VETIVER NEWSLETTER

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THE NEWSLETTER

This is the seventh Newsletter put out by the Vetiver Information Network and also, the largest in terms of articles that have been sent in by you who are on the Network. Putting this publication together is becoming progressively easier as more and more people are getting involved with their own research, trials and use of vetiver. It is very rewarding for us to get your comments and put them together like this to send back out to others. It gives those of us who are spending too much time with paperwork a sense that we are a part of something more practical and useful. Thanks to all of you who are and have been looking for good ideas and who, more importantly, have been willing to give those ideas a try.

Please read this before you go on to read other things in this Newsletter. In this issue we had wanted to put in a special section on the propagation of vetiver grass. We could have done so, we have quite a bit of information here. But, what we do not have are your concerns, ideas, issues, knowledge, techniques, needs, etc. etc. because you have not told us and we have not asked you. So now we are asking you, please turn to Page 16 and fill out the form you find there on propagation; do not mistake it with the form you will find on page 15 — that one is to get your free copy of the Board of Science and Technology for International Development's (BOSTID) book on vetiver grass, to be published soon.

And on that subject, BOSTID took its expert panel consisting of Drs. **Norman Borlaug**, **Rattan Lal**, and **Hugh Popenoe** to Louisiana to view the US Soil Conservation Service's vetiver plantings. The panel (which also includes **Dr. David Pimental**) will soon be making their recommendations to BOSTID regarding vetiver. We look forward to reading their ideas and suggestions.

One final note for all of you dog lovers, **Mr. Richard Skolnik**, of the World Bank informs the Network that *Dog Fancy Magazine* says that vetiver can be used as a natural flea repellant.

Photo 1. *At the Agricultural Research Service's Sedimentation Laboratory in Oxford, Mississippi, USA flume studies show the structural strength of vetiver grass and its ability to control runoff when planted as a hedge.*
Photo courtesy of the USDA/ARS Sedimentation Laboratory, Oxford, Mississippi.

CORRECTION ON VETIVER AWARDEES

Mr. Wang Zisong, the Deputy Director of the China Red Soils Project, has informed the network that the award of US$500 given to him for the work carried out in Fujian Province should not be credited to him alone. He writes that in carrying out the work (described in Vetiver Newsletter #6, June 1991) his cooperators were **Mr. Wong Changzhang**, **Mr. Liu Songting**, and **Mr. Huang Jianling**. We apologize for our oversight and congratulate Messrs. Wong, Liu and Huang on their excellent work and on their award.

Update On The Potential Availability Of Funds For NGO's Demonstration Work With Vetiver

In our Newsletter #5 in March of 1991 we announced that there was a good possibility that we would be able to find grant funding in order to support NGO groups currently involved in agriculture/natural resource management cooperatively with small farmers and who wished to try vetiver grass hedgerows for soil and moisture conservation. Since last March we have heard from a number of interested groups and individuals who either are already starting work with vetiver or have a keen desire to do so. Well, it is almost 9

months later and we are still writing proposals and looking for a source to provide us with a "Technology Fund". We wish to establish this Fund, not only for vetiver grass, but also for work with other promising technologies that can improve our management of natural resources. We have been receiving favorable comments on our proposals, but as yet no money. So, to all who have replied, be assured that we are keeping a special file with your requests. To those of you that have not gotten in touch with us and would like to, please do. We can make no promises, but we are trying and we are optimistic. In the meantime, keep up the good work !

Would You Like A Free Copy Of BOSTID's Upcoming Publication On Vetiver Grass ?

The National Academy of Sciences is preparing a report on vetiver and its potential. The final report, a book of 150 pages or so, will be published in a few months. They will make it widely available to politicians, administrators, financiers, agricultural planners, entrepreneurs, researchers in many disciplines, and field workers. It should help get vetiver better understood and appreciated.

An appendix in the book will give the addresses of vetiver researchers and users. Do you want to be listed? If so, please fill out the form found on page 15. Everyone replying will receive free copies of the report when it is published. Having your name listed in the book is likely to foster professional contacts with those who want to employ vetiver in their programs.

Seeds of Change in Soil Conservation

The following is abstracted from **Dr. Michael Stocking's** article of the same name in the March/April 1991 issue of *International Agricultural Development*. Dr. Stocking, a soil scientist, is currently the Dean of the School of Development Studies, University of East Anglia, Norwich, UK.

"Soil is in a perilous state. 'Textbook' conservation is not working; some argue that it should therefore be applied with redoubled vigour. But there are alternatives and this article examines some of the new initiatives being tried by conservationists."

Photo 2. Contour vegetative barrier of vetiver grass at Tamil Nadu Agricultural University in India. This university is one of more than 45 institutions worldwide who are carrying out research on the use of vetiver grass for soil and soil moisture conservation. Photo courtesy of Dr. S. Jayaraj, Tamil Nadu Agric. Univ., India

"Conservation was built on an engineering approach. If the soil should start to move, then the response was to build a barrier to arrest further movement. It sounded sensible but it ignored a fundamental factor— namely, that the conservation measures were tackling the symptoms and not the disease. The soil had already started to move; the conservation would merely try to stop it going further."

"Fortunately there are alternatives that work with nature, strengthening preventative systems and supporting biological processes which restore soil quality. Most conservation researchers are concentrating their efforts on these alternatives. Before looking at some of the initiatives, what is the current state of soil degradation?"

"Soil erosion threatens millions of people in developed and developing countries alike. FAO estimates suggest that we are currently losing between 5 and 7 million hectares of good land a year because of degradation. This land comes primarily from the 11% of the total land area (about 1500 million ha.) which is currently suitable for agriculture. FAO's view is that soil and water conservation measures must be extended to a quarter of all farmland by year 2000."

"***Networking***. The sharing of experiences is one way to promote conservation. Research networks do this, so why not implementation agencies? Soil conservation cuts across disciplinary barriers erected by subjects as diverse as agriculture, economics, engineering, extension, forestry, sociology and soil science. It therefore demands input from many specialists and coordination between government departments."

"Most developing countries do not have the specialists or institutions with the expertise to tackle soil degradation and to design appropriate methods to tackle the problems. It is a major challenge for small countries where trained manpower is scarce. Even large countries such as Indonesia struggle when specialists are not used to working together. Regional networks are an answer."

"***Local Knowledge***. Professionals need to recognise that they are not the sole repository of knowledge. Local people have much to offer in their own struggle to conserve soil and water resources without professional help. These efforts, frequently the result of

decades of accumulated experience, were often rejected by experts as rudimentary and inefficient. But evidence is gathering that farmers will maintain and even expand such measures, while at the same time neglecting important techniques. So who is wrong?"

"***Husbandry***. Part and parcel of such changes in thinking is that far from being simply a set of techniques, soil conservation is about harmonising the views of conservationists — saving soil, preventing off-site impact, concern for society as a whole with the needs and aspirations of farmers. It is about land husbandry or how to gain an acceptable living from the land without jeopardising the future. The control of soil erosion will follow as a consequence if good husbandry is achieved. In medical analogy again, it is understanding the root cause of the problem rather than the symptoms."

