

How to Initiate the Private Sector to Develop the Vetiver Industry with Special Reference to China

Hanping Xia

South China Institute of Botany, Chinese Academy of Sciences, Guangzhou 510650, China

Abstract: China's vetiver technique for the environmental purpose was initiated in 1988, almost at the same time as other vetiver promoting nations. However, it was developed relatively slowly in the first ten years (1988–97) compared with China's practical needs. The main reasons were: 1) the vetiver technique was a novelty and, therefore, needed a relatively long process to be widely accepted; and 2) the novelty had been confined in the circle of scientific research all long, and no one devoted himself to push it into the market. It was in the year 1997 when the author decided to initiate the private sector to run the vetiver technique. The first private entrepreneur who was brought into the vetiver circle is Mr. Hong Hao, the President of Hongri Grass Industry Group. He plunged himself into the vetiver industry in 1998, and established the Guangdong Association of Grass Industry and Environment in 1999 to promote development of the technique and industry. Afterwards, at least ten vetiver consulting companies in China have begun, one after the other, to run the vetiver industry under the author's help and instruction. Some of them were newly established especially for the vetiver business, such as the Guangzhou Vetiver Grass Environmental Science and Technology Co. Ltd., and the Hangzhou Zhijiang Vetiver Engineering Co. Ltd. All these companies have made great progress in promoting the vetiver technique throughout South China and made a contribution to China's environmental amelioration. Through six years of experiences, the author thinks that the following four measures are necessary in order to initiate the private sector to enter and run the vetiver industry: 1) give entrepreneurs sufficient confidence that vetiver is really effective in soil erosion and environmental amelioration; 2) do your best to help them, especially when they need you; 3) try to solve problems that they encounter in the process of running vetiver; 4) objectively analyze possible difficulties and actual economic benefits running the vetiver industry. The practice indicates that these measures are feasible and effective and, therefore, might be adopted in other regions of China and even in the world.

Key words: vetiver technique, private sector, vetiver industry, vetiver business

Contact: Hanping Xia <xiahanp@scib.ac.cn>

1 THE EARLY DEVELOPMENT SITUATION OF THE VETIVER TECHNIQUE IN CHINA

China is one of the earliest countries in the world that conduct vetiver research and application. As early as the 1950s, vetiver was introduced into China, mainly in Guangdong, for the purpose of extracting essential oil. The vetiver oil processing industry in China, however, ceased its operation several years later due to the high cost of cultivation and extraction, plus the low quality of the oil. Since then, vetiver work came to a complete stop in China; almost no one knew what vetiver was from late 1960s to early 1980s.

Vetiver has been utilized again since Mr. Richard Grimshaw, the then President of The Vetiver Network (TVN), was the first to introduce the technique into China in 1988. From then on, the research

and development on vetiver has gradually been carried out throughout Southern China. As far as research on vetiver is concerned, Guangdong, led chiefly by the South China Institute of Botany (SCIB) of the Chinese Academy of Sciences, did a lot of creative work (Xia 2001); as for dissemination, The provinces of Jiangxi, Guangdong, and Fujian claimed the most outstanding achievements (Chen *et al.* 1993; Xia *et al.* 1996, 1998; Zhang 1998). Based on their accomplishments, there were several Chinese scientists who won the King of Thailand's Vetiver Awards and The Vetiver Network Awards. As for academic exchange and training, a vetiver workshop, co-sponsored by the Ministries of Agriculture and Water Resources, was held in Fuzhou, Fujian as early as 1989. Later on, a number of training courses and international conferences were also held in many places in South China, such as the Fuzhou International Conference in 1997, the Nanchang International Conference in 1999, and the Guangzhou International Vetiver Application Workshop in 1999 (Xia, 2001). All these movements have helped to promote the development of the Vetiver System (VS) in China.

However, the development and promotion of the vetiver technique in the ten-year period from 1988 to 1997 was quite slow as a whole compared with the practical requirement of the Chinese environment. The main reasons are the following two aspects. 1) The technique was a novelty at that time and, therefore, needed a relatively long process to be accepted. It is well known that any new thing needs to spend a spell of time to be completely understood and accepted. 2) The novelty had been confined in the circle of scientific research, and no one devoted himself to push it into the market. As a result, almost no enterprises knew the technique; even a few knowing it also did not dare to take action due to scarcity of sufficient technical help. After getting to know the focuses of the problem, the author made a resolution in 1997: initiate the private sector to create and run the vetiver industry.

2 REPRESENTATIVE PRIVATE ENTERPRISES INVOLVED IN THE VETIVER CIRCLE

Through 6 years of endeavor and struggle, there have been at least ten private companies around South China involved in the vetiver circle; among them the representative companies are briefly introduced as follows.

