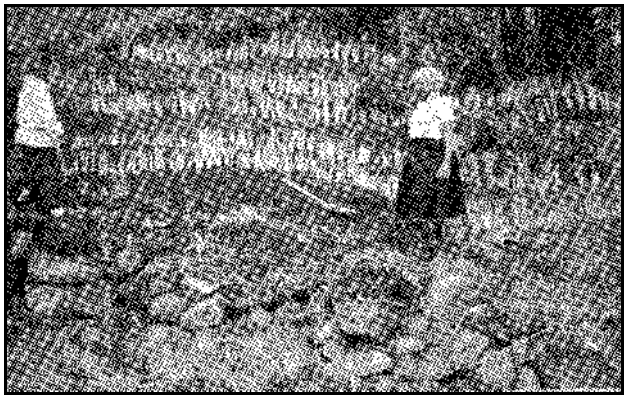

Photo 13. A wall above a road at 60%, planted with vetiver.

Photo credit: Elise Pinners

Another problem encountered was caused by the shortage of planting material. Instead of selecting only 1 or 2 sites to be properly and completely treated, it was decided to plant small (and insufficient) quantities at a dozen culverts. As a result, there was only a single line of vetiver planted on one or both sides of some culverts. It was concluded that it would be better to demonstrate VS correctly on one or two culverts only, and include a demonstration of roadside stabilisation at the same site.

Aditionally, it was determined that the single line of vetiver was planted too high on the culvert sides so that it appeared as if vetiver was actually supposed to prevent water from leaving the road on the culvert side. It was concluded that should be planted further down the slope so that water is not blocked from flowing off the road surface. Also, if there is a shortage of planting material, it would be better to start at the foot of the slope.

The problems described above were corrected in the weeks following initial planting when hedges were replanted by technicians and representatives of the road maintenance committees (including vetiver suppliers). One road wall about 6 m long and 3 m high, above the inlet of a culvert, was shaped to a slope of about 60º and planted with about 5 rows of vetiver (**Photo 14**). Additionally, a few rows of vetiver were planted on the outlet side of a culvert that which was well compacted (**Photo 15**).

Photo 14. Vetiver planted along the outlet of a culvert.

Photo credit: Elise Pinners

Conclusions

Contour farming: Timing of exchange visits is important. They should take place just before farmers start preparing their land, since they can adapt their farming methods (making contour beds and eventually planting vetiver on contour lines) at that time. During these visits farmers could be stimulated to start experimenting with contour farming, vetiver, and other improved soil fertility management methods.

Some have asked what role can vetiver play in preventing fires entering farms from grazing areas and whether vetiver hedges even prevent cattle from entering the farm. Other wonder what the limitations are of contour farming practices (including tied ridging and terracing) on extreme steep, stony slopes (where farmers in Ajei say that they cannot contour farm) and what role can Vetiver play on such sites.

Roadsides: On the roadsides where vetiver is not planted correctly, it is better to remove and return the plants to the nurseries. It is important to show only good examples so that people walking along the road draw their conclusions based on good utilization.

Vetiver for roadside stabilisation can only be applied on a large scale once roadwork has entirely finished. Application is also limited by the availability and speed of vetiver multiplication.

Organisational aspects for road maintenance: Many questions on road maintenance remain to be answered. For example, how can RMC's organise the continuation of the Vetiver multiplication and planting without spending money and how far can they rely on communal labour for multiplication and planting of vetiver? Clearly, more suppliers should be trained, but can RMC's rely on the moral obligations posed on the trained vetiver suppliers, to share their knowledge and experience and some planting material?

