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Editorial

Pesticidal Role of Vetiver

Vetiver is now well known for its role in soil and water conservation in both agricultural and non-agricultural applications. This role is the major concern and should be kept at their most active phase.

It now appears that vetiver has many other roles, some of which have also been well known. Its pesticidal role is probably the least known since very little research work has been done in this regard until recently.

A group of researchers at Louisiana State University (LSU) has discovered that vetiver is an excellent plant to be used in wetlands to treat wastewater effluent. The extensive root system of the vetiver provides a large surface area for colonization by bacteria that degrade organic material, while at the same time creating a hostile environment for pathogenic organisms. Harvesting the vetiver biomass (both roots and leaves) produced in the wetland creates a dynamic sink for nutrients and minerals in the effluent. The vetiver leaves may be used for thatch, mulch and artisan products, while the roots may be a source of essential oil for non-fragrance applications. Some of the components of vetiver oil, such as the sesquiterpene compound, 'nootkatone', may have important industrial uses, as insecticide or insect repellant, or eventually, other products may be developed. Nootkatone has now been found to repel termites.

Vetiver's ability to grow large roots in extreme conditions makes it an ideal candidate to provide large quantities of nootkatone. Ground vetiver roots containing nootkatone can be mixed with other plant materials to produce garden mulches that repel termites, while extracted oils can be applied to the soil to serve as a termite barrier.

Researchers at LSU are now looking at nootkatone for treating wood and soil in addition its use as mulches. It could create an effective barrier in the soil with regular application at low concentration. They found that nootkatone is able to kill termites in its gaseous state, and it has low volatility like mothballs. It may also be usable against other household pests such as moths and carpet beetles.

For the benefit of our readers, details of the above studies are reproduced in this issue of the Vetiverim. It is hoped that more research will be done within the Pacific Rim region which has high incidence of polluted water and also high infestation of termites. *The more we know of vetiver, the more versatile uses we may find from this miracle plant.*

Vetiver Glossary: The Vetiver System

This is part 2 of the series on Vetiver Glossary. The first part, published in Vetiverim-15, covers the term 'vetiver' and its related terms. For each term, definitions from Webster's New World Dictionary (Third College Edition, 1993), if anh, and the Editor (known as Vetiverim's definition) are given, followed by an explanation of each term.

Vetiver System – VS (previously known as Vetiver Grass Technology – VGT):

Webster's: none

Vetiverim's: *n.* a low-cost, simple system employing vetiver for: (i) soil and water conservation, (ii) environmental protection, and (iii) remediation of deteriorated or contaminated land.

Explanation: The technology was first developed for the agricultural sector by the World Bank for soil and water conservation, and later expanded to cover non-agricultural sector through *bioengineering* and *phytoremediation* for environmental protection such as slope and embankment stabilization, reclamation of wasteland, rehabilitation of contaminated land, water purification, pollution control, prevention or mitigation of natural disaster, etc.

Environmental Protection:

Webster's: none

Vetiverim's: *n.* The process whereby the environment, which is affected by mechanical or chemical processes, is protected by certain means, natural or artificial; the natural means are through the use of vegetation like planting vetiver to reclaim deteriorated lands or rehabilitate contaminated sites

Explanation: The environment is affected by both mechanical and chemical processes. The former is through wind and water erosion while the latter is through contamination with chemical substances and heavy metals from urban and domestic wastes and by-products of rural manufacturing and mining industries. If these wastes cannot be economically treated or

removed, off-site contamination will take place. Wind and water erosion and leaching are the causes of off-site contamination. Vegetative methods are the most practical and economical control program to *reclaim* or *rehabilitate* such sites. Vetiver has been found to be highly tolerant to extreme soil conditions including high metal concentrations. Environmental protection can be accomplished through *bioengineering* and *phytoremediation* mechanisms.

Bioengineering:

Webster's: *n.* a science dealing with the application of engineering science and technology to problems of biology and medicine

Vetiverim's: *n.* the use of organisms, mainly plants, on their own or in integration with civil engineering works, to address the problems of erosion and slope stabilization.

Explanation: Vetiver can be used to protect the environment (soil, water and air) before deterioration occurs. Thus it is a prevention mechanism.

Soil Bioengineering:

Webster's: none, but it does not make sense to put the word 'soil' as a prefix to 'bioengineering' as defined by Webster's dictionary (above).

Vetiverim's: *n.* the same meaning as Vetiverim's definition of bioengineering, but is specific for soil, i.e. the use of vetiver to address the problem of soil erosion and slope stabilization.