2.1 The Hongri Grass Industry Group and The Guangdong Association of Grass Industry and Environment

Mr. Hong Hao, the President of the Hongri Grass Industry Group, is a celebrated private entrepreneur engaging in the grass industry in China. It was towards the end of 1997 that he heard of vetiver grass, and then he immediately came to SCIB to meet the author. At that time the author was very pleasantly surprised to receive him because the author was looking for entrepreneurs like him. After knowing more about vetiver's miraculous properties from the author, Mr. Hong decided to start his vetiver career in Guangzhou. A sub-company named "Guangzhou Hongri Landscape Engineering Co. Ltd." was soon set up in Guangzhou. Then the Company began to conduct projects. So far, nearly ten projects have been conducted, including one slope-stabilizing project with the total area of over 60,000 m² in Zhongshan City, South Guangdong (Appendix 1).

In order to promote VS dissemination more rapidly, Mr. Hong founded the Guangdong Association of Grass Industry and Environment in November 1999. He arranged himself as the Secretary-General, and asked the author as the Vice Secretary-General. During the past four years, the author has done his utmost to help the Association to conduct pertinent work, including the compilation and issue of vetiver

knowledge and technique, organization and operation of training courses and workshops, and acting as a liaison between governmental agencies and private enterprises. At present, in collaboration with Guangdong Academy of Agricultural Sciences, SCIB, and South China Agricultural University, the Association is actively organizing the Third International Conference on Vetiver and Exhibition (ICV-3) to be held in Guangzhou in October 2003.

2.2 The Guangdong Huihua Environmental Science and Technology Co. Ltd.

Under the coordination of the author, the Company was co-established by the Guangzhou Sunrise Green Garden Engineering Co. Ltd. and SCIB and, therefore, is a joint-stock company. Mrs. Xu Yuanxin, the Director of the Sunrise Green Co., was not only the first female entrepreneur devoting herself to the vetiver circle, but also, collaborating with SCIB, established the first joint-stock company in China running the VS. Since founded at the end of 1999, the Huihua Company began to promote the VS in the following four activities: 1) establishment of the vetiver nursery, 2) carrying out the vetiver eco-engineering, 3) publicizing the vetiver knowledge, and 4) striving to get financial supports from the national government for the above three activities. So far, the Company has succeeded in all aspects above through the help of SCIB and the author. For example, the Company has strived to obtain two items of great financial supports specially for vetiver application from the Ministry of Science and Technology of China in the last two years; one of them was from the National Sparking Planning Program, valued at Yuan 500,000, and the other was the National Agricultural Science and Technology Achievements Dissemination Item, also valued at Yuan 500,000. That was the first time that the China National Government formally gave a financial support to vetiver dissemination and application (Appendix 2).

2.3 The Guangzhou Vetiver Grass Environmental Science and Technology Co. Ltd.

This is the first company in China having the term ‘vetiver’ as part of the company’s name, and even probably the first one in the whole world. Under the author’s suggestion, Mr. Feng Ziyuan, set up the Company at the beginning of 2000. During the past three years, his company made a great progress, and the projects conducted by this Company have been extended into Hunan, Hubei, Guangxi, Guizhou, Yunnan, as well as Guangdong. Furthermore, these projects were mainly concentrated on slopes of rivers, reservoirs, canals, and lakes. More importantly, Mr. Feng, the arduous and diligent guy, is good at summarizing his work. He always sums up the success and shortage to each finished project and then writes them into papers. Under the author’s help and instruction, he has published 5 papers in periodicals, producing a quite big influence in the academic circle as well as the circle of water conservancy. At present, he and the author are applying to the China National Knowledge Property Bureau for a patent for a vetiver new technique in the aspect of slope protection of the “water body” ecosystem (Appendix 3).

2.4 The Guangzhou Rivers Enterprise Co. Ltd.

Originally, what this Company ran was mainly paints and environmental protecting equipment, almost having nothing to do with vetiver. Nevertheless, the boss of the Company, Mr. Liu Xiaofeng, was a postgraduate student of SCIB; Mr. Zeng Binhua, a staff member of the company, is a relative of an SCIB personnel; as a result, they both got to know vetiver a long time ago. As early as 1998, the company began to grow vetiver from tissue-cultured plantlets, and established the first tissue-culture laboratory mainly for the vetiver in China under the supervision of SCIB. Since 1999, the company has started to conduct vetiver projects under the instruction of SCIB. To date, several large-sized vetiver projects, including quarry, landfill, and highway slope, have been successfully finished by the Company.

At present, the company is actively co-organizing ICV-3 (Appendix 4).

2.5 The Guangzhou Eco Environment Science and Technology Co. Ltd.

Guangzhou Eco Environmental Science and Technology Co. Ltd. is a relatively newly established company as compared with the other ones. Despite only two years or so since its foundation, the Company has made a great progress. Mr. Zhang Ping, the Company's President, is a very smart and courageous guy, he always challenge difficulty that others are afraid. For example, quarry, especially headwall, is 'the hardest bone' to eco-restoration. Considering the huge economic perspective and urgent social demands in this aspect, he plunged him into the battlefield. Eventually, the world-class problem was solved through several years of endeavor; a newly typed vetiver complex eco-technique that revegetates rock headwalls quickly was invented jointly by him and the author in 2002. Due to the high efficiency of the new technique, the Company has successfully finished a project with the headwall area up to 60,000 m², and is signing a batch of new agreements with bosses of quarries or pertinent government departments. The perspective is quite optimistic. Now the Company is also co-organizing the ICV-3, and is ready to give a financial support to the Conference (Appendix 5).

