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Editorial

The King of Thailand Vetiver Awards

The King of Thailand, a vetiver enthusiast, has been the keen supporter of Thailand's vetiver R&D from the very beginning. In June 1992, he gave a generous gift of US$ 10,000 from his private fund to the Vetiver Information Network to be used to promote research on vetiver that leads to the dissemination of useful and practical information of vetiver. One-half of the fund (US$5,000) was used to run the activities of the Vetiver Information Network; the other half was used separately to award an individual contributing the most significant piece of research work. The winner of this award was Dr. P.K. Yoon of the Rubber Research Institute of Malaysia for the tremendous body of analytical rigorous and eminently practical and useful work that he had done.

In 2000, His Majesty has graciously given another grant of US$ 10,000 for the best achievement in vetiver R&D. The awards were split into two prizes, valued at US$ 5,000 each; one for the best vetiver research and the other for the best dissemination of vetiver technology work. All papers submitted for presentation in the Second International Conference on Vetiver (ICV-2) were eligible for competition. There were over 50 papers for each category. At the end, the Selection Committee of the Office of the Royal Development Projects Board could only select the best three papers (instead of just one) in each category to receive the King's Awards. All awardees were provided with financial support to attend and present their award winning papers at ICV-2 held at Cha-am, Phetchaburi, Thailand, 18-22 January 2000.

In association with ICV-3 to be held in Guangzhou, China, 6-9 October 2003, Her Royal Highness Princess Maha Chakri Sirindhorn, Chairperson of His Majesty the King of Thailand's Chaipattana Foundation, has graciously agreed to grant US$10,000 from the Chaipattana Foundation for "The King of Thailand Vetiver Awards" for the most outstanding works on vetiver. This is the third time that such awards are given. As in the second series, the third series will be split into two prizes, valued at US$5,000 each; one prize will be awarded to the outstanding research on vetiver and the other to the outstanding dissemination of vetiver technology. For more details, please see the article, "The King of Thailand

Vetiver Glossary 6: Vetiver Parts Used in Propagation

This is the sixth part of the series on Vetiver Glossary. The first part, on "Vetiver and Its Related Terms", was published in Vetiverim 15; the second part, on "The Vetiver System", in Vetiverim 16; the third part, on "Species and Related Taxa", in Vetiverim 17; the fourth part, on "Use and Utilization of Vetiver" in Vetiverim 18; and the fifth part, on "Vetiver Propagation" in Vetiver 19. The format used includes the definitions from: (i) Webster's New World Dictionary, Third College Edition, (ii) <www. dictionary.com>; and (iii) the Editor's, known as Vetiverim's. Their explanations are also provided.

In the case of vetiver, 'propagation' is defined as "any means of reproduction, either for increasing the number of individuals or for subsequent planting out in the field". As vetiver in cultivation rarely produces seeds, thus only asexual reproduction is employed extensively in its propagation. In the vetiver literature, several terms have been used, sometimes indiscriminately, to designate the parts of the vetiver plant that can be used in propagation. Their definitions and explanations are given below:

Tiller:

Webster's: *n.* a shoot growing from the base of the stem of a plant

www.dictionary.com's: *n.* a shoot, especially one that sprouts from the base of a grass

Vetiverim's: *n.* a shoot sprouting from the base of the stem of a grass

Explanation: 'Tiller' is the term commonly used in cereals such as rice, wheat, maize, etc. to describe lateral offshoots borne on the lower part of the stem which is mostly underground. The process in which tillers are produced from the base of the stem is known as 'tillering'. Tillers can be detached from the mother plant and used as planting material. A tiller always includes leafed stem material as well as non-elongated internodes from whose compacted lower nodes (also stem) arise the adventitious roots. Because new tillers may arise from nodes on an existing tiller (i.e. an infinite number of tillers can arise from a single tiller), it is often difficult to determine in the field the morphologic separateness of one single tiller. Because of this, the term seems to mean colloquially a single emergent stem with attached root. Many tillers are commonly used in a single planting operation. In vetiver, two or more tillers still attached to each other are used as planting material in a single planting operation; these are sometimes referred to as a 'slip' (see below). A full-grown tiller of vetiver is called a 'culm' (see below), which can also be used to propagate new plants.

Slip:

Webster's: *n.* a stem, root, twig, etc. cut or broken off a plant and used for planting or grafting; cutting; scion

www.dictionary.com's: *n.* a part of a plant cut or broken off for planting; a grafting, scion or cutting

Vetiverim's: *n.* a shoot cut off from a plant used for planting

Explanation: Many authors used this term synonymously with 'tiller'. Some even erroneously called it a 'root division'. (In vetiver, the structure from which the 'slip' grows is the base of the stem, not the root!) In pineapple, 'slip' is used to mean a structure formed at the base of the fruit stalk as well as the base of the crown, known as 'crown slip'. ('Crown' is used in pineapple to mean the top leafy part of the fruit while in vetiver it is the semi-circular base of the whole root system which is a dome-shaped structure of dead material, debris, and growing tissue, much of it are numerous underground stems joined together.) In sweet potato, 'slips' are adventitious shoots developed when the mother root is placed under warm moist condition. It should be noted that 'slip' is the only term signifying the separation from the mother plant. In the vetiver literature, it is used to mean a group of tillers (two or more) used as planting material in one planting operation. It is preferably used in buying contract to mean a single unit of planting material consisting of two or

NOT be used to avoid further confusion as it does not bear any meaning other than being separated or the result of splitting.

Culm:

Webster's: *n.* a stalk, stem; the jointed stem of various grasses, usually hollow

www.dictionary.com's: *n.* the stem of a grass

Vetiverim's: *n.* the above-ground part of the stem of a grass, usually hollow

Explanation: *n.* the culm of the vetiver grass is strong, hard, and lignified, having prominent nodes with lateral buds that can form roots and shoots upon exposure to moist condition. Culm is normally produced on the upper part of the stem especially after flowering stage. Laying the cut pieces of culm on moist sand, or better under mist spray, results in the rapid formation of roots and shoots at each node.

Cutting:

Webster's: *n.* a slip or shoot cut away from a plant for rooting or grafting

www.dictionary.com's: *n.* a part of stem removed from a plant to propagate new plants, as through rooting

Vetiverim's: *n.* a part of stem with at least one node each used to propagate new plant

Explanation: Although commonly used as propagating material in horticultural crops, 'cutting' is rarely used in vetiver. This term is synonymous with 'cut culm' or 'culm-cutting' referred to by P.K.Yoon [1991: Extracts from Look-See at Vetiver grass in Malaysia – First Progress Report. Vetiver Newsl. 6: 86-96].

Culm-Branch:

Webster's: (none)

www.dictionary.com's: (none)

Vetiverim's: *n.* a branch developed from the lateral bud of the stem of a grass

Explanation: Culm-branch is a term derived from similar structure in bamboo and other ramified grasses. It was Yoon (1991) who used this term in vetiver literature for the first time to mean a branch developed from the lateral bud of vetiver culm of more than three months old whose main culm has been repeatedly cut down to induce tillering.

Clump:

Webster's: *n.* a cluster, as of shrubs or trees

www.dictionary.com's: *n.* a thick grouping, as of trees or bushes

Vetiverim's: *n.* a cluster of tillers developed originally from a mother plant in all directions

Explanation: In vetiver, a clump is formed when a plant has been grown for a certain period of time and produces numerous tillers in all directions. A one-year old clump may have as many as 100 or more tillers, all of which are still attached to each other.

