VETIVER NEWSLETTER

NEWSLETTER OF THE VETIVER INFORMATION NETWORK

July 1994
NUMBER 12

Commentary

This newsletter, number 12, pulls together information from a number of states in India, that we recently visited, that are in the process of developing comprehensive watershed development programs. The states include those from the relative high rainfall areas of eastern India (Orissa > 1,000 mm of annual rainfall) to the drought prone western India (Rajasthan) where rainfall is sometimes less than 300 mm. We visited three groups of programs: The Pilot Project for Watershed Development in Rainfed Areas (covering the states of Andhra Pradesh, Karnataka, Madhya Pradesh, and Maharashtra - started in 1984 - recently completed and under evaluation); The Integrated Watershed Development (Plains) Project (covering the states of Orissa, Gujarat, and Rajasthan - started in 1990); and the Integrated Watershed Development (Hills) Project (covering Jammu and Kashmir, Punjab, Haryana, and Himachal Pradesh — started in 1990). The main objective of all the projects is to improve farm incomes and nonfarm land productivity, through interventions that include: in-situ moisture conservation measures, rehabilitation of degraded lands and gullies, planting of trees, shrubs and grasses, livestock developing, the training of participants, and expanding the use of NGOs. The newsletter will focus on vetiver and related in-situ moisture conservation components.

You will also find in this newsletter information from users in Asia, Africa, and Central America. Some notable activities are taking place in southern Africa following **John Greenfield's** visit in November 1993. **Steven Carr**, from

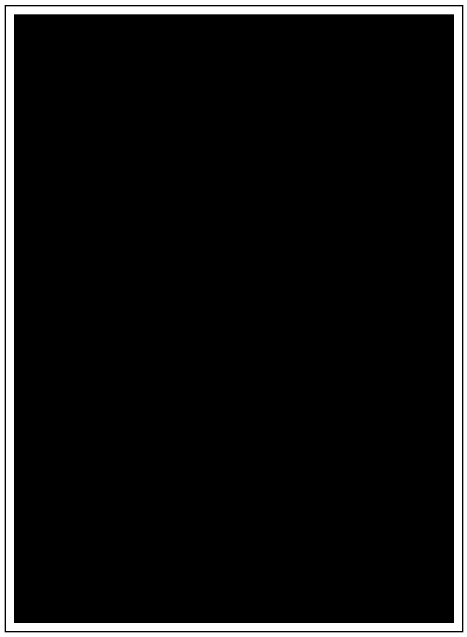

Photo #1. *Eco-Link - a South African NGO's promotional poster for using vetiver grass for soil and water conservation.* ***Photo credit...Sue Hart***

Malawi, reports a growing interest in vetiver in his country, as there is also in Zimbabwe, Zambia and South Africa. **Ato Akalu**, from Addis Ababa, has reported on the effective application of vetiver in Ethiopia. **Jano Labat** (Zimbabwe) and **Tony Tantum** (South Africa) both report new interest in the use of vetiver for mine dump stabilization. **P.K. Yoon** (Malaysia) has once again demonstrated how vetiver can be used to stabilize very large highway embankments in Malaysia. **Paul Truong** continues to demonstrate the tolerance of vetiver to very high levels of toxic minerals, in this case manganese. **Ray Wijewardene** of Sri Lanka reports on the inclusion of vetiver hedges as part of the SALT system for soil and moisture conservation in tea and tobacco.

As demand grows within and outside your countries, some of you may be involved in the sale of planting material — a word of reminder that we must aim to produce high quality planting material and handle it properly, and reduce transportation time to a minimum to assure high survival rates.

During the past six months, the Network has sent to selected participants a number of interesting documents. These include (a) Technical Information Package Volumes 1 and 2 — these volumes reprint (including photographs) of some of the work submitted for last year's Vetiver Awards; (b) Use of Vetiver for Soil Erosion Control of Embankments in Bangladesh by P.K. Yoon; (c) Neem - A Tree for Solving Global Problems by the U.S. National Research Council; and (d) a manual on "Communications for Technology Transfer in Agriculture" by the U.S. Academy of Educational Development. Anyone not receiving

these papers and who would like a copy please let us know. We will bulk up the responses and get a print rerun in October.

India — A Progress Report

In-situ moisture conservation, applied in a number of forms, has proven in all localities to have been successful in: improving crop yields; tree and shrub survival and associated growth rates; reducing rainfall runoff and soil loss, and improving ground water recharge. There are differences as to the degree of success between technologies and between sites:

- Contour, across the slope cultivation: This measure has virtually zero cost and depending on soil type and rainfall has, compared to traditional along the slope (AS) methods, increased yields of annual crops from 10% to 25%.

- Vetiver grass hedges: 15% to > 50% incremental crop yields are reported as compared to AS cultivation methods. Vetiver when planted on black (vertisols) soils, particularly black shallow soils, show significant incremental yields (**Chart 1**). This technology has a good chance of success (**Photo 2**) under rainfall regimes of more than 700 mm, and on selected moisture rich sites (such as gully bottoms, river banks and saline areas) in areas where rainfall is less than 700 mm.

- Other grasshedges: Other species are being tested. These include Saccharum munja, Agave sislana, Eulaliopsis binata, and Pennisetum purpureum. Saccharum and Eulaliopsis are difficult to establish as effective hedges (as amply demonstrated at the Kandi Research Station in Punjab and by their general absence in the project areas. Agave has potential in the very dry areas, particularly on nonfarm land. Napier grass (P.Purpureum), unless fully protected, has no chance of survival under drought or uncontrolled grazing conditions. Over 95% of all grass hedges appear to be based on vetiver grass.

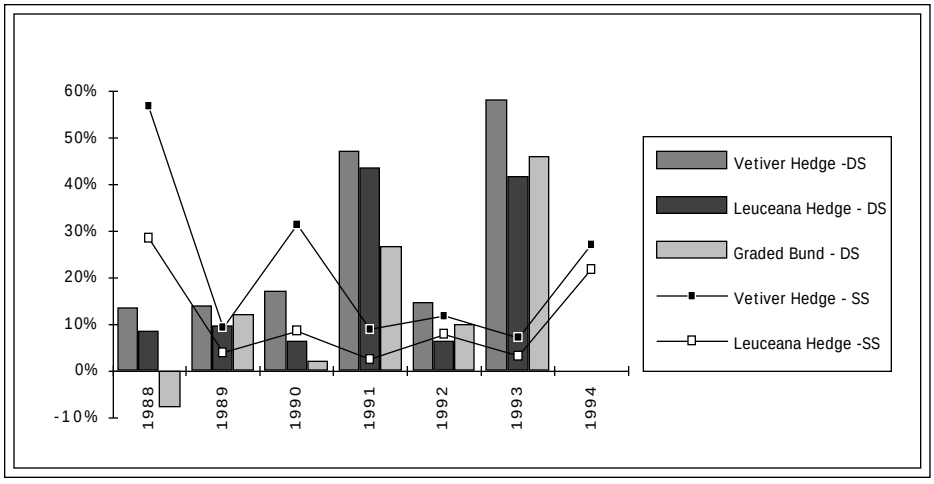

Chart #1. *India, Maharashtra, Akola. A comparison of the impact of three soil and water conservation sytems on shallow (SS) and deep (DS) black*

- Continuous Contour 'V' Ditch (CCVD). CCVD as applied to non farm land, is now a widely accepted technology as is the basis for land preparation for tree planting. Survival rates are normally well above 80 to 90%, and growth rates have improved significantly. CCVD is occasionally modified as a trench rather than a "V" ditch; there appears little evidence for the additional expense involved in trenching. CCVD at 8 meter horizontal intervals in most cases reduces runoff by as much as 97%.