"***Political Will***. Tracing back the causes often leads to failure in government policy and the institutions that government sets up to effect the policy. It is here, with sufficient political will, that the greatest advances could be made in promoting soil conservation. If governments through their policies made it worthwhile for a farmer to conserve soil, then soil degradation would be a thing of the past.

Justifiably soil conservation has developed a bad name, especially in many developing countries where its techniques have been forced on unwilling peasantry. People have shown by their neglect of the measures that much that is sold as conservation is unworkable, impractical and sometimes even detrimental to society and the environment. Today there is a change in thinking. Structures such as terraces and check dams were previously seen as the starting point. But the new philosophy, **Francis Shaxson** of FAO assures us, "assumes that the primary thrust is better soil management, with structures only used when they are unavoidable." This emphasis on production and making soil conservation worthwhile to the land user would seem a far wiser basis for a long-term strategy to reverse the appalling decline in the quality of our soil resources."

Figure 1. Inoculation of the roots of vetiver grass with mycorrhizal fungi improves growth significantly. Note that while some of the fungi were better than others in promoting biomass production, even the least successful of the fungi still improved the average biomass production by over 50% compared to the control.

Mycorrhiza and Vetiver - Rehabilitating Degraded Lands

The following preliminary research results were provided to the Network by **Drs. J.C. Dodd**, **S. Williams** and **P. Jeffries** of the Durrell Institute of Conservation and Ecology/ Biological Laboratory at the University of Kent, Canterbury, UK in an article entitled: *The Effect of Arbuscular Mycorrhizal Fungi on the Growth of Vetiver*. The authors work with mycorrhiza — a term for a particular association between the roots of a plant and the vegetative parts of a fungus. Mycorrhiza help plants take up nutrients and soil water more efficiently; this is very important under conditions where nutrients are limited. In their work, Drs. Dodd and his colleagues found that by inoculating vetiver roots with fungi taken from the roots of maize, that early growth and establishment of the vetiver plants was much better. The authors point out that if we establish plants with the right mycorrhiza for rehabilitation and stabilization of degraded lands, then the fungi can be there for the benefit of other crop species that will eventually be grown there.

The Effect of Arbuscular Mycorrhizal Fungi on the Growth of Vetiver.

"Mycorrhizal fungi occur in nearly all soils on earth and form a mutualistic symbiosis (an association beneficial to both) with the roots of most terrestrial plants. The arbuscular mycorrhizal fungi (AMF) occur over the widest ecological range and are commonly

found in association with most of the important agricultural and horticultural crops. Most plants in natural ecosystems will also have well developed mycorrhizas. The growth of many plants can be improved when inoculated with effective strains of AMF in soils low in plant available phosphate (P), primarily as a result of more efficient uptake of this nutrient. At present, however, inoculum must be produced on the roots of a suitable host plants such as onion in temperate regions and a forage legume like Pueraria phaseoloides or Sorghum spp. in the tropics, since they cannot yet be grown on synthetic media. AMF can have other beneficial effects on plant growth including increased tolerance of water stress and helping to bind soil particles into more stable aggregates by their extensive mycelial network outside the root. The latter could be of considerable importance in aiding the stabilization of badly eroded areas or the recuperation of soils in hilly areas along with Vetiver for example. The possibility that AMF could aid the early growth and establishment of Vetiver and allow the buildup of mycorrhizal populations, in soils where the indigenous fungi have been removed by loss of top soil, has great potential for the rehabilitation of degraded land."

"In a small experiment here in UK we evaluated the effects of four different AMF on the growth of Vetiver microplants weaned into peat and supplied by MASDAR (UK). The experiment occurred between 20 August 1990 and 25 March 1991 in a heated greenhouse where the minimum temperature was maintained above 12°C. Three-litre pots were filled with a non-sterile sand (pH 7.3 in 0.01M CaCl2) and free of AMF. Five fungal treatments were established; *Glomus etunicatum*, *G. geosporum*, *G. mosseae*, *G. versiforme* and a non-inoculated control. 25 g of chopped roots of maize, colonized by the appropriate AMF, were placed below a plantlet in the planting hole of each pot. Each treatment had six replicates. Water was given weekly to bring pots back to field capacity. Plants were harvested at the end of the experiment and the dry weight of plant tops and the percentage of root colonized by AMF assessed."

"Figure 1 shows that *G. mosseae*, *G. geosporum* and *G. etunicatum* increased the dry weight yields of Vetiver compared with both the non-inoculated control and plants colonized by *G. versiform*e. Plants inoculated with the former three AMF also had the highest levels of root colonization (Fig. 1). The linear correlation between dry weight and the percentage of the root system colonized by AMF in this experiment was very positive (r = 0.814)."

"These data indicate that AMF could help the early growth and establishment of Vetiver plantlets in alkaline soils where there are no indigenous AMF, such as in badly eroded hill areas. This and other evidence infers that the recuperation of soils and soil fertility must include a regeneration of the soil microflora and especially the beneficial microorganisms such as AMF and rhizobium bacteria if the growth of legumes is envisaged. Many tropical plants (cassava, legumes and fruit trees) depend on their mycorrhizal symbiosis for efficient uptake of nutrients in poor soils. If Vetiver plantlets were inoculated with AMF, appropriate for the soils in which they were planted, then they would benefit not only from colonization of their own root system but also in aiding the buildup of inoculum for the roots of other crop species being grown in association, such as legumes. This multidisciplinary approach to the recuperation of degraded soils may bring more successful results in the long-term."

"We would like to express our gratitude to **Mr. Glenn Allison** of MASDAR LtD, UK for his collaboration in supplying Vetiver plantlets."

Influence of Accession Variability and Fertilization on the Establishment and Growth of Vetiver Grass in a Field Nursery.

The following research article was received by the Vetiver Network from **Drs. P.E. Igbokwe**, **S.C. Tiwari**, **J.L. Burton** and **R.E. Waters, Jr.** from Alcorn State University, Lorman, Mississippi, USA. Dr. Igbokwe and his colleagues carried out two field experiments to evaluate the survival and growth potentials of four different accessions (geographical sources) of vetiver grass (from India) as affected by fertilization. They found that fertilization increased the number of tillers and seedheads per plant in 1990; and increased the plant height, the number of tillers, seedheads per plant and the plant's biomass in 1991.

They also found differences be-

Table 1. Treatment effects on plant survival, plant heights, number of tillers and seedhead formation, 1990

tween the vetiver plantings which resulted from the different plant's origins. The individual accessions showed differing plant height, number of tillers and seedhead in 1990; and differing plant height only in 1991. The interaction between fertilizer and accession was significant for seedhead in 1990 and plant regrowth in 1991. The authors concluded that the accessions tested can be established successfully on the soil type in which the experiment took place; that they respond to soil-applied NPK fertilizers; and they can survive the mild winter months in Southwest Mississippi. The authors also measured biomass production and reported that the combined root and shoot biomass productions after six months of regrowth could range from 176,798 kg/ha for one of the accessions (lowest) to 353,596 kg/ha for another (highest); plant spacing was 20.3 cm x 20.3 cm.