2.6 The Yunnan Green Land Enterprise Co. Ltd.

The Company lies in Kunming, the capital city of Southwest China's Yunnan Province. Due to the remote geographical location, the Company did not know vetiver until the end of 2001. Then Mr. Huang Bo, its Vice Manager-General, immediately paid a special trip to Guangzhou, asking the author to give help to their work. Under the help of the author, vetiver shipped from Guangzhou was successfully established on mountain slopes of 1,900–2,100 m above the sea level in Yunnan. Last year, the Company, uniting with SCIB, successfully applied to Yunnan Natural Science Foundation for a research proposal to further disseminate the technique throughout the southwest region of China (Appendix 6).

2.7 The Hangzhou Zhijiang Vetiver Engineering Co. Ltd.

This is the second company in China named after the term "vetiver". It was founded in July 2000 in Hangzhou, the capital city of East China's Zhejiang Province. The president of the Company is Mr. Zhao Zhaoqing, a former official of the Zhejiang Provincial Traffic Department. Since foundation, the Company has played an important role in East China for the dissemination of VS. Despite not giving a face-to-face help to the Company, the author also provided Mr. Zhao with a large amount of vetiver information and technique material, and replied all of his queries, one time after another, through telephone, email, and mail (Appendix 7).

3 THE MAIN MEASURES INITIATING THE PRIVATE SECTOR TO ENTER AND RUN THE VETIVER INDUSTRY

On the whole, the development and dissemination of VS in the last 6 years was much rapider than the previous ten years. More importantly, the vetiver industry has formed in Guangzhou, and is exercising influence on other places of South China. This indicates that involvement of private section has made a distinct promotion to the development and dissemination of the new technique. Through a summary of the past 6-year work experience, the author thinks that the following four points may be the main reasons attracting the private sector to enter and run the vetiver industry.

- 1) Give entrepreneurs sufficient confidence that vetiver is really effective in soil erosion and

environmental amelioration. As stated above, the VS is a novelty and, therefore, is a little bit difficult to be widely accepted in a short time. In order to persuade these entrepreneurs to accept the novelty, the author offered them, always free of charge, lots of pertinent material, including brochures, books, articles, discs, posters, photos, vetiver samples, and even a small quantity of vetiver seedlings; moreover, the author always led them, on his own initiative, to visit demonstration spots. In order to assure them that vetiver really has a massive, deep and strong root system, the author made a special experiment showing vetiver roots and got samples of bulky roots. Everyone felt very surprised at vetiver's strong, deep roots, and became more confident of the miracle plant after they visited the samples.

2) Do your best to help companies, especially when they need you. For example, when the Hongri Company was just founded, vetiver planting materials were very scarce. In order to meet the demand for establishing a large-scale nursery, the author personally made a special trip to Jiangxi Province to buy vetiver planting materials for the Company in April of 1998. Another example, the Huihua Company obtained two 500,000-Yuan funds from the pertinent government agencies as mentioned above. In fact, it was the author who voluntarily helped the Company to finish the two thick application forms. In addition, all companies above-mentioned asked the author many times to give an instruction on the spot, the author always did his best to meet them. For instance, the author ever flew to Kunming, nearly 2000 km away from Guangzhou, at the request of the Yunnan Green Land Co. Ltd., which took him 5 days, from 3-7 August 2002. All these the author did for these companies were voluntary; he never charged them. However, to those demands unbeneficial to development of the vetiver industry, the author always ignores them. For example, the bosses of certain three firms in Guangzhou attacked mutually at the beginning. Each boss spoke ill of the other two sides in order to make himself occupy the vetiver market; at the same time, each boss involved in "fight" asked the author to be with him and to be against the other two sides. The author deeply knew that it would be very unfavorable to the development of the newly born vetiver industry no matter which side he stood, and furthermore he felt that he could not keep in silence to the severe accident. Whereupon he rose to speak, making an intercession patiently among the three sides. Through nearly one year of endeavor, the fight eventually ceased. At present, almost all vetiver enterprises in Guangzhou have formed a good situation of mutual competition and of mutual cooperation.