Explanation: It is a term used to distinguish it from the term, 'genetic engineering', which is used in medical or genetic sciences.

Water Bioengineering:

Webster's: none, same reason as 'soil bioengineering' (above).

Vetiverim's: *n.* bioengineering as applied to solving the problem of sedimentation of water ways, reservoir, etc. caused by erosion and contamination.

Explanation: Same as explanation for soil bioengineering.

Remediation:

Webster's: *n.* the act or process of remedying or overcoming learning disabilities or problems. (From remedy = to put back in proper condition; to correct or remove).

Vetiverim's: *n.* the process of remedying deteriorated, contaminated or intoxicated soil and water.

Explanation: Remediation of deteriorated, contaminated or intoxicated soil and water can be accomplished through natural or artificial means; the uses of plant (phytoremediation) and microorganisms (bioremediation) are gaining popularity as they are passive, natural, and aesthetically pleasing.

Bioremediation:

Webster's: none, but can be deducted as remediation through the use of organisms.

Vetiverim's definition: n. the productive use of microorganisms to remove or detoxify pollutants, usually as contaminants of soils, water or sediments that would otherwise threaten public health.

Explanation: The prefix 'bio' should imply any organisms but in its specific meaning, it refers to only microorganisms. Microorganisms have been used to remove organic matter and toxic chemicals from domestic and manufacturing waste discharge for many years. Indeed microorganisms are frequently the only means, biological or non-biological, to convert synthetic chemicals into inorganic compounds. What is new is the emergence of bioremediation as an industry driven by its particular usefulness for sites contaminated with petroleum hydrocarbons.

Phytoremediation:

Webster's: none, but can be deducted as remediation through the use of plants.

Vetiverim's: *n.* the use of plants to clean up deteriorated, contaminated or intoxicated soil and water.

Explanation: It is a curing mechanism. Vetiver can be used to cure environmental problems that have already occurred. Depending on the nature of the problems, two processes are involved in such cleaning up, viz. *reclamation* (naturally-caused) and *rehabilitation* (human-induced). It can help to *reclaim* wastelands or deserts, or to *rehabilitate* contaminated or intoxicated soil and water. It can be used along with, or in some cases, in place of, mechanical methods. It is an aesthetically pleasing, passive, solar energy driven cleanup technique.

Reclaim:

Webster's: *vt.* to make (wasteland, desert, etc.) capable of being cultivated or lived on, as by filling, ditching, or irrigating.

Vetiverim's: 1. *vt.* to make (wasteland, desert, etc.) capable of being cultivated or lived on, by mechanical (e.g. filling, ditching, or irrigating) or biological (e.g. by using plants) means. 2. *vt.* to restore deteriorated lands through the use of the vetiver system.

Explanation: See explanation in 'Reclamation'.

Reclamation:

Webster's: *n.* 1 a reclaiming or being reclaimed; esp., the recovery of wasteland, desert, etc. by ditching, or irrigating. 2 the process or industry of obtaining useful materials from waste products.

Vetiverim's: *n.* 1 the process of using vetiver system to reclaim deteriorated land originated as the result of natural process. 2 the process of obtaining useful materials such as heavy metals, chemicals, etc. from wasteland areas through the use of vetiver system.

Explanation: With its unique quality of possessing deep-root system and tolerating drought, vetiver is an ideal plant to stabilize slope and build up soil through the accumulation of debris carried down from higher areas and deposited at the front of vetiver hedgerow. Vetiver can be used to reclaim deteriorated land including wasteland, desert, degraded soils, etc. (Note that the area to reclaim has been affected by natural action, not by human intervention). The reclaimable areas through the use of vetiver include: steep-slope land, sandy soil, skeleton soil, acid sulfate soil, saline soil, mangrove soil, shallow soil, etc. Vetiver can also be used to obtain useful materials such as heavy metals, chemicals, etc. from wasteland areas.

Rehabilitate:

Webster's: *vt.* 1 to restore to rank, privileges or property which one has lost. 2 to put back in good condition; re-establish on a firm, sound basis.

Vetiverim's: *vt.* to restore contaminated or intoxicated soil or water

Explanation: See explanation in 'Rehabilitation'.

Rehabilitation:

Webster's: *n.* a noun form of 'to rehabilitate'.

Vetiverim's: *n.* 1 the process of using certain mechanical or biological therapy to restore contaminated or intoxicated soil or water 2 the process of using vetiver to rehabilitate contaminated soil or water caused by man.