Ratoon:

Webster's: *n.* a shoot growing from the root of a plant (esp. the sugar cane) that has been cut down

www.dictionary.com's: *n.* a shoot sprouting from a plant base as in the banana, pineapple, or sugar cane

Vetiverim's: *n.* a shoot growing from the base of a plant that has been cut down to induce sprouting

Explanation: As vetiver (or even the sugarcane) does not seem to re-sprout from the root when the clump is cut down to the ground, but rather from the base of the stem, thus the re-sprouting structure is actually a 'tiller' which has been induced to sprout by cutting down the top part. This term should NOT be used in vetiver propagation to avoid confusion. Besides, it is the term with a wrong meaning as used in the literature, or even in Webster Dictionary, as it does not develop from the root, but the underground stem! However, it can be stated that tillers are induced to re-sprout after ratooning, i.e. the clump is cut down to the ground.

Tissue Culture Plantlet:

Webster's: (none)

www.dictionary.com's: (none) (plantlet is defined as '*n.* a young or small plant, or a little plant')

Vetiverim's: *n.* differentiated tiny plant developed from the explant through tissue-culture technique

Explanation: Using tissue culture technique, unlimited number of plantlets can be produced in aseptic condition from the explants deriving from the shoot tip, lateral bud, young inflorescence, etc. Upon attaining a good size, these plantlets can be transplanted in the containers or in the fields similar to the tillers, although much smaller in size. Tissue culture plantlets can be produced within a relatively short time at a reasonable expense. They also have certain advantages over other planting materials in that they are small in size, easy to transport, and free from pathogen (as they are grown, and still remain, in aseptic condition) which make them safe for international movement, especially across the countries with strict plant quarantine regulation.

Of all these plant parts, only the first two (tiller and slip) and the last (tissue culture plantlet) are used extensively in most vetiver-growing countries to propagate the vetiver grass, simply because they are the convenient parts to be used in propagation. Besides, the cost of their production is relatively lower than that of the other parts while the success rate is higher. Of the remaining structures, culm and clump are also used in propagation to some extent while the rest are either not used for practical reason, or do not exist.

Reactivation of the Thailand Vetiver Network

Although not officially established, the Thailand Vetiver Network (THVN) has been in operation since the early days of vetiver activities in Thailand. A website has once been created by Suranaree University through a contract from the Office of the Royal Development Projects Board (ORDPB). Updating was occasionally made by the ORDPB. It is present up to this day, with not much updating, however.

During the Second International Conference on Vetiver (ICV-2), a paper on "The Thailand Vetiver Network" has been presented by Thirathon and Pasiri (2002). The paper describes the objectives, members, organization, and activities of THVN. Being absorbed mostly by the activities of the Committee on the Development and Promotion for the Utilization of Vetiver (CODPUV) of ORDPB, activities of THVN have been fading, with the exception of the publication of a Thai-language technical bulletin, a translated version of Diti Hengchaovanich's paper on "Vetiver Grass for Slope Stabilization and Erosion Control" (Hengchaovanich 2000).

Thirathon and Pasiri (2002) described the objectives of THVN as follow:

- Collect information regarding vetiver research and development in Thailand.
- Provide information on the application of vetiver system in Thailand to interested people and organizations, both in Thailand and other countries.
- Coordinate activities with other vetiver networks.
- Disseminate the information on vetiver, especially works conducted in Thailand in the form of electronic database and websites.

Based on the above objectives, the activities on vetiver in Thailand have been carried out through the coordination of CODPUV. In this connection, two activities should be pointed out, namely the publication of a Thai-language newsletter, 'Bhumiwarin', and the website. The publication of 'Bhumiwarin' has met with some difficulties due mainly to the lack of articles and the heavy load of work of the Editor and his Editorial Board. The THVN website, accessible at <http://thvn.rdpb.go.th>, contains the following information in both Thai and English:

- His Majesty the King of Thailand's initiatives.
- Vetiver characteristics.
- Vetiver multiplication and propagation

- ♦
- ♦ Vetiver uses.
- ♦ Vetiver research and extension
- ♦ Vetiver news.
- ♦ About THVN.

THVN has a sound establishment and has served the purpose, though presently its activities have been absorbed by CODPUV such that there seems to be no activities under THVN. This issue has been brought to discussion at a recent meeting of CODPUV. It was agreed that the THVN should resume all activities spelled out in Thirathorn and Pasiri (2002). In particular, the following activities will be emphasized:

- ♦ Continuation of the publication of 'Bhumiwarin'. Effort will be made to publish the Newslettter at a regular interval of three months.
- ♦ THVN website should continue to be updated. The following information should be included:
  - News of CODPUV, e.g. evaluation and monitoring of vetiver works, seminars, publications, awards, etc.
  - Vetiver innovation conducted by various agencies, e.g. low-cost silo, ceramic pot, plant pot, furniture, fiber board, melamine product, stabilizing cassava field, etc.
  - Abstracts of papers of all research works on vetiver conducted by various agencies.
- ♦ Continuation of the publication of the THVN Technical Bulletin in Thai for the benefit of the Thai scientists, engineers, extension workers, etc.

References:

Hengchaovanich, D. 2000. Vetiver Grass for Slope Stabilization and Erosion Control. THVN Tech. Bull. 2543/1, ORDPB, Bangkok (in Thai).

Thirathon, A.; and Pasiri, S. 2002. The Thailand Vetiver Network. Proc. ICV-2, pp.198-199, ORDPB, Bangkok.

Website <http://thvn.rdpb.go.th>

Report from Australia*

1. The Fifth International Acid Sulfate Soils Conference

The Fifth International Acid Sulfate Soils (ASS) Conference was held at Tweed Heads, NSW, Australia between 25-30 August 2002. About 200 delegates from Australia and 12 countries attended the Conference to present research results and to discuss management options for this very difficult soil type which is widely used for food production in Asia and Africa. The Conference focused on management practices used on ASS in sugar cane growing regions in eastern Australia. Paul Truong's experimental site, "The Vetiver System for Water Improvement", was the highlight of the Conference's Field Trip, where delegates were shown how the Vetiver System (VS) was used effectively to reduce acidity, nutrients, and agrochemical levels in runoff and canal water. This project was partly funded by the Wallace Genetic Foundation through TVN. Le Van Du from Nong Lam University, Ho Chi Minh City, Vietnam and Paul Truong also presented a paper entitled, "Vetiver Grass System for Erosion Control on Drainage and Irrigation Channels on Severe Acid Sulfate Soil in Southern Vietnam" at the Conference. In this paper, vetiver was effectively used to stabilize channel bank erosion in Vietnam. Over the period of four months, soil loss by erosion was markedly reduced, from 400-750 t/ha to only 50-100 t/ha, on both the inside and the outside of a channel embankment. The extended abstract of the paper can be seen in a separate article.

2. European Academic Interest

There is a growing interest in the use of vetiver for wastewater treatment and soil conservation in European universities following last year "Freshwater Conference" in Bonn, Germany, where TVN, in cooperation with Joe Boehnert, presented a series of seven posters outlining different applications of the VS. In the last year, either directly or through Joan Miller, TVN Coordinator, Paul Truong has received quite a few inquiries regarding research projects and work experience from students of European universities. This has resulted in Stefanie Wagner, a final-year Geography and Soil Science student from Hamburg University, will spend five months from October 2002 working with Cameron Smeal, Environmental Manager at Davis Gelatine, and Paul Truong on the use of vetiver in wastewater treatment at the gelatine factory near Brisbane. Maarten de Wolf from Wageningen University, the Netherlands has just started his five-month work experience in the VS for soil and water conservation in Vietnam working with Dr. Pham Hong Duc Phuoc and Le Van Du at Nong Lam University, Ho Chi Minh City, Vietnam, and with Elise Pinners in Hanoi, Vietnam. Another PhD student from Hannover University in Germany, Melanie Bauer, is interested in using vetiver for phytoremediation in Uzbekistan.

