

## **Number 5     July 1998**

### **Editorial**

#### **Proceedings of the International Conference on Vetiver**

The Office of the Royal Development Projects Board (ORDPB), the Chaipattana Foundation, and the mae Fah Luang Foundation, in collaboration with the World Bank and the FAO Regional Office for Asia and the Pacific, organized the First International Conference (ICV-1) on “Vetiver: A Miracle Grass” on 4-8 February 1996 in Chiang Rai Province, Thailand, to commemorate the 50<sup>th</sup> Anniversary of His Majesty King Bhumibol Adulyadej of Thailand’s Accession to the Throne.

The Conference had been a great success as it provided a forum for experts, researchers, scientists and other participants from around the world, allowing them to exchange their views, useful experiences, knowledge and new techniques in the utilization and application of vetiver grass. Over 150 participants turned up at the Conference with over 50 paper and 25 poster presentations.

The Organizing Committee had prepared and published the Report of ICV-1 since March 1997. At the same time, preparation of its proceedings had been started soon after the closing of ICV-1. However, due to the lack of manuscripts of a number of papers presented, as well as to the incompleteness of a few others, the publication of the proceedings was delayed for more than two years after the closing of ICV-1.

The printing has just been completed and copies are being distributed to all participants attending the Conference. Those who did not attend ICV-1 but are member of the PRVN, are entitled to obtain a complementary copy upon submitting a written request to the Secretariat. The proceedings of ICV-1 are an assemblage of the various presentations grouped in seven sessions that took place during the Conference, namely one Plenary Session (5 papers), two Panel-Discussion Sessions (5 papers), two Concurrent Sessions (37 papers), and one Open-Discussion Session (1 paper), making a total of 48 papers, occupying 308 pages.

It is hoped that the proceedings of ICV-1 will be of great value for those who appreciate the value of this miracle grass since this is the first time that proceedings of such a conference have been compiled.

#### **Australian Vetiver Update** \*

There has been a keen interest in using vetiver grass technology (VGT) by road engineers in Queensland, Australia, following the highly successful application of VGT on The Brisbane-Toowoomba and Brisbane-Gold Coast Railway lines and the presentation of the paper “Application of the vetiver grass technology in land stabilization, erosion and sediment control in civil construction” at the Queensland

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\* *By Paul Truong, Resource Sciences Centre, Queensland Department of Natural Resources, Brisbane, Australia.*

Department of Main Roads (QDMR) Symposium by Paul Truong and Diti Hengchaovanich in November 1997.

Peter Evans, Manager of Infrastructure Delivery of the Border District of QDMR found that a saving of A\$100,000 in construction cost would be made when vetiver grass was used for channel stabilization in the construction of a 60m long box culvert instead of conventional gabion structures.

In tropical Queensland, VGT will be used this year in the upgrading of the Cooktown-to-Laura road and Bruce Poyser and Matt Browning of QDMR Peninsula District also plan to use VGT for the erosion and sediment control in the flood-prone highway now being designed for the Cape York Peninsula.

In addition, several shires in Queensland will start using VGT for erosion control in local roads and bridge abutments. Below is an extract from a local newspaper, the Queensland Bush Telegraph, a statewide rural newspaper, of February 1998, written by Lyn Irwin.

Vetiver, Nicknamed “wonder grass” by Main Roads staff, has been embraced by Southern Downs roadmakers as an environmentally-friendly way to prevent roadside erosion. The deep roots of the plant stabilize soil while the above-ground blades form a hedge to slow and spread water runoff and trap sediment. Soil erosion has long been a side effect of road construction and vetiver looks like being the solution. *“It’s as if someone designed a grass for engineering purposes”*, Infrastructure Delivery Manager, Peter Evans, said.

