

CHINA VETIVER NETWORK: TWENTY YEARS EXPERIENCE IN VETIVER DEVELOPMENT

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ABSTRACT:

Vetiver and vetiver grass technology was introduced to China by Mr. Richard Grimshaw through World Bank's China Red Soil Development Project in 1988. The project covered five provinces in southern China. Numerous universities and research institutes studied vetiver's biological and ecological characteristics; the establishment and management of vetiver hedges; and the effect of vetiver on soil fertility, soil moisture, soil erosion control, and crop yield. Tests showed that vetiver could play an important role in the remediation of red soils as well as in riverbank and coastal land stabilization. Thus the technology was disseminated to many other southern provinces.

In order to help farmers get more benefit, vetiver based agroforestry projects have been launched since 2001 aiming at introducing Vetiver System to protect economic trees (fruit trees, nuts, tea trees, etc.). When applied correctly slope land was protected, soil erosion was controlled, economic trees grew better and farmers got more income from well grown economic trees. These projects are:

- China Vetiver and Agroforestry Technology Project (2001-2003), supported by the Salvation Army, and implemented in Anhui and Hubei Provinces of the Dabie Mountains.
- Vetiver for Sustainable Watershed Management (2004), supported by SwissRe, and implemented in Hubei Province of the Dabie Mountains of China.
- Poverty Reduction and Resource Protection in a Guangxi Province Minority Area (2007-2008), supported by EED of Germany.

Farmers' benefit should be always the top consideration. Recently, First International Vetiver Handicraft Training Course was organized and three Thai experts were invited to train minority women to grasp handicraft skill and to generate direct income from vetiver.

In the past 20 years, China Vetiver Network has paid emphasis on vetiver development for sustainable agriculture especially in the mountainous poverty area. At same time started from 1997 VS has been used for highway and railway embankment protection. The technology was widely accepted by engineers and administrations. There are at least three provinces officially approved and recommended VS for highway protection. Up to 2004, just in Jiangxi province there were over 200 000 m² unstable highway embankment was protected by VS. In Zhejiang Province there were 600 000m² highway slopes were protected by VS. In 2003 national railway authority released a document officially accepted VS as an efficient way to stabilize railway embankment.

The National Vetiver Network played very important role in vetiver development, through organizing multiple activities such as conferences, training courses, and production and wide distribution of different publications. As a national network, we cannot expect to promote VS everywhere or in any fields in a short time. In addition, we should unite colleagues and friends from different regions or different disciplines as many as possible in order that VS could be distributed more rapidly and smoothly.

Keywords: sustainable agriculture, national network, agroforestry, embankment protection

1. THE INITIATION OF VETIVER SYSTEM IN CHINA

Vetiver and vetiver grass technology was introduced to China by Mr. Richard Grimshaw through World Bank's China Red Soil Development Project in 1988. The project covered 5 provinces in southern China. One year later, First China National Vetiver Planting Technology Workshop was co-organized by Agriculture Ministry and Water Resource Ministry in Shaowu of Fujian Province on 23-25 October 1989 in order to:

- exchange vetiver planting technology and experience;
- review vetiver application situation and prospective in other countries;
- visit vetiver demonstration plots and nurseries.

Besides, the workshop proposed further steps for vetiver applications:

- ✧ reinforcing vetiver tests and demonstrations;
- ✧ getting preparation for extension;
- ✧ strengthening mobilization and raising recognition on the function of vetiver grass on erosion control and agriculture production;
- ✧ establishing national vetiver information network.

The participants included experts and officials involving in agriculture and water conservation mainly coming from the 5 project provinces: Jiangxi Province, Fujian Province, Hunan Province, Sichuan Province, and Guizhou Province. In addition, participants also came from Chinese Academy of Sciences, International Science Union, Agriculture Ministry, Water Resource Ministry, Forestry Ministry. Altogether, 46 people from 32 institutions.

After the workshop, numerous universities and research institutes involved in vetiver tests on:

- ✧ vetiver's biological and ecological characteristics;
- ✧ establishment and management of vetiver hedges;
- ✧ effect of vetiver on soil fertility, soil moisture, soil erosion control, and crop yield.

Tests showed that vetiver could play an important role in the remediation of red soils as well as in riverbank and coastal land stabilization.

