Vetiver Technology - System Innovation and Their Application

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Abstract: Vetiver had been studied for many years in the world, but as a good mature product and technology, vetiver has been applied only in recent ten years in China. The authors take the vetiver application as the basis and technology-system innovation as the frame to discussed vetiver technology innovation, at the same time establish the application mode to make the technology serve practice well. The paper analysis the each key components" government, the public and enterprise" in order to make sure vetiver technology application can bring larger economic and social and ecological effects.
Key words: vetiver, application mode, technology-system innovation, government, the public, enterprise
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1 INTRODUCTION

Being a experimental research, Vetiver has been developed from 1950's. The research was focused on balm abstraction from Vetiver's roots. Being a plant used for the purpose of erosion control, Vetiver is applied in China as recently as 10 years ago. As the Secretary-general of Guangdong Association of Grass Industry and Environment, I initiated the first Vetiver base on Guangdong Province for commercial use with the help of Mr. Lu Xiaoliang and Dr. Xia Hangping and started to use Vetiver in Guangdong Province in 1998. Since that time there have more than 10 companies engaged in this business, with a total area of 57 $hm^{2.}$ The direct economic benefit is in excess of 10 million RMB, while the indirect economy benefit is more than 100 million RMB. Although 100 million RMB is a relatively small impact on Guangdong Province's economy, but for a grass that has only been introduced here 5 years ago the market impact is significant. The most important thing is that it brings us more social benefit and eco-benefit than economic benefit. Here I sum up my experience to be shared by everyone.

2 BACKGROUND

The population of Guangdong is more than 78,000,000, its covers an area of 180,000 km^2, of which more than 57% is covered by forest. Its rainfall is 1500-2000mm annually. The heavy and concentrated rain leads to serious soil erosion and water loss in the area of more than 1000 km^2. Therefore, it is one the more seriously affected provinces in China. Guangdong is also the first province to adopt the policy of economic reform, its GDP has increased more than 10% each year since 1980. Its GDP is 1/7 of the entire nation, and its revenue is 1/8 of the whole country. It has become the most economically developed province as well as the most market-driven province. In the last 20 years, with continuous development creating severe environmental impact with serious soil erosion problems.

3 TECHNOLOGY INNOVATION

As the economy and the quality of life improve, more attention is given to environmental impact

from both the government and society. The government of Guangdong spends more than 1 billion RMB each year in the control and treatment of environmental damages. But which technologies and what products will be adopted? Which method is the best way to protect and restore the environment? All these questions give rise to the opportunity to introduce new technologies and products in this field.

It is precisely this opportunity, which we did not foresee, that gives Vetiver the most effective and fundamental basis from which to launch. But there are two key questions: the first question is how can we present this as a new technology and not just a plant; the second question is which method and systematic approach we arrange take to ensure that it will be accepted in the market place? We have been exploring these two questions for 5 years.

3.1 Plant → Product

Vetiver is not just another plant, it has two special characteristics: first, it has a strong root system (its tensile strength is 1/6th that of steel); second, it is a pioneering plant (the Vetiver's existence can foster the growth of other plants). To companies engaged in the businesses of erosion control and environmental restoration these two characteristics in Vetiver represents both a useful function and a useful value. Therefore, it is a marketable product.

3.2 Product→ Technology

Because the use of Vetiver is mainly in the engineering field, so it must introduced as a technological application in a scientific and systematic way for its broad acceptance and use. Over the course of learning from the experiences of colleagues overseas and modifying to the local conditions and market demand in Guangdong, we developed the rules on planting with matching design - such as combining the use of Bahia grass to cover a slope quickly; mixing Eucalypts can promote vegetation succession; combining with drainage engineering can improve erosion control. These methodologies have elevated Vetiver to become the key biological component in the technical applications.

3.3 Technology_New Technology

For a technology to be recognized as new it must have comparative advantages. The Vetiver technology has a wide array of applications: soil stabilization and slope protection; riverbank erosion control; gangue reclamation; quarry reclamation; dump site landscaping; water purification, etc. Within the different fields of application, its comparative advantages are different. For example, in soil stabilization and slope protection, the Vetiver technology has advantages relative to conventional engineering technology.

3.3.1 Economy

Comparing with traditional engineering methods, the Vetiver technology has a very distinct economic advantage. It's costs are only $1/5^{th}$-1/10th that of conventional engineering technologies.

3.3.2 Permanence

If appropriate drainage and correct technical applications are used, a slope, which has been treat by Vetiver technology, can enjoy permanant stability. If there are no requirements for beautification, the slope does not need any maintenance.

3.3.3 Ecology

This is the most outstanding feature of the Vetiver technology. As a "pioneering" plant, Vetiver provides for the right conditions for the preponderance of the regional vegetation, promote natural succession in the immediate area and bring anew the steady growth of grasses, bushes and trees which results in slope stability. These are what conventional engineering technologies can't achieve.

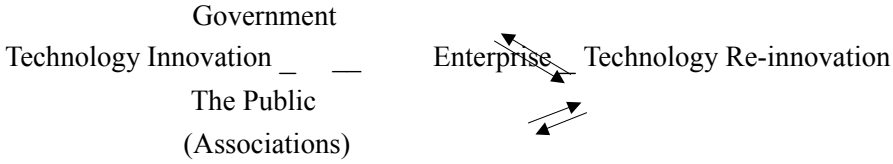
3.4 Conclusion

The result of these comparisons makes the use of Vetiver a new technology in the field of erosion control slope stabilization, as well as in the other fields of application.