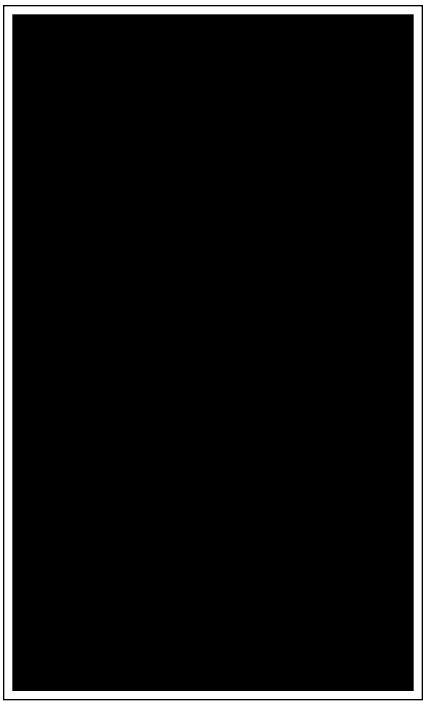

Photo # 2. *Dr. Bharad's Information Board at his 20 ha experimtal site at Akola.* ***Photo Credit ...R.G.Grimshaw***

- Chisel ploughing: This technique as being experimented in Rajasthan involves ripping to 50 cm depth, in contour lines 2-3 meters apart, using a chisel plough powered by a 40 HP tractor. It has good potential and may have equivalent water conservation benefits as CCVD. More testing is required.

Reduction in rainfall runoff: At all long term experimental sites, vetiver grass hedges reduced rainfall runoff better than any other method under on-farm

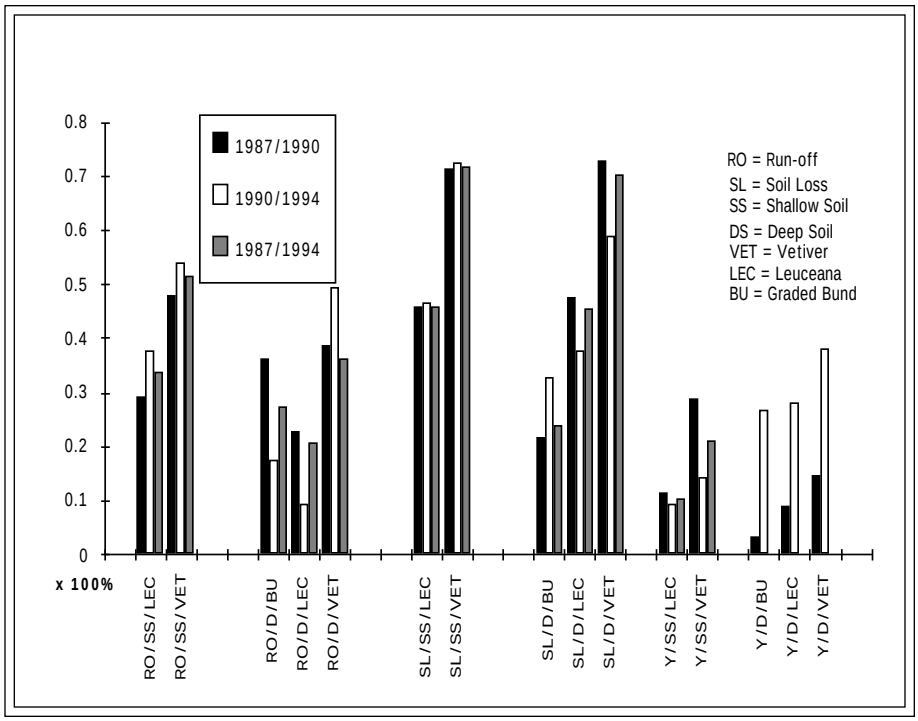

Chart # 2. *Comparison of different conservation barrier treatments at Akola Maharahtra.Incremental soil loss (SL) and run off (RO) reductions expressed as a percentage of the control (along the slope cultivation).* ***Source...Dr. G.M. Bharad.***

conditions. CCVD, supported by vetiver, performed best under nonfarm (nonarable) conditions. Runoff reductions varied between 35% and 70% with the best results on shallow soils. There seemed not much difference between runoff reductions at ICRISAT (Hyderabad — red soils) and Akola (Maharashtra — black soils). As a rule of thumb, Vetiver hedges were significantly better at reducing runoff as compared to both Leuceana sp. hedges and earth bunds (**Chart 2**). The probable reason for this is vetiver's ability to spread water more evenly, bring water velocity to a minimum, and, via its deep root system, provide a better infiltration zone at the hedge barrier.

Reduction in Soil Loss: At all sites, vetiver hedges proved significantly better than other technologies for reducing soil losses. For example, on shallow soil, at Akola, soil losses were reduced by a mean of 70% over 6 years compared to 45% for Leuceana and 24% for earth bunds. Similar results were obtained under operational research projects in Karnataka and at ICRISAT. In physical terms, a vetiver hedge will reduce soil loss from about 8 -11 tons (somtimes very much higher rates i.e.> 40 tons) per ha to 2-3 tons per ha. This is well within acceptable soil loss limits.

Gully and structure stabilization: There appears to be virtual unanimity of the superior performance of vetiver for gully stabilization and for the stabilization of structures. This is because in most cases there is better moisture conditions on water course sites, and vetiver grows particularly well under such conditions. The most impressive results appear to be in Orissa, where in some areas the use of vetiver has been a traditional practice for stabilizing outflows in field-to-field irrigation of paddy fields (**Photo 3**). This practice is now being used at Phulbani and Jagganath Prasad Districts to stabilize earthen spill ways, gully check structures, etc.

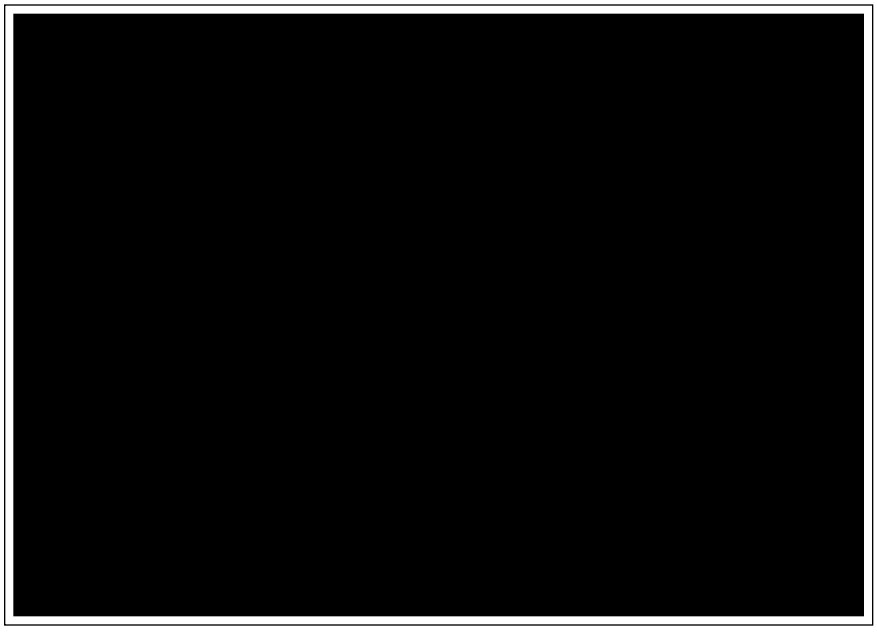

Photo # 3. *Orissa, India. For generations, farmers have used vetiver grass as a means of stabilizing paddy field bunds at the point of outflow to the lower field.* ***Photo credit...R.G.Grimshaw***

Groundwater recharge: As should be expected by the positive runoff reductions, ground water shows significant recharge where in-situ moisture conservation techniques are being practiced. At Manoli (Maharashtra), as a result of ground water recharge, some 319 new wells have been dug, and over 500 ha of land has been brought under irrigation. At the research farm at the University of Akola, it is estimated that recharge has improved by 30%, and is sufficient to drip irrigate 25% of the unit area if put under perennial horticulture. **We may well find that this recharge, if properly used, will be one of the most important economic benefits from in-situ conservation.**