3) Try to solve problems that they encounter in the process of running vetiver. The author and his research team have made scientific researches on vetiver, and found lots of its excellent features, but some new problems still appear from time to time in the process of running vetiver or implementing vetiver projects by the private sector. For example, at the beginning, vetiver was regarded as too high; thus the author conducted an experiment on effects of plant growth retardants on the growth and tillering formation of vetiver. As a result, it was found that the application rate of 8g/L B9 (daminozide) had the best inhibition effect on the growth of vetiver (Xia and Liu, 2000). Later on, some enterprisers pointed out that vetiver became brown in winter and its landscape became ill-favored accordingly. After hearing the feedback, the author immediately embarked on a collection and investigation of different vetiver ecotypes and varieties from home and abroad, including Thailand, USA, Australia, and even Africa. As a result, of 14 collected ecotypes, the ecotype Karnataka coming from India was found to be the shortest and greenest all year round (Xia and Liu, 2003). At present this ecotype is being applied experimentally by some companies. In recent years, the vetiver technique has been concentrated on rivers, reservoirs and lakes for the purpose of inner slope protection. Obviously this demands vetiver to endure a long time of submergence or flooding, but no exact data can indicate this point so far. Since 2000, the research team led by the author has initiated the new experiment investigating the tolerance of vetiver to

submergence. Although the experiment is not yet over, the phasic result indicates that vetiver can endure at least 100 days of complete submergence, much stronger than many other grasses used widely in South China. The result provides sufficient evidence for vetiver's application in "wet" slopes, which greatly enhances the confidence of vetiver enterprises and engineers of water conservancy in this respect.

4) Objectively analyze the difficulties and economic benefits to run the vetiver industry. The vetiver industry is a promising industry; it is full of temptation and challenge. However, the investment is indispensable, especially in the early stage; furthermore you cannot win repayment in a short time, and even result in failure or losing money if you run it improperly. On the contrary, you may win a considerable economic benefit and produce a good social influence. Thereby, when these entrepreneurs first came to meet the author, he always clarified this point to them first, and told them the possible difficulties and trial in the early stage; at the same time the author assured them that any firm can win resplendence and triumph as long as the personnel are persistent forward along the correct way. Honesty wins trustiness. In the past years, there really appeared some failing projects brought by certain companies due to incorrect operation, but the bosses of the companies did not lose confidence due to these small failures. On the contrary, they summarized experiences and sought after failing reasons in good season. Eventually, the vetiver industry in South China is becoming more and more attractive; the vast majority of companies running vetiver have begun to obtain profits, and some of them have won huge economic benefits.

4 CONCLUSION REMARK

In Guangzhou, besides the foregoing five companies (from Section 2.1 to 2.5), there are several other vetiver consulting companies. They are Guangdong Greenew Co. Ltd., Guangdong Kungpeng Science and Technology Development Co. Ltd., Guangzhou City Baiwo Ecological Science Research Center, etc. All vetiver companies coming from Guangzhou and other places of China have made great progress in creating China's vetiver industry, promoting the vetiver technique throughout South China, and furthermore made a contribution to China's environmental amelioration (Xia, 2002). Today, vetiver is becoming one of the most popular buzzwords in Guangzhou. One main reason is that there are so many private companies applying vetiver and so many institutions doing research on it. Together, they have made vetiver 'taking a deep root in the soil' of Guangzhou. Of course, there is another main reason, namely the organization of the Third International Conference on Vetiver (ICV-3) to be held in this city in October 2003. At that time, you will see that a team of vetiver consulting companies coming from China, mainly from Guangzhou, are being up and doing at the venue of ICV-3.

Undoubtedly, Guangzhou is becoming one of the most active centers in China and even in the world due to the fact that so many private firms are involved in the vetiver circle. The main reason resulting in development and prosperity of the vetiver private sector in Guangzhou and in South China is that, apart from a good scientific research basis, there are zealous vetiver specialists in here who have voluntarily helped or instructed the private sector to promote the VS. Obviously, the author is the representative among them.

5 ACKNOWLEDGMENT

The author wishes to thank all the vetiver firms mentioned in the text for their contribution to development of China's vetiver industry.

6 REFERENCES

- Chen K, Hu GQ, Ding HX, *et al.* 1993. Vetiver grass – an excellent hedgerow on slope of red soils for soil and water conservation. *Science and Technology of Tropical Crops*, 6: 10-13
- Xia HP. 2001. Development of the Vetiver System in Guangdong, China. PRVN Tech. Bull. No. 2001/3, PRVN / ORDPB, Bangkok, Thailand
- Xia HP. 2002. How to initiate the private sector to develop the vetiver industry with special reference to China. PRVN Tech. Bull. No. 2002/1, PRVN / ORDPB, Bangkok, Thailand
- Xia HP, Ao HX, He DQ. 1994. Effects of environmental factors on the growth of vetiver grass. *Chinese Journal of Ecology*, 13(2): 23-26
- Xia HP, Ao HX, Liu SZ. 1998. The Vetiver Eco-engineering – a biological technique realizing sustainable development. *Chinese Journal of Ecology*, 17(6): 44-50
- Xia HP, Ao HX, He DQ. 1996. A study on vetiver grass in soil amelioration, and soil and moisture conservation. *Tropical Geography*, 16: 265-270
- Xia HP, Ao HX, Liu SZ, *et al.* 1999. Application of the vetiver eco-engineering for the prevention of highway slippage in South China. *Proc. First Asia-Pacific Conf. on Ground and Water Bioengineering Erosion Control and Slope Stabilization*, Manila, the Philippines. pp. 522-527
- Xia HP, Liu SZ. 2000. Effects of plant growth retardants on the growth and tiller formation of *Vetiver zizanioides*. *Grassland and Turf*, 20(2): 29-33
- Xia HP, Liu SZ. 2003. Study on screening for excellent ecotypes of *Vetiveria zizanioides*. *Acta Pratacultuae Sinica*, 12(2): 97-105
- Zhang J. 1998. Effects and prospects of vetiver grass used as hedgerow for sand stabilization in coast areas. In: *Vetiver Research and Development*, China Agricultural Science Press, Beijing, China. pp. 179-191