It may be necessary to remind the trained suppliers of the fact that they were appointed by their RMC to receive training and planting material, and generous payments for the vetiver supplied the following year. It may also be useful to emphasize that road maintenance is supposed to be a matter of communal labour. Is vetiver multiplication and planting for roadside stabilisation not part of communal labour? The purpose of all this vetiver planting is that, in the long run, time will be saved by less frequent or less work spent for clearing gutters and culverts; reduced occurrence of landslides needing clearing and reduced number of potholes and gullies to fill, (as these are caused by insufficient drainage). v

SCALE INSECTS ON VETIVER IN GUAM

By Dr. R. Muniappan (Agricultural Experiment Station, University of Guam, Mangilao, Guam 96923, U.S.A.)

In a recent survey of vetiver hedges in Guam two species of scale insects, which were not observed before, were collected. These insects were preserved in alcohol and sent for identification. **Dr. Douglass R. Miller**, Research Entomologist, Systematic Entomology Laboratory of U.S. Department of Agriculture, Beltsville, Maryland has identified them as *Aclerda* sp. poss. *takahashii* Kuwana (Aclerdidae) and *Aulacaspis madiunensis* (Zehntner) (Diaspididae).

This scale insect *A. takahashii* was first described by I. Kuwana from the specimens collected on sugarcane in Taiwan by Ryoichi Takahashi. The adult female is thick, soft, elongate oval, creamy to light brown with dark brown caudal end. It is found on the stem beneath the leaf sheath. The ortion of the body of the adult female not covered by the sheath bulges. White wax is found around the body. All stages of the life cycle of this insect, namely, larvae, pupae and adult females (except the adult males) are found on the stem, under the leaf sheath. Feeding of this scale causes discolored necrotic patches on the stem. Black sooty mold also develops at the place of infestation due to honey dew secreted by this insect. This insect has been recorded on the plants, *Miscanthus* sp., *Saccharum arundinaceum, Saccharum indicum, Saccharum officinalis, Saccharum spontaneum* and *Thysanolaena agrostis* in other parts of the world. Geographically it has been reported from Mauritius, Reunion, India, Malaysia, Pakistan, Philippines, Taiwan, China, Egypt and Brazil.

The other scale insect, *A. madiunensis* is found on grasses but it is a pest of sugarcane. It has been reported from Java, Malaysia, Singapore, Taiwan, Australia, Uganda, Tanzania, Malawi, Kenya, South Africa, Tuvalu, Papua New Guinea, Yap and Palau.

This is the first report of both these scale insects from Guam and also on vetiver. Of these two scales, *A. takahashii* seems to cause some damage to vetiver. It was also found on *Pennisetum polystacheon* growing closer to the vetiver hedges.

Scale insects, in general, are difficult to control by chemical means. Most of them are covered by waxy material and in addition on vetiver by the leaf sheath. In most cases, biological control is sought for suppression of the scale insect population.

A number of parasitoids namely, *Aphytis mytilaspidis* in Java and Singapore; *Aphytis* sp in Queensland, Australia; *Physcus flavidus* in Sabah, Java and Singapore; *Physcus nigriclavus* in Queensland, Australia; *Physcus seminotus* and *P. subflavus* in Uganda, Kenya and Tanzania and *Adelencyrtus miyarai* in Java, Singapore and Sabah were recorded on *A. madiunensis*. In fact, the parasitoids, *Coccobius nigriclavis* and *Aphytis* sp. from Queensland, Australia in 1972 and *Aphytis mytilaspidis* from Java in 1975 were introduced to Mauritius for control of *A. madiunensis* in sugarcane fields. Also, some species of lady beetles (coccinellids) are known to feed on scales.

I have not come across the reports of occurrence of parasitoids on *A. takahashii*. This means either I was not able locate the publications on this aspect or no one has explored in this area.

Vetiver clonal material was brought in to Guam from the continental United States either via Hawaii or directly. Because these scale insects were not reported from those areas, it would be of interest to trace the origin of their introductions to Guam. *A. madiunensis* has been recorded in the Micronesian islands of Yap and Palau. It is possible this insect got introduced to Guam from these neighboring islands. The source of introduction of *A. takahashii* to Guam requires further investigation.

