

No.

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The Study on the Integrated Regional Development Plan for the Savannakhet and Khammouan Region in the Lao PDR and the Northeastern Border Region in the Kingdom of Thailand

Japan International Cooperation Agency

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The Kingdom of Thailand

The Study on the Integrated Regional Development Plan for the Northeastern Border Region in the Kingdom of Thailand

Final Report Pre-Feasibility Study

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**The Study
on
The Integrated Regional Development Plan
For
The Northeastern Border Region**

FINAL REPORT: PRE-FEASIBILITY STUDY

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ABBREVIATION

| | |
|-------|--|
| ADB | Asian Development Bank |
| AFTA | ASEAN Free Trade Area |
| AIDAB | Australian International Development Assistance Bureau |
| ARP | Agricultural Rehabilitation Plan |
| ASEAN | Association of Southeast Asian Nations |
| BAAC | Bank of Agriculture and Agricultural Cooperatives |
| BMA | Bangkok Metropolitan Administration |
| BMR | Bangkok Metropolitan Region |
| BOI | Office of the Board of Investment |
| CD | Community Development |
| CDD | Community Development Department, Ministry of Interior |
| CDW | Community Development Worker |
| CIPO | Center for Integrated Plan of Operations, NESDB |
| CND | Cross-National Development |
| CSO | Civil Society Organization |
| DDC | District Development Committee |
| D/D | Detailed Design |
| DEDP | Department of Energy Development and Promotion, Ministry of Interior |
| DLD | Department of Land Development, Ministry of Agriculture and Cooperatives |
| DOA | Department of Aviation, Ministry of Transport and Communications |
| DOAE | Department of Agricultural Extension, Ministry of Agriculture and Cooperatives |
| DOL | Department of Lands, Ministry of Interior |
| DOLA | Department of Local Administration, Ministry of Interior |
| DOF | Department of Fisheries, Ministry of Agriculture and Cooperatives |
| DOH | Department of Highway, Ministry of Transport and Communications |
| DOVE | Department of Vocational Training, Ministry of Public Welfare |
| DRF | Drug Revolving Fund |
| NGOs | Non Governmental Organizations |
| NESDB | National Economic and Social Development Board |
| NPOs | Non Profit Organizations |
| EIA | Environmental Impact Assessment |
| ESB | Eastern Seaboard |
| FDI | Foreign Direct Investment |
| RFD | Royal Forest Department, Ministry of Agriculture and Cooperatives |
| F/S | Feasibility Study |
| GIS | Geographical Information System |
| GMS | Greater Mekong Sub-region |
| GOJ | Government of Japan |
| GDP | Gross Domestic Product |
| GIP | Green Isan Project |
| GPP | Gross Provincial Product |
| GRP | Gross Regional Product |
| GSIC | Greater Saraburi Industrial Core |
| HRD | Human Resource Development |
| IEAT | Industrial Estate Authority of Thailand |
| IEE | Initial Environmental Examination |
| IEs | Industrial Estates |
| IFCT | Industrial Finance Corporation of Thailand |
| IMF | International Monetary Fund |
| IMR | Infant Mortality Rates |
| JICA | Japan International Cooperation Agency |
| LTD | Land Transport Department, Ministry of Transport and Communications |

| | |
|--------|---|
| MMR | Maternal Mortality Rates |
| MOAC | Ministry of Agriculture and Cooperatives |
| MOE | Ministry of Education |
| MOF | Ministry of Finance |
| MOID | Ministry of Industry |
| MOPH | Ministry of Public Health |
| MOSTE | Ministry of Science, Technology and Environment |
| MOUA | Ministry of University Affairs |
| NBR | Northeastern Border Region |
| NESDB | National Economic and Social Development Board |
| NIEs | Newly Industrialized Economies |
| NRDC | National Rural Development Committee |
| NRDDC | National Rural Development and Decentralization Committee |
| PAO | Provincial Administrative Organization |
| PCM | Project Cycle Management |
| PDC | Provincial Development Committee |
| PHC | Primary Health Care |
| PLWHA | People living with HIV/AIDS |
| PWD | Public Works Department, Ministry of Interior |
| PWWD | Provincial Water Works Department |
| RAPS | Project on Restructuring of Agricultural Production Systems |
| RID | Royal Irrigation Department, Ministry of Agriculture and Cooperatives |
| RJCP | Rural Job Creation Project |
| RRA | Rapid Rural Appraisal |
| RTG | Royal Thai Government |
| SKR | Savannakhet and Khammouan Region |
| SME | Small and Medium-scale Enterprise |
| SMI-IE | Industrial Estate for Small and Medium-scale Industries |
| SMLs | Small- and Medium-scale Industries |
| SWOT | Strengths, Weaknesses, Opportunities, Threats |
| TAO | Tambon Administrative Organization |
| TAT | Tourism Authority of Thailand |
| TOT | Telephone Organization of Thailand |
| TC | Tambon Council |
| VHVs | Village Health Volunteers |
| WID | Women in Development |

CHAPTER 1

INTRODUCTION

CHAPTER 1

INTRODUCTION

1.1 Overall

Several projects and programs are identified under development strategies of the NBR in the master plan. Among them, the following four (4) priority projects have been identified:

- Integrated farming program in rain-fed areas;
- Local industry platform project;
- Program for the strengthening of human resource development in the technical field; and
- Mukdahan goods distribution and processing center project.

1.2 Objectives of the Pre-feasibility Study

Pre-feasibility studies for these four (4) projects have been prepared to facilitate action along the lines of the master plan and accelerate project implementation. These may be used for negotiation with concerned public agencies as well as bilateral and international funding agencies.

1.3 Priority Projects for Pre-feasibility Study

1.3.1 Integrated Farming in Rain-fed Areas

The program aims to diversify agricultural products in rain-fed areas. At present, though rice is the major crop, almost no farming activities have been observed during the dry season in rain-fed areas. Since such traditional products are almost marginal in terms of production and earnings, it is necessary for products and farming methods to be diversified in order to improve and to stabilize farm income. Accordingly, the program will strive to introduce an integrated farming concept in these areas while selecting the most suitable crops.

1.3.2 Local Industry Platform (LIP)

The program aims to encourage industrialization of the NBR by fully utilizing local resources and promoting networkingsince the basic conditions of industrialization are not adequate in terms of software, hardware and human resources. The LIP program will help establish effective local software and hardware networks for local industrialization.

1.3.3 Human Resource development

The program aims to supply middle-class technical and managerial human resources for local needs in the NBR as well as out-migrants to the other regions. It is envisioned to contribute to the local economy as well as to Thai industrialization in the next generation, from the macro economic point of view. For this purpose, the following two projects have been selected for the pre-feasibility study since they are expected to have the fastest and most practical effects:

- IT HRD Center of Rajamangala Institute of Technology Kalasin
- Establishment of Rajabhat Institute Mukdahan

1.3.4 Mukdahan Goods Distribution and Processing Center Project

The Mukdahan Goods Distribution and Processing Center is the core facility to form Mukdahan as a center for goods distribution of the NBR. The Center aims to encourage industrialization of the NBR by fully utilizing advantages of the Indochina East-West Corridor. The Center includes various functions such as serving as a track terminal, inland container depot, and being a venue for distribution processing like leveling, packaging, sorting, checking, and light industries.

CHAPTER 2
INTEGRATED FARMING
IN RAIN-FED AREAS

CHAPTER 2

INTEGRATED FARMING IN RAIN-FED AREAS

2.1 Background of the Project

2.1.1 Background and Rationale

In the past, rice monoculture was the predominant farming system in Thailand. In the northeast, maize was the first field crop that was introduced in the region, followed by cassava and sugarcane, respectively. At present, both monocrop farming and mixed farming are practiced in the Study Area. However, farmers cultivating more than one kind of crop are still few. Most of these farmers grow rice and other crops because they own at least two plots of land, one low land for paddy, another upland for other field crops. As a matter of fact, integrated agriculture already existed in the areas in the past. However, integrated farming as it is today appears to be much more complex in all aspects than it was in the early days. In general, findings indicate that the monocropping system has led to unstable farm incomes, less work in crop fields resulting in farmer migration during the dry season. Agricultural diversification through both mixed farming and integrated farming are two most important strategic components in order to increase and stabilize farmers' income in rain-fed areas.

