VETIVERIM

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Editorial

The Private Sector and Vetiver Development

At present the private sectors in many countries such as China, Malaysia, and the Philippines are extensively involved in the development of vetiver, particularly in the marketing and development of vetiver and its products. In other countries, however, the private sector does not seem to play any role in the development of vetiver in spite of the fact that there are already various factors that facilitate cultivation of vetiver; for example, availability of experts capable of disseminating the knowledge obtained from their studies and research, and the readiness of the governmental agencies in allowing the private sector to become producers of vetiver slips. On the one hand, the government agencies stand ready to buy the slips; on the other hand, the private sector is willing to step in if it is profitable. The following guidelines are suggested:

1. The government should urge the private sector to increase their role in the production and propagation of vetiver slips. In some cases, academics and researchers in the public sector should study ways to reduce cost of vetiver propagation in order to create incentives for the private sector and general public to invest in this business.
2. The government should provide the opportunity for the private sector to be contracted for vetiver planting in various areas, e.g. newly-cut roads, newly-reforested areas, reservoirs, etc.
3. The government should issue and enforce rules and regulations for businesses such as resorts and golf courses to grow vetiver in areas as deemed needed and appropriate.
4. The government should support researches on vetiver and push the private sector to extend the results and build the awareness of the importance of the utilization of vetiver.
5. Development of vetiver products allows farmers to see the advantages of cultivation of vetiver. Therefore, the objectives of use of vetiver for conservation, and utilization of vetiver by-products for commercial purposes should be clearly identified. For instance, above-ground parts of vetiver grown for conservation purpose can be harvested at regular intervals of 3-4 months to be utilized in handicraft making; or vetiver can be planted in large black plastic bags to obtain its root mass for vetiver oil extraction without having to destroy the root system of those plants grown for conservation purpose.

His Majesty the King's Recent Address on Vetiver

On 21 February 2003 at Sala Rueng Hall, Klai Kangvol Palace, His Majesty the King granted an audience to the delegations of the Royal Project Foundation's Research and Development Committee on Vetiver Technology other personnel related to the vetiver project. These delegations included the Research and Development Committee on Vetiver Technology (representatives from the Botanical Garden Organization; Kasetsart University; Chiang Mai University, etc.), a group of research work supporters (Mr. Adisai Bodharamik, Minister of Commerce; officials from the Office of the Royal Development Projects Board; Department of Land Development, Department of Agriculture, etc.), as well as those concerned with patent registration (representatives from the Department of Intellectual Property). The purpose of the audience was to present nine patents registered in the year 2002 for the work on vetiver and to humbly ask for His Majesty's royal consideration concerning the implementation of vetiver technology in 2002.

On this occasion, His Majesty graciously granted royal consideration and initiatives concerning the research and development on vetiver technology which can be summarized as follows:

- Accelerate the cultivation of vetiver for water and soil conservation.
- Stress on the use of vetiver for improving soil quality, restoring soil fertility and solving the problem of soil deterioration. Besides, propagation activity should be undertaken so that there will be enough vetiver tillers. Importantly, the role of vetiver in preserving the soil surface should not be overlooked.
- Increase all government agencies' potentials in the propagation of vetiver tillers and to encourage their cooperation with the Department of Land Development in producing quality vetiver tillers sufficient for meeting the needs of the target groups. Moreover, vetiver propagation using tissue culture technique should always start from the parent tiller because continuation of the propagation will weaken the tillers.
- The government should provide budgetary support to promote propagation of vetiver tillers to ensure an adequate quantity.
- Different agencies should join force in the preservation of vetiver species and ecotypes, and in the development of vetiver ecotypes, both beneficial and detrimental, which existed in all regions of Thailand.
- Study the uses of vetiver under various conditions e.g. in high and low areas, in deteriorated soil, in hardpan soil, in acidic soil in swampy areas, at the restored areas where shrimp farming was once conducted, in the coastal aquatic animals raising areas, and in mangrove forest areas.
- Demonstrate the use of vetiver hedgerows in protecting against forest fires, both in ordinary forests and cogon forests.
- Promote the use of vetiver hedgerows in preventing nitrate from contaminating the water, both in natural water sources and underground. A study on the reusing of nitrate should also be carried out.
- The research and development of vetiver technology to make vetiver a comprehensive income-generating crop under the responsibility of the Royal Projects Foundation should be continued since it is beneficial.
- Vetiver should be planted either before the arrival of the rainy season, or at the early period so that it can fully grow during the rainy season. In addition, to enable vetiver to efficiently preserve the soil surface forever, its leaves should be cut at an appropriate height from the soil surface.
- Build precise and clear-cut understanding with farmers concerning how vetiver helps fertilize the soil, for example, the abundance of surface soil originated by black soil accumulated in front of the vetiver hedgerows. In addition, there should be enough vetiver tillers for distribution. Propagation can be done by simply spliting tillers from the existing hedgerows and allow them to

grow all over the area. Finally, the quality of vetiver should be controlled by growing gradually with good care and maintenance.

