VETIVERIM

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Editorial

Bareroot or Polybag?

Two common practices in planting vetiver are through the use of bareroot and polybag. Planting material for both is obtained by digging out a vetiver clump, separating 3-tillered slips from it, trim the leaves of these slips to 20 cm and the roots to 10 cm. In bareroot planting, slips are taken to the field and can be planted in a roughly prepared line across the slope at a spacing of 10 cm between slips. Polybag planting is by planting the slips into a polybag to grow in the nursery for one month. When established they are transported to the field for planting.

There was some lively debate over the Vetiver Blog recently concerning the most effective practice of planting vetiver in the field. It all started when Jonathan Barcant <jcbarcant@gmail.com> wrote: "I have read that slips planted close together could become effective in as little as 6 weeks, and form a continuous hedge about 15 cm thick in as little as 3 months. How long do vetiver slips planting close together at 10 cm take to become effective and form a continuous hedge?"

Shantanoo Bhattacharyya's <shantanoo.bhattacharyya@gmail.com> response was, "If you plant pouched plant (one-month old pouched plant) and 10 cm apart, vetiver will become effective against topsoil erosion in about 2 months."

It was John Greenfield <27@xtra.co.nz> who recommended the use bareroot slips for planting as he said, "In Fiji where I started the whole vetiver revolution back in the '50s – we planted vetiver hedges protecting over 400,000 acres of sugarcane land using slips only and never had a failure. Not one potted vetiver plant was ever produced in the ten years that I was in Fiji running the program. To me, that's what made the system so valuable – you could dig up the plants you needed from one of our roadside nurseries, split them up, trim them and plant them as 3 tiller slips – at virtually no cost apart from the opportunity cost of the farmers' labor. In the tropics there is no need to run potted nurseries to produce vetiver plants; this only adds to the cost in labor, transport, potting mix, polybags and time. Planting hedges from slips meant that you had to follow-up the planting for three seasons with 'gap-filling' to ensure you ended up with an effective hedge."

In order provide information to the readers, the Editor took the trouble of preparing an article covering the planting of vetiver using bareroot and polybag in the article that follows.

Bareroot or Polybag: Which One to Choose?*

Many methods have been used in planting vetiver for soil and water conservation. However, only two methods are popularly used in most countries. The traditional method used was planting bareroot vetiver slips, while the new method uses polybags containing vetiver slips in a potting mix. Controversy exists among vetiverites in many countries on which one should be employed. Information about both is provided below.

Vetiver Parts Used as Planting Material

Although many parts of the vetiver plant can be used in propagation (Chomchalow, 2000), slips are the most popular one. By definition, "A slip is a part of a plant cut or broken off from a clump to be used for planting". Practically speaking however, a viable slip consists of 2-3 tillers and used as planting material. A tiller is a shoot sprouting from the base of the stem. Vetiver slips can easily be obtained by digging a full-grown vetiver clump, cut the top part to 20 cm high and the root to as little as 5 cm, and separate it into individual planting slips having 2-3 tillers each. Such slips are then used as planting material.

Methods of Planting Vetiver Slips

Two methods of planting vetiver slips are commonly practiced - bareroot and polybag planting. The former is through planting the prepared slips directly in the field while the latter is through planting individual slip in the plastic bag filled with suitable planting medium and kept in the nursery for a period of about 45 days before transporting to the field for planting. Each method is described in detail below:

Bareroot Planting

This is the traditional method when people started to plant vetiver in India, as farm boundary markers some 200 years ago. It was the most convenient and practical method used in those days when no polybags were available. What one needs to do is to dig up a clump of vetiver, split it up in to individual "slips" with 2-3 tillers each" trim the top part to 20 cm high and the root to 5 cm long, then transport the bareroot slips to the field and plant them by inserting the slips across the slope into the roughly prepared soil. Greenfield (pers.com.) planted bareroot vetiver slips, forming hedges across the slope protecting 400,000 acres of sugarcane fields in Fiji in the 1950's. This method is cheap, efficient and works perfectly in the wet tropics; it is still in use at present in many countries.

Planting Specially-Treated Bareroot Slips: An innovative technique has been developed by Chalothorn (1988) by digging up the clump, chopping the shoot to 20 cm and the root to 5 cm, split the clump into individual slips, then tie them together into a bundle, and place them in shallow water for four days (to induce new root formation) before planting. Such a practice is quite effective, especially if the operation is done in the rainy season after the soil has been sufficiently moistened.

A further improvement has been invented by Jirasathaworn and Suntharuk (1995, cited by Inthapand and Boonchee 2000) who submerged bareroot slips in humic acid solution for three days until new roots are formed. It was reported that these humic acid treated-bareroot slips grow faster after planting in mid May to the end of June than slips grown in polybags.

Advantages of Bareroot Planting: Bareroot planting has the following advantages:

- ❖ Saves cost of planting containers, planting medium, labor, transporting, and planting in the field, and the disposal of discarded polybags.
- ❖ Saves time in the preparation of planting material and operation.
- ❖ Saves labor in all steps of operation.
- ❖ Saves time in collecting containers during planting in the field and reduce load in carrying back the planting containers.
- ❖ Environmentally friendly as no containers are left in the field.

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Disadvantages of Bareroot Planting: Bareroot planting has one disadvantage:

- ❖ Survival rate is low if soil is dry; thus timing of planting is critical. The best planting time is at the beginning of the rainy season.

Polybag Planting

Polybag, 5 cm wide, 15 cm long with a diameter of 7 cm when filled with planting medium, is used as a container to plant vetiver slips. Many other sizes have also been used in several countries. Prepared vetiver slips with 2-3 tillers are used; they are inserted into the planting medium packed in to the polybag and kept in the nursery for a period of 45 days. Watering is required during this period especially in the dry season; fertilizer application should be applied to produce vigorous planting material. The polybags are transported to the field and planted in well-prepared soil.