Statement of Merit

The Vetiver System was not developed until in the end of 1980s in China; therefore it is a novelty in the eyes of many people. As a result, the “new” technique had been confined in the academic circle, and no any entrepreneur ran it by 1997 in spite of the fact that there is an extremely huge market for it in China. Thereby, the phenomenon was obviously not normal. Then, how to change the abnormal situation? In order to make the vetiver technique enter commercial market and to accelerate its application as quickly as possible, the author concentrated on the following 4 measures to conduct work: 1) give entrepreneurs sufficient confidence that vetiver is really effective in soil erosion and environmental amelioration; 2) do your best to help these companies, especially when they need you; 3) try to solve problems that they encounter in the process of running vetiver; 4) objectively analyze possible difficulties and actual economic benefits running the vetiver industry. Through 6 years of endeavor, the situation has had a big change. So far, the vetiver industry has begun to form in Guangzhou, and there have been nearly 10 private companies in Guangzhou alone involved in the industry. Therefore, it indicates that the above measures initiating private sector to run vetiver are feasible and might be applied in other countries and regions of the world.

A Brief Introduction to the First Author

Dr. Hanping Xia, a restoration ecologist, is working at the South China Institute of Botany, Chinese Academy of Sciences. Since 1991, he has been engaged in a wide range of R&D on the Vetiver System for the purpose of soil erosion control and polluted environment mitigation, including highway slope

stabilization, land reclamation and re-greening, quarry rehabilitation, mine and landfill phytoremediation, wastewater purification, etc. He creatively initiated “the Vetiver Eco-engineering” from his working experience of many years. So far he has one monograph and over 30 academic papers in this aspect published.

Appendix 1 (Translation)

Application Certificate

| | | | |
|--|--|--|-------|
| Project title | The Vetiver Eco-engineering | | |
| Application unit | Guangzhou Hongri Landscape Architecture Co. Ltd. | | |
| Mailing address | Room 806, Baogong Building, 263 Long Kou Rd.E., Tianhe District, Guangzhou Postcode: 510075 | | |
| Time scope of the achievement application | Since 1997 | | |
| Economic benefits (Renminbi 10 thousand Yuan) | | | |
| Year | | | Total |
| Net increment of production value (output) | | | |
| New increment of tax (pure income) | | | |
| <p>Applying Situation and Social Benefits:</p> <p>In the end of 1997, when hearing of vetiver, the newly born thing, our company immediately contacted with South China Institute of Botany, Chinese Academy of Sciences leading the research work, and then was ready to spread and apply “the Vetiver Eco-engineering”. From the year 1998, the Company began to set up a vetiver nursery under the instruction of Dr. Xia Hanping, the principal of the research work. Very quickly, the nursery area is enlarged from the initial 8 Mu to the present 150 Mu (15 Mu = 1 ha), becoming the largest vetiver nursery around the whole country. After preparing for vetiver seedlings, we began to carry on vetiver projects. During the past two years, the Company applied the Vetiver Eco-engineering in various aspects, such as slope protection of real estate in the suburb of city, highway slope stabilization, and revegetation for the “blank band” of inner slope of reservoir. All of these applications obtained good ecological, economic and social benefits. Furthermore, the cost of the Vetiver Eco-engineering is significantly lower than that of the stone-based engineering. Due to good efficiency and benefits, our work aroused a high attention of the Guangdong Provincial Science and Technology Department; as a result, the Department appointed our company to be the demonstration and application unit of the scientific fruit. At present, there are lots of users and clients who are buying our vetiver seedlings or are ready to collaborate with our company to conduct the Vetiver Eco-engineering.</p> <p>Our company is the first company running vetiver in China. Our experience indicates that vetiver is a very promising plant species for soil and water conservation, and the Vetiver Eco-engineering is creditably a new hope to defeat soil erosion for human.</p> | | | |
| Application Unit: Guangzhou Hongri Landscape Architecture Co. Ltd. September, 2000 | | | |

Appendix 2 (Translation)