At the end of the audience, His Majesty the King gave blessings to all the people as follows: *"Work with a will and determination. Do not give up. The work will then succeed, creating benefits for the whole nation. I wish you all happiness, good physical health, mighty spirits, and success in work. Also, live as an important force for the nation forever."*

A Vetiver Photo Gallery Production

For a large agricultural country, soil erosion has proved to be a key factor influencing farming production for centuries. To coordinate thousands of scientists and extensionists to help protect soil erosion and to provide more farming products for the farmers, the China Agroforestry Network was established in 1993; it has been supported by the International Center for Research in Agroforestry (ICRAF).

However, when we extended agroforestry technology we found that farmers could hardly accept alley cropping, one of the most important agroforestry systems, as trees or bushes covered too much valuable farmland.

With funding support from The Vetiver Network (TVN), the China Vetiver Network (CVN) has been established in 1996, in cooperation with the China Agroforestry Network. The initial and primary objective of CVN was to disseminate vetiver technology for natural resources conservation and sustainable development in China, particularly in southern China. CVN's second objective was to help user groups in different sectors and provinces to initiate vetiver grass-based programs. Since then, there has been a great development of vetiver system in China, and CVN collected enormous amount of photographss and related information. To reflect the development, to distribute successful experiences to other potential vetiver users, and to disseminate its experiences to the world, CVN proposes to produce the vetiver photo gallery with brief descriptions. This will encourage the scientists and engineers in other countries to use and extend China's experience more vividly and rapidly.

Contents: The vetiver photo gallery is entitled, "Vetiver Grass and Its Uses in China" and includes over 100 color photographs selected from several thousands of photographs. The contents of this photo gallery are given below:

Preface
Forward
Vetiver system and its history and development
Characteristics and behavior of vetiver grass
Vetiver system for agriculture
Vetiver system for embankment protection
Highway embankment
Railway embankment
River and waterway embankment
Pond, lake and reservoir embankment
Vetiver system for mine tailing re-vegetation
Vetiver system for environmental protection
China Vetiver Network and its function in technology development and dissemination

Language: The vetiver photo gallery will be produced in both English and China languages. The two languages will appear together at the same page to generally describe the topic and to explain the photographs. Foreign agroforestry expert Dr Charles (Todd) P. Chirko of the Michigan State University will be invited to prepare the English edition.

Printing: The vetiver photo gallery will be printed on high quality paper; a total of 5,000 copies will be printed.

Distribution: The photo gallery will be produced by September 2003 and will be distributed to:

ICV-3 participants

Chinese potential users (4,000 copies)

Foreign scientists and engineers, upon request.

Editorial Note: The Editor welcomes this most useful undertakings and would like to express his gratitude to Prof. Liyu Xu, the Coordinator of the China Vetiver Network, who has diligently and patiently prepared this vetiver photo gallery. It would be an additional welcome to all vetiverites, not only in China, but in other countries around the world. He would like to extend his invitation to all potential donors to support the production by contributing financial support to produce this photo gallery. ***– Ed.***

The Vetiver Awards

Vetiverim has already published the news about the two sets of vetiver awards to be presented to the outstanding works on various aspects of vetiver R&D in the previous issues. As the deadlines for nominations of both awards are approaching, the Editor would like to remind all potential candidates to submit their nominations before such dates. Brief accounts of the two sets of awards are given below:

1. The Vetiver Network Awards

Categories and Prize Money:

1. *Water Applications*
   - *1.1 Watershed protection/Improvement*
   - *1.2 Engineering – Natural and Constructed*
   - *1.3 Quality – Pollution Control and Treatment*
2. *Engineering/Infrastructure Protection*
3. *Land Reclamation*
4. *Dissemination*
5. *Country Vetiver Award*
6. *Farmer/User Awards – Regional*
   - *6.1 Asia*
   - *6.2 Africa*
   - *6.3 Latin America*
   - *6.4 Others*
7. *Vetiver 'Champion.*

Awards will range between US$ 3,000 and US$ 500 for the first through the third places. All awardees will also receive a special commemorative certificate.

Procedure for Submission: All vetiver users, be they individuals or groups, who have shown initiative in research , or utilization or promotion of the vetiver system. These may include farmers, technicians, NGOs, students, scientists, researchers, private companies, innovators, etc. who have produced documented concrete, repeatable results. Please send nominations by 30 June 2003 to:

The Vetiver Network
2500 Chase Avenue
Bethesda, Maryland 20814, USA
Email: vetiver@vetiver.org
Homepage: www.vetiver.org

Please include a self-addressed card that will be returned to you to acknowledge the receipt of nomination.

Presentation of Awards: The presentation of the TVN Award will be made during the Opening Ceremony of ICV-3 in Guangzhou, Guangdong, China on 6 October 2003. The winners will receive the awards from Her Royal Highness Princess Maha Chakri Sirindhorn, the Patron of the Vetiver Network.

Travel Grants: Although TVN does not provide any travel grant to the winners of the TVN Awards, it is expected that the Organizer of ICV-3 would provide some assistance to them, specially if they come from developing countries. Please contact the ICV-3 Organizer at: office@ICV-3.com.