Using Growth Promoters to Induce Faster Growth of the Slips: By soaking the slips for 15-20 min in growth hormone solutions (3 commercial brands of growth hormones and 2 levels of auxin plus mineral) and immediately planted in the polybags, Ho, et al. (2000) found that the growth rate of the vetiver slips has increased considerably and can potentially reduce the growing period by as much as 50%. The gain in shoot and roots length in just 3 weeks was almost double that of the control treatment using water only. An auxin level of 0.34 ppm was suggested as this amount did not appreciably inhibit root growth and yet produced a good enough shoot growth.

Advantages of Polybag Planting:

Polybag planting has the following advantages:

- ❖ Ensures a better survival rate and faster establishment of the vetiver plant than conventional bareroot planting.
- ❖ Convenient in terms of distribution and providing services or support to various agencies and interested public.
- ❖ Easy to develop and keep record of the number of bags and slips needed to meet the demand.

Disavantages of Polybag Planting:

Polybag planting has the following disadvantages:

- ❖ High cost of polybags and planting medium.
- ❖ High cost of maintenance in the nursery.
- ❖ High cost of transportation to the field.
- ❖ High cost of labor in all steps of the operation such as land preparation, moving plant from the polybag, planting and collecting polybags.
- ❖ If polybags are not collected after planting in the field, they create a problem for the environment.
- ❖ Takes more time in all stages of the operation.
- ❖ Facing the problem of demand and supply; a lot is wasted when no one wants the planting material at one time and supply not being available at other times.

Which One to Choose?

As pointed out earlier, controversy exists among vetiverites on which one should be chosen and there seems to be no clear acceptance of either one. The information provided above should suffice the decision of the project manager on which method is to be chosen.

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Outline of the Sixth International Conference on Vetiver (ICV-6): Vetiver & Energy*

1. Context of the Event

The International Conference on Vetiver (ICV) is a prestigious scientific event of worldwide experts and reseachers in various applications of the Vetiver System under the auspices of The Vetiver Network International (TVNI), the Continuing Committee for the Sixth International Conference on Vetiver (CC/ICV-6) and the Chaipattana Foundation. This event has been held every 3-4 years since 1996:

ICV-1: Vetiver Grass - A Miracle Grass (Chiang Rai, Thailand, 1996).
ICV-2: Vetiver Grass & Environment (Phetchaburi, Thailand, 2000).
ICV-3: Vetiver & Water (Guangzhou, China, 2003).
ICV-4: Vetiver & People (Cacaras, Venezuela, 2006).
ICV-5: Vetiver & Climate Change (Lucknow, India, 2011).

At the Business Meeting of ICV-5, Miss Trang Phan, on behalf of Vietnam Vetiver Network (VNVN), proposed hosting of ICV-6 in Danang, Vietnam in 2015. This is not only a good opportunity for Vietnam to share, discuss, and to learn from worldwide experts the latest vetiver technologies and applications, but also to confirm their role as an enthusiastic member of TVNI.

2. Legal Approvals

- The approval of Danang People's Committee for hosting the Sixth International Conference on Vetiver (ICV-6) in Danang, Vietnam in 2015.
- The approval of the Continuing Committee for the Sixth International Conference on Vetiver for Danang, Vietnam to be the host of ICV-6 in 2015.

3. Purposes

- To affirm the prestige and the role of The Vetiver Network International (TVNI) and the ICVs which are held periodically.
- To establish a scientific forum for sharing the latest information, technologies and applications of the Vetiver System, promote vetiver's special characteristics its comprehensive technical, economical and environmental aspects.
- To improve the connection between national and international experts of the Vetiver System.
- To encourage participation of other sectors such as investors, socialists, international organizations and individuals on the use of VS various applications.

This is considered as an opportunity for the Vietnamese to present their research and practical applications, thereby empowering the Vietnam Vetiver Network and strengthening the cooperation among countries around the world.

4. Proposal of the Theme and Sub-Theme

- The proposed theme is 'Vetiver and Energy'.
- The main theme has not been finalized yet and is still open for more discussion to choose the most suitable theme for ICV-6.
- The sub-theme has not yet been proposed.

5. Organizations

- The Vietnam Vetiver Network (VNVN); SBTV Construction & Advanced Technology Company Ltd.;

Under the auspices of:

- Government of the Socialist Republic of Vietnam;
- Danang Government;

** By SBTV Construction & Advanced Technology Company Ltd., Hai Chau, Da Nang, Viet Nam; Website <www.sbtv.com.vn>; E-mail <info@sbtv.com.vn>.*

- ❖ The Chaipattana Foundation;
- ❖ The Vetiver Network International (TVNI);
- ❖ Pacific Rim Vetiver Network (PRVN);
- ❖ Danang People's Comittee;
- ❖ Veticon Consulting Company, Australia.

With the the supports of:

- ❖ Vietnam Institute of Geosciences & Mineral Resourses;
- ❖ Danang Department of Agriculture & Rural Development;
- ❖ Danang Department of External Relations;
- ❖ Danang Department of Information & Communications;
- ❖ Danang Department of Planning & Investment;
- ❖ Danang Department of Science & Technology;
- ❖ Danang Department of Resoures Environment;
- ❖ Danang Department of Culture, Sport & Tourism;
- ❖ Vietnam Television, Danang Television, National & International Journalism.

. 6. Organization of Human Resources

6.1 Establish the Organizing Committee

The Organizing Committee (OC) is responsible for the entire program including checking, planning and coordinating the Subcommittee of ICV-6. Members of the OC are:

1. Director of Vietnam Vetiver Network, Chairman;
2. Coordinator of Vietnam Vetiver Network, Vice Chairman;
3. Chairman of the Continuing Committee for ICV-6, Advisor;
4. TVNI Board of Director and Technical Director for Asia & Oceania, Advisor;
5. Representative of SBTV Construction & Advanced Technology Company, Member;
6. Representative of Danang Government, Member.

