

# VETIVERIM

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**Editor:** *Narong Chomchalow*

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### Publisher:

Office of the Royal Development  
Projects Board  
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Dusit, Bangkok 10300  
Thailand  
Tel.: (66-2) 280-6193  
Fax: (66-2) 280-6206, 629-8915  
E-mail: [vetiver@mail.rdpb.go.th](mailto:vetiver@mail.rdpb.go.th)  
Editor's E-mail: [journal@au.ac.th](mailto:journal@au.ac.th)  
Homepage: <http://prvn.rdpb.go>

### Editorial

#### SARS and ICV-3

The epidemic of the severe acute respiratory syndrome (SARS) which was originated in Guangdong Province of China has caused panic in many countries around the world. From Guangdong, the deadly disease which is caused by corona virus plus a number of other related pathogenic organisms, spread to Hong Kong, Taiwan, Vietnam, Singapore, and Canada, as well as several cities in China including Beijing, Hebei, Inner Mongolia, Shanxi, and Tianjin.

It is by coincidence that the Third International Conference on Vetiver (ICV-3) has been scheduled to be held in Guangzhou, Guangdong Province during 6-9 October 2003, which is only a few months away. With the uncertainty of whether or not the event will take place as planned, many intended participants have not yet registered and sent in the required pre-registration and hotel reservation fees, some did not even prepare the abstracts of their papers.

At one time when the outbreak of SARS was high, there was a census of opinion that ICV-3 should be postponed to a later date. As the Secretary of the Continuing Committee of ICV-3, the Editor sent out ballots to its members, all of whom agreed that ICV-3 should be postponed. However, as the situation has improved, and with the statement of WHO on 23 May 2003 that it "changes Hong Kong / Guangdong travel recommendations", it is now confirmed that ICV-3 will be held in Guangzhou, 6-9 October 2003.

There are, however, several difficulties associated with the prior incidence of SARS. Among these are those related to registration, hotel reservation, submission of abstract of papers for presentation, nomination for the King of Thailand Vetiver Awards, as well as for The Vetiver Network Awards. In addition, there are still some governments' travel restriction of their government officials to China and other SARS infected countries. Without the lift up of this restriction, most scientists from many countries cannot attend ICV-3. It is hoped that sooner or later, such ban on traveling to China will be lifted, and that most scientists from these countries can travel to Guangzhou, China, to attend ICV-3. However, if SARS resumes its epidemic status, the Organizer should make decision to postpone ICV-3 as early as possible.

## Vetiver Glossary 7 - Vetiver and Water: II. Water Quality

This is the eighth part of the series on Vetiver Glossary. The first part, on “Vetiver and Its Related Terms”, was published in Vetiverim 15; the second, on “The Vetiver System”, in Vetiverim 16; the third part, on “Species and Related Taxa”, in Vetiverim 17; the fourth, on “Use and Utilization of Vetiver” in Vetiverim 18; the fifth, on “Vetiver Propagation” in Vetiver 19; the sixth, on “Vetiver Parts Used in Propagation” in Vetiverim 22; and the seventh, on “Vetiver and Water: I. Water Quantity” in Vetiverim 23. 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.

### **Aerobic:**

Webster’s: *adj.* (i) able to live, grow, or take place only where free oxygen is present (ii) of or produced by aerobes

www.dictionary.com’s: *adj.* (i) growing or thriving only in the presence of oxygen (ii) of or related to aerobes (iii) depending on free oxygen or air

Vetiverim’s: *adj.* living or thriving in the presence of oxygen

Explanation: Vetiver has recently been used in wastewater treatment. In most cases it has been done aerobically, implying the need of oxygen for bacterial breakdown of waste materials. Unlike most plants, vetiver roots contain pithy material called aerenchyma that allows oxygen to reach tissues deep underwater. This permits vetiver to support aerobic wastewater treatment in place where other plants fail.

### **Anaerobic:**

Webster’s: *adj.* (i) of or produced by anaerobes (ii) able to live and grow where there is no air or oxygen, as certain bacteria

www.dictionary.com’s: *adj.* living or active in the absence of free oxygen; not requiring air or oxygen for life

Vetiverim’s: *adj.* living or thriving in the absence of oxygen

Explanation: Since vetiver can work only in the presence of oxygen in the process of wastewater treatment, thus in the absence of oxygen, such treatment has to employ certain anaerobic bacteria to break down waste materials.

### **Black Water:**

Webster’s: none

www.dictionary.com’s: none

Vetiverim’s: *n.* wastewater that contains high amount of nutrients and other pollutants such as water from toilet septic tanks, city sewage, treatment plants, tanneries, slaughterhouses, piggeries, etc.

Explanation: Domestic and industrial effluents normally contain black-colored wastewater, thus the name ‘black water’. Due to their high BOD, black water needs to be treated first before disposal. Vetiver has been used successfully in treating discharge of surplus effluent in Queensland, Australia; Guangzhou, Guangdong, China; and a few other countries.

### **BOD (the acronym of Biological Oxygen Demand):**

Webster’s: (none)

www.dictionary.com’s: *n.* the amount of oxygen required by aerobic microorganisms to decompose the organic matter in a sample of water, such as the one polluted by sewage. It is used as a measure of the degree of water pollution

Vetiverim’s: *n.* the amount of oxygen required (in mg/L over 5 days at 20°C) by microbes to decompose the organic matter in polluted water

Explanation: Aerobic microorganisms consume oxygen to decompose organic matter. The amount of oxygen required by these microorganisms is an indicator of the amount of pollution in

wastewater. The BOD test measures the oxygen consumed (in mg/L) over 5 days at 20°C. The higher the BOD the higher the concentration of polluted water. Vetiver is well known for its ability to survive in polluted water with high BOD. Thus it is being used as additional organism in the treatment of wastewater.