2. The King of Thailand Vetiver Awards

Categories and Prize Money:

1. Research Awards:

1.1 Agricultural Application	US$ 2,500
1.2 Non-Agricultural Application	US$ 2,500

2. Dissemination Awards:

2.1 Governmental Agencies	US$ 2,500
2.2 Non-Governmantal Agencies	US$ 2,500
Total	US$10,000

Procedure for Submission: Any vetiverites (whether or not they intend to attend ICV-3) regardless of nationalities may submit their nominations by 30 June 2003 to:

The Office of the Royal Development Projects Board
78 Rajdamnern Nok Ave.
Dusit, Bangkok 10300, Thailand
Fax: (66-2) 280-6206, 629-8915, Email: <vetiver@mail.rdpb.go.th>

Please fill-in the application form (in Vetiverim 22 – October 2002, or available upon request) along with abstract and full paper, both of which should conform to the format of the papers to be presented at ICV-3. In addition, a 150-word 'Statement of Merit' describing the contribution of the nominee's paper should also be provided. Please include a self-addressed card that can be returned to the nominees to acknowledge receipt of nominations. The announcement of the winners will be made in August 2003.

Presentation of Awards: The presentation of the Award will be made during the Opening Ceremony of ICV-3 in Guangzhou, Guangdong, China on 6 October 2003. The winners will receive the awards from Her Royal Highness Princess Maha Chakri Sirindhorn, the Patron of the Vetiver Network, on His Majestry's behalf.

Travel Grants: All four awardees will be granted with expenses to travel and subsist at the conference, including airfare, accommodation, and registration fee.

Vetiver for Mine Tailing Re-vegetation of Mofu Mountain, Nanjing, China*

Along the Yangtze River, Mofu Mountain is situated in northern part of Nanjing City of China, with the highest peak of 199.3 m above sea level after mining for decades of years. The mountain protects Nanjing City from northern sandstorm cold snap attack. Since the 1950s there were over ten companies involving in dolomite mining, that caused 2 million m^2 waste mountain area that is very difficult for re-vegetation. Following economic development, Mofu Mountain became part of Nanjing City and affected the city's scenery. Since 1998, the Nanjing Horticultural Bureau has started to plant some trees to re-vegetate the mountain. However, due to the poor ecological environment it was not very successful. Large area still remains barren.

In 2002, the City Mayor heard of vetiver grass, and suggested the Horticultural Bureau to contact the China Vetiver Network to use the grass to quickly re-vegetate the Mountain. This paper described the basic properties of different mine tailings and the function of vetiver to re-vegetate the Mountain.

Materials and Method

Soils: The soils came from the mine tailings. It includes coarse materials from carbonized shale, dolomite slag, Xiashu Loess, and earthy material from a lake.

Field Tests: Vetiver slips were planted along the contour, spacing at 150 x 10 cm, on 26-29 June 2002. Each slip contained 3-5 tillers. Before planting all slips were dipped in clay paste. Watering was provided after planting. Altogether 4,000 m^2 of slope area were planted. On 14 July, urea was applied at the rate of 200 kg/ha. The vetiver grass was pruned at a height of 40 cm above ground.

The effect of different mine tailing materials on vetiver growth: Three plots (each with 200 m^2) were designed for each of the materials: carbonized shale, dolomite slag, Xiashu Loess, and earthy material from a lake. Three tillers were used at random at each of plot to determine vetiver growth every 16 days.

Effect of vetiver on micro-ecological environment: Small plots (1 x 1 m2) were used at random to determine the effect of vetiver grass on vegetation recovery after vetiver planting.

Results and Analysis

Chemical and Physical Properties of Different Materials: The mechanical analysis is shown in Table 1. Of several mine tailing material, carbonized shale material contained the highest fragment over 2 mm in diameter for 49% and also the coarse sand over 70%. But it contained a little of fine sand and silt sand and the least clay for only 3.0-3.8%. It means that the material can retain very little moisture for plant use. On the contrary, the Xiashu loess contained the highest clay for 35%, without any fragments. Therefore, it can retain much moisture. The dolomite slag contained about

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¼ fragments. Besides, it contained much find sand and silt san. The earth from the lake contained the highest content of find sand. Since the carbonized shale had high fragment content and therefore could retain little moisture, about 1 kg Xiashu Loess was added to the planting hole.

Table 2 shows the basic chemical properties. It indicated that the carbonized shale contained the highest content of organic matter, total N, and available P and N. It came from its mineral origin. However, because it contained highest content of fragments, these elements may not be used by plants. Similar situation also exists for dolomite material. Table 2 also shown that different materials had different pH value from 4.13 to 8.85. Some materials had $CaCO_3$ for 328.3g/kg. All of these factors could affect the growth of plants.