6.2 Locations & Duration

Locations:

Training before the Conference: Danang City.

Expected location: SBTV office (73 Nguyen Thai Hoc, Hai Chau Dist., Danang) and Furama Resort or Danang University, some of fieldworks and tourist spots.

City tour:

Expected location: City center, Bana Hill, Marble Mountain, Hoi An ancient town (the length of the program is up to the delegates and may last for some days).

Visiting the fieldwork:

Expected location: Son Tra Peninsula where Vetiver is used to protect the slope of the road.

Conference:

Expected location: There are two proposed locations for the conference:

- The International Conference Center of Furama, a five-star resort.
- Danang University of Technology

The Location of the conference will be finalized six months before the conference.

Estimated time: April 2015

Duration: 7 days

Day 1st - 3rd:

Preparation, training volunteers, reviewing and approving the whole program.

Day 4th:

Morning: Opening Ceremony, presenting souvenirs to guests and scientific prizes for researchers, visiting fieldwork including Linh Ung Pagoda in Son Tra Peninsula.

Afternoon: Official Conference.

Late afternoon: Business Meeting

To review ICV-6 and appoint the host of ICV-7.

To nominate new members of CC/ICV-7

Evening: Dinner with two options:

- On the Dragon Cruise cruising the Han River, or
- In a riverside restaurant (Nam Hoa Vien), together with visiting the city of Danang.

. *Day 5th:*

Morning & Afternoon:

In main Conference hall: Official Conference.

Exhibition space: Open to public participation of businesses and residents.

Exhibiting handicraft products, products of competitions, scientific posters on vetiver (which will be presented and explained in English and Vietnamese).

Opening stalls of vetiver products (handicrafts, specialized publications, a vetiver directory of all experts and companies involved in vetiver applications with introductory contacts, products, researches to help participants get detailed information about activities of vetiver grass networks around the world. The information will be collected in the process of contacting delegates.

Support program (if possible) - Small conference room: Public participation of business and residents; organizing some small workshops and exhibitions of vetiver productions as well as applications; encouraging interactivity and practicality of the conference to make it more interesting, with the vetiver experts helping people to understand this biotechnique.

Evening:

Barbecue party on the beach near Furama resort, camp fire, cultural activities.

Day 6th:

Continuing Day 5th, including some additional activities:

Panel discussion among vetiver experts on certain relevant topics.

Evening: Closing Ceremony, awarding some activities in the Conference, anouncing the host of ICV-7, gala dinner.

Day 7th:

Program of visiting attractions for delegates depends on the number of interested registrants.

Preparation for the departure of delegates.

The document above is the proposed plan for the ICV-6 in Danang, Vietnam. However, the plan can be modified at a later date. The website <http://www.sbtv.com.vn/ICV6> will be available early in June for the latest announcement and subscription for ICV-6 Newsletter.

Thai Ban Research Project to Develop Handicraft using Vetiver Leaves*

"The promotion of Thai Ban Research" is one of the activities in the Fourth Contest and Campaign on the vetiver development project according to royal initiatives in the year 2009. The aim of the project is to encourage the new generation as well as educational institutes which offer design courses, to promote the value of vetiver and design, research, experiment, and create new products in place of conventional styles.. As a pilot project, PTT Public Company Limited, the secretariat of the Contest, conducted an experimental project of "learning together" with the instructors and communities.

The research was just "a simple task" because it was both a trial and for gaining experience from learning and developing products among educational institutes and communities which utilize vetiver. Also, it is a creation of a network between educational institutes and target communities. It is anticipated that after this research, the amount of knowledge and creativity in maximizing the value of vetiver leaves will be achieved. In addition, the works of the communities can be reproduced for sale in the future as a means of helping the villagers to optimize the value of vetiver leaves for handicrafts and generate additional income.

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* *By the staff of PTT Public Co.Ltd., Bangkok, Thailand.*

That is all about the "downstream project" which is planned to provide beneficial affects to the "upstream project" in order to increase the use of vetiver for conserving soil and water according to the royal initiatives.

In the first pilot year, there will be four pairs of educational institutes and communities to jointly conduct the research, namely:

1. Thai Handicraft - Why Only Weaving Work?

The research pair between Thammasat University, Lampang Campus and Ban Wo Kaeo Community, Hang Chat District, Lampang Province was undertaken under the theme, "A lamp design for decoration by using vetiver leaves as well as local material." The researched product was a standard lamp and the target customer was a working group in the age group of 25-45 years.

Tired of weaving products, the research team then designed and tested their pilot design by using recycled paper strips to form flower shapes. The flowers are stuck on to a net structure which is in the form of a lampshade. The idea was to produce simple products suitable for community work. The technicians in the community have skills of weaving bamboo and rattan but not vetiver leaves. Twining leaves of vetiver for making the products is not a very easy task for them. From the start of the concept, apart from weaving work the research pair designed 3-4 patterns of the lampshades using a flower shape technique.

Basic Knowledge from the Research:

Fiber management: The vascular bundle in the midrib vein of vetiver leaf is hard and it makes the leaves brittle. When trying to form the shape of a flower, the leaves then break if they are made from fresh leaves which were left dry without soaking in water. They discovered using vinegar in the process by boiling the leaves with vinegar or soak them in the vinegar for over a week. Leave the leaves to soften in order to get rid of protein so that they are not brittle. For soft leaves, young 2-month old leaves can be cut and used.

Dyeing: There are many techniques to dye the leaves a natural colour. For example, drying the leaves in the sun for different periods will give them different shades of colour. The leaves that are sun dried for a longer period will yield a more golden colour. The leaves that are fumigated with sulphur dioxide will turn whiter or gold, greenish yellow or greener. When they are placed next to each other, one can see the pattern.

