

History of the Royal Development Study Centres

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Office of the Royal Development Projects Board
(ORDPB)



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	Tel. 0 2422 9000, 0 2882 1010 Fax 0 2433 2742, 0 2434 1385
	E-mail: aprint@amarin.co.th
	Homepage: http://www.amarin.com

Preface

Throughout the 70 years of his reign, His Majesty the late King Bhumibol Adulyadej (King Rama IX) tirelessly paid numerous royal visits to barren and remote areas across Thailand to visit his subjects and ameliorate their woes. His Majesty granted his initiatives and strived greatly to uplift Thai people's livelihoods and welfare to be in line with sufficient and sustainable social conditions and natural resources and environmental development. Thus, based on knowledge gained that is academically proper, simple and cost-saving, the people become able to live better lives with self-reliance.

In response to His Majesty's initiatives, six Royal Development Study Centres across the country were founded to collate studies, research, experiments and development approaches in various fields, each tailored to the respective region. The successful results of much of this research are displayed in the form of living natural museums where people from all walks of life can come to experience different ways of doing things for themselves and acquire knowledge they can adapt to their own land and circumstances.

In 1999, on the auspicious occasion of the sixth-cycle birthday anniversary of His Majesty on 5 December 1999, Office of the Royal Development Projects Board (ORDPB) published an important Thai-language book entitled **"History of the Royal Development Study Centres"**. The book was republished in 2018 in remembrance of His Majesty's boundless benevolence towards all Thai people and the nation and his wish that Thailand should abide prosperously and peacefully, and its people live happily, healthily and sustainably. The purpose of releasing this English language edition of this important historical record is so that His Majesty's initiatives can now be understood and adopted more widely.

Office of
the Royal Development Projects Board (ORDPB)

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Establishment of the Royal Development Study Centres

In over 50 years of physical and mental devotion since the beginning of his reign, His Majesty King Bhumibol Adulyadej, King Rama IX, emphasised ameliorating deprivation among farmers, the majority of the population, and raising their quality of life by becoming **"self-sufficient and self-reliant"**.

Enhancing people's well-being, coupled with family and community development, is considered the foundations of self-reliance and self-development. This, in turn, leads to higher levels of sustainable development that establish and reinforce the nation's strength and stability.

It has long been recognised that Thai farmers have been facing critical difficulties such as shortages of water for cultivation, lack of land for cultivation, and deterioration of natural resources, particularly soil deterioration, acid soil, saline soil, and others. Moreover, most Thai farmers have lacked agricultural know-how needed to solve **specific problems** in **specific regions.** Depending on their geology, some regions have serious problems while others face less serious issues.

With the royal intention of providing farmers in each region with the opportunity to learn techniques, methods and solutions under actual conditions of specific geological locations,



His Majesty the King, with his sharp insight and broad vision, graciously initiated the establishment of **Royal Development Study Centres** across Thailand. These centres systematically accumulate academic knowledge, research, experimentation results, and demonstrations of cultivation and agriculture as one-stop service providers for farmers and the public. Regarded as **"living natural museums"**, they continuously undertake a comprehensive range of academic and development activities, the impressive results of which are disseminated to applicable farmers and communities.

The royal development study centres also serve as **models of integrated administration**, where diverse related government agencies are centralised in one place, without being under authorisation of any specific entities, and join forces to provide a one-stop service to farmers. The first arrangements of their kind, the centres are considered a significant step forward in the governmental administration of Thailand.

"Models of Success" from Study, Research, Experimentation and Achievement in Agriculture

Thai farmers have long encountered many important problems. They have faced water issues, particularly water shortages during the dry season and flooding from heavy rainfall. They have faced problems of insufficient farmland and deterioration of surface soil and natural



resources. In addressing these problems, they have encountered another challenge: a lack of models and approaches to effectively develop specific areas that can be easily understood and followed. Above all, applications of modern technologies must be applicable to, and suitable for, each landscape, environment and cultural context. They must also be affordable. When these conditions are not met, local farmers still choose to follow traditional agricultural approaches handed down from their ancestors. Most of the time, the yields in terms of quantity and quality are low and sometimes their expenditure of funds and energy is wasted.

Reasoning thus, six royal development study centres have been initiated from His Majesty the King's boundless benevolence and royal grace and located nationwide. Situated in different geological areas of Thailand, each study centre serves as a source of knowledge which actively studies, researches and demonstrates **Models of Success.** Farmers and all those interested in agriculture are warmly welcomed by the centres to adopt the practical, applicable, straight-forward and economical approaches they propound. Indeed, even unsuccessful experiments have value as pointers to lines of enquiry that are not worth pursuing.



The centres also demonstrate comparisons of pre- and post-development conditions and show how local wisdom can be enhanced with modern know-how to best effect. This way resources of knowledge are developed that farmers can implement to improve both their yields and their quality of life. Or as His Majesty the King once said, they can be:

> *"...a centre or place that gathers and collates studies and works out from them how to develop further experiments that generate efficient and effective outcomes..."*

The Royal Development Study Centres: Living Natural Museums

The six Royal Development Study Centres are **Models of Success** of sustainable agriculture and livelihoods, offering **exemplary approaches** for farmers and others interested in agriculture to adopt to improve their farming methods. Moreover, they conduct research, studies and experiments across a range of disciplines, including science, agriculture, natural resources, environment, geology, hydrology, management, and social science. They are **treasure troves of wisdom** that gather related fields of study together, thereby building a solid foundation for





better living and livelihoods. By making available the latest advancements in understanding and technology, they raise the quality of life for individuals and communities. And when modern know-how is coupled with **local wisdom** in this way, conservation becomes a highly effective development tool.

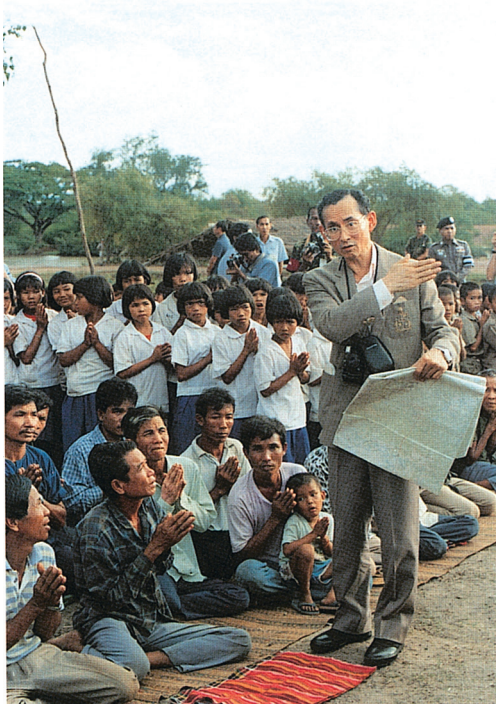
This all makes the six royal development study centres akin to **living natural museums** that not only gather and exhibit relevant items in one place but continuously perform research and experiments in actual geological conditions and socio-cultural environments. The reconstructions of each region's geological and social environment in one place enable the amelioration of the environment and lifting of the quality of people's lives. As such, they reflect His Majesty the King's exceptional intellect and great talents, leading to his being recognised and honoured as the "Hard-Working Great Development Monarch".

His Majesty the King once illuminated the role of the six royal development study centres with the words:

> *"...These royal development study centres are like living natural museums that people can visit and gain understanding from..."*

The Royal Development Study Centres: One-stop Service for Farmers

Providing information dissemination, knowledge promotion, and assistance to farmers and their communities used to be complicated and difficult. Services involving many fields of study were particularly problematic given the coordination they required between various government agencies. Farmers who sought assistance and information for their work lost a lot of



time travelling here and there to agencies scattered across the country. As such, their implementation of advantageous practices was delayed.

With all this in mind, a key objective of the royal development study centres is to provide a **one-stop service for farmers.** That is to say, to make it possible for farmers and other people interested in agriculture to access "living natural museums" throughout the country that provide all the information they need, including pertaining to agricultural land use, water management, seeds, marketing and livelihood advancement. At the same time, they can participate in training and seminars. With all such information and knowledge gathered together and available in one place, the farmers' tasks are made so much easier and more effective.

His Majesty the King once related that:

"...The royal development study centres are places where officials from many different divisions and departments, ranging from agriculture to social development to educational promotion, join forces to work together. This means that people who seek information or knowledge involving such subjects can come to the centres to obtain knowledge, while officials rapidly deliver services and assistance, all in one place. However, in the end, all Thai people acquire benefits..."

Royal Development Study Centres: New Dimensions of Administration

From the perspective of organisation management, administration of the six royal development study centres marks the first incidence of governmental management that incorporates several related agencies undertaking different operations and activities. This so-called **"centralisation"** is executed without strict supervision by any particular ministry or authorised agency. Besides the concerned government agencies, private sector entities and non-government organisations also lend their support to the six centres. Only two organisations, namely, Office of the Royal Development Projects Board (ORDPB) and the Chaipattana Foundation, serve as central offices for collaboration with other concerned entities.



Such a structure represents the integration of collaborating and cooperating entities for the benefit of Thai people. It can only be achieved when the concerned organisations surrender some autonomy to an integrated authority and devolved administration.

This structure, whereby many government agencies work together without strict supervision by an overarching authorised agency, for the benefit of the people, marks a new departure. Thai government has never before created such an administrative arrangement.

His Majesty the King once explained that:

> *"...Various departments and divisions which concern every different aspect of the people's life can exchange ideas, work together, and coordinate to have the work done..."*

Order of Establishment of the Six Royal Development Study Centres across the Country

The six royal development study centres, the so-called "living natural museums", were founded according to the following sequence*:



- Khao Hin Sorn Royal Development Study Centre

  Founded on 8 August 1979



- Pikun Thong Royal Development Study Centre

  Founded on 18 August 1981



- Kung Krabaen Bay Royal Development Study Centre

  Founded on 28 December 1981



- Puparn Royal Development Study Centre

  Founded on 25 November 1982



- Huai Hong Khrai Royal Development Study Centre

  Founded on 11 December 1982



- Huai Sai Royal Development Study Centre

  Founded on 5 April 1983

(* arranged in chronological order of royal initiatives)

In this chapter, the order of establishment of the six Royal Development Study Centres will be described briefly. The history, operations, achievements, projects in process and prospective projects of each centre will be clarified thoroughly in the next chapters.





1) Khao Hin Sorn Royal Development Study Centre

Stretching over 303.2 hectares (1,895 rai), the Khao Hin Sorn Royal Development Study Centre in Khao Hin Sorn Subdistrict, Phanom Sarakham District, Chachoengsao Province, was established according to the royal initiative of His Majesty the King on 8 August 1979. The main mission of this centre is to improve and rehabilitate natural resources. More specifically, it targets soil rehabilitation, reforestation, livestock development, establishment of cattle-buffalo banks, fishery promotion, fruits and flowering plants development, and cooperatives management, among others.

The Khao Hin Sorn Royal Development Study Centre comprises two branches:

1. Cha-ngok Mountain Area Development Project in Nakhon Nayok Province
2. Ban Sang Development Service Centre in Prachin Buri Province

2) Pikun Thong Royal Development Study Centre

His Majesty King Bhumibol Adulyadej graciously granted the initiative to establish the Pikun Thong Royal Development Study Centre when he stayed at Daksin Palace during 18 August – 3 October 1981. The study centre is located in Kaluwo Nuea Subdistrict, Mueang District, Narathiwat Province. Covering 278.4 hectares (1,740 rai), the area can be divided into: 32.32 hectares (202 rai) allocated for offices and demonstration fields; the 49.28-hectare (308-rai) "Phru" or peat swamp allocated for agricultural research and experimenting; 32 hectares (200 rai) for Khao Samnak rubber plantation, and; a 164.8-hectare (1,030-rai) reservoir. Another approximately 41,897.6 hectares (261,860 rai) of peat swamp forest in Narathiwat Province is also included.

The main mission of this centre involves studies, research and soil development, especially of deteriorated soil requiring restoration for cultivation. Its areas of accomplishment include development of soil organisms, high soil acidity, water treatments to remove acid from soil, development of peat swamp forests, conservation and preservation of plant varieties in peat swamp forests, fishery and livestock experimentation, flowering plants, and others.

The Pikun Thong Royal Development Study Centre has four branches, namely:

1. Para Rubber Plantation Project in the Area of Daksin Palace, Mueang District, Narathiwat Province
2. Pi Nae Mu Do Village Development Project, Jo Ai Rong District, Narathiwat Province
3. Munoh Livestock and Agricultural Village Project, Tak Bai District, Narathiwat Province
4. Khok It – Khok Nai and Yuyo Villages Area Development Project, Tak Bai District, Narathiwat Province

3) Kung Krabaen Bay Royal Development Study Centre

The Kung Krabaen Bay Royal Development Study Centre was founded in Sanam Chai Subdistrict, Tha Mai District, Chanthaburi Province, in accordance with the royal initiative graciously granted by His Majesty the King on 28 December 1981, stating: *...To consider finding a site suitable for implementing an occupational development project in the areas of fishery and agriculture along the eastern coast of Chanthaburi Province...*

Spanning over 5,760 hectares (36,000 rai), the centre has carried out studies, research, experiments and demonstrations concerning coastal environment development and conservation. Its areas of accomplishment include water treatment for black tiger prawn farming, mangrove forest conservation, collection of mangrove varieties, research and experiments concerning integrated agriculture, promoting understanding of cooperative systems, and training on animal husbandry.



4) Puparn Royal Development Study Centre

The Puparn Royal Development Study Centre is located at Na Nok Khao Village, Huai Yang Subdistrict, Mueang District, Sakon Nakhon Province.

The centre was founded in accordance with the royal initiative graciously granted by His Majesty the King on 25 November 1982. The Cabinet resolved on 4 October 1983 to appoint a board of the Puparn Royal Development Study Centre.



The centre covers approximately 368 hectares (2,300 rai) in addition to 1,760 hectares (11,000 rai) available for development in its peripheral areas. The major missions of this centre concern development of irrigation systems and industrial crops and experiments with upland rice varieties. The centre also studies forest ecology and soil rehabilitation and promotes livestock and fishery knowledge.



5) Huai Hong Khrai Royal Development Study Centre

The Huai Hong Khrai Royal Development Study Centre in Khun Mae Kuang Forest, Doi Saket District, Chiang Mai Province, was established according to the royal initiative of His Majesty the King on 11 December 1982. In accordance with the royal intention, the centre undertakes studies and experiments focused on effective techniques for improving riverine areas in Northern Thailand. Its objective is to provide a **model** watershed area for the region complete

with irrigation systems. The centre focuses on three types of forest planting conceived to benefit the economy. This includes development of upstream forest fertility and fishery studies focused on downstream reservoirs.

Stretching over 1,360 hectares (8,500 rai), the land the centre sits on was formerly completely barren and infertile. The establishment and development of the Huai Hong Khrai Royal Development Study Centre turned the land green and fertile. Since then it has attracted a lot of public attention and several heads of state and government have paid visits.

The centre comprises five branches, namely:

1) The Royal-initiated Fruit and Flower Propagation Development Service Centre Project at Rai Village, Hang Dong District, Chiang Mai Province
2) The Royal-initiated Ping Sub-River Basin Integrated Development Project, Hod and Chom Thong Districts, Chiang Mai Province and Ban Hong District, Lamphun Province
3) The Royal-initiated Khun Mae Kuang Forest Area Development Project, Doi Saket District, Chiang Mai Province
4) The Doi Tung (Implementation Site) Development Project, Mae Fa Luang District, Chiang Rai Province
5) The Royal-initiated Huai Larn Area Development Project, San Kamphaeng District, Chiang Mai Province

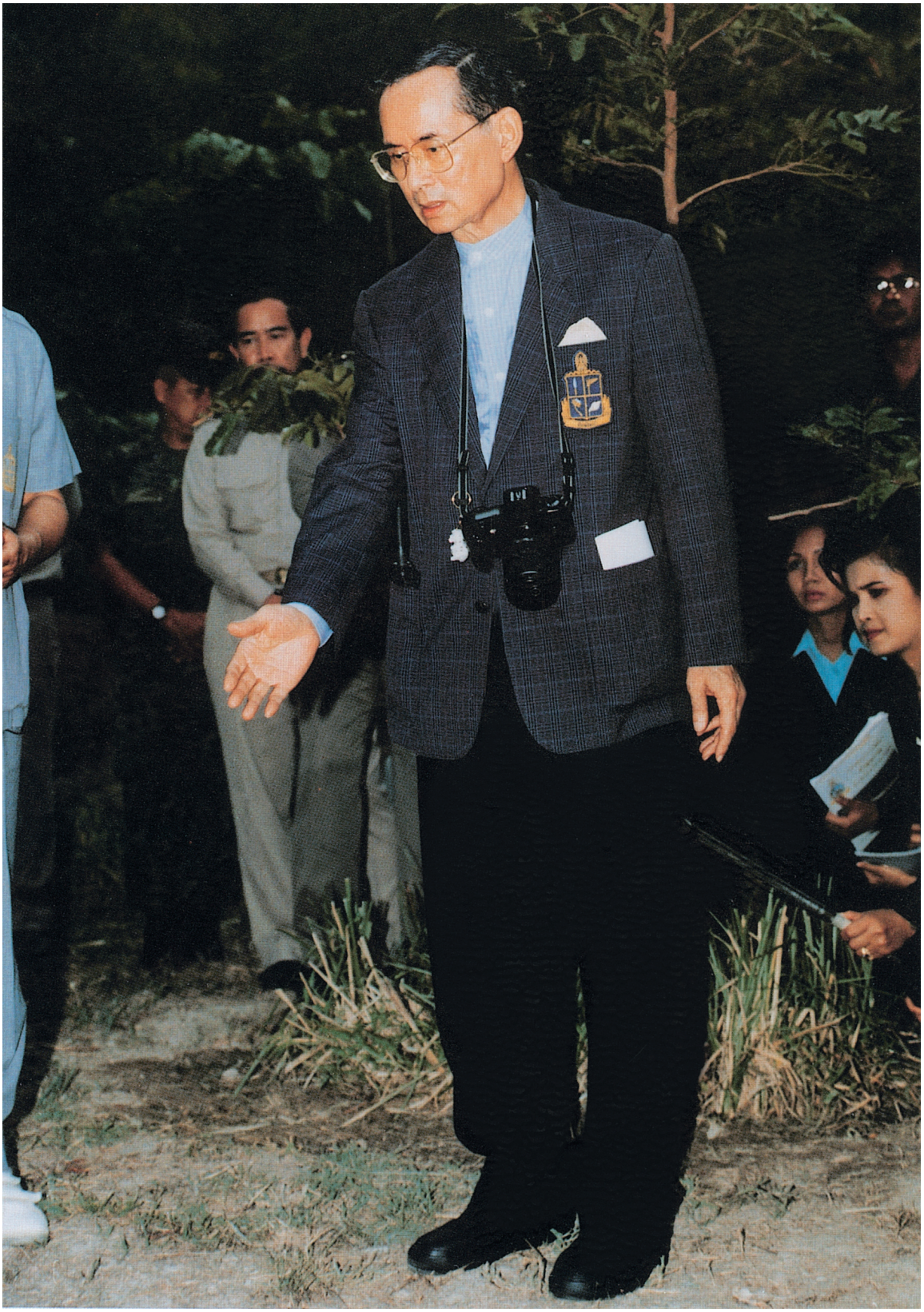
6) Huai Sai Royal Development Study Centre

The Huai Sai Royal Development Study Centre is located in Sam Phraya Subdistrict, Cha-am District, Phetchaburi Province, in the area that was formerly the vicinity of Mrigadayavan Palace. King Rama VI graciously granted a royal command preserving the area as a royal property and animal sanctuary. Later, some locals intruded into the area, devastating the forest by cultivating crops in an unscientific way. The land was turned into arid semi-desert with infertile soil and soil erosion.

His Majesty King Bhumibol Adulyadej commented that:

"...If these conditions are allowed to continue, the place will become a desert..."

To prevent that happening, His Majesty graciously granted an initiative to establish the Huai Sai Royal Development Study Centre on 5 April 1983.



The centre immediately set about developing multi-purpose forests, studying proper agricultural development techniques, undertaking conservation and reforestation, providing water resources, and studying wildfire protection and **"wet forests".**

The locals who devastated the forest are allowed to work side-by-side with the centre to improve, preserve and sustain the natural resources in the right way, so that they can live with nature peacefully and sustainably.

Spanning over 6,822.4 hectares (42,640 rai), the Huai Sai Royal Development Study Centre primarily consists of the Royal-initiated Cha-ngum Mountain Deteriorated Soil Rehabilitation Project in Photharam District, Ratchaburi Province.

The six royal development study centres across Thailand and their branches comprise **"living natural museums"** where a diverse array of development forms are gathered together. They provide essential **"models"** for farmers and the general public to apply development techniques to their own land.

The valuable chronicle of the six royal development study centres should be written and recorded accurately in honour of His Majesty King Bhumibol Adulyadej, commemorating His Majesty's sixth-cycle birthday anniversary and his boundless benevolence in graciously initiating the projects for the great benefit of deprived farmers and the nation.



History of the Royal Trails
His Majesty the King's Direct Exposure to His Subjects' Sufferings

His Majesty King Bhumibol Adulyadej's wishes to visit his people across Thailand began after his accession to the throne on 9 June 1946. In response to his noble wishes, the first royal trails were arranged after His Majesty's permanent return to Thailand in December 1951. The royal visits to all regions of Thailand reveal his following noble wishes:

Firstly, His Majesty the King graciously granted audiences to his people no matter where they were. In the early years of his reign, roads were far different from today; they were rough and muddy. But His Majesty was determined to make journeys even though these trips were inconvenient and fraught with travel difficulties.

In the early days of his reign, His Majesty took region-wide trips. Sometimes he travelled by train. Sometimes he travelled by road. His choice of transportation depended on the best way to reach and get around each destination. Interprovincial routes and places where his group could lodge also had to be taken into account.

Secondly, His Majesty's great concern was always to hear directly from his people about the problems they faced and to get a first-hand impression of the conditions in which they lived. As he travelled past district offices and communities in provinces across the country, His Majesty always allowed his subjects to get up close and would use the opportunity to enquire about their health and livelihoods.

His Majesty thereby uncovered and realised the sufferings of his people and used the information he gathered to identify the main problems people faced in each area.

Besides his trips to visit his people, His Majesty King Bhumibol Adulyadej also travelled to different temples to make merit every year. He not only visited his subjects across the country, but paid his respects at the religious sites.



His Majesty's extensive travels around his kingdom gave him many insights. He recognised how problems varied from area to area, with local contexts and socio-economic conditions being the key variables. In his bid to ease his people's woes, His Majesty graciously set up the royal development study centres tasked with delivering solutions tailored to local needs and tackling problems at their roots. His Majesty the King once said:

> *"...The royal development study centres are established to improve people's livelihoods. These centres are aimed at boosting abundance through soil development, water source development, forest rehabilitation, and the application*





of agricultural academic principles to farm and livestock planning. These centres use donations as development capital and serve as model farms. Farmers and officials can visit the centres to observe demonstration farms and gather knowledge. The study centres, moreover, undertake to develop communities in their neighbourhoods. As living conditions improve, it may be possible to set up a rice mill and then a rice bank to promote self-reliance in each village…"

His Majesty King Bhumibol Adulyadej created guidelines for the essential information. These guidelines are considered important to be recorded in the history of each royal development study centre, as follows:

1. The naming of each of the six royal development study centres

   His Majesty the King explained that:

   "…In the beginning, I did not give any names to these centres. As they were established, I simply named them the royal development study centres. I set up each operation first and then gave it a name reflecting what the centre or operation was mainly concerned with later, as it became clear…

   …The name of the overall operation is the royal development study centre. It refers to a centre or place of study to collect the study and find appropriate and practical development approaches…"



2. The royal development study centre assignment details

His Majesty the King explained that:

"...The name royal development study centre implies that they are just royally-initiated development efforts. In fact, the word 'royal' here describes the study centre. It is the study centre that is royally-initiated. Its operation is based on the royal initiatives..."

3. The approach of each royal development study centre differs according to geographical conditions in the respective areas.

His Majesty the King graciously advised that:

"...The royal development study centres may each engage in rice farming, yet their farming methods and paddy fields can be different. Farming techniques used, which may not be in line with academic principles, should be based on local geographical conditions. The centres may study those techniques because local farmers have used them. If those techniques prove useless, the centres then must explore other solutions by applying other sciences such as irrigation, soil development, or agricultural academic principles, to boost yields. Moreover,



the centres must look deeper. Besides growing rice, they should address harvesting, rice-milling and rice selling. In other words, the centres should provide solutions from upstream…"

4. His Majesty the King's guidance for the royal development study centres when encountering problems

"…In solving problems, it is alright if solutions are not in line with academic principles. Mostly, I focus on simplicity. If those simple techniques are effective, they will automatically set new academic principles…"

5. His Majesty the King's guidance for the royal development study centres' research and development efforts

"…The royal development study centres operate based on the principles that if any approaches proves practical, they will be recorded it. Those records will become textbook material. The textbooks are created from our experience. This is one of the royal development study centres' advantages. They are not experimentation stations but engage in informal or casual experimentation…"



6. His Majesty the King's clear explanation that the royal development study centres are not "experimentation stations" but places of collaboration in development

"...Some people think the royal development study centres are like experimentation stations or colleges but that is not correct. They are places where people can engage in experimentation or developmental work in certain areas. When they conclude their experiments, they will communicate what they have found in comprehensible language to those who are not necessarily specialists in the field themselves.

...This is another benefit of the royal development study centres. One group may do some work but they will make what they find available to all parties who can benefit from it. Officials in various development fields will also collaborate. This is the primary reason why these centres are not experimentation stations..."

7. His Majesty the King's guidance to the royal development study centres when facing failure

"...If the royal development study centres fail in any endeavour, that is not



a cause for punishment. Each failure will only testify to an approach that doesn't work or causes damage. After learning that lesson, the centres may repeat the approach to make sure that it really isn't useful. The lessons will provide content for textbooks that will identify wrong approaches to others so that they are avoided in future...

"...When the study centres do something wrong, the error will be evidence of an erroneous approach. It will serve as an indication to others of what they should avoid. Any damage caused won't be so big anyway because the centres only experiment on a small scale. Experiments lead to information about what works and can frame a principle and what doesn't work and can be discounted..."

8. On His Majesty the King's wishes to develop the royal development study centres as multipurpose centres that both develop knowledge and offer relaxation

"...Royal development study centres are open to people at all levels. Although they are not schools, they are places people can come to study and learn. School pupils, college students, university students, and civil servants,





whether junior or senior, are all welcome. Regardless of their duties, they can come and observe various development approaches across different academic fields. In this sense, the centres are like museums filled with academic exhibits related to development…

Besides, visits to the study centres can provide relaxation. When work is stressful, just visit the study centres. Think of them like public parks that are also educational. This is the essence of the royal development study centres…"

9. In conclusion, the clear mission of the royal development study centres

His Majesty the King summarised the royal development study centres' mission, saying:

"…The area of each study centre features scaled-down versions of different local geographical conditions. Each focuses on development of various agricultural fields…

…When experiments are successful, demonstrations are exhibited inside the centre. As such the centres serve like museums where the exhibits have been proven to be really practical…"



Khao Hin Sorn Royal Development Study Centre
Phanom Sarakham District, Chachoengsao Province

• History of the Khao Hin Sorn Royal Development Study Centre

A Brief Background

On Friday, 26 August 1988, His Majesty King Bhumibol Adulyadej (King Rama IX) granted an audience to General Chatchai Choonhavan, the then Chairperson of Office of the Royal Development Projects Board, and concerned officials at Dusidalai Hall and gave suggestions on the future project implementation. His Majesty the King graciously related the background of the Khao Hin Sorn Royal Development Study Centre that:

> *"...The Khao Hin Sorn Royal Development Study Centre is the first of its kind. Much development has not yet been seen at the study centre due to the limitations of its topography. However, the idea of having the royal development study centres has later been expanded..."*



As for the origin of the centres, His Majesty the King graciously informed the gathering that:

"...The royal development study centres originate from the Khao Hin Sorn Royal Development Study Centre...

...It all started when a village headman offered me 42.24 hectares (264 rai) of land to build a palace at the foothill of Khao Hin Sorn near Hin Sorn Temple in 1977...

...First, I tried to find out exactly where the land was. I had to ask many people before I could find it on a map of Khao Hin Sorn (Map 1:50,000; Sheet 5236 I, II, 5336 III, IV). After acquiring the land, I thought the matter over for two years and tried to find out the conditions of the land on the map. After that, I asked around about the exact geographical conditions. Finally I found the land right at the top of a map. I had to arrange four map sheets together to pinpoint all the land precisely. At that point, I asked the land donors whether they would mind if I would rather build a centre for agricultural studies there instead of a palace. They said they would be glad, so I started building the first study centre there..."

• Historical Record of the Khao Hin Sorn Royal Development Study Centre

It was on Wednesday, 8 August 1979, at 13.20 hrs. that King Rama IX, together with Her Royal Highness Princess Maha Chakri Sirindhorn and Her Royal Highness Princess Chulabhorn, departed Chitralada Villa, Dusit Palace, by royal vehicles to graciously preside over the opening ceremony of King Pinklao Monument, observe the agricultural study centre at Khao Hin Sorn Village, and visit the people of Phanom Sarakham District, Chachoengsao Province.

At 15.00 hrs. that day, His Majesty and Their Royal Highnesses arrived at Khao Hin Sorn Village, Moo 2, Khao Hin Sorn Subdistrict, Phanom Sarakham District, where they graciously granted an audience to well-wishers keen to donate funds. His Majesty then graciously assigned the funds to Mr. Sujin Kitiyarak, the then Chachoengsao Governor, to meet the cost of developing the Phanom Sarakham Agricultural Study Centre.



His Majesty and Their Royal Highnesses then graciously visited the local people who were waiting to greet them. After that, the royal party left for the Phanom Sarakham Agricultural Study Centre. After they arrived there, Mr. Thiwa Phoolsombat, Chief District Officer of Phanom Sarakham District, gave his report and presented Mr. Auan Chaithet, Village Headman of Moo 2 of Khao Hin Sorn Subdistrict, and a group of seven donors of altogether 42.24 hectares (264 rai) of land, namely:

1. Mr. Chomtru Chaithet
2. Ms. Lim Chaithet
3. Mr. Daeng Suriya

4. Mr. Chao Phong-Srisai
5. Mr. Moon Kaew-Phumhaeng
6. Mr. Aiao Supata
7. Mr. Thongyu O-Wattana

His Majesty the King conversed with the land donors, later recalling:

"...I asked the land donors whether they would mind if I would rather build a centre for agricultural studies there than a palace. They said they would be glad, so I started building a centre there..."

Following his conversation with the land donors, His Majesty the King graciously granted a royal audience to officers of the Ministry of Interior and Ministry of Agriculture and Cooperatives and addressed the topic of conducting a thorough survey of the land to be allocated for the people, the studies on irrigation, cultivation, livestock, and cottage industry.

Later, on 19 June 1997 at Klai Kangwon Palace in Prachuap Khiri Khan Province, His Majesty graciously presented to Office of the Royal Development Projects Board (ORDPB) his own records and analysis of the challenges that each royal development study centre would need to meet.

Regarding the Khao Hin Sorn Royal Development Study Centre specifically, His Majesty the King pointed out the issues and solutions as follows:



"Challenge No.1: Khao Hin Sorn Royal Development Study Centre, Phanom Sarakham District, Chachoengsao Province: 1979...