To address this situation, the MOAC was formulated and has implemented the restructuring of agricultural production system Phase I (1994-1996) and Phase II (1997-2001). The principal objective of Phase I was to reduce the areas planted to rice, cassava, pepper and coffee by 3.67 million rai, and replace them with other more valuable crops. The agricultural restructuring policy for Phase II has now focused on integrated farming. Though there are no subsidies provided for the necessary farm input, the Government has pledged to pay the interest to BAAC for farmers who adopt this program over a 3-year period.

Generally, this program on integrated farming in rain-fed areas conforms with the policy on agricultural restructuring of the MOAC, but emphasis will be placed on small farm holders. Restructuring of agricultural production in rain-fed areas can be achieved through this integrated approach. At the same time, natural water resources

development at the village level and on-farm storage or farm ponds development will play a vital role in the integrated farming approach. This farming system can act as insurance against farm risk and provide more opportunities for increasing farm incomes and working periods in crop fields. The results of the evaluation of the restructuring program for agricultural production Phase I by OAE in 1996 revealed that net farm income in the northeast increased from 623 baht/rai in the monoculture system to 1,130 baht/rai under the integrated farming system, for an increase of 81.38%.

In addition, the integrated farming system could also prevent labor migration from rural areas to big cities because of the availability of more job opportunities. In conclusion, integrated farming may be a good alternative system for small-scale farmers in rain-fed areas to attain self reliance and sustainable farm income.

2.1.2 Overview of the Agricultural Restructuring Program in the Past

In the Sixth Plan (1987 – 1991) the restructuring of the agricultural production system in line with market demand and local conditions was targeted in order to expand crops towards promising end products. During the implementation of the Seventh Plan (1992 – 1996), a policy was set to reinforce the restructuring of the agricultural production system. This was done to maintain the growth of the agricultural sector and to raise farmers' income through the restructuring of their agricultural production system in terms of quantity and quality in line with local and foreign market demands.

The MOAC then formulated a 3-years plan (1994-1996) to restructure the agricultural production system. This was approved by the Cabinet on 28 December 1993. The government provided a budget of 29,129 million baht for the initial 3 years, Phase I (1994-1996), and 4,611 million baht for Phase II (1997-2001). As mentioned earlier, the main objective of Phase I was to reduce planting areas for second rice in the dry season and reduce the unsuitable areas planted to rice, cassava, pepper and coffee by 3.67 million rai, and replace them with other more valuable crops with more profitable and sustainable production such as vegetables, fruits, flowers, field crops, fishery and livestock. The objective of the Phase II was to restructure the production systems in areas of rice, cassava, pineapple, coconut and others. In 1997, the project aimed to reduce cost by a total of 0.84 million rai and 80,000 rai each year for the period covering 1998-2001.

The agricultural restructuring policy in the Phase II focused only on integrated farming activities to replace traditional commodities.

The results of the study on evaluation of restructuring of agricultural production system Phase I (1994-1996) by the Office of Agricultural Economics, MOAC revealed that the actual reduction of planting areas for paddy, cassava, coffee and pepper amounted to 3.36 million rai or 92% of the target. These four traditional commodities were replaced

by mixed farming (39.91%), fruit trees (22.69%), fast growing trees (20.10%), and grassland (8.97%), and others (8.33%). Changes in net farm incomes indicated that in the northeast, this increased from 623 baht/rai from monoculture of traditional commodities to 1,130 baht/rai under restructuring agricultural production, for an increase of 81.38%.

Based on the results of the study conducted by the Agriculture Faculty of Khon Kaen University in 1998 on the evaluation of the agricultural restructuring policy for supporting sustainable agriculture development strategy in the northeast region during the 8th plan, it may be concluded that:

- The total number of farm households in the northeast under the restructuring agricultural production program Phase I (1994-1996) accounted for about 5.34% of total farm households;
- The net farm incomes from integrated farming in rain-fed areas are about two times greater than those from the mono-culture system;
- An integrated farming has led to better land use patterns. In rain-fed areas, land use for paddy comprise 34.19%, trees and fruit trees-39.97%, field crops-- 5.57%, vegetables and flowers-- 5.08%, livestock --1.55% and farm ponds-- 13.64%;
- Integrated farming should be recommended as the main strategy for the development of sustainable agriculture. This farming system provides more distribution of production, more work in crop fields and lower rate of fertilizer application; and
- In general, sustainable agriculture in rain-fed areas has been practiced in the northeast for the past 6 years and the major problems are insufficient water (31.67%) of farm households under this farming system, insufficient agricultural credit (20%) and infertile soil (13.33%).

In 1998, the Agricultural Land Reform Office, MOAC, formulated the Project for Revitalization of the Deteriorated Environment in Land Reform Areas through Integrated Agricultural Development/Stage I in four provinces. Khon Kaen had a project area of 107,300 rai, Maha Sarakham 18,200 rai, Sakon Nakhon 115,080 rai and Mukdahan 59,420 rai.

After the project loan became effective, project implementation started in February 2001. The major purpose of the project is to increase farmers' incomes and to conserve the forest reserve areas adjacent to the land reform areas by promotion of integrated farming or agro-forestry based on farm ponds and/or shallow wells. In addition, the Agricultural Land Reform Office intends to extend the implementation to the next stage in the four provinces covering a total land reform area of about 1.38 million rai in the near future.

2.2 Objectives

The objectives of the program are to:

- Change farming practices of small farm holding groups having less than 15 rai in rain-fed areas from monocropping of traditional crops to integrated or mixed farming system;
- Increase and stabilize farmers' income and provide more opportunities for working in crop fields;
- Expand farmland areas under sustainable agriculture in the Study Area.

2.3 The Project

2.3.1 Proposed Project Areas

Generally, the rainfed areas in the NBR may be divided into two major categories i.e. areas in Agricultural Land Reform Areas (ALRA) and other areas outside ALRA. Out of the total rainfed agricultural areas of the four provinces covering approximately 6,472,000 rai, the rainfed area in ALRA amounts to 2,835,529 rai or 44% of the total land area. Land Reform Areas (LRA) are areas designated in the Royal decree as the agricultural land reform area under the Agricultural Land Reform Act B.E.2518(1978). In general, LRA came from two types of land--public and private. The public land category may be further divided into three groups i.e. encroached forest reserve areas, de-gazetted and reclassification areas, and state land which refers to state properties and areas of public domain. Private land covers land purchased or expropriated from landowners who do not utilize their land or own land in excess of their rights in accordance with the Agricultural Land Reform Act.

LRAs are quite different in many aspects i.e. economic condition, natural resources, development potential etc, when compared to areas outside LRAs. The general characteristics of LRAs may be summarized as follows:

- Most LRAs are less developed areas with low development potential and located in the remote and poor areas of the country;
- Most LRAs are on the encroached forest reserve areas transferred to ALRO from the Royal Forestry Department. The general conditions of the areas are deteriorated se there is unbalance of nature;
- Majority of the farmer's living in the LRAs remain in poor economic conditions with low incomes compared to those living outside LRAs; and
- The percentage of poor households below the upper limit is about 46%. This figure is too high when compared with the ratio in the country as a whole (13% in 1992).

At present, the Agricultural Land Reform Office (ALRO) has been implementing the Integrated Agricultural Development Stage I in ALRA of Sakon Nakhon and Mukdahan

based on the results of the Feasibility Study on the Integrated Agriculture Development in the ALRA in the Upper Northeastern Region of the Kingdom of Thailand in 1998. In the future, ALRO intends to extend the implementation into the next stage in the four provinces of Khon Kaen, Maha Sarakham, Sakon Nakhon and Mukdahan covering the total ALRA of about 1.38 million rai.

In order to achieve a smooth and effective collaboration between the integrated farming program in ALRA and in the NBR, the proposed project area of restructuring of agricultural production in rain-fed areas under the NBR program should be located outside the ALRA. The NBR is not homogeneous and may be classified based on annual rainfall, topography, irrigation availability, soil condition into five different zones:

- Zone 1 Large-scale irrigation areas;
- Zone 2 Rain-fed paddy areas;
- Zone 3 Rain-fed upland crop areas;
- Zone 4 Phu Phan Mountain and hilly areas; and
- Zone 5 Mekong River-side fertile areas.

Zones 2 and 3 are to be proposed as priority areas for the restructuring of the agricultural production program.

The rain-fed paddy zone is located mainly in Nakhon Phanom and Sakon Nakhon with a moderate level of annual rainfall (1100-1500 mm.), making the soil suitable for paddy cultivation. Most farm households in this zone are rice monocropping households. While the rain-fed upland crop zone is mainly located in Kalasin and Mukdahan. The soil in the area is suitable for upland crops and fruit trees. At present, monoculture of cassava or sugar cane is dominant.

