

HUAY KAYENG, THAILAND: VETIVER CULTIVATION EXAMPLE

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**HUAY KAYENG, THAILAND:
VETIVER CULTIVATION EXAMPLE**

By

PTT Public Company Limited

Bangkok, Thailand

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Foreword

The 1991 “Nature Remedies Nature” initiative envisioned by His Majesty King Bhumibol necessitated vetiver grass utilization for soil and water conservation and brought to fruition many sustainable projects in the Kingdom. PTT Public Company Limited’s (PTT) initial contribution was the successful implementation of vetiver alongside the Yadana Pipeline. Subsequently, PTT introduced, as part of a mass-relation task, the cultivation of vetiver in distressed, displaced communities nearby the pipeline. Huay Kayeng, in particular, is a community heavily reliant on the cultivation of crops for survival.

PTT has placed strong emphasis on public participation, motivation, encouragement, and outward orientation in Huay Kayeng and similar projects, adhering to the “Sufficient Economy” philosophy bestowed by His Majesty the King. After working closely with the peoples of Huay Kayeng in vetiver grass cultivation as well as in soil and water conservation management, there is strong evidence to support a now thriving biotic community. Huay Kayeng has thus been promoted as a paradigm in educating regions statewide.

PTT considers the measures taken in Huay Kayeng as an applicable framework to make further communities cognizant of the benefits of soil and water conservation, not least of which would encompass sustainability and the

eradication of poverty. PTT further considers it plausible that through the effectuation of His Majesty's "Sufficient Economy" philosophy, our country may once again be united in a fashion worthy of His grace.

HUAY KAYENG, THAILAND : VETIVER CULTIVATION EXEMPLAR

Abstract

Through the painstaking research conducted by His Majesty King Bhumibol Adulyadej, vetiver grass technologies have evolved and flourished in certain ecozones of the Kingdom. Sustainability through indigenous knowledge can distinctly be defined as a scope of compounded importance and can be accented through several key endeavors on part of PTT Public Company Limited (PTT). PTT stands at the vanguard of the vetiver grass initiative on pipeline application in Thailand, clearly demonstrated in the successful 1997 implementation of vetiver alongside the Yadana gas pipeline where reinforcement of physical structures played a significant role in the germination of soil and water management or, more specifically, erosion control and slope stabilization within the region. Huay Kayeng, a PTT agro-ecozone case-study, can further shew how successful implementation in one region of the world can stimulate sustainable growth in comparable agro-ecozones elsewhere.

In conjunction with the “Sufficient Economy” philosophy bestowed by His Majesty King Bhumibol to strategize and construct a viable and thriving biotic community, the company introduced a vetiver cultivation program as part of a mass-relation task to the Huay Kayeng community which is comprised of approximately 1,320 households. Due to the construction of Vachiralongkorn Dam in 1977, a community of Huay Kayeng peoples had to migrate to a higher area where the soil was less fertile and crops were of an insufficient yield. So the company has applied the execution of His Majesty King Bhumibol’s initiative placed strong emphasis on public participation, motivation, encouragement and outward-oriented.

The implementation was divided into four phases: the first phase was a controlled experiment in vetiver cultivation on holistic land within the community where the benefits of growing vetiver grass would gradually become apparent to the farmers. The second phase was accommodating cultivation of vetiver on the farms of willing growers. Successful effectuation of these two phases initiated a third phase by which approximately a quarter of all the households therein grew vetiver grass on their own land. In the final phase, vetiver was planted in roughly half the community and in an appropriated public sector. In addition, all imbued activity was publicized and the community itself was promoted as a paradigm in educating farmers countrywide. At present, the environmental conservation of the Huay Kayeng community has achieved par excellence in sustainability and most of its farmers can clearly boast a better life.



Figure 1. His Majesty King Bhumibol Adulyadej demonstrated vetiver cultivating to Thai people.

1. Introduction

+The majority area of Thailand is used for agriculture which is also the principal occupation of the Thai people. Traditional agriculture relies on sufficient water and fertile soil. However the loss of soil surface due to flooding and landslide still happens every year. This is a problem that needs to be solved.

In 1991, His Majesty King Bhumibol Adulyadej of Thailand introduced an idea to use vetiver grass in conserving soil and water. To succeed His Majesty's initiative, in 1996 the PTT Public Company Limited launched a vetiver cultivation alongside the gas pipeline from The Yanada Gas Pipeline

Project in Thong Phaphume District, Kanchanaburi Province. By employing an engineering concerned technique, the vetiver cultivation has minimized soil erosion and prevented landslide around the area where the pipeline runs through since then. At present, indigenous plants have been regrown and the forest has come back.

The Use of Vetiver Grass System for Erosion Control and Slope Stabilization along the Yadana Gas Pipeline in Kanchanaburi.

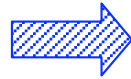


Figure 2. The Yadana gas pipeline at KP 12+300 in 1998.

Figure 3. After rehabilitated by vetiver cultivating at KP12+300 in 1999.

Figure 4. At KP 12+300, year 2000.



Figure 5. The Yanada gas pipeline construction at KP 15 in 1998.





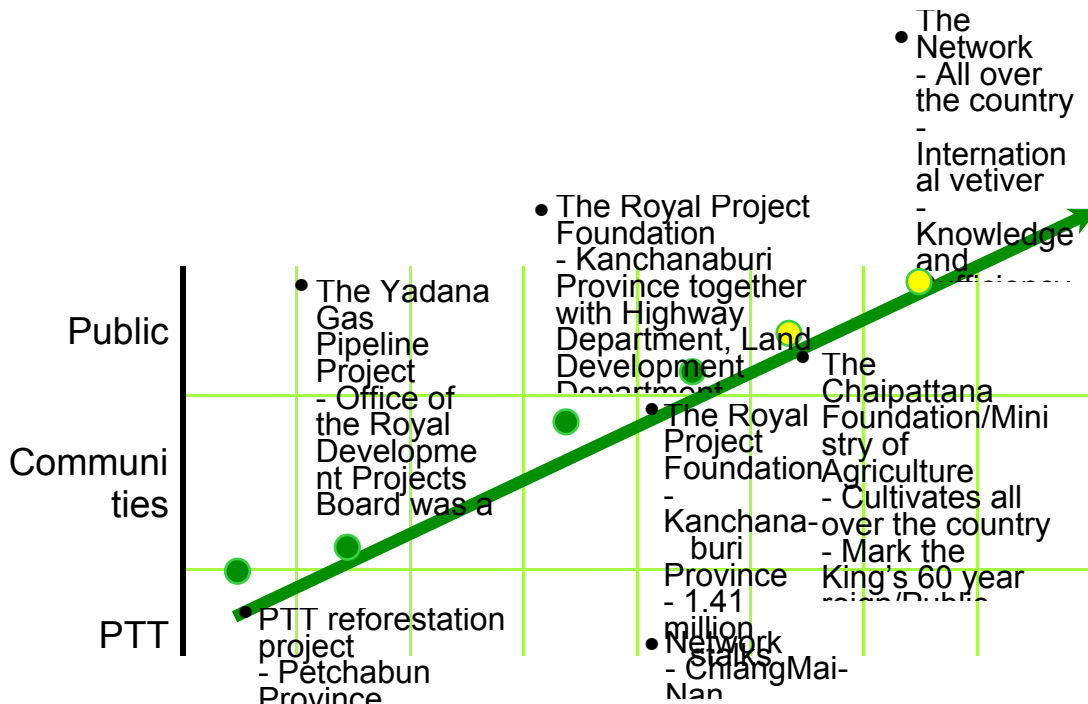
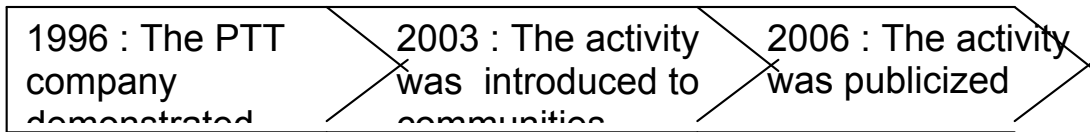
10 **Figure 6.** Forest rehabilitation by vetiver cultivating at KP15 in 1999.