Application Certificate

| | |
|--|---|
| Project title | The Vetiver Eco-engineering |
| Application unit | Guangdong Huihua Environmental Science and Technology Co. Ltd. |
| Mailing address | Room 2001, Tianhe Trade & Business Building, Tianhe District, Guangzhou Postcode: 510630 |
| Time scope of the achievement application | Since the beginning of 2000 |
| Economic benefits (Renminbi 10 thousand Yuan) | |
| <p>Applying Situation and Social Benefits:</p> <p>The Guangdong Huihua Environmental Science and Technology Co. Ltd. was co-established by the Guangzhou Sunrise Green Garden Engineering Co. Ltd. and South China Institute of Botany (SCIB), Chinese Academy of Sciences. The biggest business of the company is to run the vetiver technique and to implement the Vetiver Eco-engineering, including vetiver's research and development, seedling culture, project application, etc. Therefore, the company is actually a first joint-stock company specially running vetiver in China.</p> <p>The company was founded in the end of 1999. Since foundation, it has made a great progress under the leadership of Ms. Xu Yuanxin, and under the elaborate instruction of Dr. Xia Hanping and other vetiver experts of SCIB, and under the help and concern of the society. So far, the company has conducted a serial of vetiver projects in various regions and habitats of Guangdong Province, such as the rehabilitation of the Shenou Quarry in Shenzhen City, and the steep slope stabilization of Guangzhou Overseas Chinese Technical School and of a real estate in Panyu District of Guangzhou. All these projects won success and produced quite good ecological, economic and social benefits. Many batches of foreign guests, such as Mr. Richard G. Grimshaw, the Chairman of The Vetiver Network, Dr. Sumet Tantivejkul, the Secretary-General of the Thai Chaipattana Foundation, Dr. Samran Sombatpanit, the President of the World Association of Soil and Water Conservation, and many Chinese leaders coming from Guangdong Province, Guangzhou City and Shenzhen City have visited these project spots, and gave a full satisfying evaluation and high appraisal to these projects and their efficiency. The Company also took part in the Fourth China International Garden and Flower Exposition held in Guangzhou in 2001; and the Vetiver Garden exhibited in the Exposition by the company also won the Best Environmental Efficiency Award. In 2000 and 2001, the company strived to obtain two items of great financial supports specially for vetiver application from the National Sparking Planning Program and the National Agricultural Science and Technology Achievements Dissemination Item. Thus the company became the first one around China that obtained national special supports to disseminate the vetiver technique.</p> <p>The work conducted by our company indicates that the Vetiver System is a very excellent technique for ecological and environmental protection, and the Vetiver Eco-engineering is quite worth disseminating and spreading throughout southern China.</p> <p style="text-align: center;">Application Unit: Guangdong Huihua Environmental Science and Technology Co. Ltd. October 10, 2002</p> | |

Appendix 3 (Translation)

Application Certificate

| | | | | |
|---|---|------|-------------------------------|------|
| Project title | The Vetiver Eco-engineering | | | |
| Application unit | Guangzhou Vetiver Grass Environmental Science and Technology Co. Ltd. | | | |
| Mailing address | Room 901, Haihui Building, Guanghai Garden, Zhongshan Avenue West, Tianhe District, Guangzhou. Postcode: 510665 | | | |
| Time scope of the achievement application | Since the beginning of 2000 | | | |
| Economic benefits (Renminbi 10 thousand Yuan) | | | | |
| Year | 2000 | 2001 | 2002 | 2003 |
| Net increment of production value (output) | 65 | 164 | It is expected to be over 300 | |
| New increment of tax (pure income) | 26 | 67 | It is expected to be over 100 | |
| <p>Applying Situation and Social Benefits:</p> <p>This company is the first one in China named directly after the miracle grass “vetiver”, which was established under the initiative of Dr. Xia Hanping of South China Institute of Botany, the Father of China Vetiver. Since foundation in the beginning of 2000, the company has exclusively conducted the Vetiver Eco-engineering, namely applying the vetiver technique for erosion control and slope stabilization. The applied objects contain highway, river, park, hydropower station, and even urban community. In the past over 2 years, our company has carried out more than 10 projects in the provinces of Hunan, Hubei, Guangxi, Guangdong, Guizhou, and Yunnan. Especially after two projects (protection of the bank of Hanjiang River, the largest branch of Yangtze River, and slope stabilization of Hunan section of the Beijing–Zhuhai Highway) were successfully conducted, the company produced a huge influence in the society, and in the meantime won a good reputation and plentiful repayment. In the time of only 2 years, our company with only 6 staff members gained nearly RMB 1 million Yuan of profits; furthermore the perspective will be more wonderful. All these are due to the miraculous efficiency of vetiver and Dr. Xia’s correct instruction. The practical experience of our company in the past 2 years indicates that the vetiver technique is really a very effective eco-engineering technique, and is therefore well worth conducting in the southern regions of China; but the first thing for conducting the Vetiver Eco-engineering successfully is to grasp the technique, or else it would probably get half the result with twice the effort, and even would result in failure.</p> | | | | |
| <p>Applying Unit: Guangzhou Vetiver Grass Environmental Science and Technology Co. Ltd. May 10, 2002</p> | | | | |

Appendix 4 (Translation)