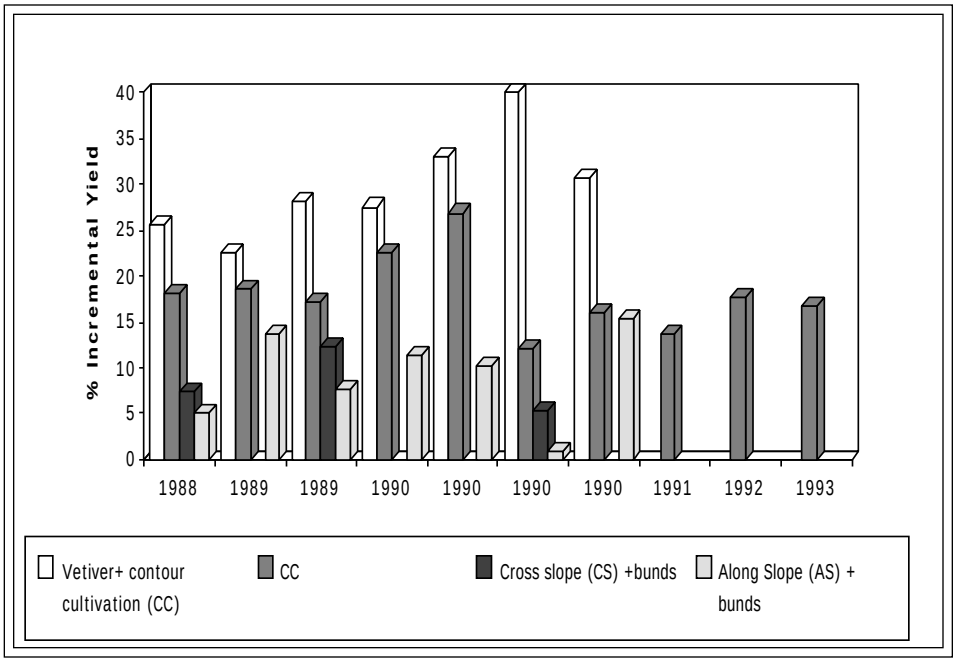

***Chart # 3**. India, Mahahrashtra, Department of Agriculture annual crop cutting statistics on farmers' fields from Manoli Watershed comparing the impact of different land treatments on incremental yields with along the slope cultivation as*

Technical issues, observations and recommendations

Vetiver Grass: In most instances, vetiver should be the preferred species on the basis of its functionality and its adaptation to a wide variation in site conditions. There appears to be few problems where there is no major water stress. There can be problems in drought years, and when planted on soils with extremely limited water capacity. For instance, in Rajasthan, trials show that the survival rate of vetiver in the first year increases from 55% to 80% if grown in the bottom of a "V" ditch as against on the top of the "V" ditch bank. The same applies to planting vetiver on the edge of inward sloping terraces on the steep slopes of the Shivalik Hills. The latter have very shallow to no soil at all, and the terrace lips are devoid of moisture. In these cases, it is better to plant at the intersection of the terrace bed and riser. The effect should be the same, but more moisture will be available for hedge establishment. (Incidentally on the deeper and wetter soil of Assam, it is reported that planting vetiver on the lip of terraces has reduced terrace collapse from 25% to zero). It is suggested that in dry areas, experiments should be made in planting vetiver directly into chisel plough rip lines (a continuous lateral column of water can be expected in these rip lines immediately after a rainfall occurrence). In Rajasthan, 100% first year survival has been achieved by using vetiver slips grown in containers (4 inch polybags). The cost is about Rps. 4 (US $ 0.125) per linear meter and is probably economical. Further testing of this technique should be carried out. In dry areas, site location will be an important factor in using vetiver. In all areas, the correct time of planting (early in the monsoon — Kashmir and other Himalayan eco-sites in early spring) will effect survival rates considerably.

Photo # 4.** Maharashtra, Akola. Use of vetiver to protect raised beds in wet areas.* ***Photo Credit...R.G.Grimshaw

It is agreed that many of the failures can be attributed to the incorrect application of technology, including: use of poor quality planting material (perhaps even dead), delays between removal from nursery and actual field planting (more than two days delay results in only 60% survival), planting at the wrong time (late in the wet season), and sometimes deliberate mismanagement (yes, it's true) of the planted material.

There are two immediate problems effecting the use of vetiver grass barriers:

- Farmer acceptance: Farmers are slow to accept the technology. It will take time, maybe four years, for farmers to adopt a new technology, particularly one that, to the farmer's eyes, appears to have no immediate short term benefits. There is a need to greatly improve farmer participation in the use of, and the marketing of the technology. Farmers need proper training in all aspects of the technology including reasons for using it (conservation, risk reduction, crop yield increases, thatching, mulching, fodder, handicrafts), and proper training in its application. A **social marketing strategy** should be developed that would include demonstrations, training, radio, TV, and written propaganda. The marketing plan should take account of the role of all the stakeholders including farmers, extension, research, conservation and forestry staff. Farmers are likely to adopt the technology more quickly in the better rainfall areas (>700 mm). Farmers should be involved in the production of vetiver planting slips, and except, perhaps, for initial demonstration, should not be paid to plant the material on their farms. *Farmers need to learn good management practices, including*: gap filling, cutting for fodder, burning for termite control, and adjacent cultivation techniques to minimize damage to the hedge. If farmers could relate the use of vetiver with the significant recharge of ground water and the consequent improvement in well and pumped water, adoption of the technology could be expected to accelerate.

At the end of the day, farmers are looking for yield increases. Chart # 3 shows, from a random sample of farms in Manoli Watershed near Akola, that a vetiver hedge barrier consistently (where recorded) shows the highest incremental yield increase, whatever the crop. Cultivation on the contour is the next best technology. The relative small difference between the two may be the reason why the adoption of vetiver grass barriers is rather slow. The key to accelerated adoption will come through better farmer training and greater farmer comprehension of the other benefits (particularly long term) that vetiver hedges provide.

- Vetiver dieback: In the drier areas (< 600 to 700 mm) and on shallow soils (< 15 cm), vetiver may be subject to dieback from about the fourth to sixth year after planting. This is compounded by intensive overgrazing. Dieback is associated with termite infestation, but it is now thought that the termite damage may be a secondary symptom as a result of a primary attack by a root fungus occurring under conditions of moisture stress. This fungus has been identified by AKV Akola. It can be contained. Investigations by **Dr. B.S. Hegde** at Bangalore (Karnataka) show that vetiver cultivars differ in susceptibility to termites (or perhaps to primary root fungus). We may therefore be able to deal with the problem through cultivar selection. **It is very important to test out under different ecological conditions the main vetiver cultivars available in your countries**, as has been done in Thailand. In I ndia, it is reported that over 100 cultivars exist. Apart from testing for dieback, testing will enable appropriate cultivar selection according to need and rainfall conditions. (It should be noted that in Thailand, of 30 cultivars site-tested (20 sites), about 8 have been recommended for use). Additionally, bad management practices, such as ploughing through the hedges, dumping crop residues on hedge rows, and failure to fill gaps and control livestock, has also led to the destruction of the hedge rows. These bad practices can be reduced through better farmer education.

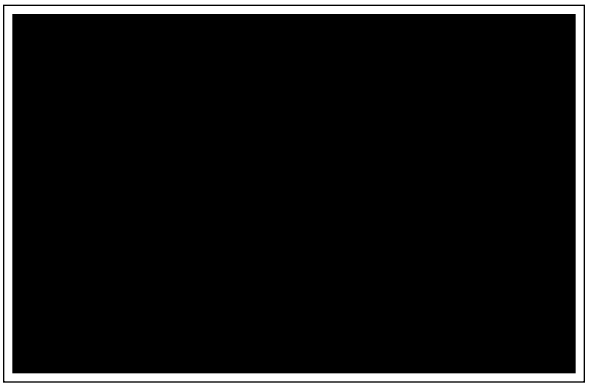

Photo # 5** . Vetiver planted in a "triangular wedge" at the bottom of a gully in Orissa.* ***Photo Credit ... R.G. Grimshaw.