Thus, to facilitate planting, scores of vetiver nurseries were established. Farmers then had access to vetiver to protect tea bushes and tea oil plants. They also fed animal stock and fish with vetiver prunings. In Fujian Province, people applied vetiver to fix coastal sand dunes, to control wind erosion, and to establish hedges for windbreaks.

Research has shown:

- Vetiver grass increased soil fertility with soil nutrients such as nitrogen, phosphorus, potassium (Xu Liyu, et al. 2003).
- The grass improved soil pH and organic matter content (Chen K. et al. 1998).
- Vetiver hedges could reduce water runoff and water erosion (Tao 1998).
- When vetiver prunings were used to mulch the ground surface, soil temperature and moisture were improved (Chen and Li 1998).

2. VETIVER BASED AGROFORESTRY PROJECTS FOR POVERTY REDUCTION AND RESOURCE PROTECTION

China Vetiver Network has always put emphasis on erosion control for agriculture production. However, we cannot just ask farmers to use VS to control soil erosion and to protect our environment. We must bring farmers benefit at the same time. Therefore in the recent years we organize vetiver based agroforestry projects in order to help farmers get more long term income

from the projects and combine vetiver planting with economic tree production. In this way farmers get profit from economic trees meanwhile hundreds of millions of vetiver seedling have planted.

2.1 Main vetiver based agroforestry projects

Table 1 describes main contents of several projects launched in the recent years. These projects covered such provinces as Anhui, Hubei, and Guangxi. The project sites are all located in the mountains where soil erosion is serious and farmers suffer from poverty. Although the economic tree species are different from Chestnuts, tea, mulberry in the Dabie Mountains to fruit trees (pear, peach, loquat, waxberry, etc.) in Guangxi province they have a common objective for soil conservation and sustainable farming when vetiver is planted as hedges. The species of selected economic trees have local priority and decided by local farmers based on local natural conditions and local market situation (Xu Liyu. 2003a).

2.2 Technical training

One of the most important components of the projects is to organize multiple training courses. Observations and discussions revealed that there is high enthusiasm among farmers who see training as an important income generating opportunity, especially when the original extension system met problem during the economy reform. The objectives of the trainings are to:

- ✧ introduce vetiver technology and help farmers to practice the technology.
- ✧ introduce general and specific agroforestry technology.
- ✧ help farmers to understand the relation of development and soil erosion control and fertility maintenance.
- ✧ help farmers to grasp technology for income generation.
- ✧ improve socio-economic status of women.
- ✧ help women to grasp necessary vetiver and agroforestry technologies.
- ✧ help women to improve capability of income generating and marketing.

The contents of multiple trainings are shown in table 2. In addition to vetiver for agricultural production, topics on vetiver system for engineering protection was also introduced to mountain farmers in order to encourage farmers to involve in infrastructure protection. For example, we helped farmers in the Dabie Mountains to establish vetiver nurseries and to use their seedling to contract embankment protection project with railway companies in order to make more profit. Some farmers in Fujian Province also established vetiver companies and involve in railway protection in southern China.

Because the implement area of a project is always limited while the poverty mountains are large area, training materials are usually distributed widely to other area of the country to disseminate VS and to spread the experiences obtained from the project site.

In addition, irrigation facility constructions, such as pumping stations, mini-water ponds, are also included in the projects to ensure long term bumper harvest.