The proposed project target for implementation is 40% of rain-fed areas outside of the ALRA in the four provinces of the NBR for a period of 20 years.

The total farmland, rain-fed areas in and outside ALRA and proposed areas for each province in the NBR are presented below.

| Province | Farmland (rai) | Rain-fed Areas (rai) | | | Proposed Areas (rai) |
|---------------|-------------------|----------------------|-----------------|-----------|----------------------------|
| | | ALRA | Outside ALRA | Total | |
| Nakhon Phanom | 1,568,097 | 439,627 | 923,089 | 1,362,716 | 369,236 |
| Mukdahan | 819,127 | 495,387 | 218,417 | 713,804 | 87,367 |
| Sakon Nakhon | 2,964,401 | 1,108,547 | 1,323,986 | 2,432,533 | 529,594 |
| Kalasin | 2,462,561 | 791,968 | 1,171,105 | 1,963,073 | 468,442 |
| Total | 7,814,186 | 2,835,529 | 3,636,597 | 6,472,126 | 1,454,639 |

To implement this program in the future, the priority areas should be selected from each of the four provinces and feasibility studies will be carried out for each priority area.

Priority areas in each province will be defined as areas where early implementation of integrated farming system development is necessary.

2.3.2 Methodology

The agricultural diversification in rain-fed areas entails farm land holding diversified with different activities. Through this system, farmers who want to shift from traditionally risky monoculture farming to integrated farming will divide their farm land into two parts, one for traditional main crops under rain-fed conditions, and the other for integrated activities, i.e. crops, fish culture and livestock (based on farm ponds), particularly in the dry season.

Therefore, the development of rain-fed agriculture can be achieved through the promotion of integrated farming. This farming system is a combination of farm activities comprising paddy development, maintenance of a number of fields for crops and vegetables, livestock farming and maintenance of farm ponds for fish culture. In this system, each activity will consequently contribute to the others. For instance, rice, straw and stubble(?) may be used to feed cattle, while animal manure can be used in fish ponds and as organic crop fertilizer. Water is essentially one of the most important basic inputs in integrated farming system. However, in rain-fed areas, water is a limiting factor and always inadequate for construction of the irrigation system. Therefore, the rehabilitation of existing natural water sources i.e. natural swamps and the excavation of community and farm ponds are necessary for the success of the development plan. Since farmers are the center of agricultural restructuring, it is important to find an appropriate measure to enable them to make their own choices properly.

In order to achieve the above-mentioned objectives, the implementation of this plan should follow key issues discussed below:

(1) Dissemination of project information

Complete information about the project such as the basic concept and characteristic of the integrated farming system, its impact on daily life, as well as the pros and cons of the project should be prepared and disseminated to the farmers in the target area. Intensive consultations and public campaigns about shifting from traditional monoculture to sustainable agriculture development scheme, i.e. integrated farming, mixed farming and agro-forestry should be conducted. Promotion of site visits to successful agricultural restructuring projects should also be considered. Once the complete information is available, further action should be undertaken to facilitate the dissemination of information, preliminary field visit and initial farmers meeting in the target area. After the initial farmers meeting, the farmers who intend to participate in integrated farming program should be given time to review their understanding of the project and confirm their participation. Participation in Rural Appraisal (PRA) should be

considered as a tool for communication and transfer of all of the project's information to target communities.

(2) Selection of implementing areas and farmers

The Study Areas vary considerably in topography, soil conditions, irrigation availability, annual rainfall and farming practices. At present, there are both mono crop farming and mixed farming in the NBR. Generally, three major types of farming practiced by farmers can usually be found in the NBR namely, rice monocropping, field crop monoculture and rice and field crop combined type. Rice monocropping is found in Zone 2 and field crop monoculture can be found in Zones 3 and 4, while rice and field crop combined type is found in Zones 2, 3 and 5. Farmers in the NBR have been practicing these current farming styles for several decades. These areas have a potential for agricultural restructuring in case an irrigation facility is provided by farm ponds or groundwater.

Based on the considerations mentioned above, the implementing area should be properly selected. A suitable site for the construction of farm ponds is one of the most important factors for area selection. In addition, there should be no water quality problem for irrigation in the areas and farm lands should not be too far from the village.

In restructuring agricultural production, farmers are the nucleus of program implementation. The active participation of farmers is vitally important for successful implementation. Government agencies concerned should thus select farmers based on the following key factors:

- The farmers have a high intention to adopt integrated farming;
- Family labor is available for work throughout the year in crop fields;
- The farmers are aware of and understand the concept of agricultural restructuring production;
- The farmers are the owners of their farmland; and
- The farmers signify their intent to participate by submitting the accomplished application form.

(3) Water resources development to facilitate irrigated agriculture

It is clearly indicated that agriculture in NBR is highly rain-fed, since only about 17% of the total cultivated area is irrigated. Most of the irrigated areas are paddy lands. Due to the scarcity of surface water and the lack of appropriate reservoir sites in the areas, the development of individual farm ponds and/or wells will be a major measure to facilitate integrated farming activities, particularly during the dry season. Furthermore, since most of the villages have community ponds or natural swamps, rehabilitation of these resources will be necessary.

In general, an irrigated area under the Restructuring Agricultural Production Program focuses on crop production in the dry season based on the capacity of its farm pond. Based on requests from farmers, the construction of 1,260 m³ capacity farm ponds for each farm household in rainfed areas has been launched recently by the concerned Government agencies without any cost sharing. The results of the study on evaluation of water resources development at the farm level by Khon Kaen University in 1995 indicated that the total number of farm ponds under this program in the northeastern region accounted for about 30,000 units in 1994. In addition, the study on evaluation of agricultural restructuring policy for supporting sustainable agriculture development in the northeast during the 8th Plan by Khon Kaen University in 1998 revealed that the number of farm ponds and capacity of ponds in rain-fed area can be summarized as follows:

| Items | Farming Types | |
|---|---------------|--------------------|
| | Monoculture | Integrated Farming |
| No. of farm household with farm pond (%) | 50.00 | 93.33 |
| Average capacity per household (m ³) | 1,160.00 | 8,373.92 |
| Average capacity per area of land holding (m ³) | 35.63 | 207.94 |
| Average capacity per area of land use for integrated activities (m ³) | 0 | 448.04 |
| Farm household with well (%) | 5.00 | 11.67 |

Small sized farm ponds of 1,260 m³ can only provide irrigation for about one rai of field crops or vegetables in the dry season. If the farmers have a high intention to adopt a larger integrated farming operation and family labor is available, then larger farm ponds of 4,000 m³ to 6,000 m³ capacity should be considered. The irrigation water requirement is one of the key factors for planning farm ponds. The capacity of a pond is designed in accordance with size of the area to be irrigated, cropping pattern, effective rainfall, consumptive use of water by crop and other agricultural activities, i.e. fishery and livestock. The annual irrigation requirements of some major irrigated crops for Sakon Nakhon and Mukdahan are presented below.

| Crop | Water Requirement (mm.) | Net Irrigation Requirement (mm.) | Irrigation Requirement | |
|-----------------------------|-------------------------|----------------------------------|------------------------|---------------------|
| | | | (mm.) | m ³ /rai |
| Wet season rice | 1,163 | 570 | 905 | 1,448 |
| Soybean (dry season) | 569 | 409 | 650 | 1,044 |
| Sweet corn (dry season) | 383 | 290 | 460 | 736 |
| Vegetable (3 crop/year) | 929 | 364 | 578 | 925 |
| Fruit Tree (all year round) | 1,531 | 774 | 1,229 | 1,966 |
| Fruit Tree (Feb.-Apr.) | 478 | 367 | 583 | 933 |

Notes : (1): Net Irrigation Requirement = Water Requirement – Effective Rainfall
 Irrigation Requirement = Net Irrigation Requirement/Irr. Efficiency
 Irrigation Efficiency 63%

Source : Guideline (2) for Integrated Agricultural Development Plan in ALRA , 1998 by JICA Study Team.

For farm pond development, the emphasis should be placed on the following key elements:

- Selection of farm pond location to ensure enough inflow during the rainy season and soil condition selection to ensure good water retention and no salinity problems;
- The depth of excavation should not be less than 3.00 meter for ordinary farm ponds and 4.00 meter for larger ponds;
- Residual soil from farm pond excavating should be utilized efficiently i.e. filling cottage yard, farm road construction, top soil for vegetable bed;
- Identification of preventive measures for slope protection and sedimentation control; and
- Irrigation system for farm pond development based on farm pond capacity i.e. bucket irrigation, hose irrigation by pump and micro-sprinkler system.