Leaf Management: There are 2-3 methods e.g. twining, braiding and weaving to reduce coarseness of the leaves so that the fiber is stronger and more durable.

Structure forming: Using. rattan and bamboo bending by the heat from a fire or drying oven, which will not break or tear the bent rattan.

Research Team: Acharn (lecturer) Srichana Chareonnate, Acharn Kittipong Kietwipak, Applied Arts Program in Industrial Craft and Design, Faculty of Architecture, Thammasat University, Lampang Center, and Uncle Jit Kanjaibutre from Wo Kaeo Community.

Wo Kaeo Community: Wo Kaeo Community, Wo Kaeo Subdistrict, Hang Chat District, Lampang Province have planted vetiver for conservation for more than six years. There is a teaching center for vetiver soil and water conservation technologies.. In spite of this the Community has not yet developed any products from vetiver leaves. Three years ago, the vetiver handicraft group was formed and now has 17 members, most of whom are senior citizens who want to spend their leisure time productively.

The community is skillful at weaving bamboo baskets, wicker baskets, making hunting equipment and weaving rattan khan toke (a circular wooden tray used in the north of Thailand) and making a grass brooms. Rattan and grass for broom making must be bought from neighboring communities while bamboo and vetiver are locally procured which helps reduce the production cost.

2. An Experiment using a Younger Generation

This project was a joint cooperation between Naresuan University, Phitsanulok Province and Ban Sai Chai Thai Community, Sukhothai Province. At the end, it became an experiment of the sophomore students of the Department of Product Design, Faculty of Architecture, Naresuan Univ.
The topic of this research is, "Handicraft development from vetiver leaves using the ideas of the "young generations", which is a pilot project to be conducted in a class for the young to get them to

understand the vetiver fiber. The project outcome has been a number of vetiver leaf systems with the emphasis on geometric design using vetiver fiber.

The results of experiment are various products, e.g.

- **Pet bags, lady's handbag, and belt**: The design employs the use of 100% vetiver. The students learned the various steps of preparing vetiver fiber as well as drying, leaf preparation for weaving, twining leaves, choosing young leaves of vetiver to make fibers softer.

- **Clock and turtle decoration**: A simple design creates modern work with simple production technique and practical usability and marketability as well.

- **Vetiver chair and Giraffe height measurement device:** They illustrate a simple, uncomplicated structure. The structure itself is strong and workable but it is not quite sound.

- **Egg lamp and a lamp from the bird nest concept:** These have an eye catching, interesting and contemporary pattern, which are a perfect creation and combination of line and shapes. They are a new concept that needs to be further developed.

Knowledge Set from the Experiment:

- The students learned how to handle vetiver fiber.
- The students learned the technique and vetiver management for handicrafts, e.g. finishing the furniture with twining technique, pieces of vetiver, and preservation of fibers, etc.
- Learning the acceotability of the target group's use of the handicrafts.

Research Team: Sophomore students, Department of Product Design, Mother Boonsake Suphakeaw and Khun Ploen Choongcharearn from Ban Sai Chai Thai Community

Coordinator: Assoc.Prof.Dr.Nirach Soodsankha, Faculty of Architecture, Naresuan University,

Ban Sai Chai Thai Community: Ban Sai Chai Thai Community, Khlong Ma Plap District, Si NakhonDistrict, Sukhothai Province conducted a research through the Cooperatives of Sai Chai Thai Housewife Group, which is a vocational group formed in 1998. With its initial members of 25, there are now only five members, which include Mother Boonsake Suphakeaw, the chairperson of the Group who has experience of planting vetiver for soil and water conservation and development of vetiver leave weaving works such as basket, vases, hats, fan, wine bottle holder and tissue box, etc.

3. Mix and Match: Vetiver and Local Material

This research was born out of mutual cooperation between Khon Kean University and Ban Sa Kaeo Community, Khon Kean Province. Their research topic is "The development of household utensil and ornaments from vetiver leaves and local materials."

Due to the constraint of time in research and product development (while the community spent their free time from rice farming to develop the products,) the research team referred to the community's existing sewing technique of making a rice container. They shaped up new yet simple forms of several products in a free form pattern. They further developed technology by using local materials e.g. loin cloth and clay, etc to be used as house decorations which can serve daily life purposes. Their design is contemporary, simple so that the villagers can make products by themselves in the future.

The researched products were household utensils and house decoration items the target group being the younger generation, 25-40 years of age. Basic knowledge gained from the research is:

- *Chemical dye technique:* A sedge dye can be used with vetiver leaves which should move from light to dark colours. Put the vetiver leaves in boiling water for 10-15 minutes or more (the longer, the darker) and when it is done, soak them in cold water instantly for permanent dyeing. After that, leave them in the sun until dry and keep them for use later.

- *Coloring technique for different colours without dyeing:* Choose the leaves of different ages and dry them in the sun for one day, they will yield different colours. If left in the sun too long, the vetiver will turn gold. For the leaves which are of the same age but left in the sun for different periods, after leaving them in the shade, different colours from yellow to green will appear.

Boiling fresh vetiver leaves and drying them in the sun will result in a green colour or boiled vegetable colour. When putting them in cold water instantly after boiling and drying them in the sun, they will turn natural green. After using them for a long time, the colour will fade and turn yellow. If leaving sun-dried leaves in the water for a long time, they will turn dark green. For example, if they are put in the water for 3-4 days, they will turn dark grey. Soaking in water does not result in

changing colour only, its vascular bundle in the midrib vein which is full of starch and sugar will also dissolve. Therefore, a problem of moth and fungi will also be eliminated.

- *Color dyeing technique:* For example, mud dyeing will give dark grey. Dyeing with teak leave (tearing young green leave and boil) will give light brown, neem tree bark will give yellowish green colour, etc.

- *Sewing technique:* Dry vetiver leaves need to be soaked in water before sewing. Damp leaves will be softer and will not be torn or broken when sewn. After sewing, the dry leaves will shrink a little which is the nature of the fiber. If the leaves get too dry, they will break.