Explanation: Vetiver has been used to rehabilitate contaminated soil and water, e.g. garbage land fills, quarries, mine tailings, effluent disposal, etc. It can also help in water purification such as in the control of algal growth (caused by human) in rivers and dams, and removal of nutrients from polluted discharge from agricultural pond in the wetland construction. Being a wetland plant, vetiver can be used in a constructed wetland system. (Note that the area to rehabilitate should have been affected by the act of man like piggery waste, sewage dumps, mine tailings, garbage landfill, etc. which contain heavy metal, pollutants, acids, salts, or alkalines, etc.). The following are examples of the processes whereby vetiver is used to rehabilitate:

✧ Area intoxicated with heavy metals from mine tailings (vetiver is highly tolerant to heavy metals such as A1, Mn, As, Cd, Cr, Ni, Pb, Hg, Se and Zn; collectively known as a process for 'mine rehabilitation')

✧ Area polluted with leachate (vetiver is capable of absorbing dissolved N, P, Hg, Cd and Pb in polluted water; collectively known as a process for 'water purification')

✧ Area polluted with effluent disposal

✧ Area contaminated with agrochemicals, especially pesticides.

Disaster:

Webster's: *n.* any happening that causes great harm or damage; serious or sudden misfortune; calamity.

Vetiverim's: *n.* 1 any unforeseen or sudden situation that the affected community is unable to cope with. 2 an event when natural hazards interact with existing conditions so that they disrupt the ability of a community to feed and care for its inhabitants.

Explanation: The natural hazards become disasters when the disruptions exceed the adjustment capacity of the community. The primary causes of natural disasters are storms and torrential rain which often result in landslides, mudslides, flood, destruction of construction sites, buildings, orchards, etc. Vetiver has been used to mitigate disaster such as to stabilize landslides at Doi Tung and in Papua New Guinea caused by heavy rains, and to stabilize shifting sand dunes in southeast China.

Disaster Mitigation:

Webster's: none

Vetiverim's: *n.* any means to mitigate natural disasters.

Explanation: Vetiver system provides a partial long-term solution to soil degradation, fits in with traditional technologies farmers are familiar with, can be controlled and managed by farmers (for its low cost), and is proven to work under such conditions. It fits in well with attempts to make life easier and more sustainable for the at-risk rural population in disaster-prone areas.

Vetiver "Green Book" Published in Thailand

A revised English edition of TVN's "Vetiver, the Hedge Against Erosion", known as the "Green Book", has been printed in Thailand by the Office of the Royal Development Projects Board. They will be packaged in boxes containing 250 booklets each. All Vetiver Network Coordinators who would like to have copies of the 'Green Book' are requested to specify quantity in multiples of 250 (i.e., 250, 500, 750, etc.). It is hoped within the next year, the Spanish, Portuguese and French versions would be printed as well.

The following is the special introduction to the revised edition by Mr. Richard Grimshaw of The Vetiver Network:

"The first edition of "Vetiver Grass – A Hedge Against Erosion" was published 13 years ago. Since that time tens of thousands of copies of the first, second and third editions have been distributed throughout the world. Thousands more have been translated and published in many different languages, including Spanish, Portuguese, Chinese, Hindi, Gujarati, Thai, Chechewa (Malawi), and the latest – Kiswahili. This small book, commonly called the "green book", has brought hope to tens of thousands of small farmers in most of the tropical and semi-tropical countries of the world. We hope that this revised edition will bring hope to thousands more.

When John Greenfield first put the book together our focus was primarily on soil and water conservation; since that time as we have leaned more about this remarkable plant through research and practice, and vetiver grass application has been extended to practically every area that involves the management of land-related natural resources. There is growing use of Vetiver Systems for land and mine reclamation, stabilization of engineered earthworks (roads,

railroads, construction sites), pollution control, and the improvement of water-related structures and water quality.

Other uses of vetiver are being identified such as its potential for eradicating termites in the southern states of the USA, for medicinal purposes (Cameroon), and for a wide range of commercial industrial uses (Thailand). Another important use of vetiver is its ability to mitigate against the destructive forces of hurricanes and other natural disasters.

The mode of use has also changed. In 1987 we depended on government agencies to promote vetiver. In most instances this was not effective. Today the big promoters of Vetiver Systems are NGOs and a growing number of commercial "landscaping" companies. Farmers are not only using vetiver grass for on-farm soil and water conservation, but also are providing "commercial" supplies of vetiver planting material to vetiver users.