Vetiver Grass System for Erosion Control on Drainage and Irrigation Channels on Severe Acid Sulfate Soil in Southern Vietnam*

In Vietnam, the establishment of drainage and irrigation channels in acid sulfate soil (ASS) is the most important technique for improving agricultural and fishery productivity. However, the embankments of these channels are highly erodible due both to its weak physical and extremely acidic conditions, where very few plants can survive; especially during the dry season leading to severe and costly bank erosion problem. Vetiver grass (*Vetiveria zizanioides* L.) thrives under tropical and subtropical climates and it is highly tolerant to adverse conditions including high acidity (Truong 1999). Vetiver grass has been used very effectively to control channel bank erosion on ASS in both northern and southern Queensland (Truong and Baker 1996; Carlin *et al.* 2002).

Experimental Design

Three trials were conducted to determine the tolerance level of vetiver grass under extreme ASS conditions and its effectiveness in reducing bank erosion. Table 1 shows the characteristics of the ASS at the three experimental sites.

Table 1. Soil characteristics at the three trial sites.

Trial	pH_{H2O}	pH_{KCl}	EC (mS/cm)	Al^{3+} (meq/100g)	SO_4^{2-} (meq/100g)	Active Fe (ppm)
1	2.80	2.50	3.93	32.4	7.56	882
2	2.50	2.35	3.14	31.0	6.25	1,170
3	3.13	2.97	0.88	0.93	2.33	114

Note: *The ratio of soil/water (solution) for pH and EC measurement was 1:2.5*

Results and Discussion

Trial 1: The objective was to determine the effect of liming on the establishment and growth of vetiver grass. Three liming rates: 0, 120 and 240g (as CaO) per linear meter row were used. After three months, plant height, tillers, and shoot growth of the 240g treatment increased more than three times than that of the control.

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* *Extended abstract of a paper presented at the Fifth International Acid Sulfate Soils Conference, Tweed Heads, Australia by L.V. Du, Faculty of Agriculture, Nong Lam University, Ho Chi Minh City, Vietnam; and P.N. Truong, Veticon Consulting, 23 Kimba St, Chapel Hill 4069,Brisbane,*

Trial 2: This factorial experiment determined the effect of lime, N, and P on vetiver growth. Five liming rates (0, 50, 100, 200, and 400g/linear m) and three fertilizer rates (0, 10, and 20g of DAP/plant) were used. Growth rate of grass in this trial was much lower than that observed in Trial 1, and all those received no lime died in about two weeks after transplanting. This is possibly due to the extremely acidic soil condition at this site. However, in general, plant growth increased with higher lime and fertilizer rates.

Trial 3: Establishment and growth of vetiver normally require abundant soil moisture, therefore the effect of flooding was tested. Results indicate that flooding between 10-20 cm deep reduced vetiver growth markedly after transplanting.

Plant survival: With adequate liming all plants grew vigorously nine months after planting. During the six-month long dry season, all plants seem to be dormant, most leaves were scorched, but they all survived and resumed vigorous growth just after 20 mm of rain at the beginning of the wet season.

Soil chemical properties: Soil pH and other chemical properties were not greatly changed by liming, even at the higher rates. This is possibly due to the very high pH buffering capacity of the pH was not affected, plants that received lime continued to grow three months after planting, indicating vetiver grass needs only a small quantity of lime for neutralizing acidity around its root at the transplanting time. Once established vetiver plant apparently can survive higher acidity.

Water quality improvement: Concentrations of some toxic elements such as Al, Fe, and SO_4 in vetiver grass were very high, much higher than those species considered tolerant to ASS. Moreover these concentrations tend to increase as the plant matures (Table 2). These high contents suggest the level of these elements could be reduced in both surface runoff and deep drain water before it reaches the channel, thus reducing the level of contamination and improving the quality of canal water.

Channel bank stabilization: Stability of channel banks was greatly improved with vetiver grass planting. Over the period of four months, soil loss by erosion was markedly reduced, from 400-750 t/ha to only 50-100 t/ha, on both the inside and the outside of a channel embankment.

Table 2. Elevated levels of some toxic elements in vetiver grass

Days after transplanting	Plant part	Toxic concentration		
		Al (ppm)	Fe(%)	SO_4 (%)
70	Leaf	568	0.58	8.36
	Root	557	1.87	7.98
105	Leaf	663	0.44	8.27
	Root	646	2.82	10.26
270	Leaf	660	0.50	9.00
	Root	600	0.55	11.00

Conclusions

1. Planting of vetiver grass greatly improves bank stability and reduces bank erosion.
2. On severe ASS, liming is needed for vetiver establishment. At least 100 g CaO/linear meter row are needed. Higher rate improves vetiver growth rate.
3. Only a small quantity of lime is needed to neutralize the high acidity around vetiver root at the transplanting time. Once established vetiver plant can survive higher acidity.
4. Vetiver grass stopped growing in dry season, but it re-grows vigorously with as little as 20 mm of rainfall.
5. Vetiver grass could improve the quality of water in drainage channels by removing

Acknowledgement

The senior author wishes to thank AusAid, Virotec, and TVN for their sponsorship to this conference. We also thank the Donner Foundation of USA for funding this program in Vietnam.

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Truong, P.N. 1999. Vetiver grass technology for land stabilisation, erosion and sediment control in the Asia Pacific region. *In:* Proc.1st Asia Pacific Conf. Ground and Water Bioengineering for Erosion Control and Slope Stabilization. Manila, Philippines.

The King of Thailand Vetiver Awards: Third Series

On the occasion of the Third International Conference on Vetiver (ICV-3) which will be held in Guangzhou, Guangdong, China, 6-9 October 2003, Her Royal Highness Princess Maha Chakri Sirindhorn, Chairperson of His Majesty the King of Thailand's Chaipattana Foundation, has agreed to grant US$10,000 from the Chaipattana Foundation for "The King of Thailand Vetiver Awards" for the most outstanding works on vetiver.

Award Categories: This is the third time that such awards are given. As in the second series which was conferred during ICV-2, the awards of the third series will be split into two categories, one for outstanding research on vetiver and the other for outstanding dissemination of the vetiver system, valued at US$5,000 each.

Outstanding Research Awards: This category will further be split into two sub-categories, namely: (i) Agricultural Applications, and (ii) Non-agricultural Applications. Each will receive a prize of US $2,500.

Outstanding Dissemination Awards: This category will also be further split into two sub-categories, namely: (i) Government Agencies, and (ii) Non-government Agencies. Each will receive a prize of US $2,500.

The winners will receive the awards from Her Royal Highness Princess Maha Chakri Sirindhorn, the Patron of The Vetiver Network, on His Majesty's behalf, during the Opening Ceremony of the Third International Conference on Vetiver (ICV-3) in Guangzhou, Guangdong, People's Republic of China, on 6 October 2003. In addition to the awards, the recipients will also be covered with the cost of participation at ICV-3 as well as the international travel between their home country and the conference venue and accommodation during the conference period. Arrangement has been made with the Organizer of ICV-3 to cover such costs if the winners are from the least developing countries. Similarly, registration fees for the four winners will also be waived by the Organizer.