Research Team: Housewife Group of Ban Sa Kaeo handicraft from vetiver leaves promotion having Ms.Thongdee Tonnoi (Sister Teaw) as a leader of the Group.

Coordinator: Acharn Suphaporn Attakomon, Acharn Rattikorn Sirikhan Butla, Department of Industrial Design, Faculty of Architecture, Khon Kaen University.

Ban Sa Kaeo Community: Ban Sa Kaeo Community, Mueang Wan Sub-district, Nam Phong District, Khon Kaen Province has planted vetiver for soil and water conservation. It has a weaving group to make household equipment for daily use, such as baskets, wicker basket, stick rice containers, mats from bulrushes and umbrella plant, and small animal hunting devices such as net traps for birds and bamboo fish traps.

4. Use of Vetiver for Pot Pourri and Spa Products

The last research pair is a joint endeavor between Rajamangala University of Technology Rattanakosin, Nakhon Pathom and the community and school of Ban Tako Lang, Ratchaburi Province, which undertook the research on, "Application of vetver leaves with potpourri and spa products."

The researched product is a combination between vetiver leaves and pot pourri and other fibers. The craft using weaving, knitting, binding and tying techniques with a focus for spa and for Buddha offerings uses. The type of researched products included pot pourri, Buddha offerings and spa products having the resorts in Suan Phueng as the target customers.

The research used existing natural materials which can be easily and locally found such as soil, coconut coir, pebbles, log, wood stems, etc. as a main structure. Vetiver leaves are used to finish the product with different techniques depending on the structure.

A distinctive point of the research is an application of potpourri made from a herb in the studied products. The pattern and style were developed and their usability was tested. A model of the work was made to respond to a purpose of use.- Vetiver Flower or 'bu-nga' vetiver ('bu-nga' is a mixture of different flower enclosed in a piece of gauze and perfumed. Various shapes of flowers were made from vetiver leaves. These flowers can be mixed with essential oils. Chopped vetiver leaves and unscented dried flowers such as pandan, aper flower, lotus, butterfly tree, and orchid, etc. are mixed in the bowl or ceramic jar which is tightly closed. Two hundred grams (or 2 cups) of dry 'bu-nga' are mixed with 25 drops of essential oil. After mixing, they will be kept in a cold place for seven days before they are ready for use.

- *Fragrant twined vetiver:* is a preparation of vetiver fiber for further use. A mix of fiber of vetiver and lemon grass, vetiver and scented pandan leaves are twined and woven or tied with the structure as needed.

- *Vetiver herbal ball:* Mix finely chopped vetiver with scented herb such as kaffir lime peel (or other herbs as needed) borneo. Stir them well and add rice flour and Thai fragrance little by little. Mix all ingredients well and add dye colour which is already mixed with water drop by drop or colour dye from herb (e.g. green from pandan, yellow from curcumin). Mix them well until the mixture becomes homogenous. Form the mixture into balls and expose them to the air to let them dry.

- *Fragrant vetiver balls:* In this method, we form the balls by sewing a thin white cloth to make a square bag and fill it with vetiver boo-ngas. Sew its lid then wrap and weave around the bag with another layer of vetiver leaves. They can be made in the shape of animals or dolls for decoration as well.

Knowledge set from experiment:

- *Scent preservation technique:* mix borneol with essential oils and camphor
- *Fragrant twined vetiver technique:* put dry vetiver leaves in warm water mixed with fragrance oils for one hour and dry them in the sun until they are fully dry. Then twine the fibers.

- *Fumigation with candle smoke:* Scented candle can be used to fumigate very fine strips of vetiver leaves which will retain fragrance longer than fumigating whole leaves.

Research Team: Asst.Prof. Suphawadee Panusampon and Acharn Choomkwan Butwiengphan, Faculty of Engineering and Architecture, Rajamangala University of Technology Rattanakosin and Acharn Chaleo Tuenpao, Director of Ban Takolang School and Acharn Krisana Koonasol, Acharn Pornpis Siachanboriboon and Acharn Banyen Tanhakorn, teachers from Ban Tako Lang School

Coordinator: Acharn Chomkwan Butwiengphan

Ban Tako Lang School: Ban Tako Lang School, Suan Phueng Subdistrict, Suan Phueng District, Ratchaburi Province offering classes for Standards 1-6 (primary level) has 113 students and 18 teachers. It is located in a multi-ethnic area encompassing Myanmese, Mon, Po and local people.

The teachers, students and communities - parents of students - are knowledgeable of vetiver, i.e. planting and propagation, as well as production of handicrafts from the leaves. Original techniques such as dyeing, weaving, twining, braiding, and folding are common practice for them. The community won the award of vetiver contest award in 2008. With this background, they then formed a group to make products for supplementary income. Nevertheless, their marketing has not been very successful as their product styles do not match the requirement of the target customers.

Rural Development and Environmental Protection in the Dabie Mountains of China: New Project Launched*

To relieve poverty, control water and soil erosion, and protect rural environment, the Vetiver System and agroforestry technology will be introduced and extended in the Dabie Mountains in Yuexi County and Jinzhai County, Anhui Province, China.

Activities

The following activities will be performed:

(1) Two vetiver handicraft training courses will be organized to strengthen and disseminate the skills. 40 women as new trainees will receive vetiver handicraft training.

(2) A total of 4,000 bamboo will be planted; 400,000 vetiver slips will be established as hedges to control soil erosion.

(3) 100 sets of biogas facilities will be constructed.

(4) 100 goats will be raised by 20 poor families.

(5) Water facility will be constructed for food security.

(6) 250 Mu of *Camellia oleifera* will be planted.

(7) A series of technical trainings will be conducted, 400 farmers will receive directive training.