In 1987 we had no networks. Today we have over 20, and more are being formed each year. The networks are independent and poor, but are operated by dedicated persons that believe in the technology, and who are prepared to get out and do something so that people know about vetiver grass and its uses. These networks can take great credit for moving the technology forward.

Every year we find new uses, new management techniques and many thousands of new users. Vetiver grass is unique and will continue to play a vital role in natural resources management. We hope with the publication of this revised version together with the publication of other dissemination material by many of the country and regional networks that Vetiver System will be used on a greatly expanded basis. Up-to-date information is always available at The Vetiver Network's web site at http://www.vetiver.org

The problem of soil erosion is greater now than it was 13 years ago for no other reason that there are more people farming declining farming areas, and more construction works as governments expand country infrastructure. The latter is a major problem; for example it is estimated that 80% of sediment loss in south China comes from construction sites, roads, railroads, and quarries. Water quantity and quality is declining, and yet no one sees how to resolve the problem. Well we have a solution that could help in a big way if used properly, and that is the Vetiver Grass Hedgerow. It is cheap, effective and easy to use. We don't need to wait for government policy and government funds; instead all we need to do is to get out and use this technology that is available to anyone who wants to use it."

Introduction of Vetiver Grass for Highway Embankment Stabilization in Zhejiang, China*

Several years ago when the senior author (Zhao Zhaoqing) was in Madagascar, he had the opportunity to see vetiver grass, but knew very little about its function, application, etc. In recent years a lot of information was accumulated by the China Vetiver Network and a leading group was formed by directors of Provincial Highway Administrative Bureau, Highway Association, Communication Bureau, etc. And a project was launched to introduce vetiver to highway protection, including the selection of healthy planting materials, the establishment of propagation base, and the application of vetiver for highway stabilization. The application showed that vetiver has miraculus function in embankment protection. Although the embankments suffered from two strong typhoon damages, the highways were not affected. It was confirmed that vetiver is an ideal plant for embankment protection. To spread the technology more rapidly a vetiver company was established and registered as Zhejiang Vetiver Engineering Development Co. Ltd. It is the first company in China involving vetiver and established by highway institutions, in addition to many companies that were established in Guangdong and Fujian Provinces by private sectors engaged in land greening and soil conservation.

1. Highway Construction and Slope Stabilization in Zhejiang Province

Located on the eastern part of China, Zhejiang Province has a continental area of more than 100,000 km^2 and a population of 40 million, dominated by hills and mountains. In recent years, highway construction has been implemented very rapidly towards its goal of establishing in Zhejiang Province “2 longitudinal, 2 latitudinal, and 5 connection highways”, of which some have been constructed and some are under construction. Beside, reconstruction of low-grade roads have also been in progress. It is inevitable to clear original vegetation when building roadbed, roadstead, etc., causing soil erosion, slope unstability, and environmental problem. In turn, the deteriorated environment often causes transportation problem through soil erosion, slope collapse, landslide, etc. and threatened traffic safety. The situation is more serious in mountainous area. For example, for the section of Li-Jin road, which is 80 km long, there were

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* *By Zhao Zhaoqing, Highway Association of Zhejiang Province; Hong Xiumin, Highway Administrative Bureau of Zhejiang Province; and Xu Jianqiang, Highway Administrative Section of Jingning County*

30 collapses in which 40,000 m^3 of soils and rocks were accumulated during the period from 1998 to 1999. Besides, there were three sections which were sunk or washed away and one landslide. It costed 3.5 million Yuan to repair.

Traditionally, engineers use concrete or rock wall or framework to fix the excavated slopes and road embankments, but it costs a lot and at the same time leads to further environmental problem because passengers do not want to see the white concrete instead of green vegetation. Following economic development, people pay more attention to the quality of the environment. As a result, highway engineers start to use bioengineering method to protect the roads and the slopes along the roads. The Highway Association of Zhejiang Province launched a project in Lishui City of Zhejiang Province in 1999 to use vetiver to protect national highway No. 330 and provincial highway No. 52, where the slope was very unstable and often caused road blocks.