Introduction. "Realizing Vetiver grass potential for becoming a hedge grass in the United States, as well as for its industrial applications, its propagation and nursery establishments are being carried out in some of the United State Department of Agriculture's Plant Material Centers, to determine its most appropriate propagation method, adaptation potential and for increasing the available plant materials already in the country. Greenfield (1989) noted that Vetiver grass grows faster in nursery and produce more tillers in shorter period of time if they are fertilized with phosphatic fertilizer in combination with some form of nitrogen. Sreedharan and Nair (1975) reported that application of 20 kg/ha each of P and K2O increased the oil yield but not the root yield. Increasing the rate to 30 kg/ha each did not improve response, but 30 kg/ha P alone increased oil yield. In India no difference in growth response was observed between fertilized (40 kg/ha N and 40 kg/ha P) and unfertilized vetiver in one plot (at 70 days) and no response until about 8 weeks in a second plot (Vetiver Newsletter, 1990). Vetiver has also been reported by the same source to establish well in soils that are characterized as P deficient. Because of the increasing interest in vetiver, and limited information on its adaptation and fertilizer requirements in the United States, this study investigated the survival potential and fertilizer effect on the growth of four vetiver accessions in field nursery in Southwest Mississippi."

Method. "Two field experiments were used to evaluate the survival and growth potentials of both fertilized and unfertilized 196257, 213902, 271633 and 302300 vetiver grass accessions planted in a field nursery. A split plot arrangement in a randomized complete block experimental design was used, with fertilization as main plots whereas vetiver grass accessions made up the subplots. The experiments were conducted on a Memphis silt loam (Typic Hapludalf: fine, mixed, thermic) soil at Alcorn State University, in Lorman, Mississippi. Soil extractable nutrient level was medium for Phosphorus (68.32 kg/ha), low for Potassium (216.16 kg/ha), very high for Magnesium (1130.08 kg/ha) and very high for Zinc (8.18 kg/ha). Soil pH was 5.3."

"Single tillers obtained from vegetatively propagated (root division) vetiver grass accessions from the Regional Plant Introduction Station in Griffin, Georgia were transplanted to field nursery on May 29, 1990. Each accession was spaced 20.30 cm on sub plots 1.42 m x 1.07 m and replicated 4 times. A total of 7 plants were transplanted into each subplot. Moisture was limited to the initial hand watering immediately after transplanting, plus natural rainfall. The average monthly rainfall during the first year of this study was 0.18 cm. The average monthly soil temperature at the same period was 22.44°C for the morning and 31.22°C for the afternoon. On June 5, 1990 each of the fertilized plots received 240.8 kg/ha of 13N-13P-13K. Weeds within the experimental plots were controlled by hoeing and hand pulling, whereas the surroundings were mowed as needed. Pesticides were not used in this study since pests were not observed. Plants were allowed to overwinter with the seedheads unharvested. Data were analyzed by the analysis of variance and means separated by least significant difference (LSD)."

"On April 22, 1991 the number of plant regrowths from the 1990 fertilizer field study were counted, and percent regrowth was used to estimate cold tolerance for the 4 vetiver accessions."

"After cold tolerance evaluations, missing plants were replaced for each accession on April 23, to initiate the 1991 study period. On May 8, plots were fertilized as for 1990. All production practices were as in 1990. The average monthly rainfall during this second year of this study was 0.95 cm. The average monthly soil temperature

Table 2. *Treatment effect on plant regrowth, plant height, number of tillers, and plant biomass, 1991.*

at the same period was 22.43°C for the morning and 28.72°C for the afternoon. Data were analyzed as for 1990.

Results and Discussion. "In 1990, fertilization increased the number of tillers and seedheads per plant, while accession variability influenced plant height, number of tillers and seedhead per plant (Table 1). Tillers were greater (9.96 per plant) for fertilized plants than (6.38 per plant) due to unfertilized plants. Seedheads per plant were also greater for fertilized plants (4.48) compared to 2.24 from unfertilized plants.

'The greatest plant height values of 2.03 metre occurred in accession number 271633. The number of tillers per plant was greatest (9.92) in accession 213902, and least (6.08) least in accession 302300. Seedhead per plant was significantly greater (4.04) in accession 271633 and least (3.30) in accession 302300."

"The number of seedheads per plant was significantly different due to the Fertilizer x Accession interaction."

"Percent survivals were 95.57 and 99.14 for fertilized and unfertilized plants, respectively. Percent survival for plant accessions 196257, 213902, 271633 and 302300 were 98.29, 94.71, 96.43 and 100.00, respectively (not in the table).

"Vetiver grass cold tolerance was not affected by fertilization and accession variability (Table 2). However, fertilized plots had 90.25% of grass regrowth as compared to 86.75% for unfertilized plants. Cold tolerance among accessions was highest, 93.00% due to 196257, and least, 84.00% due to 302300 accession."

"Data due to Spring 1991 fertilization were significant for plant height, tillers and seedhead per plant, and fresh weight. Their respective higher value of 5.12m (height), 12.06 (tillers), 5.5 (seedheads) and 1.48 kg/plant (fresh weight) were due to fertilization as compared to their respective lower values of 3.93m, 4.26, 1.66, and 0.51 kg/plant from the unfertilized plots. Accession variability influenced plant height. The greatest plant height value of 4.9m was due to 196257 accession."

"Based on 20.30 x 20.30cm plant distance, and plant fresh weight values (Table 2), total biomass production from these 6 month old vetiver grass regrowths could range from 123,516.39 kg/ha to 358,439.72 kg/ha for unfertilized and fertilized plots, respectively. Similarly, the biomass production by vetiver accessions could range from 176,798 kg/ha to 353,596 kg/ha for accessions 213902 and 196257, respectively .

"Fertilizer x Accession interaction was significant for plant regrowth. Fertilized plants reduced within row plant spacing in the range of 77 to 88mm compared the range of 62 to 76mm due to unfertilized plants, after 4 months of regrowth. Accession 271633 had nonsignificantly higher value for gap reductions than other three accessions used in this study (not in the table)."

Conclusion. "Data from these studies suggest that vetiver grass accessions 196257, 213902, 271633 and 302300 can be successfully established on the Memphis silt loam soil of Southwest Mississippi if growth factors are not limiting. These accessions will respond to soil applied NPK fertilizers, however the extent of response will depend among other factors, on seasonal variations and their genetic variabilities. High coefficient of variability reported in this study could contribute to nonsignificant difference among some parameters tested. Greater number of tiller productions could lead to faster trapping of sediments on the uphill side of the rows, resulting in earlier erosion control from fertilized plots, compared to unfertilized plots. Data also indicate that when these vetiver grass accessions are grown in Southwest Mississippi, their survival potential after a mild winter season could range from 84% for 302300 accession to 93% for 196257 accession. Combined root and shoot biomass productions could range from 123,516 to 358,440 kg/ha for unfertilized and fertilized plots, respectively. The biomass productions by vetiver accessions could range from 176,798 kg/ha (accession 213902) to 353,596 kg/ha (accession 196257)."

Acknowledgment. "The authors wish to thank the United States Department of Energy, and Mississippi Department of Energy and Transportation Division, Economic and Community Development for funding this project. Special appreciations to **Mr. Doral Kemper**, and Southern Regional Plant Introduction Station, Griffin, Georgia for providing seeds and seedlings used to initiate this study. The authors also wish to thank **Dr. Samuel Donald**, **Dr. Johnnie Collins**, Dr. **Charles Tillman** and **Mr. Tom Collins** for their support and encouragements; and **Larry Russell** for assisting with planting, field maintenance and data collection; Ms. **Janice Carter** for typing the manuscript."