Other Observations

Regenerating vetiver hedges: Under dry hostile farm conditions, it may be necessary to replant vetiver hedges every 6 to 10 years. The cost of this is minimal. Probably no more than the cost of 1 man day per 100 running meters.

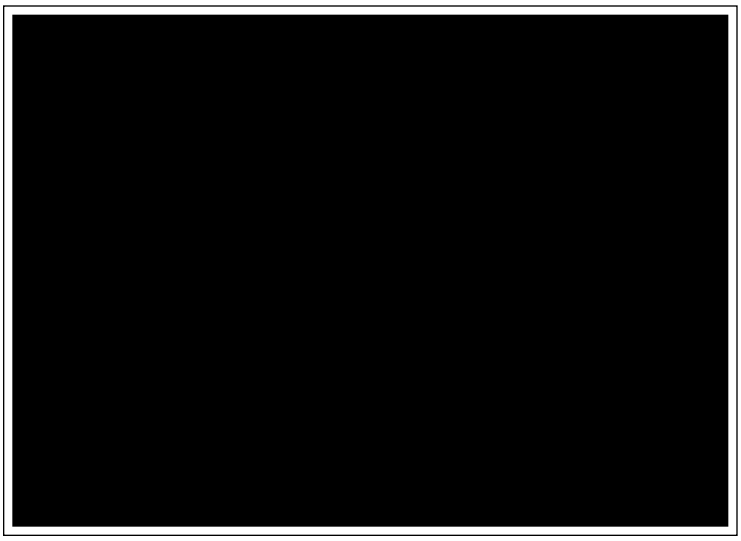

Photo # 6. *India - Phulbani District, Orissa. Containerised vetiver plants ready for transport to field site. Note nurseries are in close proximity to final point of planting.* ***Photo Credit... H.S.Kumar***

A useful technique has been developed by **Dr. Bharad**, at Akola, in the use of planting vetiver to protect the edge of raised beds (8 sorghum rows wide) on wet badly drained black soils. A good crop of sorghum can be grown on the raised bed, and the surplus water drained off to the inter-bed area is enough to support paddy rice (**Photo 4**). Vetiver can also be used to spread flood water on gently sloping lands and can help channel the surplus along vetiver defined waterways. This system is also an effective method of flushing excess salts from saline areas (Akola District - Maharashtra, and Bhilwala District - Rajasthan).

Rats are not welcomed by vetiver in the higher rainfall areas, or along paddy field bunds - could this be because the soil is moist, as would be the root system of vetiver? In the dry areas, there is ample evidence of rats making their homes in vetiver hedges (as seen at the Kandi Watershed Research Station in Punjab). In the latter case, the vetiver roots are dry, and probably make a pretty good habitat for rats. The rat issue is more likely to relate to moisture conditions rather than to root odor. Interestingly, we heard recently that USDA Wildlife Research Center at Denver Colorado may be doing some research in this area.

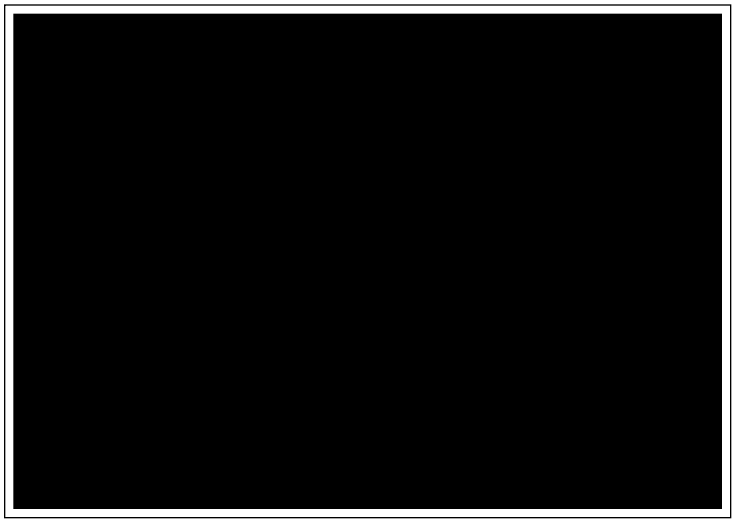

Photo # 7*. India. Phulbani District India. Gully stabilized with vetiver at 1 year old.* ***Photo Credit... H.S Kumar***

Vetiver and gullies: Vetiver will be most effective when planted as a hedge across the gully floor, and along the bottom of the gully wall adjacent to the gully floor. In such cases the vetiver hedge will reduce undercutting and will allow a slow collapse of the gully wall to form an angle of natural repose. Of course, where the gully wall is sloping, vetiver can also be planted along the wall, but one can often see poor growth when planted along the top lip of the gully with vertical sides because of limited soil moisture (**Photo 5)**.

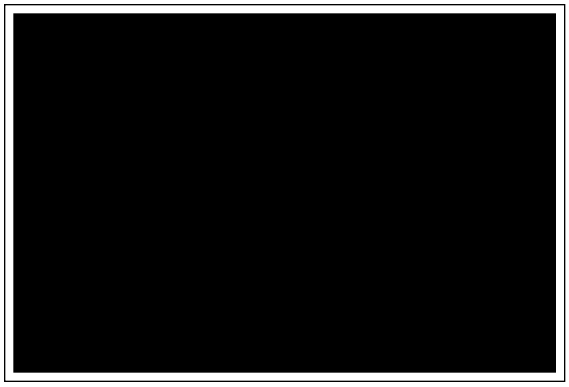

Photo #8. *India. Phulbani District, Orissa. Vetiver used for spillway stabilization - note vetiver has been heavily grazed.* ***Photo Credit.... R.G.Grimshaw***

Vetiver nursery information It is important that farmers get involved in producing vetiver slips. They can do it easily, and often they have better land resulting in better output. The following data from Akola gives some indication of production costs (note US 1= Rps 30):

- Nursery production: 40 - 70 tons of slips per ha. 40 slips/kg @ Rps. 2/kg i.e. Ps. 0.05 per slip.
- Planting material requirement for nursery establishment at 20 x 40 spacing is 2.5 tons per ha.
- Net nursery income approx. Rps. 24,000 per ha.

- Hedge establishment. Rps. 120 per running 100 m (6x3x100x0.05) = Rps. 90 + labor + transport.

Photo 6 shows some good quality poly-bagged vetiver produced at Phulbani, Orissa, used for stabilizing gullies and spillways (**Photos 7 & 8).**

Treatment/grasses	Run off - mm	Soil Loss - Kg/ha
Discharge 180 litters per hour, 60 mm applied.		
Vetiveria zizanioides	2.4	14
Cymbopogon martinii	8.7	48.5
Panicum maximum	6.1	33.9
Saccharum munja	10.7	209.4
Fallow Field (control)	**12**	**223**
Discharge 2,400 litters per hour, 40 mm applied		
Vetiveria zizanioides	20	201.3
Cymbopogon martinii	21.6	216.3
Panicum maximum	22.4	218.6
Saccharum munja	25	3495.8
Fallow Field (control)	**30**	**6716.2**

Table 1. *India - Madhya Pradesh. Comparison of effectiveness of different grass species in controlling erosion and runoff when grown as a barrier hedge.* ***Source...Dr. D.P.Nema***

India - Madhya Pradesh - Vetiver: Its Application to Black Vertisols - Great Possibilities

The Jawaharlal Nehru Krishi Vishwa Vidyalaya (University) at Jabalpur has been conducting research into vegetative soil and water conservation measures at three sites with rainfall ranging from 900 to 1,200 mm. **Dr. D. P. Nema,** Director of Research, has sent us some of the results. All the sites are classified as semiarid. Studies were carried out in planting vetiver in gullies on the Kymore Plateau. It was found that due to the high velocity of rainfall, in order to assure high survival rates, vetiver needed to be planted in more than one row across the gully or be reinforced with loose stones (*another alternative is to use poly-bagged vetiver as done in Orissa)*.

Another experiment compared plots, one barren and the other having a vetiver hedge (3 rows at 1.1 m vertical interval) + natural grasses + wild fruit trees, both on a 4.1% slope. After three years, there was a deposition of 44.6 tons/ha of soil on the vetiver plot, and a soil loss of 350.6 tons/ha on the barren plot.