The potential of groundwater development for agriculture in the NBR is quite limited. It is, therefore, difficult to introduce its extensive utilization for irrigation. Hence for groundwater development to facilitate irrigated agriculture, a micro – irrigation system should be introduced utilizing shallow wells within their safety yield.

The results of the Study on evaluation of restructuring agriculture by Khon Kaen University in 1998 showed that farm households equipped with farm ponds in the northeast under the integrated agriculture farming system covered about 93% of the total number of integrated farming households. Furthermore, based on the results of the JICA Feasibility Study on Integrated Agriculture Development in the Agricultural Land Reform Areas in the Upper Northeastern Region in 1998, about 70% of rain-fed areas need farm ponds in order to promote integrated farming.

(4) Preparation of alternative activities for farmers' decision

In restructuring production, farmers have to be engaged in new activities. This plan envisions that farmers will enjoy better farm incomes by switching from the mono-traditional crop system to the integrated farming system. In order to ensure better results, the government agencies concerned should propose farming alternatives according to farmers' needs and consistent with local conditions and market demand in each area. Furthermore, recommended farming alternatives for each area should follow the existing land use, soil condition and consider the degree of difficulty in management.

Farmlands in the NBR may be classified into three major topographic categories, i.e. lowland predominated by paddy field, upland areas and areas with steep slope. In all these areas, integrated farming can be introduced. At present, there are both mono crop farming and mixed farming in the Study Area. However, integrated farming is practiced on a minor scale, run by very limited number of households.

According to the general conditions in the field and concept of integrated farming, a typical model for integrated farming is being proposed as shown below.

| Typical Current Farming | Main | Secondary | | | | |
|---|--------------------------------|---------------------------------|--|---|--|---|
| | | Upland Crop | Vegetable | Fruit tree | Inland Fishery | Livestock |
| Paddy Cassava Sugar cane Paddy + Field Crops Paddy + Field Crops + Cattle | Paddy Cassava Sugar cane | Sweet corn Soybean Peanut | Cucumber String bean Chilli Chinese kale Baby corn Shallot Native vegetables i.e. Phark Wan, Phark Tew, Som Ban, Marum, etc. | Mango Tamarind Jack fruit Guava Banana Papaya Common lime | Tilapia Local carp Sepat Siam Snake-head fish Cat-fish | Native chicken Muscovy duck Pig Beef cattle Water buffalo |

With the availability of water from farm ponds, it is possible for a farmer to manage irrigated integrated farming during the dry season based on the capacity of his farm pond. A farming plan for integrated activities during the dry season should be prepared in accordance with water consumption for each activity and the capacity of the pond. The net water requirement for some major crops and livestock in Sakon Nakhon and Mukdahan are summarized below:

| Item | Net Water Requirement | |
|---|-----------------------|---------------------|
| | (mm.) | m ³ /rai |
| Main Rice | 570 | 912 |
| Soy bean (dry season) | 409 | 654 |
| Sweet Corn (dry season) | 290 | 464 |
| Vegetables (Jan.-Feb.) | 324 | 518 |
| Fruit Tree (Feb.-Apr.) | 367 | 587 |
| Water consumption rates for livestock : | | |
| Cattle | 40 | liters/head/day |
| Swine | 20 | liters/head/day |
| Chicken | 1 | liters/head/day |

As mentioned earlier, a small farm pond of 1,260 m³ can irrigate only one rai of vegetables in the dry season. Thus, it will be necessary to provide larger farm ponds for farmers who have a high intention to practice integrated farming.

Generally, there are many models of integrated farming, combining various farming practices such as vegetable cultivation, livestock raising and fishery and fruit tree cultivation. Under the project implementation, an integrated agriculture system where each activity relies on another, should be promoted. For example, by-products of upland crops can be used for cattle feed, and cattle manure can be used for rice and vegetable fertilizer. The cycle can also save production costs by utilizing the by-products effectively. Combination of paddy cultivation and livestock raising is

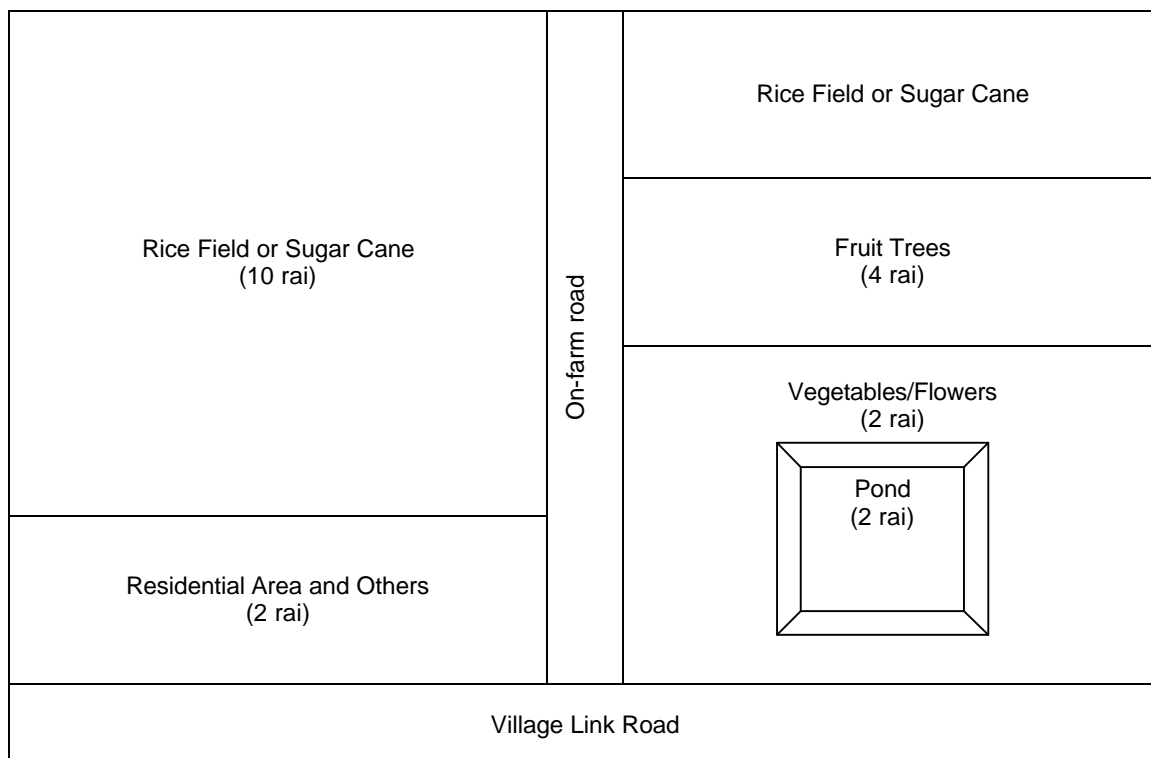
recommended from the viewpoint of economizing feed cost. Normally, vegetables are planted three times a year and chicken is rotated two times a year.

An integrated model for a 20 rai farm holding with a 6,000 m³ farm pond is proposed below.

| Typical Current monoculture | Integrated Farming with 6,000 m ³ pond | | |
|-----------------------------|---|------------|------------|
| | Activity | Wet Season | Dry Season |
| Paddy or Cassava 20 rai | Paddy | 10 rai | - |
| | Fruit trees | 4 rai | 4 rai |
| | Vegetables | 2 rai | 2 rai |
| | Beef cattle | 5 head | 5 head |
| | Chicken | 75 head | 75 head |
| | Farm pond | 2 rai | 2 rai |
| | Residential area, etc. | 2 rai | 2 rai |

A typical land use layout for integrated farming for a 20 rai farm holding with a 6,000 m³ farm pond is presented in Figure 2.1.

Figure 2.1 Typical Land Use Layout for Integrated Farming for a 20 rai farm with 6,000 m³ Farm Pond



Notes:

- (1) Residential area is for house, cattle-shed, drying and threshing yard and native chicken raising.
- (2) Rice field is for cultivation of main crops in the wet season under rain-fed agriculture condition.
- (3) Fruit Trees and fast-growing trees under rain-fed condition or young fruit trees may be provided supplemental irrigation water by pond in the dry season.
- (4) Vegetables or flowers are irrigated by farm pond during dry season.
- (5) Herbaceous perennial fruits i.e. papaya, banana are planted around farm pond with vegetable inter-cropping.
- (6) Farm pond with inland fish.