Part of the appeal of vetiver lies in its “sterility” – its inability to seed or spread runners – which deprives the plant of its potential to become an invasive menace. Actively promoted by the Department of Natural Resources, vetiver has been tested for at least eight years and is already used in the agricultural industry to stabilize contour banks, etc. The alternative means of combating erosion around road construction sites in turf, but vetiver is more suited to table drains because of its deep roots (2-3 m in a year) and its ability to withstand strong water flow. (The species has a tensile strength of about one-sixth of mild steel.)

*“By all reports, if other plans take off, this one dies back: It’s resilient enough to withstand drought, bushfire, frost and grazing but it is susceptible to deep shade and roundup.”* Main Roads corporate services manager, Rex Beer, said. Clumps, or “tillers”, of vetiver are planted 20 cm apart in rows around a site, creating a terrace effect. Gardener Lester McCosker, who has been nurturing and propagating the plant at Main Roads’ Easey Street depot for the past year, said tillers tripled in thickness in 12-18 months. Mr. McCosker has grown vetiver in a sandpit (so deep roots won’t form), with almost half the plot being replanted at a new section of road west of Inglewood just before Christmas. Vetiver has also been used at Stanthorpe Shire and will soon be planted in Balonne and Waggamba shires.

### **South China Water and Soil Conservation Meeting held in Xiamen, Fujian, China**

The South China water and Soil Conservation Association organized the South China Water and Soil Conservation Meeting in Xiamen, Fujian Province, on 10-12 June 1998. About 80 participants, mostly from provinces in South China, attended the meeting. Mr. Liyu Su, Coordinator of the China Vetiver Network (CVN), and his colleague, Ms. Zhang Jing, were invited to attend the meeting. Mr. Xu introduced the recent development of the CVN and the applications of vetiver grass technology (VGT) for engineering purposes. The very good experimental works conducted by Ms. Zhang Jing in Fujian Province were presented. They included the VGT for the protection of coastal dikes, river banks, fish ponds; for sand dune stabilization; for saline soil amelioration; and vetiver for mushroom cultivation. Following the national economic reform, many new constructions had been carried out which caused serious new soil erosion and became a key issue in soil erosion control in the country.

Mr. Liyu Xu also introduced 'Jiji Grass' (*Achnatherum splendens*), a grass similar to vetiver, but extremely drought and cold tolerant. Below are its characteristics:

- *Its natural habitat is the saline soils in northwest China such as in Inner Mongolia, Ningxia, Xinjiang Provinces. When planted on upland soils (such as the Loess soils) it grows extremely well.*
- *Like vetiver, it also belongs to the Poaceae; some farmers in northern Shanxi use it to stabilize the vertical cuts made in the hill slopes above their houses to prevent slippage and damage to the house.*
- *It has strong, deep (at least 3 m), and profuse roots.*
- *It is completely drought-tolerant, and withstands extreme cold.*
- *It has good longevity, is usually propagated vegetatively by plant division and is not invasive.*
- *It was also used to feed animals with young leaves, to make baskets, brooms, mattresses, ropes, curtains, shed-roof covers, and medicine for bile treatment. Finally, it is used for pulping and for highway stabilization.*

'Jiji Grass' appears to have many similarities to vetiver grass, although there are some very distinct differences, including a less dense and weaker leaf system. However there are enough similarities, to go by farmer's experience and knowledge, to suggest that 'Jiji Grass' could be a key to long-term embankment stabilization (terrace, dams, and roads) in North China if planted as closely spaced in-line hedgerows across the slope of embankments as has been widely proven for vetiver. It also may well be possible to use it as an effective contour hedgerow on un-terraced sloping land. The China Vetiver Network's newsletter and fact sheets will include information on 'Jiji Grass'. Some trials will be held in Shanxi, Inner Mongolia, and Ningxia on the Loess plateau shortly, just before the rainy season. Demonstrations will be established in cooperation with county or township extension stations and master farmers as well.

During the meeting a recognized expert, Dr. Mien-chun Liao from Taiwan, pointed out that it was necessary to use biological measures to protect earth terrace which are not protected by stone. The grasses will be very useful for terrace stabilization.