**COD (the acronym of Chemical Oxygen Demand):**

Webster's: none

www.dictionary.com's: none.

Vetiverim's: *n.* the amount of chemical oxidant required to break down the organic matter in polluted water

Explanation: COD is an indicator of the concentration of pollutants in wastewater. The COD test can be completed in a few hours, and thus, is preferable to be used in substitution for BOD, which takes a longer time. COD values are usually greater than BOD for a given wastewater.

**Constructed Wetland:**

Webster's: (none)

www.dictionary.com's: (none)

Vetiverim's: *n.* a wetland constructed for the purpose of wastewater treatment

Explanation: Emerged aquatic plants such as cattails, bulrushes and reeds provide a dense cover and an oxygenating substrate for bacteria in the root zone. As vetiver thrives in wetlands, it is highly suitable for the wetland system, whether natural or constructed, to remove waste products, pollutants, or nutrients from wastewater, polluted water, or eutrophicated water. In constructed wetland, a waterproof barrier is usually placed below the substrate to isolate the wastewater from the groundwater.

**Contaminant:**

Webster's: *n.* a substance that contaminates another substance, the air, water, etc.

www.dictionary.com's: *n.* a substance that contaminates

Vetiverim's: *n.* a substance that contaminates another substance

Explanation: It is a general term used to describe a substance that 'contaminates' other substance. The word 'contaminate' has a broad meaning including 'to make impure', 'polluted', 'infected' with chemical impurities (such as heavy metals), pollutants, and pathogenic microorganisms. Specifically, 'contaminant' includes any foreign material / particle / substance / gas / microorganism which is not a normal component of water such as heavy metals, suspended colloidal matter (salts of lead / arsenic, sulfur compounds, etc.), inorganic substances (nitrates / phosphates, etc., organic gases (methane, etc.), pathogenic organisms / radioactive substances, etc.

**Contaminate:**

Webster's: *v.* to make impure, infected, corrupt, radioactive, etc. by contact with or addition of something; pollute; defile; sully; taint.

www.dictionary.com's: *v.* **1** to make impure or unclear by contact or mixture **2** to expose to or permeate with radioactivity

Vetiverim's: *v.* to make impure, polluted or infected

Explanation: Terrestrial or aquatic environment may sometimes be made impure, polluted or infected with chemical impurities (such as heavy metals), pollutants, and pathogenic microorganisms.

**Contamination:**

Webster's: *n.* **1** a contaminating or being contaminated **2** something that contaminates

www.dictionary.com's: *n.* **1** the act or process of contaminating **2** the state of being contaminated; pollution

Vetiverim's: *n.* The process of making something impure, polluted, or infected

Explanation: (Same as contaminate)

**Decontaminate:**

Webster's: *v.* to get rid of a polluting or harmful substance, as poison gas, radioactive products, etc.

www.dictionary.com's: *v.* to eliminate contamination in; to make safe by eliminating poisonous or otherwise harmful substances, such as noxious chemicals or radioactive material

Vetiverim's: *v.* to remove polluting or harmful substance from a given object

Explanation: Water could be decontaminated by sedimentation (for coarse material), filtration (for suspended material through mechanical filters/biological membranes, etc.), absorption (detoxification through uptake by vetiver roots/inert chemical binders such as activated charcoal etc.), or through filtering (as through a vetiver wetland combined with microbial bioremediation).

**Effluent:**

Webster's: *n.* a thing that flows out or forth; specifically *a*) a stream flowing out of a body of water, *b*) the outflow of a sewer, septic tank, etc.

www.dictionary.com's: *n.* **1** something that flows out or forth, esp. an outflow from sewer or sewage system, a discharge of liquid waste, as from a factory or nuclear plant **2** water mixed with waste matter

Vetiverim's: *n.* washing water from septic tanks, plant nurseries, feedlots, leather and textile tanneries, sheds, slaughterhouses, piggeries, etc.

Explanation: Industrial effluents from chemical / water treatment and washing plants such as from dairy plants / food and chemical processing units / leather and textile tanneries. Such leachates could enter into water as industrial effluents.

**Eutrophic:**

Webster's: *adj.* designating or of a body of water, esp. a lake or pond, rich in nutrients which cause excessive growth of aquatic plants, esp. algae; the resulting bacteria consume nearly all the oxygen, esp. during warm weather, choking the fish, etc.

www.dictionary.com's: *adj.* having waters rich in mineral and organic nutrients that promote a proliferation of plant life, especially algae, which reduces the dissolved oxygen content and often causes the extinction of other organisms

Vetiverim's: *adj.* designating a body of water rich in mineral and organic nutrients that promote a proliferation of aquatic plants, esp. algae, which reduces the dissolved oxygen content resulting in the death of other aquatic organisms.

Explanation: The proliferation of aquatic plants, especially blue-green algae stimulated by the presence of high concentration of mineral and organic nutrients, results in the prolific growth of bacteria which consume nearly all the oxygen, especially during warm weather, choking the fish, and often causes the extinction of other organisms.

**Eutrophication:**

Webster's: (none) a noun form for 'eutrophic'

www.dictionary.com's: *n.* having waters rich in mineral or organic nutrients that promote a proliferation of plant life, esp. algae, which reduces the dissolved oxygen content and often causes the extinction of other organisms; used of a lake or pond

Vetiverim's: *n.* a phenomenon whereby a body of water is enriched with mineral and organic nutrients that promote a proliferation of aquatic plants, esp. algae, which reduces the dissolved oxygen content resulting in the death of other aquatic organisms.