2. Vetiver Application for Protection of National Highway No. 330

The Li-Jin section of national highway No. 330 was built in 1996 and finished in 1997. The location was mountainous with light loamy soil. The original vegetation was destroyed along the road during construction. Some places became barren hill. Besides, new gullies occurred every where on the highway embankments. Because the road construction broke the original slope balance, the slope became more unstable. Road collapses occurred several times. More seriously, large-scale landslides frequently occurred at the section of 5K+450, which caused traffic blockage. To clear the blockage, the highway administration had to spend large amount of labor and expenditure by building new wall or stakes from time to time.

Sections with most serious erosion problem was selected to plant vetiver grass on Li-Jin line of national highway No. 330, which includes: 5K+450 (cut), 10K+400 (fill), 12K+100 (fill), 12K+600 (cut). The total area was 11,100 m^2 (Table 1). There were 2-3 tillers per clump, spaced at 10 cm between plants and 1.0 to 1.5 m between rows

Table 1. General condition of vetiver applications**

Location	5K+450 (cut)	10K+400 (fill)	12K+100 (fill)	12K+600 (cut)
Slope condition	cut	fill	fill	cut
Planting date (Apr.1999)	24	22	23	23
Slope gradienting	1:2	1:1.5	1:1.5	1:1.5
Planting area (m^2)	3000	600	2500	5000

*** The weather was fine during planting dates. The soil were light loam with medium amount of stone*

2.1 Vetiver Growth Behavior

Observations were made each month after planting to measure the height, tillering, roots, etc. On 12 May, i.e. 20 days after planting, vetiver plant was 9.1 cm high on average, with a maximum height of 23 cm, 5 tillers per clump, and 13 cm depth of root. About 90% of the plants started the growth of roots, and 70% turned into green. On 12 June, i.e. 50 days after planting, the plant was 149.4 cm high and had 17 tillers/clump and the root was 80 cm deep on average with a maximum height of 200 cm, 21 tillers/clump. On 18 August, about 4 months after planting and the roots developed well, with 132 cm depth and 3.5 mm in the diameter of main roots.

2.2 Soil Erosion Control

Observation on 12 November 1999 indicated that at the section of 12K+100 (fill) there was dense root system from ground surface down to 80 cm. Observation on 22 May 2000, 13 months after planting, the roots were 180 cm deep. On 25 August each clump had a root system 60 cm in diameter and 230 cm deep. The grass is now 250 cm high. The embankments were well fixed by root system while the stems controlled water erosion and sediment movement.

At the section 10K+5400, raining caused embankment sinking with numerous gullies in 1998 before vetiver planting, and therefore made the road unstable. To prevent further erosion, a concrete wall was constructed at the foot of the slope (fill), but the problem still remained to be solved because the slope was still open to sky and subject to further erosion. Few months later after the vetiver was planted on 22 April 1999 erosion was controlled and the slope was fixed with only few fine gullies.

Based on the experience in 1999, another area, 7900 m^2, was planted with vetiver grass in 2000. Altogether 222,800 tillers were used at the most dangerous sections along this national highway.

2.3 Vetiver Application for Protection of Provincial Highway No. 52

The application was at the section of 40K of newly constructed highway and vetiver was planted from 29 May to 1 June 2000. Situated on high mountains, the total planted area was 6,278 m^2. Soil was sandy with little organic matter. The vetiver could not grow well and suffered from frequent draught and water logging, and great daily temperature fluctuation. Just after vetiver planting the temperature rose to 38.3 ^{o}C and followed with heavy rain (461.8 mm in June). In July, there was a continuous high temperature of 38.4 ^{o}C for 9 days with rainfall of 201.5 mm. In August, there was also a continuous high temperature of 36.9 ^{o}C for 7 days with rain fall of 251.5 mm.

In August, around 80 days after planting, a strong typhoon attacked the area with rainfall of 70 mm on 23 August, and 45 mm on 24 August. Although the soil was saturated by water the highway was little affected, and the embankment was appropriately fixed without gullies, slides, or sinking to be seen. It was shown that the survival rate was 98%. The grass reached 130 cm high. There were 3-6 tillers/clump and the roots were 80 cm deep. However, the embankment without vetiver produced a lot of sediments accompanied by collapse of the road and transportation affected.

New Termite Control Material Derived from Vetiver Roots*

A grassy plant used worldwide for erosion control may provide another weapon in the arsenal to combat subterranean termites, according to research conducted by the Louisiana State University (LSU) AgCenter. Dr. Gregg Henderson, an LSU AgCenter entomologist, learned of vetiver grass's potential as a termiticide from Don Heumann, a nursery and greenhouse operator in Metairie.