Philippines - The Introduction of Vetiver Grass to Improve An Indigenous Technology for Soil and Water Conservation.

Dr. Ly Tung and Ms. Fatima T. Balina of the Farm Resource and Management (FARMI) Institute at Visayas State College of Agriculture in Leyte have provided the Network with the following piece :

".....As farm density has increased the fallow cycles are reduced to a few years at most, farm sizes decline, and fallow cycles are replaced by continuous cropping. Subsequently, many of the cereal-based farming systems in such areas are unsustainable

Table 3. *Soil loss as effected by contour hedgerow vegetation, Claveria, Philippines, August 1988 to April 1990*

because of soil erosion and soil nutrient depletion. One of the technical possibilities to address the problem is the development of contour hedgerow farming systems. Although scientists perceive many benefits of the hedgerow system technology, its adoption rate by upland farmers is disappointing."

"In January 1990, FARMI/ ViSCA started to implement a project entitled Upland Agriculture, Philippines. The project funding comes mainly from the International Development Research Center (IDRC) of Canada."

" FARMI selected a pilot research site covering five upland barangays in the municipality of Matalom, province of Leyte. Two of the selected barangays are characterized mainly by calcareous soils where corn is most widely grown. The other barangays have strongly acidic, degraded, and infertile soils where upland rice is predominant. A close study of the production systems in these barangays reveal that farmers have developed their own technique to fight soil erosion."

Learning from Farmers.

"Through this project, we first noticed in the two calcareous-soil barangays the existence of natural grass strips in many sloping fields (mostly 10%-40% slope). These are narrow (0.5m - 1 m wide) contour strips left unplowed and allowed to vegetate naturally. They are put in at the time when a piece of fallow land is brought into cultivation. The distance (surface run) between strips may range from 4 m to 10 m (Ly Tung and Alcober, 1991). The above technique is locally termed as "cemento-cemento" or "kahon-kahon."

"As of April 1991, about 34 percent of the total 396 households in barangays Altavista and Templanza have adopted this technique of soil and water conservation. Ninety-six percent of farmer-adoptors have indicated that their primary reason for adopting is to check soil erosion (Balina et al, 1991). Of late (June 1991), we observed that a good number of adoptors in these barangays have expanded the technique to their other land parcels that are brought into cultivation after fallow."

"The natural vegetative filter strips are not without problem, however. As the dominant grass species are either cogon (Imperata) and/or low-statured native grasses, the strips are not strong enough to hold the soil, especially on steep slopes (more than 18%). According to farmers, heavy rains and/or animals cause broken strips."

Searching for Technological Improvement - The Mura grass.

"Research on the use of natural grass strips has received very little attention to date (Garrity, et al 1991). The grass strips are simple to install and have low or no labor requirements but show an outstanding capability to reduce soil loss, a characteristic which makes them potentially superior to the commonly recommended, introduced species (Table 3)."

"An interesting grass species was first observed by the authors in August 1989 in barangay Anolon, Hindang, Leyte. The grass was found grown by some farmers along the dikes of lowland rice fields for the purpose of holding the soil. In a Visayan vernacular, farmers call it Mura. After a period of verification, it turned out that Mura in Anolon is actually Vetiver grass. Interestingly, many of the farmers thought that Mura was not adaptable to the uplands. The first trial planting of Mura (5 rows at 10m/row) to test its adaptability to an acid infertile upland area of Matalom was done by the Project in January 1990. A dry spell struck the area from February through May of the same year. When Mura survived this drought, its adaptability to the uplands

Table 4*. Number of rows and total length of Mura (Vetiver) grass planted by demonstration farmers in barangay Matalom, Leyte, Philippines.*

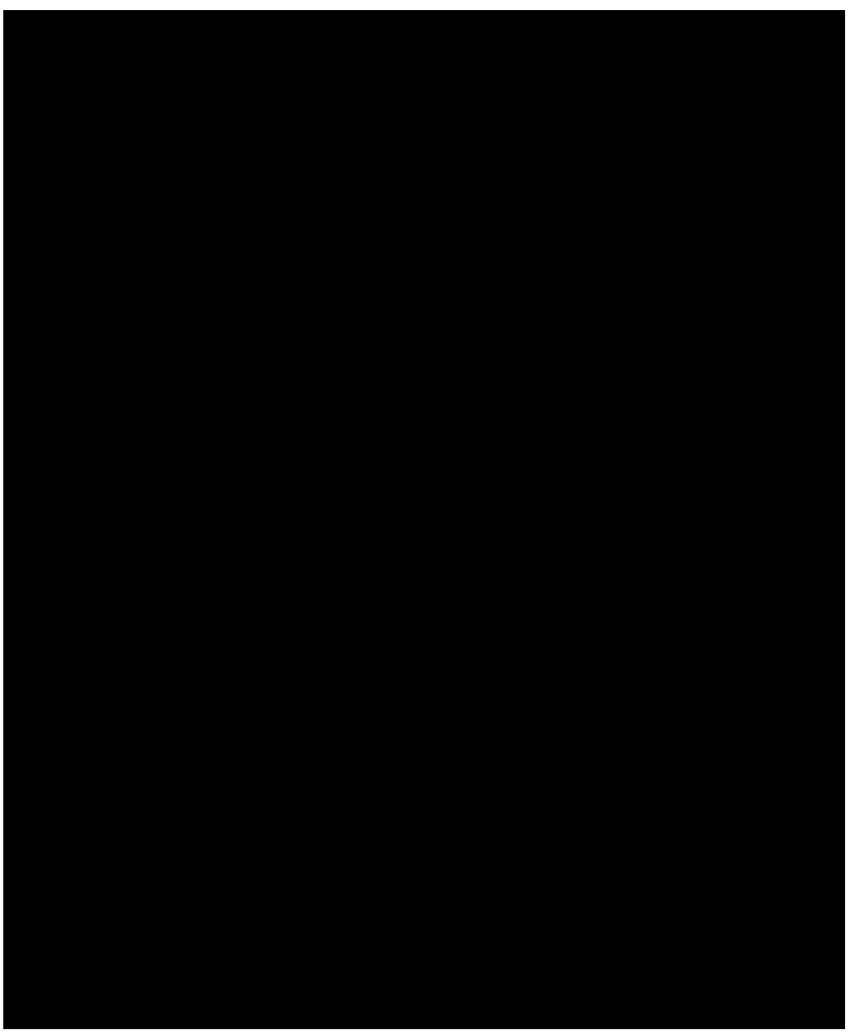

Photo 3. *Cassava in an erosion control experiment with vetiver and Arachis pintoi; showing little sign of competition effects of vetiver in cassava growth.*

and its being drought-tolerant were confirmed."

Creating Awareness Among Farmers. "Some 12 farmers from 3 barangays were invited to view a slide show on the Mura grass technology. After the slide show, they were brought to the trial planting area of Mura. Subsequently, some 10 farmer-participants signified their interest to try it in their farms. The Project provided some planting materials to interested farmers in one barangay. In the other two barangays, the farmers secured the planting materials by themselves from nearby lowland areas."