Table 1. Mechanical analysis of different materials

Mine tails	Content of different particles (%)					Texture
	>2mm fragment	2-0.2mm coarse sand	0.2-0.02mm fine sand	0.02-0.002mm silt sand	<0.002mm clay	
Carbonized shale	49.1 49.9	73.4 70.5	16.9 20.2	5.9 6.3	3.8 3.0	Sand or loamy sand
Dolomite slag	24.5 22.7	18.0 16.3	35.4 32.3	29.0 35.9	17.6 15.5	Clayey loam
Xiashu loess	0 0	0.5 0.7	32.8 29.5	32.1 34.6	34.6 35.2	Loamy clay

Earth from	3.8	1.5	79.5	10.3	8.7	Sandy
a lake	1.6	1.9	77.3	11.5	9.3	loam

Vetiver Growth on Different Mine Tailing Materials: About 95% of the grasses survive. They started to grow around 15 days after planting. It grew at different speed. The grass grew fast on the lake earth. It reached 35 cm in 15 days (Fig.1). The daily growth reached 2.3 cm/per day. The grass on the other materials grew almost the same. Therefore in figure 1 there was one line to represent all the other materials and described as 'mine tailing'. Staring from 15 July vetiver grew slowly caused by hot weather and high evaporation (Fig. 2). The growth depended on temperature and soil moisture. When without irrigation facilities the growth depended on rainfall and soil properties including soil structure. Since the lake earth had large amount of fine sands 77.3-79.5% (Table 1), better soil structure that contained much moisture and possibly much available nutrients the grass grew better. Table 3 indicates that the lake earth contained 9.3 and 10.4% water for the soil of 0-20 and 20-40 cm, respectively. The carbonized shale material contained less water because it contained

Table 2. Chemical properties of different mine tail materials

Mine tails	Organic matter gkg^{-1}	Total N gkg^{-1}	Available K $(mgkg^{-1})$	Available P $(mgkg^{-1})$	Available N $(mgkg^{-1})$	pH (water) (1:2.5)	$CaCO_3$ (gkg^{-1})	CEC $(C_{mol}(+)kg^{-1})$
Carbonized	57.0	1.43	22.8	121.3	148.3	4.13	0	8.04
shale	62.1	1.50	38.4	104.8	153.2	5.30	0	8.65
Dolomite	22.7	0.92	97.5	8.7	32.4	7.90	314.9	4.98
slag	13.9	0.64	77.8	5.2	29.3	7.84	328.3	4.95
Xiashu	5.7	0.47	89.2	16.3	36.1	7.42	6.4	11.82
loess	5.2	0.44	78.8	19.1	26.2	7.09	3.9	11.72
Earth from	6.4	0.28	60.2	13.2	22.5	8.45	54.4	3.46
a lake	6.1	0.31	54.9	14.6	23.7	8.85	56.9	3.30

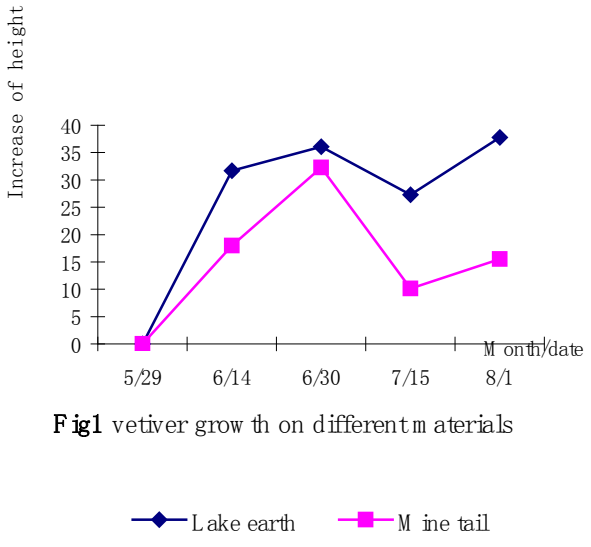

Fig1 vetiver growth on different materials

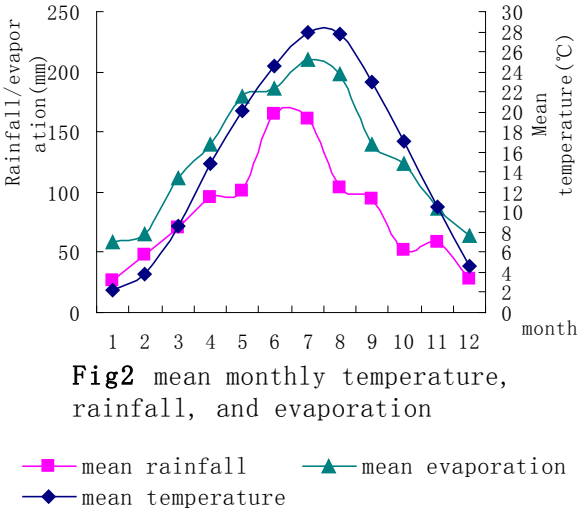

Fig2 mean monthly temperature, rainfall, and evaporation

Table 3. Soil moisture content in summer*

Mine tails	Depth (cm)	Wet weight (g)	Water content (g)	Water content (%)
Earth from lake	0-20	25.59	2.38	9.3
	20-40	57.58	5.99	10.4
Carbonized shale	0-20	36.84	2.26	6.1
(no vetiver wilt)	20-40	33.04	2.48	7.5
Carbonized shale	0-20	49.40	1.98	4.0
(no vetiver wilt)	20-40	42.70	3.02	7.1
Carbonized shale	0-20	71.78	1.5	2.1
(some vetiver wilt)	20-40	59.41	3.86	6.5