Explanation: See the explanation in 'eutrophic'.

**Eutrophicated Water:**

Webster's: none but can be deducted from 'eutrophic' and water

www.dictionary.com's: none but can be deducted from 'eutrophic' and water

Vetiverim's: Water rich in mineral and organic nutrients that promote a proliferation of aquatic

plants, especially blue-algae, which reduce the dissolved oxygen content, and often causes the extinction of other organisms.

Explanation: The characteristic of eutrophicated water is the promotion of algal growth due to the presence of high amounts of N and PO<sub>4</sub>. Depending on the origin, it can be classified into domestic, agricultural, and industrial eutrophicated water.

### **Grey Water:**

Webster's: none

www.dictionary.com's: none

Vetiverim's: *n.* wastewater that contains low amount of nutrients and other pollutants such as water from sink, shower, flushing, dish washer, washing machine.

Explanation: Grey water is water derived from human domestic activities which is not as 'black' as the ones from septic tanks, sewage, etc.

### **Hydroponics**

Webster's: *n.pl.* the science of growing, or the production of, plants in nutrient-rich solutions or moist inert material, instead of the soil

www.dictionary.com's: *n.* **1** cultivation of plants in nutrient solution rather than in soil **2** a technique of growing plants (without soil) in water containing dissolved nutrients

Vetiverim's: *n.* cultivation of plants in nutrient solution

Explanation: In order to have controlled cultivation with respect to qualitative and quantitative supply of nutrients, as well as to harvest root products vis-à-vis their possible biotransformation (under the controlled conditions of soil microbes in water), the plants species, including vetiver could be grown in aerated water tanks. In vetiver, the quality of essential oil produced in the root is very much influenced by the soil microflora, and as such hydroponics could be useful to realize biotransformation of essential oil *in planta*.

### **Hydroponic System:**

Webster's: none

www.dictionary.com's: none

Vetiverim's: *n.* a system of growing aquatic plant to remove or trap/filter contaminants present in the leachate or effluent

Explanation: In addition to that explained above under hydroponics, certain plants that have the capacity to absorb toxic compounds, including heavy (Hg, Pb, etc.) and precious metals (Ag, Au etc.) metals could be used as water purifiers / phytominers. Since vetiver can be grown in wastewater containing contaminants, it is used to purify wastewater.

### **Land Irrigation System:**

Webster's: none

www.dictionary.com's: none

Vetiverim's: *n.* a system of prevention measure of water contamination which employs a selected plant species grown as a strip to trap or filter sediment-bound chemicals or elements.

Explanation: It is a system of irrigation which works through the removal or trapping/filtering of contaminants present in effluent consisting of washing water from septic tanks, feedlots, cattle sheds, slaughterhouses, piggeries, etc. by plants which can survive both with and without stagnant water. Vetiver has been used to perform the function of removing or trapping contaminants and is found to work effectively. In order not to be confused with 'Land Irrigation' which is the normal type, it is suggested that the term be called 'Bio-irrigation System'.

### **Leachate:**

Webster's: (none) [*leach* is defined as *v.* **1** to cause (a liquid) to filter down through some material **2** to subject to washing action of a filtering liquid **3** to extract (a soluble substance) from some material by causing water to filter down through the material]

www.dictionary.com's: *n.* a product or solution formed by leaching, esp. a solution containing contaminants picked up through the leaching of soil

Vetiverim's: *n.* a liquid filter down through some material or from agricultural, industrial, or garbage landfill sources which are contaminated with nutrients, toxic substances, heavy metals and other hazardous matters.

Explanation: Depending on the sources, leachates are classified as agricultural, domestic and garbage landfill leachates.

### **Pollutant:**

Webster's: *n.* something that pollutes, esp. a harmful chemical or waste material discharged into the water or atmosphere

www.dictionary.com's: *n.* **1** something that pollutes, esp. a waste material that contaminates air, soil, or water **2** waste matter that contaminates the water, air or soil

Vetiverim's: *n.* something that pollutes water, soil or air

Explanation: Pollutant include: (i) heavy metals, e.g. Pb, Hg, Cu, Cd, Cr, (ii) pesticide residues, e.g. insecticides, fungicides, herbicides, (iii) arsenic compounds, (iv) other harmful compounds.

### **Pollute:**

Webster's: *v.* to make unclean, impure, or corrupt; defile, contaminate; dirty

www.dictionary.com's: **1** to make unfit or harmful to living things, esp. for the addition of waste matter **2** to make foul, impure or unclean; to defile

Vetiverim's: *v.* to make unclean or impure

Explanation: The term 'pollute' implies complete befoulment, decay, or corruption through contamination.

### **Polluted Water:**

Webster's: none, but can be deducted from 'pollute' and 'water'

www.dictionary.com's: none, but can be deducted from 'pollute' and 'water'

Vetiverim's: Water contaminated with harmful substances resulting from agricultural and industrial processes

Explanation: Polluted water contains such substances as: (i) heavy metals, e.g. As, Pb, Hg, Cu, Cd, Cr, (ii) pesticide residues, e.g. insecticides, fungicides, herbicides, (iii) arsenic compounds, and (iv) other harmful compounds.

### **Pollution:**

Webster's: *n.* a noun form of 'pollute'

www.dictionary.com's: *n.* **1** the act or process of polluting, or the state of being polluted, esp. the contamination of soil, water or the atmosphere by discharge of harmful substances **2** something that pollutes; a pollutant or a group of pollutants **3** the state of being contaminated with harmful substances

Vetiverim's: *n.* **1** the state of being contaminated with harmful substances **2** contamination of soil, water, etc. by the discharge of harmful substances

Explanation: Indiscriminate discharge of any and every substances that is not normally a component of water and water bodies (e.g. industrial effluents / agricultural residues/ sewerage and tannery plants etc.) into the water bodies lead to water pollution.