Table 1. Vetiver based agroforestry projects launched in recent years

Project name	Period	Location	Main donors	Main project contents
China Vetiver and Agroforestry Technology Project	2001-2003	Anhui; Hubei	Salvation Army	<ol style="list-style-type: none">1) establish high quality 16,000 chestnut trees, 400,000 mulberry trees, and 8,000,000 tea plants protected by vetiver hedges to increase income and relief poverty.2) introduce vetiver and agroforestry technology for grain production, income generation, and soil erosion control.3) increase of food production through construction of 5 pumping stations.4) develop multiple training courses for environmental protection and poverty alleviation.5) extend successful experience to the whole Dabie Mountain
Vetiver for Sustainable Watershed Management	2004	Hubei	SwissRe	<ol style="list-style-type: none">1) chestnut (900 seedlings) and tea trees (120 000) established.2) 210 000 vetiver tillers planted to protect economic trees.3) vetiver nursery established to produce planting materials for further development.4) proper agroforestry technologies were introduced, demonstrated, and extended including: pipe-water-level contour planting of crops and trees, living hedges of vetiver and multipurpose nitrogen-fixing shrubs for soil erosion control and soil reclamation, intercropping in newly developed commercial trees, etc.
Poverty Reduction and Resource Protection in a Minority Area	2007-2008	Guangxi	EED	<ol style="list-style-type: none">1) To relief poverty and protect natural resources, Vetiver System and Agroforestry were introduced and demonstrated.2) 54 000 economic trees (loquat, pear, peach, plum, waxberry) be planted.3) 3 210 000 vetiver tillers were planted to protect economic trees.4) 40 sets of irrigation system be constructed in two minority mountain villages.5) Series training courses will be organized and over 1 800 accumulated number of persons (most of them are women) be directly trained. Around 2 000 minority people will get rid of poverty.6) The experiences and information will be most widely distributed through in-direct training, information dissemination, visiting, and national and international networking.

Table 2. Contents of multiple trainings

Main title	Contents
Vetiver Technology	why vetiver can conserve soil and water planting & management of vetiver hedges establishment and management of vetiver nurseries use of pruning (fodder, mulch, mushroom cultivation)
Soil-water conservation	soil and water loss and its consequence engineering measures for erosion control function of vetiver living hedges agroforestry (contour-planting, N-fixing trees and grass, plant diversity)
Fertilizers	technique of increasing soil fertility vetiver pruning as green manure combined use of farmyard manure and chemical fertilizer
Economic tree cultivation	seedling cultivation and management planting & management of different economic trees vetiver hedge establishment for economic tree production pests and diseases control

3. VETIVER HANDICRAFT TRAINING

Following national economy reform, the economic situation has improved considerably in the past two decades in China. People no longer satisfy with food production, instead they wish to earn more profit. Supported by EED/Germany, The Vetiver Network International, Royal Development Projects Board of Thailand, and Department of Industrial Promotion of the Ministry of Industry of Thailand, an International Vetiver Handicraft Training Course was held in Longshen, Guangxi Province of China on 21 Oct.- 6 Nov., 2007.

The course was well prepared few months before the training:

- A color Newsletter was prepared to introduce vetiver handicraft production and distributed to local farmers in order to let farmers know vetiver handicraft and generate their interest in participating in the training.
- Local project partners were asked to get preparation for the training: selection of training location and trainees; preparation of handicraft materials and tools.
- A field survey was investigated in Jiangxi Province to prepare dried vetiver leaves to transport to Guangxi. In this way farmers can use Jiangxi vetiver leaves for practice when waiting for the boiled leaves to dry.

To guarantee quality, 23 trainees were selected. They grasped all procedurals of vetiver handicraft production from leave treatment, dyeing, model design and making, production of different items including:

- Different things for their own family use.

- Products to fill fruits for selling (combine vetiver handicrafts with fruits production and marketing).
- Hats, bags, containers, etc. for selling to tourists.

Through two weeks practice, all of the trainees grasped basic skills and can design and produce other similar products based on local conditions and demand. Everybody felt that the training to be the best one and the most successful. The success came from:

- ✧ At the beginning of the training course, a Leading Group was established that consisted of many important people from multiple cooperation parties. Each person of the Leading Group had its detailed responsibility. Everything was planned and arranged very clearly and implemented smoothly.
- ✧ Every 3-4 days, there was a short meeting held in the afternoon before finishing one-day's work, aiming at solve problems and improve training process.
- ✧ Around 10 key persons from various institutions were actively involved in the organization and in-course service, of which 4 scientists from China Vetiver Network worked at the training site.
- ✧ Both trainers and trainees all worked very hard. Trainees learnt very earnestly, while trainers taught very patiently.
- ✧ Logistics people did a very good job to guarantee the implementation efficiently. Our guests, the three trainers were very happy with logistics arrangement.
- ✧ Thai trainers brought China many necessary tools that might be difficult to found in China in a short time and enabled the training course implemented smoothly.