Application Certificate

| | | | | |
|--|---|------|------|------|
| Project title | The Vetiver Eco-engineering | | | |
| Application unit | Guangzhou Rivers Enterprise Co. Ltd. | | | |
| Mailing address | Room 2302, Jinhui, Dongzhou Building, 75 Guangli Street, Tiyu Road W., Tianhe District, Guangzhou. Postcode: 510620 | | | |
| Time scope of the achievement application | Since the year 1998 | | | |
| Economic benefits (Renminbi 10 thousand Yuan) | | | | |
| Year | 2000 | 2001 | 2002 | 2003 |
| Net increment of production value (output) | | | | |
| New increment of tax (pure income) | | | | |
| <p>Applying Situation and Social Benefits:</p> <p>Originally, what our company ran was mainly paints and environmental protecting equipments, almost having nothing to do with vetiver. In 1998, the company began to conduct market research when hearing of the miraculous effects of vetiver grass with special reference to eco-environmental remediation and protection. Since then, the company, under the instruction of Dr. Xia Hanping, has established his own vetiver nursery and energetically conducted the Vetiver Eco-engineering from nothing to something, and from small to big. In 1999, the company produced the first batch of vetiver tissue-cultured plantlets on a large scale through the first tissue-culture laboratory mainly for the vetiver. In 2000, the company became the first batch of companies that rehabilitated quarry using the vetiver technique. In 2001, the company took the lead in applying the vetiver technique (parts consulted Dr. Xia's research achievements) to successfully restore and protect the Datianshan Landfill, the largest landfill in South China. In addition, the company still conducted several projects of highway slope stabilization, and all of them produced pretty good efficiency. The above-mentioned projects are all very effective in the aspects of economy, ecology and society. The project spots have welcomed many batches of noted vetiver experts and environmentalists at home and abroad, and pertinent leaders, who were thoroughly affirmative to and satisfied with the quality of projects and their benefits. The work conducted in the past 4 years indicates that the Vetiver Eco-engineering is very worth disseminating and applying, and is also appropriated to do so, around southern regions of China. The company will consolidate the work and in the meantime hope that scientific research personnel can screen out new vetiver varieties with characteristics of stronger resistance and more beautiful appearance to meet the social need of various aspects.</p> | | | | |
| <p>Application Unit: Guangzhou Rivers Enterprise Co. Ltd.</p> <p>May 25, 2002</p> | | | | |

Appendix 5 (Translation)

Application Certificate

| | | | | |
|---|---|------|------|------|
| Project title | The Vetiver Eco-engineering | | | |
| Application unit | Guangzhou Eco Environment Science and Technology Co. Ltd. | | | |
| Mailing address | Mingfa Building, Middle Pearl Street, Eastern Pearl Garden, 1033 Baiyun Ave South, Guangzhou Postcode: 510400 | | | |
| Time scope of the achievement application | Since 2001 | | | |
| Economic benefits (Renminbi 10 thousand Yuan) | | | | |
| Year | 2000 | 2001 | 2002 | 2003 |
| Net increment of production value (output) | | 90 | 360 | 800 |
| New increment of tax (pure income) | | 30 | 126 | 240 |

Applying Situation and Social Benefits:

Guangzhou Eco Environment Science and Technology Co. Ltd. was found in 2001. Under the energetic support of Dr. Xia Hanping, the company, collaborating intimately with South China Institute of Botany, has conducted a great deal of work and made a complimentary contribution in the aspect of dissemination of the vetiver technique, especially erosion control and environmental amelioration. For example, we developed the Chinese website www.eco-vetiver.com to introduce and publicize the vetiver technique, and established 100 mu (15 mu = 1 ha) of vetiver nursery. In 2001, the company sold over 2 million slips of vetiver to various place of the country, and jointly finished a rehabilitation project of garbage landfill in Liuan City, Anhui Province, and a slope stabilization project of highway in Chongqing City. In recent two years, the company has carried out very fruitful work with regard to quarry revegetation. Through the complex vetiver eco-engineering technique to establish a permanent and solid ecosystem containing trees, shrubs, herbs, and creepers, we have finished revegetation of the Baitengshan Quarry and of Nanpingguanchang Quarry of Zhuhai City. The revegetated total area exceeded 100,000 m². A new technique for rapid revegetation of barren headwall invented by Manager-General Zhang Ping and Dr. Xia has been accepted by and heard as patent by China National Knowledge Property Bureau. At present, some projects for revegetation of quarries and stabilization of steep slopes in Guangzhou, Dongguan, Zhongshan, Huizhou, and Foshan are being or will be conducted soon. The industrialization of the vetiver technique has produced a marked effect, and its social and economic benefits have been quite obvious.