Scientists as well as vetiver practitioners from around the world are invited to apply for the awards by submitting the application form, along with the abstract and full paper, both of which should conform to the format of the papers to be presented at ICV-3 (see Second Announcement of 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 nominee to acknowledge receipt of nomination. The nomination must be postmarked on or before

Application Form
The King of Thailand Vetiver Awards

1. Name (First, Middle (if any), Last): ….……...
2. Sex: …….. Age: ……..
3. Department/Company: ……...
4. Position: ……...
5. Responsibilities: ……..…
   ……..
   ……..
   ……..
   ……..
6. Contact Address: ….……
   ……...
7. Country: ……...
8. Telephone No: …… Fax. No: ……Email: ……..
9. Title of paper: ……..
   …….
10. Type of work:
    Research
    ( ) 1. Agricultural Application
    ( ) 2. Non-agricultural Application
    Dissemination
    ( ) 1. Government Agency
    ( ) 2. Non-government Agency
11. Category:
    ( ) Erosion and Flood Control, and Slope Stabilization
    ( ) Pollution Mitigation and Disaster Prevention
    ( ) Wastewater Purification, Element Uptake, and Pollutant Decomposition
    ( ) Basic Scientific Research and Other Aspects
12. Author(s): ……..
……
13. Source of funding of the work: …….

Please complete this form and send it along with the full paper and 'Statement of Merit' to:

Planning and International Affairs Division
Office of the Royal Development Projects Board
78 Rajdamnern Nok Avenue, Dusit
Bangkok 10300, Thailand

(Photocopy of this Application Form is acceptable)

Screening of Vetiver Grass in Guangzhou, China*

Materials

The materials consisted of bare root slips of 12 ecotypes of vetiver grass (Table 1). Among them ecotype #1-10 were collected from five countries and regarded as good ones in the locality. The ten ecotypes were first introduced into an experimental nursery in the US by Mr. Mark Dafforn

and Dr. Robert P. Adams for a period of time, and then sent to the author in July 1999. The delivery lasted ten days (28 July to 7 August) in the hot summer, yet some slips of each ecotype survived. This indicates that vetiver really has a strong vitality and can tolerate high temperature and long period without water. Their survivals, however, showed a big difference, varying from 17 to 91%, indicating that they were different in relation to the ability to tolerate high temperature and drought.

Table 1. List of vetiver ecotypes and their performance at the time of introduction

No.	Ecotype	Origin	Slip number at planting	Slip number at 15 days after planting	Survival rate (%)
1	Capitol	USA	6	1	17
2	Huffman	USA	5	3	60
3	Sunshine	USA	3	1	33
4	Lilongwe	Malawi	11	10	91
5	Zomba	Malawi	7	5	71
6	Kandy	Sri Lanka	4	2	50
7	Karnataka	India	3	2	67
8	Malaysia	Malaysia	5	2	40
9	Parit Buntar	Malaysia	3	2	67
10	Sabak Bernam	Malaysia	7	2	29
11	Domesticated	Guangdong, China	-	-	-
12	Wild	Guangdong, China	-	-	-

Ecotype #11, 'Domesticated' was introduced from abroad in 1950s; it was widely cultivated in China. The DNA fingerprinting reveals that it is the same genotype as the most extensively cultivated variety around the world, i.e. 'Sunshine' (Ecotype #3). As it had been cultivated for nearly 50 years, therefore some changes in physiological, ecological or morphological features probably might have taken place. Ecotype #12 ('Wild') was sampled from the wild vetiver community of Wuchuan County, Guangdong Province. The community, lying in the wetland near the sea, has existed for hundreds of years; no one knows its origin. Furthermore, the vetiver of this community has distinct disparities with the widely cultivated variety ('Domesticated') in the aspects of morphological characteristics and ecological features. Because of the above reasons, it was named 'Wild' ecotype, which presents a striking contrast to the 'Domesticated' one.

Results

Plant Height as a Measure of Growth of Different Ecotypes

The growth rate of the 12 vetiver ecotypes tested is shown in Table 2. Prior to planting in October 2000, all slips were cut to 30 cm high. After 14 months of growth, different ecotypes produced tangible differences regarding plant height. At the last measurements, the tallest ecotype was 'Huffman', whose average height was 288 cm, and the tallest plant was up to 305 cm high whereas the shortest ecotype was 'Karnataka', whose average height was only 176 cm, and the shortest plant was only 170 cm . Thus the difference in height between the shortest and tallest plants was 135 cm. Actually, their height revealed only a little difference during vegetative stage of growth. For example, at June observation, the tallest ecotype ('Capitol') averaged 197 cm, while the shortest ('Zomba'), 153 cm, only a 44 cm disparity between them. It can be seen, therefore, that a huge difference of plant height results mainly from reproductive growth. In addition, during the whole period of investigation, especially in the early growth phase, the leaves of 'Karnataka' ecotype seemed to be greener than those of other ecotypes. Among them 'Lilongwe' had the lightest leaf color, and the leave colors of ten other ecotypes were between them. It was very difficult to

Table 2. Comparison of the plant height (in cm) of 12 vetiver ecotypes

No.	Ecotype	Oct.	Dec.	Feb.	April	June	Aug.	Oct.	Dec.
1	Capitol	30	79	76	124	197	217	259	276
2	Huffman	30	76	82	125	194	231	288	291
3	Kandy	30	82	88	127	171	189	235	237
4	Karnataka	30	66	64	94	160	171	176	178
5	Lilongwe	30	63	68	87	170	226	246	250
6	Malaysia	30	52	55	105	160	191	211	227
7	Parit Buntar	30	71	72	109	180	223	273	279
8	Sabak Burnam	30	76	75	110	186	225	265	275
9	Sunshine	30	73	70	122	186	228	271	275
10	Zomba	30	67	66	78	153	221	251	269
11	Domesticated	30	73	70	122	186	228	271	276
12	Wild	30	74	71	130	192	237	274	280

Table 3. Accumulative tiller number per clump of different ecotypes during the growing period*

No.	Ecotype	Oct.	Dec.	Feb.	April	June	Aug.	Oct.	Dec.
1	Capitol	3	3.5bc	7.5abcd	14.3cd	21.8cde	33.8cde	44.5bcd	51.0cdef
			(1.19)	(1.94)	(2.66)	(2.84)	(4.19)	(4.66)	(4.67)
2	Huffman	3	3.3bc	5.3bcd	10.8cd	18.5de	30.8cde	41.8bcd	56.5bcde
			(0.63)	(1.31)	(2.17)	(3.07)	(4.82)	(4.17)	(2.53)
3	Sunshine	3	3.8abc	7.0abcd	14.5bcd	22.0cde	36.5cd	43.5bcd	59.0bcde
			(0.48)	(0.58)	(1.26)	(1.87)	(3.30)	(4.99)	(6.94)
4	Lilongwe	3	3.5bc	5.8bcd	13.5cd	21.0cde	30.5cde	34.0de	39.5fg
			(0.50)	(0.25)	(1.32)	(1.73)	(2.47)	(2.08)	(3.29)
5	Zomba	3	2.3c	4.3d	10.0d	15.3e	20.0e	24.5e	31.5g
			(0.48)	(0.63)	(0.58)	(2.29)	(0.91)	(1.19)	(1.04)
6	Kandy	3	5.3a	9.5a	24.3a	42.5a	55.0a	66.8a	82.5a
			(0.85)	(1.71)	(5.76)	(7.90)	(8.30)	(7.41)	(8.03)
7	Karnataka	3	5.5a	9.0ab	19.8abc	36.0ab	52.5ab	55.8ab	68.0ab
			(0.65)	(1.41)	(3.75)	(3.46)	(4.29)	(4.72)	(3.94)
8	Malaysia	3	3.5bc	4.8c	9.8d	17.0e	29.5de	37.3cde	44.0efg
			(0.29)	(1.03)	(1.89)	(1.22)	(4.13)	(7.20)	(7.56)
9	Parit Buntar	3	4.3ab	6.8abcd	17.0abcd	23.0cde	39.0bcd	47.5bcd	66.0bcd
			(0.63)	(1.11)	(5.34)	(4.24)	(7.55)	(8.29)	(6.92)
10	Sabak Burnam	3	4.5ab	7.8abcd	16.5abcd	28.8bcd	41.5abcd	49.0bcd	62.3bcd
			(0.65)	(1.11)	(2.50)	(3.20)	(4.29)	(4.93)	(5.55)
11	Domest-icated	3	5.5a	10.3a	23.8ab	31.3abc	45.5abc	52.3abc	67.5ab
			(0.29)	(1.55)	(5.11)	(7.00)	(8.31)	(8.14)	(8.30)
12	Wild	3	4.3ab	8.0abc	17.0abcd	25.0bcde	35.8cd	40.0bcde	49.0defg
			(0.25)	(1.08)	(1.29)	(2.65)	(4.84)	(4.67)	(4.42)
Max-Min		3	3.2	6	14.3	27.2	35.0	42.3	51.0