...Deforestation for cultivation of field crops, such as corn and cassava, has depleted the soil and made it sandy. During the dry season, soil erosion is caused by wind (wind erosion). During the rainy season, the soil surface is washed away (water erosion).”

- Record of His Majesty’s Royal Ideas for the Khao Hin Sorn Royal Development Study Centre

Documents that King Rama IX graciously presented to ORDPB recorded that:

A. Regarding the quality of soil at the Khao Hin Sorn Royal Development Study Centre at the initial stage, His Majesty analysed and described it as:

“sandy soil deficient in minerals”

“...The quality of soil in the creek is alright, with few problems. Fertilizer can be used to improve the condition of this soil. However, the soil on the hills is comprised of sand, hard soil and rock. To hold the soil and generate organic fertilizer, grass needs to be planted along the contour line. Sandy soil without grass just gets washed away by the rain. To retain the moisture, it is necessary to plant various varieties of trees...”

B. Regarding the royal initiatives on water source development:

“...First, we need to build a dam across Huai Chek where there are aqueous capillaries (Coordinate QR. 715208). When I presided over the opening ceremony of King Pinklao Monument at Khao Hin Sorn Temple, I made a survey on the site and specified the spot on which to build the dam (8 August 1979). Once the dam is finished, the next task is to build reservoirs outside the centre, specifically at North Huai Samrong and South Huai Samrong...”

His Majesty graciously passed the information to concerned officials at Dusidalai Hall on 26 August 1988, saying:

“...Initially, I asked the Royal Irrigation Department to construct reservoirs. It might have seemed a bit strange because the reservoirs covered almost all the donated land. Just a few areas were left for cultivation and they would have to be irrigated. It all began like this which was not considered academically incorrect. Although it seemed to be academically incorrect because most of the land was designated for building reservoirs, leaving only a few rai for growing crops, it was considered as an example to show that storing water in reservoirs not only benefits our land but low-lying land and the people living there...”





As for locating the reservoirs, His Majesty further explained that:

"...The construction of an earthen dike across Huai Chek (3) to create a water storage area should be carried out at a location where it doesn't affect land used for rice cultivation, even if that means it can't store as much water as the plan calls for..."

C. Regarding the royal initiative on "selecting activities that are suitable for local condition" in order to make the best use of the land, His Majesty explained:

"...After developing water sources, planting field crops and fish farming is possible in the river basin. As for the hilly areas, they will be suitable for animal husbandry, coupled with planting grass, as well as fruit trees and forest. Animal husbandry, grass, fruit trees and forest will, in turn, improve soil quality and eventually the improved soil will make it possible to make use of the land. But the process of improving degraded land and making it fertile might take some time..."

D. Regarding the royal initiative on "diverting water from low-lying land to higher elevations", His Majesty explained:

"...In addition to the land where water is supplied by the irrigation system, the land that is situated above reservoirs also gains benefits from stored water for growing plants and the study of growing plants relating to providing of water from low-lying land to higher elevations by various means, for example, the use of pumping machines to divert the water, or we can power the pumps by windmill, or by solar-energy-powered electric pumps. Or we can use water wheels driven by flowing water to pump water upwards along ducts..."

E. Regarding the royal initiative on "planting trees to gain multiple benefits", His Majesty explained:

"...Once the soil has been classified for field crop cultivation or afforestation, the next stage is to grow trees. Such trees help conserve the soil surface and retain moisture. Moreover, they are useful for household uses, such as for firewood, for building, for fruits, and other purposes..."



F. Regarding the royal intiative on establishing an administrative committee to oversee the implementation of the Khao Hin Sorn Royal Development Study Centre, His Majesty graciously made a statement on the importance of establishment of **"the committee"** comprising representatives of different divisions and departments. Its primary responsibility is to formulate policies and strategies for developing the 42.24 hectares (264 rai) of land into a comprehensive agricultural study centre.

G. One of the most significant royal initiatives, which has become a key practice for every Royal Development Study Centre, is **"transforming deteriorated or degraded land into fertile land".**



From the early days of the establishment of the Khao Hin Sorn Royal Development Study Centre, there were people reporting to His Majesty the King that it was not worth investing in trying to improve such deteriorated land. However, the King refused to believe it and responded with some royal guidance:

"...Later, officials from different divisions and departments told me that the area had bad soil that was unproductive. They said it would not be worthwhile to set up a study centre there. I responded that there are lots of places with degraded soil in Thailand. If we kept saying this

or that area had bad soil and did nothing about it, the whole country would degenerate into desert. When they heard this, the officials understood and buckled down to finding ways to rehabilitate the damaged soil and make it fertile again, and eventually the area was able to support cultivation of rice and many other crops. If we had only been guided by the most commonly used formula of calculating the proportion of investment capital and returned benefits, we would not have made such progress. But I think if this place has been developed, the area that gains benefits will increase as well as the agricultural produces.

Moreover, the areas outside the centre will also see higher yields. Therefore, it was feasible to establish the centre and continued to conduct studies and follow the ultimate outcome. The study centre was then established..."

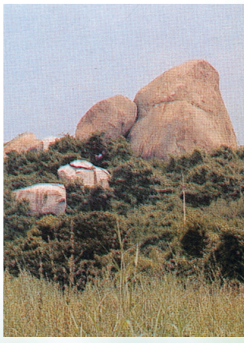
• Khao Hin Sorn Royal Development Study Centre



Location

The Khao Hin Sorn Royal Development Study Centre is situated around 100 kilometres from eastern Bangkok in Khao Hin Sorn Subdistrict, Phanom Sarakham District of Chachoengsao Province. Approximately 15 kilometres from Phanom Sarakham District Office, it is on the right-hand side of the Chachoengsao-Kabin Buri Road or Highway 304.

Former Geographical Conditions

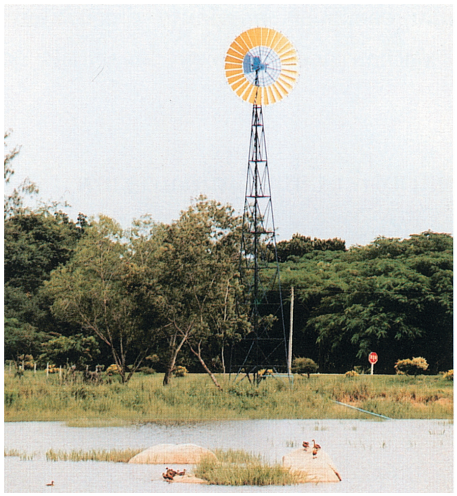


An initial survey found most of the land to have sandy soil subject to high-intensity rainfall. Annual precipitation averaged 1,200 mm with most rain falling within a short period. At times, over 60 mm of rain falls in an hour. The soil, meanwhile, could only retain about 30 mm of that, leaving the rest to wash away and erode the soil, ultimately draining its fertility to a severe degree.

Soil Quality Problems

One In terms of infertility, the centre and surrounding areas, where recovery of deteriorated soil was urgently needed, accounted for about 6,400 hectares (40,000 rai). Methods of soil improvement selected included producing and applying compost, thereby saving the expense of purchasing fertilizer, and switching from cassava cultivation to farming leguminous plants.

Two 1,600 hectares (10,000 rai) were found to have the most severe soil erosion. The need was identified to build earthen dikes to slow the flow of water. 3,200 hectares (20,000 rai)



of the land was identified as having moderately severe soil erosion, with ploughing and planting along terraces identified as an effective way to stabilise the areas.

Three Another problem was excessive water drainage across 263.04 hectares (1,644 rai) of rice fields, for which the solution would be to dig drainage canals.

Four Of 18,114.24 hectares (113,214 rai) peripheral to the centre, in 13,223.72 hectares (82,648.22 rai), or 73%, the soil was found to be highly degraded, mainly due to cultivating cassava without a suitable irrigation system. Another 30% of the land was characterised as having high to very high severity of soil erosion, with the land being abandoned during the dry season and dry spells.

Lack of Water Sources

The area of Khao Hin Sorn Royal Development Study Centre slopes downward, from east to west, forming several important streams and a canal flowing in the same direction, as follows:



1. Nam Jon Stream and its forks arise on the hill in the east and southeast of the centre, and flow through the middle of the centre to form one stream. The stream then flows westward to Muang Phrong Stream and into Tha Lat Canal. However, the stream at times runs dry and does not provide a steady source of water year-round.

2. Muang Phrong Stream forks from Nam Jon Stream and runs westward into Tha Lat Canal. Again, the flow dries up at times and cannot be relied upon throughout the year.

3. Chek Stream arises to the northeast of the centre, joining Nam Jon Stream within the centre. Again, the stream does not flow consistently throughout the year.

4. Lang Na Swamp is located near Phanom Sarakham–Kabin Buri Road and contains water all year.

5. Tha Lat Canal is an important water resource in Phanom Sarakham District. The canal originates in the Khao Yai, Ang Rue Nai and La Lak mountain ranges, flowing northwest into Bang Pakong River. The canal never dries up but can only retain a small volume of water as it meanders through a relatively small area of 2,620 sq. km. As such, even in the rainy season from May to October, when precipitation reaches as high as 1,250 m^3/second, the maximum capacity of the canal is only 150 m^3/second of that, causing frequent flooding of low-lying land.

The early irrigation system in Phanom Sarakham District: Due to the altitude of the Khao Hin Sorn Royal Development Study Centre, it was unable to deliver water to the project area which was the important matter at that time.



All things considered, the Khao Hin Sorn Royal Development Study Centre faced several knotty problems in addition to the core issue of soil deterioration arising from soil erosion resulting from the sandy nature of the soil. Other challenges included precipitous geographical conditions allowing the severity of soil erosion and lack of knowledge among farmers about soil and water conservation. There was also the issue of inappropriate cultivation methods. For example, farmers didn't enhance the soil and just repetitively grew monocrops such as cassava. As a result, the soil quickly became infertile. Problems were compounded by insufficient water supply for cultivation and poor water retention by the soil, making the already existing water shortages even more acute.

The unfortunate impact of all the problems was poor quality crops that only commanded low prices. In the early days of the centre, farmers' income levels continued to disappoint. The lion's share of their income, accounting for 80%, came from selling crops. When their income from other sources was added, the total still only came to about 10,115 baht a year for an entire family. Meanwhile, their cost of living was nearly double that – some 20,115 baht per family per year – leaving a steep shortfall of 10,000 baht.

• Administration

The Khao Hin Sorn Royal Development Study Centre's administrative organisation is as follows:

1. Royal Development Study Centres Executive Committee
2. Sub-Committee on Master Planning, Monitoring and Evaluation
3. Sub-Committee on Khao Hin Sorn Royal Development Study Centre Project Implementation



• Operational Sites

The Khao Hin Sorn Royal Development Study Centre's currently active operational sites are as follows:

1. Khao Hin Sorn Royal Development Study Centre in Phanom Sarakham District, Chachoengsao Province (198.4 hectares or 1,240 rai)

2. Khao Hin Sorn Royal Implementation Project in Phanom Sarakham District, Chachoengsao Province (104.8 hectares or 655 rai)

3. 15 villages surrounding the Khao Hin Sorn Royal Development Study Centre in the Jon River Basin area of Khao Hin Sorn and Ko Khanun Subdistricts (18,114.24 hectares or 113,214 rai)

4. Land donated to His Majesty King Bhumibol Adulyadej in Ban Song and Khao Hin Sorn Subdistricts (5.28 hectares or 33 rai)

5. The Royal-initiated Cha-ngok Mountain Area Development Project in Nakhon Nayok Province (3,705.12 hectares or 23,157 rai)

6. Royal Implementation Project Site in Ban Sang District, Prachin Buri Province, (Ban Sang Development Service Centre) (23.2 hectares or 145 rai)

• Responsible Agencies and Their Missions

The Royal Irrigation Department supplies water sources to support operations within the centre and surrounding farmers' fields and is responsible for building nine reservoirs with total water storage capacity of 5,492,000 m^3.

The Royal Forest Department implements reforestation plans by setting up arboretum, botanical garden and herb garden and planting fast-growing trees. The Department also encourages farmers to realise the importance and benefits of forests and supports afforestation by running a tree seedling nursery and distributing seedlings to farmers.



The Department of Fisheries conserves aquatic animals, disseminates knowledge about aquatic animals, advises how to increase yields, gives fishery demonstrations, and distributes various breeds of freshwater fish.

The Department of Livestock Development, in collaboration with the Armed Forces Development Command and Charoen Pokphand Foods PCL. hosts training programs on how to boost livestock yields, gives pasture demonstrations, promotes pasture, improves animal breeds including swine and cattle, and establishes cattle and buffalo banks that offer instalment financing of purchases.

The Land Development Department conducts soil surveys, classifies types of land tenure, plans land use, surveys socio-economic conditions of farmers and local villagers, and demonstrates soil and water conservation and soil improvement methods for increasing crop yields. The Department also introduces soil and water management measures to prevent erosion, and produces seeds of plants for soil conservation for farmers. Above all, the Department works to spread adoption among farmers of soil preservation and nourishment techniques, raise awareness of the benefits of compost, and encourage the production of organic compost for household use.

The Department of Agriculture conducts studies and demonstrates growing plants suited to challenging weather and geographical conditions. The suggestions include planting xerophytes such as cashew trees in place of cassava as well as particular rice varieties and para rubber trees. The Department also demonstrates how to power agricultural engineering tools from naturally-generated energy.

The Department of Agricultural Extension promotes and demonstrates plant propagation and cultivation of fruit trees and home-grown vegetables. Its responsibilities include hosting training on fruit tree propagation, pest eradication, and maintenance of fruit trees, perennial plants, field crops, and vegetables. It also leads the collection of Thailand's best mango varieties.

Chachoengsao Provincial Administrative Organisation facilitates other concerned government agencies when operating at the study centre. The provincial organisation also runs a collaboration and coordination centre to accommodate visitors and provide a venue for training sessions and meetings. It also arranges a weekly market for selling fresh agricultural produce from the study centre, and runs a shop selling good quality agricultural tools and materials.

The Royal-initiated Botanical Herb Garden Project, under the Royal Forestry Department, takes responsibility for collecting herb varieties and disseminating knowledge and information about them to the general public. It also encourages people to grow herbal plants and vegetables for medicinal purposes and to increase household self-sufficiency. Having been trained at the centre, lecturers spread awareness and understanding of the benefits and properties of Thai herbs throughout society.

Kasetsart University disseminates general information about the study centre's work, and undertakes plant research leading to variety modification and improvement to suit actual geographical conditions.

The Community Development Department trains farmers and other locals how to make handicrafts, ranging from basketry to weaving, to provide extra income. The Department is also assigned to supervise and develop Sirindhorn Childcare Centre.

The Department of Public Works is responsible for establishing and operating the waterworks system that provides clean water for consumption and agricultural use.

The Cooperative Promotion Department supervises rice mill affairs for the benefit of farmers, runs agricultural cooperatives, and issues agricultural credits.

The Provincial Electricity Authority is responsible for electrical installations and electricity supply to concerned agencies and villages surrounding the study centre.

First Army Area ensures a stable and secure environment in which development can flourish.

The Office of Accelerated Rural Development is responsible for road construction within the centre and connecting nearby villages.

The Office of Vocational Education Commission is responsible for the setup of the Chachoengsao College of Agriculture and Technology which provides vocational education opportunities in agriculture, leading to "Vocational" and "High Vocational" certifications. The Office further supports occupational development in other fields of agriculture.

• Operation of the Khao Hin Sorn Royal Development Study Centre

1. Forest Rehabilitation

The Khao Hin Sorn Royal Development Study Centre divides its area to execute forest rehabilitation into three parts: Somdet Phra Pinklao Arboretum, Khao Hin Sorn Botanical Garden, and a seedling nursery centre.

Somdet Phra Pinklao Arboretum: Stretching across 32 hectares (200 rai), the Arboretum preserves indigenous trees and grows rare trees and trees with particular economic value. The Arboretum's garden has been beautifully landscaped so it can also be enjoyed as a recreational facility.

Botanical Garden: Spanning over 64 hectares (400 rai), the Garden maintains existing forest and grows 12 families of trees and plants, namely: Apocynaceae; Lamiaceae; Zingiberaceae; Rutaceae; Moraceae; Arecaceae; Dipterocarpaceae; Fabaceae; Leguminosae; Ebenaceae; Meliaceae; and Orchidaceae. As it expands forested areas, the Garden has increased the variety of tree species to around 1,000, and mushroom and fungi varieties to 300. The Garden also collects and conserves the rarest species of wild trees found in Eastern Thailand, including keeping detailed records of orchid and banyan family phenologies. A dedicated herb garden, gathering more than 460 kinds of herbal varieties, was established in 1984, to which a herbal sauna open to the public was added in 1997.



Seedling Nursery Centre: Covering 8 hectares (50 rai), the Seedling Nursery Centre operates a plant nursery and grows five varieties of trees (earleaf acacia, *leucaena leucocephala*, common ironwood, ironwood horsetail and eucalyptus) in a demonstration forest. More trees are grown in forest areas within the centre and on the royal land. The Nursery also propagates plant seedlings, distributing over 500,000 seedlings annually to the general public since 1997.

It also provides seedlings for the Reforestation Campaign in Commemoration of the Royal Golden Jubilee, disseminates forest development and conservation knowledge in surrounding villages, and supplies farmers with seedlings to plant in free spaces at the ends of their rice fields.

2. Water Resources Development

King Rama IX's initiatives have ameliorated water sources at the Khao Hin Sorn Royal Development Study Centre by creating nine reservoirs, as follows:

1.	Huai Chek	Water storage capacity	120,000	m^3
2.	Huai Yaek	Water storage capacity	9,000	m^3
3.	Huai Samrong Tai	Water storage capacity	625,000	m^3
4.	Huai Man Pla	Water storage capacity	250,000	m^3
5.	Left Huai Yaek of Lower Nam Jon Stream	Water storage capacity	1,970,000	m^3
6.	Upper Huai Samrong Nuea	Water storage capacity	608,000	m^3
7.	Lower Huai Samrong Nuea (earthen dikes)			
8.	Upper Huai Nam Jon	Water storage capacity	1,800,000	m^3
9.	Huai Yaek 2	Water storage capacity	110,000	m^3

Besides building reservoirs, the Khao Hin Sorn Royal Development Study Centre has dredged water irrigation canals, repaired water distribution systems, improved the irrigation canals, and distributed water to 275.2 hectares (1,720 rai) of plantations within the centre and 812.8 hectares (5,080 rai) of plantations in the surrounding villages. Since 1987, the centre has built 326 water storage sources near plantations, with total capacity of 1,260 m^3 (1999). It has also dug 125 ponds across 240 hectares (1,500 rai), coupled with an initiative to promote vetiver grass planting around the ponds to prevent soil erosion.

3. Soil Rehabilitation and Conservation

Soil in Khao Hin Sorn Subdistrict is generally sandy and subject to surface erosion and infertility. The soil condition stems from encroachment into fertile forest areas coupled with many years of sugar cane, cassava and eucalyptus cultivation. Regarding soil surface erosion, the Khao Hin Sorn Royal Development Study Centre began extensively and regularly surveying land use in 1987 while laying plans for soil and water conservation. The surveys have been undertaken annually for each village within the 240 hectares (1,500 rai) area.

Other projects the study centre has successfully implemented include laying 20 water ducts and 48,996-metre waterways into paddy fields. It has also supplied 91 drainpipes, improved paddy field layout across 370.4 hectares (2,315 rai), and constructed 13 water distribution buildings and six weirs. It has also developed a soil and water conservation system, involving building 108.44 kilometres of earthen dikes in conjunction with cultivating vetiver grass around them.

Moreover, the study centre has propagated over six million vetiver grass seedlings (1999) for distribution to farmers, and promoted and demonstrated the making of domestic compost, manure and green manure. Last but not least, the centre has organised training sessions that enhance land development knowledge among farmers living nearby the centre.



4. Double Cross Hybrid of Fruitage Plants Project

His Majesty King Bhumibol Adulyadej graciously assigned His Serene Highness Prince Chakraband Pensiri Chakrabandhu, Chairman of the Board of Khao Hin Sorn Royal Development Study Centre, to supervise the Double Cross Hybrid of Fruitage Plants Project. The project involves studying plant hybridisation to develop new plant species of better quality, especially suited to the prevailing environmental conditions, and disseminating related knowledge and technologies among local farmers.

The Khao Hin Sorn Royal Development Study Centre, in collaboration with Kasetsart University, has conducted research into crossbreeding a vast range of plant species, among which seven varieties have proved particularly successful, namely:



1. "Chakkra 1 F_1" — a single-cross sweetcorn hybrid
2. "Khao Hin Sorn F_1" (11476) — a single-cross sweetcorn hybrid with a sweet taste measured at 18.6 per cent brix
3. "Chat Thong 1-4 F_1" — a triple-cross sweetcorn hybrid
4. "Chat Thong 29 F_1" — a triple-cross sweetcorn hybrid
5. "Chat Ngoen" — a single-cross waxy corn hybrid
6. "Phanom Sarakham" — yard-long bean
7. "Khao Hin Sorn" — yard-long bean

5. Fields of Agricultural Studies, Experimentation and Activities

- Study and experimentation on crop cultivation
- Experimentation on integrated farming
- Study and experimentation on field crop cultivation
- Study and experimentation on horticulture
- Study and experimentation on para rubber cultivation
- Study and experimentation on comprehensive paper mulberry cultivation

- Study and experimentation on sericulture
- Study and experimentation on horticulture & herbal plant conservation
- Study and experimentation on organic vegetable cultivation
- Study and experimentation on mushroom cultivation
- Setting up of experimentation plots and development of technology
- Experimentation on sustainable agriculture
- Dissemination of technology

The Khao Hin Sorn Royal Development Study Centre encourages farmers living nearby to grow good quality plants with good yields. The centre has selected some of the farmers to trial fruit tree and vegetable cultivation techniques developed by the Department of Agriculture. Around 20 farmers have initially implemented the practices in areas of 0.32 hectare (2 rai) each.

6. Study on the Effectiveness of Compost Utilisation in Soil Rehabilitation at the Sustainable Agricultural Development Pilot Project

The Khao Hin Sorn Royal Development Study Centre has studied sustainable soil rehabilitation by comparing the effectiveness of compost and green manure utilisation to grow vegetables and some economic crops. The study focuses on physical and chemical alterations in Mabbon Soil (Soil Group No. 35).



7. Study Project on Appropriate Land Use for Growing Flowering and Ornamental Plants

The centre has studied cultivation of flowering and ornamental plants suited to the geographical conditions in 1.6 hectares (10 rai) of land, creating a model which has prompted farmers to grow the plants as either a full-time or part-time occupation. Using plant breeders, places supporting a comprehensive array of flowering and ornamental plants have been created among farmers.



8. Animal Husbandry Promotion in the Jon River Basin Area

Fishery: The centre has been active in breeding freshwater animals, releasing aquatic animals into water sources, distributing them to farmers, demonstrating, promoting and breeding them. The centre also hosts regular training sessions on aquatic animal breeding.

Livestock: The Khao Hin Sorn Royal Development Study Centre promotes animal husbandry, including cattle, poultry, swine, and others. Local farmers are encouraged to grow fodder while the centre produces nutrient-added fodder for them and provides animal health check-up services.

9. Land Management for Agriculture Project According to the "New Theory" Farming Practice

The Khao Hin Sorn Royal Development Study Centre has successfully demonstrated His Majesty the King's "New Theory" farming practice for land management. The project involves exemplary farmers' land comprising a 1.6 hectare (10 rai) area behind Reservoir no. 12 (Huai Chek Reservoir), a 5.28 hectare (33 rai) stretch of donated land at Than Phut Village, Ban Song Subdistrict, Phanom Sarakham District, and areas around the houses of five farmers' living in the surrounding villages. It has thereby developed water sources based on land management following the New Theory farming practice for integrated farming that enable farmers to generate year-round income.

10. Quality of Life Development

Cooperative promotion: The study centre activities also embrace rice milling, supporting loans for cooperative members, preparing good quality products for sale to members, hosting training in food processing to create products for sale, crop cultivation, animal husbandry occupational promotion, and providing silos for unmilled rice.

Community development: The centre's community development activities involve occupational and handicraft promotion, creating recreation areas for villages, hosting training for various occupational groups, arranging youth camps, and organising savings groups to support self-funding.

11. Educational Promotion

The centre has supported the establishment of Chachoengsao College of Agriculture & Technology offering vocational education curricula in agriculture and commerce leading to Vocational and High Vocational diplomas. The college also offers short-term and mobile vocational agriculture training.

- **Positive Changes & Achievements at the Khao Hin Sorn Royal Development Study Centre and Surrounding Villages**

Evaluations of the study centre's operations that were undertaken by Office of the Royal Development Projects Board in 1986 and 1997, identified some impressive achievements, including:

Livelihoods: Some 21.27% of local people were identified as labourers, 19.43% worked in crop plantations and fields, and 7.09% worked in rice paddy fields. Since the study centre was set up, many locals have more than one job, usually farming and labouring.

The survey also found that 3.09% of locals had adopted integrated farming practices and worked full-time in the fields. This was never previously the case, so it can only be attributed to positive impacts from the study centre.

Land tenure and use: Most local families now hold land tenure. In 63.03% of cases the land belongs to a farmer, whereas in 19.93% of cases it is held by one of the farmer's parents, and in 14.14% of cases the land is leased and has further lease payments pending. Subsequent reviews found that the amount of land owned by each household was declining, due mainly to economic conditions forcing sales of some part of the land.

Once farmers started following the study centre's advice and practicing integrated agriculture in place of mono-cropping cassava, land use had been changed. Meanwhile, 63.93% of the farmers surveyed switched from growing rice and field crops to growing fruit trees, and 32.79% switched from growing rice and field crops to integrated agriculture.

Economic conditions of farmers: The average income per household in villages surrounding the centre has steadily risen. In 1996, average annual income after expenses was 75,740.53 baht. At the top end of the scale, some households earned in excess of 300,000 baht but most earned 50,000 - 90,000 baht.

Moreover, one out of every five households had money left to save. On the other hand, 60.07% of households had some debt, mostly borrowings to invest in cultivation.

Also interestingly, 42.01% of the people surveyed said that their economic circumstances had improved in the past five years while only 8.33% thought that their economic circumstances had worsened.



Infrastructure: The survey found that the villagers living near the study centre held the following views:

- 87.15% said that transportation had improved.
- 71.53% said that domestic water supplies had improved and were now adequate.
- 54.86% said that water availability for agricultural use had improved and was now adequate.

Another survey, conducted by the Land Development Department in 1981, found the average annual income per household to be 17,236 baht. An ORDPB survey in 1986, found that incomes per household in villages surrounding the study centre had risen to



27,991 baht, while the most recent ORDPB survey, in 1997, found the figure had risen sharply to 75,740.53 baht, a fact that pleased the officials at the study centre greatly.

Clearly, the Khao Hin Sorn Royal Development Study Centre has achieved satisfactory results that have significantly improved the lives of people living in its vicinities.

His Majesty King Bhumibol Adulyadej once expressed his own satisfaction with the outcomes on a royal visit to the Khao Hin Sorn Royal Development Study Centre, accompanied by Her Royal Highness Princess Maha Chakri Sirindhorn, on Wednesday, 23 April 1997, as follows:

> *"...At Khao Hin Sorn, various parties joined in to help. After 15 years, the centre has become a model, and it has become easier for other places to replicate. It needs perseverance. So now, everyone benefits. The people are happy. I am happy, too. Here they could not even grow cassava. Things have changed a lot. The place is now well-shaded and cool..."*



Pikun Thong Royal Development Study Centre
Mueang District, Narathiwat Province

- **History of His Majesty the King's Royal Visits to the South for Direct Exposure to His Subjects' Sufferings**

In 1959, His Majesty King Bhumibol Adulyadej made the first of many remarkable visits to people living in Thailand's South. The first such trip took place after His Majesty ascended the throne as he embarked on visits all over the kingdom. Below are remarkable details about his historic trip to the South.

On 6 March 1959, Their Majesties the King and Queen travelled to the South by train from Chitralada Train Station. Their Majesties passed through Nakhon Pathom, Ratchaburi, Phetchaburi, and Prachuap Khiri Khan Provinces before reaching Chumphon Province, where they stayed overnight.

From Chumphon Province, Their Majesties journeyed southwards to Phuket, Phang-Nga, Krabi, Nakhon Si Thammarat, Trang, Phatthalung, Songkhla, Satun, Pattani, Surat Thani Provinces, and the southernmost province of Narathiwat. Following extensive travels, Their Majesties returned to Bangkok on 27 March 1959.

Through this trip to the South, His Majesty gained insights into the local people's living conditions and problems. The trip also allowed His Majesty to get close to Thai and Muslim inhabitants in various corners of the southern region. His Majesty thereby developed greater knowledge and deeper understanding of the Southern people. Backed by these qualities, His Majesty was able to identify the true causes of problems among all the people in the South.

Out of his intention to devote a significant amount of his time to people living in the South and deliver them maximum benefits, His Majesty King Bhumibol Adulyadej graciously granted royal permission to construct Daksin Palace on Tan Yong Mountain in Mueang District, Narathiwat Province. From 1 August 1973 onwards, His Majesty stayed overnight at Daksin Palace when paying royal visits to the South. His Majesty also used the palace as a centre for his research and experiments seeking varieties of plants suited to the conditions of the South.

From spending time in the country's Southern Region, His Majesty learned much about various problems the locals faced, particularly with respect to their occupation on agriculture. Records of His Majesty's royal works ahead of the establishment of the Pikun Thong Royal Development Study Centre reveal a great deal.

31 August 1974



His Majesty the King personally visited Khlong Reh Village, Ba Reh Tai Subdistrict, Bacho District, Narathiwat Province. During his visit, he talked to Mr. Suwat Thampaiboon, Chief District Officer of Bacho District, about problems encountered around digging canals to drain excess water from "Phru", peat swamp areas or low lands that were waterlogged and became flooded paddy fields during the rainy season. His Majesty graciously advised that, in order to dig canals to drain water to the sea, the Royal Irrigation Department would need cooperation from locals to donate parts of their lands for the canals. Locals would be compensated for their lands by having more lands available to cultivate. His Majesty further suggested to Mr. Janya Nilphan, the engineer supervising the construction of the Pattani River irrigation system, that to ease the flooding woes mostly associated



with the monsoon season that usually begins in December, a temporary drainage canal should be urgently dug through peat swamp in the north. After that, a canal should be dug to drain water from peat soil areas in the south. Besides solving the flood problem, the drainage canals made more cultivable lands available to the farmers.

12 September 1974

His Majesty King Rama IX inspected the digging of a canal to drain water from an area of waterlogged peat soil in Chuwo Village, Moo 5, Bacho Subdistrict, Bacho District, Narathiwat Province. The canal aimed to drain water from paddy fields that usually flooded during the rainy season. The great benefit of draining water into the sea was the acquisition of considerably more areas that farmers could cultivate. During his inspection, His Majesty advised the officials from the Royal Irrigation Department to consider building barriers along Tak Bai – Su-ngai Kolok Road and in Ko Sathon to prevent the chronic, all-too-common month-long floods.

15 September 1974

His Majesty the King graciously gave his guidance to the Chief District Officer of Bacho District on the benefits of using canals to drain water from peat swamp areas in Ba Reh Tai Subdistrict. His Majesty pointed out that, firstly, the canal would prevent paddy fields from floodwater. Moreover, the canal would turn large swamps into plots of land that government

could allocate to farmers. According to His Majesty's explanation, water gates could be built to maintain the proper water level in the paddy fields and prevent seawater from flooding the canal.