Figure 7. At KP 15, year 2001.

Appreciating His Majesty's contributed initiative, the PTT company in 2003 dedicated a 2.25 million USD fund for vetiver research in three years. This fund was transferred to the Royal Project where vetiver cultivation for conserving soil and water was to be supported. Thereby, the PTT was assigned to be a member of the working committee for vetiver cultivation of the Royal Project. The company then expanded its successful experience into 4 projects as follows:

1. Vetiver cultivation encouragement project in Huay Kayeng sub district, Thong Phaphume District, Kanchanaburi Province which is a community nearby the Yadana gas pipeline. The community is also a mass relation -targeted area of the PTT for cultivating vetiver grass to conserve soil and water according to His Majesty's idea.
2. Vetiver cultivation project at the border patrol police Wichit-wityakan school which situates nearby the Thai-Myanmar border.
3. Vetiver cultivation project to prevent landslide alongside the Thong Phaphume – Ban E-Tong road which encompasses approximately 30 km uphill part and consists of more than 50 landslide points.
4. Vetiver cultivation project in the PTT's reforestation area covering 1,580 acre nearby the border at Ban-E-Tong, Pilog sub-district to reinforce the growth of trees.

These activities of PTT has been continually implemented through the end of the year 2006. Vetiver cultivation in accord with His Majesty's idea that seeded in targeted communities is now publicized. The company also supports the people in all over Thailand to cultivate vetiver grass totally at least 5 million stalks to mark His Majesty King Bhumibol 60 year-reign by providing the essential knowledge and materials. Remarkably, the company's projects concerning contests of vetiver planting promotion and vetiver information poster design are very much positively responded.



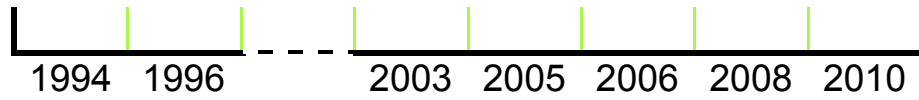


Figure 8. The chart of an overviewed vetiver cultivating activities by PTT since 1994.



Figure 9. Encouragement on Huay Kayeng community to use vetiver for soil and water conservation.

Figure 10. Vetiver cultivation area in Huay Kayeng sub district



Figure 11. PTT has cultivated vetiver at Wichit-wityakan school, situated nearby the Thai – Myanmar border (Before vetiver

Figure 12. Wichit-wityakan school (After vetiver cultivation)



Figure 13. PTT cooperated with the Department of Highways cultivated vetiver alongside the Thong Phaphume –

Figure 14. The Thong Phaphume – Ban E-Tong road. (After vetiver cultivation)



Figure 15. PTT has cultivated vetiver in 1,580 acre forest plantation adjacent to the Thai – Myanmar border (Before

Figure 16. 1,580 acre forest plantation (After vetiver cultivation)



Figure 17. Vetiver cultivation project press conference at PTT head office



Figure 18. Dr. Sumeth Tuntiwechkul along with the president of PTT Public Company Ltd., and the deputy director general of Land Development



Figure 19. Southern community has attended vetiver cultivation



Figure 20. Thai youth in vetiver cultivation activity.



Figure 21. The vetiver exhibition



Figure 22. Press tour in vetiver

2. Vetiver cultivation encouragement project in Huay Kayeng community

Huay-Kayeng is a sub district within Thong Phaphume district, Kanchanaburi Province of Thailand. This community situates only 10 kilometers from the Thai-Myanmar border and elevates an average of 300 meters above sea level. By its 1,315 households (population of 8,457), this medium sized community comprises of 8 villages (10 groups). Agriculture is the main occupation of the people. They grow rice, tapioca, corn, para rubber trees and fruit trees, keep livestock, hunt and gather from the forest. Some are employed as laborer. In general, the people are poor with their average income of 305 USD annually (data at 2004)

Dated back in 1977, due to the construction of Vachiralongkorn Dam, Huay Kayeng community had to migrate to a higher area where each household was provided with a 5.5 acre land for farming and another 0.4 acre land for housing. The people that used to do rice farming and fisheries in lowland then had to rely on a less fertile soil and limestone hill. From year to year, their crops yielded less and less products. Suffering from the insufficient income, some had to leave or even sold their land and turned to be agricultural laborers in other villages or in the cities.

In 2002, the PTT commenced a mass relation activity in Huay Kayeng community. The development projects that have been implemented are as follows:

- Strengthened Community Project that encourages the community to analyze and determine its own way to solve economic and social problems.
- Future Youth Project, to form a group of young people who perceive and understand their own community profiles and can contribute to the development and conservation of the community environment.
- Forest Conservation Project, that cooperates with the community to conserve a 11,850

acre forest and its wild life in Huay Kayeng, Thong Phaphume district where the Yadana gas pipeline partially runs through.

- Western Thong Phaphume Research Project, that joins the Biodiversity Project of Thailand (BRT) in doing an area based-research on the biodiversity of flora and fauna in the 11,850 acre conservation forest and its nearby area to generate a knowledge that will lead to a sustainable conservation.