Testing and Feedback by Farmers. "Initially, one farmer planted Mura in the lowland, two planted both in the lowland and upland, and seven planted in the upland only. To date (June 1991 the number of farmers in four barangays who have tried/expanded planting Mura has increased to 17 (Table 2). As reflected in the table, all farmers but one planted Mura in the uplands. The number of rows planted varied from farmer to farmer with a total length of 1,124 meters for the uplands."

"Farmers' feedback was taken and the following comments were gathered:

1. As hedgerows in the upland, Mura seems to be stronger than cogon because it is deep-rooted.
2. Mura does not grow tall compared to leguminous trees/ shrubs such as Gliricidia, thus pruning is not needed.
3. Less water can pass through the Mura hedgerows during heavy rains once they are already established.
4. Mura is better than cogon because its root growth is vertical while Cogon has lateral roots which produce new shoots; hence, more maintenance for cogon is needed.
5. Crops such as corn and rice planted near Mura hedgerow show better performance.
6. Mura has an expanded/dense base which can serve as a physical barrier preventing soil and water to pass through.
7. "I favor Mura over Gliricidia since it will not give me problems when it matures. With Gliricidia its laterally growing roots interfere with land preparation, resulting in so much delay."
8. "I have observed that Mura contributes much to the control of topsoil erosion. The transported soil is accumulated along the Mura hedges where it is trapped. Where there is no Mura the rate of erosion is really high and a lot of gulleys are formed. I have observed all these things after the recent (super) typhoon Ruping."
9. "I have also observed that Mura can tolerate partial shading caused by the ipil-ipil."

As of June 1991, one farmer has already expanded the planting of Mura in another parcel of his farm and there are six who are planning to do the same when the rains come. Some of them have cited insufficient planting materials, at; present, as a constraint for expansion. The comments of farmers who have planted Mura suggest that they are optimistic about its performance as hedgerows in the uplands."

Concluding Statement.

"After a year 17 upland farmers have tested and adopted Vetiver grass for soil and water conservation. Indications are that the technology will be spread and be sustained even if the project no longer exists. A main ingredient leading to such a good adoption rate in a short period of time appears to be the following: learning from farmers first before attempting to introduce technological improvements. In the long run the simple grass (Vetiver) strips will not remain simple. They provide foundation for subsequent diversification into more labor-intensive hedgerow enterprises. This diversification is being looked into by the project."

"Based on the Project's experiences and reinforced by recent literature on the use of Vetiver grass for soil and water conservation around the world, the Project has prepared and pretested a leaflet written in Cebuano for distribution to all farmers covered by the Project. However, it should also be useful for other upland farmers in Region VIII."

From The International Center For Tropical Agriculture (CIAT)

Dr. **Douglas R. Laing**, Deputy Director General of CIAT in Cali, Colombia writes :

"I enclose for your information some photographs taken recently in Mondomo Cauca, Colombia showing vetiver with *Arachis pintoi*. I believe this is a first. The results seem to be shaping up quite well from various viewpoints. The final results at the end of the first year and particularly after 2 or 3 years will really tell. At the moment erosion is at a minimum in the vetiver plots and cassava seems to be growing

well without competitive effects close to the barriers."

"The idea of the Arachis association is to provide a source of nitrogen for the system as a whole. Arachis is shade tolerant and fixes nitrogen quite well in acid soils at intermediate altitudes, i.e. where most of the erosion seems to take place in the tropics. Over time there could be a reasonable contribution of nitrogen provided from this association. The Arachis could also be cut for fodder without endangering the vetiver as a hedge against erosion. This would reduce one of the main constraints in the use of vetiver per se, i.e. its apparent low acceptability to bovines."

"The experiment shown in the photos isthe work of **Mr. Martin Ruppenthal** from the University of Hohenheim who is working at CIAT in a collaborative project funded by the BMZ. We will keep you
posted on the outcome."

Table 5. *Effects of mulching with native grasses (wild grass, banana stems and vetiver grass on white ant (termite) attacks and mortality in some horticultural crops.*

An Update From Karnataka, India On The Effects of Vegetative Barriers on Crop Yield and Soil Loss

Dr. **B.R. Hedge** from the University of Agricultural Sciences in Bangalore (who has been carrying out research involving vetiver hedges for over 4 years now) has provided the Network with some information from the 90-92 Annual Report of the AICRP for Dryland Agriculture. In comparing a control plot (no hedgerows, graded bunds at top and bottom of plot), a plot with a vetiver hedgerow (in plot center, graded bunds at top and bottom of plot) and a plot with a *Pennisetum hohenackeri* hedgrow (in plot center, graded bunds at top and bottom of plot), he reports that there was no influence on overall yield of millet. This is significant as the crop rows adjacent to the hedgerows exhibited some competition effects. Yields in the adjacent two or three rows (editor: these would be located within about 30cm to 50cm of the hedgerow) were reduced from, in one case 0% (row 3) up to a maximum of 52% (row 1) in another case. This suggests that yield increases in the interior rows would have had to occur in order to offset the losses due to the competition of the hedge. Soil losses in the three plots during that year were very low due to rainfall characteristics; losses were .49, .51, and .54t/ha for the vetiver, pennisetum, and control plots, respectively.

A Preliminary Study on Vetiver Grass Mulch Effect On White Ant (Termite) Attack In Horticultural Plantings.

From the **Staff of the Watershed Technology Development Center** in Solo, Central Java, Indonesia :

"The objective of the study is to determine the usefulness of vetiver leaf for preventing white ant attack of horticultural plants. The study is executed in an area of marginal and shallow soils at Gunungsari, Sub-district of Wonosegoro, Boyolali."

"Table 5 shows the number of trees observed, the intensity of the white ant attacks and the percentage of the trees killed by white ant attack. From the data it can be seen that there is a significant difference between the three mulches used — cuttings from the wild grasses, banana stems and vetiver grass cuttings. The use of banana stems or vetiver grass as mulch decreased the intensity of white ant attack and the percentage of trees killed by white ant. That vetiver is as effective as banana stems is important as it is impossible to fulfill the need for mulch with banana stems. It is suggested that further more detailed research should be carried out to test the usefulness of vetiver mulch in preventing white ant attack on horticultural plants."

Letters from Vetiver Network Correspondents

Australia

The Network has received information through **Dr. Noel Vietmeyer** at the United States National Academy of Science, that, according to Mr. **R.S. Junor**, Commissioner, Soil Conservation Service, New South Wales, the Australian Soil Conservation Service's "interest in Vetiver has been reawakened and currently we are undertaking a major project to evaluate vetiver in four states of Australia. The project is coordinated through our Plant Materials Centre and the officer responsible is **Mr. Ken Reynolds**..... Over the next three years vetiver will be evaluated at a wide range of sites, in various environments and for different uses. Throughout the duration of the project, results will be distributed through the Vetiver Newsletter."

Dr. Paul Truong, the recipient of one of the Vetiver Awards for his work on saline tolerance in vetiver, writes

Photo 4. *Digging Vetiveria in the Benue Floodplain near Demsa, Nigeria*

that he is continuing his salinity work and, in addition, hopes to set up trials to evaluate the effectiveness of vetiver in stabilising coal mine overburdens. He writes: "If this trial is successful, Vetiver will provide our mining industry with a low cost and effective means of reclaiming mine wastes."