### **Sludge:**

Webster's: *n.* any heavy slimy deposit, sediment, or mass, as the waste resulting from oil refining, the mud brought up by a mining drill, the precipitate in a sewage tank, the sediment in a steam boiler or crankcase, etc.

www.dictionary.com's: *n.* the precipitate produced by sewage treatment; any thick messy substance

Vetiverim's: *n.* biosolids remaining after sewage treatment

Explanation: Sludge creates environmental problem if not properly managed. Vetiver can be used to reduce the ill effect of sludge. Sludge may be applied to agricultural fields as a soil amendment, composted or palletized, if proper sanitary guidelines are followed.

### **Standing Shallow Water:**

Webster's: (none)

www.dictionary.com's: (none)

Vetiverim's: Shallow water that is maintained throughout most of the year in a basin

Explanation: This is the case of swamps, wetlands, bogs, marshes, etc. where standing shallow water is maintained throughout most of the year. As it can survive well in water and, together with its high rate of water consumption and tolerance to a high degree of water contamination, vetiver is ideal to be used to solve the problem of such a situation.

### **Turbidity:**

Webster's: *n.* a noun form for 'turbid' which is defined as "muddy or cloudy form having the sediment stirred up"

www.dictionary.com's: *n.* muddiness created by stirring up sediment or having foreign particles suspended

Vetiverim's: muddiness formed by stirring the sediment

Explanation: The clarity of water is impeded by the amount of suspended sediment. Aquatic plants including vetiver can be used to absorb sediment-bound organic matter present in the water. Turbidity is measured by determining light transmission through the water.

### **Wetland:**

Webster's: *n.* **1** swamps or marshes **2** an area of land characterized by swamps, marshes, etc. that is preserved for wildlife

www.dictionary.com's: a lowland area, such as a marsh or swamp, that is saturated with moisture, esp. when regarded as the natural habitat of wildlife; a low area where the land is saturated with water

Vetiverim's: *n.* **1** a lowland area saturated with water **2** swamp or marsh where aquatic plant is normally grown

Explanation: Wetlands, either natural or constructed, can be used for water purification in the process of phytoremediation. Aquatic plant growing in the wetland can remove or trap/filter contaminants present in leachate or effluent drained into the water body. Vetiver has been used to remove heavy metals, toxic substances, pesticide residues, chemical elements, and other hazardous materials present in contaminated water.

## **Sources of Commendable Names of Vetiver\***

Vetiver has been appraised with many commendable names by a number of vetiver experts on various occasions. These names and their sources of origin are given, in chronological order of their first appearance, below:

**An Ideal Plant:** In his article, "Vetiver Grass (*Vetiveria* spp.) – *The Ideal Plant* for Vegetative Soil and Moisture Conservation", John C. Greenfield (1989) stated that, "...Vetiver is a climax plant capable of growing over an extremely wide range of soils and climates. It meets all the criteria of a vegetative soil conservation plant. Vetiver grass is not just another grass, it is a special grass..."

**A Miracle Grass:** King Bhumibol Adulyadej of Thailand, in his first statement on vetiver made on 22 June 1991, described vetiver as *a miracle grass* as it has so many beneficial characteristics

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\* By Narong Chomchalow, Coordinator, Pacific Rim Vetiver Network, ORDPB, Bangkok

(Chomchalow 1992). This name has been used as the theme of the First International Conference on Vetiver, “Vetiver: *A Miracle Grass*”, held in Chiang Rai, Thailand in February 1996.

**A Living Wall:** His Majesty the King of Thailand made a remark, on 20 February 1992, of the vetiver plant as *a living wall* as its clumps are able to slow down the rapid movement of water and wind (Chomchalow 1992). The direct benefits of this *living wall* include: (i) increasing organic matter and moisture in front of the hedgerow, and (ii) acting as a sieve, not allowing any debris to pass through but to accumulate in front of the hedgerow.

**A Living Dam:** During the royal visit to Huai Sai Royal Development Study Center at Cha-am, Phetchaburi, on 22 July 1992, His Majesty the King of Thailand summoned the staff that vetiver acts as *a living dam* which helps improve physical and chemical properties of the soil (Chomchalow 1992). In the Editorial of Vetiverim-6 (Oct.'98), the author (Chomchalow 1998b) used the term, *a living dam*, to describe one of the amazing properties of the vetiver grass whose roots and clumps act as *a living dam*. Its direct benefits include: (i) adhering soil particles thus reducing soil erosion, (ii) increasing the amount of organic matter collected in front of the hedgerow, (iii) increasing moisture content in front of the hedgerow as the result of accumulation of organic matter and water, and (iv) filtering out toxic substances brought in by water and, after being absorbed in the plant tissues, these will slowly disintegrate, while clear and clean water is able to pass through this living dam.

**Glory to the Land:** The author (Chomchalow 1992) used this phrase as the title of his booklet, *Glory to the Land*, which “intends to participate in the innovative endeavors of His Majesty the King of Thailand in arresting soil erosion and environmental degradation. It signifies His Majesty himself, whose presence in his kingdom is *glory to the land*; it also signifies the vetiver itself by virtue of its unique property in being suitable to be used as a living hedge, which is resistant to fire, drought, diseases and pests, which can grow on most soils in a wide range of climatic conditions, and which can improve the moisture content of soil profile without competing with crops.”