*Samples collected on 5 August 2002

too much of fragments. Even for same material, carbonized shale, the moisture differed possibly caused by different location on the slopes. Some material contained only 2.1% water where vetiver appeared wilt under high temperature. Field investigation showed that the growth of vetiver differed with landform. It grew better on the foot and middle of the mountain because soil there was thicker than the upper part (Fig. 3). But general speaking vetiver grew much better than other plants. During 11-17 July when air temperature reached 39^{O}C (the highest temperature in the recent 10 years), only part of the vetiver shoots appeared yellow and wilt, while the whole plant of some *Jasminum mesnyi* and *Photinia vagina* appeared yellow and even withered away.

Effect of vetiver on micro-ecology: Many study showed that vetiver hedge can improve micro-ecology and therefore can promote other plants to grow up (Xu 2002b). It was proved by present study. On the carbonized shale slope four 2x2 plots were taken at random at both with and without vetiver hedges to measure vegetation coverage. It showed that with vetiver hedges the vegetation coverage reached 92%, while the ground without vetiver hedges was only 45%. In addition, the former contained multiple plant species, while the latter consisted of only wormwood. It is because vetiver hedges stopped fine earth and runoff and therefore improved soil moisture and other properties that were beneficial to other plants.

Conclusion

Although it was very difficult for plant to grow on the dolomite mine tails that had different mechanical and chemical properties, vetiver grew quite well on the different materials. There was little different on vetiver growth on different mine tail materials except for lake earth that was transported there from a lake. Just like on highway and railway embankment vetiver hedges formed in three months. It was proved again that vetiver is an excellent pioneer plant for waste mountain re-vegetation.

Vetiver had wide tolerance and could improve ecological environment in short time in order that other plants can grew up the ground surface can be re-vegetated.

Vetiver had high adaptability and can grow well on different materials. It is un-necessary to add soil to mine tails when planting. Although it grew better on lake earth, it grew even better than other plants on mine tail. Vetiver had well developed roots in just two months after planting and can fix soil solum from moving.

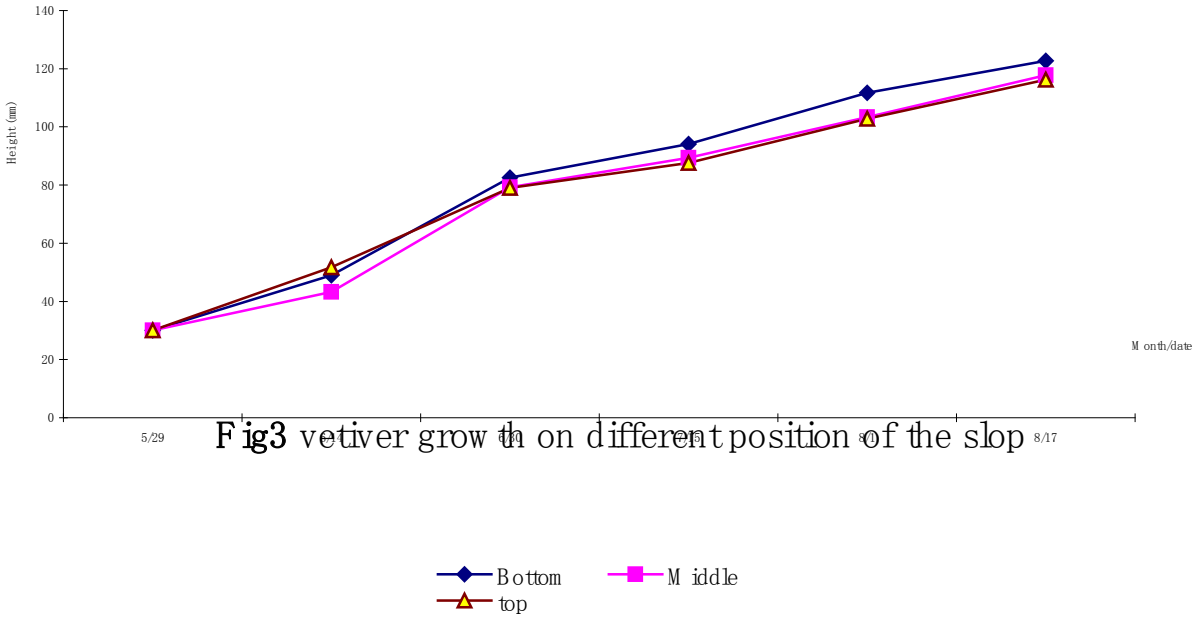

Fig3 vetiver growth on different position of the slop

Although vetiver is a heliophile it could grew well under young popular trees

Based on this study and many other studies, vetiver can be planted in March, April, May, June, and September. The best time is March and April because within this period there is rainfall, weak sun shine, and low evaporation. Once the grass survived it can enter a fast growing period under higher temperature. I would grow slowly when the temperature near 40^{o}C in July and possibly August. It can be planted without watering and can reach highest survival rate.