At Sehore, Vindhyan Plateau, measurements of soil loss/deposition at two vetiver contour hedges showed that over 6 years soil deposition had increased from 6.8 cm to 19.1 cm and that by the fifth year (due to the increased density of the hedge) soil erosion had been reduced to zero.

In comparative trials to evaluate survival rates of grasses, it was found that vetiver had the highest survival rates (V. zizanioides - 98.3%, Sorghum halepens - 92%, Cymbpogan martinii - 83.7%, Saccharum munja - 78%, Cynadon dactylon - 16.7%).

Another study compared runoff and soil losses between grasses. The results are shown in - Table 1:

Rajasthan - the Driest Region of India - Vetiver's Limit?

We received a special report on experimental studies involving some of the agronomic features of vetiver grass. Experiments were carried out at five sites on soils that were primarily sandy loam to sandy clay loam Alfisols. Average annual rainfall, depending on site was from 300 mm to 630 mm. The average number of rainy days per annum varied from 12 to 29. The pH was between 8.3 and 9.

Generally under these dry conditions soil moisture is the critical factor in establishment and growth. The work, under well recorded and controlled conditions by **Dr. Mahnot** at the College of Technology and Engineering at Udaipur, is worth following, and some of his three years' experiments are recorded below.

- Under dry conditions, vetiver should be planted 10 to 20 cm apart with 3 slips per planting hole. The difference in spacing was not significant, but survival increased from 51% (1 tiller) to 82% (3 tillers).

- Inorganic and organic manures and polymers had an impact on survival. The most cost effective and practical was farm yard manure, which when applied at 0.6 kg per meter, resulted in survival of 87% (control 67%), tillers per clump — 24 (control 10.5) and girth of clump - 44.5 cm (control 22 cm).

- Vetiver planted in bottom of "V" ditch resulted in highest survival of 80% after one year.

- If field planting was delayed to 3 days after lifting from nursery, survival rates were reduced to about 70%.

- Polybag-raised vetiver plants had 98% survival as compared to bare rooted vetiver - 17% (2 tillers per planting hole).

Because vetiver is very responsive to moisture availability at the time of planting, and conversely is difficult to establish under very dry conditions (as in Rajasthan during the past two or three years), it will be essential to look into different establishment techniques that involve optimizing soil moisture at planting time. The use of polybags is clearly a successful technique, but may be too expensive for general use. On the other hand, it may be quite economic for use under special circumstances involving the stabilization of costly structures.

Kerala - the Church and Vetiver

The Archbishop of Trivandrum, the **Most Reverend Benedict Mar Gregorios** writes to say that he has started the multiplication of vetiver and is widely promoting its use. He sees a good potential for vetiver in sea shore stabilization — Kerala has 600 miles of eroding shoreline. He writes, "Although vetiver is a native of Kerala. It is very much neglected. People emotionally care for crops that bring money immediately!" The issue of farmer adoption of vetiver is critical and requires special attention in designing and implementing soil and water conservation programs.

The following quote sums up the difference between adoption and non-adoption:

"There is a huge difference between telling someone to do something because it is good for them and explaining clearly why something is good so that they can make up their own minds" ***Isabel Carter***

Too often we tend to "tell" farmers; the successful vetiver programs should be characterised by the inclusion of a well thought out action plan that includes good farmer programs that explian the benefits and use of vetiver (through, for example, quality promotional programs and training).

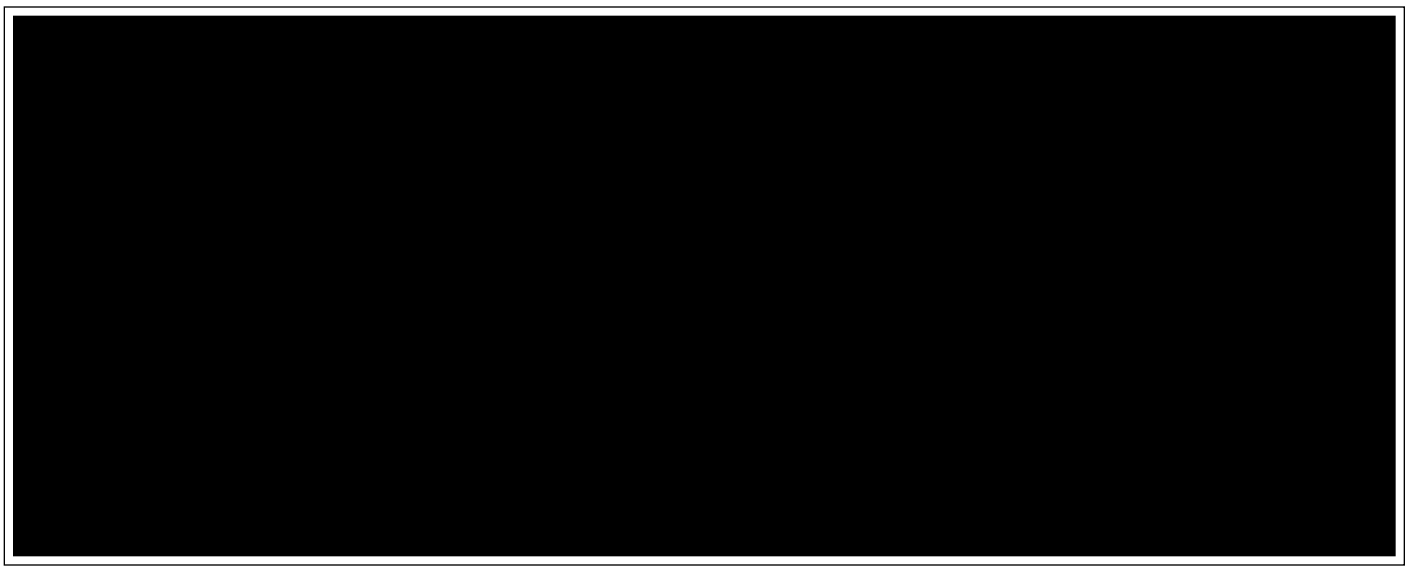

Figure 1. *The width of the avenues between the double-hedgerows varies between 6 and 7 meters depending upon the tea clone used and the corresponding planting density. The total width covered by the hedgerow, inclusive of the vetiver-grass strip need not exceed 1 meter. Spacing between hedge row and tea row 1 to 1.5 meter. a = 40 - 50 cm, b = 100 cm; c = 6 - 7 meter.* ***Source...Tea Research Institute of Sri Lanka, and the Upper Mahelwali Watershed Management Project.***

Photo # 9**. Malawi. Vetiveria zizanioides hedge protecting a young pine plantation.* ***Photo credit...Stephen Carr

Sri Lanka -Tea - SALT and Vetiver Grass Hedges

Ray Wijewardene has developed a "sustainable land management system for tea" that combines a double row of leguminous hedge row and a single row of vetiver (known in Sri Lanka as *Savandra* grass) aligned on the contour with 6 rows of tea between hedge rows. A 1.5 m space is allowed between hedge row and the first line of tea (**Figure 1**). There are eight different species of leguminous shrubs that can be selected according to site and end use. Ray writes to say that they now have more than 6,000 ha of degrading tea and tobacco lands under this system. Benefits include improved soil nutrition, reduced erosion and improved soil moisture which together adds up to sustainable and increased tea and tobacco yields. It also results in reduced costs because drains no longer fill with sediment, and eventually he thinks that drains will not be needed. The SALT (Sloping Agricultural Land Technology) system pioneered by Rev. Harold Watson in the Philippines is a well known technique and the incorporation of vetiver into SALT provides pretty nearly a fool proof system. Just one more bit of history. Back in 1947, vetiver hedge rows were identified by Eden (the recognized "tea" scientist at that time) as the best means of erosion control in tea following experimentation in the Usambara Mountains of Tanzania. So there is nothing new in this technology! If you need more information on this application in Sri Lanka I suggest you write to the Tea Research Institute of Sri Lanka, St. Coombs, Talawakelle and/or The Upper Mahaweli Watershed Management Project, PO Box 98, Kandy, Sri Lanka. Fax 08 32343. They have produced a very simple and descriptive brochure about the system.