### **Vetiver in East China Highway Conference**

The East China Highway Conference was held in Xiamen, Fujian Province, on 8-11 June 1998. There were 60 participants who are Jiangxi, Fujian, Jiangsu, Shanghai, Zhejiang, Shandong, and Anhui Highway bureau officials, engineers, university professors, and vocational schoolteachers. Some came from highway-planning and design institutes, and highway-maintenance departments. The main topic of the Conference was highway greenization. Mr. Liyu Xu, Coordinator of China Vetiver Network, was invited to attend the Conference. Accompanied by a set of slides, a paper titled “Vetiver for Highway Stabilization and Greenization”, which was jointly prepared by engineers from Jiangsu Highway Bureau and Jiangsu Communications Planning and Designing Academy, was presented during the Conference. It showed vetiver application in Malaysia, Thailand, Australia, and in China in particular. Since 1989, vetiver grass technology has been introduced to highway departments in Guangdong and Fujian Provinces. It was shown that the grass played an important role in highway stabilization in mountainous areas, which cover around 70% of the Southern part of the country. Since then, more and more engineers from both highway and railway departments went on the use vetiver.

During the conference, most of the participants felt gratified to hear about the grass. Vetiver grass technology (VGT) generated great interest in the meeting and the participants were keen to get more information. The engineers from Fujian, Anhui, and Jiangsu Provinces decided to test vetiver grass for their newly built highways.

The participants recommended that an international meeting on the application of the VGT for highway stabilization be held in late 1999 in order to encourage more engineers to try the new technology and reduce expenses for stabilization with engineering measure instead of biological means which can not only protect highway from soil erosion damage but also protect the environment. The participants realized that vetiver could be a hot topic among engineers, as during the period of 1994-96, 34,000 km of highway were constructed in the country. Many of these new roads need to be protected and ‘greenized’.

## **Vetiver in Papua New Guinea\***

I doubt that there are many other places in the world where farmers are producing food, in the long term, on slopes that are usually over 40° and often up to 60°.

At the beginning of 1997 we started introducing vetiver grass to farmers in the Gembogl District in Simbu Province following up our previous work over three years in three of the other districts in the Province. This area has the highest mountain in PNG, at 4,059 m, and is very precipitous, but has a high population density. Farmers quickly realized the potential of the vetiver grass system (VGS) and saw it would complement the traditional methods they use for erosion control. In the nearly 18 months since we started, over 2,000 farmers obtained planting material and have either vetiver grass hedges in their gardens or nurseries, so they can make future plantings. All this activity occurred in spite of the worst drought in living memory which prevented any grass being planted in the last six months of 1997. Grass that had had enough time to establish a reasonable root system (two months from planting) before the drought hit, generally survived the dry spell with no difficulty. In some gardens I saw, vetiver was the only plant that was still green or alive during the height of the drought.

We have had good rains since the end of 1997 and the grass has come into its own. We have been inundated with requests for planting material and instruction in its establishment and management. We supply limited amounts of grass for free and find that farmers really use what they get. Farmers are beginning to recognize the importance of plantings the hedges on the contour, rather than in the traditional straight lines. Some have mastered the use of the A Frame to mark out the contour lines.

Recently, we set up a demonstration block for the Department of Works so they can see how vetiver grass could be used to help them stabilize roadside cut-and-fill areas. Given our mountainous terrain, there are many road verges that could benefit from its use. So that hedge establishment will be quick in these vulnerable areas we have been growing the grass in meter-long strips in the nursery so that the root system is well established by the time we plant it out. In an attempt to reduce the cost of nurserying the strips, we have tried large diameter lengths of bamboo, split lengthwise into halves and filled with soil, rather than using sheets of plastic to form folds to hold the soil for rooting. Results to date are encouraging.