All of these made the training to be most successful. All of the cooperation parties and persons satisfied with the training course. The successful training course indicated that to invite Thai trainers to China to teach local farmers is very economical, compared with sending very few farmers abroad to learn.

4. VETIVER SYSTEM FOR ENGINEERING PURPOSE

4.1 Initiation of vetiver systems application for highway embankment protection

The first Vetiver System (VS) applications for engineering purpose was for highway embankment stabilization in Jianyang County in northern Fujian Province in 1997. The demonstration site showed people that vetiver grass could prevent highway embankments from landslides and at the same time could efficiently protect paddy fields from silt deposits. The demonstration was warmly welcomed not only by engineers but also by farmers.

Meanwhile, Thai expert Mr. Diti Hengchaovanich introduced his expertise in using VS for highway protection in Malaysia during International Vetiver Workshop in Fuzhou, the capital of Fujian Province, from 19-24 October 1997. He pointed out that vetiver had a strong fibrous root system that penetrated and bound the earth to a depth of up to 3 m and could withstand the effects of tunneling and cracking. Thus, the grass was more effective than hardwood roots in stabilizing slopes. His theory and experiences generated great impact among Chinese engineers. In China many highway and railway were constructed in the recent decades and there is huge market for VS applications.

Later on 8 July 1998, an official document was prepared and released by the Highway Bureau of Fujian Province. The document fully approved utilization of vetiver for stabilizing highway embankments and asked all highway institutions, offices, and departments at the county and prefecture levels throughout the province to study vetiver technologies and implement them for

highway stabilization and erosion control. The document further requested that all institutions strengthen their exchange of ideas and experiences in order to extend the grass throughout the entire province more rapidly.

To speed up VS extension in the engineering sector, the International Conference on Vetiver Bio-Engineering Technology for Erosion and Sediment Control and Civil Construction Stabilization was co-organized by the China Vetiver Network and The Highway Administrative Bureau of Jiangxi Province in Nanchang, Jiangxi Province in October 1999. The conference was a breakthrough for highway and infrastructure protection. Both foreign and Chinese experts were invited to present lectures. All of the participants visited demonstration site. The Nanchang Conference played an extremely important role in VS application for engineering in China and acted as a historical milestone in the sense that (Xu, Liyu. 2002a):

- 1) The demonstration showed engineers and government officers the fact that vetiver could be widely used for highway embankment stabilization and could reduce costs.

- 2) The conference transferred VS applications in China from the previous decade's focus on use for agriculture purposes to engineering applications.

- 3) VS was fully approved by provincial and national highway experts, and the demonstration and project received a third place award from the National Highway Society in 2002. It was also introduced in the China Communication Newspaper and on the Human Resources of China Communications web site.

- 4) The conference generated interest among private individuals because they found that VS could bring them high profits. From this time on, the private sectors began to actively and positively promote VS (Wan Ming; et al 2003).

Next year in April 2000 in Zhejiang Province, a demonstration was established on the newly constructed National Highway No. 330 on 10,600 m² of slopes to prevent the frequent landslides. In November 2000 the Zhejiang Communication Bureau organized an appraisal conference on vetiver, the first conference of this kind in China. Provincial and national experts attended the conference and toured the demonstrations. As a result, Vetiver Systems were fully approved and thus, disseminated throughout the province and the country as well.

4.2 Vetiver systems for railway embankment protection

However, no railway institution was allowed to start vetiver planting until they received permission from the top railway authorities via the Railway Survey and Design Academies. This meant that if an organization wanted to use VS it had to pass through various doors for permission. With great effort, the Xinchang Railway Company located in Nanjing, the capital of Jiangsu Province, became the first railway to establish a demonstration on newly constructed railway embankment on fluvial plain in spring 2001(Xu Liyu 2003b).

Later in autumn, the Railway Vetiver Technology Identification and Evaluation Conference of China was held in Nanjing from 18-20 October 2001. Around 40 participants attended the conference, including experts from various national railway academies and administrations. During the conference all the participants went to Huangqiao to inspect the demonstration site. Vetiver System was fully approved by railway experts.