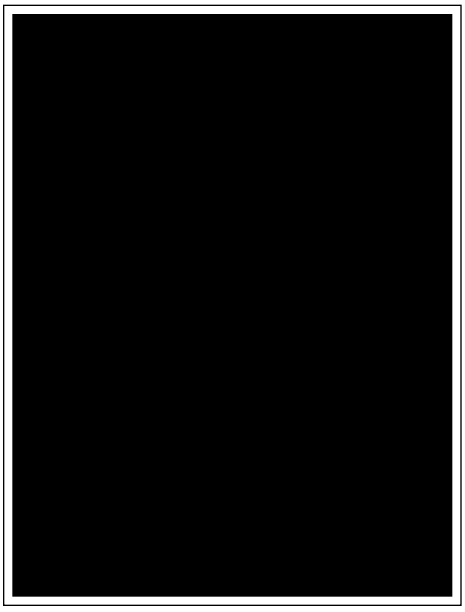

Photo # 10**. Malawi. Vetiver hedge protecting fruit orchard.* ***Photo Credit ...Stephen Carr

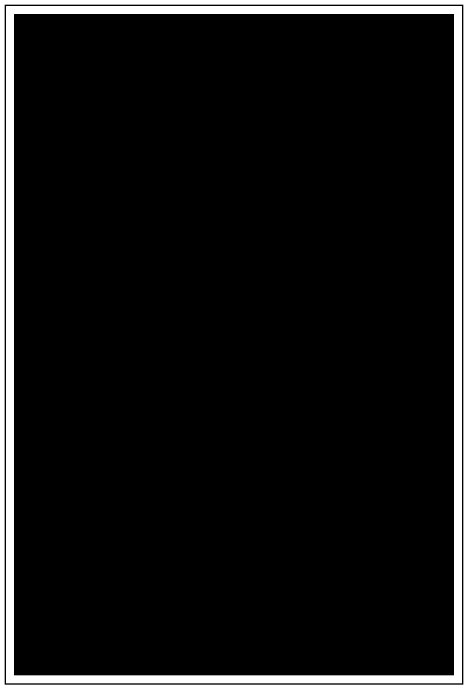

Photo # 11.** Bangladesh.Vetiver can be propagated from nodal shoots.* ***Photo Credit.... Pou Jensen

A Malawian Initiative

Stephen Carr writes to say that vetiver workshops have been started in Malawi for all senior soil conservation officers. He has sent some good photos of vetiver being used on farm and forestry demonstrations (**photos 9 & 10**). He has encountered problems in some nurseries from a fungus that has led to reduced growth in the nurseries and extensive dieback in the field. It has been identified as Helminthosporium spp. I wonder if there is any relationship with the Indian problem mentioned above. Perhaps Malawian and Indian researchers could exchange some views. The wife of one of his farmers was "delighted with vetiver stalks which made far better fire lighters than other local grasses (Hypperhenias) particularly on damp mornings." IFAD is reportedly about to implement a project in Malawi that will use vetiver as a key technology.

Philippines - On-Farm Research Notes

The Farm Resource Management Institute (FARMI) of the Eastern Visayas has initiated a project on the "Adaption/ adoption of Appropriate Upland Technologies at Punta". One of the studies includes the adoption of contour hedge rows using vetiver grass as the foundation. The activity is not yet completed, but it is promising that the initial 40% turn out of targeted clientele who are adopting the intervention on contour hedge rows using vetiver grass on a trial basis is indeed noteworthy. Observations show that the receptivity of farmer cooperators is promising; from the original two farmers, it had risen to 15 - 20 farmers at the time of the report. We will keep a watch on this study.

Bangladesh - Vetiver is Ideal Plant for Erosion Control and Flood Embankment Stabilization

Pou Jensen of the Royal Danish Embassy in Dhaka (previously she was a vetiver enthusiast in Africa) writes to say that vetiver is quite common in Bangladesh. Its local name is *Binna or Binda* and is used for thatching, fodder and bund protection. There is plenty of vetiver in the Chittagong District, and she says it is also used widely in the northern Dinajpur District. She says that she has not seen any flowering vetiver - yet. In drier areas, she has found that vetiver can self-propagate at the stem nodes (**Photo 11)**. We have seen this phenomena in other countries. It provides a means of multiplication, and of course is the basis for "layering" of vetiver. As a reminder, we have copies of P.K. Yoon's report on embankment stabilization in Bangladesh (it contains some very useful photographs). If you would like a copy, please let us know.

Photo # 13. *Zimbabwe - Chiredzi. Jano Labat's sugar cane field drain protected by vetiver grass. Hippo Valley Estates are now following this practice. John Greenfield on left side.* ***Photo credit... John Greenfield***

Please note we are told that the Government spends over $150 million a year for maintenance of river and sea wall embankment stabilization — Vetiver could reduce this cost considerably.

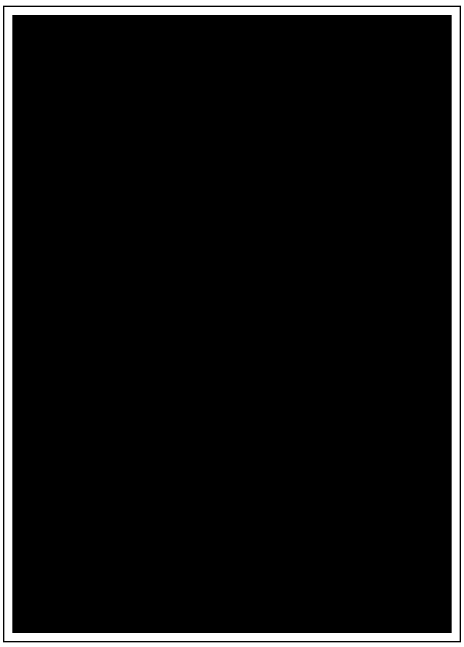

Photo # 12*. Zimbabwe - Centenary. Vetiver used to stabilize wall of dam on tobacco farm.* ***Photo Credit....Colin Nethersole***

Zimbabwe - Commercial Farming Applications

Colin Nethersole is a relatively new vetiver user. He farms at Centenary, and incidentally has the nicest vetiver logo that we have seen. He has used vetiver to protect a dam wall (**see photo 12**), and is about to protect 30 hectares of his farm using the vetiver as contour hedge rows. He has established a number of nurseries and has vetiver planting material for sale. He reports that most seeds seem to appear sterile; no visible pest or disease problem, and no nematode damage to roots; vetiver shows very vigorous regrowth are burning; vetiver is not a weed problem; and