The booklet in Melanesian Pidgin that we produced has created a lot of interest in the VGS among people we would not ordinarily be able to contact. Each of the over 100 Community Schools in the Province have given sets of the booklets for use as class readers. This gets across the VGS message as well as

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providing the schools with enough books for each student in the class during reading lessons. Many schools did not previously have enough books for a whole class.

### **A Campaign to grow Vetiver in Thailand**

Following His Majesty the King's initiative, the Department of Land Development (DLD) has launched a national campaign since 1996 to plant vetiver grass throughout the kingdom during the week of 9-15 June with the main objective to use vetiver as a means of environment protection, particularly for soil and water conservation. This year is the third time that the DLD has conducted such a campaign. Due to the phenomenon of El Nino which has affected the climatic condition of Thailand such that there was an unusual drought in certain regions in June, the period of the campaign was extended to cover the whole month instead of just a week as in the past two years.

The DLD has prepared a total of ten million vetiver seedlings at its experimental stations and centers throughout the country for free distribution to farmers, governmental agencies, NGO's and private enterprises interested in planting vetiver. Leaflets describing how to grow and take care of vetiver grass as well as the various uses of vetiver have also been prepared and distributed.

### **Seven Technical Bulletins on Vetiver published in Thailand**

The Sub-committee on Technical Matters, Planning and Evaluation of the (Thai National) Committee on the Development and Campaign for the Utilization of Vetiver according to His Majesty's Initiative has prepared and published (in Thai language) seven technical bulletins on vetiver for country-wide distribution to agricultural workers and farmers. They are: (1) Vetiver Grass, (2) Vetiver Clones, (3) Propagation of Vetiver Grass, (4) Growing and taking Care of Vetiver Grass, (5) Vetiver Grass and Soil and Water Conservation, (6) The Use of Vetiver on Agricultural Areas, and (7) Utilization of Vetiver Grass. A total of 5,000 copies of each, with full illustrations, have been published by the Office of the Royal Development Projects Board (ORDPB). Copies are available free of charge upon request from the ORDPB, or the Department of Land Development, and its affiliated offices and stations throughout the country.

### **His Majesty the King of Thailand's Recent Address related to Vetiver**

His Majesty, King Bhumibol Adulyadej of Thailand, delivered an address at the gathering of a mass from 26 provinces led by the First Army Area at the Marukkhathaiwan Palace on 23 June 1998. The following is an excerpt from His Majesty's address related to vetiver:

“...There is a good example of land reclamation at Khao Cha-ngum Sub-District of Ratchaburi Province where soil was excavated for landfill elsewhere, and only laterite was left behind. No trees were able to grow there. This was exacerbated further by the logging of trees on the mountain high above. The only operation in reclaiming such land was by promoting of the growth of trees with no additional planting but allowing natural vegetation to grow without further cutting. After ten years have passed, this has now proven to be quite successful as the trees are now forming a healthy forest. On the foothill, crop cultivation has been attempted. This has made lateritic soil to become fertile once again due to the deposition of crop residues and the growth of the vetiver grass. One may not understand why this is so. A simple explanation is that as the mountain is covered with trees, when their leaves fall, they are washed downhill by the rain. With no growth of vetiver grass, nor good physical protection, the debris is washed down further to the water body below. Thus no land reclamation is possible. With the growth of vetiver grass and the construction of a check dam, the sediments are not allowed to move into the lake but deposited right there. Thus, rehabilitation is possible. Without such an operation, the land will be barren with only hardpan layer and sand while all the good fertile soil has been eroded into the lake, causing it to be shallow as the result of siltation. As the lake is shallow, the rainwater from the mountain will result in a flood on the lowland. Moreover, the rainwater which runs downhill will move rapidly as there are no trees to obstruct its path, thus damaging crops and other structures. However, such water which moves very fast at first soon runs dry, leaving no water for consumption and irrigation of crops. This is an example of a careless use of nature...”