19 September 1974

His Majesty the King graciously granted his guidance to the Subdistrict Headman and people living in Khok Khian Subdistrict, Mueang District, Narathiwat Province that digging a canal to drain water from peat swamp areas would benefit villages in both Mueang and Bacho Districts since the canal would drain floodwater from inundated paddy fields into the sea during the rainy season.

13 August 1976



His Majesty King Bhumibol Adulyadej personally visited Khlong Tan Village, Moo 4, Sala Mai Subdistrict, Tak Bai District, Narathiwat Province. During a conversation with Major Thien Kaewnit, Chief District Officer of Tak Bai District, His Majesty discussed how government agencies could provide support to locals so that they could raise animals and grow plants suited to the prevailing geographical conditions characterised by sandy soil. Locals caught fish and raised livestock such as ducks and chickens. The geographical condition also allowed grass to grow and thus locals could also raise goats. The promotion of such livelihoods looked set to encourage better economic growth in local villages. Moreover, His Majesty suggested that areas that were no longer forest should be appropriately allocated to locals via cooperatives. The land allocation, according to the royal initiative, should not allow any individuals to own the lands. Rather, the allocated land should belong to a cooperative which locals are allowed to use it.

21 August 1977

His Majesty inspected the site of the Tha Phru Drainage Project for peat swamp areas in Jeh He Subdistrict, Tak Bai District. During the inspection, His Majesty suggested that after the water was fully drained, the dried out plot should be reserved to establish a station to conduct fishery and agriculture experiments. Findings from the station would be useful to farmers who would eventually be allowed to use the land plots.

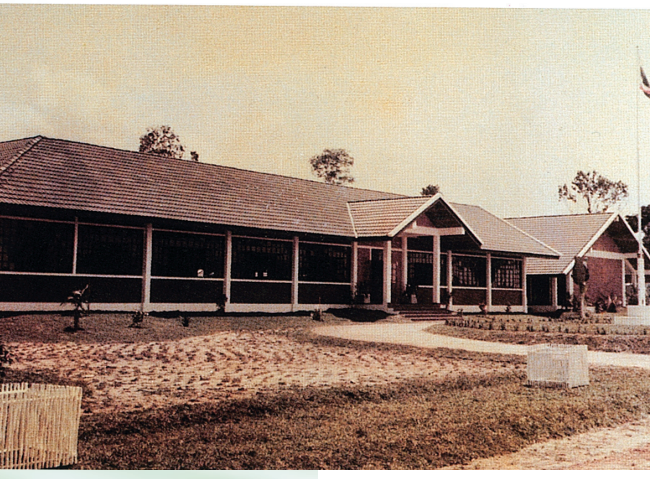
4 October 1979

His Majesty the King visited local people and observed progress of the Royal-initiated Bacho Drainage Project. After the Royal Irrigation Department dug a canal to drain water from Bacho peat soil areas that would be flooded almost throughout the year and left unused, the areas became dry enough to cultivate. Covering about 1,600 hectares (10,000 rai) of land, the areas in Ba Reh Tai Subdistrict could be allocated for paddy fields and livestock husbandry. Instead of suffering flood damage almost every year, the paddy fields around the peat areas became suitable for two rounds of annual plantings.

25 August 1981

His Majesty the King graciously paid a royal visit to the Kap Daeng Drainage Project in Phraiwan Subdistrict, Tak Bai District. During his inspection, His Majesty released 2,000 Nile tilapia and Java barb fish. In response to His Majesty the King's initiative, the Royal Irrigation Department, in collaboration with locals, dug a seven-kilometre-long canal and constructed a building at the end of a local canal. As a result, it became possible to drain floodwater from about 640 hectares (4,000 rai) of peat areas so the area could then be drier and allocated to locals for their use.

Later, His Majesty travelled by a royal vehicle to the experimental plantation in the peat area under the direction of the Narathiwat Land Development Centre. During his visit, His Majesty had a conversation with the Land Development Department officials and granted his guidance on how to improve the locals' land to make it suitable for rice farming every year which would, in turn, remove the motivation for them to encroach on public land. His Majesty also advised the officials to plant indigenous trees in forest areas because they would be best suited to local climate and soil conditions.



• Early Days of Pikun Thong Royal Development Study Centre

The chronology of His Majesty King Bhumibol Adulyadej's royal visits to various places in the South and local problems he heard about was recorded as important documents he entrusted to the Office of the Royal Development Projects Board. A synopsis of the data can be expressed as follows:

His Majesty analysed the soil problems and granted his guidance for the establishment of the Pikun Thong Royal Development Study Centre, clarifying that:



"...The area is mostly old peatland. Soils comprise plant matter that has accumulated over time and been mixed with seawater. As such, the soil contains sulphur which, when exposed to air, oxidises, and when mixed with water becomes sulfuric acid..."



Moreover, His Majesty the King graciously expressed the following:

...Regarding the old agenda on 29 September 1979, His Majesty the King granted the initiative to build a reservoir at the coordinate of RH 173064 with map scale 1:50,000; Sheet 5321 I, at Ban Yang Daeng (RH 167056) in Kaluwo Nuea Subdistrict, Mueang District, Narathiwat Province. Survey soldiers were assigned to examine geographical conditions of the mentioned coordinate...

Regarded as historically important information about the establishment of the Pikun Thong Royal Development Study Centre that should be recorded, the document given by His Majesty to the Office of the Royal Development Projects Board stated that:

...In September 1981, His Majesty the King expedited construction of "Klai Ban" reservoir to support the establishment of the study centre in Ban Pikun Thong in Kaluwo Nuea Subdistrict, Mueang District, Narathiwat Province...

This document and the annals of royal works reveal that His Majesty found an appropriate location for setting up the Pikun Thong Royal Development Study Centre and inspected the target location in person. The record states that:

On 23 September 1981, His Majesty the King, accompanied by Her Royal Highness Princess Maha Chakri Sirindhorn, drove his royal car from Daksin Palace to the venue of the inauguration ceremony for Tan Yong Satthamai Pavilion. At the same time, His Majesty observed the geographical conditions of Kaluwo Nuea Subdistrict, Mueang District, Narathiwat Province, and the topographical conditions around Sapom peat swamp area. On this occasion, His Majesty granted his guidance to Royal Irrigation Department officials to ameliorate the area by digging a drainage canal to channel water away from the peat swamp area so the land could be allocated for locals to use. His Majesty further recommended construction of a small reservoir to provide local farmers with water for agricultural use throughout the year.



- Royal Initiative Regarding the Establishment of the Pikun Thong Royal Development Study Centre

Documents and other records from 18 August to 3 October 1981, tell how His Majesty King Bhumibol Adulyadej, Her Majesty Queen Sirikit, Her Royal Highness Princess Maha Chakri Sirindhorn, and Her Royal Highness Princess Chulabhorn stayed at Daksin Palace



in Narathiwat Province. During their stay, His Majesty had a conversation with Privy Councillor His Serene Highness Prince Chakraband Pensiri Chakrabandhu; Narathiwat Governor Mr. Chit Nilpanich; Assistant Director-General of the Royal Irrigation Department Mr. Lek Chindasa-nguan; Director of Narathiwat Provincial Agricultural Extension Office Mr. Warin Busaban; chief district officers; and government officials, during which His Majesty said:

> *"....Large areas of Narathiwat Province are lowland areas of poor soil quality, facing waterlogged conditions all year round, amounting to roughly 48,000 hectares (300,000 rai) altogether. They consequently deprived most farmers of any meaningful land utilisation. Even after the land has been completely drained, it still would not prove viable for any agricultural purposes, due to such high content of pyrite in the soil giving rise to sulfuric acid, and would turn further acidic when dried. Therefore, it would be necessary for various agencies concerned to come together, and jointly study and find ways to improve this peat swamp land, in an integrated approach. Afterwards, the project success may be applied to develop other peat swamp areas further elsewhere..."*

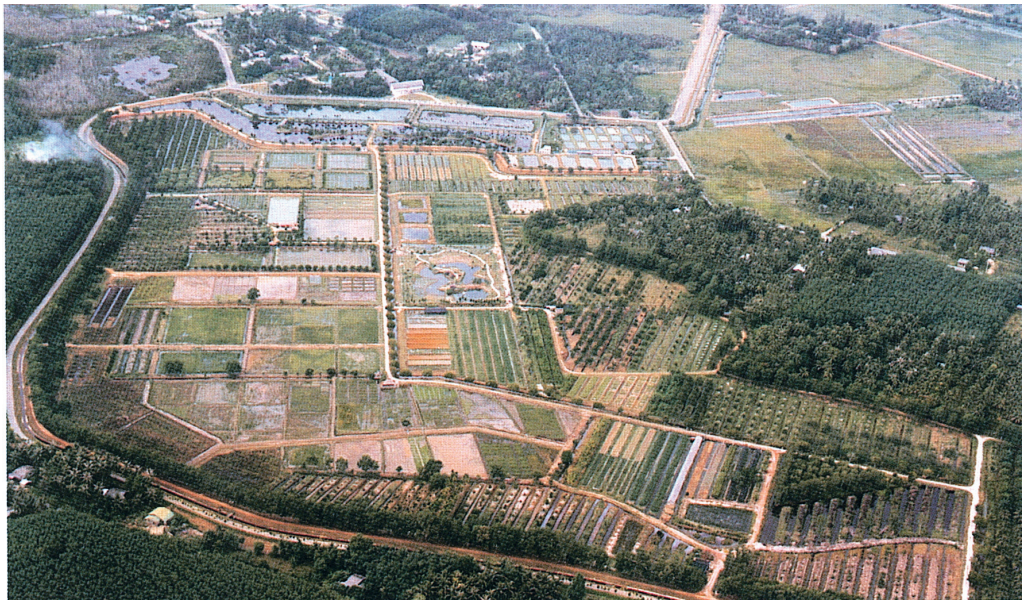
Implementation of the move to establish the Pikun Thong Royal Development Study Centre was duly recorded in documents given to the Office of the Royal Development Projects Board, which state in part that:

> *...In January 1982, the Pikun Thong Royal Development Study Centre was established and construction of Klai Ban reservoir, with water storage capacity of 2,250,000 cubic metres, was completed in 1983.*

After receiving the royal initiatives, Narathiwat provincial officials and the then Secretariat Office of the Coordinating Committee for the Royal Development Projects (today the Office of the Royal Development Projects Board) held joint meetings, chaired by His Serene Highness Prince Chakraband Pensiri Chakrabandhu, to formulate related policies and set up the **"Pikun Thong Royal Development Study Centre"**. Based on the policies, the Secretariat Office of the Coordinating Committee for the Royal Development Projects coordinated with related government agencies to study the feasibility of the centre and the problems afflicting the target areas. The Secretariat of the Royal Development Projects Board established operational guidelines based on the royal initiatives and prepared conclusions for the Royal Development Projects Board to consider and approve. On 6 January 1982, the Royal Development Projects Board approved in principle the operation of the Pikun Thong Royal Development Study Centre. The Office of the Royal Development Projects Board was put in charge of coordinating with other government agencies, setting up operations, and drawing up a master plan.

Since its inception, the Pikun Thong Royal Development Study Centre has taken up many of the royal initiatives, with strong emphasis on experimenting and developing peat swamp area. Successful results from its research and experiments are extended to apply in the field. However, the ultimate goal of the development is to empower people so that they can live sufficiently with self-reliance.





• Pikun Thong Royal Development Study Centre

Areas

The Pikun Thong Royal Development Study Centre sits between the villages of Pikun Thong and Khok Saya in Kaluwo Nuea Subdistrict, Mueang District, Narathiwat Province. The location is only 2 km from Daksin Palace. Covering 278.4 hectares (1,740 rai), the areas are divided into:

- Highland area: 32.32 hectares (202 rai) allocated for an office building; a training building; a vocational training building; a palm oil distilling and processing plant; accommodation for staff; fruit orchard, para rubber and livestock demonstration areas; and forestry work.

- Peat swamp area: As former peatland with high soil acidity and organic soil issues, it is allocated for experimental plots in low-lying area, covering 49.28 hectares (308 rai) of land. This area is reserved to improve peat soil condition for cultivation of rice, field crops, vegetables, fruit trees and fishery.

- Khao Samnak para rubber plantation area: 32 hectares (200 rai) at the foothill of highland area, allocated for: experimental para rubber plantations; inter-cropping of fruit trees in para rubber plantations; horticulture; flowering and ornamental plants. Water from Khao Samnak reservoir is distributed to the para rubber plantation.

- Klai Ban Reservoir area: 164.8 hectares (1,030 rai) of land located in the south of the study centre is allocated for a small reservoir to store rainwater. With storage capacity of 2,000,000 m^3, water from the reservoir flows through watercourses to the study centre and its vicinities to use for research and experimentation.

- Royal Initiatives for the Operation of the Pikun Thong Royal Development Study Centre

The Pikun Thong Royal Development Study Centre has followed His Majesty King Bhumibol Adulyadej's initiatives as follows:



1. Soil Acidity Acceleration and Amelioration Project *(Klaeng Din)*

Problem: Peat swamp areas formed by sedimentation of seawater and deposition of organic matter, with strongly acidic soil containing sulfuric and organic soil (soil with decaying plant materials).

On 16 September 1984, His Majesty the King said:

"...Conduct an experiment in which the soil is made strongly acidic through draining. Then study ways to combat the acidity..."

In 1987, His Majesty further advised:

"...Change the process. Now, let's pump different volumes of water into and out of each plot..."

In 1990, His Majesty recommended:

"...Get the soil improvement process started by studying techniques for improving soil that is too acidic for growing economic crops so it can thereby be put to good use..."

In 1992, His Majesty the King suggested:

"...Collate the studies' findings to compile a manual of solutions for rectifying overly acidic soil, so the same techniques can be applied to solve the acidic soil problems in Nakhon Nayok Province. Conduct further studies of improved soil to ascertain whether it gains in acidity if left unused for a year..."

In 1993, His Majesty further advised:

"...Continue studying the changes to see how long the acidity persists..."

Responses to the King's initiatives: The Pikun Thong Royal Development Study Centre has conducted extensive studies into ways to change soil conditions. These studies have included

experimenting with the royal technique of "soil acceleration and amelioration" *(Klaeng Din)* whereby land is dried and soaked alternately throughout a year in order to accelerate soil acidity. After drying and soaking, soil acidity is tested by planting and seeing if the crops grow. The results are analysed to determine the best way of improving the soil so that the plots can be put to the best use.

2. Soil Horizon Studies at the Pikun Thong Royal Development Study Centre

Problem: Soft peat swamp soil cannot support much weight without piling. Although the areas have a layer of hard soil, it is mostly deep-lying at around 40 metres below the surface. Stratigraphical data from peat swamp areas including rock layer depth is gathered for consideration.

His Majesty advised as follows:

> *"...Soil in peat swamp areas is soft, so it cannot carry great weight. You have to use foundation piles to provide sufficient support. The hard soil layer is usually deep down, about 40 metres beneath the soil surface. To gather stratigraphical soil horizon data from peat swamp areas, including rock layer depths, I recommend excavations of soil horizon in peat swamp area. The studies' findings will provide crucial information for construction engineering in the areas..."*

Response to the King's initiative: To determine soil horizons in its peat swamp area, along with Kap Daeng, Bacho and To Daeng swamp areas, the Pikun Thong Royal Development Study Centre surveyed and excavated 24 spots. 180 soil samples were analysed for chemical engineering data and the findings were collated in a report.

3. Limestone Solution to Acid Water Problem

Problem: Water in Nam Baeng Canal has high acidity.

The King's initiative: Study the de-acidifying effects of adding limestone powder to water in the canal before it reaches farmland.

Response to the King's initiative: The Pikun Thong Royal Development Study Centre studied treating acidic water with limestone powder to see if it became suitable for cultivation. The study found yields from paddy fields where water mixed with limestone powder was used to be equivalent to yields from rice fields where limestone powder was sprinkled directly over the soil.

4. Construction of Flume across Peat Swamp Areas

His Majesty King Rama IX suggested that freshwater from Su-ngai Padi Canal should be distributed to Yuyo Village in Bang Khun Thong Subdistrict, Tak Bai District. The channels would





need flume to prevent the fresh water being mixed with acidic water in areas it flows through. Since peat swamp soil is organic with clay subsoil, its stratigraphical structure was unsuited to supporting heavy weights. In adopting the solution of using foundation piles of the flume to support construction in the area, it would be necessary to drive the piles very deeply which would be expensive. His Majesty provided the solution of developing flume to support irrigation canals across peat swamp area inside the study centre. Flume design focused on supporting more heavy weights by leveraging buoyancy force and plate bearing, thus obviating the need for fixed foundation piles. The model was duly tested at different weights, including documenting and evaluating any subsidence. The experiment conclusively showed that the flume model, using steel boxes with clamps, to be a practical solution in peat swamp areas and a promising subject for further studies.

Response to the King's initiative: The Royal Irrigation Department adopted the model to apply in some sections at the Royal-initiated Su-ngai Padi Canal Project.

5. Raising Farmland Ridges for Crop Cultivation in Peat Swamp Areas

His Majesty King Bhumibol Adulyadej suggested that:

"...Ridges for growing perennial plants in acidic soil areas should first be prepared by removing surface soil. Next, scoop up soil from lower layers and use to fortify the ridges. Then top off the ridges with the surface soil that was initially removed. This will make the ridges higher..."

Response to the King's initiative: The Pikun Thong Royal Development Study Centre prepared ridges by first removing surface soil and placing it nearby, digging a ditch on the part where surface soil has been removed, and using the removed surface soil to strengthen the bank of the ridge. The processes were in line with His Majesty's initiative. Fruit trees, vegetables, and field crops were grown on the prepared land and produced good yields.

6. Project of Raising Fish in 4 Waters, 3 Tastes

Problem: Areas in the South, from Surat Thani down to Narathiwat Provinces have problems on fresh, acidic and saline water, thus are known as "the land of 4 waters, 3 tastes" i.e. freshwater, acidic and saline water. During the dry season, salty water from the eastern coast flows into freshwater channels, turning water there salty. During the rainy season, floodwater spreads, and when it reaches peat swamp areas, the water turns acidic.

The King's initiative: His Majesty the King graciously gave his guidance on experimenting with raising fish in brackish water and its solutions to the problems.



Response to the King's initiative: The Pikun Thong Royal Development Study Centre, via Narathiwat Coastal Aquaculture Development Station, conducted a study of acidic-water impacts on silver perch. Solutions from the study have been applied to help farmers in areas with water-related problems.

7. Publishing a Manual of Solutions to Strongly Acidic Soil

The King's initiative: Results from studies on changes of acidity in acid sulfate soil should be compiled into a manual of ways to rectify acidic soil.

Response to the King's initiative: The Pikun Thong Royal Development Study Centre compiled and published a manual of solutions for strongly acidic soil conditions and distributed to various organisations, individual farmers and other interested parties.

8. Extension of Development Results

Problem: Since the agricultural areas are strongly acidic, farmers have left the land vacant and unused.

The King's initiative: Experiments on changes of acidity in acid sulfate have been conducted to reduce acidity in sulfate soil by injecting water into the soil, keeping it flooded for four weeks before draining the soil, and finally adding a little limestone powder. The technique has proven effective in relatively quickly improving sulfate soil. His Majesty suggested that the technique be applied in other areas with acidic soil.

Response to the King's initiative: The development results have been extended to apply on agricultural areas in villages around the Pikun Thong Royal Development Study Centre and its branches, as well as the villages of Khok It – Khok Nai, Yuyo, Kap Daeng in Tak Bai District of Narathiwat Province, and Khae Khae swamp in Sai Buri District of Pattani Province.

• Objectives of the Pikun Thong Royal Development Study Centre

The Pikun Thong Royal Development Study Centre has the following objectives:

1) To carry out studies, research and experiments to ameliorate organic soil and other soil problems, soil in peat swamp areas as well as areas where the royal initiatives are given to achieve agricultural and other benefits in accordance with regulations governing utilisation of peat soil areas

2) To conduct studies, research and experiments to establish guidelines and approaches to developing agriculture, livestock husbandry and agro-industry suited to the geographical conditions of the South, thereby establishing successful development models that can also be applied elsewhere

3) To provide a comprehensive service centre where experiments and demonstrations showcase successful interdisciplinary development models and which acts as a living natural museum where farmers and the public can find examples and models to follow and apply in their lives

4) To serve as a centre for exchanging academic knowledge and practices and information centre on various kinds of development to target groups

5) To improve and raise incomes, and thereby the quality of life, of people living in the vicinities of the Pikun Thong Royal Development Study Centre and its branches, with the aim of enabling them to live sufficiently with self-reliance and contribute more to the country's overall development

6) To develop and conserve natural resources and the environment, in particular in peat swamp areas, so as to maintain and rehabilitate the abundance and enable appropriate utilisation

• Present Operational Sites

The Pikun Thong Royal Development Study Centre's works have been in the following areas:



1. **Peat swamp forest covering** 41,897.6 hectares (261,860 rai) of land, comprising three areas:

- **Preservation area** covering 9,105.12 hectares (56,907 rai) of fertile peat swamp forest. The area has strictly conserved, minimising environmental changes and assigning no-hunting status.

- **Conservation area** covering 17,590.08 hectares (109,938 rai) of degraded peat swamp forest with environment damage in some parts. The area was restored its former fertility either rehabilitates in order to be a reserved forest through studies, research and surveys that identify appropriate alternative crops, methods to boost tree growth, or turns them into development area so that utilisation of the land doesn't damage forest ecology. The centre also undertakes public relations exercises designed to dissuade people from encroaching on peat swamp forest.

- **Development area** covering 15,202.4 hectares (95,015 rai) of damaged forest where floodwater has been drained. This area is used for agricultural activities. Different areas are designated for joint development among various government agencies that conduct research to find approaches to improving and managing peat soil areas according to the need of people.

2. **Nine surrounding villages around the Pikun Thong Royal Development Study Centre** covering 3,690.88 hectares (23,068 rai). Agricultural and occupational development is promoted in these villages, enabling locals to become self-reliant. Training that is suitable with locality is provided to give people more alternatives in occupations. As geographical conditions and social structures differ between villages, the centre adapts its approaches accordingly.

3. **Branches of the Pikun Thong Royal Development Study Centre:** The Centre has four branches*, namely:

– ***Para Rubber Plantation Project in the Area of Daksin Palace:*** Located in Khao Tan Yong Village, Mueang District, Narathiwat Province, covering about 2.528 hectares (15.8 rai), this project demonstrates how to grow good para rubber varieties inter-cropping with other plants.

– ***Pi Nae Mu Do Village Development Project:*** Located in Bukit Subdistrict, Jo Ai Rong District, Narathiwat Province, covering about 21.6 hectares (135 rai), this project demonstrates efficient land and water utilisation.

– ***Munoh Livestock and Agricultural Village Project:*** Located in Kosit Subdistrict, Tak Bai District, Narathiwat Province, covering about 240 hectares (1,500 rai), this project demonstrates land and water management for livestock and agriculture in peat soil areas.

– ***Khok It – Khok Nai and Yuyo Villages Area Development Project:*** Located in Tak Bai District, Narathiwat Province, covering 4,810.4 hectares (30,065 rai), this project develops areas with very acidic soil according to successful outcomes of projects conducted elsewhere by the Pikun Thong Royal Development Study Centre, including those adopting the "New Theory" model.

4. **Development Areas according to the Royal Initiatives:**

– Amelioration of very acidic soil at Khok It – Khok Nai Village using fresh water to wash out acidity and toxicity in the rice fields, then draining the water, and mixing the soil with limestone powder

– Development of areas with very acidic soil in Yuyo Village, spanning over 560 hectares (3,500 rai) of deserted paddy fields and degraded Melaleuca forest, in accordance with the "New Theory" farming practice as it pertains to managing water and soil. Very acidic soil has been improved by controlling underground water to appropriate levels, creating ridges along which perennial trees can be grown, and adjusting paddy fields.

– Preparing ridges of organic soil on which fruit trees are grown in the Kap Daeng peat swamp. The area had been abandoned for over ten years due to the soil's seriously high acidity. The ridges help prevent the trees from floodwater inundation and make it easier to remove acidity from the soil.



– Development of Khae Khae peat swamp area: Advice is given on how to improve organic soil, sandy soil, and water-quality is tested.

* Presently, there are five branches. The fifth one is the Royal-initiated Pak Phanang River Basin Area Development Project.

• Administration

Administration of the Pikun Thong Royal Development Study Centre is based on the model used by other royal development study centres, comprising an executive committee and various subcommittees, as follows:

1. Executive Committee for the Administration of the Royal Development Study Centres is tasked with formulating guidelines to achieve the centre's objectives, including its operations and management, to ensure that the objectives are achieved. The executive committee also advises and makes recommendations to Office of the Royal Development Projects Board.

2. Subcommittee on Master Planning, Monitoring and Evaluation of the Royal Development Study Centres draws up master plans for the study centre based on information it gathers, screens and studies. The subcommittee also reviews project details and annual budgets as well as oversees implementation to ensure compliance with the master plan.

3. Subcommittee on Academic Affairs of the Royal Development Study Centres formulates policies; supervises, coordinates and provides academic advice; monitors progress, and deals with any problems related to the centre's studies, research and experiments.

4. **Subcommittee on Implementation of the Pikun Thong Royal Development Study Centre** supervises the centre's operations to ensure compliance with the master plan, draws up annual work plans, and prepares annual budgets for approval.



• Responsible Agencies and Their Missions

Agencies pursuing the Pikun Thong Royal Development Study Centre's activities include:

The Land Development Department is the key agency in charge of managing and coordinating the study centre's projects, as well as evaluating and publicising its operations. The Department also conducts soil surveys, plans land use, conducts research and studies, and improves peat soil areas to make them suitable for farming.

The Royal Irrigation Department handles construction of reservoirs and lays down irrigation systems. It also develops water control systems, drains water from experimental fields, and creates irrigation systems.

The Department of Agriculture conducts studies and research to find plants that grow well in peat soil and generate good economic and extends findings from studies and research to farmers to utilise for their benefit.

The Royal Forest Department surveys ecosystems of plants in peat swamp areas; disseminates ways to develop the areas; conserves peat swamp forest; implements demonstration fields for plants, particularly fast-growing plants for firewood and economic crops that can thrive in peat soil and bordering areas, and propagates seedlings and hands them out to farmers around the centre.

The Department of Livestock Development conducts studies, research and experiments looking at growing animal-feed crops in peat swamp areas. It also improves pastures, as well as lawns in farmers' coconut orchards nearby the centre to grow fodder grass. The Department also encourages animal husbandry among locals surrounding the centre, including hosting training courses for them.

The Department of Fisheries conducts research to identify aquaculture that is appropriate to water sources in peat swamp, promotes raising aquatic animals among farmers and provides relevant advice.



The Department of Agricultural Extension operates demonstration fields and provides training for farmers to distribute new agricultural knowledge.

The Office of the Rubber Replanting Aid Fund supports plantations of good para rubber species and provides necessary aids as appropriate.

The Community Development Department organises groups of like-minded farmers, provides fundamental training in cooperation with other agencies to develop leadership qualities, and hosts crafts training programs.

The Department of Industrial Promotion has established a plant to manufacture products from *Lepironia articulata* to develop them into tools and manufacturing materials. It also trains and enhances farmers in various cottage industries.

The Department of the Non-formal and Informal Education provides fundamental education and occupational training, and supports socio-economic development.

The Office of Accelerated Rural Development constructs and maintains roads heading to the study centre and linking neighbouring villages.

The Armed Forces Development Command constructs roads to the areas of the villages around the centre.

The Provincial Electricity Authority provides supporting systems for electrical installations within the centre and its surroundings.

Narathiwat Provincial Administrative Organisation collaborates with the Land Development Department in managing, coordinating, monitoring and evaluating the study centre's works.

The Department of Disease Control conducts studies and research on infectious diseases and provides healthcare services, including publicising elephantiasis prevention methods and treating those afflicted.

The Department of Lands gathers information and prepares evidence of ownership of land procured by provincial administrative organisations, so as to facilitate payment of compensation to initial land holders.

The Thailand Institute of Scientific and Technological Research conducts studies and research on fast-growing trees suited to peat and sandy soil conditions, and studies uses of activated charcoal produced from organic soil.

The Royal Thai Survey Department provides the study centre with aerial images that are used for demarcating peat swamp areas for development.

Prince of Songkla University offers advice and conducts studies and research in support of peat swamp development, and has studied feasibility of building a small refinery for processing palm oil.

The Cooperative Promotion Department supports operation of the Pikun Thong Royal Rice Mill in Ko Sathon Village, Tak Bai District, and activities of village cooperative.

Provincial Public Health Office provides communities with healthcare services.

Provincial Primary Education Office provides primary education and has urgently implemented steps to raise educational standards.

Provincial Commerce Office educates groups and individuals living around the centre about marketing and provides relevant support.

The Department of Public Welfare assists and develops the underprivileged and others afflicted with various problems. It also seeks to empower the potential of target groups to become self-reliant.

• Operation of the Pikun Thong Royal Development Study Centre

The Pikun Thong Royal Development Study Centre operates according to "plans" which are devised to implement His Majesty the King's initiatives, as follows:

1. Study, Research and Experiment Plan

This plan involves studying, surveying, experimenting, and researching soil, water, peat swamp forest, agricultural and industrial development, according to the specific initiatives of His Majesty the King. Studies, research and experiments aim to solve immediate problems as well as for time- and money-saving solutions supported by appropriate, practical development guidelines. Local wisdom and biological diversity are also taken into account.



2. Result Extension and Technology Dissemination Plan

This plan aims to disseminate and extend successful outcomes of studies, research, and experiments among farmers and general public through training and demonstrations. It strives to make target groups in agricultural and other sectors understand various practical means of uplifting their income and quality of life and apply them promptly. Development efforts focus on new knowledge and technologies tailored to the local context, so as to optimise efficiency and income to farmers.

3. Infrastructure Development Plan

This plan aims to develop and raise the efficiency of fundamental services that are vital for making a life such as transportation, water, electricity and other infrastructure in the Pikun Thong Royal Development Study Centre, its branches, and surrounding communities, as is needed and appropriate.

4. Occupational and Income Development Plan

This plan aims to develop and raise productivity in the agricultural sector by implementing the "New Theory" farming practices for sustainable agriculture, and other productivity in non-agricultural sectors such as handicrafts and cottage industries. Production is designed to be systematic and comprehensive, so as to raise incomes among people living in the centre's environs. It is hoped that the outcomes will dissuade villagers from migrating to towns and cities when economies are stagnating and attract those who have already migrated to return.

5. Social and Quality of Life Development Plan

This plan is mainly aimed at empowering people living around the centre through the provision of social services and enhanced learning processes, coupled with public participation, to achieve physical, mental, social, emotional and intellectual development goals, thereby strengthening families and communities to be ready for further steps of development.

6. Natural Resources and Environment Development Plan

This plan aims to develop and conserve natural resources and ecology in peat swamp areas and rehabilitate deteriorated peat swamp forest to its original abundance. Achieving the objectives involves inculcating a green mind-set and nurturing awareness among locals of how it is in their own interests to safeguard the areas' natural resources. The plan manages the natural resources by emphasising on clear systems and ensuring consistent and better quality.

7. Management plan

This plan aims to ensure that the study centre's operations are entirely in line with His Majesty King Rama IX initiatives and truly fulfil the fundamental objectives of implementation according to interdisciplinary models with the provision of a one-stop service centre and living natural museum, coordinated the work with related agencies, and imparting measurable benefits to the people. In the next phase, management will assign specific roles to related agencies, clarify objectives of implementation, encourage joint development and enhance efficiency of the planning process and development system, indicators, including developing the readiness of resources and fine tuning evaluation practices.