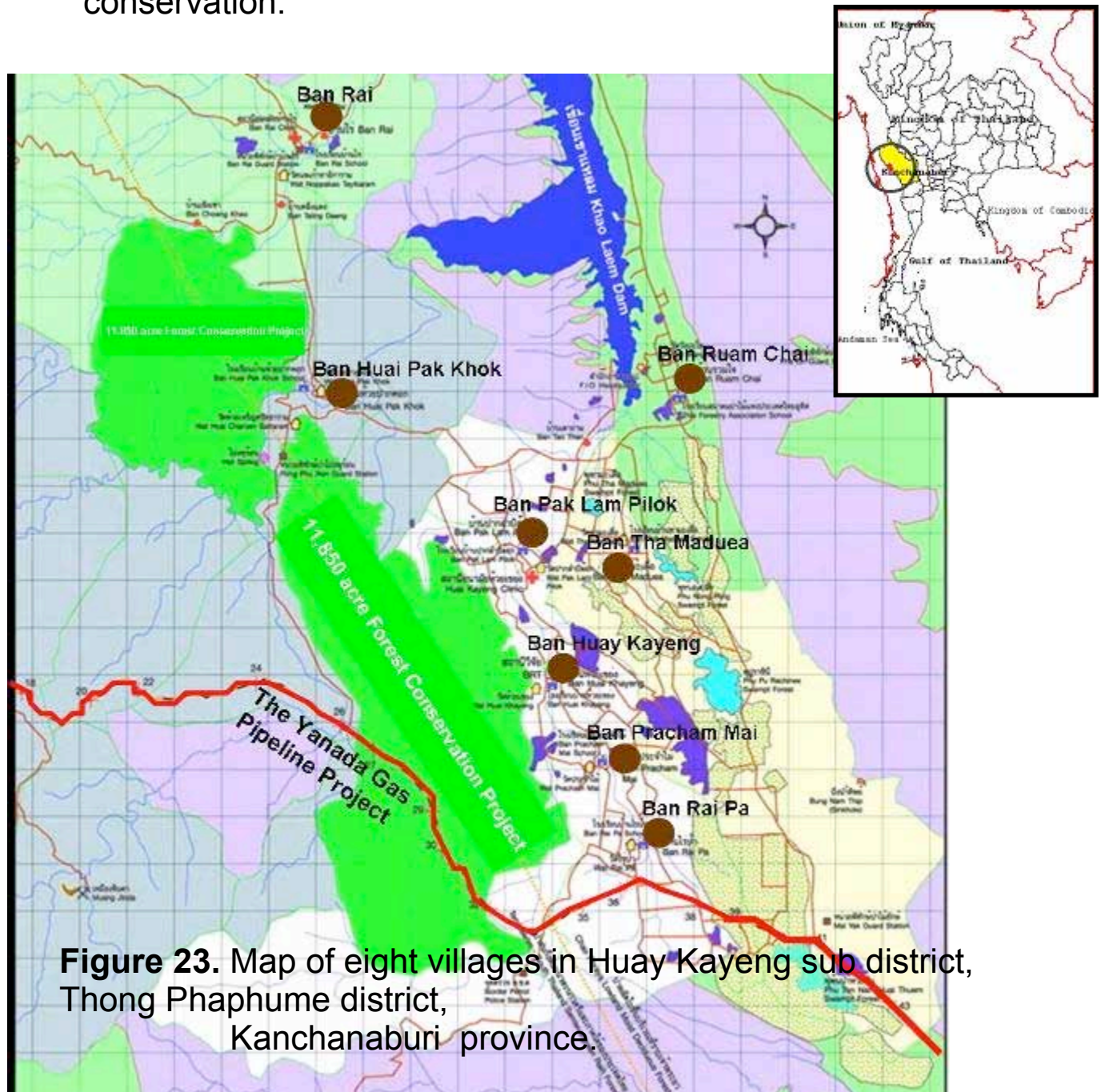


Figure 23. Map of eight villages in Huay Kayeng sub district, Thong Phaphume district, Kanchanaburi province.

These activities are implemented in accord with the Sufficient Economy philosophy bestowed by His Majesty King Bhumibol that emphasizes the self-dependent of a community. The concept of sustainable conservation has to be inherited to young people who will strengthen their own community and form a paradigm for the knowledge management.

Reinforced by many organizations, the PTT therefore conducted a vetiver cultivation project. Vetiver was cultivated in the community's private and public area in order to conserve water and improve the soil quality. The project that commenced in 2004 and has been implemented until present time is named "Vetiver Cultivation Encouragement in Huay Kayeng Community".

3. Rationale

The following objectives warrant the PTT's Vetiver Cultivation Encouragement in Huay Kayeng Community project.

- To apply and publicize His Majesty King Bhumibol's initiative of using vetiver to conserve soil and water. Evidenced by the experience in cultivating vetiver alongside the gas pipeline from the Gas Pipeline Project, the PTT thus confided to apply this successful activity to its mass relation-targeted community.
- To promote the self-reliant economy of the PTT's mass relation-targeted community according to His Majesty King Bhumibol's Sufficient Economy philosophy. This doctrine has been shown to relieve the sufferings during the 1997 economic crisis.
- To share and exchange wisdom with the community in the use of and benefit from vetiver. A cautious action together with the check and balance process should result in an efficient outcome and new knowledge.

- To encourage vetiver cultivation in the community. Interested visitors can learn and expand this knowledge to other areas.

4. Strategy and Implementation

The PTT' strategies for the Vetiver Cultivation Encouragement project in Huay Kayeng were as follows:

- Public participation was applied in every steps of the process.
- The outward-oriented development was conducted in order to let the people appreciate the benefit from vetiver by themselves and willing to grow it.
- All applicable measures were employed to reinforce motivation. The PTT had to respond abruptly to the community's requests and assist the people to get rid of the obstacles.
- The feeling of the people's self-pride was promoted. Let them narrate their own success.

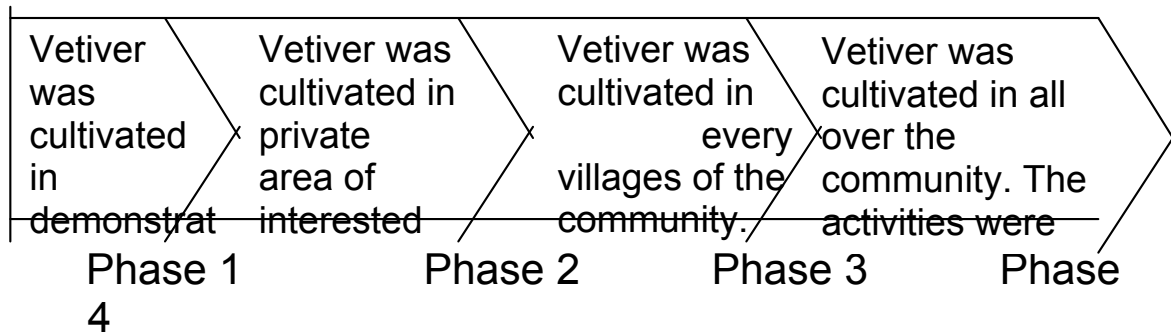
The implementation was divided into 4 phases as follows:

Phase 1 In order to show the benefit of growing vetiver, the grass was cultivated in the demonstration area selected by the community.

Phase 2 Vetiver cultivated in the private area of interested villages was encouraged. Motivation reinforcement was applied and every activity was closely observed.

Phase 3 Through public participation Vetiver was cultivated in every villages of the community.

Phase 4 Vetiver was cultivated in the appropriate community's area. All the activity steps and the accomplished success were brought to the attention of other national and international communities.