Applying Unit: Guangzhou Eco Environment Science and Technology Co. Ltd.
May 16, 2003

Appendix 6 (Translation)

Application Certificate

| | | | | |
|---|--|------|------|------|
| Project title | The Vetiver Eco-engineering | | | |
| Application unit | Yunnan Green Land Enterprise Co. Ltd. | | | |
| Mailing address | 40 Qingyu Street, Kunming, Yunnan Province. Postcode: 650031 | | | |
| Time scope of the achievement application | Since the end of 2001 | | | |
| Economic benefits (Renminbi 10 thousand Yuan) | | | | |
| Year | 2000 | 2001 | 2002 | 2003 |
| Net increment of production value (output) | | | | |
| New increment of tax (pure income) | | | | |

Applying Situation and Social Benefits:

Our company, founded in 1997, is engaged in rehabilitation and revegetation of degraded ecosystems, and application and industrialization of pertinent bio-techniques. Since 2001, the company has begun to run the vetiver technique, which has got elaborate instruction and huge help of Dr. Xia Hanping of South China Institute of Botany, Chinese Academy of Sciences.

In 2001, our company actively conducted research and utilization of vetiver to rehabilitate and revegetate degraded ecosystems in stony regions of Yunnan Province. Collaborating with Dr. Xia, we applied to Yunnan Provincial Department of Science and Technology for a research proposal entitled “ Study on reclamation and resistance of screened vetiver variety to degraded ecosystem in Karst rock-melting regions of Yunnan”. At the same time, the company conducted the dissemination and application of the Vetiver Eco-engineering in a hydropower station lied Jiuxiang Resort, Yiliang County, Kunming, Yunnan. The project is to construct biodiversity basal platform using vetiver as a pioneer on a steep slope and barren, weathered rocks; as a result it produced a huge fruit and benefit.

In this year, there were severe rainstorms and floods in Yunnan (the rainfall of one single day was up to 142 mm in the first half of July and August in Yiliang County), resulting in sideslips, collapses, mud-rock flows, and floods in many places, but our vetiver project experienced all sorts of real trials. In the same section of the slope, one part that was not conducted the Vetiver Eco-engineering produced sideslip and collapse, and resulted in destroy of a construction project; whereas another part in which the Vetiver Eco-engineering was implemented was safe and intact under the protection of vetiver hedgerows despite of the fact that it was steeper (over 75°) than the first part. This project acquired huge economic and social benefits, made a contribution to the society, won very good reputation for our company, and set an example for our company to conduct the Vetiver Eco-engineering in Yunnan Province in the future. All in all, the project won a high appraisal coming from government and society and therefore, energetically enhanced the working zealously and confidence of the staff members of our company.

Through the practice of the project, it has fully testified that the vetiver technique recommended by Dr. Xia Hanping is a quite effective technique for ecological restoration. It has a promising future, and significant benefit.

Applying Unit: Yunnan Green Land Enterprise Co. Ltd.

August 28, 2002

Appendix 7 (Translation)

Application Certificate

| | | | | |
|---|--|------|------|------|
| Project title | The Vetiver Eco-engineering | | | |
| Application unit | Hangzhou Zhijiang Vetiver Engineering Co. Ltd. | | | |
| Mailing address | Room 707, Transportation Service Building, 379 Tiyu Rd. W., Hangzhou Postcode: 310006 | | | |
| Time scope of the achievement application | Since 1999 | | | |
| Economic benefits (Renminbi 10 thousand Yuan) | | | | |
| Year | 1999 | 2000 | 2001 | 2002 |
| Net increment of production value (output) | | | | 32.5 |
| New increment of tax (pure income) | | | | 8.7 |

Applying Situation and Social Benefits:

This is one of the earliest established companies in China which are named after the miracle plant “vetiver”. Her foundation and run has obtained the energetic concern, support and instruction of Zhejiang Provincial Traffic Department, China Vetiver Network as well as South China Institute of Botany (SCIB), Chinese Academy of Sciences, the earliest institution conducting vetiver research in China. Since establishment, our company, led by Mr. Zhao Zhaoqing, has conducted at least 6 vetiver slope-stabilization projects along highways. These projects, situated in the Provincial Highway Nos. 52 and 53, the National Highway Nos. 330 and 205, Hangzhou-Nanjing Highway, and Hangzhou-Quzhou Highway, covered a total area of 279,000 m², and all won success. They were all checked and confirmed by experts invited by Zhejiang Provincial Traffic Department, and gained a unanimous good appraisal. Furthermore, these projects saved Reminbi 8.37 million Yuan (about 1 million US dollars) for the government and highway department; they cost only 12-20% of the stone-based engineering, or the hard method, which is consistent with the result calculated out by Dr. Xia Hanping of SCIB. Today, the Company is becoming stronger and stronger, and the influence of the Vetiver Eco-engineering is also enlarging in Zhejiang and in East China. We deeply believe that our company will bear more abundant fruits in the respect of application and dissemination of the Vetiver Eco-engineering under the continuing concern and support of SCIB, China Vetiver Network, and The Vetiver Network; we also deeply believe that vetiver will take deeper and firmer roots in East China as well as in Zhejiang.

Due to various reasons, such as returning loans, experiments, taxes, trainings and meetings, as a result the company itself won quite few profits, but it is still worth doing. It is anticipated the Vetiver Eco-engineering is promising and its future is quite optimistic.

Applying Unit: Hangzhou Zhijiang Vetiver Engineering Co. Ltd.
November 6, 2002