- Achievements and Changes at Pikun Thong Royal Development Study Centre and the Farmers of Surrounding Villages

To a considerable extent, the operation of the Pikun Thong Royal Development Study Centre has been successful. Its success can be measured according to the index of quality of life of people living in the centre's neighbourhoods. Their quality-of-life index rose from 0.569 in 1992 to 0.644 in 1996, shifting from the low- to the mid-range.



Looking back over the five years, locals perceived the changes in their financial status as follows:

- Better 51.77%
- Same 25.29%
- Worse 22.94%

Roughly 24% of locals directly attributed their improved financial circumstances to the knowledge they gained from the Pikun Thong Royal Development Study Centre.

The Pikun Thong Royal Development Study Centre also implemented development projects in other target areas, notably the Royal-initiated Area Development Project at Yuyo, Khok It - Khok Nai, and Khok Krathom, as well as Khae Khae peat swamp, in Pattani Province.

The project was also extended to areas under the remit of the centre's four branches. This enables the farmers to be able to make use of the land effectively.

To-date, these projects have brought the people increased and adequate access to fundamental agricultural know-how and service. As for basic social services, a survey found every area in the surrounding villages to have average provision.

As the study centre has adhered to devising development guidelines tailored to the specific context of each area, the research and experiments it has undertaken through the following projects to enchance farmers' occupations:

- Soil Acidity Acceleration and Amelioration Project to turn the land to be arable
- The Study on utilising limestone powder to reduce acidity in acidic water
- The Study on sustainable agriculture based on His Majesty the King's "New Theory" farming practice
- The establishment of refinery for processing palm oil plant
- The Royal-initiated Area Development Project at Yuyo Village in Tak Bai District of Narathiwat Province
- Temperate Flower Plants Cultivation Project in Betong District of Yala Province



The Pikun Thong Royal Development Study Centre has consistently responded to and implemented the royal initiatives. Its yearly plans have formed the key frameworks for ensuring continuous budgeting and operations. The projects have proved successful, a prime example being the time His Majesty the King suggested applying a model developed by the centre in accordance with a royal initiative to improve acidic soil in Yuyo Village that proved successful to de-acidify soil in Ban Na District, Nakhon Nayok Province, where it was again successful.

For the past 15 years and counting, the Pikun Thong Royal Development Study Centre has followed His Majesty the King's royal initiatives. To a large extent, the centre has been successful in its endeavours, as indicated by 68.23% of households covered by the centre who say they have benefited from its operations on occupational development.

The centre's major works could be summarised as follows:

Some 93.33% of the findings of the Pikun Thong Royal Development Study Centre's studies

have been extended applied practically to the people. Well over half of the studies, around 60%, have been fully implemented while 33.33% have been partially implemented.

Major positive changes delivered by the centre's activities to the people and communities living in its vicinities can be summarised as follows:

1. The number of people in households and people living in villages around the centre has slightly increased. According to surveys of the villages on basic minimum needs conducted between 1992 and 1996, the number of households rose 0.6%, from 1,416 in 1992 to 1,425 in 1996. Over the same period, the number of people rose by 6.2%, from 7,766 to 8,248. On average each household had 4.9 members.

2. Households benefited from improved basic services as follows:

   - 95.29% said that transportation was more convenient
   - 95.88% said access to electricity had improved
   - 87.06% said year-round drinking water availability had become sufficient
   - 54.70% said that water for agricultural use had become adequate.

3. Main occupations among locals living around the study centre shifted to:

   - 26.53% working in agriculture
   - 15.21% labourers
   - 12.37% working outside agriculture.

4. Security of land tenure with respect to livelihoods was considerably lifted among households around the study centre. 81.18% had land title documents for every plot they possessed, while only 6.47% had land title documents for some plots. 88.01% of land ownership documents were Nor Sor 3/Nor Sor 3 Kor and 10.73% were freehold title deeds.

5. In 1996, the average household income in villages surrounding the centre was 73,078.06 baht — higher than the target under the 7th National Economic and Social Development Plan. Income sources were as follows:

   - Labour wages: 22,666.31 baht per household per year
   - Agriculture: 20,563.94 baht per household per year
   - Trade: 12,872.18 baht per household per year
   - Fishery: 5,062.78 baht per household per year

- Livestock: 3,826.31 baht per household per year

- Others: 8,086.54 baht per household per year

The average annual household income in villages surrounding the centre was 2.6 times higher than the targeted 15,000 baht average income per household according to the basic requirements standard for 1996.

Over the five-year period (1992 – 1996), changes in household income were perceived by householders as follows:

- 51.77% said their household income had increased

- 25.29% said their household income had stayed the same

- 22.94% said their household income had decreased.



It was also found that households in villages surrounding the centre earned on average 1,091.53 baht a year more than their expenses which averaged 71,986.53 baht.

6. Solving acidic soil problems ranked among major activities of the study centre. Indeed, 48.82% of households in villages near the centre still struggle with the problems and efforts to solve them by 37.35% of households have not implemented yet.

For many years, His Majesty King Bhumibol Adulyadej performed arduous royal deeds for inhabitants of the South with the Pikun Thong Royal Development Study Centre serving as a centre of experiments, studies, and research. As such, the Pikun Thong Royal Development Study Centre bears eloquent testimony to the wisdom and effectiveness of His Majesty' rural development initiatives. Not only have they taken great strides to end poverty but they have battled nature into submission, as exemplified by Soil Acidity Acceleration and Amelioration Project *(Klaeng Din)*, underscoring His Majesty's broad vision and exceptional talents.



Kung Krabaen Bay Royal Development Study Centre
Tha Mai District, Chanthaburi Province

- History of Kung Krabaen Bay Royal Development Study Centre

Former Conditions of the Area

Having visited his subjects in Thailand's coastal areas and islands several times, His Majesty King Bhumibol Adulyadej (King Rama IX) was exposed to the extensive damage to coastal natural resources at first hand. His Majesty clearly saw how dramatically deteriorated and reduced they had become, and nowhere was the rot more manifest than along the eastern coast. Stretching over 100 kilometres, Thailand's eastern shoreline was endowed with an abundant array of coastal resources and regarded as one of the most important fishing grounds of the country. As for neighbouring areas inland, most were dominated by agriculture, including field crops, vegetable gardens, fruit orchards, and rice fields.

With rapid population growth and technology development, competition for resources was fierce. The situation was exacerbated by overfishing which reduced fisheries breeding and growth rates. Excessive exploitation of the limited natural resources rapidly degraded the environment and intensified the scarcity of coastal resources, not least the formerly abundant fishing grounds.

Moreover, the cultivation in inland areas was being ruined by the intrusion of saline water into the mangrove forests. The forest reserve was also encroached upon. The areas were seriously deteriorated and desolated. All this was understandably having considerable adverse effects on people's livelihoods and well-being, and community coherence.

Mangrove forests are vital sources of food and provide nurseries for propagating a wide range of marine life. They also serve as key coastal defence mechanisms.

His Majesty King Bhumibol Adulyadej graciously gave the records of his own analysis on the problems of the royal development study centre with details, as follows:

"...The Kung Krabaen Bay Royal Development Study Centre, Tha Mai District, Chanthaburi Province: alkaline soil due to intrusion of saline water..."

On 10 May 1991, His Majesty graciously granted his guidance on mangrove reforestation to Mr. Kosit Panpiemras, the then Deputy Minister of Agriculture & Cooperatives, on the occasion of the Royal Ploughing Ceremony that took place within the grounds of Chitralada Palace. The guidance concluded that:

"...Mangrove forest is vital to the ecology of the coastal areas of the Gulf of Thailand. However, our mangrove forests are being encroached and destroyed by those who seek their own benefits. As such, we must find ways to conserve and rehabilitate our mangrove forests, especially Rhizophora apiculata trees which are exotic and difficult to propagate because their growth depends on tidal currents. Therefore I would like the related agencies — the Royal Forest Department, Department of Fisheries, Royal Irrigation Department and Hydrographic Department — to join forces to find an appropriate location in which to experiment with the propagation of Rhizophora apiculata trees and mangrove reforestation..."





• Early Days of the Kung Krabaen Bay Royal Development Study Centre

His Majesty King Bhumibol Adulyadej knew the difficulty, due to severe deterioration of what was supposed to be an area blessed with valuable natural resources, that people living around Kung Krabaen Bay and its peripheral coastal areas had making a living.

To tackle the situation, in January 1980, His Majesty assigned His Serene Highness Prince Chakraband Pensiri Chakrabandhu, a privy councillor, to conduct a survey of Kung Krabaen Bay in Khlong Khut Subdistrict, Tha Mai District, Chanthaburi Province. In due course, the survey revealed that despite being in a forest reserve, the mangrove forests around the coast of Kung Krabaen Bay were partially deteriorated where people had encroached and settled down to make a living. Nevertheless, His Serene Highness saw how the area could still be developed for coastal aquaculture and duly set up an aquaculture station, to the great benefit of the locals and their communities. He then enlisted the support of Chanthaburi Province, Department of Fisheries and related agencies to conduct another survey of the area to ascertain its suitability for setting up the Kung Krabaen Bay Royal Development Study Centre under His Majesty's royal initiative.

His Serene Highness Prince Chakraband Pensiri Chakrabandhu was interviewed about the project on the National Broadcasting Services' "From the Sky to the Land" radio show that aired on 21 April 1983. Here's how he described the conditions the task force initially found in the area and how they shaped the objectives:



"...The desire to achieve the aim was originated from the high potentials of the bay for the development of fishery which are the aquaculture both in saline and brackish water i.e. shells, crabs, fish, especially giant perch. As aforementioned, the project should be established at Kung Krabaen Bay. However, agriculture cannot be omitted because we consume rice every day as stable food. Therefore, the promotion of comprehensive farming has to be carried out as well as animal husbandry such as pig, duck and chicken raising. This is called 'Comprehensive Agricultural System' but the main principle rests on coastal fishery..."

Concerning initial implementation of the project, His Serene Highness further explained that:

"...This project at Kung Krabaen Bay will bring about great benefits as it will develop new approaches to fisheries that will be demonstrated and trained among the people which would sharply increase yields. Such approaches to boosting people's incomes, like raising oysters in parallel with everything else, had never been tried before but they worked very well. The success of our practical approach to raising oysters drew a lot of interest from people living in nearby provinces. As we provided training for them, they started to follow our lead and become more prosperous themselves as a result. At the same time, the fisheries developments continued to run in parallel with agriculture development ..."

• Royal Initiatives Founding the Kung Krabaen Bay Royal Development Study Centre

When presiding over the inauguration of the King Taksin the Great Monument in Chanthaburi Province on 28 December 1981, His Majesty King Bhumibol Adulyadej gave an initiative to Mr. Boonnak Saisawang, the then Chanthaburi Governor. The essence of the royal initiative was stated as:



> *To consider finding a site suitable for implementing an occupational development project in the areas of fishery and agriculture along the eastern coast of Chanthaburi Province.*

On this occasion, King Rama IX graciously gave 603,060 baht donated by well-wishers at the inauguration ceremony to Mr. Boonnak Saisawang, the then Chanthaburi Governor as the initial fund for the project.

Two days later, on 30 December 1981, His Majesty granted another of his development ideas for the project in Chanthaburi Province to Mr. Lek Chindasa-nguan and Mr. Suha Thanomsingha at the Royal Chitralada Villa. This royal initiative can be summed up as follows:

> *Please consider locating a degraded forest in a national preserve or public spaces to be the site of a Development Study Centre, like that at Khao Hin Sorn, where coastal development can be studied.*

The clear picture of the Kung Krabaen Bay Royal Development Study Centre was reflected in His Majesty's address given to the chairperson of the Royal Development Projects Board who led the participants of a seminar and concerned parties to receive the royal guideline for the next phase of project implementation at Dusidalai Hall on 26 August 1988 that,

> *"...The study centre at Kung Krabaen Bay is dedicated to studying of coastal areas, coastal plant varieties, fish species and fisheries..."*

• Responses to the Royal Initiatives

After receiving the royal initiatives and discussing them, Chanthaburi provincial officials urgently drafted a project on the studies and demonstration of aquaculture and coastal fisheries solutions in conjunction with agriculture development and social improvement. Moreover, the officials prescribed an area of Kung Krabaen Bay in Khlong Khut Subdistrict, Tha Mai District, Chanthaburi Province, in which to locate the Kung Krabaen Bay Royal Development Study Centre.

Then, His Serene Highness Prince Chakraband Pensiri Chakrabandhu, a privy councillor, and concerned parties jointly surveyed the location's geographical features and conditions. Having inspected the lay of the land, he agreed that the specified location of Kung Krabaen Bay was appropriate to develop aquaculture and set up a station for the propagation of aquatic animals. The then Chanthaburi Governor Mr. Boonnak Saisawang recalled how the survey became an historic event:



"...I ushered a panel of experts led by His Serene Highness Prince Chakraband Pensiri Chakrabandhu, the privy councillor and the consultant on the project, together with Dr. Sumet Tantivejkul, Secretary to the Royal Development Projects Board (RDPB), and other concerned officials, onto a helicopter and we set off to explore sea bass, oyster and prawn breeding sites around Kung Krabaen Bay. All parties were satisfied with what they saw..."

In August 1982, the Secretariat Office of the RDPB conducted a survey of socio-economic conditions of the people in the project area around Kung Krabaen Bay in order to set the development guideline. The survey revealed Kung Krabaen Bay in Tha Mai District of Chanthaburi Province to be a major site of natural resources. The sea and beaches around the bay was confirmed as one of Chanthaburi Province's most significant fishing grounds. The bay area was found to be home of mangrove forests in good condition scattered across horizontal expanses of 150 – 300 metres. Moreover, the environs of the mangrove forest were identified as breeding areas and homes to a variety of aquatic fauna that people consume as food. At the same time, the area constituted a coastal defence.

Some 264 hectares (1,650 rai) of mangrove forest fell within the Kung Krabaen and Khaem Nu Bay National Forest Reserves by order of Ministerial Regulation No. 579 (1973) issued under the National Forest Reserve Act, B.E. 2507 (1964). The area adjacent to the mangrove forests was agricultural land used for rice farming, gardening and some field crop cultivation. Comprising highlands, lowlands, bay area and ocean, it was also recognised as an area of natural beauty. Unfortunately, however, every aspect of natural resources had deteriorated. Fishing grounds, for example, were less fertile due to overfishing beyond the capability of natural propagation. Another serious concern was the intrusion of saline water into paddy fields due to encroachers cutting back the protective mangrove forest to use the wood for various purposes and to create fish and prawn farms.

• Kung Krabaen Bay Royal Development Study Centre



Location

The Kung Krabaen Bay Royal Development Study Centre sits along the eastern coast of Thailand, covering parts of Tha Mai and Na Yai Am Districts. The location is 30 kilometres west of Mueang District, Chanthaburi Province, and 230 kilometres southeast of Bangkok. The boundaries of the centre are as follows:

Northern boundary:	Stretching to Khao Yai Mountain, Pak Krok Mountain and Nong Khem Village
Southern boundary:	Reaching the Gulf of Thailand at Chao Lao Mountain and Tai Ran Dok Mai Cape
Eastern boundary:	Stretching to Khao Yai Mountain Range, Mue Lek Mountain, Tha Sala Mountain, Tao Moh Mountain, Roi Ru Mountain, Ta Kerd Mountain, Mu Dut Mountain and Amphawa Mountain
Western boundary:	Reaching the Gulf of Thailand at Kung Krabaen Mountain, Hin Khan Cape and Noi Na Cape

Geographical Features

The Kung Krabaen Bay Royal Development Study Centre is set in a narrow river basin shaped like a wedge or **"V"**. To the east, a mountain range runs north to south with a rocky area and islets until it reaches the Gulf of Thailand. The highest peak in the range is Mu Dut Mountain at 213 metres above mean sea level. To the west, a small mountain range rises from the mouth of Kung Krabaen Bay and extends northwards along the coast.

The kidney-shaped middle of the bay area measures some 640 hectares (4,000 rai). A sand ridge encloses the area, leaving only one place where the sea can flow in and out. The mouth of the bay measures 650 metres across. The bay is approximately 2.6 kilometres wide, 4.6 kilometres long and 8.0 metres deep. Seven short canals flow into the bay.

The bay area is surrounded by a flat plain of mangrove scrub, ranging in width from 30 – 200 metres and nestling the curve of the bay along approximately five kilometres. Prawn farms operated by the villagers who join the project run alongside. Adjacent to these are paddy fields with foothills and mountains beyond. The foothills are largely covered with para rubber plantations and fruit orchards.

The neighbouring coastal plain features a beautiful beach lined with she oak and coconut trees, stretching six-kilometres, which is regarded as one of Chanthaburi's premier recreational locations and tourist attractions.

Weather Conditions

Located beside the sea, the Kung Krabaen Bay Royal Development Study Centre is directly influenced by the southwest monsoon and its climate is hot and humid year-round. Annual precipitation averages 2,813.5 mm, temperatures average 26.7°C, and relative humidity averages 77.19%.

There are three seasons, namely:

- Rainy Season: Lasting approximately six months, from May to October. The highest monthly rainfall averages over 250 mm. The highest amount of rainfall is in June, when it has reached 512.6 mm. Temperatures during the rainy season range 26.6 – 27.7°C.

- Winter: Lasting around three months, from November to early February. The lowest temperatures of around 24.5°C are recorded in January which is also the month of the lowest rainfall, averaging 12.2 mm.

- Summer: Lasting around three months, from mid-February to early May. The hottest period usually occurs in late April/early May. April is the hottest month with temperatures of 28.0°C. Average precipitation during the summer is 111.1 mm.

Thai-Canadian Collaboration

On the occasion of His Majesty King Bhumibol Adulyadej's 60th birthday, the Canadian International Development Agency (CIDA), a Canadian government agency, offered assistance to the Kung Krabaen Bay Royal Development Study Centre. Running from 1990 to 1995, CIDA provided extensive support to the centre, from building construction to provision of scientific equipment and instruments.

• The clear objectives of the project were to:

1. Uplift well-being and livelihoods of people around Kung Krabaen Bay and nearby, especially of those poverty-stricken;

2. Develop fisheries and coastal aquaculture in conjunction with other activities, in order to increase yields and provide a foundation for fisheries development;

3. Conserve the balance of nature and ecology and sustain the area's outstanding features.

• Administration

To ensure efficient and continual implementation of the Kung Krabaen Bay Royal Development Study Centre in response to the royal initiatives, four administrative committees were established as follows:

1. Royal Development Study Centres Executive Committee

2. Master Planning, Monitoring and Evaluation Committee



3. Royal Development Study Centre Operations Sub-Committee

4. Kung Krabaen Bay Royal Development Study Centre Academic Sub-Committee

• Operational Sites

The Kung Krabaen Bay Royal Development Study Centre's target operational sites are the coastal area and its environs. These can be divided as follows:

1. **The central area,** covering approximately 640 hectares (4,000 rai), includes the area surrounding Kung Krabaen Bay in Khlong Khut Subdistrict of Tha Mai District and some parts of Sanam Chai Subdistrict in Na Yai Am District, Chanthaburi Province.

2. **The environs,** covering about 5,120 hectares (32,000 rai), embraces areas in Khlong Khut and Sanam Chai Subdistricts and nearby agricultural areas and fishing villages located along the coast.

The study centre has also allocated the land to be developed in accordance with the surroundings and resources, and consistent with land-use development goals, as follows:

1. **Preservation area:** differentiated by specific features and natural values that would be endangered by adverse conditions. Such areas are deemed to require special protection measures that allow necessary changes to take place naturally.

2. **Conservation area:** beneficial to their surroundings and communities such as mangrove reserved forest, green belt of the community, coastal defences and areas with attractive scenery that are suitable to develop as tourist attractions. Any development should be based on sustainable conservation and protection of the existing natural resources.

3. **Development area:** comprising land that is not properly utilised due to poor condition rendering them unsuited to agriculture such as deteriorated forest, deserted areas, areas with soil problems, and plantations with saline water intrusion. Development areas in the Kung Krabaen Bay Royal Development Study Centre include seashore and nearby areas, including indented coastline comprising 16 surrounding villages of the centre, namely: Noen Pradu, Mu Dut, Chao Lao, Hua Laem, Kung Krabaen, Khlong Khut Bon, Khlong Khut (Khlong Khut Subdistrict), Nong Hong, Nong Phrong, Khlong Bon, Pak Tapon, Sanam Chai, Song Pi Nong, Tha Khlaeng (Sanam Chai Subdistrict); Na Cha (Ka Chae Subdistrict) and Amphawa (Khlong Khut Subdistrict) Villages. The last one was added to the study centre's surrounding villages in May 1997.

• Operation of the Kung Krabaen Bay Royal Development Study Centre

Since its inception in 1981, the Kung Krabaen Bay Royal Development Study Centre has carried out tasks in line with its operation plan aimed at raising incomes and using local resources sustainably. Areas of activity range from mangrove forest conservation to crop cultivation and animal husbandry promotion, among others. The core activity is aquaculture, including breeding shellfish and fish for distribution to farmers to raise, and cultivating aquatic fauna, notably seawater prawn farming, which as a result of the study centre's efforts has taken off in its environs in Chanthaburi Province.



The Kung Krabaen Bay Royal Development Study Centre operates according to six major plans that authorised agencies adopt as guidelines:

1. Study and development plan for fisheries and coastal aquaculture

2. Study and development plan for natural resources and environment rehabilitation and conservation

3. Study and development plan for agriculture and livestock

4. Study and development plan to enhance well-being and socio-economic development

5. Academic services and technology dissemination plan

6. Administration and management plan.

The ORDPB and related agencies set the study centre's operations approach as follows:

1. To study and conduct integrated research into fisheries, forestry, agriculture and household industry suited to the geographical conditions

2. To study development of fisheries and conservation of forestry resources and ecosystem conservation, and promote academic advancement that recognises its fundamental role in further studies and development

3. To serve as an information centre, sample analysis laboratory, and innovative demonstration centre

4. To serve as an occupational development and training centre for people living in the study centre's surrounding villages in such fields as fisheries, forestry, agriculture and environment conservation using local resources

5. To uplift livelihood, occupation and income levels in communities around Kung Krabaen Bay, particularly for poorer people, thereby enabling them to become more self-reliant

6. To apply study results as models for other development projects

The Kung Krabaen Bay Royal Development Study Centre's records in the above areas are:

1. Fishery Work



1.1 The Kung Krabaen Bay Royal Development Study Centre conducts extensive research into coastal aquaculture, including studying the impacts of coastal aquaculture, and researching diseases and parasites afflicting aquatic fauna. In addition, the study centre offers academic services, including analysis of water and soil quality in ponds, providing a clinic for aquatic animals, detecting viruses such as white spot using polymerase chain reaction (PCR) techniques, and examining antibiotic residue in black tiger prawns. Moreover, the centre organises training sessions and disseminates coastal aquaculture, fishery resource management, and coastal resource conservation technologies.

1.2 At the same time, the study centre develops and promotes fisheries-related occupations, including constructing a wharf and wave barriers to facilitate small fishing boats. In this connection, it also demonstrates and provides fishing tools for the local fishermen.

2. Forestry Work

2.1 The Kung Krabaen Bay Royal Development Study Centre conserves the indigenous mangrove species. It has undertaken extensive related studies and research, as well as conservation of mangrove forest including experimental cultivation of mangrove trees in swamp at Kung Krabaen Bay. It has also studied the productivity of small-sized trees for producing local fishing tools, grown multi-purpose trees, experimented with planting trees in deforested peat swamp areas, and surveyed various insect species in forest areas of the study centre. The centre has also disseminated information about forestry in the form of the Mangrove and Coastal Forests Learning Centre to raise conservation awareness among teenagers and the general public.

2.2 The study centre has gathered a vast variety of mangrove tree species from across the country, making it the premier site of mangrove ecosystem studies. In this connection, it propagates mangrove tree seedlings for distribution to farmers, the general public, and various public and private sector entities. The centre also conserves large tracts of mangrove forests for study and research purposes.

2.3 The study centre has undertaken projects on natural resource management and rehabilitation and development of deteriorated environments. These projects involve planting trees and conserving forest along local roads, canals and rivers, as well as forest protection and conservation. Another area of activity involves carrying out inspections to prevent violations of the National Forestry Reserve Act within its boundaries.

2.4 The study centre has undertaken an east coast natural resource preservation project, including protecting wild animals and their habitats so that they can live safely and breed freely. It also prevents encroachment into natural areas and develops effective approaches to the core issues.

3. Agricultural Extension Work

The Kung Krabaen Bay Royal Development Study Centre promotes integrated farming. In this connection, it trains farmers to make a living from cultivating crops, including providing practical demonstrations. These activities also helped establish the agriculturists' institute. The study centre also encourages non-agricultural occupations and supports the roles of the farmers' wives by founding groups and training them to process agricultural produces. These activities include fermenting fish sauce, as well as making shrimp paste and various sweets and snacks using local plants and animals as raw materials, thereby further enhancing the quality of life in Tha Mai District.

4. Cooperative Promotion Work

The Kung Krabaen Bay Royal Development Study Centre disseminates knowledge and promotes understanding of the farming cooperative convictions, principles and approaches. Concerned farmers have jointly established Kung Krabaen Fishery Cooperative Ltd. The cooperative supports its 188 members by acquiring and selling tools and consumer products. The cooperative also nurtures a business credit culture, as well as encourages savings deposits and fixed deposits. It also promotes occupational development among farmers living around the study centre.

5. Land Development Work

The Kung Krabaen Bay Royal Development Study Centre has set up projects to survey, study and experiment with conserving and nurturing soil in the vicinities of beaches to ensure suitable quality for growing economic plants. It has also provided clean water sources for consumption and agricultural use, disseminated agriculture knowledge and trained farmers. The centre also sets up demonstration plots to experiment and promote knowledge on preventing soil erosion among farmers. Moreover, there is the demonstration of composting to be applied in households.

6. Livestock Work

Another field of endeavour by the study centre involves livestock promotion and development. More specifically, farmers are trained in farming poultry such as chickens, quails and Muscovy ducks. The farmers are also trained in animal health development.

7. Community Development Work

Another project initiated by the Kung Krabaen Bay Royal Development Study Centre aims to uplift the quality of people's lives by meeting their fundamental requirements. The study centre has coordinated with Subdistrict Community Development Office and collaborated with other agencies to solve specific problems by building concrete rainwater tanks and laying reinforced concrete roads. Moreover, the centre has hosted training sessions for farmers on natural resources and environment conservation. Yet another project in which the centre is involved supports continual remuneration for those raising children at Child Development Centre, as well as provides lunches and dietary supplements.



8. Agricultural Work

The Kung Krabaen Bay Royal Development Study Centre has undertaken studies and research in search of new plants suited to the prevailing environmental conditions. It has also propagated the plants and distributed them among farmers inside and outside the centre in the hope of increasing their household income. The study centre has also experimented with growing cashew nut trees, herbal plants, and mushrooms as well as propagating fruit trees, flowering plants, and ornamental plants. The centre has undertaken a research and study project to create an integrated agriculture model and experimented it in the farmers' plots in the project area and its surroundings, especially where the New Theory farming is practiced. Moreover, it has promoted and developed rice cultivation among farmers in the surrounding villages. Satisfactory results of the study have been conveyed to farmers through demonstrations, training and technology transfer.

9. Irrigation Work

The study centre has provided water sources for various government agencies in the project area. It has also supported construction of a dike system to separate saline water from fresh water, as well as built and repaired roads and maintained them in good condition in recognition of how they enable farmers to deliver their agricultural produce.

10. Disease Prevention and Quality of Life Promotion Work

10.1 Khlong Khut Subdistrict Public Health Centre has established and developed a primary healthcare centre to support public health in local villages and monitor the quality of the environment in which they are situated. As part of this initiative, the centre has implemented the projects to train seaside eatery owners and staff and public health volunteers from every household in the Subdistrict to have public health awareness which they then pass on to nearby communities.

10.2 Sanam Chai Subdistrict Public Health Centre has founded and developed a primary healthcare centre to support public health in villages. It has also controlled the environment where communities are situated and conducted several health-related campaigns, including promoting food hygiene in remote areas, providing vaccines to prevent poliomyelitis, and preventing and controlling dengue fever.

11. Agricultural Economics Work

The Kung Krabaen Bay Royal Development Study Centre endeavours to uplift the livelihoods and well-being of people inhabiting its environs. It was with this in mind that in 1996, the centre undertook a study and research projects on black tiger prawn farming and marketing in the area of the centre.



12. Education Work

12.1 Ban Chao Lao School, located in Khlong Khut Subdistrict, Tha Mai District, Chanthaburi Province, undertook a project to sustain its botanical garden. Royally initiated by Her Royal Highness Princess Maha Chakri Sirindhorn, the project is a collaboration of teachers and students, mainly located in the centre's area, to conserve natural resources and the environment and raise awareness of how to preserve plant species in the area. The students thereby have an opportunity to learn the local and scientific names of plants and discover for themselves how they grow and the benefits they bring. In this way the students develop a thorough understanding of the local ecosystems and come to realise the true value of nature. In addition, six primary schools around the centre jointly set up "Kung Krabaen Conservation Club" where teachers and students undertake a range of activities to conserve both the environment and aspects of Thai culture.

12.2 Tha Khlaeng Secondary School, located in Sanam Chai Subdistrict, Na Yai Am District, Chanthaburi Province, has set up a project to maintain its botanical garden. Royally initiated by Her Royal Highness Princess Maha Chakri Sirindhorn, with the objective of conserving

a vast variety of local plant species, the project is collaboration between teachers and students mainly located in the centre's area. The project is arranged in such a way as to encourage students to take the initiative to learn the local and scientific names of the plants, understand how they grow, and appreciate their benefits. This gives the students a thorough understanding of the local ecosystems and teaches them the true value of nature.

13. Public Works

The Kung Krabaen Bay Royal Development Study Centre has been designed and built according to plan. In 1998, the Office of Public Works and Town and Country Planning designed and approved five structures at the centre, namely: an 8x20-metre compost structure; a 15x20x1.5-metre reinforced concrete tank; a boardwalk trail through the mangrove facilitating nature studies; an 180-square-metres multi-purpose room; and renovation of a 1,000-square-metres earthen well and waterway system for aquatic animal breeding.

14. Public Relations Work

The centre disseminates general information about its work to the general public, including producing several publications distributed through various channels.

15. Seawater Irrigation System for Shrimp Culture

So far the problems facing shrimp culture at Kung Krabaen Bay have not been so severe as to force farmers to give up. However, if Kung Krabaen Bay continues to face degradation of water quality due to the long-term effects of shrimp farming, that could change. To prevent this happening, the centre is building a seawater irrigation system for shrimp farming that separates water inlet and outlet. Seawater will be pumped into shrimp farms through water inlet pipes while wastewater will be collected and treated by aeration and biological methods before releasing it back into Kung Krabaen Bay.

16. Master Planning for 1999 – 2003

In 1999, Office of the Royal Development Projects Board (ORDPB) joined hands with related government agencies and the centre's heads of activities to plan and develop the Master Plan for 1999 – 2003 clarifying the essential points of the royal initiatives and bringing them into sharper focus. Planning land use and identifying development projects suited to the geographical conditions, this master plan has made use of aerial photographs and geographic information system (GIS). It consists of six major plans as follows:

1. Study and development plan for fisheries and coastal aquaculture
2. Study and development plan for natural resources and environment rehabilitation and conservation
3. Study and development plan for agriculture and livestock
4. Study and development plan to enhance well-being and socio-economic development
5. Academic services and technology dissemination plan
6. Administration and management plan.