5. Implementation Details

Phase 1: October 2003 – December 2004

- The PTT launched the project. An “ Idea Sparkling” symposium was organized to introduce the use of and benefit from vetiver.
- A workshop was conducted for the community’s leaders and volunteers. They were brought to see a real vetiver cultivation area in ChiangMai in the north of Thailand.
- The community spent more than 5 months before it could accept the idea of vetiver cultivation. Meanwhile, the PTT staff continually added more information. Finally, the community decided to accept a demonstration plantation, which was settled at Ban Rai village. Vetiver was then cultivated in the selected area where the provided Karen chili, strawberry, lily and some fruit trees were cultivated. The motivation at this stage was the high market price of the products from those cultivated plants.
- The “ Huay Kayeng’s Vetiver Cultivating Day” was organized. The vetiver stalks were distributed by H.S.H. Prince Bhisatej Rajani, the director of the Royal Project Foundation who also cultivated the grass together with the Huay Kayeng people.
- The PTT staff was assigned to observe the growth and development of the

plants such as Karen chili, strawberry and some kinds of flower cultivated in the vetiver cultivated area.

- It was concluded that, at this first phase, an emphasis was put on the cultivation of valuable crop more than the vetiver. Then some farmers began to see the importance of soil and water conservation and also the benefit derived from vetiver. An intention to adopt vetiver cultivation into their own land was emerged as a result from participating in the first phase activities.

Phase 1: October 2003 – December 2004



Figure 24. PTT has hold the “Idea Sparkling”



Figure 25. Community leaders were taken to inspect the vetiver beds in northern Thailand.





Figure 26. Blending plantation between vetiver and

Figure 27. H.S.H. Bhisatej Rajani, the director of the Royal Project Foundation, distributed

Figure 28. The January 2005 - September 2005

an advice - The first group of people who had seen the worth of vetiver cultivation in the mixed

demonstration area notified their agreement. Such a request of the community who simply

saw the benefit derived from vetiver and agreed to cultivate it

was such an “outward-oriented development” of the community itself without any commitment

from outside. The PTT therefore organized a meeting to disseminate the information

on to interested persons and informed that the company would sponsor the community’s

vetiver cultivation and provide

vetiver stalks with no limits.

- In the PTT’s registration to be a vetiver cultivator, it was found that from 8 villages, 55 households participated. That was 4.18 % of all the community’s households.

- The “Delivery of Vetiver Grass to Home” by the PTT was arranged.

- An expert who gave advice was sent to the house of each registered member.

- A PTT staff was assigned to full time stay in the village in order to monitor every activity steps and gave advice promptly.
- The vetiver cultivators were taken to Ranong and Surathani provinces where they could exchange their experiences with the ones who cultivated vetiver to conserve soil and water in the durian and mangosteen orchards.
- By applying what they learned in the educational excursion, the vetiver cultivators improved their techniques of vetiver cultivation as follows:
 - Vetiver was cultivated in a steep area to prevent soil erosion.
 - In the plains, vetiver was arranged as a circle around a tree and in a steep area, as a semicircle in front of a tree to conserve the soil surface. The moisture was also preserved by vetiver mulch.
 - The vetiver leaves were used as a component to make a compost fertilizer.
 - Vetiver was cultivated around vegetable beds and the vetiver leaves were used as mulch to cover the beds.
 - Young vetiver leaves of the low-land varieties such as the Srilanka or Sonkla 3 were used as cow feed and as bedding for piglets after birth.

Phase 2: January 2005 – September 2005



Figure 31. PTT supported experts to monitor and give advice on vetiver cultivation



Figure 33. The community cultivated vetiver in the steep area.



Figure 34. Vetiver cultivation in circle-pattern surround a tree in the



Figure 35. Vetiver cultivation surrounds a tree.



Figure 36. Vetiver cultivation surrounds the vegetable beds and use of vetiver leaves to mulch vegetable beds.



Figure 37. Vetiver cultivation surrounds the vegetable beds and use of vetiver leaves to mulch vegetable beds.



Figure 38. Vetiver leaves were used to produce homemade compost



Figure 39. Vetiver leaves would apply to be bedding for new born pig.

Phase 3: October 2005 – February 2006

- After the benefit derived from vetiver cultivated in the private area of the pioneers

was obviously seen, the topic was brought for a discussion in the council of the sub-district leaders.

- The council which consisted of volunteers who pledged to make merits for their villages cooperated with the PTT to establish a project “Family of Sufficiency Economy”. Each household that joined the project had to cultivate vetiver grass and vegetables, regularly save money, abstain from drinking on religious days and set up an account of the family’s expenses. The joined household was then given 5 hens or 1 pig or catfish within the budget of 22.5 USD to raise for improving life quality according to the Sufficient Economy philosophy. The project was funded initially by PTT.

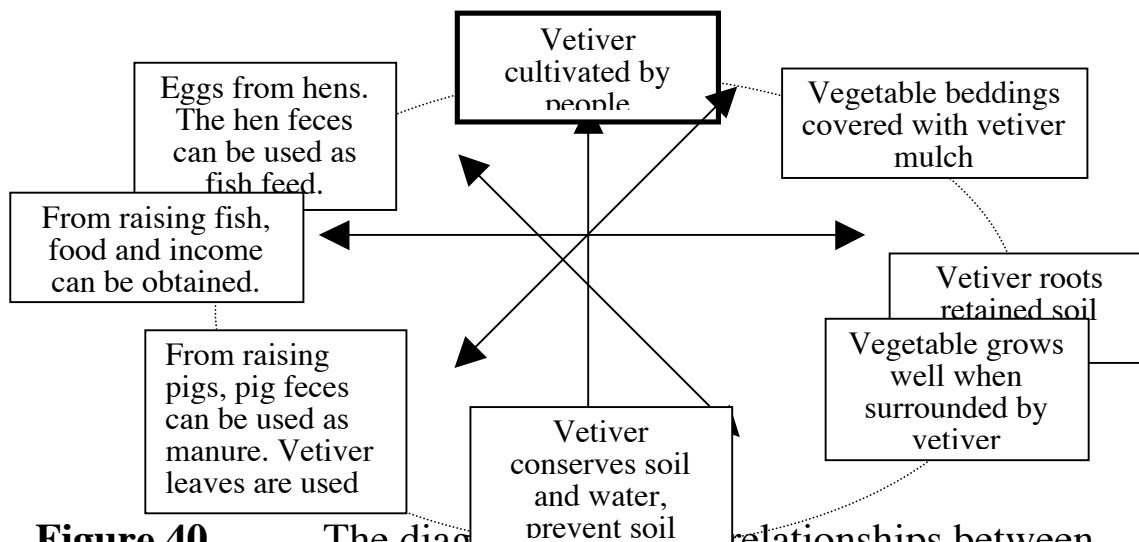


Figure 40. The diagram shows the relationships between vetiver cultivating within the community and the “Family of Sufficiency Economy” operation.

Phase 3: October 2005 – February 2006



Figure 41. The forum on vetiver information



Figure 42. The council conference on vetiver discussion.



exchanging within the community



Figure 44. PTT continued arranges the “Delivery of Vetiver Grass to Home”



volunteers was 15 households, in October 2005.