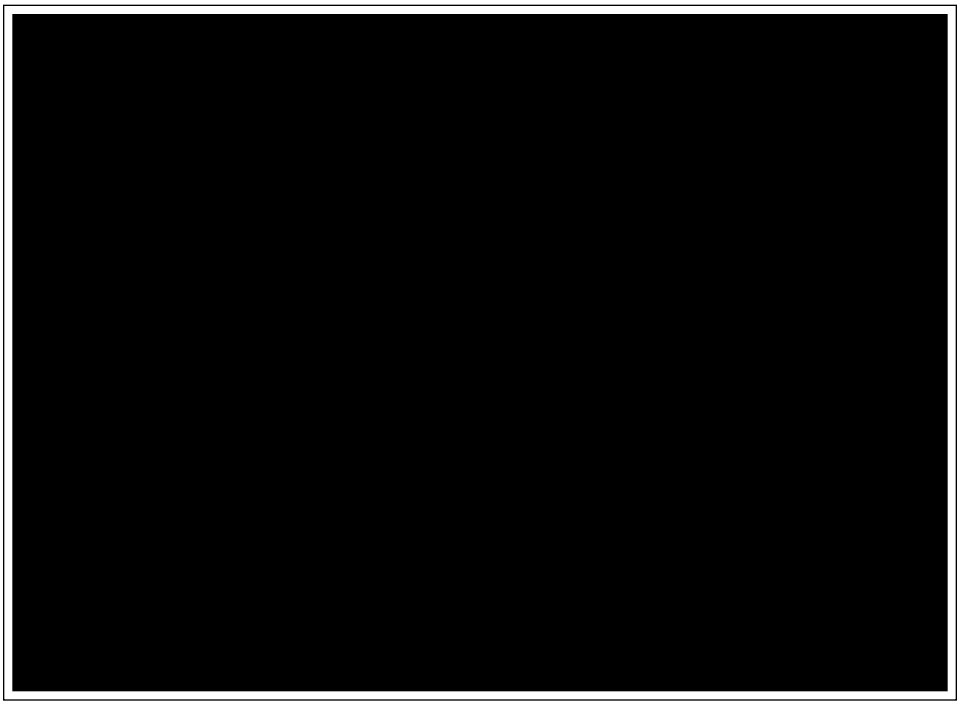

Photo # 14 *.Malaysia - East - West Highway. Stabilization of down slope fill of highway using Vetiveria zizanioides. Six months old vetiver planted from containerised grown plant material. Consulting Biologist - P.K.Yoon.* ***Photo Credit:... P.K.Yoon***

in fact keeps invasive weeds out, and reduces the need for herbicides. He seems pretty happy with vetiver, growing it on sandy to sandy loam soils, temperature range 10°- 30° C, and rainfall averaging 800 mm (the last two years > 600 mm).

Jano Labat from Chiredzi, the network's most dynamic and dedicated vetiver user in Zimbabwe, has used vetiver in a number of ways on his farm, including for the stabilization of drains (**photo 13**). He has been working with Zimbabwe's largest sugar estates - Hippo Valley Estates Ltd. - which produce 250,000 tons of sugar per year. Hippo's Assistant Field Manager, **John Kavumbura**, wrote to Jano, "We now believe there is no other grass that will serve the same purpose as vetiver grass, and to this end we have embarked on an ambitious program of planting vetiver to the tune of 6 km per section per month. All our vetiver will be planted in drains..."

United Kingdom - An NGO at Work

Bob Mann of the Methodist Relief and Development Fund writes that his organization has established vetiver nurseries in the Gwembe Valley in Zambia, also at Pobe in Benin. On a recent visit to northern Ghana, he found vetiver (Vetiveria nigratana) on the banks of reservoirs near the town of Wa in the west. The local people simply know it as "conservation grass", brought to the area many years ago by engineers who were building the dams. It was surviving well in this very dry area. He understands that V. nigratana grows naturally in northeast Ghana, but not in the north west.

In the Gwembe Valley, a drought stricken and very poor area adjacent to Lake Kariba, Bob Mann and **Felix Kalikiti** (a Zambian forester) found vetiver in a remote valley south of Chirundu. The seeds are sterile, the grass is used to thatch huts, and the cane-like stems are used to make the walls of their huts. The local names are "Masanga" in Tonga, and "Masindasulu" in Goba. Felix Kalikit, who is multiplying vetiver for farmer soil conservation trials has confirmed that the vetiver is V. zizanioides. For those of you working in northern Zambia, V. zizanioides is available at Mpika Research Station. Also John Greenfield found it at Msamfu Research Station, in the early 1980s, where it had been established in the same lines for 60 years. Bob sees (and we agree) that it is very important that farmer managed vetiver nurseries are established so that farmers can see how the plant grows and behaves before it is established on the farm. In the Gwembe Valley, vetiver was sold for thatch - so here we have an alternative economic use.

China - "A Fix for Soil Aluminium Toxicity"

Mr. Xia Hanping from the South China Institute of Botany reported on some of his Institute's experience in Guangdong Province. Using vetiver, some 400 ha of severely eroded lands in four counties have been brought under control. At one area, known as "the Red Desert", erosion has been completely controlled over two years, and has resulted in economic and environmental benefits. One interesting observation relates to vetiver's ability to decrease the content of exchangeable aluminium, and take up other toxic minerals. For further information on these initiatives in south China, refer to the special edition of the Vetiver Information Network bulletin of December 1993.

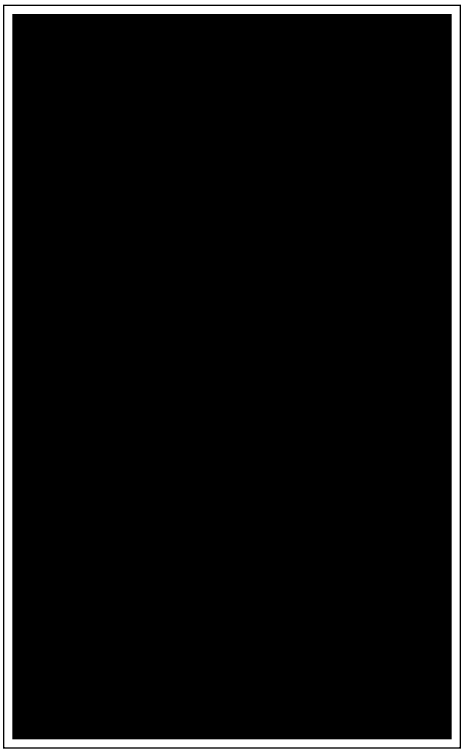

Photo # 15. *Malaysia - East - West Highway. Cross section of vetiver hedgerows (photo #14) across road fill embankment. Note overlay lying on original land form (see root - lower right). Vetiver roots have struck through fill into original material - some measure 3.4 meters.* ***Photo credit:...P.K.Yoon***

Malaysia - The Wizard at Work!! Highway Stabilization

P.K. Yoon, the winner of the King's Award for Vetiver Research, has extended his initial trials on Malaysia's East-West Highway to a large test site on a very unstable section of the Highway affected by serious slippage. Although only planted within the last six months, the hedges have been well established and are effective. (**Photos 14 and 15**). It seems that Malaysia's engineers are impressed as the demand for containerised grown vetiver planting material is greater than supply. P.K. is also helping a company in Spain to get started in vetiver. **One of the many reasons that he is so successful is that he combines his great depth of scientific knowledge with a very practical approach which, above all, depends on assuring that the technology is applied properly.** For those of you who know the plantation industry (P.K. is a rubber scientist), a key to success is in the correct application of technology. The same should apply to small farmer and engineering uses of vetiver as well. P.K. has recently been to Spain to help establish a vetiver grass operation there, it will be interesting to hear his views on the possibility of using vetiver grass in Mediterranean type climates.

Nepal - Abundant Opportunities, but Very Few Takers

The Community Welfare and Development Society of Nepal is undertaking trials using vetiver. Other users in Nepal might be interested in contacting the Society for more information. We are concerned that a lot more use could be made of vetiver in Nepal, but we don't get much feedback, and there seems to be little promotion of the technology. It has been used successfully on irrigation projects in the Terai, and for hill road embankment stabilization in eastern Nepal. Please, could readers of this Newsletter in Nepal give us some feedback.

Fiji - Where it All Started

David Meadows, the World Bank's coconut specialist, while visiting Fiji, took time out to look at vetiver. He writes "It was quite clear that Vetiver had been extremely effective in controlling sheet erosion. Vetiver hedges were also extremely effective in protecting the banks of waterways and strengthening bunds, even under extremely saline conditions ..... because of neglect and lack of maintenance, vetiver, that had been planted in the 50s and 60s, had spread ....farmers reacted by tearing out the whole thing rather than restoring the hedge to the original dimensions ....vetiver hedges have been damaged by cane trucks, since the hedges have impeded the trucks, large gaps have been cut in the hedges with consequence reduction in conservation effectiveness .... the Chief Extension Officer, **Mr. Subramanian**, indicated that vetiver did well under tree crops including tea, and needed no maintenance as the shade from the trees reduced the vigor of the grass..."