Scale insects are highly cryptic and their presence could escape notice except under the most rigorous inspection regime. This necessitates the need for formal quarantine and phytosanitory procedures if it becomes necessary to introduce vetiver to a new location. According to Mr. **Mark Dafforn**, National Academy of Sciences, Washington, DC, because good quality vetiver germplasm has been shown to occur in almost every country, international movements should rarely be required and should always be carried out through established procedures involving the appropriate governmental authorities. Otherwise, the risk of transporting pests and diseases is too great.

Food and Agricultural Organization (FAO) has developed guidelines for safe movement of different crops. FAO and/or The Vetiver Network could possibly develop similar guidelines for vetiver. The absence of any reported serious pathogenic diseases or pests, except the scale insects, at present, a rigid quarantine inspection and dipping of the cleaned vetiver slips in an insecticide solution before shipment should be practiced. Of course, all shipments should accompany a phytosanitary certificate.

In addition, the impact of these scales, especially *A. takahashiii* on vetiver should be studied. Since this scale has been reported from some of the countries in Asia, Africa and South America, its occurrence on vetiver in these countries should be verified. If this insect proved to be a serious pest, varietal screening should be done for resistance and also the use of natural enemies should be explored. v

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INSECTS ON VETIVER HEDGES

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This paper is the third in a series done by the author on vetiver and insects.

Method and Content

Vetiver was introduced from Jiangxi Province into experimental sites located on and near Gao Feng Tree Farm (N 22 29'; E 108 21') in Guangxi Province. Daily observations of the insect populations found in these newly introduced plants were subsequently made during a period of 422 days. For purposes of comparison, the observation periods were considered to be split into two 211 day periods: "First Period" (the initial introduction period) from March 20 to November 15, 1998 and "Second Period" from Nov. 16, 1998 to July 14, 1999.

Visual observations were made during 30 minutes periods at the same time each morning, afternoon, and evening; random observations were also made. Observations were recorded on: species; number; time of day of observation; time and day of emergence; feeding, mating, flying and gathering habits; and preferred microhabitat. Comparisons were also made between hedges of vetiver grass hedges in rural plots and mixed vetiver grass/several other kinds of plants in urban gardens. Atmospheric temperature and relative humidity were record daily.

Results and Analysis

During the second period 102 species of insects were observed on vetiver hedges. The observed insects belonged to the Class Hexpoda and represented 14 Orders and 63 Families. The majority of the observed insects were of the Order Hymenoptera, representing 12 families and 19 species. The next most abundant were the members of the Order Lepidoptera, with 11 families and 18 species represented. Followed by: Diptera, 10 families and 14 species; Coleoptera, 8 families and 12 species; Orthoptera, 6 families and 8 species; Odonata, 3 families and 7 species. In total, 50 families and 78 species were represented from the above 6 orders; accounting for some 78% of the observed total.

Comparing these observations with observations during the first period: the order Isoptera was no longer represented and two new orders appeared - Thysanoptera and Neuroptera. This represented an increase by one in the number of orders, and an increase of 10 families and 23 species. Between the two periods, the number of species of rudimentary insects decreased whereas the number of species of higher orders, such as Hymenoptera, increased. In the first observation period, species number in the order of Orthoptera ranked second; in second observation period Orthopterans dropped to fifth in terms of species number.

Leaf - eating insects: 13 species of leaf-eating insects inhabited the vetiver leaves. Six species belong to Acridoidea family of Orthoptera order. The leaf-eaters were dominated by *Oxya intricata* (Stal) in both observation periods. *Chlorophorus annularis* (Fab), a pest on bamboo, and *Cylas formicaris* (Fab), a pest on yams and *Tessaratoma papillosa* Drury, a serious pest on longan and litchi trees were observed. The numbers of species of leaf-eating insects decreased from 13 to 4 as other annual grasses became available and as the vetiver entered into its second year.