Figure 45. The community started to record (4 households) joined the project and followed the Sufficiency Economy” doctrine.

Figure 46. One baht saving daily by keeping in a bamboo saving box (right).



- There were 275 households, 1 monastery and 1 school (1 school was counted as 4 households)

It was concluded then that 280 households (21.29 % of all in Huay Kayeng community) had taken part in the project from phase 1-3.

- The community leaders assigned a working staff to observe the project's vetiver cultivation and livestock at least once a month and then evaluated the activities and gave appropriate advice.

- The vetiver cultivation activity was conducted under the condition "Deliver of Vetiver Grass to Home". Comments and advice from an expert were also given regularly.

Phase 4: March 2006 – December 2006

Vetiver cultivation was expanded to every village of Huay Kayeng sub-district. In the first 4 months of phase 4, there were more 313 households (253 households and 5 schools that were equivalent to 60 households) that joined the project. It was concluded then those 593 households (45.09 % of all in Huay Kayeng community) had taken part in the project from phase 1-4.

Motivation reinforcement was still conducted as did in the phase 3. Each joined household was given 5 hens or 1 pig or catfish within the budget of 22.5 USD to raise for improving life quality according to the Sufficient Economy philosophy.

A staff consisted of village representatives (1-2 persons from each village) was established to evaluate the vetiver cultivation and the project "Family of Sufficiency Economy".

The outstanding households, those of Mr. Reung Plongjit, Mrs. Suda Kalawongse, Mr. Chamlong Maneerat, Mrs. Son Wangkaew and Mr. Kamsang Meeta, were selected as an example model for interested agencies. The knowledge of vetiver cultivation and its advantage of the community leaders then was sufficient to share to interested persons.

In 2006, PTT will organize a vetiver cultivation contest as an event to celebrate His Majesty King Bhumibol 60 year-reign. Beside an amount of money, the winner will be awarded a trophy bestowed by His Majesty. Huay Kayeng community is one of many organizations that was invited to submit its vetiver cultivation activity to this contest.

Phase 4: March 2006 – December 2006



Figure 47. Vetiver cultivating along the river bank



Figure 48. Vetiver cultivating surrounding pond in



Figure 50. Vetiver cultivating on the slope area in Ban Rai.





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Figure 59. PTT hold vetiver cultivating project press



Figure 60. Vetiver cultivating ceremony at PTT head office.

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Figure 61. PTT published vetiver knowledge documents for distribution to the public.



Figure 62. PTT created a vetiver exhibition mobile kits for dissemination to the nationwide

Figure 63. PTT set the “Vetiver Cultivation Contest for the events of the Sixtieth Anniversary Celebrations of His Majesty’s Accession to the Throne” project to stimulate Thai’s interest in vetiver. **Implementation Outcome**
 The work process under the principle of public proper planning can be summarized as follows:

Through many organizations, the information of vetiver grass was first introduced at meetings of informal community leaders. The topic was thoroughly discussed before an idea of vetiver cultivation was accepted.

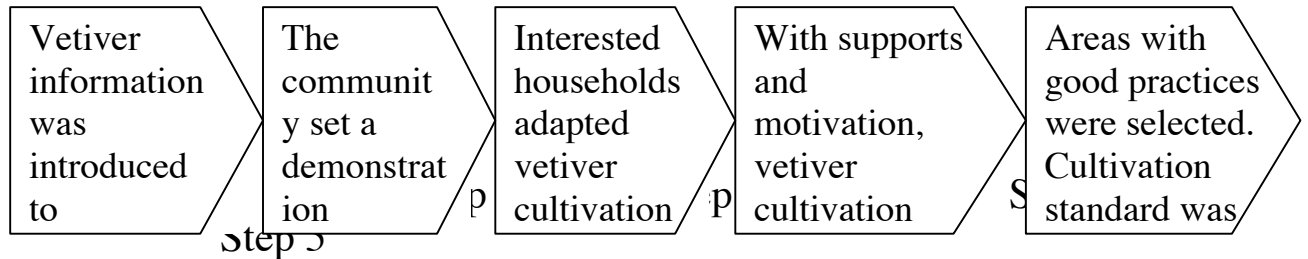
Step 2 The community participated in the project by defining a public area to demonstrate vetiver cultivation.

Step 3 Learning from seeing and practicing, some community members decided to adopt vetiver cultivation into their own private land. This was a change that initially emerged from inside and “outward-oriented”.

Step 4 Supported by the council of the community’s leaders, the activities concerning vetiver cultivation were expanded to all over the community.

Step 5 Outstanding vetiver cultivation areas were selected as a model to share knowledge with interested organizations or persons. These demonstration plots were

properly managed in order to preserve and improve their cultivation standard.



- **The activity participation of the community**

Table 1. The activity participation of the community.

Phase	<u>Number of participated groups</u>	<u>Accumulated number of participated households</u>	<u>Per cent of all the households</u>
Phase 1	1	1	0.07
Phase 2	9	55	4.18
Phase 3	10	280	21.29
Phase 4	10	593	45.09

- **The number of cultivated vetiver stalks**

Table 2. The number of cultivated vetiver stalks.

Phase	<u>Number of cultivated stalks in each phase</u>	<u>Increased rate in each phase (%)</u>
Phase 1	40,000	0.00
Phase 2	623,200	1,480.50
Phase 3	711,500	14.16

Phase 4	989,000 *	39.00
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(Note * primary estimation)

- **Technical development of the community's cultivation**
The patterns of vetiver cultivation of the community were as follows:

Pattern 1 Vetiver cultivated in steep area-orchards

- The proper cultivating area was defined.
- Weeds under fruit trees were eradicated.
- The vetiver cultivation line was formed as a semi-circle embraced each tree from below. All the semi-circle lines were simply leveled by using a plastic tube with water.
- The ground along the cultivation line was dug by 10 cm deep.
- Vetiver of the defined variety (Sonkla 3) was cultivated along the groove. The space between each stalk was 5 cm while the one between each bag (in case of using stalks from a bag) was 10 cm.
- The ditch was covered with soil and watered. Early rainy season was the best time to cultivate vetiver.

Pattern 2 Vetiver cultivated in plain area-orchards

- The cultivating area was prepared as in Pattern 1.
- The cultivation line was formed as a circle surround a tree or 1 or 2 straight lines between trees.
- Other steps were the same as in Pattern 1.

Pattern 3 Vetiver cultivated in vegetable beds

- The cultivating area was prepared as in Pattern 1.
- The cultivation line was formed as a rectangle surround a vegetable bed.
- More cultivation lines were formed across the slope.
- Other steps were the same as in Pattern 1.

Pattern 4 Vetiver cultivated nearby a pond, water reservoir or river banks.

- The cultivating area was prepared as mentioned before.
- The cultivation line was formed along the bank. The first line was 50 cm from the bank while the second line was 20 cm from the first line.
- Other steps were the same as in Pattern 1.