In order to ensure the success of the program, the decision to adopt the new integrated farming method should emanate from the farmers. Thus, focus should be given to the provision of adequate information, technology and demonstration on alternative agricultural activities which offer higher returns in line with the local conditions, market demand and farmers' needs. The decision to switch to other promising crops and activities should likewise come from the farmers themselves, based on active information and technology on alternative agriculture.

(5) Promotion of agricultural extension services and training for integrated farming system

In general, the DOAE is the major agency for agricultural support services and is responsible for imparting modern agricultural technology to farmers. Since the integrated farming system covers different activities, the efforts of the DOAE alone may not be adequate. It is therefore strongly proposed that all other relevant agencies should work closely under the project implementation program. Emphasis should be placed on intensive consultation and public campaigns for shifting from traditional monoculture to integrated farming systems including proposing alternatives to farmers for their consideration. Moreover, assisting the farmers to formulate annual and seasonal farm plans and farm accounts are deemed necessary. Besides the government agencies, the active selected farmers should be invited to act as instructors or contact farmers to teach their fellow farmers some specific subjects based on their experience. Site visits of the farmers to successful restructuring agricultural production projects of a similar nature should also be encouraged. In addition, their farms can be used as demonstration plots. For effective extension services for integrated agriculture development, changing agricultural extension systems from being sole promoters of agricultural activities to provision of farming alternatives for farmers is strongly proposed.

For the effective implementation and strengthening of training for the integrated farming system development, there should be two major types of training, namely, agricultural production training and occupational skills training. Agricultural production training consists of classroom training and on site training. The main purpose of on site training is to demonstrate to farmers specific farm practices. While occupational skills training is aimed at giving optional know-how on how to make non-agricultural products. This program can help the farmers gain additional income from value added farm products and off-farm activities.

Training for integrated farming system may cover an introduction to integrated agriculture, farm planning, farm accounting, marketing and other necessary training subjects. Training subjects may be divided into 3 categories i.e. plant production, animal and fish production, farm management and marketing. Within these subjects, field crops, fish culture and horticulture should be emphasized. To facilitate training, manuals, booklets or brochures with illustrations concerning each subject should be

provided farmers. These documents will help the farmers clearly understand the subjects.

(6) Providing soft loans and necessary farm inputs

For the promotion of restructuring agricultural production, the provision of agricultural credit service and necessary farm inputs to farmers who adopt integrated farming system has been the essential support provided by the government. The conversion of cultivated areas for mono-traditional crops into integrated farming areas will require a large amount of initial investment for farm pond construction, livestock breeding and fruit tree plantation. Since most farmers are poor, those who choose to adopt the integrated farming system would need loans in order to adjust their farm production structure since integrated farming activities such as fruit tree planting and livestock raising, cannot provide income within one year as they need a few years to yield production. This indicates that a long-term and medium-term loan with low interest rate should be provided to farmers who intend to join this project. In general, loan for restructuring agricultural production may be divided into 3 types as follows:

- Short term loan for one year crop production, (i.e. field crops, vegetables) that can obtain returns within one year;
- Medium-term loan for livestock raising that cannot produce incomes within one year, but can earn within 2 or 3 years; and
- Long-term loan for pond construction, micro irrigation, building cattle-shed and fruit tree plantation. This loan would be used for compensation of living expenses of farmers while economic returns from farming are still inadequate.

Short term loans are normally by BAAC. Borrowers may get loans during planting season and pay them back within one year upon selling of products.

According to the results of the feasibility study on the Integrated Agricultural Development in the ALRAs in the upper northeastern region by JICA in 1998, the preferable amount of loan per farm for each farming type in Sakon Nakhon is summarized as follows:

(unit : baht/farm)

| Type of Pond | Agricultural Activities | | Pond Construction |
|---------------------------|-------------------------|-------------|-----------------------|
| | Lowland Type | Upland Type | |
| 1,260 m ³ Pond | 37,991 | 53,935 | By Gov't without cost |
| 6,000 m ³ Pond | - | 46,794 | 122,743 |

The results of the study mentioned above identified the unit cost of major items for project implementation in rain-fed area as follows:

- Farm Pond Construction (1,260 m³) = 2,500 baht/rai of land holding
- Farm Pond Construction (4,800 m³) = 5,800 baht/rai of land holding
- Community Pond Construction (100,000 m³) = 3,000,000 baht/pond
- Farm road and village link road = 2,400 baht/rai

- Soil conservation work = 2,100 baht/rai
- Support for farming = 2,400 baht/rai

Aside from agricultural credit, a fund for supporting non-farming activities, i.e. handicraft and cottage industry is also necessary for securing additional farmers' incomes.

In order to achieve integrated farming development, aside from agricultural credit services, the provision of farm inputs i.e. certified seeds, seedling fingerling, fertilizer and pesticides, and effective quality control to assure high quality uses of those inputs are the most essential works which can affect crop production. Therefore, services and inputs provided by the government must be of good quality and delivered on time. Finally, supporting services for marketing are deemed necessary for agricultural development. Concerned government agencies should formulate a systematic and effective measure for the provision of updated market information to farmers and farmers' organizations involving price, quantity, quality marketing outlets, and characteristics of each product needed in the market.

(7) Project monitoring and evaluation

The project comprises a variety of activities including agricultural infrastructure development, agricultural development, extension and training, credit and marketing services. In order to measure progress of the works and the actual project performance for improving the effectiveness of the on-going project activities, a project monitoring and evaluation system should be carried out on a continual basis. For monitoring, at least two monitoring activities should be conducted i.e. interim monitoring and completion monitoring. The interim monitoring should be carried out during the first half of implementation, while completion monitoring will be carried out during the last year of project implementation. The monitoring to be done in the interim will be a tool for deciding whether any other improvements in project implementation are needed for the remaining period of the project while the completion monitoring will aim to measure the actual project performance.

In general, project monitoring is aimed at improving the efficiency of on-going project management through measurement of project activities and project output. Evaluation is then undertaken to effectively revise previous programs.

Restructuring agricultural production covers 3 key fields: agricultural infrastructure works, agricultural development works and social/environment works. The key indicators for each type of work will be selected for monitoring and evaluation. The example of key indicators for each type of work are proposed as follows:

1) Construction Works : farm pond / farm road, etc.

- Quality of construction
- Actual utilization
- Actual inflow into farm pond and water availability
- Maintenance
- Others

2) Agricultural Development work

- Addition income made
- Additional working day in crop fields
- Actual agricultural alternative activities to replace monoculture traditional crops
- Farmer's capability in integrated farming system
- Others

3) Social / Environment

- Number of increased employment
- Number of active forum/group/organization
- Quality of life
- Overall impact of integrated farming to farmers
- Others

These key indicators should be properly disseminated so that the important information can be properly discussed and recorded.

Key indicators with significant comments obtained will need to be reevaluated.

2.4 Demand Analysis

2.4.1 Estimate of Calorie Intake

Economic growth and modernization of people's life style have changed food habits of the Thai people. In particular, it is remarkable that consumption of carbohydrate has gradually decreased and consumption of fish and meat has increased. Calorie intake, which was 2,153 Kcal in 1989, rapidly climbed to 2,300 Kcal in 1994 and 2,400 Kcal in 1998.

The forecast on calorie intake until the year 2020 indicates that it will continue to increase in the medium term and then slow down in the long term. To illustrate this point, the calorie intake of Japan was 2,291 Kcal in 1960, then it went beyond 2,400 Kcal in 1964 and settled at 2,500 Kcal in 1968. After that, the increase rate slowed down to just over 2,600 Kcal in 1986 and recently, it has stayed at about 2,800 Kcal.

Under continuous economic growth and modernization of life style in the future, the calorie intake in Thailand is assumed to increase at the same level as that of Japan's in 2020, as shown in Table 2.1.

Table 2.1 Estimated Calorie Intake in the Future

| | Thai | | | | Japan |
|----------|-------|-------|-------|-------|-------|
| Year | 1998 | 2000 | 2010 | 2020 | 1999 |
| Kcal/day | 2,462 | 2,522 | 2,725 | 2,898 | 2,850 |

Source: JICA Study Team

2.4.2 Estimate of Food Consumption

Rice is the traditional staple food in Thailand while fish is consumed more than meat. This characteristic is similar to that of East and Southeast Asian countries. Eating meat is not so much traditional but more of the influence of western eating habits resulting in the gradual increase in meat consumption. According to Table 2.2, rice consumption is decreasing at an annual rate of - 1.4%, while poultry consumption is increasing due to expansion and low price of broiler production. Beef consumption is constant but it is still smaller than that of poultry and pork. But milk consumption is increasing. The livestock industry which has traditionally been small-scale and managed by individual farmers, is gradually shifting to commercial operations run by large companies. It is expected that lower costs and promotional activities would enlarge the livestock market.