- **Positive Changes and Achievements at the Kung Krabaen Bay Royal Development Study Centre and Nearby Villages**

The socio-economic conditions at Kung Krabaen Bay have markedly improved as a result of the positive changes to the Chanthaburi coastline performed by the study centre, and the potential for continued increments here and in other coastal areas remains considerable.

Population in the centre's area

The Kung Krabaen Bay Royal Development Study Centre covers 16 villages of Khlong Khut, Sanam Chai and Krachae Subdistricts. With improving natural conditions spurring migration, their combined population rose from 5,548 in 1994 to 5,737 in 1996.

Moreover, the United Nations Development Programme's (UNDP) Human Development Index of villager well-being rose from 0.657 in 1992 to 0.673 in 1994 and 0.70 in 1996, an index of 0.500 – 0.799 indicating medium-level quality of life.



Occupations

People living around the centre engage in a variety of occupations: 18.56% are identified as fishermen and herdsmen; 13.38% work as labourers; 9.35% work as crop planters and gardeners; 6.19% are vendors; and 4.46% are rice farmers. Moreover, working in crop plantations and fields was a second occupation for 29.50% of the locals.

Land tenure

The local farmers consider land tenure very important and necessary. As such, 79.50% of them hold land tenure. In 76.71% of those cases the land belongs to a farmer, and in 11.80% of

cases it is held by one of the farmer's parents. An average of 1.48 hectares (9.24 rai) of land is held by each household.

Land use for agriculture

Household land use can be broken down as follows: 22.36% for housing, 45.96% for agriculture, 27.64% for housing and agriculture combined, and 1.24% for leasing. 2.80% of the land was unutilised.

While only 32.10% of the farmers assigned more of their utilised land for agriculture, 41.10% of them transformed deserted land into integrated agriculture land. 32.88% switched from growing rice and field crops to fruit cultivation and 4.11% switched from field crops and a particular fruit variety to other field crops and fruit varieties.

Water sources for agriculture and consumption

A survey of how villagers' view water supply changes over the past five years found 74.69% deeming current supplies adequate.

Regarding sanitation, 58.64% found no change, 35.19% thought it had improved and 6.17% thought that it had worsened.

Regarding water availability for agricultural use, 61.11% said it was adequate. However, while 26.54% thought the situation had improved, 45.68% saw no change.

Income and debts

In 1999, fisheries and aquaculture were the most common income sources among households in the area, generating average annual incomes of 59,335.57 baht each. Incomes from cultivation average 17,568.91 baht while incomes from commerce average 10,163.58 baht. Average annual income per household was 109,397.17 baht. 38.89% of villagers said their income has risen significantly since the study centre started operating while 21.60% thought there had been no change and 5.56% said their income had declined.

As 58.64% of farmers living in surrounding villages borrowed funds to invest in their business plans, average debt per household reached 19,436.84 baht.



Puparn Royal Development Study Centre
Mueang District, Sakon Nakhon Province

- **History of His Majesty the King's Royal Visits to the Northeast Where He Had Direct Exposure to His Subjects' Sufferings**

Following his accession to the throne, His Majesty King Bhumibol Adulyadej expressed his wish to visit his people across Thailand, see for himself the geographical lay of the land, and get first-hand impressions of the conditions in which the people lived.

The first region His Majesty the King visited was the Northeast of Thailand, which was during 2 – 20 November 1955. His Majesty is considered the first Thai monarch to have travelled extensively in the Northeast — a source of great delight among the inhabitants.

His Majesty King Bhumibol Adulyadej and Her Majesty Queen Sirikit embarked by train from Chitralada Station on 2 November 1955. Passing through Ayutthaya, Saraburi and Nakhon Ratchasima Provinces, Their Majesties made stops along the way to visit their subjects.



Continuing the journey, Their Majesties also made stops in Khon Kaen, Loei and Udon Thani Provinces, before heading to Nong Khai Province. Their next stop was in Sakon Nakhon Province which they used as a base to visit more of the area and a place to stay.

Their Majesties' extensive travels throughout the Northeast made them aware of the people's woes and the highly inconvenient transportation links they lived with.

• Chronicle of Royal Initiatives Arising from Royal Visits to the Northeast

His Majesty King Bhumibol Adulyadej graciously gave an interview to the executives of the Office of the Royal Development Projects Board (ORDPB), comprising of Mr. Sumet Tantivejkul, Mr. Manoon Mookpradit and Mr. Pimolsak Suvanathat, about his extensive travel around the Northeast and how they had inspired him to initiated several royal development projects. His Majesty disclosed that:

> *"...(In 1955), I went to the Northeast in the dry season, in November. It was very cloudy, but the region was perched. So, two ideas occurred to me. Check dams will have to be built...The ideas came to me while I was travelling from Nakhon Phanom, past Sakon Nakhon, to Kalasin Provinces and down to Sahatsakhan District, which is now Somdet District...There I stopped to visit the people. It was dry and dusty.*

I asked *How's the weather this year?*

He replied *Really bad*

I asked *The problem is drought or no rain?*

He replied *On the contrary, the problem is flooding.*

I memorised the location. The place where floodwater came from is Nam Phueng Dam today. The water flew down the hill to the forest areas. On the steep slope, check dams should be built. In the rainy season, the rainwater will be obstructed by check dams which help to prevent flooding. In the dry season, the water will be released into the downstream…"



Every province Their Majesties stopped at and visited their subjects was afflicted by severe drought.

For example, on Tuesday, 15 November 1955, Their Majesties visited local people gathered in front of Maha Sarakham City Hall. The then governor of Maha Sarakham Province, Luang Anumutratchakij, reported to Their Majesties that the province regularly faced drought issues. He said there had been insufficient precipitation for rice farming for at least the past three years, causing the people to be poverty-stricken. They were, however, absolutely delighted that Their Majesties had called in on them.

Later on the same day, Their Majesties arrived in Roi Et Province where they graciously granted the then Roi Et Governor, Khoon Aksornsarasith, the opportunity to report to them in person about the livelihoods of the local people. He spoke as follows:

"...Roi Et Province comprises nine districts with a total population of 540,000. Geographically, the province is situated on a high plateau. People generally grow rice and field crops. Some raise beasts of burden and do livestock farming. However, their livelihoods are not consistently fruitful, due mainly to having insufficient water for consumption and agricultural use. Agriculture is mainly dependent on rainwater. If it doesn't rain enough when it's supposed to, people face shortages and are deprived of rice and water. This is grievance they confront with year to year..."

On 16 November 1955, during the royal visit to Roi Et Province, when their royal conveyance arrived in front of Thawat Buri District Office, Their Majesties graciously granted a royal audience to a group of people led by the Chief District Officer of Thawat Buri District, Mr. Chatchawan Suwannapong.

As they stopped their royal convoy intermittently, Their Majesties asked the people who came to greet them about their lives and livelihoods. When their royal conveyance arrived at one house, 300 sen (one sen equals 40 metres) away from Thawat Buri District Office, one man came forward to extend an offering to Their Majesties. As the royal vehicle drew to a halt, Their Majesties enquired directly about the man's life and occupation. As they listened to his replies, Their Majesties suggested that he add vegetable gardening and livestock rearing to his activities in addition to his staple rice farming.



Their Majesties the King and Queen then moved on to visit their subjects in Ubon Ratchathani, Surin and Si Sa Ket Provinces. They once again saw the poverty and deprivation the people throughout the region faced in their daily lives. **On 19 November 1955,** the then Si Sa Ket Governor, Mr. Kiti Thakari reported that every day was a struggle for the people to make a living. His Majesty responded that he was aware of their difficulties and concerned about their problems. He asked everyone to continue to strive and meanwhile he would inform the government that they should provide more assistance.

The next day, **on 20 November 1955,** Their Majesties visited Buri Ram Province, the final stop on their tour of the Northeast before returning to Bangkok. In all, they had covered some 2,272 kilometres, extensive travels that had given His Majesty essential first-hand information he was to use in future developments and which created the foundations for the establishment of the Puparn Royal Development Study Centre.

• Puparn Ratchanives Palace: Up Close with the People

His Majesty King Bhumibol Adulyadej graciously granted royal permission to construct Puparn Ratchanives Palace in a location that facilitated having audiences with local people so he could get to understand their problems. Construction of the palace enabled His Majesty to fully devote his efforts and time to visiting these subjects and hearing of their woes first-hand. The awareness of his people's problems that His Majesty's thereby gained spurred the initiation of several royal development projects aimed at uplifting the people's well-being and livelihoods.

In 1975, His Majesty assigned a team to survey the geographical features of the Northeast in preparation for constructing a palace for him to stay at during his royal visits. After considering the potential of Puparn Mountain Range from an aerial map and examining survey results, His Majesty reflected that the foothill plain and stream adjacent to Tat Ton Waterfall Reserved Forest offered the most suitable location in which to construct the palace and also serve as a forestry rehabilitation study centre.

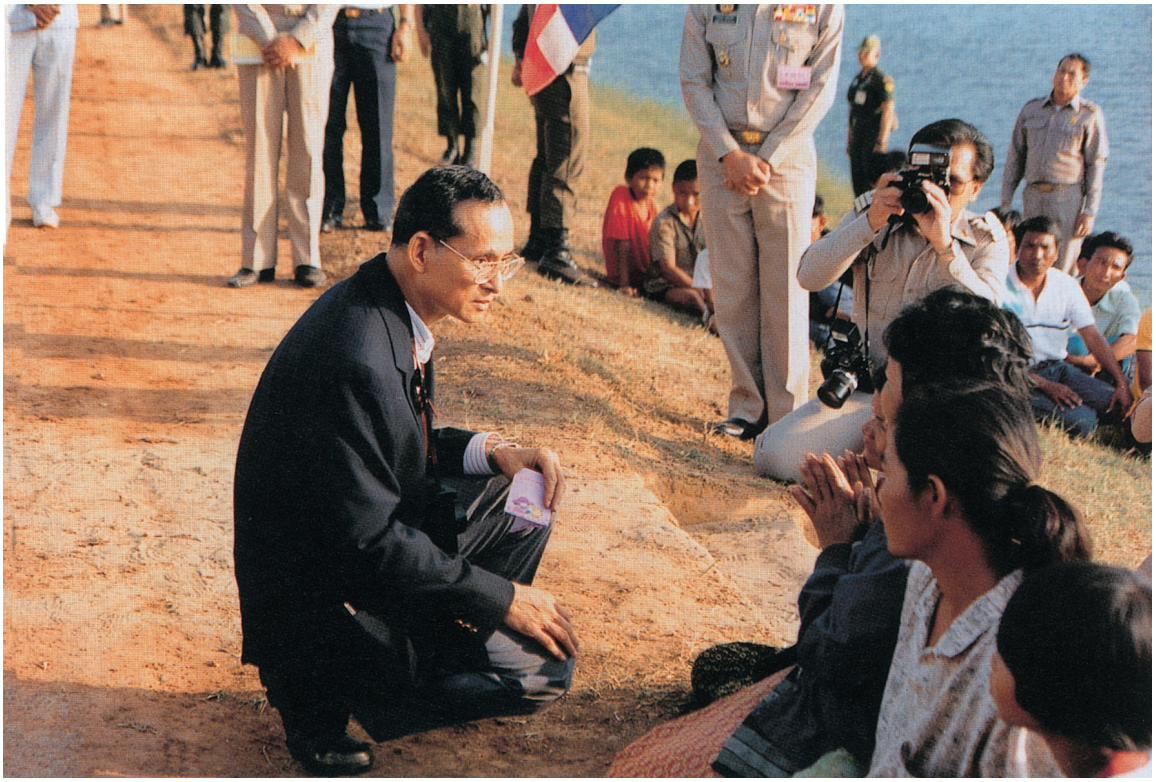
Their Majesties the King and Queen, joined by Her Royal Highness Princess Maha Chakri Sirindhorn, first stayed at Puparn Ratchanives Palace on 19 November 1976. From then on, Their Majesties paid extensive visits all across the Northeastern Region. Not only would they hear directly of the people's woes but they would gain a deep understanding of their problems. This, in turn, would enable Their Majesties to come up with practical solutions to the problems. Initiating the royal development study centre to serve as a source of academic studies, research and experimentation ensured the plan's success.



• Early Days of the Puparn Royal Development Study Centre

An extract from His Majesty King Bhumibol Adulyadej's personal records and analysis, graciously presented to the Office of the Royal Development Projects Board (ORDPB), reveals the daunting extent challenges that the Puparn Royal Development Study Centre took on so effectively:

> *"...The Puparn Royal Development Study Centre in Mueang District, Sakon Nakhon Province was once a sparse forest that was encroached. The trees were cut down by villagers for firewood and to clear areas for cultivation. As a result, the forest in the northern area of the centre was substantially destroyed. Water shortages arose in the dry season whereas water flowed torrentially in the rainy season. The heavy rain eroded the topsoil and patches of the underlying salts would be exposed...*



His Majesty King Bhumibol Adulyadej graciously extended further insight into the problems of the locale, succinctly describing the soil as:

"...sandy, salty and dry..."

Many more challenges facing Northeastern Thailand arose from:

Soil problems: The prevailing geographical conditions were infertility, characterised by deficient natural resources in terms of forests, soil, water quality, and minerals. Being predominantly sandy, the soil could only store small amounts of water and become salty.

Forest and water source problems: The natural water sources were deficient. Moreover, the soil had poor moisture retention. As such, it was altogether incapable of properly supporting crop cultivation and other agricultural activities. The result was low yields which in turn adversely affected the farmers' incomes and quality of life. This prompted the farmers to seek more land for cultivation by encroaching into forests and cutting trees. The cycle of drought was thus reinforced as more natural resources were rendered deficient. As forests are essential sources of water, their disappearance had curtailed water supply, undermining what was originally a diverse and effective ecology.

Academic knowledge problems: Beside the aforementioned problems concerning the deficiency of the agricultural inputs, there was also the lack of knowledge on which farmer

livelihoods depend that caused this vicious cycle of problems. Especially, there were the lack of the correct technical agricultural knowledge, and the knowledge on the improvement and preservation of the quality of the agricultural inputs involving forestry and proper land use. There was also a lack of knowledge about marketing and price mechanisms. All these factors together not only undermined the farmers' yields but their incomes.

These three key problem areas were vital in developing the Northeast through the establishment of the Puparn Royal Development Study Centre as a one-stop service with the demonstration of agricultural development models that local people could adopt and apply on their own lands.



- **His Majesty King Bhumibol Adulyadej's Initiatives before Founding the Puparn Royal Development Study Centre following the Establishment of Puparn Ratchanives Palace in 1976**

Arriving at Oon River on Sunday, 21 November 1976, His Majesty King Bhumibol Adulyadej traversed the ridge of a paddy field on foot to inspect the site of a check dam that locals had built to store water for agricultural use, but which had been destroyed by a recent flash flood. His Majesty graciously presented his guidance on providing assistance to the people to Mr. Somporn Klinpongsa, Sakon Nakhon Governor, Mr. Phoon Charoenphol, Chief District Officer of Kut Bak District, and Mr. Roongrueng Chulachart, Chief Engineer of the Nam Oon Dam Project to survey Nam Oon Dam and E-Don creek in detail. The aim was to consider the appropriateness of the building of a weir at the location that could store big volumes of water to facilitate agriculture.

Two days later, on 23 November 1976, His Majesty visited local people at Nam Oon Dam in Phang Khon District. Before looking at the topographical map of the region and entering into the royal pavilion, His Majesty discussed irrigation projects in Sakon Nakhon Province with Mr. Roongrueng Chulachart, Chief Engineer of Nam Oon Dam Project and related officials from other irrigation projects in Sakon Nakhon Province. It was advised that the project should be implemented systematically to ensure maximum benefit to the region.

Before the Puparn Royal Development Study Centre was founded, His Majesty graciously paid several visits to its environs:

On 8 November 1977, His Majesty observed the location where Huai Tad Hai Yai (presently Tad Hai Yai) and Huai Diak Reservoirs would be built. Later he visited local people at Huai Yang Village in Huai Yang Subdistrict, Mueang District, Sakon Nakhon Province. His Majesty graciously granted his idea to the Director-General of the Royal Irrigation Department and General Prem Tinsulanonda,



the then Assistant Commander-in-Chief, Royal Thai Army. His Majesty explained that,

> *"...According to the Royal Irrigation Department's plan to construct Huai Tad Hai Yai Reservoir at the coordinate of 482 UD 985900, map scale 1:50,000, sheet 5843 III, is deemed suitable for construction. However, construction of Huai Yang Reservoir (Phu Mai Ruak) to a depth of about 10 metres at the coordinate of 48Q UD 979890, map scale 1:50,000, sheet 5843 III, should also be considered. With a storage capacity of approximately 1,000,000 m^3, such a reservoir could be the twin of Huai Tad Hai Yai Reservoir, enabling more water to be distributed to agricultural areas. In terms of reservoir design, maximising storage capacity should be considered. Construction of the two reservoirs should be undertaken urgently, starting with Huai Yang Reservoir, followed by Huai Tad Hai Yai Reservoir..."*

On 17 November 1980, His Majesty visited Huai Wian Prai Reservoir Project in Huai Yang Subdistrict, Mueang District, Sakon Nakhon Province. In response to His Majesty's initiative, the Royal Irrigation Department marked a line where an earthen dike would be constructed to block the flow of water from Huai Wian Prai or Wian Prai stream. Another line was marked for laying water distribution pipes to convey water from the reservoir to concrete irrigation canals which could supply water to various ponds for further distribution. This project enables year-round water supply, both for agriculture and consumption, to as much as 240 hectares (1,500 rai) of land.

On 19 April 1981, once again His Majesty the King paid a royal visit to the Royal-Initiated Huai Diak Reservoir Project in Huai Yang Subdistrict, Mueang District, Sakon Nakhon Province. The Royal Irrigation Department was conducting a survey for the preparation of Huai Diak earthen



dike construction. The reservoir would be capable of distributing sufficient water to farmers to cultivate as much as 400 hectares (2,500 rai) of land in Mueang District, including storing enough water to enable year-round consumption.

On 25 November 1982, His Majesty the King graciously granted an audience at the Royal Aide-De-Camp Department, Chitralada Palace, to His Serene Highness Prince Chakraband Pensiri Chakrabahdhu, Privy Councillor, Mr. Soontorn Ruenglek, the then Director-General of the Royal Irrigation Department, and Mr. Lek Chindasanguan, to present his guidance for the Puparn Royal Development Study Centre for the first time. **His Majesty said that a plan should be drawn up to ensure water supply to support the Puparn Royal Development Study Centre, Sakon Nakhon Province. This would be necessary to enable the study centre to conduct a comprehensive development-oriented studies and experimentation on forestry development, various agricultural development and agro-industry. The centre would thereby provide examples that would facilitate local farmers to apply them on their land. This would eventually lead to the ultimate goal of self-reliance of the local population.**

On this occasion, His Majesty also granted an initiative to the Royal Irrigation Department regarding its planned construction of Huai Tad Hai Yai Reservoir at the coordinate of 48Q UD 961909, map scale 1:50,000, sheet 5843 III. The purpose of the project was to supply water to support the study centre's activities across an area of around 288 hectares (1,800 rai). The reservoir would facilitate research and experimentation conducted within the centre all year round.



On 21 December 1982, Dr. Sumet Tantivejkul, Director of the Secretariat Office of the Coordinating Committee for Royal Development Projects (Presently, the Office of the Royal Development Projects Board), along with the working team, had a meeting and then surveyed the water distribution area at the Huai Diak Reservoir Project site, with a view to establishing the Puparn Royal Development Study Centre. The survey team included representatives of various government agencies, among them Mr. Lek Chindasanguan, the then Assistant Director-General of the Royal Irrigation Department, along with Royal Forest Department, Land Development Department, and Department of Lands officials. Following the survey, the parties drew up a primary report on the study centre to present to His Majesty. The report determined that the study centre area would comprise two parts, namely:

1. Approximately 96 hectares (600 rai) of land that would derive water from the large water distribution canal located on the right of Huai Diak reservoir.

2. Approximately 192 hectares (1,200 rai) of mostly deciduous forest situated in the Huai Tad Hai Yai Reservoir Project. Around 16 hectares (100 rai) of this land fell within the area allocated by the Department of Lands. About 176 hectares (1,100 rai) of the land was identified as being part of Pa Phu Lom Khao and Pa Phu Peck National Reserved Forests.

When the primary report on the Provision of Water Supply Project for the Study Centre was presented to His Majesty the King on 25 December 1982, His Majesty said that both the findings of the report and the actions identified accorded to his wishes.





His Majesty offered further guidance, as follows:

Concerning the 1st part of the study centre, comprising approximately 96 hectares (600 rai), was located in the water distribution area of the Royal-initiated Huai Diak Reservoir Project, the area, identified as being located within the boundary of the area allotted to the Department of Lands, was surrounded with mixed deciduous forest, some of which had been encroached by villagers.

Concerning the 2nd part of the study centre, comprising approximately 192 hectares (1,200 rai), earmarked to build Huai Tad Hai Yai Reservoir along with its attendant water distribution system, this area was also surrounded with mixed deciduous forest. Around 16 hectares (100 rai) of land was identified as being located within the boundary of the area allotted to the Department of Lands. The other 176 hectares (1,100 rai) was national reserved forest under the Royal Forest Department.

In November 1983, His Majesty King Bhumibol Adulyadej graciously visited Na Nok Khao Village to observe its general topographical features and the specific location for the proposed Huai Tad Hai Yai Reservoir. **His Majesty reflected that the area was once covered with mixed deciduous forest. However, villagers encroached and cut down trees for firewood and cultivation. Forest located in the upland had also been devastated. This caused water shortages in the dry season and torrential water flows in the rainy season. The net result was soil erosion leaving only a thin layer of topsoil. Salts in the soil would be exposed in small patches on the surface. Following his extensive study of geographical conditions and problems in the Northeast, His Majesty the King pointed to features that differed from other regions, not only in terms of geographical conditions and natural resources but local culture and traditions. His Majesty further concluded that in identifying appropriate development approaches for the Northeast, studies and research should focus on specific local problems and conditions and the ways of life while in corporating topographical condition, namely local natural resources and social conditions, namely traditions, culture, and local wisdom.**

Getting down to details, His Majesty gave his guidance that *water stored in Tad Hai Yai Reservoir should be distributed to agricultural areas at Na Nok Khao Village. His Majesty personally selected Na Nok Khao Village in Huai Yang Subdistrict, Mueang District, Sakon Nakhon Province, as the area most conducive to establishing the study centre. Given the similarity of its environmental condition and biological cycles to prevailing conditions in the Northeast, the selected area would thereby reflect the topographical features of the region as a whole.*

The Puparn Royal Development Study Centre was thereby initiated as a model in the restoration of the region's geographical and social environment and conduct studies and research to find ways to develop it accordingly.



• Puparn Royal Development Study Centre

Location

The latitude and longtitude of the Puparn Royal Development Study Centre are 17˚04 to 17˚07'N and 104˚00 to 104˚04'E. The total area of 2,128 hectares (13,300 rai) is located within Pa Phu Lom Khao – Phu Peck National Reserved Forests and Mai Kraya Loei Namphung Forest Project (LN.9) Section 1, in Huai Yang Subdistrict, Mueang District, Sakon Nakhon Province.

Its geographical profile is characterised by small hills, 10 – 45 per cent of which have steep slopes, and which range in height from 180 – 420 metres above moderate sea level. The highest peak is approximately 420 metres above sea level. The second-highest peak, at 397 metres above sea level, is located around the middle of the area, north of Phu Mai Ruak Mountain. Another peak, Phu Pong Daeng Mountain, rises 359 metres above sea level. The lowest of the peaks, at 180 metres above sea level, is Lower Huai Tad Hai Yai Stream. The four principal streams are Huai Tad Hai Yai, Huai Yang, Huai Diak, and Huai Tad Hai Noi.

Weather Conditions

Weather conditions at the Puparn Royal Development Study Centre can be described as follows:

Rainy season: May to October

Winter: November to February when conditions can be bitterly cold

Summer: February to April when it can get very hot

The average temperature in the study centre area is around 26.4˚C. The highest temperature is approximately 37.9˚C and the lowest is approximately 12.1˚C.

The precipitation averages 362.1 mm with the lowest of 0.7 mm. The number of days of precipitation in a year averages 136.8.

The low point of relative humidity, 62.6%, is recorded in March, with the highest point, 81.2%, in August. Average annual relative humidity is 72.9%.

In winter through summer, from November to April, a heavy morning fog covers the whole area, thereby reducing visibility to less than 1 kilometre. During the day, the light remains dim with visibility of 6 – 7 kilometres.

Soil and Rock Conditions

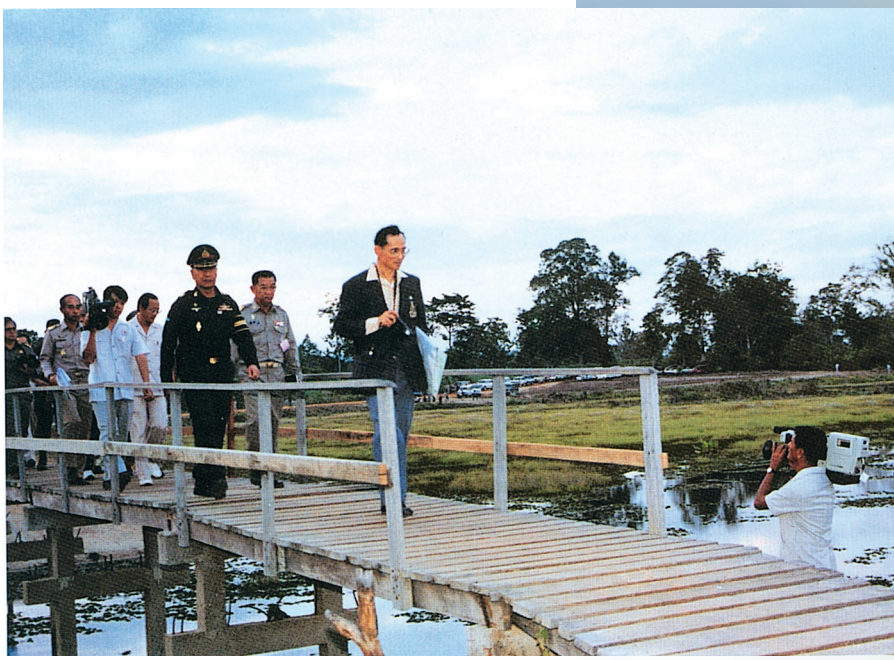
The general geological features of the study centre area include sandstone of conglomerate type and shale. Lower layers of soil comprise shale, sandstone and limestone.

Soil types can be categorised as follows:

Soil resources	Upper layers of soil	Lower layers of soil	Geographical features and uses
Roi Et soil series	- Sandy loam soil or loamy sand soil; Light grey or greyish-brown with reddish-yellow and dark brown mottling - Soil acidity ranges strongly acidic to highly acidic	- Sandy loam soil and sandy clay loam soil and clay in some areas; Pinkish-grey with dark brown and yellowish-red mottling - Soil acidity ranges slightly acidic to strongly acidic	- Found in flat terrain and low-lying ground with poor drainage - Mostly used for rice farming
Korat soil series	- Sandy loam soil or loamy sand soil; Ranging dark greyish-brown to dark brown - Soil acidity ranges moderately acidic to highly acidic	- Ranging sandy loam soil to sandy clay loam; Ranging brown to dark brown - Soil acidity ranges highly acidic to strongly acidic	- Found in flat terrain and low-lying, well-drained ground - Mostly used for cassava and cotton cultivation, as well as deciduous dipterocarp forest
San Patong soil series	- Ranging sandy loam soil to sandy soil; Greyish-brown to dark brown - Soil acidity ranges slightly acidic to moderately acidic	- loamy sand soil; Pinkish-grey - Highly acidic	- Found on gently undulating slopes and low-lying ground with poor water retention - Mostly used for cassava and cotton cultivation or left as deciduous dipterocarp forest
Borabue soil series	- Sandy loam soil or loamy sand soil; Dark greyish-brown - Soil acidity ranges moderately acidic to highly acidic	- Clay loam mixed with conglomerates; Dark brown with a lower level of lateritic soil - Soil acidity is high level	- Found on well-drained overlapping steep slopes, gently- to steeply-undulating slopes, and shallow ground mixed with gravel

- **Royal Initiatives Regarding the Operation of the Puparn Royal Development Study Centre**

After the Puparn Royal Development Study Centre was successfully established as an integrated research and experimentation centre, His Majesty King Bhumibol Adulyadej maintained a strong interest in its work and paid regular visits to observe its progress. His Majesty wished to see the centre achieve its goals and continued to graciously grant his guidance on study and development works.



In November 1984, His Majesty the King expressed the wish for the Puparn Royal Development Study Centre to represent the region's geographical conditions so that it could serve as a living natural museum. Activities range from study of land use, plant cultivation, produce processing such as glass noodles, fishery development relative to the prevailing geographical conditions, use of cooperative system to develop villages, forest development to prevent encroachment and soil erosion, growing of Three Forests for Four Benefits, agricultural development by introducing farmers to grow para rubber trees of good varieties and suitable with the locality, to forest development using simple irrigation systems such as using bamboo piping.

A year later, on 12 November 1985, His Majesty made another royal visit to the Puparn Royal Development Study Centre and graciously granted his guidance for the centre's management to allow more participation by local people. His Majesty further identified the need to separate some agricultural produce to support farmers in neighbouring areas. His Majesty also suggested that the Provincial Commercial Office should assist farmers in finding markets for their produce. Meanwhile, the study centre would manage manufacturing, sales and distribution to create circulation and accumulation while giving the local people a chance to develop their financial management skills.

On 30 November 1985, His Majesty the King graciously granted to the study centre his ideas for promoting sericulture in a small, inexpensive structure which would serve as a model for farmers to apply. Turning to livestock development, His Majesty suggested that farmers should join together in small groups that could be developed into a cooperative as they succeeded.

On 22 November 1989, His Majesty graciously granted to the centre his idea for setting up a system of integrated farming outside the irrigation area or for the so-called rainfed agriculture. Instead of depending on irrigation water, His Majesty advised dredging existing ponds and swamps to store more water and ameliorate the water shortage problem.

With his sharp insight and broad vision, His Majesty advised the centre to undertake a study to identify trees that could grow between the cracks in stony fields, thereby boosting organic resources in the area. His Majesty showed his deep concern for the environment and addressed the pollution problem with the ground-breaking "nature cures nature" concept he devised. His Majesty tasked the Puparn Royal Development Study Centre with studying how much oxygen trees produce and finding ways to reduce carbon dioxide emissions so as to mitigate the greenhouse effect.



His Majesty's great benevolence, treating his people's sufferings as his own, was manifest. Every time he visited his subjects, His Majesty would always ask them about their difficulties and then find ways to rectify them.

During a visit to the Northeastern Region on 26 November 1990, while they were staying at Puparn Ratchanives Palace, Their Majesties the King and Queen and Her Royal Highness Princess Maha Chakri Sirindhorn found that the lateritic soil was prevailing in the region. Understanding the problem clearly, His Majesty graciously granted his idea to resolve it by digging up lower layers of soil, mixing it with the upper layer of lateritic soil, and ploughing up and over. His Majesty believed that, within two years, crops could grow in the area.