Bhutan

Possible First Vetiver Planting in Bhutan

Mr. P.G. Harrison writes from the Department of Primary Industries and Fisheries in Australia that he believes that, what may be the first vetiver plantings in Bhutan, have been put in at Pemagatshel this last February. Mr. Harrison informs the network that planting material was obtained through World Bank staff from Kathmandu and that they had excellent establishment with new tillers appearing only 10 days after transplanting. They planned to try and distribute vetiver to farmers this last July or August.

Bolivia

Mr. Mathieu Kuipers, Project Coordinator of a cooperative program between the Ministry of Agriculture and Campesinos (MACA), the Corporation for the Development of Cochabamba (CORDECO) and the United Nations informs the Network that they are beginning to develop a program to assess and utilize vetiver grass hedgerows. Mr. Kuipers has also provided us with Ing. **Alfredo Ballerstaedt's** (MACA) translation of the Vetiver Handbook as well as an introduction that Ing. Ballerstaedt has written on the vetiver system for Bolivia.

Cape Verde

Vetiver Introduced to "New" Country

Ms. **Frances Harris**, a Plant Scientist with the Henry Doubleday Research Association who is working in a collaborative project with the Instituto Nacional De Investigação Agrária on agricultural and forestry research, writes that their project has introduced vetiver to Santiago Island.

"A supply of the grass was brought out from England in February 1991 and is now growing well in a nursery. When the rains start, these plants will be divided and should provide enough material to plant a demonstration trial on a steeply sloping site. Survival and growth of vetiver grass will be monitored and its effects on soil erosion and crop yield will be observed.

"Cape Verde foresters, soil conservationists and agriculturalists are very interested in vetiver. They have been very helpful with respect to allowing it to enter the country and providing materials necessary to build an enclosed nursery. Many Cape Verdians have requested planting material and are very curious to see if it will grow successfully here. If it does, it is likely that the National Soil Conservation Service will use it regularly in their campaign to control soil erosion."

"Vetiver grass has also been introduced to the second-largest island, Santo Antao, by a Dutch agricultural project. Unfortunately, I have been unable to contact them. If any groups from Cape Verde have responded to your (Network), I would like to know of them."

Costa Rica

Six Years of Vetiver Use

Dr. C. Bufford Briscoe writes that he now has about six years experience with hedgerows of vetiver, lemongrass (*Cymbopogon citratus*), and citronella (*C. naudus*) on his farm in a humid zone ("Ten days without rain is rare") receiving about 2400 mm/yr rainfall. He reports that there had been no apparent differences between the hedgerows until 1990, when, more than 90% of his lemongrass (apparently) died of a root rot. Other than this, he tells us that there are no visually obvious differences in the densities of the three hedgerow types, nor has he observed any die out in the centers of any of the hedgerow species....which he suggests may be due to annual trimming. He reports that flowering in the plants is rare to nonexistent. Dr. Briscoe also states that on a consultancy to St. Vincent, West Indies this year, he found that lemongrass is considered to be an important pest...."it flowers and seeds abundantly, and has spread over considerable areas".

Hong Kong

A Perspective On "Good" versus "Bad" Fodder Grasses For Erosion Control

In the May 1991 edition of *Asia-Pacific Uplands - A Newsletter for Scientists*, **Dr. R.D. Hil**l of the Department of Geography and Geology, University of Hong Kong writes about upland development in Guizhou Province, P.R.C.

".....For higher more temper-

ate areas pampas grass (*Cortaderia argentea*) may offer possibilities and for lower more tropical areas Vetiver may be suitable for erosion control. Neither is good quality fodder. This is important since good-quality fodders are likely to be environmentally-sensitive, or require significant inputs (which no farmer can afford and would not use anyway on public-access grazing lands). More importantly, vigorous low-quality fodder is likely to suffer less cutting or grazing pressure and thus continue to be effective in erosion control, especially if planted, as recommended, in a double-row hedge along the contour."

Dr. Hill is publishing this newsletter for the Pacific Science Association as a medium for the sharing of news and views, for the informal publication (in brief) of research reports and for documentation on management systems which are economically and environmentally sustainable for the utilization of the **Asia-Pacific uplands. If you are interested in joining this network, contact Dr. Hill at the University of Hong Kong.**

(**Editors note** : there are two points in Dr. Hill's article on which we would like to comment. The first is to note that in some areas pampas grass is considered to be a serious weed, and the second is to state that the Network does not recommend double rows of vetiver in areas where control of sheet and rill erosion are desired. Double rows may, however, be desirable or necessary in situations where runoff is concentrated, for example, stream banks and active cutting areas in gullies.)

India

Letter From A Karnataka Farmer

Mr. R.S. Patil of Hombal, Gadag, Dharwad writes to the Network that : "I am happy to give you my feedback from my last 6 months of work. During the summer I found our Forest Department's vetiver nursery and requested a supply.....I was able to make vetiver bunds (hedges) on 8 acres of Black-cotton soil land (**ed. note** : *high shrink/swell clay soils subject to deep cracking when they dry - Vertisols*).

Photo 5. *Mr. Patil's vetiver about 90 days after planting from single tillers.*

This land has been planted on all boundaries....(and) divided into two equal parts with khus (vetiver) planted across the waterway. A total of 67 acres (drains) through this land to another farmer's land. Another farm of my own has also been planted....there I have planted khus on 3 boundaries (of a) 7.5 acre land (and have) made 16 parts. Everywhere I have used single rootlets (plants)."

"We are encouraging farmers to make vetiver nurseries on their own land through a small group, a farmer to farmer association called 'DHARLTRI'. Already four small nurseries have been established....We are promoting Permaculture, organic farming, vetiver importance in soil erosion and other related methods of sustainable Agri-methods in our area."

Mauritius

More Evidence That Vetiver Grass Hedges Stop Encroachment of Weeds Into Farmer's Fields

The following information was sent to the Network by Dr. Noel Vietmeyer and comes from a communication by **Dr. Jean-Claude Autrey**, Head of the Plant Pathology Division of the Mauritius Sugar Industry Research Institute.

"Any sugar cane grower in Mauritius will tell you that vetiver is used both for erosion control as well as some sort of barrier to prevent noxious weeds such as Cynodon dactylon to penetrate fields from roads. The abundant root system of vetiver is ideal for this purpose."

People's Republic of China

Plantings Expanding in Jiangxi

Mr. Zhang Guangming, a regular contributor to the Newsletter and one of the individuals who has been instrumental in promotion of vetiver grass in China, writes : "Under the influence of vetiver establishment in the Red Soils project area, Jiangxi Is now expanding its planting area. By the end of 1990, we had established a protection area of 5,000 mu (332 ha), nurseries of 100 mu (6.7 ha) with six million planting slips. Vetiver is not only planted in the Phase I Red Soil project area. In mid-March, 1,500 county government staff and farmers were organized to plant 30,000 meters (protection area 1,000 mu) of vetiver strips with 700,000 slips in proposed phase II project area. In Xinfeng county, 100,000 slips (protection area 100 mu) have been planted at the edges of level trenches, in the soil plugs of gullies and

around the slopes of hills on the contour. Priority will be continuously given to planting material and planting quality."