Pattern 5 Vetiver cultivated in a general steep area.

- The cultivation lines must be across the slope. The cultivation area was prepared as said before. When the area was made into terrain when it was so steep.



- Each cultivation level line was achieved by using a plastic tube with water. The space between

Figure 68. ~~It was up to the slope. The steeper the slope was, the shorter the spaces were.~~

- **Benefit derived from vetiver cultivation that the community obtained**

- a) Learning how to cultivate in accord with topography

The vetiver cultivation to conserve soil and water is extremely essential for Huay

Kayeng community which had to migrate to a higher area where the land was steep and less

fertile. Besides preventing the surface soil erosion, vetiver also improved the soil quality to be

more suitable for agriculture purposes.

- b) Learning how to cooperate to plot an implementation plan themselves

The community members were allowed to discuss and share their opinion freely in

order to construct an implementation plan themselves. This

development, in every step, was

not influenced by any government officials but emerged from inside the community and was

outward-oriented.

- c) Learning how to do an integrative agriculture

The community members learned how to maximize the use of their land. Many

kinds of plants can share a small area of 0.5 – 1.5 acres and thus produced consequently

income in all over the year. Together with the products from their livestock, the farmers now

can live in accord with the Sufficiency Economy doctrine.

- d) Learning how to rely on themselves

The community members also learned how to maximize the use of vetiver. Vetiver

leaves are made a compost fertilizer, cow feed and used to cover vegetable beds. Doing

this, together with other activities such as regularly saving the money and abstaining from drinking on religious days, has helped the farmers to save their money substantially.

e) Improving of cultivating area

Due to vetiver cultivation, the cultivating area in Huay Kayeng has been gradually improved. At present, the soil surface contains more moisture and is more fertile which guarantees long term agriculture.

f) Decreasing the cost of production while increasing the income

Vetiver helps the farmers to decrease their cost of production. For examples, due to the home made compost fertilizer, the expense for fertilizer was decreased. The orchards and vegetable beds need less watering because the soil contains more moisture. The use of vetiver leaves as animal feed also decrease the expense for buying it. Moreover, complimentary agriculture supported by vetiver cultivation yields more product in both quantity and quality terms.

▪ **Sustainable development**

Important factors for sustainable development are constructing knowledge through practices, discussion and evaluation this knowledge within the community and transferring the new knowledge to the following generations. The implementation of vetiver cultivation in Huay Kayeng community was originated from the participation of every parts of the community in considering and making a decision. With a support from the PTT in every steps, the accomplished concept is thus in accord with the agreement of the majority and becomes a common knowledge. Remarkably, the participation of the Volunteer Youth of Huay

Kayeng since the beginning of the project has resulted in the absorption and transfer of knowledge and experiences from the leader council that guarantees a future implementation.

5. Problems and Obstacles

a) Community issue

In the beginning, the community had no idea how vetiver cultivation could be beneficial. The income derived from vetiver cultivation was not obviously seen promptly. Through patient and continual explanation of The PTT staff plus motivation reinforcement in each step, the community members turned to accept vetiver cultivation.

b) Knowledge issue

The lack of proper media and experienced cultivators resulted in a delay in sharing the knowledge. However, succeeded cultivator households in later time were such a good example that, besides displaying substantial benefits, could share a practiced experience and made it simple. The exchange of knowledge from external visitors and the effort to take part in vetiver cultivation contests also help updating the knowledge of the community.

c) Vetiver issue

Some points concerning the vetiiver stalks are as follows:

- The nude stalks were left for a long time before being cultivated.

Solution: The farmers should be advised to cultivate the stalks promptly.

- Some vetiver stalks were not ready for cultivation.

The stalked may be transplanted before the right time.

Solution: The stalks must be closely observed after cultivation. Weak stalks should be replaced by stronger ones.

- Vetiver stalks brought from outside were damaged from transportation.

Solution: The vetiver stalks cultured inside the community should be used.

8. Keys to Success

▪ **The vetiver properties**

Vetiver itself contributes to the conservation of soil and water which is welcomed by farmers. However the outcome can not be seen immediately and a certain period of time is needed. The cultivation technique is easy to learn and the accomplished knowledge will help the farmers to improve the use of and the benefit from vetiver cultivation in a sustainable way.

▪ **Participation of the community**

The community's vetiver cultivation activity can not be succeeded without the participation of all parts in the community. Moreover the support of materials and knowledge from outside organizations including the Land Development Department, Department of highways, the district office, local administration bodies, the Royal Project Foundation, Department of Agricultural Extension and PTT accelerates this achievement.

▪ **A close follow up and proper advice**

Vetiver cultivation can result in a waste of time and a dissatisfied outcome unless a proper management and sufficient knowledge are applied. The PTT therefore assigned a staff to provide vetiver stalks, observe the activities and give proper advice. The staff also coordinate with the leader council to conduct complimentary activities to fortify the project "Family of Sufficiency Economy".

▪ **A proper motivation**

Another important factor that contributes to the success of the community's vetiver cultivation is a proper motivation of which steps are as follows:

Table 3. The motivation enhancement activities in each phase of the program.

Phase 1	<ul style="list-style-type: none"> - The activity " Vetiver Cultivation Day" was organized. - Valuable crop was cultivated in vetiver planted area. - Free young plants reimbursed vetiver cultivation. - Vetiver cultivators were brought to the north for an educational excursion
Phase 2	<ul style="list-style-type: none"> - Vetiver was delivered to home. - Knowledge and advice were given at home. - Educational excursion in Ranong and Suratthani was offered.
Phase 3	<ul style="list-style-type: none"> - Join in the Sufficiency Economy project, each household received, hens, pig or fish within a budget of 22.5 USD. - A staff of the leader council visited and gave advice. - Vetiver was delivered to home.
Phase 4	<ul style="list-style-type: none"> - The project "Family of Sufficiency Economy" was continued. - Outstanding cultivated areas were selected. - The leader council offered supports and encouragement. - Vetiver was delivered to home. - Vetiver cultivation contest to mark His Majesty King Bhumibol 60 year-reign will be organized.