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Introduction of Vetiver System to Protect Irrigated, Flood Prone Areas in Central Coastal Vietnam*

Objectives

The long-term objective is to introduce Vetiver Systems (VS) for flood-related hazard mitigation e.g. on riversides, dikes, dams, and dunes.

Short-term objectives, for this one-year project, include demonstration of VS in 2 sites and through these demo's: convincing key-persons in central Vietnam on opportunities of VS.

* Financed by the Small Embassy Program of the Netherlands Embassy, Coordination:

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trantv@hn.vnn.vn
in collaboration with Elise Pinners (advisor) fadofos-organisation@hn.vnn.vn

Background information of this project is shown in Appendix.

Partners

Introduction of VS requires collaboration with and between local partners with very different backgrounds/disciplines. In Quang Binh, there was collaboration with DARD, provincial Departments of Dike Management and Flood Control (DDMFC), the agro-forestry project (IFAD/MOSTE), Le Thuy district forest enterprise, and local farmers affected by the dune sand problem and hired for implementation of works. In Da Nang there was collaboration with the provincial Department of Dike Management and Flood Control (DDMFC), and local farmers (shrimp pond farmer) and farmer representatives (local road).

Expertise

Expertise was provided first of all by the implementers themselves (Dr. Tran Tan Van and Elise Pinners), but also by the coordinator of the Vetiver network in Vietnam, Dr. Phuoc from HCMC University (especially training on multiplication methods, phdphuoc@hcm.vnn.vn) and Dr. Paul Truong from the University in Brisbane, Australia (especially on design, truong@uqconnect.net).

The sites

The sites differ to some extent to the sites mentioned in the original proposal.
Quang Binh province, Le Thuy district, Hong Thuy and Thanh Thuy villages:
Dune stabilization*:* foots of sand dunes that are undermined by local streams when there are heavy rains. The bulk of the sand thus transported is deposited in irrigated areas downstream (on the other side of the national highway), which is disastrous for that farming system, of major concern to the farmers. The IFAD/MOSTE project tries to stabilize dunes with Casuarinas and an NGO helped construct sand-dikes (with heavy equipment) to avoid sand deposition on farms. However, the effectiveness of Casuarinas is limited, and from time to time the highly instable and barely vegetated sand-dikes surrender to sand-floods. Besides, the drains crossing the national highway quickly fill up with sand.

For practical reasons the sandy dikes downstream have not been dealt with.
Da Nang province: The proposal to stabilize a dam in Hoa Vang commune has not been dealt with because it requires involvement of local authorities concerned with this dam (these authorities appeared to have plans themselves to rehabilitate the dam).

Instead there were three other sites:

Shrimp pond farm along Vinh Dien river (Mr. Hien)

Road on a landfill along riverbank of Co Co river (Ngu Hanh Son Tourist Area, near Non Nuoc Pagoda), and island in that river

Above a riverbank revetment.

Main activities

The main activities that were carried out are:

☐ Meeting in HCMC (Jan. '02) with Vetiver expert Dr. Paul Truong (discuss demonstration lay-out) and Dr. Phuoc (discuss collaboration, Vetiver network Viet Nam)

Site selection, preparations for action planning and implementation

☐ In one field trip (March '02), for site 1 (first dune), and 2 a & b, and for the nurseries we did:

☐ participatory site assessment action planning VS presentation, vetiver multiplication training establishment of the demo's. Several monitoring visits (almost monthly, see attached reports) Field visit (Feb. '02) by several

partners, to discuss: the demos, technical aspects, other opportunities for VS application in central Vietnam, how future initiatives can be organized, supported, funded.

Besides, there was some networking and info sharing done with others active in the Vetiver network in Vietnam, and also with potential partners. Thus we met the director of the Dike Department (Mr. Dang Quang Tinh), and people from NDM-P (Dr. Kuberan, Dr. Marshall Silver), and we also kept informed the National Institute of Soils and Fertilizer (Ms. Tran Thi Tam, Mr. Vu Thang).

Results

6.1 The demonstrations

In short, there are the following demos:

Site	Description	Remarks
Quang Binh, Le Thuy district	- 3 rows 11 months old on foot of dune slope	Looks very promising!
	- 3-4 rows 4 months old on foot of othr two dune slopes, totalling 1.5 km	The site that we visited looks very good even though the rows are not watered, now to see whether it will survive next dry season without watering. However, vertical rows absent.
Da Nang, Hoa Quy ward	- shrimp pond bank 11 months old, + adjacent gully	Looks good, but anticipation of poor soils necessary to avoid gaps/irregular growth.
Da Nang, Hoa Quy ward	- shrimp pond bank 3 months old + above riverbank revetment	Serious cattle damage on the pond bank, but well protected along riverbank revetment.
Da Nang, Hoa Xuan ward	- above riverbank revetment, 3 month old	Nicely protected slope.
Da Nang, Qua Giang river, Co Man ward	- above riverbank revetment, 01 month old	Nicely protected slope.
Da Nang, near Non Nuoc Pagoda	along river, road built from dredged soil, 11 months old along the island	

Further, there are larger nurseries established both in Le Thuy district (Quang Binh) and in Da Nang.