Table 2.2 Food Consumption per Capita per Day

| | 1989 | 1994 | 1995 | 1996 | 1997 | 1998 |
|--------------------|-------|-------|-------|-------|-------|-------|
| Rice | 112.4 | 107.5 | 108.3 | 107.4 | 106.9 | 109.0 |
| Cereals | 21.9 | 27.4 | 26.4 | 28.0 | 25.3 | 26.9 |
| Sugar crops | 29.4 | 57.0 | 72.0 | 68.4 | 66.5 | 69.4 |
| Sweeteners | 18.0 | 24.2 | 27.1 | 28.0 | 28.9 | 30.7 |
| Vegetables | 36.9 | 37.3 | 38.2 | 37.1 | 35.6 | 36.3 |
| Oil crops | 28.0 | 28.6 | 29.2 | 22.7 | 25.9 | 24.9 |
| Fruits | 95.1 | 94.4 | 93.6 | 92.2 | 92.4 | 88.5 |
| Beef | 5.8 | 5.9 | 5.7 | 5.6 | 5.0 | 4.5 |
| Pork | 6.1 | 8.4 | 8.3 | 8.6 | 9.2 | 7.8 |
| Poultry | 6.1 | 13.9 | 13.8 | 14.4 | 14.1 | 15.8 |
| Milk | 10.6 | 19.3 | 24.0 | 23.3 | 26.8 | 21.6 |
| Eggs | 8.8 | 9.8 | 9.6 | 9.9 | 10.2 | 9.5 |
| Fish, Seafood | 20.3 | 30.1 | 32.0 | 31.2 | 33.4 | 33.1 |
| Calories (per day) | 2,176 | 2,328 | 2,398 | 2,422 | 2,432 | 2,462 |

(Kg/day/person)

Source: Food Balance Sheet, FAO

To forecast future food consumption, a dietary change should be taken into account. Table 2.3 shows a comparison of P.F.C. (Protein, Fat, Carbohydrate) consumption in Thailand, Japan and Europe. It appears that Japanese adhere to a balanced intake of carbohydrates, proteins and fats, while Europeans eat foods rich in protein and fat. Thai people take more carbohydrate-rich foods. The proportion of protein and fat in their diet is not high at the moment.

Table 2.3 Estimate of P.F.C per Food Consumption

| | Year | Carbohydrate | Protein | Fat | Others | Total |
|----------|------|--------------|---------|-------|--------|--------|
| Thailand | 1989 | 33.6% | 14.4% | 7.0% | 44.9% | 100.0% |
| | 1994 | 29.1% | 18.8% | 6.2% | 45.9% | 100.0% |
| | 1995 | 27.6% | 19.1% | 6.0% | 47.3% | 100.0% |
| | 1996 | 28.4% | 19.5% | 4.8% | 47.3% | 100.0% |
| | 1997 | 27.5% | 20.6% | 5.4% | 46.5% | 100.0% |
| | 1998 | 28.4% | 19.3% | 5.2% | 47.1% | 100.0% |
| Japan | 1989 | 41.0% | 32.7% | 8.7% | 17.5% | 100.0% |
| | 1994 | 40.1% | 33.9% | 8.8% | 17.1% | 100.0% |
| | 1998 | 40.6% | 34.2% | 8.2% | 17.0% | 100.0% |
| Europe | 1989 | 25.8% | 41.5% | 11.3% | 21.3% | 100.0% |
| | 1994 | 29.9% | 39.3% | 10.2% | 20.6% | 100.0% |
| | 1998 | 29.1% | 39.7% | 9.8% | 21.3% | 100.0% |

Source: JICA Study Team estimates.

In the future, P.F.C of Thailand will be closer to the Japanese P.F.C., which is a balanced diet of protein, fat and carbohydrate. With decrease of rice consumption, other source of carbohydrate such as bread will increase, and sources of protein and fat will be consumed more to reach the Japanese P.F.C ratio. Thus, the food consumption of Thailand will be estimated based on the changes of Japanese food consumption.

During 1960 to 1995, meat consumption in Japan increased 6 times, milk and dairy products consumption increased by 4.1 times, and egg consumption increased by 3.4 times.

With reference to the Japanese case, food consumption in Thailand is estimated as shown in Table 2.4. In 2020, rice consumption will decrease to 103.5 kg/year, beef, pork, poultry meat will increase to 17.5 kg/year, 18 kg/year and 47 kg/year, respectively. Milk will increase to 47 kg/year, and fish will increase to 52 kg.

Table 2.4 Estimated Food Consumption until 2020

| Food | Year | Thailand | | | | | | Japan | | | |
|--------------------------------------|-------|--------------------------|----------------|------------------------|----------------|------------------------|----------------|--------------------------|----------------|-------|--------------|
| | | 1998 | | 2000 | | 2010 | | 2020 | | | |
| | | Annual Consump. (Kg), 2/ | '000Kcal/ year | Annual Demand (Kg), 3/ | '000Kcal/ year | Annual Demand (Kg), 3/ | '000Kcal/ year | Annual Consump. (Kg), 2/ | '000Kcal/ year | | |
| 1. Rice | 3,300 | 109.0 | 359.7 | 108.4 | 357.7 | 105.4 | 347.8 | 103.5 | 341.6 | 61.0 | 201.3 |
| 2. Other cereals and root crops | 955 | 27.0 | 25.8 | 27.9 | 26.6 | 38.0 | 36.3 | 42.0 | 40.1 | 107.0 | 102.2 |
| 3. Sugar crops | 290 | 69.4 | 20.1 | 72.0 | 20.9 | 75.0 | 21.8 | 75.0 | 21.8 | 0.0 | 0.0 |
| 4. Sweeteners | 3,483 | 30.7 | 106.9 | 33.0 | 114.9 | 35.0 | 121.9 | 39.0 | 135.8 | 36.0 | 125.4 |
| 5. Vegetables | 190 | 36.3 | 6.9 | 36.2 | 6.9 | 37.0 | 7.0 | 37.0 | 7.0 | 120.0 | 22.8 |
| 6. Oil crops and Vegetable Oils | 6,900 | 24.9 | 171.8 | 24.4 | 168.4 | 24.0 | 165.6 | 24.0 | 165.6 | 26.0 | 179.4 |
| 7. Fruits | 807 | 88.5 | 71.4 | 87.3 | 70.5 | 84.0 | 67.8 | 85.0 | 68.6 | 55.0 | 44.4 |
| 8. Beef | 2,790 | 4.5 | 12.6 | 4.3 | 12.0 | 6.5 | 18.1 | 9.5 | 26.5 | 11.5 | 32.1 |
| 9. Pork | 2,113 | 7.8 | 16.5 | 8.2 | 17.3 | 14.5 | 30.6 | 17.5 | 37.0 | 18.0 | 38.0 |
| 10. Poultry Meat | 1,935 | 15.8 | 30.6 | 17.5 | 33.9 | 18.0 | 34.8 | 18.0 | 34.8 | 16.0 | 31.0 |
| 11. Milk | 785 | 21.6 | 17.0 | 22.0 | 17.3 | 38.0 | 29.8 | 47.0 | 36.9 | 70.0 | 55.0 |
| 12. Egg | 1,490 | 9.5 | 14.2 | 9.6 | 14.3 | 12.0 | 17.9 | 13.0 | 19.4 | 20.0 | 29.8 |
| 13. Fish | 1,110 | 33.1 | 36.7 | 36.0 | 40.0 | 45.0 | 50.0 | 52.0 | 57.7 | 71.0 | 78.8 |
| 14. Others | | | 9.0 | | 20.0 | | 45.0 | | 65.0 | | 100.0 |
| (Total Calories per capita) | | | 899.1 | | 920.6 | | 994.4 | | 1,057.8 | | 1,040.1 |
| Daily Calories per capita (Kcal/day) | | | 2,463 | | 2,522 | | 2,725 | | 2,898 | | 2,850 |

Note: 1/ USDA Nutrient Database, 2/ Food Balance Sheet, FAO, 3/ Estimated by JICA Study Team

2.4.3 Future Demand of Agricultural Products

Based on the food consumption estimate, future domestic demand of agricultural products is shown in Table 2.5. The table implies:

- The current rice production is more than the domestic demand.
- Sugar crops, sweeteners, vegetables, oil crops and vegetable oil, beef, pork, poultry meat, milk, eggs and fish will be demanded more than the current supply.
- To supply these products to meet future demand, it is necessary to have a policy either to increase production in Thailand or increase importation.
- It is possible to increase production of these commodities through agricultural diversification by mixed farming, in particular livestock raising, culturing of fresh water fish, cultivation of vegetables and production of vegetable oils.