"Don brought me some vetiver plants about two years ago", Henderson said. "There was a growing interest in termites then, and I was getting a lot of calls from all kinds of people. But Don was earnest, so I took a look at what he brought." Because he was aware of the growing damage termites are causing in the New Orleans area, Heumann thought he might have uncovered a possible solution to the termite problem. "I was growing marsh grasses and

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* *From LSU AgCenter News: (www.agctr.lsu.edu/lns0601.htm) Contact: Gregg Henderson at (225) 388-1634 or ghender@unixl.sncc.lsu.edu*

other grasses in greenhouses and noticed that there were no bugs in the greenhouse with vetiver," Heumann said. "Everyone knew it has agents against certain bugs – people used to use it in sachets to control moths – so I decided to do my own insignificant testing on termites," he added. After Heumann decided he might be on to something, he took some plants to Henderson.

Vetiver, it turned out, is both a repellent and toxic to termites. "Our first experiment was with ground roots in sand", Henderson said, explaining that termites avoided going through the sand when it was introduced into a termite colony. Henderson's second experiment extracted oils from vetiver roots, and the oils also repelled termites. Henderson isolated several compounds from the vetiver oils and discovered a chemical, called 'nootkatone', was responsible for turning away termites. The substance is also found in Alaskan yellow cedar. "We've sprayed sand with 'nootkatone', and it's still active after one month," Henderson said. "As a contact material it repels termites, and its vapor is toxic to them."

The LSU AgCenter has filed for a provisional patent on the use of 'nootkatone' as a termite repellent. Henderson and Heumann are included as co-inventors along with Dr. Roger Laine of the AgCenter's Department of Biochemistry.

Widely known for its effectiveness in erosion and sediment control, vetiver grass is highly tolerant to extreme soil conditions and is often used to rehabilitate contaminated lands. The deep roots anchor the plant and hold soil together on hillsides and contours. The plant's ability to grow large roots in extreme conditions makes it an ideal candidate to provide large quantities of 'nootkatone'. The inventors expect ground vetiver roots containing 'nootkatone' can be mixed with other plant materials to produce garden mulches that repel termites, while extracted oils can be applied to the soil to serve as a termite barrier. "Much mulch is actually termite food," Heumaan said. "Treating it with vetiver oils would be very effective."

Researchers are looking at 'nootkatone' for treating wood and soil in addition to mulches. "It's a natural product", Henderson said, adding it could create an effective barrier in the soil with regular applications at low concentrations. "We also know 'nootkatone' will kill termites in its gaseous state, and it has low volatility like mothballs", Henderson said. "It also may be usable against other household pests such as moths and carpet beetles". More research must be done before the product can be brought to market, the inventors said. "This has potential, but it needs to be tested", Henderson said. "No one product will solve the termite

problem". "We need an integrated pest management approach," he added. Henderson was quick to point out the discovery of vetiver grass as a source of a new termiticide is an example of how an inquisitive businessman working with a university researcher can bring new products to society. "It's a perfect example of a public-private partnership," he said.

Vetiver Oil in Aromatherapy

In the EMVN Newsletter No. 3 (April 2000), Mike Pease gave the following descriptions of vetiver oil when used in aromatherapy:

❍ From "The Complete Aromatherapy Book" by Suzanne Fischer-Rizzi:

"…Intense yin with rising yang…"

Other extracts that might amuse readers are:

"…Vetiver has the scent of Mother Earth, mysteriously hidden in deep, dark recesses, drawing on the fullness of her life-giving energy…"

"…Vetiver nourishes people who have cold feet or have their heads in the clouds…"

"…It is a useful remedy for exhausted women whose diminished energy reserve makes them vulnerable under stress. The oil may be helpful for men who have become insensitive and restless, or who have lost connection with their inner being…"

"…Vetiver is a secret ingredient which, when mixed with geranium and ylang-ylang in lotions is used to enlarge breasts…"

Criss Juliard, who is now in Senegal, adds the following:

❍ From "The Illustrated Encyclopedia of Healing Remedies" by C. Norman Shealy, Bridge Water Book Co., gives a few uses for vetiver essential oil when used as massage or aromatherapy:

"…Vetiver oil relieves stress, anxiety, nervous tension and insomnia; also provides relief from arthritis, insomnia, rheumatism, aging skin, fatigue; it is grounding and regenerating…"

To add to the above, the following are what the Editor (NC) has found from his text books on aromatherapy:

❍ From "Fragrant Sensuality – Aromantics and Nature's Essential Oils" by Valerie Ann Worwood, Bantam Books:

"…Vetiver oil relaxes deeply felt tensions and fears. It's sexually arousing and strengthening, earthly and positive with a no-nonsense attitude. It's for something you want to get out of life…"

❍ From "The Illustrated Encyclopedia of Essential Oils" by Julia Lawless, Element Books, Dorset:

"…Skin Care: Acne, cuts, oily skin, wounds…"

"…Circulatory, Muscles and Joints: Arthritis, muscular aches and pains, rheumatism, sprains stiffness…"

"…Nervous System: Debility, depression, insomnia, nervous tension…"

❍ From "Aromatherapy – An A-Z" by Patricia Davis, C.W. Daniel Co. Ltd.:

"…Deeply relaxing, so valuable in massage and bath oil, and adds a subtle note to many blends for massage. Among other oils, it blends very well with sandalwoods and jasmine, and could be considered as an alternative bass note in blends where myrrh might otherwise be used…"

Report of the Thai-Language Training Course on the Vetiver System

With fund donated by the Heineken Breweries Co. Ltd., the Land Development Department, on behalf of the Office of the Royal Development Projects Board (ORDPB), organized the Thai-Language Training Course on "Development and Campaign on the Use of Vetiver Grass According to His Majesty's Initiative" from 12 to 15 December 2000. It was held at Viang Inn Hotel in Chiang Rai Province. There were 80 trainees who are vetiver practitioners from various government and non-government organizations.

The lecturers were vetiver experts from the ORDPB, the Highways Department, the Department of Industrial Promotion, and the Land Development Department. The study tour was conducted to visit the areas where farmers campaigned on the use of vetiver for slope stabilization, and for soil and water conservation. It also included practical works on vetiver propagation and nursery management, planting out in the fields, the utilization of vetiver in handicraft making at the Women's Cooperatives at Ban Huai Muang, Mae Suai District, Chiang Rai Province. Field trip was also made to visit to Doi Tung Development Project to see different methods of vetiver propagation including tissue culture method, the utilization of vetiver in handicraft making, weaving industry, the manufacture of plant pots made from vetiver biomass, etc.

Back in the classroom, the trainees were divided into six working groups to discuss the following topics:

Group 1: The possibility of development and campaign on the use of vetiver according the His Majesty's initiatives, with Mr. Witoon Chinapan as discussion leader.

Group 2: The approach in the development and campaign on the use of vetiver in target area, with Mr. Phitag Inthapan as discussion leader.

Group 3: The suitable techniques of planting for propagation at different levels, with Mr. Atit Sukasem as discussion leader.

Group 4: The suitable techniques of propagation at different levels, with Mr. Sunthorn Rachavongse as discussion leader.

Group 5: The planting of vetiver in the target areas and plan of operation, with Mr. Satien Klinchampa and Mr. Srisakdi Thani as discussion leaders.

Group 6: Expansion, public relations, and technology transfer, with Mr. Charuek Thanbun and Mr. Anuvachara Photinam as discussion leaders.

Letters to the Editor

A Request from Iran

Recently as part of my literature review for my research project on the use of vegetation for bank stability, I found your newsletter in the internet. From this site I found the great role of vetiver plant on bank stability. In Vetiverim-13 (Oct. 2000), you mentioned the CD ROMs on vetiver. This is something that I really need to understand the plant. Therefore I would like to ask you to send me a copy of this CD ROM and any books or printed material which can help me understand the application of this plant.

M. Shafai-Bajestan, Dept. of Irrigation
Shahid-Chamran University, Ahwaz, IRAN
Email: m_shafai@yahoo.com

Although Iran is not in the Pacific Rim, yet I am obliged to comply with your request. Thus, I have arranged to send you the CD ROMs on vetiver as well as some available publications. ***– Ed.***

Use of Dibbling Tubes in Propagating Vetiver in the Gas Pipeline Project

Vetiver is propagated in the nurseries by tillers that can be separated from the culms. They are planted in dibbling tubes of black polythene, about 120 mm long by 30 mm diameter, with three grooves down the inside to prevent root coiling. This process takes 8-12 weeks before transplanting into field. A dibber is used to make a hole 120 mm deep to insert the root mass generated in the tiller tube. An ideal process for mechanization due to the weight of tiller tubes to carry and empty into pre-dibbed holes. Vetiver hedges, as they are often referred to, grow in straight lines about 50-150 mm apart to form an impenetrable barrier to silt movement and the roots stabilize slopes by growing to depth of 3-4 m. They are ideal for controlling run-off on pipelines and other disturbed slopes.