Besides improving the soil, His Majesty advised to search for disease-resistant animals such as ducks and half-breed cows and to breed more Meishan pigs. His Majesty indicated that investment should be based on simplicity and low cost, so farmers could adopt the practices and apply the methods themselves. Expressing his concern over the issue, His Majesty disclosed that,

"...If there is something wrong, even a small thing, the farmers become burdened with debt, which is awful for them. Even in a year, they can't clear all

the debt. So, in giving animals to common villagers to be raised, everything must be the simplest to prevent danger from economic failure…"

• Operation of the Puparn Royal Development Study Centre

The Puparn Royal Development Study Centre extends over around 2,128 hectares (13,300 rai). This comprises an agricultural development zone of roughly 368 hectares (2,300 rai) and around 1,760 hectares (11,000 rai) of peripheral areas earmarked for forestry development in the locales of Pa Phu Lom Khao and Pa Phu Peck National Reserved Forests.

The upper area of the study centre is supplied with water by Tad Hai Yai Reservoir, while Huai Diak Reservoir distributes water to the other areas.



The Puparn Royal Development Study Centre began its operations in 1984. The sub-committees and concerned government agencies have been working together, with the Royal Irrigation Department who takes the main responsibilities. Aiming to discharge its duties efficiently and in harmony with the environment, and to enable findings from studies and research to be implemented by farmers, the centre established the following developmental frameworks:

1. Irrigation Work

The study centre built water storage containers and water distribution systems to support its agricultural studies and works. The centre has also transferred know-how to enable the farmers to optimise water utilisation in cultivation. The enabling reservoirs and other water resources were as follows:

- Tad Hai Yai Reservoir (water storage capacity: 900,000 m^3, equipped with water distribution system): Able to distribute water to support activity areas inside the study centre area and farmer plots in Na Nok Khao Village, totalling 256 hectares (1,600 rai), along with 160 hectares (1,000 rai) of forest development areas.

- Phu Mai Ruak Reservoir (water storage capacity: 720,000 m^3, equipped with water distribution system): Able to supply water to 112 hectares (700 rai) of farmers' plantations.

- Huai Wian Prai Reservoir (water storage capacity: 330,000 m^3, equipped with water distribution system): Able to provide water for 17.6 hectares (110 rai) of land allotted to Pa Mai villagers.

- 65 weirs: constructed to increase water availability to 160 hectares (1,000 rai) of afforestation land relying on irrigation and to help maintain watershed forest.

In addition, the study centre provides such essential infrastructure as electricity and waterworks.

2. Study and Development of Model Villages Work

The Puparn Royal Development Study Centre has set up various entities in the surrounding villages that aim to help develop women and children, to ensure orderly communities and to raise the quality of life of the people to reach the fundamental levels. Such entities established by the centre include rice banks, marketing demonstration and occupational promotion centres, regarding agriculture, handicrafts, and industry.

3. Agricultural Study and Development Work

The Puparn Royal Development Study Centre conducts studies, research and experiments in agriculture and appropriate modern agricultural technology with the aim of boosting agricultural output and farmers' incomes. Areas of study have included:

- ***Rice cultivation:*** The centre has undertaken rice growing studies and experiments aimed at identifying plant varieties suited to the local conditions which therefore become popular among farmers. RD 6 and Jasmine 105 rice varieties were found to be most suitable, while *Sew, Mae Jan* and Sakon Nakhon 69 rice varieties were the most suitable rice varieties for upland areas.



- ***Field crop cultivation:*** The study centre has undertaken research to increase yields by identifying high-yield crop varieties, and designing weed control, cultivation and compost techniques. It found that higher soy bean, mung bean and sweetcorn yields could be obtained by reducing chemical use.

- ***Horticulture:*** The study centre has researched fruit varieties best suited to conditions in the Northeast. Appropriate varieties identified include *Kaew* mango, custard apple, *Nor Phor 1* and *Hong Huay* lychee, *Rong Rien* rambutan, *E-dor* and *Sri Chompoo* longan. The centre has annually propagated and distributed over 20,000 high-yield fruit tree seedlings to farmers living in its environs.

- ***Sericulture:*** The centre has promoted silk farming using inexpensive structures that serves as a model for farmers to adopt and apply. It has succeeded in apportioning 2.56-hectare (16 rai) of villages nearby the centre and 0.8-hectare (5 rai) of villages outside the centre for growing mulberry trees.

- ***Mushroom cultivation:*** The centre has experimented with mushroom cultivation using suitable materials commonly found in the area and has trained people interested in propagating

mushrooms. The centre has successfully developed propagation methods that have been applied to cultivate a vast variety of economically-viable mushrooms, including Oyster, Pink Oyster, Indian Oyster, Shiitake, and Straw mushroom varieties as well as Lingzhi and Lion's Mane medicinal mushrooms.

- ***Para rubber cultivation:*** The centre has studied and experimented in search of high-quality para rubber varieties suited to the soil and weather conditions of the Northeast. These studies led to the successful breeding of three varieties of rubber, namely, PR 225, RRIM 600, and GT 1, that yield 228, 198 and 312 kilograms of latex per 0.16 hectare (1 rai) per year respectively, which is as high as yields in the traditional growing areas of the South.

- ***Food processing:*** The study centre has recommended farmers to process mung bean into glass noodles and sweet soy sauce to earn extra income.

- ***Integrated agricultural study and development:*** The study centre has formulated a plan and devised management practices to develop integrated agriculture farming using rainwater and irrigation. The plan includes rice and field crop cultivation, animal husbandry and fishery.

4. Demonstration of Water Source Promotion and Development for Fishery Work

The Puparn Royal Development Study Centre has researched and developed freshwater fish raising techniques appropriate to the geographical features of the Northeast. The centre has also disseminated aquaculture know-how, including how to catch aquatic animals properly. The centre has promoted raising fish in concrete ponds and demonstrated how integrated fish and swine, and African catfish and chicken farming can be worked around the ponds. In addition, the centre has organised training in fish breeding and raising, and has propagated and distributed over 400,000 freshwater fish to local farmers annually.



5. Household Industry Occupational Promotion Work

With the aim of facilitating people living nearby the centre to utilise free time to apply the knowledge on household industry to produce household products to use themselves or to sell, the Puparn Royal Development Study Centre hosts training to acquire various skills.

The training has covered hardboard manufacture, basic and intermediate dressmaking and tailoring, synthetic dyeing, weaving on looms, metal soldering, tie-dyeing, batik making, bamboo furniture manufacture, plant fibre products manufacture, metal forging, cement products, general welding and small engine welding, and others. Roughly 120 locals participate each year.

6. Livestock Study and Development Work

The Puparn Royal Development Study Centre conducts research to find species of animals, types of fodder, and livestock management techniques that can boost incomes of people living around the centre and be extended to other communities. For instance, the centre has promoted annually raising around 800 Muscovy ducks, native chickens, and especially Meishan swine, with five villages around the centre. Animal husbandry demonstrations have been arranged accordingly.

7. Soil Quality Study and Improvement Work

The Puparn Royal Development Study Centre undertakes studies to identify simple soil rehabilitation techniques that farmers can easily adopt to achieve higher crop yields. The centre has found that soil quality can be improved by cultivating leguminous plants, encouraging farmers to use compost and green manure, and growing vetiver grass in cracks between stones to prevent soil erosion and increase topsoil retention. Moreover integrated farming practices are used to improve crop cultivation in lateritic soil. These practices have been successfully implemented in several villages around the centre, including achieving 1,000 tons of domestic composting annually.

8. Forestry Study and Development Work

The study centre is responsible for conserving forest and watershed forest resources. It nurtures existing forests and supports afforestation while preventing wildfires. The centre has preserved over 1,760 hectares (11,000 rai) of existing forests and 320-hectares (2,000 rai) of watershed forests. The centre has also promoted crop cultivation involving a wide variety of plants and has undertaken a comparative study of growth of *leucaena leucocephala*, para rubber, eucalyptus and purging nut. In addition, the centre has promoted lac breeding and annually propagated over 500,000 seedlings of a vast array of plants for distribution to local farmers.



9. Agricultural Promotion Work

In its studies and experiments, the Puparn Royal Development Study Centre applies agricultural knowledge until it achieves satisfactory results. In the hope that the farmers will adopt and apply the know-how, the centre explains everything through demonstrations. For example, mushroom cultivation is promoted by erecting structures for cultivation. At the same time, an integrated agriculture model demonstrates how mushroom cultivation can be combined with high-yielding orchards of Mango, *Srithong* Tamarind, and *Chompa Gob* Jackfruit.

10. Central Administration Work

Study centre officials collaborate with other agencies and facilitate their activities at the centre.

11. Public Health Promotion Work

The Puparn Royal Development Study Centre encourages local people to be self-reliant in terms of basic healthcare. This involves taking a fundamental approach to public health involving healthy lifestyle choices. A higher quality of life results. For its part, the study centre has improved environmental sanitation and supplies the people with sufficient clean water for consumption, accounting for 97% of their needs, while achieving a high good health index rating of 85%.

The study centre has also hosted training on how to use Thai herbs for health and medicinal purposes, developed a herb garden and propagated plants.

12. Training and Technology Dissemination Work

The Puparn Royal Development Study Centre disseminates research results and agriculture know-how to people living in its surrounding villages and other provinces in the Northeast. It is hoped that as locals adopt the practical approaches they are advised to, and learn from the experience, their quality of life will be uplifted. In disseminating cultivation, fishery, animal husbandry and soil quality know-how, the centre gives over 1,000 locals a year the opportunity to attend training programs and supports them accordingly.

Simple tests and program evaluations of participants on each course are conducted. Course effectiveness is gauged by comparing pre-training and post-training scores. The evaluations have found 56% to be the average pre-training score, rising to 79% post-training, clearly testifying to the gain in knowledge of how to make the best use of the land.

Dissemination of Development Approaches

The Puparn Royal Development Study Centre disseminates models of integrated agriculture practices to locals as follows:

"New Theory" agricultural practice according King Rama IX's initiative

New Theory advocates a self-sufficient living among farmers who have limited rice-growing resources that are adequate to provide for their family and who have sufficient water in the dry season.



Extension of development results to villagers in a collaborative manner

Officials work closely together in development fields such as plants, fishery, livestock, forestry, and land development, all under the same framework and using similar work plans. The study, research and development promotion teams join forces to come up with practical solutions that they implement together under a unified framework. Above all, the implementation is required to provide an opportunity for farmers to choose their own development paths according to what will generate the most benefits.

Emphasis on "human development"

To ensure successful implementation of integrated agriculture based on the New Theory farming practice, the study centre cultivates understanding by passing on research findings and experimentation results to over 10,000 concerned locals by enjoining them to attend fundamental training sessions. Moreover, on-site support services are provided to around 2,000 farmers to improve their cultivation expertise.

• Positive Changes and Achievements at the Puparn Royal Development Study Centre

In 1983, prevailing geographical conditions at Na Nok Khao Village in Huai Yang Subdistrict, Mueang District, Sakon Nakhon Province, included deficient forest, soil and water resources and poor fertility. More specifically:

Forest – What was formerly mixed deciduous forest had been devastated by locals intruding to cultivate crops and raise animals. Drought and arid soil had ensued.

Soil – Low-quality, thick sandy lateritic soil pervaded, along with saline soil and clay beneath. Water retention was poor.

Water – Rain was the prevailing source of water for agriculture leaving farmers vulnerable to the vagaries of the weather. Water was often in short supply and soil aridity was a persistent problem.

As a result, yield levels of the major crops of rice and cassava and others were low. Cultivation also faced pests and plant diseases while animal husbandry faced epidemics among cows, buffalos, ducks, chickens and pigs alike.

The inevitable consequences included low incomes, averaging only 13,000 Baht per household per year, and commensurate poverty. The locals received no education that would benefit their livelihoods. The households also lacked proper hygiene, resulting in poor health and low quality of life.

Following its establishment, the Puparn Royal Development Study Centre, in collaboration with other government agencies, implemented development approaches that directly assisted the Northeast's residents. This strategy bore several fruits:

– Promotion of forest conservation and development surrounding the centre using irrigation systems. Four reservoirs were constructed with total storage capacity of 5,950,000 m^3. Equipped with water distribution systems, the reservoirs supply water to 368 hectares (2,300 rai) of land. In addition, check dams were built to store water for consumption and agricultural use. From being infertile and lacking moisture, areas surrounding the centre were transformed into abundant forest and natural water resources and sound fertility.

– Promotion of industrial crop cultivation and produce processing into agro-industrial commodities. To solve the lateritic problem, soil condition has been rehabilitated by implementing "deep cultivation" (digging up lower layers of soil to mix them with the upper layer, ploughing up and over using tractors, and nurturing soil with compost and other organic matter, so plants can grow well in the improved soil). The study centre has also successfully encouraged farmers to grow healthy, high-yielding crop varieties that have agro-industrial development potential. The study centre's solutions have taken infertile soil incapable of supporting plant life, rendered it fertile again, and shown how it can be used to cultivate a wide variety of plants, including rice, corn, several kinds of beans, mango, jackfruit, tamarind, lychee, longan, rambutan, and more, along with para rubber.

– Promotion and development of agricultural occupations. The study centre has enabled animal husbandry and fishery activity among farmers by presenting them with low-cost methods of raising healthy, disease-resistant animals suited to the prevailing geographical conditions. The study centre has demonstrated effective approaches to raising dairy cattle, beef cattle, Meishan swine, Muscovy ducks and native chickens. Along the way it has propagated 60 thriving animal-raising groups in surrounding villages. Moreover, the centre has experimented with the integrated fish and native chickens or Meishan pigs farming.






ศูนย์ศึกษาการพัฒนาอันเนื่องมาจากพระราชดำริ
งานศึกษาระบบการเกษตรแบบยั่งยืน
การศึกษาระบบพืชร่วม

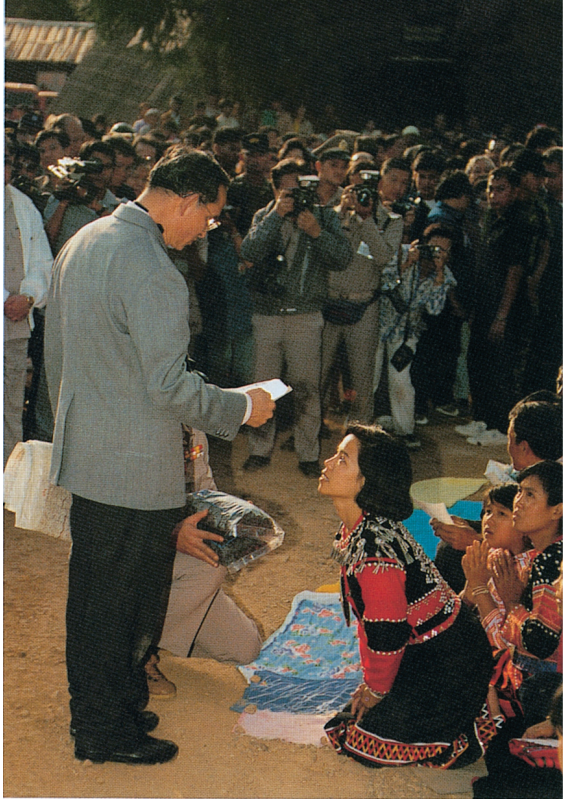
– **A study and research centre specialised in agricultural development which promptly and efficiently disseminates practical, applicable technologies and know-how that directly benefits farming communities in the Northeast.** The demonstrations have been provided to farmers, so they could apply knowledge to their land.

These achievements have given the locals wider choices and more opportunities for making a living. They have reduced the risks they face and assured them of steady income. Evaluations of the study centre's operations in 1991 revealed that 60.6% of local people participating in the training found it to be of great benefit. Moreover, 51.1% of the participants who applied the knowledge they acquired to their land saw their incomes increase, and 35.0% of all participants earned 1,000 – 9,000 baht more in a year.

The locals gained both direct and indirect benefits. Average annual income per household increased from 13,000 baht in 1983 to 21,000 baht in 1986 and 36,522 baht in 1996. Provision of comprehensive public utilities and support, along with good hygiene and sanitation, flowing from the study centre's initiatives positively impacted the people in many ways. All this simply stemmed from focusing on building up fundamental resources, especially forest, soil and water, that could form the basis of the people's livelihoods according to the principle of self-sufficiency.

In the ten years and counting since it arrived on the scene, the Puparn Royal Development Study Centre has conducted considerable research and studies into areas of agriculture and cultivation that farmers living nearby now utilise to earn better livings than they have ever enjoyed before. The research and studies have brought major benefits not only to farmers who live around the centre and beyond, but also to the many academics who frequently visit the centre for information and assistance. These sufficiency-based development approaches have directly resulted in higher income levels, made learning opportunities widely available and facilitated practical applications of the know-how on the farmers' land.

The Puparn Royal Development Study Centre's outstanding performance has uplifted the quality of life for thousands of farmers and their families. Land in the Northeast that was arid and infertile now abounds with useful organic matter. And all as a direct result of His Majesty the King's benevolent and insightful wishes for the centre to serve as truly a **"living natural museum"** and truly a **"model for the development of the Northeastern Region"**.





Huai Hong Khrai Royal Development Study Centre
Doi Saket District, Chiang Mai Province

• History of His Majesty the King's First Royal Visits to the North

On 27 February 1958, His Majesty King Bhumibol Adulyadej and Her Majesty Queen Sirikit visited their people in the North of Thailand. Embarking by train from Chitralada Station, they passed through Ayutthaya, Lop Buri, Takhli, Nakhon Sawan, Phichit, and Phitsanulok, stopping at stations to visit provincial governors, government officials and local people waiting to greet them.

On arrival in Phitsanulok Province, Their Majesties the King and Queen graciously granted a royal audience to government officials and people who had come to greet them. Then Their Majesties proceeded by royal conveyance to Phra Si Rattana Mahathat Temple to pay homage to the Buddha Chinarat, take in the historical sites, and visit the large crowds.

Their Majesties continued on their journey to Sukhothai Province where they visited several historical sites at Si Satchanalai Historical Park. They paid homage and made offerings at the monument to King Ramkhamhaeng the Great, and visited local people, then headed to Tak Province where they stayed overnight.

As they toured the North, large crowds greeted the royal couple wherever they went. Their Majesties stopped their royal conveyance intermittently to ask the people about their lives

and livelihoods and to accept touching offerings the people presented to them. Their Majesties, at the same time, presented the people with sums of money as a token of remembrance.

On 4 March 1958, His Majesty King Bhumibol Adulyadej and Her Majesty Queen Sirikit arrived at the construction site of Bhumibol Dam in Sam Ngao District, Tak Province, to inspect the construction progress. Embarking by Jeep arranged by the Royal Irrigation Department, Their Majesties inspected the site wearing the same style safety helmets that the Royal Irrigation Department engineers wear while working on-site.

From Tak, Their Majesties proceeded to Lampang and Lamphun provinces to visit people there before heading to Chiang Mai Province. Arriving in Chiang Mai Province, Their Majesties went straight to Suan Dok Temple to pay homage to Phra Chao Kao Tue, a famous Buddha statue, and offer garlands and pay respects to the Three Kings Monument. Their Majesties next went up to pay homage to Phra That Doi Suthep, a well-known golden pagoda. As they descended from Doi Suthep, Their Majesties had a conversation with a crowd of locals and people from many hill tribes, including Miao, Karen and Yang. Some of the hill tribe people delightfully grabbed Their Majesties' hands, expressing their appreciation of Their Majesties' benevolence in granting them an audience.

Their Majesties travelled extensively in Chiang Mai Province visiting the local people in district after district.

After travelling all across Chiang Mai Province, Their Majesties the King and Queen continued their journey to Chiang Rai Province, then headed back south to Lampang, Phrae, and Nan provinces, before returning to Bangkok on 17 March 1958.

Their Majesties' first extensive travels through Northern Thailand made them more aware of the people's woes. Having identified hill tribe people's problem on occupation as the North's pressing issue, Their Majesties made several more visits to the region over the coming years.



Their Majesties expressed their wish to fully devote their time and efforts to visiting people in the Northern Region and graciously granted royal permission to construct Bhubing Palace on Buak Ha Mountain in Chiang Mai Province, where Their Majesties periodically stayed from 1962 onwards.

His Majesty King Bhumibol Adulyadej was to visit hill tribe people in many areas of Northern Thailand, witnessing first-hand devastation of forest areas across mountains to grow opium poppies and destructive slash-and-burn agriculture. Lacking forethought, these actions not only violate the law but perpetrate long-term destruction of watershed forest sheltering the sources of several rivers. His Majesty foresaw that if the destruction of watershed forests continued, the adverse and unexpected effects would be considerable.



His Majesty therefore came up with a practical solution by initiating the establishment of the Project under His Majesty's Patronage to support hill tribe people in 1969. His Majesty explained that:

> *"...Another very important issue is that, as far as I know, the way the hill tribe people cultivate their crops can lead our country to catastrophe: they deforest for their plantations in an incorrect way. If we all help them, it's like we are helping to sustain the goodness, the well-being and the security of people across the country. If the project succeeds in enabling these people to stay in the same place and enjoy a satisfactory life there in ways that support the policy of forest and soil conservation, it will generate sustainable benefits..."*

The project was duly renamed as the Project under His Majesty's Patronage for Hill Tribe People Development and the Royal Project in the Northern Region respectively.

• His Majesty King Bhumibol Adulyadej's Royal Visits to the North and Northern Region Development Initiatives Prior to Founding Huai Hong Khrai Royal Development Study Centre on 11 December 1979

On 5 January 1972, His Majesty King Bhumibol Adulyadej arrived at Pang Kwai Village in Mae Ngon Subdistrict, Fang District, by helicopter to inspect field crop yields harvested from hill tribe plantations. His Majesty graciously granted his idea for cultivation to Mr. Yaofoei Saechao, head of the hill tribe developers. His Majesty also expressed his concerns regarding water consumption and management and stressed that well-considered water use would be of great benefit not only to hill tribe people but people living in low-lying areas.

On 5 January 1973, His Majesty King Bhumibol Adulyadej paid a royal visit to Khun Klang Village, Moo 13, Bon Luang Subdistrict, Chom Thong District, Chiang Mai Province. His Majesty graciously granted his guidance to the village headman to accelerate afforestation along mountain ridges and nearby water sources to prevent soil degradation and erosion. The afforestation would also retain water and moisture.

On 28 January 1974, His Majesty King Bhumibol Adulyadej visited his subjects at Phui Village in Mae Chaem District, Chiang Mai Province, where he inspected water storage containers equipped with pipes that channelled water to them from the stream. His Majesty gave his suggestion to Mr. Anan Isaraseri, Lecturer in the Faculty of Agriculture, Chiang Mai University, to grow trees beside the streams as this would help serve as a model for the locals to follow and start planting trees themselves for soil conservation.

On 24 January 1977, His Majesty King Bhumibol Adulyadej arrived at the 14th Unit of the Experimentation of Watershed Development Project at Pang Hin Fon in Huai Phap Subdistrict, Mae Chaem District, Chiang Mai Province. His Majesty inspected the experimental reforestation plots and the seedling nursery centre. His Majesty informed Mr. Uthai Chanphaka, Chief of Water Conservation, and Mr. Decha Chumkasian, that:



"...Reforestation must be implemented in line with a plan, in conjunction with uplifting the quality of life of hill tribe people. Concerned officials at the Royal Forest Department, the Royal Irrigation Department, and the Department of Agriculture should join forces to conduct a survey of watersheds in areas under their responsibility and draw up improvement and associated occupational development plans. For the trees to be reforested in areas where forests have been devastated, fast-growing varieties of trees that offer a range of benefits should be grown together. Ground cover plants should be grown along watercourses to hold the soil and retain moisture.

Moreover, small weirs should be built to channel water to plantations on both sides. Water flowing along the weirs also increases moisture in nearby areas.

However, the officials are suggested to explain to locals that the decreased levels in natural water sources stem from watershed deforestation undertaken without awareness of the important roles the forest plays..."

On Wednesday, 26 January 1977, His Majesty King Bhumibol Adulyadej arrived at the Mae La River Basin Area Development Project in Pong Yaeng Subdistrict, Mae Rim District, Chiang Mai Province, and spoke as follows:

"...Reforestation along the mountain ridges should be carried out by growing different varieties of trees that would bring several benefits by providing fruit, construction timber, and firewood that the locals always use. When trees are cut down, replacement trees should be planted with all haste..."

On 28 January 1977, His Majesty King Bhumibol Adulyadej paid a royal visit to Mai Lisu Village, Mueang Haeng Subdistrict, Chiang Dao District and graciously granted his initiative that:

"...Reforestation should be immediately undertaken by growing ground cover plants along the water channels. This helps spread moisture and increases the amount of water available for irrigation..."

On Wednesday, 16 February 1977, His Majesty King Bhumibol Adulyadej paid a royal visit to San Kamphaeng Cooperative Village Project in Don Tai Subdistrict, San Kamphaeng District, Chiang Mai Province where His Majesty was greeted by Mr. Prakob Hutasingha, Chairman of the Board of San Kamphaeng Cooperative Village Project. His Majesty granted his idea that:



"...To conserve water sources and supply water for the project's irrigation system, the Royal Forest Department and the Royal Irrigation Department must survey water sources. They must also implement reforestation both inside and outside the project's areas by growing ground cover plants in watershed areas. Meanwhile, small check dams should be built across watercourses to create water storage areas that can retain moisture for forests in the areas in the symbiotic manner. The evaporation rate from water storage areas will be less if there are forests..."

His Majesty's idea granted at San Kamphaeng Cooperative Village reflected that its geographical features and soil condition was similar to the adjacent areas at the Huai Hong Khrai Royal Development Study Centre. The royal initiative on check dam was from time to time mentioned and His Majesty granted his idea again on 28 February 1977 at Na Chon Village, Mae Na Chon Subdistrict, Mae Chaem District, Chiang Mai Province that:

"...Small check dams should be built at regular intervals above the previous check dams to create small ponds. This will help forests retain moisture, restore arid areas to their former fertile condition, while conserving watersheds..."

The historical record of His Majesty King Bhumibol Adulyadej's royal visit to Huai Hong Khrai Reservoir, located at the 4th Cooperative Village of Mae Pong Subdistrict, Doi Saket District, on 23 February 1980, reveals that the reservoir was duly renamed "Huai Hong Khrai Royal Development Study Centre".

The record shows that:

His Majesty King Bhumibol Adulyadej graciously visited San Kamphaeng Cooperative Village Project and locals living in San Kamphaeng District, Chiang Mai Province.

Upon arrival at Huai Hong Khrai Reservoir located in the area of the 4th Cooperative Village of Mae Pong Subdistrict, Doi Saket District, His Majesty entered the pavilion to see a plan of the layout of San Kamphaeng Cooperative Village Project and Huai Hong Khrai Reservoir. The Office of Accelerated Rural Development was in charge of constructing a reservoir with a capacity of 2,000,000 m^3 of water to supply 160 hectares (1,000 rai) of plantations of the project and areas beyond it. On this occasion, His Majesty graciously granted his guidance to the project's committee that in order to rectify the aridity of the area, a survey should be made of its natural streams to see where to build check dams to store water. Some of the water could support the reservoir in the project and for plantations and pastures. Moreover, storage containers should be built at regular intervals to distribute water to the surrounding areas. This would be the most efficient way of using water wisely. Areas that could not be cultivated could still be developed into pasture.

The conclusions reflected His Majesty's study of geographical conditions at the Huai Hong Khrai Royal Development Study Centre beforehand.

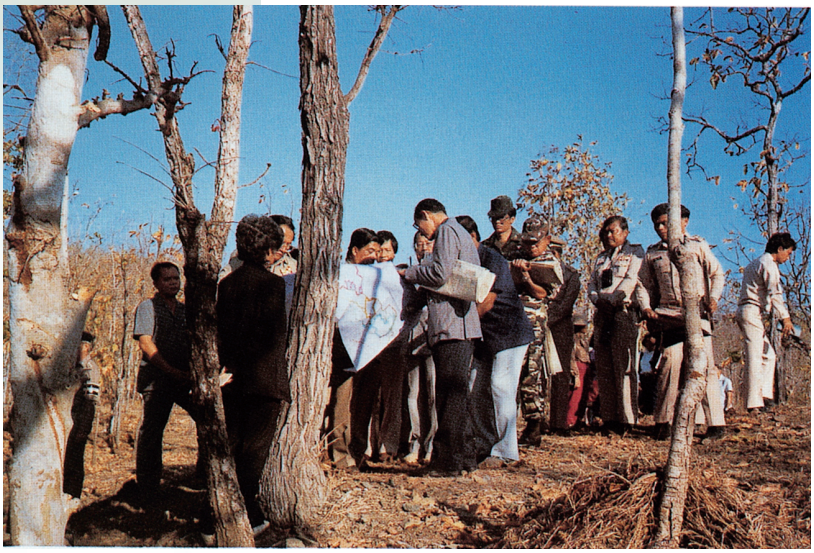
A year later, on 23 February 1981, His Majesty paid a royal visit to the irrigation project at Doi Saket, Chiang Mai Province, where His Majesty shared the royal initiatives with representatives of related government agencies that:

"...Water can permeate into the ground in the area around the reservoir. A solution would be to build subsurface dikes in the concerned forestry and

plantation areas which would enhance moisture there. Such projects have already proved effective in the Northeastern Region. Moreover, water sources in the area above the irrigation project should be surveyed with a view to build cost-saving check dams which would create more moisture in the areas and gradually transform the degraded forest into fertile one…"

As such, His Majesty King Bhumibol Adulyadej's royal visits to the areas around the Huai Hong Khrai Royal Development Study Centre, and his initiatives on check dam and reforestation, clearly preceded implementation of the various development projects undertaken within the study centre.

The historical fact of the establishment of the Huai Hong Khrai Royal Development Study Centre in Doi Saket District, Chiang Mai Province, was recorded in the document graciously presented by His Majesty the King on 19 June 1997, at Klai Kangwol Palace in Hua Hin District, Prachuap Khiri Khan Province. The document recorded that:



"…Regarding the old agenda from 22 February 1982, I inspected the Lower Huai Hong Khrai Dam built for the benefit of the locals in San Kamphaeng Cooperative Village, and consulted with Mr. Thinnakorn Khomkrit, a livestock specialist, about raising dairy cattle in the area above the dam. Mr. Thinnakorn said that the area was quite rocky, and only a couple of cattle could be raised there. In all, he said, it was not worth investing in.

The thought immediately occurred to me that if I acquired that land, I could make people envious of it very much in five years…"

"…On 11 December 1982, I asked for permission to set up Huai Hong Khrai Royal Development Study Centre in the area of the Huai Hong Khrai Basin which covers a total area of about 1,360 hectares (8,500 rai). At that time, the forestlands in this area were deteriorated due to the illegal forest encroachment and forest fires. The soil was washed out, remaining only laterite stones and pebbles…"



For the land at the Huai Hong Khrai Royal Development Study Centre, His Majesty King Bhumibol Adulyadej analysed the soil condition as:

"...The Huai Hong Khrai Royal Development Study Centre: Rocks, pebbles and arid land..."

As for the causes of the problems, His Majesty noted that:

"...The forests have been destroyed. During the rainy season, the soil is washed away until there are only rocks and pebbles left..."

In the initial stage of the development by the Huai Hong Khrai Royal Development Study Centre, His Majesty assessed the situation as follows:

"...a) At the lower area, there is the Huai Hong Khrai Reservoir. However, other natural water sources are dried up. Reservoir and weir construction needs to be urgently undertaken to retain soil moisture and improve soil quality.

b) The first step is to divert water from Mae Lai Stream downward to small reservoirs arranged in descending order from the top area to the Huai Hong Khrai Reservoir. Check dams will be built across small streams. The water will be channelled from the small reservoirs to the small streams so that the degraded forests will be steadily rehabilitated and become fully fertile again. No need for much reforestation. Moreover, areas near Huai Hong Khrai Reservoir where the incline is not too steep can be used to grow field crops. Fish can also be raised in the reservoir. The irrigation system will be built between 1984 and 1989.

c) Once the irrigation system is finished, the land can be divided into different areas as follows:



1. Highland areas and former fertile forest will be rehabilitated into the following areas:

1) Areas with constant irrigation by check dam and irrigation channel



2) Areas with dried up streams occasionally irrigated by rainwater-collecting check dams and irrigation

3) Areas with dry streams solely supplied by rainwater-collecting check dams

4) Areas with dry streams solely supplied with water from nature (without check dam supply)

For these four cases mentioned above, the forest should be additionally planted.