### **New Varieties of Vetiver released in India**

The root of vetiver contains the world-famous *Khus* (vetiver) oil which is obtained by hydro-or steam-distillation of dried roots cut into pieces. The oil is characterized by a typical *Khus*. While the oil, used as a base in several perfumery and cosmetic products worldwide, fetches a very remunerative price in the international market, its roots also serve as an efficient soil-binder, hence useful for conservation of soil and soil moisture. As such, the vetiver plant is an eco-friendly biomeans of wasteland management. The utility of vetiver might increase significantly if its roots-length and girth both coupled with the oil contents – are genetically improved, so that a dual-purpose variety could be developed. Furthermore, genetic manipulation of the odor value of the oil conferring some pleasantly new aroma may also be a welcome change for the perfumery industry.

Against this backdrop, an intensive screening program of the 45 germplasm collections of India was undertaken. The repeated clonal selection through vetiver assembled from different parts of India was initiated before 1990 at the Central Institute of Medicinal and Aromatic Plants in Lucknow, different

evaluation trials over years resulted in three elite strains which were re-designated as vars. *Dharini*, *Gulabi*, and *Kesari*, respectively and released in 1998 for commercial exploitation. Their agronomic performance and aroma values relative to the check variety, KS-1, are as follows:

*Var. Dharini:* It is a robust, high-tillering and early-flowering variety which registered 94% and >154% superiority over the check var. KS-1 for root and oil yields, respectively. It yielded 3.1 t/ha of dry roots containing 1.25% oil and 38.89 kg/ha of *khus* oil in the pilot-scale trial (PST) compared to 1.6 t/ha of roots with 0.95% oil and 15.3 kg/ha of oil of KS-1. The oil emits the typical *khus* (earthy) note. In addition to being high in oil-yielding, the var. *Dharini* has the longest and thickest roots, hence is very suitable for soil and soil-water conservation as well. Thus, it is a dual-purpose variety of vetiver.

*Var. Gulabi:* It is a medium-tall and very late-flowering variety; it yielded 2.8 t/ha of dried roots containing 1.20% oil (vs. >1.6 t/ha with 0.95% of check) and 33.6 kg/ha oil (vs. 15.3 kg/ha) under the PST, thus registering 75 and 120% higher yields of roots and oil, respectively per unit area. Its oil carries a perceptible rose note, hence its name *Gulabi*.

*Var. Kesari:* It is a tall and late flowering variety that gave 2.9 t/ha of dried roots (+ 81% of KS-1) with 1.02% of content and 29.6 kg/ha oil (+ 93% of KS-1X in PST). Its oil has a saffron (*Kesar*) note as reflected by its name, *Kesari*.

These varieties of vetiver of special perfumery value can be extensively exploited by the essential oil industry. *Var. Dharini* can also be utilized for soil conservation.

### **Vetiver blind**

*“Vetiver blinds, that lend to burning summer noon the scented chill of winter ringhts”.* (written by Biari (1595-1664) in the *Satasai*).

The past few months had been very hot in most tropical Pacific Rim countries as the result of the El Niño phenomenon. Vetiver blinds would be very useful at the time when temperature rises above 40 °C as it was experienced in many cities and towns of the Region. Such conditions have been frequently encountered in India where native people make use of vetiver blinds to cool down the heat of the summer, especially in the burning noon of the Northern part where the heat of the wind on the skin can lead to dehydration. This is the time when no one will venture out of doors, thus abandoning the empty streets. Indians are accustomed to remaining indoors, having the windows of the houses darkened with heavy blinds woven from the wiry, fibrous roots of vetiver – the densely tufted perennial grass that grows wild in the hot regions of India. The vetiver blinds are continually doused with water throughout the day, turning the very wind that can dehydrate a person walking in the sun, into a scented cooling breeze, which passes



through the soaked vetiver releasing a bittersweet aroma. It is believed that this scent has a therapeutic effect in healing heat stroke, headaches, and delaying senile decay.