(8) Many training and extension materials will be produced in large quantities and widely distributed for extension purposes. Numerous farmers will get indirect training.

The project duration is two years, from May 2011 to April 2013.

1. The Preparation and Initiation of the Project

Before the project started many preparations were conducted through bilateral visits, holding meetings and field investigations in order that the project could be implemented more smoothly and completed as soon as possible (Table 1). This is especially necessary for Jinzhai County, the new project site. The Jinzhai County is situated in the hinterland of the Dabie Mountains that covered about 100,000 km^2. Farmers there have had lot of difficulties in their lives. Especially since 1950's when several reservoirs were constructed causing a loss of 100,000 Mu (about 6,700 ha) of fertile land and 140,000 Mu (about 9,300 ha) economic trees. A total of 100,000 farmers were displaced, which aggravated the difficulty of farmers' lives.

In addition, a tentative timetable for the implementation of multiple project components was proposed and the budget request schedule was divided for different components. The timetable of the implementation was mainly based on the preparation under local natural conditions as well, such as problems of the local climate. For example, the first vetiver handicraft training course was set in October

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2011 in Jinzhai because the climate there is colder than Yuexi County, while in Yuexi, the farmers were busy with rice harvesting at that time.

2. Water Facility Reconstruction for Food Security

2.1 The repairing of two earth fill dams: In the Dabie Mountains there is very little farmland. The most important farmland, the rice field, is very valuable, covering about 5.9% in Jininzhai County. The rice production has a long history of providing the basic food needs in the mountains. To guarantee rice production small dams were constructed to restore water for irrigation purposes in 1970's. However, since the national economy reforms all of the land was divided to small plots and allocated to individual farmers, the dams and ponds have not had proper maintenance over the past 30 years and have gradually lost their function.

In the beginning of 2011 when local farmers heard that the ponds were to be reconstructed, they all voluntarily took part in the process of ponds reconstruction. At first they were organized to clean out the sediment before the coming of raining season, which lasted about one month. At same time, the Village Committee searched for supplies of the best and cheapest materials such as cement and sand, and the necessary technicians. In addition, a leading group was established to manage the whole process.

Since all of the preparations were conducted once they got the news of the approval of the project they finished the main work of repairing the ponds in just one month, which enabled the storage of irrigation water as early as possible and led to very good rice harvest.

2.2 The benefit from the reconstructed ponds: The weather this year was extremely erratic. There was insufficient rain fall from spring to summer, only totaling about 50 days. For the Jinzhai County, 1/3 paddy fields were not planted. For another 1/3 of the field planting had to be postponed to mid June. For the project village, of 800 Mu (about 53 ha), there were 300 Mu field without rice seedling planted caused by dry weather.

Under irrigation from the two reconstructed ponds, there were nearly 200 Mu of paddy fields produced a good harvest. Each Mu produced about 400 kg rice, totaling 80,000 kg for 200 Mu of fields. It was double that of the late planted seedlings. As a result, the two water ponds solved the food problems of 200 people affected by bad weather

Later, in October 2011, villagers were organized to finish the remaining work of the irrigation system. About 1,300 m of pipes were installed leading spring water to the pond in order that the irrigation system has plentiful water source and can last long time producing the highest profit.

To control soil erosion and control sediment from moving into the water ponds, vetiver hedges will be established next spring. It is expected that the ponds can work for at least another 20 years and farmers' food supply can be guaranteed.

Table 1. Meeting/visiting for the preparation of the project

Time	Location	Description
5-6 May 2010	Jinzhai County	Field investigation on local land use. Planting system and food production. Irrigation system and water facility. Social/economic situation. Livestock production, problems affecting farmers' basic subsistence, local market analysis.
21 July 2010	Nanjing	Basic natural condition. Crop production in Jinzhai County. Economic tree production. History of livestock production. Handicraft production in the near-by area.
15-16 Sept. 2010	Jinzhai County	Field investigation on tea production, *Camellia oleifera* cultivation, economic tree production. Vegetable production and storage (ginger). Insect protection.

		Fertilizer applications. Organic farming.
28-29 Mar. 2011	Jinzhai County	Introduction to vetiver grass and its application in agriculture, infrastructure protection, environmental protection, etc. Local tourism development and possible market of vetiver handicrafts, local handicraft production. Preparation for the early initiation of the project (farmer mobilization, material preparation and transportation). Detailed location for *Camellia oleifera* planting, vetiver planting. Budget and financial regulation.

3. Two Vetiver Handicraft Training Courses

3.1 The First Vetiver Handicraft Training Course in Jinzhai County: Of the two vetiver handicraft training courses planned in the project, the emphasis was put on that held in Jinzhai County because it had outstanding tourism markets which should be good for handicraft sales. As early as on 22 July 2011, three people from China Vetiver Network visited Jinzhai County. They brought farmers lots of materials, tools, and printed matter. All these things are necessary for vetiver handicraft training.

In addition, plenty of artificial flowers were sent to Jinzhai in August that will be used for vetiver handicraft products marketing in order that women farmers can get income immediately once they understand the handicraft technologies. To guarantee the supply of vetiver leaves, large quantity of leaves were cut, boiled in water, and dried in Jiangxi Province. Then, on 20 August 2011 a total of 180 kg of dried leaves were sent to Jinzhai, in addition to plenty of vetiver planting materials (slips).

3.1.1 The Selection of Trainers: In early September the selection of 3 trainers in Changpu Township of Yuexi County was carried out. The main parameters for the selections are:

• They should grasp the vetiver handicraft technology well and can make at least one kind of vetiver handicraft at top quality.

• They should be good at cooperating with others and can teach others hand-by-hand patiently.

• At least one trainer can make models of high quality and produce a high quantity in a short time so that it can meet the needs of trainees.

• They should have good health.

To make the selection more substantially and equitably a table was prepared to summarize the basic information on the candidates, which showed their experience during vetiver handicraft training courses in the past years (Table 2).