Table 2.5 Future Demand of Agricultural Products

| Food | Demand | | Supply | | Diffence Between 1997 Supply and 2020 Demand |
|---------------------------------|-------------------------------------|---|----------------|----------------|---|
| | 2020 | | 1990 | 1997 | |
| | Annual Demand per person (Kg) | Annual Demand Total Population (000 ton/year) | (000 ton/year) | (000 ton/year) | |
| 1. Rice | 103.5 | 7,926.4 | 20,601.0 | 23,580.0 | 15,653.6 |
| 2. Other cereals and root crops | 42.0 | 3,216.5 | - | - | - |
| 3. Sugar crops | 75.0 | 5,743.8 | 2,288.3 | 4,021.0 | -1,722.8 |
| 4. Sweeteners | 39.0 | 2,986.8 | 1,373.0 | 1,930.1 | -1,056.7 |
| 5. Vegetables | 37.0 | 2,833.6 | 1,390.6 | 2,405.4 | -428.2 |
| 6. Oil crops and Vegitable Oils | 24.0 | 1,838.0 | 541.6 | 677.7 | -1,160.4 |
| 7. Fruits | 85.0 | 6,509.6 | 4,481.2 | 6,842.4 | 332.8 |
| 8. Beef | 9.5 | 727.5 | 242.6 | 264.5 | -463.1 |
| 9. Pork | 17.5 | 1,340.2 | 496.0 | 498.5 | -841.7 |
| 10. Poultry Meat | 18.0 | 1,378.5 | 1,446.6 | 1,453.3 | 74.8 |
| 11. Milk | 47.0 | 3,599.4 | 205.4 | 385.7 | -3,213.7 |
| 12. Egg | 13.0 | 995.6 | 524.6 | 586.5 | -409.1 |
| 13. Fish | 52.0 | 3,982.4 | 2,089.5 | 2,661.8 | -1,320.6 |

Source: JICA Study Team estimates.

2.5 Financial Analysis

2.5.1 Assumption

The financial analysis is made to check the feasibility of the program for a farm household. For this purpose, a 20 rai farm is assumed since this is the average size of farmlands in the NBR.

Table 2.6 Integrated Farming

| Items for integrated farming | Size |
|------------------------------|--|
| Rice production | 10 rai (Rice 5rai, sticky rice 5 rai) |
| Fruits and vegetables | 6 rai |
| Fish raising | 2 rai |
| Chicken | 75 heads |
| Cattle | 5 heads |
| House | 2 rai |

2.5.2 Project Cost

(1) Initial Investment

Total cost for initiating integrated farming for 18 rai is 180,000 Baht.

Table 2.7 Initial Investment Cost

| Items for integrated farming | Estimated cost (baht) |
|------------------------------|-----------------------|
| Digging pond | 100,000 |
| Fruit tree | 10,000 |
| Chicken, Cattle | 50,000 |
| Other expense | 20,000 |
| Total | 180,000 |

(2) Operation Cost

Total operation cost for integrated farming for 18 rai is 14,000 Baht including fertilizer, pesticide, feeds and fodder.

Table 2.8 Annual Expense

| Items for integrated farming | Estimate annual cost (baht) |
|------------------------------|---|
| Rice production | 7,000 |
| Fruits and vegetables | 3,500 |
| Fish raising | 2,000 |
| Chicken | 1,500 |
| Cattle | 700 (16,000 sell 2 cattle once a two year) |
| Total | 14,000 |

2.5.3 Revenue

Total operation cost for integrated farming for 18 rai is 14,000 Baht including fertilizer, pesticide, feeds and fodder.

Table 2.9 Annual Revenue

| Items for integrated farming | Estimate annual cost (baht) |
|------------------------------|-----------------------------|
| Rice production | 11,725 |
| Fruits and vegetables | 4,500 |
| Fish raising | 10,000 |
| Chicken | 6,000 |
| Cattle | 20,000 |
| Total | 4,500 |

2.5.4 Financial Evaluation

The Financial Internal Rate of Return (FIRR) of integrated farming is 13.1 %. This indicates that integrated farming is feasible for farmers..

2.6 Implementation Program

2.6.1 Implementation Schedule

Since an integrated farming system is a combination of different farm activities such as crop production and livestock and fish production, a key to the success of this program is how to coordinate and integrate various activities for promoting integrated farming program.

The components of the integrated farming program with executing agency and implementation schedule are presented as follows:

| Project No. | Project Name | Responsible Agency | Implementation Schedule (Year) |
|-------------|--|--|--------------------------------|
| 1 | Dissemination of Project Information to Help Farmers making Informed Decisions | Executing : DOAE Supporting : CPD DOA DOF DLD BAAC CDD ALRO | 2003-2005 |
| 2 | Farm Pond and Natural Water Source Development in Target Areas | Executing : RID Supporting : ARD LDD CPD ALRO | 2003-2013 |
| 3 | Promotion of Extension Services and Training for Integrated Agriculture | Executing : DOAE Supporting : CPD DOA DOF DLD LDD, ALRO | All project period |
| 4 | Providing an Agricultural Credit Subsidy and Assistance in Marketing | Executing : BAAC Supporting : CPD | All project period |
| 5 | Project Monitoring and Evaluation | Executing : OAE Supporting : BAAC | All project period |

2.6.2 Implementation Administration

MOAC will be the lead executing agency responsible for project implementation. This development plan covers various components, i.e. crops, livestock, fishery, agricultural extension services, agricultural credit, farmers' institution and marketing. A single agency, however, cannot handle all the components. Hence, the success of the project can be achieved only through a better coordination of these activities with other agencies involved in the project. In order to ensure a smooth and successful implementation of this project, several levels of coordination are needed : ministry level for plans and budgets; and provincial level/district level for coordination of local government agencies.

Most of the activities under this program are implemented by various concerned agencies in the MOAC and other relevant Ministries. The organization structure is based on establishing a Committee and Sub-Committees at different levels comprising all concerned agencies and representatives of the farmers in each area.

At present, MOAC has established the Restructuring of Agricultural Production System Committee at the national level and a Sub Committee at the Ministry level based in the central head office. At the regional level, there is a Sub-Committee in each province and Amphoe. The implementation administration of this plan will utilize the existing organizational structure of sub-committee in each area.

2.6.3 IEE

The program does not include construction activities except for digging small ponds. Thus, there are no significant environmental impacts, according to the IEE results as shown in Table 2.10. However, the program is expected to cause changes in the ecosystem brought about by land use changes from paddy field to paddy field with ponds and fields.

Table 2.10 Results of IEE.

| No. | Environmental Item | Evaluation | Reason |
|----------------------------|---------------------------------|------------|---|
| Social Environment | | | |
| 1 | Resettlement | D | No resettlement will occur in connection with Project implementation |
| 2 | Economic Activities | D | Direct impacts on economic activity will not be caused by the Project |
| 3 | Traffic/Public Facilities | D | Traffic/Public Facilities problem will not be caused by the Project |
| 4 | Split of Communities | D | There is no collective village near the Project site |
| 5 | Cultural Property | D | Important cultural properties are not present within the Project site |
| 6 | Water Right and Right of Common | D | There is no effect |
| 7 | Public Health Condition | D | Public health condition problem will not be caused by the Project |
| 8 | Waste | D | Waste will not be cause by the Project |
| 9 | Hazards (Risk) | D | Natural hazards/risks will not be increased by the Project. |
| Natural Environment | | | |
| 10 | Topography and Geology | D | As the proposed new facilities are not so huge, change of topography and geology will not occur |
| 11 | Soil Erosion | D | Integrated farming is done in the paddy field. There is no soil erosion expected. |
| 12 | Groundwater | D | Groundwater is not used both at the construction and the operational stages. |
| 13 | Hydrological Situation | D | Drainage problems may be handled properly. |
| 14 | Coastal Zone | D | The project area is not near the coastal Zone |
| 15 | Fauna and Flora | D | There are no important animals or plants found in the project area. |
| 16 | Meteorology | D | Change of meteorological conditions will not be caused by the Project. |
| 17 | Landscape | D | There are no important scenic spots around the project area |
| Pollution | | | |
| 18 | Air Pollution | D | Air Pollution will not be caused by the Project |
| 19 | Water Pollution | D | Water Pollution will not be caused by the Project |
| 20 | Soil Contamination | D | Soil contamination will not be caused by the Project |
| 21 | Noise and Vibration | D | Noise and Vibration will not be caused by the Project |
| 22 | Land Subsidence | D | Land subsidence will not be caused by the Project |
| 23 | Offensive Order | D | Land subsidence will not be caused by the Project |

Note: Evaluation categories

A: Serious impact is anticipated.