The scent of vetiver has been referred to by many Indian poets as “*the smell of the first monsoon shower on parched soil*”, or “*the perfume of a rejuvenated earth*”.

The reason behind this effect is the presence of the spongy roots of vetiver so valued for their aroma. Although the essential oil extracted from vetiver roots can be made into a favorite perfume, the one taken from vetiver roots when they are soaked in water is not very volatile, so it is often used as a fixative for other highly volatile perfumes.

Another way to keep the body cool is by applying a paste made from vetiver roots to the skin to bring down body temperature in cases of fever or heat stroke, and rubbing a liniment made from vetiver essential oil to relieve rheumatic pains.

### **Multipurpose Uses of Vetiver Grass**

Vetiver is a miracle plant with multipurpose uses, ranging from environmental protection, rehabilitating problem soils, to direct uses as herbal medicine, animal feed, compost, thatching and other household uses. Below are extract taken from an article, “Vetiver Grass: A Living Barrier conserving and returning Nature to the Land – A Theory on the Prevention of Soil Degradation and Erosion”, published in a fully illustrated book, “Concepts and Theories of His Majesty the King on Development” published by the Royal Development Projects Board, the Department of Technical and Economic Cooperation, and the UNDP to commemorate the 50<sup>th</sup> Anniversary of His Majesty the King’s Accession to the Throne.

1. *Contour Planting of Vetiver across the Slope:* This type of planting yields the best results when vetiver is mature and forms tightly packed rows with no gaps. When rainwater runoff occurs and water-borne sediments encounter the rows, vetiver traps the silt and reduces the speed of the runoff. Thus more water has time to seep down to lower layers of the soil, while the rest flows through. The vetiver root system which can penetrate the soil as far down as 3 m is able to hold the soil effectively and prevent it from being washed away, whether through sheet or gully erosion, or through tunneling. Over time, sediment accumulated at the front of the vetiver row increases and eventually forms a natural terrace.
2. *Solving the Problem of Gully Erosion:* The technique consists of planting one horizontal line of vetiver above the gully and lining up bags of sand or earth to serve as breakers to reduce runoff velocity while the vetiver is taking firm root.
3. *Vetiver Planting on Sloping Land:* Vetiver should be planted in hedgerows on the area of hillside ditches and buns or on the outer edge of the rainy season. Furrows should be plowed and vetiver slips planted therein at the rate of 3-5 slips per hole. Hedgerows should be spaced at vertical intervals of not

more than 2 m. Vetiver will grow and form a dense hedge within 4-6 months. In dry areas, the grass should be cut once every 1-2 months to a height of about 30-50 cm to accelerate tillering. Grass cutting must be carried out everywhere and the cut leaves should be used for mulching.

4. *Controlling Gully Erosion:* Vetiver should be planted across gullies horizontally or in an inverted V shape, called “Sergeant’s Stripes” by His Majesty, pointing against the water flow direction, to prevent the formation of deep gullies. The grass can also be grown in overflow ditches along contour lines to retain water and help spread it to crop cultivation areas. Growing vetiver in this way traps silt and slows down surface runoff.

5. *Preventing Damage to Step Terraces and Hillside Ditches and Buns:* In sloping areas, it has become a popular practice to grow rows of vetiver along edges of terraces or along hillside ditches and buns to prevent damage to these costly structures. (to be continued)

Although donors don’t seem to want to fund The Vetiver Network directly, it looks as though some are interested to finance vetiver activities at a local (regional) level. I recently heard from the Director of the Swiss Development Corporation (SDC), Ambassador Walter Fust, that vetiver had indeed an important role to play in environmental conservation, that the SDC projects often had vetiver components, and that he would alert his regional offices the vetiver coordinators/managers are looking for fund.

It is suggested that those who are interested in this fund should contact the SDC (if they exist) in your country, and see how they might help you in your programs. I will keep the readers posted on other leads as and when they come in.

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