Table 2. Basic information of candidates for selection of trainers.

Name	Awards (2009)		Awards (2010)		Duty	Skill
	Grade	Product	Grade	Product		
1. Xu Lixia	2nd	vase	-	-	Group leader, trainer	Model-making; different products; can use computer
2. Wang Linfang	1st	bag	-	-	Group leader, trainer	bag
3. Liu Dongmei	3rd	bag	2nd	cap	Vice Group leader	bag, cap, mat
4. Yan Taolin	3rd	hat	1st	hat	Vice Group leader	hat
5. Zhou Shuwei	2nd	basket	-	-	Group leader, trainer	basket
6. Liu Yonghong	2nd	hat	-	-	Group leader, trainer	hat, mat
7. Cheng Qingxiao	3rd	bag	-	-		hat, mat

3.1.2 The Implementation of the Training Course: The training course was started on 10 October 2010 at Dafan Village of Shuanghe, Township of Jinzhai County. A Slogan was hung outside the training hall, which said “Develop vetiver handicraft industry and protect rural environment”. It

indicated that from the beginning the selling of the products was put on an important basis and a new Industry should be developed. In addition a photo exhibition was prepared to tell farmers:

- The basic characteristics of vetiver grass;
- Vetiver for agriculture production;
- Vetiver for engineering and environmental protection;
- The information dissemination in China.

A total of 20 trainees were divided into 3 groups and each trainer was responsible for a group. However, a little later, it was found that more women wished to participate in the training course. In the end there were 30 participants, which indicated that women had high enthusiasm for vetiver handicraft production.

The opening ceremony was organized in the morning. Directors of the county government and township government attended, in addition to the news agency. The main contents of addresses and presentations were:

- Introduction to the vetiver system.
- The process of vetiver handicraft production.
- How to make models for handicraft production.
- Introduction to vetiver handicraft products from China, Thailand and India.

The government leaders expressed their strong support for the training and requested trainees to learn earnestly. Meanwhile they hope to use vetiver grass to protect earth terraces and mine tailings. There are large areas that need to be protected and re-vegetated. In recent years many mine tailings and quarries appeared in the village they brought farmers income but at the same time led to environmental problems. They also expressed their thanks to EED and the German Government for their support to the project. Additionally, they wished to thank trainers from Yuexi County for their long time, travel and selfless work.

To enable the training to be most successful, multiple training materials were distributed to trainees. Furthermore, the China Vetiver Network bought some technical books that were badly needed for modern farming and sent them to the village, such as *Camellia oleifera* cultivation, organic rice production.

The representative of trainers, Ms. Xu Lixia, was invited to give a speech. She pointed out that the trainees can grasp vetiver handicraft technology and therefore could increase their income and social position. She encouraged participants to study unwearyingly and learn from each other in order to get unsurpassed achievements and to sell their products successfully.

To disseminate the training and the project more rapidly and widely, several news agencies and reporters were invited to attend the ceremony and reports were found on their websites:

- ❖ Jinzhai County News website.
- ❖ Jinzhai County Pioneer website.
- ❖ Liuan City News website.
- ❖ Liuan City Commercial News website.
- ❖ China Anhui (province) News website.
- ❖ West Anhui Daily News.

The active involvement of news agencies will surely generate great impact in the nearby area and the country. The training course attracted attention of local governments. On 11 October a group of leaders from province, city and county visited the training course and expressed their support.

To guarantee the success of the training course, the Village Committee prepared a series of regulations such as daily working time, fire protection, and daily workshop clearing. The trainees were divided into 3 groups one leader was proposed for each group.

The whole training course lasted 2 weeks and included:

Day 1-2: Opening ceremony and initiation:

(1) Introduction to vetiver for soil erosion control and slope stabilization;
(2) Introduction to vetiver handicraft production;
(3) The preparation of vetiver leaves:
- Cutting and selection of vetiver leaves
- Boiling, drying and dyeing of vetiver leaves

(4) Preparation of the models;

(5) General introduction on different models for boxes, hats, baskets, etc.

Day 3-11: Making of vetiver handicraft products

- Small boxes (2 days)
- Hats, bigger bags and baskets (4 days)
- Mat (1 day)
- Model making (2 days)

Day 12: Handicraft finishing and decorating

- Sulfur fuming
- Lacquer glazing

Day 13: Evaluation, selection and awarding; Closing ceremony.

3.1.3 The evaluation and awarding: To encourage trainees to produce high quality products, in the afternoon of 22 October 2011 the awards system was processed. At first each trainee selected her best product for evaluation, competition and judging. A total of 25 products were exhibited. Then Prof. Wang from China Vetiver Network announced the parameters for selection. The parameters considered for awards selection were:

- ❖ Material selection: including the color, thinness and length of the leaves, the treatment of the leaves.
- ❖ Manufacturing skills: the transition of different parts of a whole product should be done smoothly, without a break, joint or void.
- ❖ Decoration: design, the patterns, attached small decoration material, etc.
- ❖ Formative level: the whole product should be beautiful as work of art.
- ❖ Complexity: If the product was easy or difficult to make.

All products were exhibited and evaluated. The selection was done by secret ballot. All of the trainers, trainees, and organizers had the right to vote. A total of 8 women received the awards (Table 3)

Table 3. Results of the awards.

Name	Age	Education	Products	Award	Duty
Chen Tangmei	37	Junior middle school	Wine bottle cover	1st Award	
Hu Guangjun	29	Junior college	Ellipse container	2nd Award	Group leader
Wu Mingming	24	High middle school	Ellipse vase	2nd Award	
Zhu Yingxiu	45	High middle school	Pen container	3rd Award	Class Director
Shen Naixiu	46	Junior middle school	Bag	3rd Award	
Cai Xianxia	39	Junior middle school	Vase	3rd Award	
Sun Hueie	31	Junior middle school	Mat	3rd Award	
Bo Lihua	42	Junior middle school	Bag	3rd Award	

Additionally, during the process of the course 5 products were selected and sent to the Canton Fair (see below). The producers also got awards equal to 3rd award. In addition to financial awards, all of the trainees got a set of photos showing different vetiver handicraft produced in China and Thailand. These will be very useful for them to design and produce new handicrafts.