2. Soil comprised of rocks, pebbles, sand, and laterite needs to be improved so that it can develop to be pasture for livestock, field crops, and horticulture.

3. Areas close to Huai Hong Khrai Reservoir are for planting rice.

4. Fish can be raised in the Huai Hong Khrai Reservoir mutually managed by a fishery group or cooperative. After five years of operation, positive results will be obvious. After about ten years, the extent of the success will be even clearer. Soil conservation using water and vetiver will sharply accelerate the land's return to fertility..."



• Huai Hong Khrai Royal Development Study Centre

Location

The Huai Hong Khrai Royal Development Study Centre is situated in Pa Miang and Mae Pong Subdistricts, Doi Saket District, Chiang Mai Province. The location is about 27 kilometres northeast of Chiang Mai downtown

and on the right-hand side of the Chiang Mai – Chiang Rai Road (Highway 118), approximately two kilometres from the road.

Soil types and land use

According to a survey of soil types in the Huai Hong Khrai River Basin, most of the soil is derived from weathering of volcanic rock and sedimentary rock. More specifically, soil types and land use in the Huai Hong Khrai River Basin can be classified into five types as follows:

1. Soil derived from weathering of volcanic rock has moderate fertility, suitable for growing fruit trees and forest.

2. Soil derived from weathering of sedimentary rock has moderate fertility, suitable for growing forest.

3. Soil derived from weathering of sedimentary rocks, similarly to (2), has a thicker layer of topsoil that can support fruit trees.

4. Soil derived from similar weathering to (2) and (3) is more fertile and suitable for food crop cultivation.

5. Soil derived from similar weathering to (2), (3), and (4) has a thinner layer of topsoil that is suited to pasture.

Soil conditions in the Huai Hong Khrai River Basin can support various usages to attain different benefits. However, the topsoil should not be dug over for agriculture only. Based on the land use survey, the development activities can be divided as follows:

1. Forest development

2. Fruit tree experimentation

3. Plant community experimentation

4. Pasture development

5. Fishery development

Provision of Proper Water Sources Inside the Centre

Most of the centre's area should be developed and conserved its fertility and develop. Recognising this, the Huai Hong Khrai Royal Development Study Centre drew up approaches to the provision of proper water sources as follows:



1. Moderate height check dams need to be built across Huai Hong Khrai Stream and its branches to store water and retain moisture for watershed areas.

2. To create a path in the areas cutting across streams and water channels, dikes must be built to keep the water. Earthen dikes should also be built across several small watercourses to retain moisture all year round in the area.

• Royal Initiatives for the Establishment and Operation of the Huai Hong Khrai Royal Development Study Centre

The Huai Hong Khrai Royal Development Study Centre was established in the area of Khun Mae Kuang Forest, Doi Saket District, Chiang Mai Province, in response to His Majesty the King's initiatives granted on 11 December 1982. The study centre covers an approximate area of 1,360 hectares (8,500 rai). According to His Majesty's wishes, the centre is the place to conduct a study, research and experimentation identifying development approaches suited to the geographical conditions of the North; and to disseminate such information among people to enable them to apply on their lands. The centre's studies focus on three types of forest planting for four benefits, that is, trees for multipurpose uses, for fruits and for firewood which further facilitates soil and water conservation with moisture retention in watershed areas as the fourth benefit. The centre has also studied forest fertility in the upstream while downstream is focused on fishery in the reservoirs, agriculture, livestock and dairy cattle, as well as agro-industry. Accordingly, the study centre is served as a comprehensive hub providing benefits to anyone who comes to see activities at the centre for further applying on their lands. This conforms to the royal initiative that:





"...The royal development study centre should be like a living natural museum..."

In other words, it serves as a **"development outcomes"** where the public can learn and apply knowledge. To achieve these ends, the centre's development approaches are as follows:

1. Particularly emphasise on watershed conservation in response to the royal initiative on forest fire control using wet fire breaks together with watershed forest development.

2. Create different sizes of water sources and different types of water storage so as to retard water flow and supply water to irrigation area of 160 hectares (1,000 rai) for cultivation.

3. Encourage people living in villages around Huai Hong Khrai Reservoir alloted in the project plan by the Office of Accelerated Rural Development to participate in the centre's undertakings while the Department of Fisheries develops appropriate systems for catching aquatic fauna.

4. Develop part of the centre into pasture for dairy cattle or beef cattle.

5. Develop agro-industry as highlighted by the royal guidance, including cultivation of shallot, garlic, stevia, medicinal herbs and scented wood.

6. Consider using a part of land to establish demonstration plots operated by related government agencies for comprehensive studies of plant varieties and use the down stream area of the reservoir to show how land can be cultivated.

7. Assign the Royal Irrigation Department to be the key agency overseeing the centre's activities.



On Friday, 3 February 1984, His Majesty King Bhumibol Adulyadej, accompanied by Her Royal Highness Princess Maha Chakri Sirindhorn, drove a royal conveyance from Bhubing Palace to the Huai Hong Khrai Royal Development Study Centre in Doi Saket District, Chiang Mai Province, and graciously gave his guidance that:

"...The main objective of this project is to urgently rehabilitate and conserve the Huai Hong Khrai watersheds, which are now dry, using modern methods. For example, we can divert water from reservoirs located uphill to water channels to spread moisture. The rest of water will flow downward to low-lying reservoirs from which water can be used for agriculture. At the same time, we should reforest along those water channels since there is more moisture than that at the mountain ridge. In doing so, the situation will improve quickly. This method also saves seedlings and saves forest from fires. As the water channels retain more moisture, check dams should be built across them at regular intervals to store water. Bamboo pipelines should be used along both sides of the water channels to carry the water. This method spreads moisture all along the water channels. As for fisheries, we should start to control, manage, and conserve fish species while promoting fishing in an orderly manner. This will also enable the people to gain benefits equally. Regarding agriculture such as economic crops and dairy cattle, small groups can be formed which can develop to be cooperatives as appropriate. At the same time, agro-industry should be studied so as that when we encounter oversupplies of agricultural produce, we can process them for preservation for some time that can be sold later..."



• Administration

In establishing Office of the Royal Development Projects Board (ORDPB), the following appointments were made:

– Executive Committee for the Administration of the Royal Development Study Centres Project: His Serene Highness Prince Chakraband Pensiri Chakrabandhu, the then Privy Councillor, was appointed as Chairman of the Executive Committee while the Secretary-General of the Royal Development Projects Board was appointed as Vice Chairman; together with the appointment of representatives of related organisations as members of various related committees.

– Subcommittee on Master Planning, Monitoring and Evaluation of the Royal Development Study Centres Project: The Secretary-General of the Royal Development Projects Board was appointed as Chairman of the Subcommittee and representatives of related organisations were appointed as members of Subcommittees.

When His Serene Highness Prince Chakraband Pensiri Chakrabandhu passed away, the prime minister at that time as the Chairman of the Royal Development Projects Board appointed H.E. Mr. Chulanop Snidvongs Na Ayudhya, the then Privy Councillor, as Chairman of the Executive Committee for the Administration of the Royal Development Study Centres Project.

• Operational Sites

The Huai Hong Khrai Royal Development Study Centre's operational sites and branches are as follows:

1. Huai Hong Khrai Royal Development Study Centre in Doi Saket District, Chiang Mai Province: In line with its operational sites and land use plan based on His Majesty's royal initiatives, this site comprises five sectors:

– Rain-fed areas for forest development

These areas include the centre's steep-sloping upper area inaccessible to irrigation, and part of the lower area that derives water from Reservoir 1, as otherwise it does not have enough water and, as such, cannot supply water in the streams in same areas. In the west of the centre, check dams are built for forest development area and for storing rainwater. Besides, the area has been reforested by planting more trees in existing forest that has been devastated or has low density. Such forest is nurtured by cutting down trees, preventing deforestation and illegal digging up of bamboo shoots, and implementing forest fire prevention measures. Another part of the area adjacent to Reservoir 2 is used to breed wildlife to develop watersheds. The whole rain-fed areas for forest development cover 960 hectares (6,000 rai).



- Irrigated areas for forest development

These areas are located in the East. Water is supplied from Reservoir 1 through pipes along the mountain ridges. Check dams at regular intervals across streams store water and also increase surface- and ground-water levels. Irrigation canals have been dug in a small fish-bone system irrigation canal to disperse water to both sides of the check dams and increase soil moisture. This creates wet fire breaks that reduce forest fire severity. Some forest areas have been planted with additional trees, conserved and nurtured. Some areas have been developed into pasture and planted with fruit trees to feed wildlife. Moreover, bamboo, some indoor fruit trees, pepper, rattan, and macadamia have been planted altogether in forest areas. In sum, intensive forest development has taken place in irrigated areas to bring multiple benefits. The whole irrigated areas for forest development cover approximately 128 hectares (800 rai).

- Agricultural development area

The area is in the middle of the river basin which is reserved for agro-industrial experimentation and integrated afforestation in the form of agro-forestry. The experiments have been carried cut to identify cultivation models and practices tailored to the social context of the upper Northern Region that conserve soil and water. Experiments have been conducted with, among others, rice, field crops, fruit trees, herbal plants, indigenous vegetables, flowering and ornamental plants, and plants for local industry. The area is also a place for collecting plant genetics, including indigenous trees and trees from other parts of Thailand and other countries. This area covers over 96 hectares (600 rai).

- Livestock development area

The area lies in lowlands adjacent to Reservoir 7 where is developed for animal husbandry. The animals are raised in the sparse forest to increase its value. At the same time, the methods for raising the animals suitable to the topographical conditions of the upper Northern Region; food productivity; increase in efficiency of forest growth; as well as distribution of trees are studied here. Mostly, the animals that are domesticated include dairy cattle, chickens, ducks, geese, and swine. The total area for livestock development is around 112 hectares (700 rai).



- Reservoir and fishery development area

This area is home to seven reservoirs. Three large reservoirs store and supply water to several areas. The other four reservoirs are used in fish culture experiments and to study water source management for fishery, mainly for Pang Riap Rua Village. The area is also used for recreational site and fishing. The total land area is 64 hectares (400 rai).

2. 1st Centre branch: The Royal-initiated Fruit and Flower Propagation Development Service Centre Project, Hang Dong District, Chiang Mai Province

3. 2nd Centre branch: The Royal-initiated Ping Sub-River Basin Integrated Development Project, Chom Thong District, Chiang Mai Province and Bang Hong District, Lamphun Province

4. 3rd Centre branch: The Royal-initiated Huai Larn Area Development Project, San Kamphaeng District, Chiang Mai Province

5. 4th Centre branch: The Royal-initiated Khun Mae Kuang Forest Area Development Project, Doi Saket District, Chiang Mai Province

6. 5th Centre branch: The Doi Tung (Implementation Site) Development Project, Mae Fa Luang District, Chiang Rai Province





• Operation of the Huai Hong Khrai Royal Development Study Centre

The Huai Hong Khrai Royal Development Study Centre has been successful to a considerable extent. Its success is apparent in its fundamental infrastructure, effective studies, and research and experimentation record. It is also evident in its harmonious coordination and collaboration with governmental agencies and the services it provides to farmers in the target areas, surrounding villages as well as various organisations and the general public. The work it has carried out since its inception falls into two main sections:

Section 1: Studies, Research & Experimentation

1. Water Source Study and Development Work

Studies are carried out to find ways to provide water to support the study centre's various development tasks. These studies focus in particular on development of check dam in watershed area to create water storage and maintain soil moisture through the dry season. Fish-bone system irrigation canals are arranged to disperse water and increase soil moisture, facilitating reforestation and creating wet fire breaks. Reservoirs are constructed to catch water flowing from high to low areas, to support cultivation, animal husbandry and fisheries.

Remarks: Presently, there are six centre branches. The sixth one is the Royal-initiated Mae Ao River Basin Area Development Project, Pa Sang District, Lamphun Province.

Activities include:

- Connecting small river basins is operated as a guideline for further development on connecting larger river basins in the future.

- Construction of reservoirs for water storage

- Laying down water dispersion system is made to facilitate forest fire prevention, create moisture, and bring about physical changes of forest ecology in the reforestation area using irrigation system across 128 hectares (800 rai) including the installation of water distribution system and 80 check dams.

- Installing water distribution system is operated using different sizes of PVC pipes to deliver water to the livestock study and development area of 184 hectares (1,150 rai).

- Laying down water dispersion system is studied to increase moisture from mountain ridges through streams with connecting system using pipes and small reservoirs along the ridges together with stone check dams at the end of the reservoirs.



- Retaining moisture along the natural streams especially in the dry season by building earthen check dams. According to the study, it is found that the check dams that have been built for 2 - 3 years can store water as effectively as the permanent ones because the fallen leaves and twigs accumulated at the check dam ridge enhance efficient water storage.

2. Forestry Study and Development Work

In the quest for proper techniques and technologies to rehabilitate watershed in the North, the following implementations have been carried out:

- Area protection and forest fire prevention: The forest fires have been prevented by devising wet fire breaks with fish-bone system irrigation canals that widely disperse water. This method has prevented forest fires in the 242.56 hectares (1,516 rai) of irrigated forest development areas. It has also restored deteriorated forests to their original abundance and transformed sandy soil with friable soil and rocks into fertile black soil rich in nutrients.

- Planting three types of forest trees: Trees for multipurpose uses, for food, and for firewood are planted. The principle for planting the various types of trees is to plant the trees from the top of mountain ridges using trees which have seeds to allow the natural dispersion of seeds from the top of the mountain to the low ground. This method will create thick and dense forests.

- Agro-forestry study: Forestry development and economic development are studied hand-in-hand.

– Ecosystem studies in irrigated areas: It is found that dipterocarp forest ecosystem in irrigated areas has been improved with clearly noticeable increases in *dipterocarpus tuberculatus*, Siamese rosewood, *morinda elliptica*, and *Rad* trees. The proliferation of trees creates an index of forest abundance and diversity that can be improved. The experiments were also found to increase forest canopy from one layer to two layers is also increased. It was also found that the growth rate of forest trees in irrigated areas during the dry season is higher than in non-irrigated areas.



– Watershed research: Research on meteorology and hydrology in the river basin, planting in the agro-forestry system, soil erosion prevention, and topsoil loss reduction have been conducted.

– Breeding wildlife: Studies are made on ways to breed wildlife, ungulates and poultry.

3. Land development studies

Land study and development work has been undertaken in support of operations of other related government agencies in making use of the land properly and suitably to the land's capability and activities as planned. The studies include:

– Development methods and models of soil and water conservation tailored to the Upper Northern Region

– Optimising land with deficient fertility inappropriate for cultivation to achieve higher crop yields

– Impacts of forest development on moisture conditions in forest areas

– Impacts of land use on hydrological conditions in the Huai Hong Khrai river basin

4. Cultivation Study and Experiment Work

Cultivation and experimentation on a vast variety of plants has been operated accordingly such as horticulture crops, vegetables, field crops and rice. In each case, the studies sought to identify varieties suited to the prevailing geographical conditions while producing and propagating seeds for distribution to farmers. The implementation can be summarised as follows:

- Horticulture work is carried out across 40 hectares (250 rai), comprising:

  - Fruit trees: mango, lychee, sweet tamarind, longan, jackfruit, and pomelo

  - Industrial crops: pineapple, passion fruit, para rubber, macadamia, and cashew

  - Vegetables: plants in the leguminosae, cucurbitaceae, and solanaceae families. With their short roots, these plants can grow well and improve soil quality and water absorption. However, if planted repeatedly in the same area, they will become vulnerable to pests. Crop rotation and mixing vegetables with pest- and disease-resistant medicinal plants are good solutions namely *Derris*, tomato leaf, tobacco leaf, custard apple leaf, and neem. It is found that these can prevent common cutworm, diamondback moths and aphids. Growing vegetables under the shade nets to reduce chemical use and using microorganism prove effective in avoiding castor semi-looper and common cutworm.

- Field crop work comprises growing soybean, peanut, cowpea, pigeon pea, sunflower, and sweet corn. Studies aim to demonstrate and propagate field crop varieties that are cultivated in experimental plots. One variety that has been proved particularly successful is Chiang Mai 60 Soybean which is already distributed to farmers.

- Rice work comprises experimental cultivation of Kor Khor rice varieties grown in both lowland and upland areas. The produce is mainly due to the amount of water and soil fertility. Upland varieties such as Sio Mae Chan, Aree 258, and Fnur 7505, produce satisfactory yields. Khao Chao Khao, another upland variety, is low-yielding while, Khao Chao Suphan Buri 90, a lowland variety, is high-yielding.

- Mushroom work comprises angel, oyster, Abalone, Shiitake and Champignon mushrooms. The studies have found that all the aforesaid varieties thrive in the prevailing environmental conditions.

Besides the above, approximately 120 medicinal plant varieties and sandalwood trees are collected and studied.

5. Intensive Agriculture Study and Development Work

This involves planting a wide variety of perennial trees for consumption and for extra income. It also involves growing annual crops for food, medicinal purposes, and generating income. The studies can be broken down as follows:



– Industrial crop study work: Many varieties of industrial crops for which there is significant demand, including aloe vera, *kai* or *ternstroemia gymnanthera*, and paper mulberry have been experimented and propagated.

– Vegetable study and collection work: 98 varieties of indigenous vegetables have been studied to see how much yield they can produce and determine their nutritional values.

– Cultivation and study of field crops under different topographical conditions studies: Plants have been experimentally cultivated in a remote area, around a town, and in agro-industrial plots.

– Fragrant flowering plants collection work: Around 32 varieties of fragrant flowering plants have been collated to study their growth, of which the ten best-performing varieties have been propagated.

– Local farming practice work: Sustainable farming has been studied on 8 hectares (50 rai) of steep slopes.

– In addition, the centre has conserved plant genetics, and collected and propagated 68 varieties of indigenous vetiver grass.

6. Livestock and Dairy Cattle Study and Development Work

The study and research on dairy cattle and promotion of raising poultry and swine has been conducted. Consultancy service and regular visits to the surrounding villages have been offered as well.

7. Fishery Study and Development Work

The regulations for fishing in reservoirs and appropriate fishing techniques have been drawn up and explained. The knowledge on aquaculture in ways that prevent overfishing and other harms to fish species is also promoted. The regulations are applied by other reservoirs as well. The fishery operations can be summarised as follows:

– Fishery management of Huai Hong Khrai Reservoir 7, including establishing a fishery group comprised of villagers living around the centre. Currently the group has 25 members.

– Breeding fish and releasing them into reservoirs. The centre has demonstrated raising fish in floating baskets and raising Red Nile Tilapia fish in cylindrical cement ponds equipped with water-flow system. The demonstration shows how fish can be raised in the small streams that flow past villagers' houses by arranging ropes across the stream to trap fish while still allowing the water to flow.

– Fish raising promotions are followed up regularly.

8. Frog Species Conservation and Development Work



The conservation and development work has carried out studies and experiments on integrated frog farming and conservation. The farmers has been disseminated relevant academic knowledge, and marketing expertise, and supported frog breeding and distribution. Study areas have included maintaining natural environmental balance and achieving sustainability, developing occupations and raising various frog species, including East Asian frogs and bullfrogs that thrive in the Northern region's climate. Farmers have also been encouraged to raise the frogs in the centre's environs, the royal-initiated Khun Mae Kuang Forest Area Development Project, Kawila Nukul School, and villages in Mae Chaem District, Chiang Mai Province. Besides a project to return frogs to nature was set up whereby young East Asian frogs are released into forest areas inside the centre. After releasing the frogs, surveys found frogs thriving inside and outside the centre. Bird numbers, particularly black heron and white heron, were also found to be growing. Both findings clearly indicated improving food supply.

Section 2: Result Extension

The development of surrounding villages and disseminating technology among them was embarked in 1989. The operation has gone well, and its details are as follows:

– Forestry development work: The centre has hosted training and disseminated knowledge about forest fires and adverse effects of deforestation among villagers living around the centre.

– Land development work: The centre has provided the villagers with training on soil and water conservation.



– Agricultural promotion work: The study centre has promoted cultivation of fruit trees, industrial crops, field crops, rice in demonstration work, and integrated agriculture farming.

– Occupational promotion work in various cottage industries: The study centre has organised training courses on dressmaking and tailoring, weaving, mulberry-paper flower making, and food processing and preservation initiative among the groups of farmers' wives.

– Animal husbandry promotion work: The centre has provided training on beef cattle, dairy cattle and poultry raising.

– Fishery promotion work: The study centre has hosted training courses and promoted raising of various fresh water fish.

– Additionally, demonstration of land development according to the "New Theory" farming practice is set up for the people in the surrounding villages. Six farmers who have their own lands have joined the project and implemented the theory. They have dug eight water storage ponds on their lands, equipped with water system, that derive water from distribution canals. This increases the volume of water in the farmers' ponds with which they can grow fruit and use during the dry season.

• Achievements and Changes at Huai Hong Khrai Royal Development Study Centre and the Farmers in Surrounding Villages

In its roughly 17 years of operation, since 1982, the Huai Hong Khrai Royal Development Study Centre has advocated for residents of ten surrounding villages. Its various studies and experiments have satisfactorily achieved much, including the following:

Quality of Life

The index of villagers' well-being in the surrounding villages rose from 0.606 in 1992 to 0.684 in 1994 and 0.851 in 1996. Therefore, the index of villagers' well-being had improved from medium to high level. This index was in line with the guideline of the United Nations Development Programme (UNDP) Human Development Index of Quality of Life marking that an index of 0.800 – 1.00 signifies high-level quality of life.

Occupations

People living around the centre engage in a variety of occupations: 23.73% identifies as labourers; 11.49% works in paddy fields; 10.30% works in crop plantations and fields; and 6.87% is vendors. Most have a second occupation.

Land Tenure and Use



Agricultural land tenure is as follows: 71.14% holds land tenure, 85.47% has land title documents, and a few do not hold any land title documents and lease land to cultivate. Land use can be broken down as follows: workplace – 39.65%; home – 37.03%; home and workplace combined – 16.03%; leasing – 5.54%; unutilised – 1.75%. Most villagers' land of 50.84% is in irrigated area and most of them get more use from their land. Some 52.94% of the farmers switched from growing rice and field crops to cultivating fruits. 17.65% switched from field crops and a particular fruit variety to other field crops and more fruit varieties. 73.53% of the farmers followed the study centre's advice.



Economic Circumstances of Farmers

The average annual income of people living in villages surrounding the Huai Hong Khrai Royal Development Study Centre was 63,888 baht. The most common source of income was from labouring. Other sources of income and average rates are as follows: cultivation – 13,534 baht; animal husbandry – 7,566 baht; and commerce – 7,531 baht.



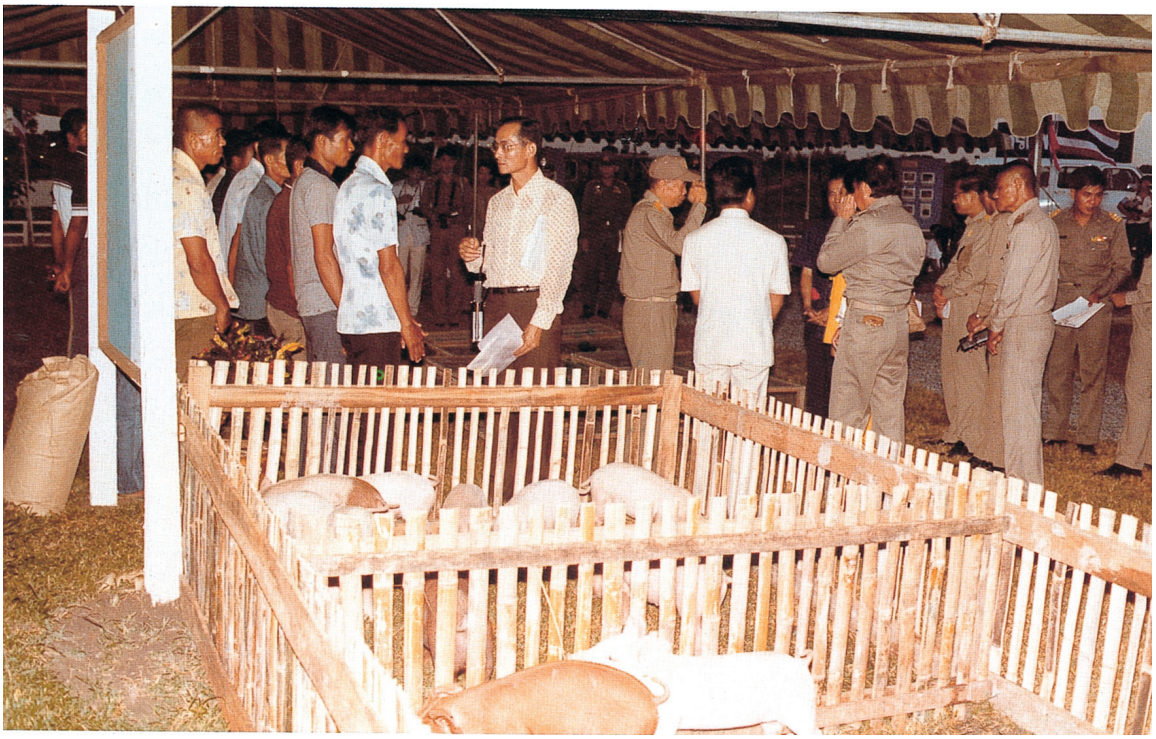
Moreover, 53.63% of surveyed villagers did not borrow money to invest in cultivation while the other 46.37% did. 49.16% of most people earned enough to cover their expenses.

Significantly, 44.13% of the people surveyed said that their economic circumstances had improved in the past five years, and 15.08% found that their economic circumstances had improved considerably. They attributed the improvement to the knowledge they gained from the Huai Hong Khrai Royal Development Study Centre in animal husbandry, fishery, integrated agriculture farming, and other fields.

Infrastructure

Villagers surrounding the study centre gained benefits from the construction of comprehensive infrastructure. Roads made transportation more convenient. Water source development made water available for consumption and agricultural use. Public utilities (such as electricity, water supply and etc.) also raised the standard of living.

To a great extent, the Huai Hong Khrai Royal Development Study Centre has achieved satisfactory and concrete results that have significantly improved the lives of people living in its environs and nearby areas. Today, it serves as a centre of study and experimentation in developing watershed area with the emphasis on water source and watershed forest development that enables water retention and keeps soil moist year-round, especially in the dry season. These are effective in preventing forest fires. Moreover, thanks to excellent collaboration between concerned agencies and, above all, His Majesty King Bhumibol Adulyadej's boundless benevolence, the Huai Hong Khrai Royal Development Study Centre has successfully spread awareness and appreciation of the importance of sustainable development to the local people.



Huai Sai Royal Development Study Centre
Sam Phraya Subdistrict, Cha-am District, Phetchaburi Province

- **History of His Majesty King Bhumibol's Royal Visits to this Region for Direct Exposure to His Subjects' Sufferings**

Following his accession to the throne and royal wedding, His Majesty King Bhumibol Adulyadej and Her Majesty Queen Sirikit graciously visited their people living around Klai Kangwol Palace in Hua Hin District, Prachuap Khiri Khan Province, where they would often stay temporarily.

Whenever their royal duties allowed, Their Majesties the King and Queen would pay visits to several areas in the region. Sometimes His Majesty drove a royal vehicle himself. As the roads then were far different from today, His Majesty faced difficulties along the routes but the experience made him aware of the people's socio-economic woes and inspired him to find solutions and initiate remedies to improve their well-being.

From 29 April 1950 onwards, Their Majesties the King and Queen stayed overnight at Klai Kangwol Palace every year. It thus became the cradle for hundreds of royal development projects. As the historical records testify, His Majesty initiated several of his earliest development projects in this region. Here's how the story unfolded.

The Huai Mongkol Road Project at Hin Lek Fai Subdistrict, Hua Hin District, Prachuap Khiri Khan Province, is regarded as His Majesty's first rural transportation development project. His Majesty granted permission to top executives of the Office of the Royal Development Projects Board (ORDPB), namely, Dr. Sumet Tantivejkul, Mr. Manoon Mookpradith and Mr. Pimolsak Suvanathat, at Chitralada Villa, Dusit Palace, on 17 March 1986. During the interview His Majesty disclosed that:



"...Construction of a road leading to Nong Phlub and Huai Sat Yai Project commenced in 1952. At the time, it was inaccessible...

So I went up there with a bulldozer and gave it to Naresuan Military Camp to help in the construction of a road to Huai Mongkol. That made it relatively easy to get to Huai Mongkol for the first time and now it only takes 20 minutes.

At that time, I set off by jeep between 8 and 9 o'clock in the morning and didn't arrive at Huai Mongkol until afternoon. The rough terrain constantly jolted the jeeps all over the place..."

This first-hand experience of His Majesty King Bhumibol Adulyadej led to the establishment of the "Ban Huai Mongkol" road construction, considered the first among His Majesty's most rural development projects.

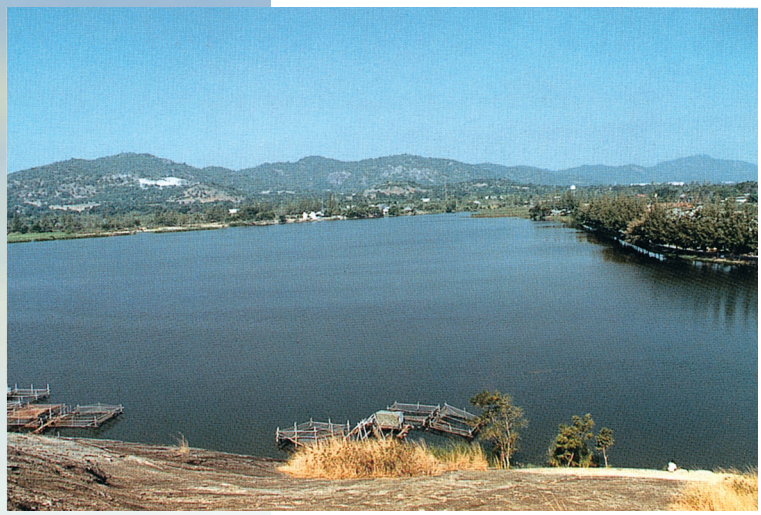
Another milestone event in the early annals of the royal development projects was His Majesty's personal visit to Khao Tao Village, Hua Hin District, Prachuap Khiri Khan Province, which led to the **"Khao Tao Resevoir Project"**, His Majesty's first water source development project. His Majesty graciously related that:



"...The building of Khao Tao Reservoir began in 1953, after I visited by Polo Jeep. The jeep had to drive through the mud pool locally called Ta Kard where seawater reached. After the water drained, the mud remained. No plants could survive. Only baby crabs could live there and so the area was unused..."

"...Then the Khao Tao Reservoir Project was originated. If the area is surrounded, it can create swamp or reservoir to keep rainwater. The water could then be used.

"...Milkfish could be taken from Khlongwan, Prachuap Khiri Khan, and released. The villagers could also form into groups to raise this fish..."