4 MODE APPLICATION

If the key to success of being established as a new technology lies with its promotion, then the careful use of promotion is the key to whether the promotion can be of success.

4.1 Proposed Promotional Method



4.2 Analysis of Each Key Components

4.2.1 Government

Government mainly wishes to establish ecological benefits. As the investor of an environmental project, the government has the same desires as any investor – in this case it is to establish ecological benefits through investment. As with the rule of market, government hopes to obtain the maximum benefit through the least amount of investment. Therefore in this arena there is a goal - that is new technologies will have the support of the government. At the same time, government also hopes the continuous innovations will better utilize societal investments to help the government to achieve the targeted blue print.

4.2.2 The Public (Associations)

The public mainly wants social impact. The quality of environment directly relates to the quality of life. With the increase of public awareness on environmental issues, there is more public pressure on the government to take effective measures to maintain and improve the quality of environment gradually. At the same time, the public itself will also take an active part in the building of ecological environment more and more.

What the public wants is social benefit.

4.2.3 Enterprises

Enterprises want economic benefits. Enterprise apply investments from the government to effect changes in the environment. Therefore, Government investments are a part of the market plans for enterprises. As the pursuer of economic benefit, enterprises hope to accomplish that goal through minimal costs. They are then driven to explore new technologies and innovations.

The basis for promotion (of nay new technology) is R&D. Without their findings and cooperation, promotions will have no fundamental support. Within a particular field and/or discipline the exchange of scientific data/knowledge is of paramount importance. They are also the key to drive the promotion. In 1999 we invited the Chairman of the International Vetiver Network, Mr. Richard G. Grimashaw, Dr. Paul Truong, and Dr. Diti Hengchaovanich to the International Vetiver Symposium held in Guangdong. This invited a great deal of attention from the government, various societal associations, as well companies within and from outside the same field. cause more attention by government and other scientists. The symposium helped launch the wide spread acceptance of Vetiver application in Guangdong.

Government and the public are the two key factors to make application success. Government is

the dominant and the public is the organizer. Their relationship is mutual. Government relies on the public to select information and suggestion and the public also depends on government's policy support. The main goal is to make enterprise take part in the main body of application really. The Grass Industy and Environment Association plays the role of prephase organizer, and strives for supports by reporting to government and gets more opportunities by propagandizing to owners and more society attentions, and strives for participation by propagandizing to enterprises. Enterprises is the one of three key factors. It is the basic approach for enterprises by the means of commercial to application.

5 APPLICATION PROGRESS

In 2000, the 8000M^2 demostration project had been done in the safeguarding slope of Xinfengjiang reservoir in the support of professor Luo Fuhe, who was the deputy headman of science and technology hall (Figure 1). In the same year, the vetiver biology technology was approved as one of hundred key application projects of Guangdong province. The Vice Nomarch Lu Zhonghe view the project progress.

Vetiver biology technology had been introduced into the meeting of economic-trade consulting held in Zhujiang delta of the GuangDong province and mountain land. Province Secretariat Li changchun and province governor Lu Ruihua viewed the exhibition platform (Figure 2).

In 2000, Hongri group as the promise "no good efforts no charge" started to enter this steep slope protection engineering field to do 8000 M^2 protecting slope engineering project (Figure 3-4). It was the first time to apply the Vetiver new bio-technology to commerce. From then on, this technology had started to be accepted gradually by owners. The technology had been applied by enterprises.

A lot of enterprises began to use the new technology and exploited the new value of the new technology in commerce activities. For instance, the new technology combined with other biology and engineering technology can form a innovation technology using the character of its pioneer plant in the innovation project. The technology can achieve the landscape effects as its outstanding shoots and leave in wastes filled land. The technology also can be exploited their beauty role as the materials of ikebana. The enterprises achieved their economy effects in innovation and in another words also promoted the innovation. So a good cycle system had been established

6 CONCLUSIONS

Government, the public, and enterprises have influenced each other. Their goals are united in the ecological restoration field through the pursuit of ecological, social, and economic goals. So enterprises in this field begin to pay attention to social and ecological effects. They benefit greatly from their activities. Therefore, we hope to establish new modes of enterprises based on an economy build on ecology. That is to say, new enterprises in pursuit of economic, ecological, and social benefits will be established in the future.

A Brief Introduction to the First Author

Honghao, Standing Director of Grass Society of China, Director of Research Committee of China, County Administration,Commissioner of 6th Committee of Guangdong Sci&Tech, Association, Secretary-General of Guangdong Association of Grass & Enviroment,. Since 1996, he has been engaged in a wide grass application include the Vetiver. He has rebuilt more than 1000 hm^2 Alkali-land in North China, and has applied more than 20 hm^2 Eco-egineering of Vetiver in South China.

Photo 1 Mr. Lu Zhonghe, the Vice-Governor of Guangdong Province visiting the Vetiver Demonstration Engineering on Heyuan

Photo 2 Exhibition and Ceremony at the Economic-trade Consulting between Zhujiang Delta and Mountain Area of Guangdong Province

Photo 3 Before the Engineering of Nanyangxiang Slope, Zhongshan

Photo 4 After the Eco-engineer of Vetiver in Nanyangxiang Slope ,Zhangshan