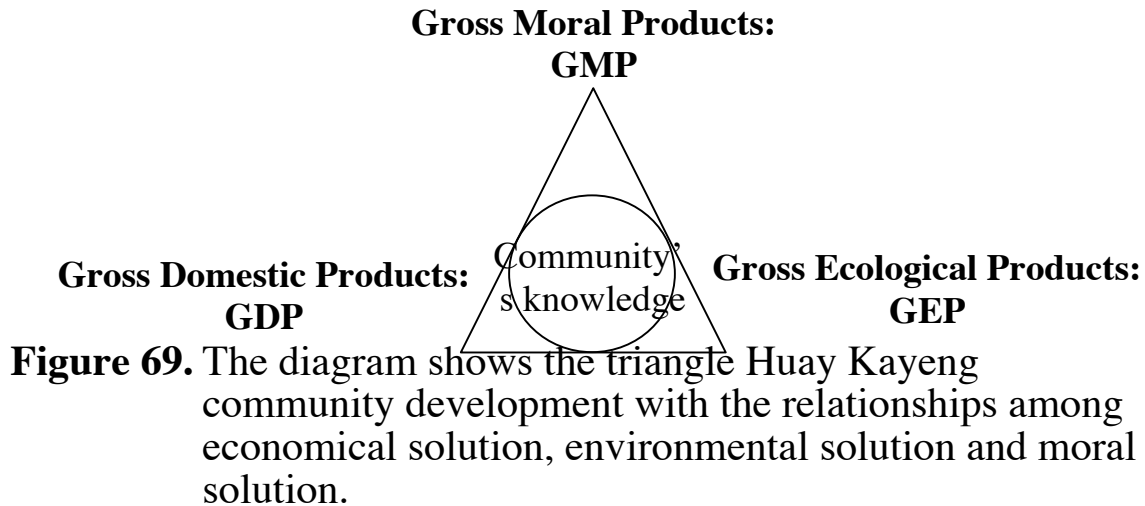
▪ **Knowledge management**

To the community's perception, vetiver cultivation to conserve soil and water was something new and queer. To comprehend this knowledge, the community needs to practice or see the succeeded substantial outcome. Information must be shared among the community

members and between the members and the leaders. They have to learn how to construct activities that are consistent with the community conditions. The use of knowledge exchanging platform and joint problem-solving by expert and novice with which the "expert" and the "novice" work hand-in-hand on a task will transform tacit knowledge to implicit knowledge.

9. Conclusion

Vetiver cultivation in Huay Kayeng community has been encouraged by PTT in response to His Majesty's initiative to use vetiver for conserving soil and water. With its own experience in vetiver cultivation and a strong intention to introduce this success to Huay Kayeng which is the company's mass relation-targeted area, the PTT implemented a project that aimed to promote vetiver cultivation and the people's well being. By employing public participation, motivation, encouragement and outward-oriented development together with the Sufficient Economy philosophy bestowed by His Majesty, the project implementation could not only solve agricultural problems concerning the infertile land but also increase the household income. The community now can rely on its own while the environment is conserved. Finally, social problems will gradually diminished and there will be more harmony among the people. This project is thus an example of how vetiver grass can be used to promote sustainable development and improve the people welfare.



10. Community Success (some comments)



- **Mr. Sumitre Mingkwan, age 52 years**
The headman of village 8, Ban Ruam Chai,
Huay Kayeng sub district
Member of the leader council
Occupation: farmer

He first cultivated vetiver in August 2005. It was not accomplished because he started the cultivation too late. Some of the vetivers died because they were cultivated in shady area. He tried again and discovered that the fault was resulted from his assumed incorrect techniques. The motivation to cultivate again came from television and from the advice of the PTT staff.

“Today I understand that the benefit derived from vetiver cultivation is to conserve soil and water and keep the soil surface. Vetiver also loosens the soil structure. Having cultivated vitiver, I feel good. Vetiver helps conserve nature and environment in accord with His Majesty’s initiative. I’d like everybody to be interested in vetiver cultivation. **It is such a useful plant that conserves environment and minimizes the use of chemicals and fertilizer**”.



- **Mr. Thanadet Kankaew, age 68 years**
A peasant of village 8, Ban Ruam Chai,
Huay Kayeng sub district
Occupation: farmer with a 3.2 acre land cultivated pomelo and Durian

His cultivated area is a slope. Vetiver was introduced in 2005 but failed because it was in the shady area. It was cultivated again in the next year to retain water in the steep area.

“Vetiver is advantageous because its leaves can be used as bedding for vegetable seedling and to make compost fertilizer. I feel good now. The environment is improved. The plant diseases such as mold is less. **I’m so proud of what I have done”.**



- **Mr. Thad Kankaew, age 72 years**
A peasant of village 8, Ban Ruam Chai,
Huay Kayeng sub district
Occupation: farmer of integrated agriculture

He came to know vetiver from television and learned more from the PTT staff. His vetiver cultivation began in 2005 in order to retain water and preserve the soil surface for his para rubber trees in the steep area.

“Today I have found that vetiver cultivation can speed the growth of para rubber trees when compared to those years before. There is no more soil erosion and the water is retained. This reduces the cost, using less fertilizer. **I’m so proud. This is His Majesty’s idea and I will keep on doing it no matter how tired I am.**



- **Mrs. Bunsrang Puangsakul, age 28 years**
A peasant of village 7, Ban Wang Nam Khiew,
Huay Kayeng sub district
Occupation: housewife

She got to know vetiver from channel 11 television. Nothing much was learned until she joined the committee for the project “Family of Sufficiency Economy”. Since the area of her house is slope, the PTT people advised her to cultivate vetiver to prevent soil erosion.

Perceived that this is His Majesty’ initiative, she then started to cultivate vetiver seriously.

“We were born as Thai people. His Majesty takes care of us and wants us to live a sufficient life. As a Thai citizen I would like to something in return.

When I cultivate vetiver, it seems to me that His Majesty is watching and I’m so glad to be a part of this project. Doing such a good thing makes life worth living”.



- **Mr. Kanchit Chanpanya, age 34 years**
A peasant of village 7, Ban Tao Tharn,
Huay Kayeng sub district
Occupation: Farmer with orchards

He heard about vetiver from the PTT project in 2005. After the educational excursion in Ranong he compared what he might gain and loose and concluded that vetiver

was able to prevent surface soil erosion. He started to cultivate vetiver in September 2005.

That was at the end of the rainy season and the vetiver soon died due to insufficient water.

“When I learned that the PTT’s vetiver project had initiated from His Majesty’s idea, I really want to cultivate this vetiver which I assume to be bestowed by the King”.

“Today vetiver cultivation has brought back the soil fertility. I can feel the soil’s life.

Covering the soil surface with vetiver leaves also accumulates good bacteria and improves the soil quality. The soil surface will not be lost since vetiver holds the soil particles together”.

“I’m so proud to cultivate vetiver according to His Majesty’s idea. That is always the target and I will do my best for this country. Now more people are getting to know the vetiver advantage and want to cultivate it like us”.



- **Mr. Ta Chaiwut, age 67 years
A peasant of village 1, Ban Ta Madeu,
Huay Kayeng sub district
Occupation: Farmer with mushroom farming**

Through the introduction of the PTT staff, he learned that vetiver leaves can be used to make compost fertilizer. He therefore started to cultivate vetiver in July 2005.

“I cultivated vetiver near the water bank to prevent soil erosion. The flowing water used to take away more and more soil. Now that the vetiver is grown up, such soil loss does not occur any more. The soil condition is improved. Seeing the growing vetiver makes me so proud”.



- **Mr. Bunniam Duangchan, age 52 years**
The headman of village 1, Ban Ta Madeu,
Huay Kayeng sub district
Member of the leader council
Occupation: Farmer

Although he knew that vetiver is advantageous to soil properties and prevent soil erosion since 2005 but not before his educational excursion in Ranong that he felt confident in vetiver cultivation. He wanted to cultivate vetiver and encourage the others to do so.