"Recently a training course was sponsored in Nanchang for an environmental protection forestry project. Participants from 16 provinces discussed vetiver establishment. Special funds have been allocated to Jiangxi and Guangdong provinces for trial planting. Mr. Liao Baowen, from the Tropical Forest Institute of the China Academy of Forestry came to Jiangxi ADC on April 14 for information and handbooks on vetiver. He says that the Institute, which is near the South China Botanical Garden where three people have started research on vetiver, and the Forest Bureau of Yangxi county in Guangdong province will plant a 150 mu (10 ha) vetiver demonstration for a forestry project."

In Fujian province, the Network is informed that under the direction of the Water and Soil Conservancy, two more counties (Anxi and Jianyang) will put in vetiver trials on about 255 mu (17 ha). The trials will consist of hedges on sloping agricultural fields, in gully control, to stabilize collapsed slopes, to stabilize fruit/tea terraces, to protect ponds, and along roadsides. The trials will monitor impacts of vetiver on erosion, runoff, soil nutrients and work at enhancing management techniques.

Rates of Tillering Significantly Increased by Pruning

According to work carried out by **Mr. Chen Cayang** and **Mr. Cheng Hong** of the Department of Water and Soil Conservation, Nanchang Water Resources and Hydropower Academy in Nanchang, Jiangxi, the rate at which tillering occurred in vetiver was definitely affected by pruning. In their trials, pruning of vetiver in late August had increased the rate of tiller formation by 71% at the end of one month and by 83% at the end of the second month; they conclude that pruning should be carried out prior to flowering, but after growth has begun to slow so as to maintain the maximum photosynthetic surface during the period of optimal growth. The authors carried out their work in six locations, between latitudes N18°10' and N36°33' (rainfall 706 to 2,000 mm/yr; lowest temperature -9°C; soil pH = 4.5 to 5.6) and make the observation that based on the first year's data, so far vetiver appears to be sufficiently adapted to this climatic range for use as a soil and water conservation species. They will continue monitoring.

In Zhejiang, Vetiver Grows in Cold Uplands

Mr. Qiu Jiye of Zhejiang has written to the network to inform us that vetiver grass has been planted in the Province since 1971. It has been planted as clumps, not as hedgerows, primarily for stabilizing soil, for pickling spice (from the root), and for fuel from the stalk. Mr. Qiu notes that vetiver has a large range of adaptability from acid soils (pH = 4.5) to alkaline soils (pH = 8.5) and from mountainous uplands (mean winter temp 7°C; min = -7°C; 35 frost days; 10-15 snow days) down to sea-level.

Vetiver Is A "Delicious" Spice

Mr. Gao Weisin of the Institute of Mountain Disasters and Environment in Chengdu informs the Network that new economic uses for vetiver grass are being found in China. He tells us that vetiver is being found useful to feed fish and also "Another use of V. grass is to be used as a spice, especially with meat. These dishes are very delicious."

Republic of South Africa

Private Firm Stabilizes Difficult Sites

Mr. Anthony Tantum has been working with vetiver grass since 1966, when he first saw the Mauritians using vetiver grass hedgerows to stabilize drains on a sugar estate in the Lower Shire Valley; today he has a private company which specializes in land stabilization with vetiver grass hedgerows. In a recent letter to Dr. Noel Vietmeyer at the United States National Academy of Science, Mr. Tantum recounts the following : "In 1990, **Neils Carsten** of the Roads Department (Cape Provincial Administration) asked (me) if vetiver could solve a serious erosion problem at the Stellenbosch flyover (Exit 22 of Hwy N2 to Cape Town). The embankment was very steep; the "soil" pure white sand. Vetiver was planted in April 1990, closely spaced and without fertilizer. Virtually all plants survived,and their growth was good. Natural terracing was already visible before the end of the year."

"In another trial in the Stellenbosch area (on the R44 road to Paarl), a steep road bank with very poor subsoil was planted. Nothing grew in the white clays with red patches until vetiver was put in April 1990. Today the grass is growing and tillering well, and the bottom hedge, for example, had built up between 70 and 100 mm of soil in just the first 7 months !

Another remarkable approach in South Africa has been achieved by the Institute of Commercial Forestry Research. Vetiver has now been accepted by the forestry industry on fire breaks; which have been a major source of erosion up until the introduction of the vetiver hedges. The insurers of this industry have accepted the concept of vetiver hedges, on fire breaks, not being a potential fire hazard. In June of each year, the hedges are herbicided with Gramoxone and burnt a week later. Within two weeks the hedges come back as green belts across the fire breaks."

Thailand

'Faek' Well-known in Thailand

The following are some excerpts from two articles passed on to the Newsletter. The first is by **Dr. Weeachai Na-nakorn**, who is the Co-ordinator of the recently established Thai Vetiver Network, written in response to some question arising from a seminar on Vetiver grass given in Thailand last May. The second is from **Richard Grimshaw**, Chief of the World Bank's Asia Technical Department, Agriculture Division and gives some of his impressions from his May trip to Thailand to speak at the seminar on Vetiver.

Those interested in joining the Thai Vetiver Network can contact Dr. Nanakorn at The Forest Herbarium, Royal Forest Department, Phaholyothin Road, Bangkok 10900.

"According to interviews with the Department of Biology, Faculty of Science, Chiang Mai University, and reference to the Royal Forestry Department's Directory of Plants in

Photo 6. *Water is ponded to the depth of 30 cm during a test run at the Agricultural Research Service's Sedimentation Laboratory in Oxford, Mississippi, USA.*

Thailand, vetiver grass, known in the scientific name as *Vetiveria zizanioides*, is a plant under "Faek" family in Thailand. The new generation who are not familiar with rural life may wonder as to what is Faek. "Faek" is well known among Thai people in many provinces because it can be used for house and farmhouse roofing. However, according to people in the countryside, natural Faek is now becoming scarce. People have begun using Imperata cylindrica for roofing instead. In their opinion, roofing made from Imperata cylindrica is not as effective as that made from Faek because Faek leaves, when assembled into a band, can aggregate themselves tightly due to the characteristics of the bottom end of its leaf. As a result, rain water does not hold on nor leak. Due to its more durability, its price is higher than roofing made from Imperata cylindrica."

Where Can Faek Be Found in Thailand? Faek is commonly found in the low plateau lands of the Nakhon Sawan and Uthai Thani provinces; where it grows along the edge of swamps and roads. The specimens in the collection of the Botanical Center, Royal Forestry Department, come from areas of 250 metres MSL in Nakhon Patchasima province, 400 metres MSL in Phayao province and 800 metres MSL in Mount Phu Kradung in Loei province. Since natural Faek can be found thriving in different environments, it can be said that Faek can endure occasional floods, droughts and low-quality soil."

Faek and Soil and Moisture Conservation. "According to a World Bank report, Faek which was burnt in dry season could thrive on again during the following rainy season. This qualification means that it is likely to be suitable for use as a plant for soil and moisture conservation because there are often fires on upland crops during the dry season. It is under an experimentation as to how quick native Faek in Thailand can thrive on in time in rainy season for effective soil and moisture conservation."