** Means (with (SE), n=4) followed by same letters in the same row indicate there is no significant difference*

Tiller Forming Capacity of Different Ecotypes

After vetiver was planted for only one month (November 2001), the number of tillers of different ecotypes was significantly different. Furthermore, the difference became larger and larger as time passed. At the last measurement 14 months later, the ecotype yielding the largest number of tillers was 'Kandy', which yielded 82.5 tillers per clump, while the ecotype yielding the smallest number of tillers was 'Zomba', with only 31.5 tillers per clump. Thus, a large difference of 51 tillers between them exists as shown in Table 3. So, 'Kandy' is undoubtedly far better than all other ecotypes, while 'Karnataka' and 'Domesticated' ranked second, and 'Zomba' the poorest with regard to tiller formation.

Blooming Situation of Different Ecotypes

In this experiment, the ecotype that came into bloom first was 'Zomba', followed by 'Wild', 'Sabak' 'Bernam', 'Lilongwe', 'Kandy', 'Sunshine', 'Domesticated', 'Malaysia', 'Parit Buntar', 'Huffman', and 'Capitol'. Their first bloom occurred on 9, 12, 18, 21, 23, 30 August, 1, 8, 8, 17, 25 September, respectively; the maximum difference was 46 days. Since the main inflorescence stalk of vetiver is about 50-70 cm long, so this is the radical reason that all ecotypes suddenly become much higher in autumn, whereas 'Karnataka' remained the shortest ecotype as it did not produce any bloom at all (Table 2). In the subsequent two months, the growth rate of inflorescence of each ecotype was also different. 'Zomba', the earliest blooming ecotype, did not produce the highest number of inflorescence in the end, while 'Capitol', the latest blooming ecotype, eventually became one of the ecotypes with the highest number of inflorescence due to its exuberant reproductive growth (Table 4). It is worth noticing that the 'Karnataka' ecotype did not bloom, but kept on growing vegetatively during this period, by producing culm-branches from the lateral buds of the culm. A single mature culm may produce 3-9 such culm-branches, and a clump may produce around 30-40 culm-branches, each 40-50 cm in length. Because of the formation of culm-branches, 'Karnataka' ecotype was green in the winter while other ecotypes turned brown of varying shades. Due to the heavy stress of the formation of culm-branches, this ecotype became deflecting and even lodging, and its appearance became somewhat tousied.

Blooming rate is referred to as percentage of numbers of tillers with inflorescences to total tillers. Obviously, it is more precise to compare the blooming rates of different ecotypes than number of inflorescences. For example, the final inflorescence number of 'Kandy' ecotype was about 1/6-1/3 of other ecotypes, but its blooming rate was only 1/10-1/5 of other ecotypes (Table 4), which was due to its far more number of tillers than those of other ecotypes.

Table 4. Number of inflorescences per clump and earring rate (%) of 12 different ecotypes of vetiver

No	Ecotype	Total number of inflorescences					Blooming rate				
		Aug.	Sep.	Oct.	Nov.	Dec.	Aug.	Sep.	Oct.	Nov.	Dec.
1	Capitol	0	0	13	34	44	0	0	7.30	17.78	21.57
2	Huffman	0	0	16	22	23	0	0	9.57	11.22	10.18
3	Sunshine	0	1	24	30	30	0	0.62	13.79	14.85	12.71
4	Lilongwe	0	4	19	25	28	0	2.94	13.97	16.80	17.72
5	Zomba	1	5	21	26	30	1.25	5.68	21.43	23.81	23.81
6	Kandy	0	2	7	7	7	0	0.84	2.62	2.309	2.126
7	Karnataka	0	0	0	0	0	0	0	0	0	0
8	Malaysia	0	1	16	33	36	0	0.74	10.72	20.63	20.45
9	Parit Buntar	0	1	22	27	27	0	0.58	11.58	12.32	10.23
11	Domesticated	0	4	26	36	37	0	2	12.43	14.68	13.70
12	Wild	0	5	35	45	45	0	3.38	21.88	25.57	22.96

Roots Biomass of Different Ecotypes

If vetiver did not have massive roots, its ecological effectiveness would be weakened dramatically. Therefore, it is necessary to consider the growth of roots when screening for excellent ecotypes. It can be seen from Table 5 that there was a large difference of the biomass of roots of different ecotypes. The ecotype with the least root biomass was 'Wild', and that with the most root biomass was 'Zomba', in spite of the fact the latter had the poorest ability of tillering.

Table 5. Root performance of 12 different vetiver ecotypes*

Item	Ecotype #											
	1	2	3	4	5	6	7	8	9	10	11	12
A*	0.87	0.82	0.88	1.25	1.44	0.77	0.42	0.51	0.97	0.58	0.57	0.39
B*	50	60	60	20	30	40	80	70	60	70	40	30

** Item A is the root weight (g DW/tiller) per tiller, and Item B is percentage of the root amount with diameter <1 mm to the total root amount (%)*

Comprehensive Evaluation of the Growing Performance

It can be seen from the foregoing discussion that various ecotypes of vetiver present distinct differences regarding their growing performance. Each ecotype has its own advantages and disadvantages. No one ecotype performs the best in all aspects. In order to screen out the best ecotype on the whole, 12 ecotypess have been divided into 12 grades; each grade endowed with 1 point. This means that the best ecotype in a certain aspect is given 12 points, and the poorest one, 1 point. The ones with same performance are given a mean value. Then, accumulative point for each ecotype could be figured out. The ecotype obtaining the highest scores is obviously the best one. Table 6 shows the scores of the 12 ecotypes in different aspects and their total scores. Karnataka ranks first, which is beneficial mainly from its non-blooming and low stature resulted from non-blooming. In addition, the culm-branches growing from the culm nodes were found to be good propagating materials. If these culm-branches were cut off from mother plants after they attain the length of 30-40 cm, they not only increase new resource of propagating materials, but also keep the mother plants' normal appearance from lodging. 'Kandy' lies in the second; it has the rapidest tillering speed, its blooming rate is very low, and its appearance is quite good, and therefore is also worth disseminating widely. 'Domesticated' and 'Sunshine' belong to the same genotype and their points are quite close, indicating that the former has produced quite a few changes even after 50 years of being introduced into China. Regarding the 'Wild' ecotype, the main reason that it scores the lowest points is, no doubt, associated with its prior long-term waterlogged habitat. The waterlogged environment is disadvantageous to root growth and tiller formation. Although the 'Wild' plants had grown in our nursery for two years before conducting the observation, they still did not obtain the identical or similar features as the 'Domesticated' or other ecotypes.