“I adopted vetiver cultivation since my house is on a slope area. I found that there is no more soil erosion, the nearby plants could absorb more water, the vetiver leaves can decay and turn to be fertilizer, finally vegetable beds covered with vetiver leaves can retain the moisture. Not like other grasses, vetiver is evergreen even in the dry season. No worries about fire. The people here also say that vetiver grows rapidly and firmly holds soil particles. There is a tendency that more people are interested in vetiver cultivation and I myself will encourage them to cultivate vetiver around the vegetable beds”.



- **Ms. Wilawan Tabbun, age 33 years**
A peasant of village 2, Ban Pak Lam Pilok,
Huay Kayeng sub district
Occupation: Farmer, cultivates white turmeric and para rubber

She knew vetiver from the magazine” Agricultural Technology”. Learning that in Ranong, vetiver cultivation is successful and there is no more soil erosion, she felt like she

want to cultivate it. In 2005 she adopted 6,000 vetiver stalks to cultivate in her para rubber plantation, around the ponds and in the slope area.

“I feel glad and proud to cultivate vetiver. We believe in His Majesty’s idea. I’m so proud to be one of the pioneers and will tell the others to cultivate it in slope areas”.



- **Mrs. Panaprai Chanpan, age 31 years**
A peasant of village 4, Ban Pak Pracham Mai,
Huay Kayeng sub district
Occupation: Farmer, laborer

She cultivated vetiver in 2005 because of the landslide from the nearby house. Her neighbor’s house situates in a higher area. Soil scraps often fell into her house even when a dog or a rooster running. Sometimes it was rubbish that made her house dirty.

“It’s better since we started to cultivated vetiver. Vetiver helps a lot. When it grows up, soil scraps, pieces of wood or rubbish can not fall into our house. They will be stuck at the vetiver ridge that look like a beautiful fence”.

“I’m so proud to do something in accord with His Majesty’s idea. To myself, I accomplish what I expect the vetiver can contribute”.



- **Mr. Kamsaeng Meetha, age 48 years**
The headman of village 3, Ban Huay Kayeng,
Huay Kayeng sub district
Member of the leader council

Occupation: Farmer, vegetable cultivation

He first knew vetiver from the meeting with the PTT staff who was assigned to give information. He learned more from the educational excursion in Mab Eung Husbandry Center in Cholburi province. With his confidence that vetiver could help improving soil quality and retain soil moisture, In 2005, he started to cultivate vetiver around his vegetable beds.

“After cultivating vetiver, I noticed that the vegetable beds have more moisture than before. The soil around the vetiver ridge is also improved. I think the success of vetiver cultivation is much more than what we expected before. Vetiver could really help”.



- **Mr. Reung Plongchit, age 68 years**
From village 8, Ban Ruam Chai,
Huay Kayeng sub district
Acting president of sub district council

Occupation: Farmer

He had been inspired to cultivate vetiver since he heard about the vetiver research of His Majesty. Until 2005, with the help of the Land Development department and PTT, he was taken to see real vetiver cultivation in Ranong and Suratthani.

He made up his mind that he had to do it. His vetiver cultivation was succeeded, even without watering. He thought it was such a miracle grass.

“I had to water my fruit trees 2 times a week, now once a week is enough. The soil still holds moisture and the leaves are always green. Vetiver helps me reduce my expense a lot, from more than 5 USD to around 3 USD. The trees such as rambutan and lime were not fruitful

before. Now they re' all bearing lots of fruits. I think this must be resulted from vetiver. I will keep on cultivating vetiver since such a success comes from only 9



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- **Mrs. Suda Kalawong, age 44 years**
A peasant of village 8, Ban Ruam Chai,
Huay Kayeng sub district
Occupation: Farmer (integrative agriculture)

Before she came to know vetiver in 2005, she had to buy straw to cover her vegetable beds. Learning that vetiver leaves can be used as well, she decided to cultivate vetiver and thus reduce the amount of money to buy straw which costed each time almost 20 USD.

“Today I can boast the benefit of vetiver. I’m so proud and glad to join this project. This is the King’s grass. I have cultivated it for 1 year. The fact I found is that vetiver does not grow well in the shady area. Therefore I have to cultivate more vetiver to replace the dead one.



- **Mr. Winai Kamla, age 50 years**
A peasant of village 4, Ban Pracham Mai,
Huay Kayeng sub district
Occupation: Farmer and cow seller

“I started to cultivate vetiver last year in the area behind my house. This land was not fertile and the soil could not hold water. Every month, I had to pay for water 1.5 USD. After

cultivating, the soil has been improved. My banana trees can give fruit and shoots. I even find some earthworms in the soil. Now I don't have to pay for water. The vetiver leaves can be used to cover the soil surface to reduce moisture loss. In the past, some people may not see the virtue of this grass. Now everybody agrees that vetiver can really help us”.



- **Mr. Chamlong Maneerat, age 43 years**
A peasant of village 8, Ban Ruam Chai,
Huay Kayeng sub district
Occupation: Farmer, vegetable and fruit cultivator
A model cultivation for visitors

“I heard about some benefit from vetiver but had never cultivated in my own 1.2 acre land. Finding out that the PTT conducted the home delivery of vetiver, I seriously started to cultivate the grass in my 0.6 acre slope area. Vetiver has prevented the loss of soil surface and retained the given fertilizer. Its leaves can also be used to cover vegetable beds. This year the vetiver has grown up. The soil fertility can be obviously seen. I used to apply 5 tons of manure to my land each month, or it can be deducted by half and may be once in 2-3 months. I'm so proud to be a part of activity initiated by the King, conserving soil and water by vetiver cultivation”.

11. Summary of the community's benefits derived from vetiver cultivation

Table 4. Summary of the community's benefits derived from vetiver cultivation.

Items	Before	After vetiver cultivation
1. Watering	1. Necessary time was 4 hours in a 1.5 - 2 acre area	1. Due to more moisture retained, watering time reduces by 50%.
2. Soil Erosion	2. There was a loss of the soil surface in the slope area.	2. Silt is stuck at the vetiver ridge. Fertile surface soil can be retained.
3. Fertilizer	3. Each month, a 0.4 acre area needed 1 ton of manure or compost fertilizer which costs 5 USD.	3. Due to more moisture retained and the homemade compost fertilizer, this expense reduces by half.
4. Plant disease	4. Cultivated plants were infected with mold.	4. Vetiver mulching can protect the plants from mold.
5. Soil quality	5. Infertile soil not suitable for	5. Fertile soil with advantageous

<p>6. Vetiver leaves mulching</p> <p>7. Other applications</p>	<p>cultivation</p> <p>6. In a 0.8 acre area, straw mulch costs 17.5 USD per month.</p> <p>7. Not available</p>	<p>microorganisms has been revived.</p> <p>6. Vetiver mulch costs nothing.</p> <p>7. A fence for small livestock, animal feed, animal bedding, a barrier to protect a house</p>
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