Then in 2002 the national railway released an official regulation which put vetiver as a effective plant for railway embankment protection and greenization. The regulation was published in 2003 (table 3). This means that the door was officially opened for all railway applications through out the country so long as temperature is suitable for vetiver growth. At the same time in 2002, the first railway vetiver company named Xinchang Vetiver Slope Stabilization Co. Ltd. launched that

indicated the initiation of extension of VS for railway stabilization through joint effort of railway authority and private companies. In 2002 and 2003 the Vetiver System was applied to an increasing number of railways in Jiangsu, Anhui and Fujian Provinces. Meanwhile, many other applications appeared in different part of the country (Fig.1).

4.3 Vetiver systems for other purposes

Once people grasped vetiver technology they wished to promote it to all other fields so long as there is potential for VS applications. Since Nanchang Conference 1999 people used VS for river bank protection, civil building protection, polluted water (lakes, pig yard, etc.) treatment, mine tail revegetation in different parts of the country (Fang Changjiu and Chen K. 2003).

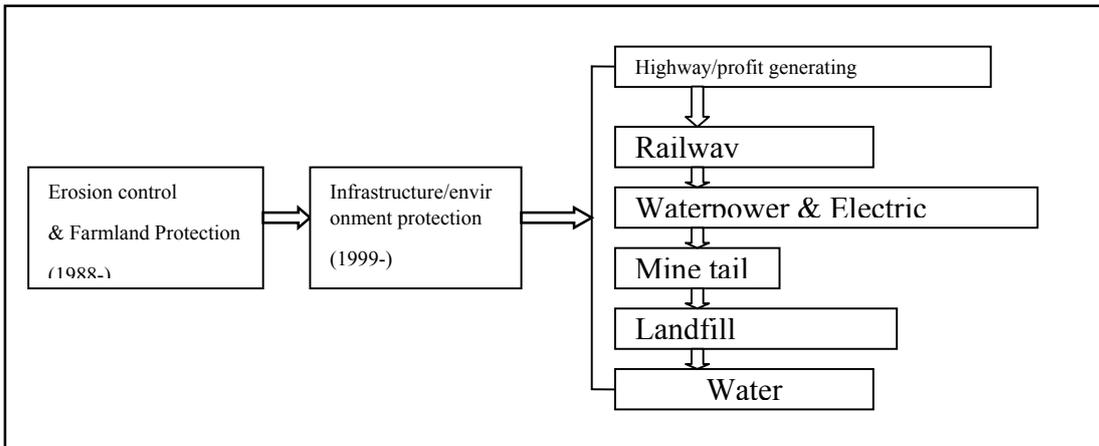
Besides, numerous researches were done by many national or provincial universities or research institutes. The topics cover a very wide area, including:

- VS for polluted water treatment (lakes, pig farms, city wasted water);
- Draught tolerance of different eco-types of vetiver;
- Water tolerance of different eco-types of vetiver;
- Insects on vetiver hedges;
- Regulation of vetiver for embankment protection;
- Study on AM fungi in rhizosphere of vetiver grass;
- Salt tolerance research of vetiver;
- Vetiver for highway, water power project protection;
- Protect vetiver planted in autumn from cold winter (Xu Liyu, 2008);
- Effects of grasses of vetiveria and pennisetum on trophic groups of soil nematodes (soil micro-organ).

Table 3. Chronicle on Vetiver System for engineering protection approved by authorities

Years	Authority that Releases the Document
1998	Highway Bureau of Fujian Province
2001	Zhejiang Provincial Communications Bureau
2003	Jiangxi Provincial Communication bureau
2003	Jiangxi Provincial Highway Bireau
2003	Jiangxi Provincial Highway Society
2003	Construction and Management Dept. of China Railway Ministry

Fig 1 Vetiver development procedures in China



5. NATIONAL NETWORK FOR FAST DEVELOPMENT

As a national network there is plenty of work to do. All information and progresses should be collected; Close cooperation among network members should be established; Correct development policy should be designed.

5.1 Network establishment

The first step for national network was to disseminate vetiver information to most potential people as many as possible. Therefore the top task was to search institutions and people who might be most interested in the Vetiver System, in other words, in which areas or fields the Vetiver System might be applicable. The network office in this regard expended a great deal of effort. They collected information on numerous institutions and personnel involved in agriculture, forestry, water and soil conservation, ecology, the environment, land management, highways, railways, mining, and excavation. The list also included universities, technical schools, research institutes, extension stations (centres), and government units. All of information was collected, analysed, and evaluated. The most potential people and institutions were recoded for information dissemination, totalling over 1000 units or persons.