**A Miracle Herb:** In his article, “Vetiver: *A Miracle Herb*”, published in ‘The Herbalists’ No. 61, 1995, Jen Cozart described the conventional values of vetiver. In addition, he also stated that, “vetiver has been recorded as a medicinal plant in the Ayurveda. It has a special use as a tea for curing hangovers and calming the nerves of people and horses in Honduras. In folk medicine, it is used to induce sweating and as a stimulating agent. Herbalists appreciate vetiver for its fragrant roots and as an insecticide or as oil for perfume.” (Anon. 1996b).

**A Living Barrier:** In the illustrated book, “Concepts and Theories of His Majesty the King on Development” jointly published by the Office of the Royal Development Projects Board, the Department of Technical and Economic Cooperation, and the United Nations Development Programme, there is an article, “Vetiver Grass: *A Living Barrier – Conserving and Returning Nature to the Land - A Theory on the Prevention of Soil Degradation and Erosion*” (ORDPB 1996).

**A Living Soil Nail:** Diti Hengchaovanich (1997) described vetiver as *a living soil nail* as “its innate strength and vigor enables it to penetrate through hard pan, between boulders, weak spots between rock layers; it also manages to punch through asphaltic concrete pavement. It thus behaves like *a living soil nail* of 2-3 m depth commonly used in alternative ‘hard approach’ slope stabilization work”. In the Editorial of Vetiverim-6 (Oct.'98), the author (Chomchalow 1998b) used the term, *a living nail*, to describe one of the amazing properties of the vetiver grass “whose roots are able to penetrate deep down the soil of hard structure, thereby breaking it, making it friable and porous enough for air and water to pass through. Its direct benefits are to hold soil particles together on steep slope where soil cover is cut to make highways or railroads, to prevent soil erosion of the embankment, and to penetrate hard pan of soil layer impervious to water, thus making water to pass through such layer.”



- A Wonder Grass:** This is the nickname of vetiver given by the staff of the Queensland Department of Main Roads as it has embraced by Southern Downs road makers as an environmentally-friendly way to prevent roadside erosion (Truong 1998). This name was also used by John Sanderson in the article, “A *Wonder Grass* for All Industries”, published in “Australian Grain: Northern Focus”, Vol. 10, No. 2, May-June 2000 (Anon. 2000c).
- An Amazing Grass:** In his booklet, “Amazing Thai Vetiver”, the author (Chomchalow 1998a), described vetiver as *an amazing grass*. It was also used as the topic of a group discussion (Vetiver: *An Amazing Grass*) at the Third Thai National Conference on Development and Promotion of the Utilization of Vetiver Grass held in Bangkok 14-15 January 1999.
- A Versatile Plant:** In the Editorial of Vetiverim-6 (Oct.’98), the author (Chomchalow 1998b) concluded that vetiver is really *a versatile plant* with multiple uses and benefits to mankind. Also, in John Sanderson’s article, “A Wonder Grass for All Industries”, vetiver was described as *a versatile plant* (Sanderson 2000).
- A Magic Grass:** Vetiver was experimentally used since 1993 to provide shade for sheep in the Mitchell Grass Downs region of Western Queensland, Australia by Greg Bortolussi, a research scientist of the Queensland Department of Primary Industry. After six years, it was found that vetiver has been a great success, and the graziers in the Julia Creek region have called vetiver *a magic grass* (Truong 1999).
- A Plant that Never Dies:** This name was given by the farmers in the northern part of Senegal along the Senegal River to identify the plant. The term was used and posted on large banners at agricultural fairs and booths, and in 2000, as the title of presentations in Senegal by members of the ‘Club Vetiver’ (Juliard, pers. comm.).
- An Essential Grass:** This name is a part of the title of the book, “Vetiver Grass: *An Essential Grass* for the Conservation of Planet Earth”, compiled and edited by John C. Greenfield (2002). In his words, “Vetiver is a plant that can protect dams and harbors from siltation. It is a plant that can improve crop production through moisture and nutrient conservation. A plant that is fire tolerant and live stock resistant, but a plant that will grow only where man plants it. A plant that can last over 200 years as a natural hedge, but can easily be ‘destroyed’ if it is no longer wanted.”
- A Unique Plant:** In his book, “Vetiver Grass: An Essential Grass for the Conservation of Planet Earth”, John C. Greenfield (2002) gave the title of Chapter I as, “Vetiver Grass - *A Unique Plant*”. And, at the end of Chapter II, he emphasized the uniqueness of the vetiver grass as, “Vetiver grass has been *a unique plant* for centuries. Chemists, botanists, sultans, sheiks, kings, farmers, traders, and even the ‘tax man’ in the tropics have devoted more time to this particular plant in the past than just about any other.”
- An Eco-Friendly Grass:** Rao and Suseela (2002) stated that vetiver has wide ecological amplitude, which should be exploited for eco-development. The grass with its tuft-forming habit and thick root system greatly helps in checking soil erosion. Small-scale village-level industries based on vetiver could be established for vetiver oil extraction as well as for straw bale and hand-made paper manufacturing; this can reduce the stress on bamboo resources. Such activities could improve the economy of the poor; it also helps in the conservation and eco-development of the locality.
- A Multi-Purpose Grass:** His Majesty the King of Thailand summoned the executives of the National Research Council of Thailand on 22 November 2002 at Klai Kangwon Palace, Hua Hin, Prachuap Khiri Khan as follow: “...Vetiver is *a multi-purpose grass* with numerous uses. In addition to being used conventionally in soil and water conservation, environmental reclamation, etc., its roots which penetrate deep into the soil help to absorb toxic substances brought in by water; more over, the vetiver clumps planted around cropping area can prevent termite damage to the crop’s produce; it also prevents snakes from coming into the field...” (Anon. 2003).