Insects on spikes, culms and roots: Eight species of insects were observed on the spikes; of which the aphids were the longest lasting. On culms 6 species of insect were observed. *Xyleborus* sp. (a moth) was found on stressed plants on difficult sites and others plants exhibiting light-colors and weak leaves. *Saccharicoccus* sp., a sucking insect was found to damage, but not destroy, nodes of culms in the urban site. Labiduridae of Dermaptera order were observed to emerge on damaged culms and roots. Five species of insects were found on roots - earwigs, crickets, vinegar flies, a scarab beetle were observed. *Blattella germanica* (L) were found for the first time in this area on vetiver roots. Saprophytic insects - mycetophilids, Ostomatidae and springtails - were found on decaying roots.

Predatory Insects: Altogether 26 species of predatory insects were observed. Seven species belonged to the Odonata. There were 7 species of ants. In the second observation period, newly emergent species included: *Ropalidiidae* and *Delta campaniforme esuriens* (Fabricius); *Micraspis discolor* (Fab); *Vibidia duodecimgutata,* (Poda). *Nephus* sp. of the order of Coleoptera was a new discovery for the area. *Melanostoma scalare* (Fabricius) in the order of Diptera was found. The emergence of the Mantodea decreased in the second observation period, with only *Paratenodera sinensis* Saussure being found. The emergent days *of Vespa tropica leefmansi* Van der Vecht was also decreased. The emergent times of parasitic insects increased but the number of species was reduced during the second observation period. Only 5 species were observed: *Larvaevoridae, Ichneumonidae, Aphelinidae, Encertidae* and *Tetrastichidae* (which was a new observation, found on eggs of borers on the leaves).

Insects Inhabiting the Vetiver Hedges: There were 38 species in total inhabiting the vetiver plants. Species diversity was greatest in the mixed hedges in urban areas. *Musca domestica* vicina Macqurt and *Chrysomyia megacephala* Fab continuously inhabited the vetiver. Next were *Saccharicoccus* sp. and the aphids. Mating was observed of *Musca domestica* vicina Macqurt. The number of species and times of emergence of *Nematocera* increased after the vetiver was pruned in winter; these included: mosquitoes, midges, and *Psychodidae*. The presence of *Amata* sp., *Lampides boeticus* L. and *Pieris rapae* L. changed from temporary (first period) to continuous. The *Amata* sp.

especially was found in both rural and urban settings. *Lampides boeticus* L. would stay on the hedges overnight. Length of occupation increased for *Apis cerana* Fab. Among short term occupying insects, most were butterflies. Some insects such as *Stephanitis* (Stephanitis) *typica* (Distant) and *Coptosoma* sp. (which feeds on the seeds of *Gendarussa vulgaris*) would not stay on the vetiver.

Discussion

Waloff (1968) hypothesized that, with the changing age of a plant, its nutrient content and physical condition changes which in turn promotes succession among its insect population. The observations here support that hypothesis. For example, in the first period *Macrotermes barneyi* Light emerged but it didn't emerge in the second period. Feeding by *Oxya Intricata* (Stal) decreased in the second period from 45 to 19 days. However, in the second observation period *Catantops* sp. presence increased to nearly 20 days. The appearance of sucking insects decreased on the leaves and increased on the stems. Insects species during vegetative period and reproductive stage were different. For example, *Saccharicoccus* sp.and *Aphididae* became dominant insects only at the period of heading.

A greater diversity in plant communities is normally expected to result in a greater diversity of insect communities. This was found to be true in this experiment when comparing pure vetiver hedges in rural plots with mixed vetiver grass/other plant hedges in urban gardens. The greatest differences were found in the numbers of species of leaf beetles (*Amata* sp. and *Catantops* sp.) which always emerged in the vetiver grass hedges in rural plots where there were few natural predators; in the mixed plots in urban gardens not only were there more natural predators, but also more butterflies, saprophytic flies, etc. This is a preliminary observation.