Although the training course was very successful, or even better than expected, there are still some problems. There were not any dyed vetiver leaves because of the wet weather, until 14 October 2011. As a result, for the forthcoming training it necessary to prepare some dyed leaves before the training begins..

It was decided that vetiver slips will be distributed to each trainees next spring for their own propagation in order that handicraft production can be sustainable.

3.2 Vetiver handicraft training course in Yuexi County: The second vetiver handicraft training course was held in Yuexi County from 24 October to 6 November 2011.

4. The Construction of Biogas Facilities

Historically, farmers in the mountains use firewood as the only fuel source, which caused

tremendous loss of forestry, leading to water and soil erosion and natural disasters from the depleted land. It is reported that a biogas tank of 8 m^3 can produce biogas equal to fuel wood production of 0.2 ha or the biomass of steppe for 10 ha. Therefore the application of biogas can protect forests and reduce water and soil erosion and relieve natural disasters. In other words, the construction of a bio-gas facility means the afforestation for about 0.2 ha should benefit rural the environment and global climate change.

In addition, the application of biogas can help women reduce time for cooking and therefore have more time for other work, vetiver handicraft production for example. Biogas can also improve their working conditions. During cooking, biogas is smokeless and the tanks produce good quality manure that can reduce the amount of fertilizer application, benefiting sustainable farming.

In May 2011 China Vetiver Network distributed printed pamphlets for local farmers and later they organized lectures covering the following topics:

- Why use biogas?
- Basic information on the construction of biogas systems (such as materials needed, shape and volume of the tank).
- How to construct a biogas facility.
- Process for the construction.
- Proper depth of the tank.
- The relation between the tank, toilet and hog pen.
- The proper cover of the tank.
- The pipe installation.
- How to use biogas safely, which included 10 key points to guarantee safety.
- Maintenance and trouble-shooting of biogas facilities.

Lectures containing similar information were presented in the village, showing farmers detailed pictures. Through information dissemination, lectures and visits farmers realized the importance and benefit of the application of biogas. Numerous farmers volunteered to construct a biogas facility. Finally the first 50 farmers were selected, and as a result the construction process went smoothly. The main points covered included material preparation, tank construction, and gas cooker installation. The technicians employed were invited from the County Biogas Office. Since they are specialists in the construction, the whole job was done very quickly and finished on 29 September 2011.

King Bhumibol Adulyadej Receives Humanitarian Soil Scientist Award

The International Union of Soil Sciences (IUSS) has presented His Majesty, King Bhumibol Adulyadej of Thailand their award as "Humanitarian Soil Scientist" for his work on soil management and stabilization.

His Majesty granted an audience to the IUSS Chairman, Emeritus Professor Dr. Stephen Northcliff, and his colleagues from the IUSS at Siriraj Hospital in Bangkok on Monday, 16 April 2012, when Prof. Northcliff presented the Humanitarian Soil Scientist award to His Majesty the King, honoring him as the world's first recipient of this award for his dedication to soil resources management.

Dr. Northcliff stated that the IUSS committee had agreed that His Majesty has a great understanding and passion for good soil management and has been working continuously to achieve better soil management for Thai farmers.

Since the 17th World Congress of Soil Science, which was held in Bangkok in August 2002, His Majesty, as a foundation supporter and benefactor of the vetiver system, has been a leader in tackling soil degradation, not only in Thailand, but worldwide. He has also provided land to Thai farmers and initiated several royal projects, creating development study centers across the country to help his citizens cope with soil erosion and degradation. IUSS recognizes His Majesty's ingenuity and relentless effort in developing soil quality, resulting in appropriate land improvement, soil and water development, and the mitigation of degraded soils. One among many of his initiatives is the promotion and the utilization of vetiver grass for soil and water conservation and prevention of soil erosion which makes Thailand one of the most successful centers of the Vetiver System application.

His Majesty the King is very concerned about soil problems in many areas throughout Thailand, areas which have low productivity leading to poverty. To tackle the problem of low soil productivity, His Majesty graciously initiated the establishment of six Royal Development Study Centers (RDSCs) throughout Thailand to serve as the models for solving soil problems in an integrated manner.

For example, the Khao Hin Son RDSC is the model for soil rehabilitation through natural means; the Phikun Thong RDSC conducts research to find solutions for highly acidic soils; the Khung Kraben Bay RDSC provides a breeding ground for animals and tree nurseries in areas with saline soils; the Huai Hong Khrai RDSC restores eroded watershed areas; the Phu Phan RDSC finds ways to manage soil and water in the Northeastern Region which is affected by drought and sandy soils; and the Huai Sai RDSC conducts experiments on the development of hard-pan soils.

The IUSS Chairman added that His Majesty is a leader in soil improvement not only in Thailand but also as an example to the world leaders. His work has inspired many international soil scientists to follow his example and help develop further methods of improving sustainable soil management. After reading the citation to the King and presenting the Medal, they enjoyed 40 minutes of discussions with him on soil science, soils in Thailand and soils globally.

The International Union of Soil Sciences (IUSS) is the global union of soil scientists, founded in 1924. The purpose of the IUSS is to "Foster all branches of soil science and its applications, to promote contacts among scientists and other persons engaged in the study and the application of soil science; to stimulate scientific research and to further the application of such research, for the benefit of mankind." The IUSS has as members in about 86 National and Regional Societies, with about 55,000 scientists all over the world, and further individual members in about 57 countries. Every four years, the IUSS holds the World Congress of Soil Science at various locations around the world.