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### Plenary Reports to be Presented at ICV-3

In the Second Announcement of the Third International Conference on Vetiver: Vetiver and Water, which was issued in March 2003, mention has been made about “Plenary Reports” which will be presented during 10:30-17:35 of 6 October 2003. The following statement was issued, “Each presentation comprises two parts. The main presentation gives a comprehensive introduction, to be presented by an established vetiver specialist. The secondary presentations provide case examples to support the main topic. The main and secondary presenters will be at the invitation of the IVC-3 Organizing Committee.” The Organizer has approached Dr. Paul Truong and Dr. Narong Chomchalow to help finalized the program for the Plenary Reports. In addition, there will be a special session for the presentation of the King of Thailand Vetiver Award Winning Papers after the Plenary Lectures, followed by viewing of the poster and exhibit. The new program for the whole day of 6 October is presented below:

**08:30-10:00 – Opening Ceremony**

**10:00-10:30 – Coffee Break**

**10:30-16:10 – Plenary Lectures\***

*10:30-11:00 - Plenary No.1*

Topic: Vetiver Grass - A World Technology and its Impact on Water

Speaker: Richard G. Grimshaw

*11:00-11:40 - Plenary No.2*

Topic: Vetiver System for Water Quality Improvement

Speaker: Paul Truong

*11:40-12:20 - Plenary No.3*

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\* Secondary presentations of each report have not yet been determined at this early stage. They are expected to provide case examples to support the main topic. Their names and topics will be presented in the next issue of *Vetiverim*.

Topic: Vetiver Systems for Agriculture Development

Speaker: Xu Liyu

**12:20-13:30 - Lunch**

13:30-14:10 - Plenary No.4

Topic: Vetiver System for Slope Stabilization

Speaker: Diti Hengchaovanich

14:10-14:50 - Plenary No.5

Topic: Vetiver System for Land Reclamation

Speaker: Xia Hanping

14:50-15:30 - Plenary No.6

Topic: Vetiver System and Private Sector

Speaker: Criss L. Juliard

**15:30-15:50 - Coffee Break**

15:50-16:30 - Plenary No.7

Topic: Other Uses, and Utilization of Vetiver

Speaker: Narong Chomchalow

**16:30-17:50 - Presentation of the King of Thailand Award Winning Papers**

16:30-16:50 Research: Agricultural Application

16:50-17:10 Research: Non-Agricultural Application

17:10-17:30 Dissemination: Governmental Agencies

17:30-17:50 Dissemination: Non-Governmental Agencies

**18:00-19:00 Visit Poster and Exhibition**

**19:00 onwards: Dinner or Free Evening**

<b>Guidelines for Preparing Abstracts and Technical Papers for Presentation at ICV-3</b>
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**Abstract:** Please limit the content of the abstract to 400 words and place it before the main paper. .

**Text:** The text of the main paper is limited to approximately 6,000 words or 10 pages. However, to account for figures, tables, photos, and other illustrations, a 12-page maximum will be considered.

**Key words:** Limited to 10 words at maximum.

**Contact:** Email of the author or one of the authors must be provided.

**Word Processing:**

Microsoft Word 95, 97 or 2000 formats are recommended for preparation of abstracts and full papers.

The adopted font is Times New Roman for English, and Song for Chinese. Use A-4 size paper (210mm x 290 mm) with the margins of 2.5 cm for the right, top, and bottom, and 3 cm for the left.

All line spacings are at Multiple 1.25.

Paper title is in font size of 16, bold black, centered

Name of author(s), bold, organization and address are in font size of 12, centered, and in *italic*.

Text of paper and abstract is in font size of 11.

The first level title of the paper in font size 12.

Table is in font size of 11, line spacing at Single.

The first level title of the paper is labeled with 1, 2, 3, ..., bold black and with one blank line above and below the line. The second level title is labeled with 1.1, 1.2, 2.1, ... in font size of 11, bold black with one blank line only above the line. The third level title with 1.1.1, 1.1.2, 2.1.1,... in font size of 11 and with italic; when the title surpasses 3 levels, please indicate with 1), 2), 3), ..., and then A, B, C, ...

**Presentation**

Figures, photographs and tables are inserted into main text at proper places. Title of table is in font size of 11, bold black and in left-aligned. Words in table are in font size of 11. Graphic illustration is in font size of 11, placed below the figure and centered. Alternatively, all photos can be put together as Appendix after the list of References.

To improve clarity and reduce file size (for faster transmission), it is advisable to convert all graphs, photos and illustrations to Black and White (Gray scale). If this is not practical then choose dark colors.

References must be included, and alphabetized the last name of the first author. Format of reference: author, (more than two authors use comma to separate), year of publishing, title of paper, journal's name, volume number, issue number, pagination; in font size of 11. For example (Chomchalow and Barang, 2002; Truong, 1999; Xia, *et al*, 2000):

Chomchalow N, and Barang M. (eds.). 2002. Proceedings of the Second International Conference on Vetiver. The Office of the Royal Development Projects Board, Bangkok.

Truong PNV. 1999. Vetiver grass technology for mine tailings rehabilitation. In: Proceedings of The First Asia-Pacific Conference on Ground and Water Bioengineering for Erosion Control and Slope Stabilization. Manila, The Philippines. pp. 315-325.

Xia HP, Liu SZ, and Ao HX. 2000. Comparative study on salt resistance of *Vetiveria zizanioides*, *Paspalum notatum*, and *Alternanthera philoxeroides*. Chinese Journal Applied & Environmental Biology, 6: 7-17.

**Biodata:** A brief introduction of the first author or speaker (about 100 words) should be indispensable in the end of the paper, which is in font size of 11.