Others have noted vetiver's high insect-resistance. This was also seen in this experiment. Insect-resistance is displayed in two characteristics: anti-feeding effect and endurance. These two behaviors appeared gradually over time in the vetiver plants. An example of this was the reduction in feeding over time by *Oxya Intricata* (Stal). These results indicate that there may be good prospects for use of vetiver to control insect pests in agroforestry management. However, much remains to be studied, including the appearance of *Chlorophorus annularis* (Fab), *Saccharicoccus* sp., and *Tessaratoma papillosa* which seemed to be attracted to the vetiver hedges. v

Role of Vetiver Grass in Stone Lines Stabilisation In The Central Plateau of Burkina Faso

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Abstract

Burkina Faso is located in the Sahel zone of western Africa. Soil erosion control measures have been emphasised on physical techniques like earth and stone bounds [bunds – Ed.], small dikes and vegetative barriers. These techniques have succeeded but their utilization is limited by the labor intensiveness and more importantly by the lack of stones in existence. A trial was held in the north central zone of Burkina to evaluate the suitability and adaptability of Vetiveria zizanioides hedge rows to insure good stabilization and durability of stone bounds. Two local species, V. nigritana and Andropogon gayanus have been used for comparison. Results have shown that after three years, V. zizanioides and A. gayanus grew well upstream of stone bounds and established a very tight line that stabilised the stone bounds. Rates of plant growth, regrowth, and biomass generation were also best despite a severe attack by termites. On the other hand, the performance of Vetiveria nigritana was the least impressive and did well only in conditions of increased humidity.

Introduction

The Sahelian zone is experiences the problem of temporal and spatial rainfall variability. Soil loss results from the high intensity rainfall which can reach I30 > 35 mmh^{-1}. Erosion is further worsened by scarce vegetative cover and by soil crusting. In Burkina Faso, rainfall runoff accounts for up to 40% of annual average rainfall, and soil losses of between 4 to 8 t/ha/year have been estimated despite average slope of under 3%. This has resulted in low soil productivity and poor crop yields.

Soil erosion control has especially put emphasis on the implementation of techniques which allow to the soil to absorb the maximum of rain water (ploughing, mulching, tied ridging, hoeing, etc.), but also by large popularisation of physical measures such as earthen bounds, stones bounds [bunds – Ed.], small dikes, etc. These techniques have shown tangible results and are much appreciated by farmers, but are labor intensive and stones are not abundant. Thus, research centred on hedge rows and grass strip utilisation are of increase interest. When propoerly installed, these measures are more durable and need little maintenance. This study aims to evaluate the suitability and adaptability of Vetiveria zizanioides hedge rows to insure good stabilization and durability of stone bounds.

Methodology

A trial was held in the agricultural research station of Kamboinsé, located at 12 km from Ouagadougou (Latitude 12°28N; Longitude 1°32W; Altitude: 296 m). The climate is a north Sudanian type with a long dry season and a rainy season which starts in May. The annual average rainfall for the last fifteen years is 750 mm and

occurs during the 6 months between May-October. Average temperatures vary from 24 °C to 38 °C. Vegetation is septentrional Sudanian type with species such as *Butyrospermum paradoxum, Parkia biglobosa, Lannea microcarpa, Adansonia digitata, tamarindus indica* and *Acacia albida*.

The experimental plot was installed in 1994 on a bare and degraded soil on a slope of 1.5%. The soil type is an Alfisol with pH of 6,7, a low organic matter (<1%), nitrogen (0.04%) and phosphorus (0.33%) contents.

Three stone bounds (SB) were established in July 1994 along contour lines with approximately 33 meters between diguettes [bund – Ed.]. On each diguette, 4 treatments were applied:

- T0: stone bound without grass strip
- Tvz : stone bound + Vetiveria zizanioides grass strip
- Tvn: stone bound + Vetiveria nigritana grass strip
- Tag: stone bound + Andropogon gayanus grass strip

Lines of each grass were planted 30 cm upstream of each diguette and distance between stumps (tillers) was 20 cm for all species. A 2 m horizontal interval was left between treatments. The field between diguettes was cultivated with peanut.