The field visit

The program was tightly scheduled, but generally worked out well. Many more participants than planned for. The participants were very varied: institutes (HWRU. RIGMR), NGOs, local authorities, companies.

In the discussions about the different sites most technical questions (e.g. on planting time, planting distance, design, watering, manure, resistance to particular soil conditions, flooding, potential problem as a weed in farms, etc.) were addressed referring to the coming VS presentation, and the reports that were distributed to the participants both in English and Vietnamese.

Sand dune stabilization

It was observed that in both sites the growth was good, and regular, and that other vegetation established well between the rows.
Questions of particular interest were:
Planting time: more research is needed on the right planting time. Planting in March (just before the hot dry period) is well possible but then watering is needed, which increases costs and risk. These plantings have survived well the summer storms in August through November. Planting in October is also well possible, the plants survived the winter without any watering, but the critical question is: will they be able to survive the hot dry season equally without watering? The expectation is they will, but observations need to continue on this. If they do survive, then planting in October is much more practical (also cheaper).
Design: planting more rows, above the three already established, is only possible once the plants are big enough to withstand sandflow caused by planting above; however, it seemed hardly necessary to continue planting more rows above, because the major cause for the dune to collapse is the waterflow eroding the foot of the dune; this erosion has now been reduced considerably, according to farmers there is much less sandflow in downstream the site, and thus their problem of sand invading the farm is much reduced.
Design: some vertical rows could have been added in the 2nd site (can still be done in March).Most participants found the demonstrations very interesting, and several intended to try themselves; particularly authorities (DARD/DOSTE) from Quang Binh, Quang Tri, Thua Thien-Hue, Quang Nam and Quang Ngai expressed their intentions to set up more demonstrations in dunes. In Quang Binh there are plans to control dune sand erosion in 22.000 ha south of Dong Hoi, to protect about 10 local roads that often fill up with sand.

Shrimp pond bank and above riverbank revetment

It was observed that bank growth was irregular due to
variable soil. However, growth of other grass in-between the rows was very good.

Questions of particular interest were:

Soil: shrimp pond banks (or other man-made banks) can be of very variable quality, as we observe in this demo; the extreme soil condition (pH 3) has to be anticipated, by using lime and NPK and/or organic fertilizer, to ensure more regular growth.

Planting time: if planting is done at the end of a rainy season, will the plants survive dry season without watering? Or if planted at the first rains, will they survive the strong current caused by heavy rains and floods?

Protection against cattle damage.

Physical properties: can VS alone (i.e. without other, structural measures) do well on steep banks? Will it withstand high velocity? Will it deal with the slip circle on very high banks as in Q. Ngai? Many participants point out that it is time to try out VS on a real riverbank, planting down to water level, with vertical rows to slow water velocity. But should it be done by comparing with (instead of combining, i.e. above) structural riverbank revetment, as is proposed by Brown & Root in Quang

Ngai, or should VS be tried in places where authorities have no intentions (and means) to carry out any structural measure? This leads to the question: what local authority can be in charge of this? The adjacent gully plugging looked also good (to reduce damage from flow of field water to the river). Most participants found the demonstrations very interesting, and several intended to try VS themselves for:

Ha Tinh: - roadside stabilization
Quang Binh: - dune sand fixation on dune slopes and along sanded roads
☐ on-farm slope erosion control
Thua Thien-Hue: - Ho Chi Minh highway and river bank protection
Da Nang: - roadside stabilization
Quang Ngai: - on estuary dykes (Brown & Root)
☐ on-farm erosion control combining Vetiver with Guinea grass (for fodder)
Quang Tri: - sand dune fixation.

Discussion of future opportunities to apply VS, and how to organize it.

There were practical questions, like:

☐ where to obtain vetiver planting material,

☐ for what price the need to have a complete handbook on all applications (in Vietnamese), - with technical, design instructions

where to obtain funding for establishment of VS demo's (& technical support) and research.
For these questions the suggestions all went in the direction of: knowledge networking between all those concerned, voluntary exchange of technical expertise, materials, sources of funding, planting materials.
And there was the question on how to organize future activities. The project has finished, local partners are encouraged to take initiative and try things, but at this stage there remains a need for:
technical support from outside (especially help with design, some training and follow-up)
active exchange of experience between the provinces.
For example, if riverbanks need protection, whose problem is it? If DDMFC has to concentrate on priority sites, using large budgets for structural measures, and not always having the interest or capacity to develop alternative methods for sites of less priority, who will take on this task?
Department of Agricultural Research and Development (DARD). The extension center/stations
Quang Binh authorities propose a workshop with experts (incl. VS experts but also others), local authorities, donors and farmers.
The draft project proposal (only English version) was distributed to a few participants.