**Submission:** Please email/fax/mail your full papers the following addresses. For email please send in Microsoft Word format.

Our ISP limit for each file is about 1MB, it will not accept file much larger than the limit, so if your paper is bigger than that in Word, please split it in to 2 or 3 files (we can join them up here), or Zip it or use Abode PDF.

**For foreign participants:**

Dr. Paul Truong  
23 Kimba St, Chapel Hill  
Brisbane, Q 4069  
Email: Truong@uqconnect.net  
Fax: 61-7-3378 3187  
Tel: 61-7-3378 3174

**For Chinese participants:**

Dr. Xia Hanping  
South China Institute of Botany  
Chinese Academy of Sciences  
Guangzhou 510650  
Email: xiahanp@scib.ac.cn  
Fax: 86-20-8523-2831  
Tel: 86-20-8523-2403

**Poster**

Each poster presentation displayed should include:

Title  
Name and address of authors  
Abstracts  
Research objective  
Experimental materials and methodology  
Key conclusions  
Major references

Each poster presenter will be provided with two boards of 90 cm by 120 cm each for displaying.

#### **Publication**

Papers accepted for oral presentation, submitted by the deadline and presented by one of the author at the Conference, will be published in the Technical Papers Section of Conference Proceedings.

Papers accepted for oral presentation, submitted by the deadline and *not presented* by one of the author at the Conference, will be published in the Poster Papers Section of Conference Proceedings.

Papers accepted for oral presentation, but *not submitted by the deadline will not be published* in Conference Proceedings. These papers will be distributed separately during the Conference.

**Abstract submission deadline:** 30 June 2003 by mail, fax or email; email is preferred.

**Full Papers submission deadline:** 31 July 2003. If email is not available, please mail or fax hardcopy to the below addresses.

### **Meeting of the Thai National Vetiver Operational Plans**

According to the resolution of the cabinet meeting held on 1 April 2003, the cabinet agreed with the proposals submitted by the Office of the Royal Development Projects Board to administer the Royal Initiated Development and Promotion of the Utilization of Vetiver Grass Project (2002-2006), and recognized it as one of the important government policies to fulfill the royal initiatives.

The Government assigned the concerned agencies to apply the Vetiver Master Plan regarding the use of vetiver grass as a framework in formulating their own operational plans. Accordingly, the Bureau of the Budget is to be responsible for allocating budget to support the implementation of the activities of those agencies as deemed appropriate.

The Office of the Royal Development Projects Board organized a meeting among concerned agencies to jointly consider the operational plans for the implementation of the Royal Initiated Development and Promotion of the Utilization of Vetiver Grass Project on 30 April 2003 at Maruay Garden Hotel in Bangkok. Representatives from 43 concerned government agencies attended the meeting whose objective was to boost the importance of the use of vetiver grass, particularly for water and soil conservation, in accordance with the main tasks of each agency. The implementation should embrace the major work plans of the Third Vetiver Master Plan, in terms the research, study and experimentation, the extension, public relations, and administrative activities.

To accomplish the Third Vetiver Master Plan, the ORDPB will systematically coordinate among the agencies and thoughtfully filter their operational plans on the use of vetiver grass so that there will be no repetitions in the operation while fitting to the main tasks of each agency. Then, the ORDPB will gather those operational plans and inform them to the Committee of the Royal Initiated Development and Promotion of the Utilization of Vetiver Grass Project. At the same time, the ORDPB will also present the operational plans to the Budget Bureau to be used as the basis for effective allocation of the budget to each agency for the implementation of the project.

### **Vetiver Root – Oil and Its Utilization**

The Pacific Rim Vetiver Network (PRVN) has recently published another technical bulletin, entitled, “Vetiver Root – Oil and Its Utilization”, as the first bulletin for 2003. It was written by Dr. U.C. Lavania, Deputy Director, Central Institute of Medicinal and Aromatic Plants, Lucknow, India. This 12-page bulletin, including 4 color pages, was edited by Dr. Narong Chjomchalow and Dr. Samran Sombatpanit. The abstract of this paper is presented below:

*Vetiver, a native plant of India is known for its perfumery and medicinal value since ancient times, much before the world became familiar with rose scents. It is a gift of India to modern world,*

*and finds its greatest use in modern perfume creations. The essential oil distilled from the roots of vetiver, is one of the most complex mixtures of sesquiterpene alcohols, ketones and hydrocarbons, and also one of the most viscous oils with an extremely slow rate of volatility. Slow evaporation rate of vetiver oil coupled with its pleasant aroma makes it a perfume by itself. Its high solubility in alcohol that improves its miscibility with other perfume material, makes it unique perfumery resource, for which no synthetic substitute is yet available. The oil and its constituents are used extensively for blending oriental type of perfumes and floral compounds, as well as in other cosmetic and aromatherapy applications. It is very persistent and one of the finest fixatives known. Vetiver oil is a main ingredient in 36% of all western quality perfumes and 20% of all men's fragrances. Dried roots are used as sachets / stuffing material to prepare ventilating screens that provide cool air effect when moistened with water. The annual world trade in vetiver oil is estimated to be around 250 tons, with Haiti, Indonesia (Java), China, India, Brazil, Japan being the main producers, and USA, Europe, India, and Japan being the main consumers. The essential oil produced in different countries possesses distinct odor note – Reunion (Bourbon) oil with roseate note is highly regarded in perfumery industry, but the vetiver (Khus) oil obtained from wild 'Khus' roots in India is considered to be the best for its balsamic woody note. A state of art account about vetiver oil as a valuable resource from utilitarian viewpoint is provided.*

Copies of this 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 Royal Development Projects Board.