5.2 Production and distribution of multiple publications to different people

Multiple materials have been produced through efforts of key network members and sent to different people. These materials include books, booklets, newsletters, FACT Sheets, New Year Chards, etc. (table 4). It should be mentioned that we should produce different publications for different people. For scientists they need research articles and books, while farmers may be fond of looking at posters with plenty of pictures.

5.3 Vetiver systems dissemination via public channels

To disseminate Vetiver Systems more widely, numerous public agencies and channels introducing the grass from different points of view were utilized through joint efforts of network members. These included the central television station, Informal Reference Information, the Science Times, the Communication Times, the Nanjing Daily, the Jinling Evening Paper, the Lishui Daily, the Farmers Daily, the Yuexi Newspaper, the Anhui Economy Paper, and others. Some of these papers reported VS more than once. At same time, many research articles were published in

different journals, such as the Water and Soil Conservation Research, China Water and Soil Research, World Agriculture, Ecology Science, Journal of Ecology, Journal of Biology, Science and Technology of Tropical Crops, Red Soil Research of Jiangxi Province, the Bulletin of Water and Soil Conservation, Jiangxi Science, the Highway Journal, East China Highway, Mountain Research, Agricultural Science and Technology of Guangdong Province, Water and Soil Conservation of Fujian Province, Science and Technology of Water Conservation in Jiangxi Province, Acta Agriculturae Jiangxi, the Highway Survey and Design of Guangdong, Communication Survey and Design of Fujian, the Jiangsu Highway Society Newsletter, and so on. It is worth noting that many articles were co-authored by scientists from different disciplines, for example from agriculture and engineering. This played an important role in Vetiver Systems dissemination among different institutions and promoted application within differing divisions. According to an incomplete list there were several dozens articles published in different highway journals promoting vetiver applications with highway construction (Xu, Liyu. 2002b).

Table 4. Main vetiver publications in China

Name of publications	Year	Descriptions
Vetiver Newsletter	1996-	a quarterly journal introducing new achievements, new developments, and new technologies from China and abroad. It was printed in Chinese, with occasional publications distributed in English.
Vetiver for Water and Soil Conservation: FACT sheet	1996-	printed on different colour paper in order to attract people's attention. They introduced practical technology and were mainly for use with farmers and extension workers.
Agroforestry Today	1993-2000	a quarterly journal in Chinese. It primarily introduced vetiver based agroforestry systems and was mostly distributed to agroforesters.
Vetiver Research and Development	1998	The book was written for scientists, university professors, and government officials.
Vetiver Grass: The Hedge against Erosion (green book)	2001, 2004, 2007	Translated into Chinese for both scientists and farmers
Vetiver Grass for Slope Stabilization and Erosion Control	2001	written by Thai expert Mr. Diti Hengchaovanich and was translated into Chinese. This book introduced his successful experiences in using vetiver for engineering purposes. It was widely distributed to engineering institutions
Vetiver System and its research and application in China	2003	in both Chinese and English. It was distributed during ICV-3 in Guangzhou. It contained 120 colour photos most of which came from China
ICV-3 Proceedings	2003	Edited by Dr Paul Truong and Dr Hanping Xia and published in English
Vetiver System: Theory and Practice	2008	Introduce recent vetiver system progress in China and in the world
Vetiver New Year's Greeting Cards	2001	produced in large quantities and distributed to many different people during the Chinese New Year holiday called Spring Festival
Chestnut Tree Cultivation with Vetiver Hedge Protection	2001	Introduce how to use vetiver hedges to protect newly planted chestnut tree. Distributed mainly in the Dabie Mountains
Tea Tree Cultivation with Vetiver Hedge Protection.	2001	Introduce how to use vetiver hedges to protect newly planted tea tree. Distributed mainly in the Dabie Mountains

Mulberry Cultivation Vetiver Protection.	Tree with Hedge	2001	Introduce how to use vetiver hedges to protect newly planted mulberry tree. Distributed mainly in the Dabie Mountains
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5.4 Select a most promising subject

There were a lot of subjects for vetiver development in a country. However we could not expect that all of the subjects could be promoted at the same time. During a certain period we have to search for all possible subjects and then select most important one as a target.