Ethiopia - Vetiver could be the Key to Soil and Water Conservation

Ato Akalu Ngewo from Addis Ababa has written to say that there is a growing interest and use of vetiver in western and southern Ethiopia. There are a number of NGOs promoting vetiver, and the Fincha Sugar Estates are using it for erosion control. Ato Akalu writes "...With the devolution of power to the regions, many institutions, NGOs, civic organizations, development associations are mushrooming in all regions ... It is interesting to note that all of them aspire for relief, rehabilitation and development through conservation and other infrastructural development... Government is also making a conducive atmosphere for NGOs to participate in rural development .... The coming three or four years could be crucial for Vetiver Grass Technology (VGT) promotion, tri-

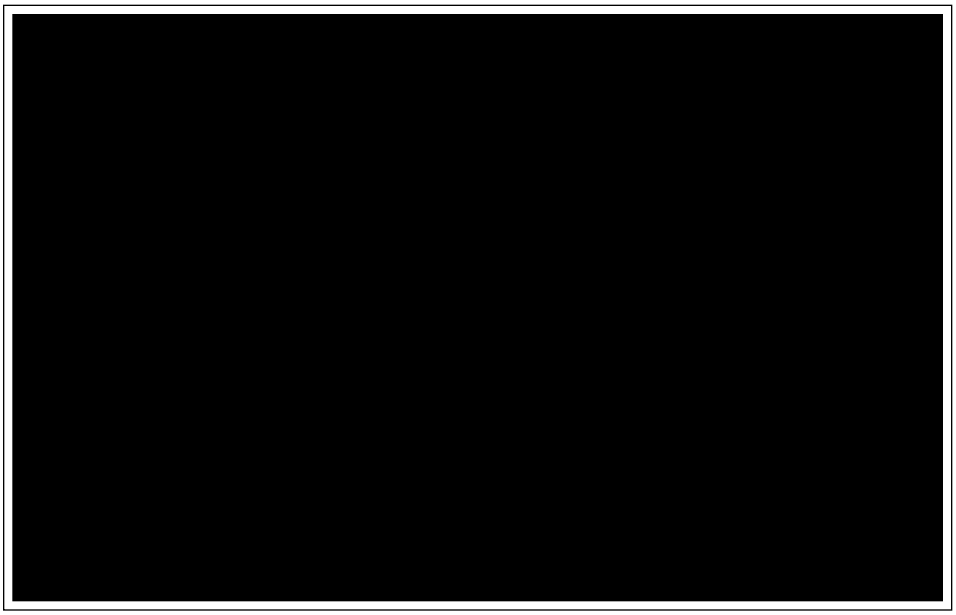

Photo # 16. *South Africa - Natal. Maxime Robert's main farm drain running through a sugar cane field stabilized with vetiver. Note the spurs to deflect storm water tfrom the center.* ***Photo Credit ...John Greenfield***

als, demonstrations, research and development in Ethiopia, and the opportunity should not be missed ..... I believe that the jump start of VGT could be turned into sustainable vegetative soil and water conservation development in Ethiopia.." There has been some excellent work done with vetiver in Mettu (Western Ethiopia) and there are some very good opportunities for the technology in this highly erodible but potentially very fertile country. **Ato Akalu** has been the driving force behind the introduction of vetiver in his country, and The Network would like to congratulate him on his efforts. Those NGOs and others who participate in the Vetiver Information Network and who are working in Ethiopia and want to know more about the technology should contact Ato Akalu Ngewo at his home address — PO. Box 1562, Addis Ababa, Ethiopia.

Kenya - Slow Progress, but Opportunities Abound

Vetiver hedges have been tested in a number of areas in Kenya, and have been found to be effective. Perhaps it might be a good idea to test vetiver in the tea and coffee growing areas. If anybody needs further information, please contact Jacob Kampen at the World Bank's office in Nairobi or fax the Vetiver Information Network directly - **USA - 202 522 1658**

Costa Rica and Central American Growers - Accelerating Interest in Vetiver

Following a Vetiver Network visit to Costa Rica last year, the **Department of Agriculture** has stepped up its promotion of vetiver in the south of the country, particularly in coffee growing areas. We look forward to hearing more about the program there, as well as in other Central American countries, following Jim Smyle's establishment in San José. **SHARE - Guatemala**, having tested vetiver with farmers for the last four years, and convinced of its utility, have, we understand, decided to go ahead with a program that will train 22 other NGOs in Guatemala and 3,500 farmers in the use and merits of vetiver grass hedgerows. Those Panama readers who are always looking for vetiver. We now have confirmation that it is growing and thriving.

Indonesia - River Bank Stabilization

We have heard from **Dr. Ramu**, River Basin Adviser, that the Directorate of Water Resources has the funding to establish four substantial test sites in different river basins in Sumatra in order to study and test the effectiveness of vetiver for river bank stabilization.

South Africa - New Horizons

Tony Tantum is the Network's key person in South Africa and has been instrumental in the promotion of vetiver grass technology. Under South Africa's new government, opportunities abound for using the technology for the conservation of natural resources. In previous Newsletters, we have reported on Tony's work, but would remind you that in South Africa the technology has already been effectively applied to: on-farm conservation (**Mr. Maxime Robert - Photo 16)**; highway stabilization; erosion control on firebreaks; railroad embankment stabilization; building site stabilization; and now the mining companies (Anglo American) are taking a keen interest in using vetiver grass to stabilize mine dumps . *The Network suggests that containerized grown vetiver be used for this task, since mine dump soils are generally very bad (low pH, devoid of nutrients, and often with limited water).* Tantum also suggests that Salt bush will grow on these mine dump "soils", and is quite a good stabi-

lizer.

Australia - Believe it or not

Paul Truong has just completed a study on the tolerance of vetiver grass to manganese toxicity. Together with its tolerance of aluminium toxicity the results help to explain why it can thrive on poor and hostile environments. He was unable to induce Mn toxicity when reducing soil pH to 3.30 and increasing extractable soil Mn to 578 ppm (**Photo 17**). Plant Mn at 890 mg/kg was also very high without showing any toxicity symptoms. In comparison Mn toxic contents of some of the common crops are 217 ppm for sorghum, 494 ppm for cotton, and 210 ppm for corn. Paul adds that he hopes to start a project looking at some of the native Australian vetiver species such as V. filipes, V.elongata,V.pauciflora, V. rigida. This would be a valuable contribution to expanding our knowledge about vetiver grass. Are there any of our readers prepared to help finance this new task?

Paul Truong has received funding to test out vetiver to replace terraces on very steep sugar lands near Cairns (Queensland), and for the replacement of stubble-fallow strips in a strip cropping layout on the flood plain in the sub-tropical/temperate region near Brisbane. The objectives of this latter work would be to monitor in the field the effectiveness of the hedges in spreading flood flows and in reducing flow velocities and soil movement -- Altogether about 10 km -- of hedge. In connection with the latter **Paul Dalton** and **Dr. Rod Smith** of the University of Southern Queensland have carried out experiments to determine some of the hydraulic characteristics of vetiver hedges. The first year's results are positive and it appears hydraulically feasible to use vetiver hedges to control flood flow and erosion on cropped flood plains. The hedge spacings required are comparable to, and slightly greater than, the strip spacings required for conventional strip cropping, but are far less sensitive to the magnitude of discharge. There appears to be a limited range of slopes for which the hedges alone would provide adequate protection against erosion. Note this experiment was carried out on vetiver grass of less than one year old. Experiments will continue with mature hedges.

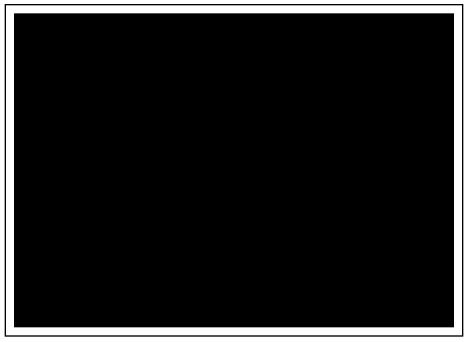

Photo # 17. *In search of Vetiver,*
Photo Credit:...Charles Maquire

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