Measurements made during the 3 years of study were:

- Plant regrowth rate
- Plant height (every 7 days)
- Number of tillers formed (every 7 days)
- Soil moisture content on different zones of the field along 2 transects
- Dry matter production

Results and discussions

Soil water content: Soil water content decreased with distance upstream from the stone bounds with the highest water content observed immediately upstream of the stone bound. Water content increased downstream from uppermost stone bound.

Plant regrowth rate : Two weeks after planting (1994), tiller regrowth was good, notably for *V. zizanioides* and *A. gayanus* . The average plant regrowth rate was 97% for *V. zizanioides*, 66 % for *V. nigritana* and 82 % for *A. gayanus*. However, the regrowth of *V. zizanioides* and *A. gayanus* is homogeneous on all 3 stone bounds but increases from first (downstream) bound to third (upstream) bound for V. nigritana.

In the beginning of the 1995 rainy season, i.e., after eight months of drought, plant regrowth rate decreased for all species. Values obtained were 85% for *V. zizanioides*, 68% for *A. gayanus* and 34% for *V. nigritana.*

During the three years, *V. zizanioides* and *A. gayanus* illustrated good tiller regrowth (>80 %). On the other hand, *V. nigritana* appeared less resistant to drought with an average regrowth rate of 51%.

Plant height growth: During the first month after planting, plant growth was slow for all 3 species. Growth increased significantly during the rainy months of August and September before it stabilised at the end of the rainy season. The maximum height reached 103 days (27 July to 07 November) after planting was 103.5 cm for both Vetiveria species, and 203 cm for *A. gayanus*. Flowering was observed for all species in mid-October. Lines of three grasses (*V. zizanioides, Vetiveria nigritana,* and *A. gayanus*) were planted 30 cm upstream of each diguette and distance between stumps (tillers) was 20 cm for all species. In the second year, plant height increased appreciably reaching 3m for *A. gayanus*, 2.3m for *V. nigritana* and 1.5m for *V. zizanioides*. The greatest height for *A. gayanus* and *V. zizanioides* were measured on the intermediate diguette while *V. nigritana* reached greatest height at the first (upstream) diguette.

Evolution of stumps number: The number of stumps in 1994 increases from 2 to 6 for *V. nigritana*, 2 to 14 for *V. zizanioides* and from 2 to 12 for *A. gayanus*. The next year (1995), the number of stumps per plant strongly increased and reached 110 for *A. gayanus*, 36 for *V. zizanioides* and 27 for V. nigritana. During the third year, the number of stumps remained similar to that of 1995.

Biomass production and resistance to termites attack: The quantity of dry matter increased during the first two years, then decreased in 1996 (figure 6). *A. gayanus* produced more dry matter than the two vetiver species. Nevertheless, *V. zizanioides* biomass production was double that of *V. nigritana*.

Peanut production in 1995 and 1996 also increased. This could be related to soil physical and chemical property improvement by stone bounds and grass strips. The comparison of the three species concluded that *V. zizanioides* and *A. gayanus* suitability was interesting upstream the three diguettes. It was upstream of the first diguette that *V. zizanioides* obtained the best productions of biomass, despite the low soil water content at this zone. On the other hand, *V. nigritana* grew better upstream downstream of the stone bound, demonstrating that this specie is more demanding in terms of humidity (this species grows traditionally in bottoms and humid zones). Following an attack of termites in the beginning of 1995 rainy season, *V. zizanioides* shoots were better able to resist attack than the two other species.

Conclusion

This study showed that among the three tested species, *A. gayanus* and *V. zizanioides* were the most suitable for stone bounds stabilisation. The two species showed a resistance to termite attacks during the dry season so that their regrowth rate at the beginning of the following rainy season was satisfactory. *V. nigritana* seems to prefer conditions with good humidity. **V**

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