In sum, the 'Karnataka' is evaluated as the best ecotype in terms of its growth and development. This experiment, however, did not measure the length of roots; so we have not yet known how long its roots grow. But another special experiment on 'Karnataka' roots' growth rate and length is now ongoing. In addition to this, the 'Karnataka' ecotype has not yet been applied for the purpose of erosion control and pollution mitigation, thus its ecological efficiency remains to be investigated.

It should be pointed out that a new cultivar of vetiver was just bred out, whose leaf margins are golden, and therefore looks better than the common ecotypes. Its growing characteristics and physiological and ecological features will be investigated in the near future.

Table 6. A comprehensive evaluation for the 12 ecotypes of vetiver*

No.	Ecotype	Plant height	Total number of tiller	Tillering rate	Earring rate	A*	B*	Total points	Rank
1	Capitol	5	5	4	3	8	6	31	9
2	Huffman	1	6	6	10	7	8	38	7
3	Sunshine	6	7	8.5	8	9	8	46.5	4
4	Lilongwe	9	2	2	5	11	1	30	10
5	Zomba	8	1	1	1	12	2.5	25	11
6	Kandy	10	12	12	11	6	4.5	55.5	2
7	Karnataka	12	11	11	12	2	12	60	1
8	Malaysia	11	3	3	4	3	10.5	34.5	8
9	Parit Buntar	3	9	8.5	9	10	8	47.5	3
10	Sabak Burnam	7	8	7	6	5	10.5	43.5	5
11	Domesticated	4	10	10	7	4	4.5	39.5	6
12	Wild	2	4	5	2	1	2.5	17.5	12

** A is the mean root weight per tiller, and B is the percentage of the root amount with diameter <1 mm to the total root amount (see Table 5)*

Acknowledgments

This experiment was supported by the President of the Chinese Academy of Sciences. Thanks are also due to Prof. Robert B. Adams of Baylor University, USA, and Mr. Mark R. Dafforn of the National Academy of Sciences, USA for the supply of the first ten ecotypes of vetiver tested in the experiment.

The Fourth Thai National Conference on Vetiver

To fulfill His Majesty King Bhumibol Adulyadej of Thailand's initiative regarding the use of vetiver grass for the purpose of soil and water conservation given since 1991, agencies concerned have conducted a number of researches and joined hands in promoting the benefits of planting vetiver grass among the people through the coordination of the Office of the Royal Development Projects Board (ORDPB) which serves as Secretariat to the Committee of the Development and Promotion of the Utilization of Vetiver (CODPUV) According to His Majesty's Initiative. Throughout the past years, works on the vetiver system have been guided by two Master Plans and are about to enter its third phase under the framework of the Master Plan III (fiscal year 2003 – 2007). Moreover, three National Conferences had successfully been held in 1993, 1994, and 1999, respectively, to offer a forum for an exchange of newly-developed knowledge, and up-to-date information as well as experiences among academics and vetiver practitioners. Above this, for the Third International Conference on Vetiver (ICV-3), which will be held in China in October 2003, Thailand has received an honor of playing a significant role in its organization.

Given all these circumstances, ORDPB deemed it necessary to organize the Fourth National Conference on the Development and Promotion of the Utilization of Vetiver Grass According to His Majesty's Initiative. The Conference will be held between 28-29 November 2002 at the Miracle Grand Hotel, Bangkok, Thailand. The objectives are to represent a forum for the presentation of various papers conducted by experts involved in the vetiver system as well as for an exchange of knowledge, experiences, problems and obstacles in the works pertaining to the vetiver system, and also to prepare for ICV-3. The program structure includes plenary lectures, group lectures, group

reach 300 may consist of officials from the central administration of the agencies concerned, implementing officials, representatives from Tambon (Sub-district) Administration Organizations, representatives from the private sector and NGOs, professors and university students, as well as the CODPUV members.

A New Technical Bulletin Published by PRVN

Another technical bulletin, No. 2002/1 on "The Role of the Private Sector in Disseminating the Vetiver System with Special Reference to China", has recently been published by the Pacific Rim Vetiver Network. It was prepared by Dr. Xia Hanping of the South China Institute of Botany, Chinese Academy of Sciences, Guangzhou, Guangdong Province, China, in cooperation with the private enterprises involving in vetiver project consultancy. This 16-page bulletin was edited by Dr. Narong Chomchalow and Dr. Samran Sombatpanit. Its abstract is presented below:

China's vetiver system (VS) was initiated in 1988, almost at the same time as other vetiver promoting nations. However, it was developed relatively slowly in the first ten years (1988–97) compared with China's practical needs. Mr. Hong Hao, the President of Hongri Grass Industry Group, plunged himself into the vetiver circle in 1998, and established Guangdong Association of Grass Industry and Environment in 1999 to promote the development of the VS. As a result, he became the first private entrepreneur of China disseminating the VS. Afterwards, at least ten private firms in China have begun, one after the other, to disseminate the VS. Some of them were new companies established especially for the vetiver business, such as the Guangzhou Vetiver Grass Environmental Science and Technology Co. Ltd. and the Hangzhou Zhijiang Vetiver Engineering Co. Ltd. All these companies have made great progress in promoting the VS in China, particularly in Guangzhou. However, it was very difficult for any company to make a rapid development without guidance or help from scientific institutions or vetiver specialists. For example, the Guangdong Huihua Environmental Science and Technology Co. Ltd., the Guangzhou Eco Environment Science and Technology Co. Ltd., the Yunnan Green Land Enterprise Co. Ltd. and others, have received guidance and help from the South China Institute of Botany (SCIB) of the Chinese Academy of Sciences. The Guangzhou Rivers Enterprise Co. Ltd. has been guided simultaneously by SCIB and Zhongshan University. In sum, Guangzhou is becoming one of the world's centers promoting the VS due to its huge impulse function of the private sector with support from scientific institutions. The private sector is also playing the same important role in other areas of China as well as in many other countries of the globe.

This bulletin should be of value to vetiver scientists, engineers, and others who would like to use vetiver for soil and water conservation. Copies of this technical bulletin have been sent to key personnel of the vetiver networks around the world. For those who want to have a copy, please write to the International Affairs Section of the Office of the Royal Development Projects Board. Readers from China may obtain copies directly from Dr. Hanping Xia, South China Institute of Botany, Guangzhou, Guangdong, China.

Further Announcement on ICV-3

The Third International Conference on Vetiver and Exhibition (ICV-3) under the theme, "Vetiver and Water: An Eco-Technology for Water Quality Improvement, Land Stabilization, and Environmental Enhancement", will be held in Guangzhou, China, 6-9 October 2002. This conference offers opportunities for those interested in soil and water conservation and the use of vetiver grass and its applications – the latter being broadly known as the Vetiver System (VS) – to participate and share their views with researchers, engineers, administrators, government officials,

For intending participants knowing little or nothing about vetiver grass technology and its related applications, VS is a stunningly simple low-cost technology that has proven itself time and again in nearly all tropical and subtropical zones of the world for soil and water conservation, land stabilization and reclamation purposes. It is a technology that has tremendous cross sector application and is of interest and of use to engineers, agriculturists, environmentalists, water specialists, and others. The technology has been thoroughly researched and is now applied in various forms by tens of thousands of users around the world. The theme of the Conference, "Vetiver and Water", will present the participant an eco-technology for land stabilization, water quality improvement and environmental enhancement. In particular the technology poses an enormous challenge to the increasingly conspicuous water problems and, at the same time, provides a promising hope for the conservation of water and its quality improvement. The critical depletion of the availability of clean water that has occurred during the last century foretells the magnitude of the challenge that the human race will confront in this new millennium in relation to water quality and quantity.