- ◆ The most important topic should have huge potential for further development (had huge market).
- ◆ It should be relatively easy to be implemented with little difficulties, compared with other subjects.
- ◆ It could play an important role for further extension, i.e. once VS was developed in this area it could extend to other relative field with no trouble.
- ◆ It could be easily accepted by the related authority.

Based on the above consideration we selected highway as a breakthrough because:

- 1) Highway construction had been very rapidly through out the country. It had huge market;
- 2) There were several grades and related administrative management authorities in highway, i.e. the expressway, national highway, provincial highway, etc. There was very little relation between them. That is to say we could apply VS at any highway grade without consideration on others. On the contrary, for railway construction there was rigid management.

5.5 Launch projects in different region

In the recent decade, many conferences, training courses and development projects were organized in different area of the country in order that people in these area could be mobilized, be familiar with VS and therefore use VS. During the preparation and implementation of these conferences, training courses, and projects we cooperate many local institutions which were selected from our network member list. We unite scientists and universities, or institution as many as possible. As a result, once the conference/projects was finished vetiver development in this area was promoted greatly.

Table 5 Conferences and training courses launched in different area of the country

Years	Conferences/training courses	Location
1997	International Vetiver Workshop	Fuzhou, Fujian Province
1999	International Conference on Vetiver Bio-Engineering Technology for Erosion and Sediment Control and Civil Construction Stabilization	Nanchang, Jiangxi Province
2000	Appraisal Conference on Vetiver for Highway Protection	Lishui, Zhejiang Province
2001	Railway Vetiver Technology Identification and Evaluation Conference of China	Nanjing, Jiangsu Province
2001-2002	Vetiver for economic tree cultivation	Anhui and Hubei Provinces
2003	ICV-3	Guangzhou, Guangdong Province
2007	International Vetiver Handicraft Training	Longsheng, Guangxi Province

5.6 Wide cooperation with selflessness

Why vetiver system can get so great achievements in China and in the world? Why VS development can last so long time (at least already 20 years)?

- The first reason should be that the grass has many miracle advantages, which is other plants do not have.
- Another important reason is that many outstanding experts actively involve in VS tirelessly and selflessly.

We are all in one family VETIVER FAMILY. As we know that one person's capability is very limited. However, if many people in ONE FAMILY unit together and do a same thing the vigour should be very great. The tremendous achievement in 20 years in China was reached through joint effort of numerous people from both China and abroad. For example:

To speed up VS extension in the engineering sector, Thai engineer Mr Diti went to China to introduced his experience in 1997, 1999, and 2003 respectively (Hengchaovanich, D. 1998). Besides, he helped me to organized 10 Chinese scientists to visit VS development in northern Thailand on 23-26 Jan 2000. We visited VS demonstrations, tissue cultivation workshop, work site of highway embankment protection, etc., watched VCD. His organization was excellent and completely free.

Many other international experts visited China and introduced their experiences, some of them for many times.

We got support from TVNI experts when we seek projects. They provided very strong reference letters that insure our application proposals to be successful. In VETIVER FAMILY we work together as brothers.

There are many vetiver articles and books published in the recent decades in the world. Many publications were distributed free of charge. Some of them were translated into other languages without copyright charges, which enable VS to be disseminated more rapidly.

When we introduce VS for highway embankment protection, we invited senior highway engineers from different recognized highway institutions as authors to publish articles in highway journals in order that more engineers could accept VS, even though the article was purely prepared by vetiver worker.

6. CONCLUSION

China gained tremendous achievements in the past 20 years. The scientists did a very good job in testing and research in order to provide valid proof; The governmental authorities issued official documents as passport; The private companies promoted development through seeking various projects in every corner they could reach; China Vetiver Network played an important role in national coordination, organization, and policy making. The achievements came from a great deal of effort from numerous scientists, officials, and extension workers from both China and abroad in the VETIVER FAMILY. There will be more progress in China and in the world so long as we FAMILY MEMBERS join together to learn each other and to cooperate more closely.

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