In 1953, His Majesty graciously granted the initiative to build a reservoir to ameliorate drought and the people's woes stemming from having insufficient water supply for consumption. Khao Tao Reservoir was His Majesty's first irrigation project and he backed it with his personal purse of 60,000 baht. His Majesty later recalled that:

"...I invested 60,000 baht out of my own pocket to build the first reservoir, so no government budget was used..."

"...You can ask the Royal Irrigation Department. Mr. Chuchart did it for me for 60,000 baht. The initial water storage capacity was rather low; however, the Royal Irrigation Department later enlarged the reservoir by building dikes and sluices. This 60,000 baht is used as initial fund without using government budget..."



The water source development at Khao Tao was instrumental in His Majesty developing irrigation expertise, as his experience in the field accumulated, became exceptional.

The list of royal development projects in Huai Sai Royal Development Study Centre's environs went on to include Hup Krapong, Don Khun Huai, Nong Phlub, Kui Buri, Ni Khom Khao Yai, that each had their own royal story to tell, including these highlights:

The Hup Krapong Project that is so renowned today extends over an area as large as the Huai Sai Royal Development Study Centre. His Majesty graciously set the project up with the aim of helping people whose livelihoods were troubled with low crop yields insufficient even to provide for their own families.

The history of the Hub Krapong Project was officially recorded from the royal address when His Majesty graciously granted permission to the then Secretary-General of the Office of the Royal Development Projects Board (ORDPB) and the ORDPB's executive team to interview him on the background of the **"Hup Krapong"** Project at Chitralada Villa on 17 March 1986. Excerpts are as follows:

> *"...Regarding Hup Krapong Agricultural Cooperative, when was it established? Not when I laid its foundation stone but several years earlier. We had already accomplished much in the area before we set up Hup Krapong as a village. The project wasn't established out of the blue and the village came later. The first involvement was at vegetable plot in Cha-am..."*

Also on the topic of Hub Krapong, His Majesty mentioned that:

> *"...Strangely, the history of Hup Krapong is relatively unknown to most people. It is an undocumented project. Many years back, raintrees lined the road from Bangkok to Hua Hin and Cha-am. Now, only a few are left. Mr. Suratern told me that sealing wax is an important commodity used in good quality paint. When lac insects built their nests in the raintrees, the branches were cut, pounded, and dried to make sealing wax. We also asked unemployed villagers in that area to form a group to look after the trees in their front yards..."*

> *"...As the group expanded, it increasingly focused on agriculture. Then it merged with a group of vegetable, and with our support became a successful cooperative..."*

The Hup Krapong Project has had a steady development trajectory ever since, and has come to be regarded as a shining example of comprehensive planning that has gained wide acceptance.

Regarding the **Nong Phlub** Land Development Project According to His Majesty's Wishes, which suffered from similar soil issues to those at the Huai Sai Royal Development Study Centre, work on the project yielded a great deal of knowledge and information about land development that His Majesty proceeded to draw on heavily during the early years of his reign.

Nong Phlub was primarily developed according to the royal wish to help farmers grow plants year-round, not just during the rainy season, as prevailed. Before the development project, the farmers generally didn't cultivate crops during the dry season as they were accustomed to there being insufficient water. His Majesty duly arranged the project in such a way as to demonstrate the benefits of storing water for agricultural use during the dry season.



In a royal remark made on 17 March 1986, His Majesty spoke of the area's agricultural potential despite its aridity. He graciously suggested building a reservoir to store water that could be used for agriculture during the dry season. As the project provided its effectiveness, His Majesty expressed how pleased he was to learn that:

"...Despite the dryness, farmers can still earn a living..."

With his unique trove of experience and unprecedented insights into development in this area, in directing the course of the Huai Sai Royal Development Study Centre, His Majesty addressed issue of the problems analytically. A royal document bestowed on the Office of the Royal Development Projects Board states:

"...Huai Sai Royal Development Study Centre: sandy, hardpan soil low in nutrients..."

His Majesty graciously explained the source of the problems:



"...Concerning the Huai Sai Royal Development Study Centre in Cha-am District, Phetchaburi Province, the area was originally sparse forest. Unfortunately, the forest had been devastated by people for firewood, followed by excessive planting of field crops and pineapples, until the soil was totally depleted and sandy. The sandy soil was then easily eroded by wind and washed away by rain. Only hardpan soil was left which, on exposure to the air, hardened even further and had no useful nutrients."

Historical documents tell of His Majesty's keen interest in studying soil conditions since the earliest years of his reign, long before the establishment of the Huai Sai Royal Development Study Centre. An excerpt from the royal cremation book for the funeral of Mr. Suratern Bunnag states:

"...Responding to His Majesty's wish to develop certain areas in Prachuap Khiri Khan Province, Mr. Suratern acted as coordinator, working with Thai and foreign officials who visited the areas to survey the geographical conditions..."

At this point, His Majesty the King evidently understood the soil problems around the Huai Sai Royal Development Study Centre inside out.

• Huai Sai Royal Development Study Centre

Early Days of Huai Sai Royal Development Study Centre

Areas of Phetchaburi and Prachuap Khiri Khan Provinces, as well as other nearby provinces, originally enjoyed a great abundance of natural resources. However, as people from other areas immigrated to and settled in the area, they devastated the forest for agriculture in the wrong ways. For example, they used chemicals to eradicate weeds, causing considerable adverse impacts on the soil and water sources. With no nourishment, soil quality of the land became poor rapidly. Washing away of topsoil further depleted nutrients leaving only sandy and hardpan soils. The devastation finally and totally provoked imbalances in nature and the environment. As rain didn't fall when it was supposed to, there were long periods of drought. The land became arid semi-desert with infertile soil. Naturally, all this unavoidably caused great difficulties for the people that were set to become more intense if they were not resolved correctly and urgently.

To make matters worse, some locals encroached on the grounds of Mrigadayavan Palace, a royal property supervised by the Crown Property Bureau, causing a similar state of affairs to the aforementioned.

Chronology of Remedies



His Majesty King Bhumibol Adulyadej clearly understood the exact nature of the difficulties. To begin tackling the situation, His Majesty graciously granted an audience for the purpose of conveying his remedies at the Royal Thai Aide-De-Camp Department, Chitralada Villa, on 5 April 1983, to His Serene Highness Prince Chakraband Pensiri Chakrabandhu, the then Privy Councillor, together with Mr. Soontorn Ruenglek, the then Director-General of the Royal Irrigation Department, and Dr. Sumet Tantivejkul, the then Director of the Secretariat Office of the Coordinating Committee for the Royal Development Projects. His Majesty's approaches to tackling the problems included restoration of the devastated areas, including the grounds of Mrigadayavan Palace, to their original abundance by revitalising and replanting forest, rehabilitating water sources to maintain moisture, and facilitating agricultural development. Actual implementation would entail involving the local people in the initiatives. The development of local people was therefore formed and set the goal of achieving

self-sufficiency and developing their communities through the auspices of the new development study centre. His Majesty chose to restore this area because it has been a part of royal property under the supervision of the Crown Property Bureau. His Majesty the King re-emphasised the rehabilitation programme in a royal address on 26 August 1988, saying:

> *"...Restoration at Huai Sai started with the area supervised by the Crown Property Bureau. It's part of Mrigadayavan Palace but there are a lot of people living there. Despite difficulties and hurdles, a great effort is made to uplift the people's well-being by planting forest on the hills and irrigating the land using solar-energy-powered electric pumps..."*

Meanwhile, the Huai Sai Royal Development Study Centre was founded to create effective development models for deteriorated areas in the Western Region and rectify other problems.



Location

The Huai Sai Royal Development Study Centre was established in Sam Phraya Subdistrict, Cha-am District, Phetchaburi Province, in the West of Thailand. The site is situated approximately 220 kilometres along Phet Kasem Road from Bangkok. Area boundaries are as follows:

Northern boundary: Reaching Sawoei Kapi Mountain in Ang Hin Village

Eastern boundary: Stretching to Huai Sai Nuea, Nong Takuat and Huai Sai Tai Villages

Southern boundary: Reaching Sam Phraya Mountain in Rai Mai Phatthana Village

Western boundary: Stretching to Nong Sai and Nong Khao Nok Villages

Weather Conditions

Enjoying year-round sunshine, the weather in this area is generally pleasant; neither bitterly cold nor unbearably hot.

At the project area, annual temperatures and precipitation average 27° C and 800 mm respectively.



Soil Types

Initial surveys revealed that soil in the area is mainly lateritic and sandy, with very low fertility. The degraded condition of the soil was identified as being caused by human encroachment into forests to cut firewood. Field crop cultivation, particularly pineapple, worsened conditions and further depleted nutrients, leaving the soil sandy. When the remaining soil was washed away



with water and blown away by wind, only hardpan remained. And the hardpan would become even harder when exposed to air. Being so hard and deficient in nutrients, there was no way the soil could sustain cultivation. Moreover, for many years the locals had grown pineapple in the area using chemicals, neglecting to nurture the soil until it was spoiled and hardly any organic matter remained. Thus the soil quality had been totally undermined.

Geological Conditions

The area embraces three categories of geological features:

1. Monadnock, a very coarse-grained granite gneiss formed in the Triassic age around 214 million years ago, is found in the Noi and Sawoei Kapi mountains. Medium to very coarse-grained gneiss is found in Thong, Bo Khing, Rung Rang, and Tao Poon mountains.

2. Sediment from the Quaternary epoch, including conglomerates, gravels, and sand, is mostly found on the foothill slopes.

3. Sediment from the Quaternary epoch, formed by sedimentation of seawater, comprises sand and gravels that prevail on the plains in the area.



How the "Huai Sai Royal Development Study Centre" was royally bestowed its name

His Majesty King Bhumibol Adulyadej graciously bestowed the names of each royal development study centre, primarily referencing the location. However, the area occupied by the Huai Sai Royal Development Study Centre was once home to herds of **"hog deer"**, or *Nuea Sai*, leading locals to name it **"Huai Sai"**.

With this in mind, His Majesty graciously bestowed the name **"Huai Sai Royal Development Study Centre"**, after it was initially named Khao Hin Sorn Royal Development Study Centre (according royal letter No.0002/3041 dated 29 March 1980).

• Administration

To ensure responsive and efficient implementation of the royal initiatives, four executives and subcommittees were established to draw up operational plans of the Huai Sai Royal Development Study Centre, namely:

1. Executive Committee for the Administration of the Royal Development Study Centres Project

2. Subcommittee on Master Planning, Monitoring and Evaluation of the Royal Development Study Centres Project

3. Subcommittee on Academic Affairs of the Royal Development Study Centres Project

4. Subcommittee on Implementation of the Huai Sai Royal Development Study Centre

• Present Operational Sites

The Huai Sai Royal Development Study Centre has set the important target areas for study and development as follows:

1. The grounds of Mrigadayavan Palace covering 3,616 hectares (22,600 rai), in accordance with His Majesty King Vajiravudh (King Rama VI)'s royal command issued in 1920.

2. The conservation area spanning 3,152 hectares (19,700 rai) across three important watershed ecology sites: Sam Phraya Mountain, Huai Ta Paet Reservoir, and Hub Sabu-Nong Kang Mountain.

3. The Princess Mother Garden covering 54.4 hectares (340 rai).

4. Two target villages inside the Huai Sai Royal Development Study Centre and 16 villages outside the centre targeted for study, development, results compilation and technology dissemination.

5. The Royal-initiated Khao Cha-ngum Deteriorated Soil Rehabilitation Project in Ratchaburi Province which is the study centre's branch.



• Responsible Agencies and Their Missions

Agencies pursuing the Huai Sai Royal Development Study Centre's implementation are as follows:

The Royal Thai Police is the key agency in charge of coordination between the centre and other agencies. It also supervises the study centre's budget and draws up operational and public relations plans with other agencies.

The Royal Forest Department

– reforests and rehabilitates deteriorated areas; nurtures forest plantations; conducts research and studies and disseminates forestry knowledge; supports forest planting for household use; conserves rare and endangered wildlife, and; runs an open zoo as a recreational and educational facility;

– studies, researches, analyses and experiments with vetiver grass planting in hardpan soil; research and experimental planting of selected tree varieties suited to hardpan soil conditions together with vetiver grass, to feed indigenous wildlife and return animals to nature.

The Royal Irrigation Department constructs watercourses equipped with water pumping systems to drive water to Sawoei Kapi and Tao Poon Mountains and support forestation and wildlife conservation.

The Land Development Department

– is in charge of land and water management that suits the respective geographical and environmental conditions of each ecosystem to help facilitate reforestation;

– constructs check dams across existing streams flowing along gullies to restore water and moisture in soil in support of watershed afforestation and wet forests.

The Department of Agriculture conducts studies and experiments to identify integrated agriculture farming models and methods tailored to topographical features and local farmers' livelihoods. This is to serve as alternative farming methods that farmers living nearby the centre and in other areas can adopt and apply to their lands.

The Community Development Department collaborates with other agencies, as well as people living inside and outside the study centre, to develop occupations for locals. The department has also set up a childcare centre to support farming families.



The Department of Agricultural Extension distributes among farmers in surrounding villages modern agricultural knowledge, ranging from utilisation of advanced agricultural technologies to solutions for specific agricultural problems. To further support distribution of agricultural knowledge the department supports formation of small groups of farmers that promote food processing and preservation and distribute agricultural produce. The Department's livelihood support entails furnishing farmers with farm inputs.

The Department of Provincial Administration works closely with the study centre to resolve conflicts over lands and coordinates with and notifies locals over compensation for their lands.

The Department of Livestock Development

– conducts studies and research on animal husbandry to identify development system and models and feeding methods that boost livestock yield and optimise adaptation of sandy soil areas to pasture;

– demonstrates animal husbandry practices and fodder-grass cultivation to farmers living nearby the centre; organises occupation groups of farmers to facilitate business promotion and operation and product distribution; hosts training programmes and distributes knowledge on livestock technology and animal health, healthcare, and disease prevention; provides and improves artificial insemination services to improve animal breeds; promotes production of farm animals to provide food for lunches at schools near the study centre.

The Department of Fisheries has undertaken numerous projects in the field of aquaculture at the centre such as experiment, promotion and demonstration of aquatic animal propagation. These include advising how to increase aquatic animal yields in different water sources; and providing related assistance to people living inside and outside the centre such as organising fisheries in schools, demonstrating aquatic animal breeding and propagation, raising various aquatic animal breeds, and increasing aquatic animal yields.

The Department of Lands has allotted land to two villages, Thai-Muslim Village and Thai-Buddhist Village, and undertaken land surveys for people willing to return land they have occupied for a long time to the centre.

The Department of Industrial Promotion supports occupations among farming families besides agriculture that provide supplementary income, including gemstone cutting, food processing, and others.

The Department of Energy Development and Promotion conducts studies and research and works to put the findings into practical use, whether in farming or occupation development, by setting-up demonstrations. Fields of study have included cultivating fast-growing trees for firewood, creating wind wheel to generate energy.

The Office of the Vocational Education Commission demonstrates and promotes flowering and ornamental plant cultivation; and arranges integrated agriculture training programmes for vocational students and farmers. The office also distributes the plants among government agencies.

The Cooperative Auditing Department hosts training courses in conjunction with farmer development and agricultural organisations (housewives' groups) of the Huai Sai Royal

Development Study Centre. There are three projects. Two such trainings are to develop the skills of the farmers surrounding the study centre, that is, accounting and follow up on making accounting by the farmers. Another project involves financial and accounting practices.

The Crown Property Bureau resolves conflicts over land locals have long occupied illegally that the study centre needs to develop in order to optimise land use in accordance with His Majesty the King's initiatives.

The Primary Educational Service Area Office in Cha-am District is responsible for orchestrating the Agriculture for School Lunch Project in which it collaborates with schools and the study centre. The office also applies integrated agriculture farming models at schools that impart valuable knowledge to students and help provide their lunches.

The Office of the Permanent Secretary, Ministry of Public Health, provides nutrition, sanitation, infectious diseases control (particularly HIV/AIDS) and other services to people living in surrounding villages.



The Thai Red Cross Society provides medical treatments for common illness, first-aid, dressing and stitching wounds,1ชุด as well as mother and child pre- and post-natal healthcare.

Kasetsart University conducts research and experiments with double cross-hybrids of fruit-yielding plants and asparagus.

Chulalongkorn University conducts studies and experiments on frog farming, amphibian conservation and returning them to nature.

Mahidol University carries out studies and research into herbal plant cultivation and propagation using plant tissue culture techniques. The plants are used to make medicines. Once the propagated plants are strong enough, they are planted in the Princess Mother Garden overseen by the Department of Agriculture.

Rural Lives Development Foundation disseminates among young participants in training sessions it hosts, research and results of experiments implemented by government agencies working for the Huai Sai Royal Development Study Centre. The foundation also supports integrated agriculture farming and demonstration plantations (chemical-free vegetables), and operates an occupational training centre for farmers, especially youngsters who join training courses.

• Huai Sai Royal Development Study Centre Operation

The Huai Sai Royal Development Study Centre's operation plan has five key elements:

1. Natural Resources and Environmental Conservation and Rehabilitation

- Reforestation, forest rehabilitation and nurture in an area of 752 hectares (4,700 rai) as well as wildlife breeding, propagation and returning to nature to restore and maintain ecosystem balance;



- Planting vetiver grass inside the study centre for soil and water conservation in accordance with His Majesty's initiative;

- Water source and irrigation system development inside and nearby the centre;

- Construction of check dams across streams flowing along gullies in order to conserve soil and water, and building earthen dikes to divert water to irrigate dry soil areas and to add more moisture in soil.

The Huai Sai Royal Development Study Centre's works under the above-mentioned plans can be categorised as follows:

1.1 Water Resource Development Work

The following reservoirs have been constructed in response to His Majesty's initiatives:

1. Ban Nong Sai Reservoir (water storage capacity: 0.12 million cubic metres) was created in 1984 to provide water for the centre's study and research works covering 23.36 hectares (146 rai) located above Huai Sai Reservoir in the southwest of the centre;

2. Huai Sai Reservoir (water storage capacity: 1.9 million cubic metres) was constructed between 1983 and 1987 to provide water for agricultural areas at Thai-Muslim Village covering around 560 hectares (3,500 rai);

3. Huai Ta Paet Reservoir (water storage capacity: 3.9 million cubic metres) was constructed between 1985 and 1989 to provide water for agricultural areas at Ang Hin and Thai-Buddhist Village covering about 688 hectares (4,300 rai);

4. Khao Kra Puk Reservoir (water storage capacity: 0.32 million cubic metres);

5. Installation of water distribution system along the mountain ridges of Sawoei Kapi and Kra Puk and for a 48-hectare reforestation project. Other activities include:

- Installation of tunnels to channel water from Ban Thung Kham Reservoir to Huai Ta Paet Reservoir over a total distance of 18.6 kilometres. Pipes were connected to channel water to Huai Sai and Khao Kra Puk reservoirs. A distribution system was erected to channel water to Thai-Muslim and Thai-Buddhist villages;

- Dredging Ta Paet and Yai streams and Bang Kra Noi Canal.

1.2 Forestry Development Work

Three categories of forestry development comprise:

1. Study and Experimentation

- Indigenous trees studies and experimental planting

2. Afforestation: From 1984 – 1997 across 886.4 hectares (5,540 rai)

3. Forestry promotion and development

- Fruit tree maintenance work

- Plant genetics work at Sawoei Kapi Mountain

- Raising awareness work of forest resource conservation

1.3 Wildlife Animal Breeding and Propagation

A wildlife breeding and propagation centre was set up at Tao Poon Mountain in 1988. The centre experimented with releasing ungulates such as hog deer, Eld's deer and barking deer as well as poultry, including peacocks, pheasants and jungle fowl, into 32 hectares (200 rai) of forest. After releasing the animals the centre monitored their progress and found that they were able to adapt to the new environment and grow their numbers naturally.

Moreover, the environmental conditions and water sources have been improved to serve as a wildlife breeding ground and a recreational facility for the general public. It also disseminates knowledge about forest resources and wildlife conservation.

1.4 Soil Improvement Work

Surveys have been implemented since 1984 with the aim of maximising land use according to prevailing geographical conditions. The plans for soil and water conservation were

laid to prevent soil erosion, planted vetiver grass experimentally to identify efficient planting methods and strains, and modes of propagation. The study and demonstration on improving soil quality using compost and green manure is also operated.

2. Education and Development Plan in Line with His Majesty's Initiatives



- Study and experiments on livelihood and occupations are conducted to identify agricultural technologies that farmers can use to develop marketable products and services

- Study and experiments on environment are studied to identify models for rehabilitating soil, water and forest ecosystems to their original abundance

The above-mentioned plans have been implemented as follows:

2.1 Agricultural Study Work

The centre has experimented with sustainable agriculture, particularly: fruit plant cultivation; integrated farming practices; agro-forestry; and natural farming that does not depend on chemical fertilisers, and specifically reduces the use of chemicals in vegetable cultivation.

2.2 Double Hybridisation Work of Vegetables Project

This project was established in response to His Majesty King Bhumibol Adulyadej's guidance graciously presented to His Serene Highness Prince Chakraband Pensiri Chakrabandhu. Its objective is to propagate watermelon, seedless watermelon, cantaloupe melon, and sweetcorn.

The Huai Sai Royal Development Study Centre joined forces with Kasetsart University which was tasked with studying and experimenting with crossbreeding a vast range of plant varieties. Four varieties were identified as being highly promising, namely:

1. Huai Sai Thong F_1 – a single-cross yellow watermelon hybrid
2. Phet F_1, Sam Phraya F_1 and Cha-am F_1 – a single-cross red watermelon hybrid
3. Huai Sai F – a single-cross watermelon hybrid
4. Pui Fai F_1 – a single-cross sweet muskmelon hybrid

2.3 Frog Breeding and Raising Project

The studies of frog farming have been undertaken including Chinese edible frogs and bullfrogs; and biology of giant Asian river frogs, truncated-snout burrowing frogs, and banded bullfrog (*Kaloula pulchra*).

Moreover, frog farming is promoted among farmers living around the centre and in nearby areas and raised breeders to support other projects. Scientific knowledge and practices are also disseminated to farmers, interested parties, government agencies, and schools it supports through a related school lunch project.

Four local farmers have responded to the initiative by experimenting with raising frogs.

2.4 Herbal Plants Cultivation and Collection Work

This project was initiated in 1993 with the aim of collecting selected varieties of herbal plants and establishing a botanical garden where viable herbal plants are propagated for the purpose of producing effective herbal medicines and other useful products.

The selected varieties of herbal plants include sweet wormwood, Japanese peppermint, climbing lily and thorn apple.

3. Results Extension and Technology Dissemination Plan in Accordance with His Majesty's Initiatives

- Results from research and experiments are disseminated to farmers living in 14 villages surrounding the centre and to the general public. The aim is to uplift the quality of life of the locals and help them achieve self-sufficiency by developing viable occupations.

The above-mentioned plans have been implemented as follows:

3.1 Fishery Work

The centre established a fishery village project to demonstrate fish culture and increase the number of aquatic animals sufficiently to meet consumption demand. Fish species that have been promoted include Java barb, giant gourami, and iridescent shark, along with several others.

3.2 Vocational Agriculture Work

A training course was founded for the young in the surrounding areas of the centre on the topics of cultivating mushrooms in bags and utilising dung from cows fed with pineapple peel and others.

The project facilitates grade 2, higher vocational students to conduct studies and research agriculture problems arising where they live.

3.3 Livestock Promotion Work

Livestock promotion among farmers of the centre began in 1986. In the initial phase, the centre promoted raising beef cattle as an alternative occupation. However, to ensure stable incomes and improved livelihoods, the farmers followed the centre's advice to switch to raising dairy cattle. So far, there are 25 farmers raising dairy cattle in various villages with about 278 dairy cattle in total, of which 120 are dairy cows mature enough for milking. Around 39,720 kilogrammes of raw milk is obtained from the cows each month. With this remarkable success, the project has attracted seven villages surrounding the centre to join. This brings 70 more to join the project. There are 1,074 dairy cattle, of which 413 are dairy cows, and monthly raw milk output amounts to 137,018 kilogrammes. Including raw milk from various villages inside and outside the centre, the total annual volume delivered to Thai-Danish Dairy Farming Cooperatives Company Limited's collecting centre in Phetchaburi comes to approximately 5.9 tons. From the collecting centre, the milk is despatched to the Dairy Farming Promotion Organisation of Thailand's southern branch.

Besides dairy cattle, there are other animals that are promoted to raise as alternative occupations to generate more income for the farmers. The list of animals raised includes beef cattle, goats, sheep, swine, native chickens, broilers, layer chickens, ducks and rabbits.

4. Quality of Life Promotion and Development Plan

- The centre develops people's occupations, in conjunction with social improvement and infrastructure promotion activities, so they have enough income and achieve self-sufficiency.

The above-mentioned plans have been implemented as follows:

4.1 Agriculture for Lunch Project

This project was established in response to the royal initiative of Her Royal Highness Princess Maha Chakri Sirindhorn. The project initially targeted participation from schools located around the centre, with a view to gaining acceptance and collaboration, and then extending it further and keeping it running steadily. So far, ten schools have joined the programme. Activities include growing vegetables, raising poultry such as broilers, layer chickens, Muscovy ducks and quails, and rearing fish, among others.

4.2 Occupational Training Project for Cottage Industries and Handicrafts

This project disseminates basic knowledge required to get started in various cottage industries and encourages local people to craft products for household use while also supporting their current occupations. Products include: cement items such as water jars; rattan/bamboo furniture; cashew nut cultivation; batik making; gemstone cutting; processing farm produce to

create the likes of crispy banana chips, butter-baked banana, dried sweetened squash, papaya preserve, and others.

4.3 Bookkeeping Training, Finance and Accounting Advisory Services Project for Farmers Living Around the Centre

With the aim of giving farmers basic bookkeeping knowledge, this project started assisting groups of farmers' wives at Ang Hin and Tai Ang Khao Kra Puk villages since 1994. In 1995, the assistance was extended to farmers' wives groups at Ban Rai Mai Pattana village, a cow-raising development group, and a sweet muskmelon growing group of Ang Hin village.

5. Project Management Action Plan

Coordinating with related agencies;

Formulating principles and scope of responsibility of related agencies to ensure maximum benefits;

Drawing up a master plan of the Huai Sai Royal Development Study Centre (1998 – 2001) as a framework for other agencies to follow to achieve efficient implementation and maximum benefits for the people.

The above-mentioned plans have been implemented as follows:

5.1 Land Dispute Resolution and Certification of Utilisation of the Study Centre's Land Projects The study centre allocated each family 0.16 hectare (1 rai) of land on which to reside, 0.80 hectare (5 rai) of land in irrigated areas for cultivation, and 1.12 hectares (7 rai) of land outside irrigated areas. The centre also issued to each of the concerned families legal land ownership titles that only prohibit transfer or sale of the land. Also under the project, the people are urged to tend fast-growing trees for industrial firewood.

5.2 Managing and Classifying Utilisation of the Centre's Land Project To maximise utilisation of land according to soil conditions and environment, the land is allocated under the following categories:



- Land for growing field crops and fruit trees
- Land for growing specific plants or pasture
- Land for rice farming
- Land for forestation
- Land for reservoirs
- Land for community and building structures

• Achievements and Changes at Huai Sai Royal Development Study Centre and the Farmers in Surrounding Villages

In 1997, the ORDPB undertook an evaluation of projects implemented by the Huai Sai Royal Development Study Centre, with the following findings:

Households and Population

There were 14 villages located around the study centre. Four of which are in the municipal area of Cha-am Subdistrict, Phetchaburi Province.

A 1996 village Based Socio-Economic Data (1996 NRD2C) found that the 14 villages comprised 1,030 households with 5,036 inhabitants altogether. An average of five people comprised each household.

Infrastructure

Essential infrastructure around the centre was assessed as adequate to support livelihoods. The details were as follows:

2.1 Transportation: Every village was accessible along an asphalt road served by public transportation. 92.72% of respondents found the transportation to be greatly improved.

2.2 Electricity: Every household had access to electricity.

2.3 Water for consumption and use: Availability of water for consumption and use was in the mid-range. 82.04% of respondents said they had access to sufficient water. 45.14% said water quality had improved. 42.23% said they had sufficient water for agricultural use.

Occupations

Of all the people living around the centre, 20.65% were labourers, 17.41% worked in the agricultural sector, and 5.51% were vendors. Only a few of the locals worked in rice farming, fisheries or service sectors.

85.92% of households located around the centre saw no change in occupation. Of the 14.08% where a change in occupation was seen, 51.72% switched from farmers to labourers, with the prospect of higher income (41.38%).

Since most of the people living around the centre were labourers, 39.91% of their primary income came from that source while agricultural income accounted for only 25.72%.

Income

Most of the working age people living around the centre were labourers and farmers respectively.

The average annual income of the households was found to be 92,655.49 baht which was deemed fairly good and enough to live on.

Regarding income sufficiency, the survey found as follows:

- 58.25% of respondents said they had sufficient income.

- 24.76% said they did not have sufficient income.

- 16.99% said they had sufficient income to be able to save.



Regarding the economy of each household over the previous five years, the survey found that:

- 12.62% of respondents said their household economy was greatly improved.

- 33.50% said it was moderately improved.

- 33.01% said it was unchanged.

- 16.50% said it had worsened.

However, although the household economy outlook was generally bright, debt remained an issue for many. The survey found that 41.75% of households around the centre carried debt, mainly incurred when they had to borrow to invest in their occupation. 58.25% of the households reported having no debt.

Land and Land Use

Each household had on average 1.67 land plots.

In terms of land tenure (with and without title), each household owned an average of 2.62 hectares (16.42 rai), broken down as follows:

- In 12.28% of cases the land was held by one of the farmer's parents.

- In 61.99% of cases the land belonged to a farmer.

- In 16.37% of cases the land was leased without lease payment.

- In 9.36% of cases the land was leased with lease payment.



In terms of application, 81.08% of households utilised the land for plantations. 34.38% switched from rice farming, field crop farming, and horticulture to planting fruit trees. 50% switched from field crops and a particular fruit variety to other field crops and more fruit varieties.

However, during the 2 – 3 years prior to the survey, 9.22% of the households had sold their land to other villagers or outsiders from the same province to cultivate.

More than 15 years it has been operating, the Huai Sai Royal Development Study Centre has achieved satisfactory results. In broad terms it has improved conditions in rural areas facing deteriorated natural resources and environmental conditions. Its projects have translated into models of development that are applied successfully not only within the centre's scope but wherever similar challenges are encountered. In the 50 years prior to the study centre's establishment, the rural area had degenerated from habitats rich in natural resources, with forest cover, water supply, and a variety of wildlife, to an arid, barren, seriously deteriorated wasteland, conditions made all the worse by excessive cultivation of pineapple. Now, thanks to His Majesty's ideas



and the study centre's implementation, the area has been restored to something close to its original abundance, with thriving forests, watercourses and wildlife, including lots of hog deer. Moreover, inhabitants of the area have been developed that they become self-supporting and have happiness in a sustainable manner. His Majesty King Bhumibol Adulyadej was pleased by the project's success and expressed his admiration for the outcomes at Klai Kangwol Palace, Hua Hin District, Prachuap Khiri Khan Province, on 14 July 1997, declaring:

> *"...What we did at Huai Sai could be regarded as a success, deservedly achieving the status of sound theories and reference materials.... I am very pleased..."*

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Office of the Royal Development Projects Board (ORDPB)

2012 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict,

Bang Phlat District, Bangkok 10700 THAILAND

Tel. 0 2447 8500 Fax 0 2447 8562 www.rdpb.go.th

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