From Richard Grimshaw's trip to Thailand

"During the month of May (May 21 to May 24) I visited Mae Hong Song Province in Northern Thailand. Specifically I visited the Royal Project (near Chiang Mai) and the Thai- Australian Project at Mae Ho (near Mae Sa-reang) and the Thai-German Project at Nam Lang in Pang Ma Pha District. I was impressed by the efforts being made to help the Hill Tribes and by the indigenous farming practices by these Hill farmers. Clearly bush fallow/crop rotations are being reduced in duration and soil fertility is declining. Soil loss due to erosion is extremely high - sometimes more than 100 tons/ha per annum."

"Experimental work by the Thai-Australian, and Thai-German projects confirm that vegetative systems of soil and moisture conservation are significantly superior to engineered/structural systems. Not only are they cheaper but also require less maintenance. The two most commonly used conservation hedges were *Leuceana spp*. (a Shrub hedge) and grass strips of various species."

"Vetiver may well prove to be readily adoptable by the local farmers. Presently, they are showing increasing interest in grass strip conservation - even on the steepest slopes (over 50% slope). The main problem with the grasses being used are their spreading habits and limited longevity."

USA

Vetiver hedgerows have been established by the Soil Conservation Service in and near Baton Rouge, Louisiana under the initiative of **Mr. Mike Materne** of the SCS with the aid of **Dr. Kitty Derstine** and **Ms. Cindy Shexnayder**. In one particularly impressive trial, the SCS has planted vetiver hedges to test their ability to control gullies and arrest sediment flows in a military tank testing ground at Ft. Polk, La. Planted in May 1990, the hedgerows have established well and begun to trap sediments. During 1991, Louisiana has had record rainfall (it is their wettest year on record) and under these extreme conditions the structural integrity of the vetiver hedges in the active drainageways has not been compromised — more than 50 cm of sediments have built up behind the hedges despite their not being fully closed yet.

Vetiver Barriers Pond Water

Further evidence of the structural strength of vetiver hedgerows has been provided to the Network by **Drs. S. Dabney** and **G. Dunn** at the United States Department of Agriculture's Agricultural Research Service Sedimentation Laboratory in Oxford, Mississippi. In a flume study, water flowing at 28 liters/sec (flume width 61 cm) was ponded to a depth of about 30 cm behind a vetiver hedge; gravity head loss through the hedge was about 23

cm. Photos showed that the vetiver hedge was only slightly deflected by the flow.

More on drought and cold tolerance

Two areas of concern are vetiver's ability to establish under difficult, particularly drought, conditions and its ability to withstand cold. The following letter from **James E. Eagan** of Esparto, California provides the Network with some information of interest :

".....An associate of mine visited Sunshine, Louisiana and made arrangements to ship 3 square feet of Vetiver grass root to me in Woodland, California. We started propagating the Vetiver from tillers in about 200 pots in my small backyard in Woodland. During July of 1989, I was forced to separate and transplant the tillers under very hot and adverse conditions. Water was a serious problem due to Californias drought conditions. As a result irrigations were sparse and the tillers were severely stressed. Quite frankly, I expected a near zero survival rate. I was surprised that I lost less than 10% of the materials. However, due to the stress the plants were very slow to develop and averaged about one foot of height during the next six months.

In December of 1990 the hardest freeze in at least 50 years struck our area. Night time temperatures stayed between 10 and 20 Fahrenheit (-12C to -7C) for approximately 17 to 20 days. At the end of this time all of the plants were brown and wilted right to ground level. There was only a hint of green remaining on a few of the plants. I again expected nearly a 100% loss. Amazingly enough all but a few plants showed signs of new growth in about 6 or 7 weeks. The actual rate of loss was 2% or less."

"One fact that I should have mentioned earlier is that the original root stock that was obtained from Louisiana was air freighted to me in California in burlap sacks. The roots were kept moist in a wheel barrow for 2 weeks and covered with newspapers until my associate and I had time to separate and plant the tillers. (Other plants which are now growing very well) were literally started from scraps that I had discarded as meaningless during the initial planting. Obviously, I am impressed with the durability of Vetiver grass."

Editors Note : *We have seen repeatedly that vetiver grass is capable of surviving under some fairly rough conditions and handling;that is one of the reasons why it is well adapted for use as a soil conservation species. It is not, however, a very good idea to take the approach that vetiver does not need any care in order to establish and grow. All plants benefit from careful handling and good planting practices. Better mangement means greater survival, faster establishment, better growth, and overall better results. Poor management and careless planting, particularly under dry conditions, can result in failure with vetiver as it can with any plant.*

Zimbabwe

Protecting Valuable Irrigation Works

The following excerpts are from a letter written by **Mr. Alan Norton**, Project Manager of the Rupike Irrigation Scheme.

"I am currently installing the Rupike Irrigation Scheme on behalf of the Rio Tinto Foundation. My interest in Vetiver grass started because of my concern at the large areas of denuded borrow pit (approx. 15 ha) left by the contractors who constructed the dam. The borrow pits are within the immediate dam basin, largely on slopes greater than 5% and on highly erodible granite-derived soils. Already there has been much visible soil wash into the dam from the pits in addition to the considerable amounts from farther up the catchment. The installation of the dam, irrigation facilities and associated infrastructure represents a large investment and we do not want the life of the project shortened unnecessarily by siltation of the dam. We have attempted to plant Vetiver on the contour in the borrow pits in order to check the erosion. Much of the grass is on decomposing granite with thus very little soil for root development. Also the cattle and goats in this area are so desperate for food that they feed on the grass not only when it is young and palatable, but also when it is dry and/or fully grown in its coarse state. However, despite these set backs and a long dry season, the grass is surviving in most places. We have started a vetiver grass nursery in order to bulk up to plant in other places especially on the waterways in the fields."

Notes From A Long Time Vetiver User

The Network received this letter (excerpts from it are given below) from **Mr. Jano Labat**, who has known of vetiver for some years, but, only recently had become aware of its use for soil and water conservation. Since then, through his own efforts, Mr. Labat has written a small pamphlet on vetiver grass to pass out to his fellow farmers and within which he has offered to help them with more information or planting material. The Network would like to recognize Mr. Labat's initiative and commend him for his activist approach toward providing solutions to problems — in this case, the use of vetiver to control soil loss.

"I must say that, although 1 have been associated with Vetiver for quite a number of years, I was not aware of its many uses until February (1990, when I saw) your booklet and newsletters and (Tony Tantum from Howick, Republic of South Africa) told me of his programme. Needless to say I am an addict of Vetiver since. Recently I have been see Tony and see first hand all his work. I was most impressed."

"I have already established a nursery of 3.2 ha. on my farm. The grass was planted on 15 March 1991 under flood irrigation. You might be interested to know that to control weeds I have sprayed the Vetiver with herbicide three days after planting, at a concentration of 3 litres/ha. The herbicide used was ATRAZINE 500 FW (47% atrazine, 3% active triazines, 50% inerts). There were no ill effects to the Vetiver."

The findings, interpretations and conclusions expressed here are entirely those of the authors and should not be attributed in any manner to the World Bank.