Acknowledgments
The project Coordinator and advisors wish to thank the Netherlands Embassy for the grant of $US15 000 through the Small Embassy Program to conduct this project. We also appreciate all the support given to us by local and regional officials; in particular the cooperation and interests of local farmers.

Appendix : (Extract only, for full report please check on www.vetiver.org)

Coastal Sand Dune Stabilization in Central Vietnam*

Introduction
The 'Geological Hazard Assessment for Coastal Provinces of Central Viet Nam' study conducted by the Research Institute of Geology and Mineral Resources (RIGMR), has identified flood damage to coastal zone and farmland is one of the major hazards of the region and recommended

the use of Vetiver Systems (VS) for the reduction of flood damage, particularly the stabilisation of dikes, riverbanks and coastal dunes.
Dr. Tran Tan Van from RIGM is a key person in the Vetiver Network in Vietnam asked Ir. Elise Pinners, an Agronomist who has extensive field experience in using vetiver for riverbank and roadside stabilisation in Cameroon, West Africa, to assist in providing technical advice and seeking funds to initiate this project.
Through her relentless effort Elise Pinners succeeded in obtaining $US15 000 from the Dutch Embassy SEP (Small Embassy Projects) funds allocated for the poverty reduction program. This project started in 2002 and now is in its second phase of large-scale implementation.

The Problem

Farmers in Central Coastal Vietnam are regularly confronted with flood or storm related damage, and have to spend much of their time and money to restore badly damaged structures. The measures they used are not effective enough (e.g. stabilisation of dykes by local grass, which are easily uprooted by flood, or small waves) or of short term measures such as blocking sand dune flow by sand dikes, which themselves are poorly stabilised due to lack of vegetation cover.
In this project area, local farmers have to spend much time and resources to maintain and repair the dikes and dams in their irrigated land. In Quang Binh Province, those farmers who had their land invaded by sand dunes are now facing starvation, and have nowhere to go. In Da Nang during the last flood, farmers feared drowning if the dams breached.

Current efforts

Technical support, when available, has its own problems. Local civil engineers are used to more expensive hard solutions such as rocks and cement (even these solutions are not always effective or durable), they are not used to 'green' and soft methods, and the requirements that go along with these methods: timely planting, involvement of local population at planning, implementation and maintenance stages.
Agro-forestry projects focus on tree planting but it is expensive to implement and slow in growth. Trees are effective for wind erosion control but they give little protection against neither water erosion nor trapping sand eroded by heavy rainfall.

Current project

This project has three sites: Dune and related dike stabilization in Quang Binh province. Riverbank stabilisation *cum* roadside near Da Nang city. Stabilisation of banks of shrimp ponds and nearby gully along the bank, near Da Nang city.

Letters to the Editor

Vetiver and Banana Growing

This is not great stuff, but it is meant to improve the visibility of vetiver usage in Senegal on the site. This is from a major banana growing area where the bridge every year was washed away, preventing several 1,000 tons of bananas from reaching the markets. This year, with the planting of several 100 vetiver plants, the bridge showed no signs of giving in, and trucks flowed through with ease. Banana growers have been installing vetiver hedges to reduce erosion, retain humidity in the soil, and use it for mulch. Yield increase is flagrant and comes earlier than plantations that do not use vetiver. Much of the information transfer was done using pictures from the (Thailand) Office of the Royal Development Projects Board, "Vetiver and the Environment". The Gouloumbou banana picture shows the banana bunch already hanging, while trees in another section next to this one had not yet flowered.

Criss Juliard, DynaEnterprise, Senegal
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Thanks for sharing us the information and photos on using vetiver to stabilize the bridge as well as reducing erosion, retaining humidity in the soil, and using it as mulch.- Ed.

East Bali Poverty Project

I am pleased to report that we have finally updated our Homepage:
www.eastbalipovertyproject.org.

The update reflects progress of ALL projects up to early March 2003. I would like to draw your attention to the two most encouraging developments over the last six months:

1. Our exciting new organic farming program funded by the British Embassy Small Grants Scheme "Sustainable nutrition, food security and eventual economic development for impoverished children and their families in Bunga, Cegi, Pengalusan and Manikaji hamlets of Desa Ban, Bali"

2. The Water Resources development project aiming to provide safe water for the population of Desa Ban that presently can only get water from remote springs and wells.

In our Homepage, we have included many recent articles on a wide variety of projects, which will help you get a better 'feeling'of our programs and the children's and community's progress.

Thanks to all of you who have supported East Bali Poverty Project over the last four years, helping us to help the disadvantaged children look forward to a healthier and brighter future, and we
hope that you will continue to support us, especially in view of the serious reduction in donations since the tragic bomb blast in Bali on 12 October 2002.

David Booth, Founder & Chairman
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