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*Thanks for sharing the information. I used to work on propagating fast-growing nitrogen fixing trees in the dibbling tubes and found the method quite effective. The method can be applied to vetiver. But instead of carrying the tubes and emptying the root mass into pre-dibbed holes, why don't you take the root mass out from the dibbling tubes first and carry only the root mass packed in a suitable container like corrugated paper box with plastic sheet lining? This would save the energy of carrying the whole tubes and bringing back empty tubes. – **Ed.***

Vetiver News from New Zealand

An important vegetable growing area for Auckland, New Zealand's largest city, is located on the slopes of old volcanoes located to its south at Bombay (lat. 37°S). The frost-free slopes and fertile soils give year-round crop production but cultivation has also allowed large soil losses during heavy rainfall. My experiences with vetiver grass over a period of 8 years further to the south at lat. 38°S showed that initial growth rates of vetiver grass were high. However, shading by the mature plants own leaves tended to cool the soil to below 18 °C and appeared to allow cicada *(Amphisalta zealandica)* nymph root attack to kill the plants after about 4 years.

The success of a small vetiver survival trial in warmer conditions 50 km north of Auckland encouraged me to plant a trial of vetiver grass at Bombay in late 1999. After two summer growing seasons, the plants are well established and healthy. The plants will be mown or burnt early next summer to maximize soil heat absorption, although the incidence of cicada nymphs in a cultivated cropping area is not expected to be significant.

The next step is to find ways of incorporating vetiver hedges into the vegetable growers mechanized cropping systems without interfering with current farm operations.

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Vetiver Oil to Awaken Lust

In misplaced searches today on 'vetiver assay' and 'vetiver breast', I stumbled upon the following incantation supposedly from Persia, with mild explanations, at:

http://www.santesson.com/aphrodis/persia.htm

Does someone want to start a collection of such 'quotables'? I think Vetiverim has a monopoly on poetry…thus far.

The Wanton Maid

- On the head of she who will choose…

a drop of gardenia
to catch the zephyr and float to him
whom she would choose.

- On the eyelids of she who will choose…

a drop of rose oil
to entice him
whom she would choose

- On her mouth…

a drop of honey
to soften the mouth of him
whom she would choose.

- On her tongue…

a drop of peppermint
to spark the flame in the loins of him
whom she would choose.

- On her neck…

a drop of ambergris
to give the flush of heat to him
whom she would choose.

- On each breast…

a drop of almond milk
to nourish him
whom she would choose.

- On her stomach…

a drop of vetiver
to awaken lust in him
whom she would choose.

- On her mound of mirth…

a drop of patchouli
to unleash the throbbing serpent in him
whom she would choose.

- On the lips of her maiden flower…

a drop of lilacs
to lick for him
whom she would choose.

- For when these drops are combined with her lover's milk of passion…***their union inside her***
will bring the fruit of happiness
and long life to she who will choose,
and he whom she has chosen.

'A Vetiverite in Babylon'

*In the last sentence of this issue's Editorial, I said that the more we know of vetiver, the more versatile uses may have been found from this miracle plant. To awaken lust in him is surely a valuable way of its use! For those who are interested in vetiver oil, see more of its aromatherapeutic uses in this issue of Vetiverim –**Ed.***

Spanish Version of PRVN Technical Bulletin

Oscar Rodrigues (of the Latin America Vetiver Network) has translated the PRVN technical Bulletin on "Vetiver Grass System for Environmental Protection" by Paul Truong and Dennis Baker (No. 1998/1), and "Vetiver Handicrafts in Thailand" by the Department of Industrial Promotion, Royal Thai Government (No. 1999/1) into Spanish, and he would like to make sure he has permission to do that. Thought I'd let you answer although I would have said it was fine as long as the source is given.

Joan Miller, The Vetiver Network

Washington, DC, USA

*Of course, any one is free to translate any of our technical bulletins into any languages because our objective is to popularize the use and the utilization of the vetiver system worldwide. As you rightly pointed out, it is fine so long as the source is given. Our only worry is that we are running short of manuscripts for future publications as there seems to be a slow down of work in this exciting field (I hope I am wrong in my statement!). May I, on behalf of PRVN, invite potential authors to please submit your paper for possible publication as a PRVN Technical Bulletin in the future. Our aim is to produce at least two bulletins a year. –**Ed.***