Although "Vetiver and Water" is the theme or thread that will run through the conference, it will not mean that the wide range of VS applications will be neglected. To the contrary, all VS applications will be discussed in detail, and all will show their impact on the conservation of water and water quality. The Conference aims not only to exhibit China's, especially Guangzhou's achievements in vetiver R&D to the world, but more importantly, to introduce world achievements to China in order to further improve the development of VS in China – a country that needs the technology more than most others.

This will be the third international conference on vetiver grass and its applications since the first and second in Thailand in 1996 and 2000. The past conferences were considered highly successful and participants were able to return to their home countries with new knowledge that in most instances was immediately useable for problem solving applications.

More information and details about the conference is available contact:

Address: ICV-3 Office, Guangdong Academy of Agricultural Sciences, Wushan, Guangzhou 510640, P.R. China
Website: <www.ICV-3.com>, Email: <office@ICV-3.com>
Tel: (86-20) 8551-4259, Fax: (86-20) 8750-3358
Also at The Vetiver Network's website at <www.vetiver.org>
Specifically: http://www.vetiver.com/TVN_IVC3_Second_Announce.pdf

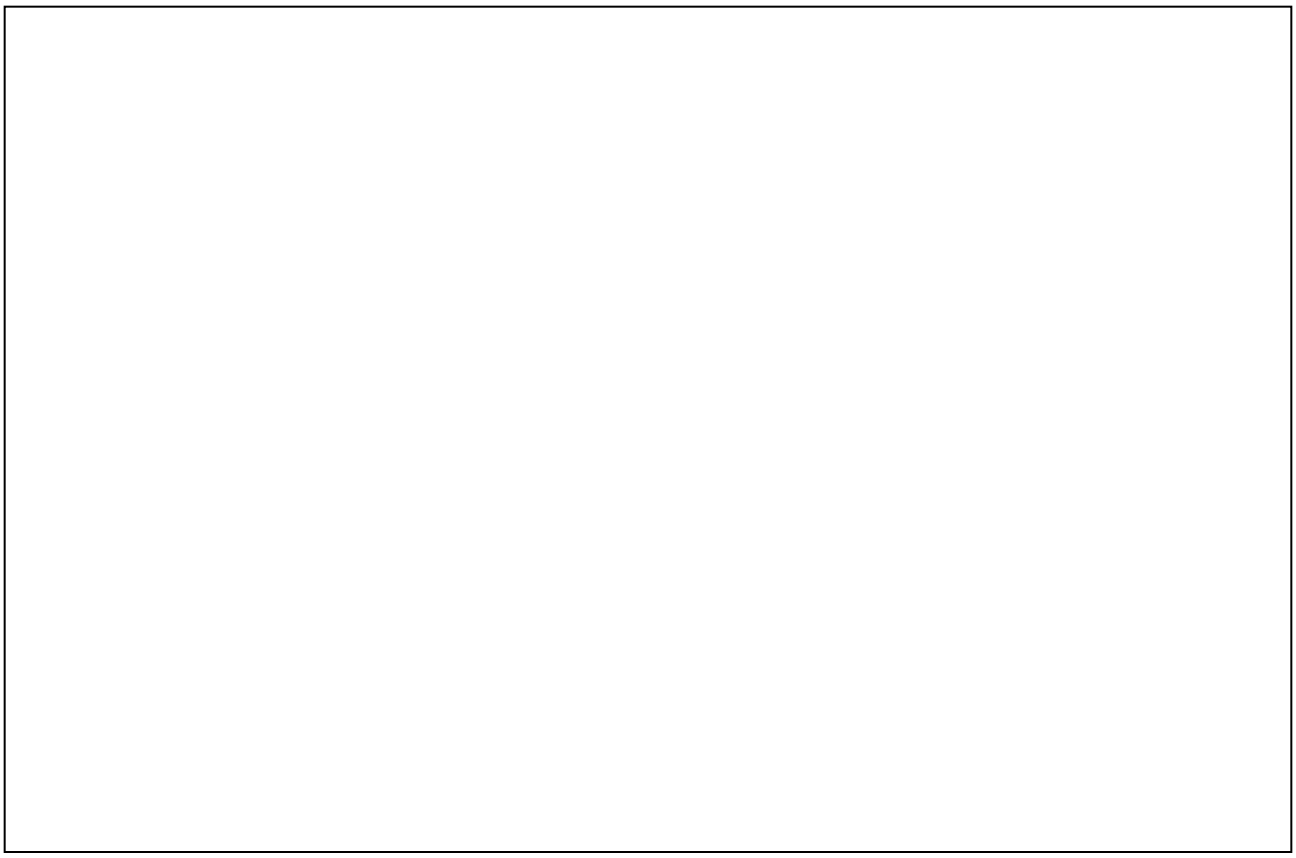
Vetiver Products Displayed at the Intellectual Property Fair in Thailand

The Intellectual Property Fair was held on 17-18 August 2002 at the Oval Ground in front of the Grand Palace in Bangkok, Thailand. It was organized by the Intellectual Property Department of the Ministry of Commerce with the idea of protecting intellectual property rights of the products made by Thai inventors. There were some 50 booths of various agencies and companies being exhibited. One of these was the Royal Project Foundation which displayed vetiver products, many of which were once displayed for His Majesty's viewing (see Vetiver Exhibits for His Majesty the King of Thailand's Viewing" in Vetiverim 17:11).