### Letters to the Editor

#### **Vetiver Planting Material**

We are a small grower of ornamental plants and trees in Puerto Rico getting started in vetiver propagation. At this time we have one client considering vetiver in quantities that we could not deliver by digging up our own slips. Although this project is still at a very early stage, we would like to consider tissue culture as a possible source of planting material. Could you give me an idea of pricing and lead time required to purchase from you? How would you ship to us? Puerto Rico is USA territory in the Caribbean Sea and is part of the USA postal system. Agricultural regulations would be as for other USA locations. Your input would be greatly appreciated in order to give this client realistic pricing and delivery plans as soon as possible.

AlbertoRodriguez  
<alrod@bigfoot.com>

could you provide me with the name of a supplier of vetiver grass propagation material or seed in Thailand? I am currently working with an ADB funded Northwestern Rural Development Project working with the provincial Departments of Rural Development in Battambang, Seim Reap, Banteay Meanchey and Odtar Meanchey in northwest Cambodia. I am based in Sisophon close to Arunyapraphet. The project is principally about building roads. Leighton Williams, the engineer-hydrologist is considering the possibility of planting vetiver to hold road embankments. As the community development person I am very interested in this as an opportunity for farmers to earn money. Can you provide me with a supplier of plants in Thailand or Cambodia from whom we could obtain start up propagation material? If you know of anybody who can provide me with information on a successful farmer-based production system so much the better.

John McKinnon  
<john.mckinnon@kinsa.co.nz>

*There have been a number of quotations of the vetiver slips for sale in the Vetiver Discussion Board <<http://www.vetiver.com/cgi-bin/discus/discus.cgi>>. As for the detail of vetiver tissue culture plantlets, kindly contact Dr. Uthai Charanasri of the Doi Tung Development Project at <[c.uthai@mailcity.com](mailto:c.uthai@mailcity.com)>. - Ed.*

### **Request for Publication**

I am working as a tea scientist in South India from 1969 and have taken keen interest in plant improvement and agronomy of tea plant. I have been wanting to contact you ever since I read your publication “Manual of International Training Course on the Vetiver System” in the website. It is terrific and indeed a very useful publication covering all aspects of the ‘wonder plant’. We are using and promoting vetiver in tea plantations in India particularly in the last five years. I am sure you are aware that the first ever report on vetiver as soil conservation plant was reported from Ceylon in the 1940s by T. Eden of the Tea Research Institute of that country. Unfortunately, his work went unnoticed by most people until the World Bank came to the scene in the 1980s!

I shall be grateful if you could kindly let me have a copy of your valuable publication for our reference. I have been corresponding with our ‘Guru’ on vetiver, Mr. Richard Grimshaw, who inspires millions of people around the world with his writings on VGT. He has been of great help in educating me on the plant (whose origin was traced to our country!).

P. Haridas, Deputy General Manager - R&D,  
Tata Tea Limited, P.O. Munar - 85 612 Kerala State (India)  
<[haridas.p@tatatea.co.in](mailto:haridas.p@tatatea.co.in)>

*Unfortunately, the Manual of the International Training Course on the Vetiver System has been out of print as it has been on high demand of our readers. However, I shall sacrifice my own personal copy and let you have it. I hope it is helpful to your tea plantation management. - Ed.*

### **Attraction of Banana Roots to Vetiver Hedges**

I want to take this opportunity to thank you and the Royal Development Projects Board for all of the quality material you have sent to us in Senegal. Several have been translated into French and disseminated. We hope your entire team is well.

One of the areas where we have been successful in expanding vetiver use has been in the banana subsector. We have found a correlation between banana plants’ root system and their attraction to vetiver hedges, especially when the banana is under stress or watering is sparse. Interestingly, as we promote drip irrigation for water conservation measure, we find that bananas irrigated by drip perform better when associated with vetiver hedges than banana plants watered by traditional methods. Uncovering the roots from the bulb of the banana plant, we find *the lateral root system seeks the direction of vetiver hedges*. We wonder if any studies on the subject have been conducted in Thailand or in the Pacific Rim related to this root growth. We know there is symbiosis between fruit trees and vetiver hedging, but had not seen it in root growth.

Criss Juliard, DynaEnterprises, Dhaka, Senegal  
<[cjuliard@dynaenterprises.com](mailto:cjuliard@dynaenterprises.com)>

*The development of banana lateral root system towards the direction of vetiver hedges is very interesting. You have a good reason to believe that the banana roots could sense potential humidity*

*stored in vetiver roots. Or perhaps it may be related to chemotropism, a phenomenon in which a plant structure moves towards or away from chemical stimuli, which, in this case, may be essential oil stored in the vetiver roots. Unfortunately, I have not heard of any such study in Thailand nor in the Pacific Rim countries. I may have overlooked it. I shall start searching for it from now on and let you know if I run across any. Meanwhile, has any body conducted such or related studies in your country? - Ed.*

### **New Deadlines of the Third International Conference on Vetiver (ICV-3)**

Based on the statement of WHO on 23 May 2003, the outbreak of SARS is now under control in Guangzhou, the venue of ICV-3 during 6-9 October 2003. The Organizers and other related bodies have now issued a new revised deadlines of various activities related to ICV-3 as follow:

- Registration and accommodation reservation: 30 June 2003
- Submission of abstracts: 30 June 2003
- Submission of full papers: 31 July 2003
- Submission for The Vetiver Network Awards: 31 July 2003
- Submission for the King of Thailand Vetiver Awards: 31 July 2003
- ICV-3 Exhibition application: 31 August 2003
- Announcement of The Vetiver Network Awards: xx
- Announcement of the King of Thailand Vetiver Awards: 31 August 2003