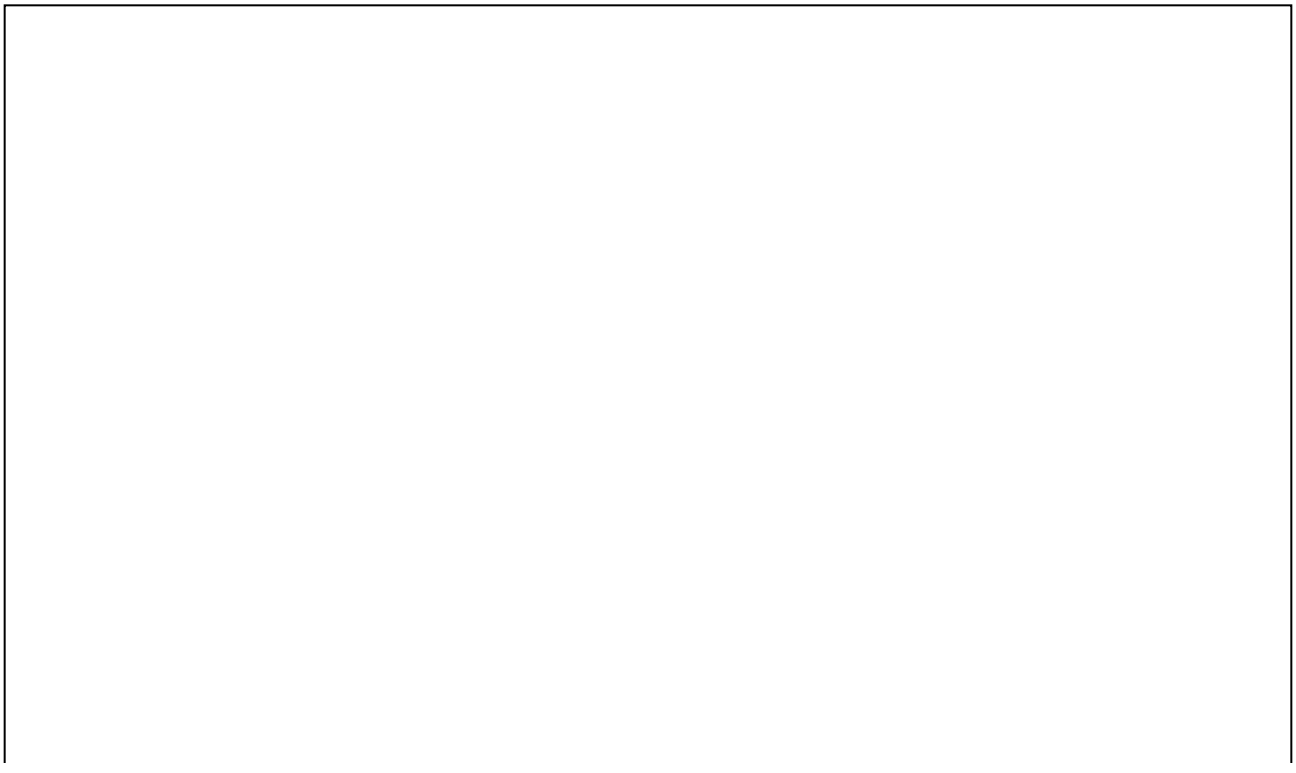
The principles of obtaining property rights of the Royal Project Foundation's innovation on vetiver products, based on His Majesty's advice, are:

1. All rights become the property of the Nation.
2. The higher intelligent persons must not take advantage of the lower intelligent persons.
3. Those who act improperly are discouraged.
4. Those who produce industrial products must use the best possible design.

The Editor visited the Fair on 18 August and found that these exhibits were very interesting.



Above clockwise from top left: an armchair lined with vetiver threads; samples of home appliances made of vetiver; samples of rolls of vetiver threads of different types (strengthen with wires of different sizes and materials); a foot-paddled vetiver thread-making machine.
Bottom, clockwise from top left: firewood sticks (made of compressed mud + vetiver culm), light-weight panel board, ingredients for panel board (vetiver ash, cement, lime, and their mixture), a panel board (made of vetiver + cement); vetiver thread-making machine and wood-substituted vetiver appliances; a box-shaped basket made of vetiver threads; a stool made of vetiver threads.



Vetiver Planting Ceremony to Celebrate Her Majesty the Queen's Birthday

On 12 August 2002, the vetiver-monitoring team from ORDPB visited the Queen Sirikit Botanic Garden to witness the vetiver planting ceremony on the auspicious occasion of Her Majesty Queen Sirikit's Birthday Anniversary. There were 900 pupils from 30 schools in Chiang Mai participating in the Ceremony which started with a gathering to read the blessing citation, followed by actual planting of vetiver slips grown in the dibbling tubes into the previously prepared holes along the slope of the cut side of the newly constructed road in the Garden. Before planting, a lecture was delivered for the pupils to appreciate the value of vetiver in erosion control. An instruction on how to plant vetiver was also given. It was a colorful ceremony with the pupils of different schools wearing colorful uniforms.

(Photographs)

His Majesty the King of Thailand Summoned the Prime Minister on "New Thought, New Practice with Vetiver"

On 13 September 2002, His Majesty King Bhumibol Adulyadej of Thailand summoned the Prime Minister, Police Lieutenant Colonel Thaksin Shinnawatra, at Klai Kangwon Palace, Hua Hin, as quoted, "For large-scale construction projects in which vast lands, especially hilly areas, are affected, vetiver should be used as the leading plant to effectively rehabilitate and restore the

and botanical gardens provide support in terms of vetiver planting materials and information on suitable ecotypes with a long root system as well as correct cultivation method.

The Prime Minister brought this issue for discussion in the Cabinet on 17 September. The Cabinet resolved to accelerate the vetiver project to obtain the result quickly in order to solve the problem of soil erosion and flood.

Letters to the Editor

Research Articles

Thanks for sending me the advanced copy of Vetiverim 22. I am delighted to see two research articles including one extended abstract. I hope that such activities would continue or even increase in the future. May I suggest, that in the future you may consider incorporating extended abstracts of the presentations in the conferences, e.g. selected poster presentations, etc., that are unable to find space in the Proceedings. I appreciate your Vetiver Glossary 6, and its format of presentation, especially Vetiverim's definition and your editorial explanation. However, with respect to your explanation under the section 'tissue culture plantlets', I am a bit apprehensive to the use of 'shoot tip' as one of the explants. In grasses it is either nodal explants or shoot meristems, as the meristems are not at the tips but basal in leaf sheath and intercalary along the stem nodes.

Umesh C. Lavania
Central Institute of Medicinal and Aromatic Plants
Lucknow 226015, India,<lavania@cimap.res.in>

Thanks for your comments on research articles and Vetiver Glossary. The problem with the former is the lack of contributions from research scientists. Luckily, two have submitted their papers for this issue. I shall try my best to satisfy your suggestion by asking out loud to all research scientists to please submit your research results which you have submitted for presentation in any conference, either as oral or poster papers. Since 'Vetiverim' is not a research journal, and to save space, the presentation should be in the form of extended abstracts.

Your comment on tissue culture plantlets is well taken. However, the term 'shoot tip' is used here as a generalization, not specifically for grasses where "meristems are not at the tips but basal in leaf sheath and intercalary along the stem nodes" as you pointed out. - ***Ed.***

Vetiver Handicraft Making

As the proposed training course on Vetiver Handicraft Making has been cancelled and possibility to do it is still uncertain, Fundacion Polar from Venezuela has proposed to sent to Thailand the original candidate we earlier mentioned. Grace Rivero, the proposed candidate, has already got some basic knowledge on handicraft making and is teaching in our country using vetiver fiber. Your experience and knowledge with vetiver as a handicraft material in Thailand would make a difference, and we would like this person to get some of your experience to be spread among people involved in social projects for community development in Venezuela. If it is possible to arrange an individual visit for her, we wolud be very grateful. Fundacion Polar will cover her expenses during her stay in Thailand.

Oscar Rodriguez Parisca, Coordinator LAVN
<osrp@telcel.net.ve>

It is a pity that such a course has to be cancelled due to lack of support from the funding agency. However, to organize the training course for just one person it will be very costly. We calculated that the in-country expenses would be around US$ 1,630 for a period of 15 days. If you

other countries, especially Madagascar, which has notified us of their intention, would join the course.- ***Ed.***

Vetiver Grass-Clay Composite

I am Alex from the Asian Institute of Technology, Bangkok, Thailand. My thesis is concerned with the finite element analysis of vetiver grass-clay composite structures. Our institute is now doing some research on using vetiver grass-clay composite for making grain storage silo. Please send me some information about the vetiver grass such as mechanical properties, the application, or anything that deals with vetiver grass.

Alex, Master's student, School of Civil Engineering
Asian Institute of Technology, Bangkok, Thailand
http://www.ait.ac.th/

We are surprised to receive your letter as your institute has done a lot of research along this line and should have all the information you need. For additional information about constructing grain storage silo using vetiver as a component, may we suggest you to contact M.R. Samjamjaras Rajani of the Royal Project at ☎ 053-810-765 Ext. 155 .- ***Ed.***

(Mailing envelope)