B: Some impact is anticipated.

C: Extent of impact is unknown. (Examination is needed.)

D: No impact is expected. EIA is not necessary.

E: Necessary to consider mitigation measures afterward.

2.6.4 Recommendations

Integrated farming should be identified as the main strategy in the development of sustainable agriculture, provided that there is water availability from irrigation systems, farm ponds or wells.

In order to ensure the effectiveness of project implementation, the government should step up its efforts in the following key activities:

- Research on horticultural crops;
- Providing information and technology on alternative agricultural activities and marketing;
- Establishment of necessary farmers' groups and promoting their group action for better project implementation;
- Encouraging farmers' participation in project implementation;
- Promoting the production of certified seeds and improved livestock breeds with quality control; Promote systematic and effective coordination and collaboration among various parties involved in project implementation i.e. the government agencies, private sectors, agricultural credit financiers and farmers.

In order to ensure the smooth and successful implementation of this project, effective coordination is needed for project management at several levels, i.e. national level, provincial level and project level.

CHAPTER 3

LOCAL INDUSTRY PLATFORM

CHAPTER 3

LOCAL INDUSTRY PLATFORM

3.1 Background of the Project

In general, the supporting functions for local industries are the local human resource development (HRD) function, technical/technological assistance function, function for enhancing the entrepreneurs, incubation function, consulting function for management skills, and so on. The Industrial Promotion Center of Thailand is the supporting institution responsible for undertaking these functions.

In the global context, the enhancement of supporting industry functions is important. This is true in Japan, the USA, Germany, and other developed countries. New business creation measures, e.g. incubation function, encouraging and/or nurturing the entrepreneurship, etc. are reinforced. In connection with such movement, the encouragement of the industrial usage of the fruits of research and development (R&D) activities has resulted in the collaboration between the academe and industry to support technological development in local industries.

It is also notable that most of the industry-supporting policies have been shifting to establishing efficient organizations, manned by competent personnel that are able to handle difficult situations.

While there are differences in the conditions of countries, regions and industrial structures, basically the supporting functions of new business creation and development of industries are the same. NBR, therefore, should possess these supporting functions such as private-academic collaboration, HRD, incubation, information dissemination, finance, consultancy, research, marketing, etc. In order to efficiently provide such services, the most important issue is to establish a local information network to integrate all sectors in the region with other regions and countries of the world. Through such a system, the various resources in the region will be utilized and relevant information will be fed back to each sector in order to stimulate regional change.

The establishment and enhancement of linkages through such an information network is a key factor to activate the regional industry, promote investment, and create new businesses. Accordingly, the establishment of the “Local Industry Platform (LIP)” as the local information network to support local industries is proposed, with two purposes in mind:

- to develop the local industry, promote direct investment, create new businesses, and establish a core management body; and
- to implement related activities.

3.2 Objectives

The overall objective of the LIP is to encourage industrialization of the NBR by fully utilizing local resources and undertaking networking. Since basic conditions for industrialization are not adequate in terms of capital, human resources, hardware and business information, the Local Industry Platform (LIP) program is envisioned to establish a core network that will link agencies concerned in central government and local governments, as well as local resource persons in and outside of the NBR.

LIP aims to promote technology transfer, and accelerate the development of new technology and new industries for the purpose of nurturing human resources and promoting the popularization of the local information system to catalyze the activation of local industries.

3.3 The Project

3.3.1 Location

LIP is expected to be established in each province in the long term. However, for the first stage of the LIP project, Sakon Nakhon has been selected. In order to obtain technical support and full involvement of resource persons, LIP will be located in the Rajabhat Institute, Sakon Nakhon.

3.3.2 Concept and Function of LIP

(1) Concept of LIP

Shortly, the LIP is the proposed system to efficiently implement industrial development and new business creation.

The business concept of the LIP is shown in Figure 3,1. This concept is different from that adopted by the existing Industrial Promotion Center of Thailand in view of the following:

- The LIP will be managed by the Local Government or private sector
- One of the major activities of the LIP on information networking aims to promote the usage of IT in the region.
- The LIP will appoint personnel from the private sector and enhance the linkage between industry and the academe and/or among industry, the academe, and the public.

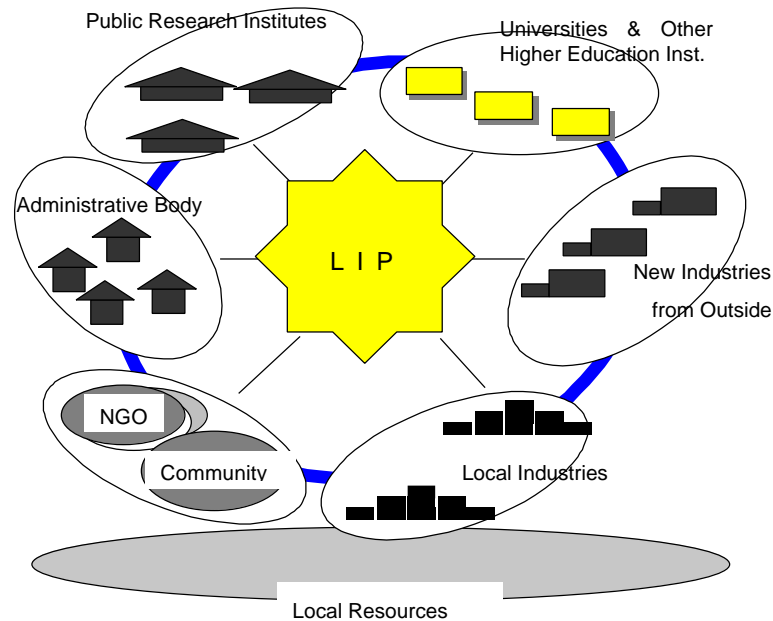


Figure 3.1 Concept of LIP

(2) Formation of LIP

The LIP consists of two major parts: one is the Local Consortium and the other is the implementation body called the Platform. The former is composed of sectors organizing the region such as private companies, universities, R&D institutes, NGOs, regional inhabitants, and regional governments responsible for discussions and decisions on basic policies to guide the activities of LIP, as well as securing funds. The latter is the implementation body to be entrusted to a Local Consortium.

(3) Functions

The functions are categorized into two groups as dictated by s. The identified functions will address shortages in the region. Existing facilities, such as Kasetsart University, Rajabhat Institute and the Rajamangala Institute of Technology will be expected to cooperate with the Platform. The Platform is envisioned to act as a one-stop service center, providing support in market development, information dissemination and exchange, HRD, promotion of regional IT usage and in other areas.

The following functions, though still to be discussed and decided on by the regional consortium, are to be handled by Platform:

1) HRD support function

The personnel to be nurtured shall cover the following fields: Information Technology, Business Administration, Production Management, Quality Control, Entrepreneurship, Middle Management, and Community Development.

2) Technology development support function

The components of this function are: support for technology development by private company, excavation of development seed in the region, leasing and/or rental of testing and analyzing equipment, entrusted testing and analyzing, and assistance of collaboration among the industry, academe, and the public.

3) Technology transfer function

This function hopes to strengthen and facilitate the technology transfer for research and development from R&D institutions to the private sector.

4) Venture business support function

The components of this function include: service matching between the market need and technology seed and management of incubating industries. (?)

5) Financial assistance function

This function will be undertaken in cooperation with venture capital, banks, financial companies to provide financial assistance to entrepreneurs and start-up businesses.

6) Consultancy service for management function

This shall be undertaken in cooperation with accountants, lawyers, banks, and the CCI to provide management services to companies.

7) Marketing support function

This function shall cover market development services and to the promotion of e-commerce.

8) Information dissemination and exchange function

Information on industries, technologies, products, and markets will be provided in order to strengthen the exchange among the different types of industries and between regions.

9) Regional IT usage promotion function

Performance of this function is envisioned to support the acceleration and expansion of the broadband telecommunications system in the region, develop the agent system and database, and promote IT usage in communities and other relevant organizations.

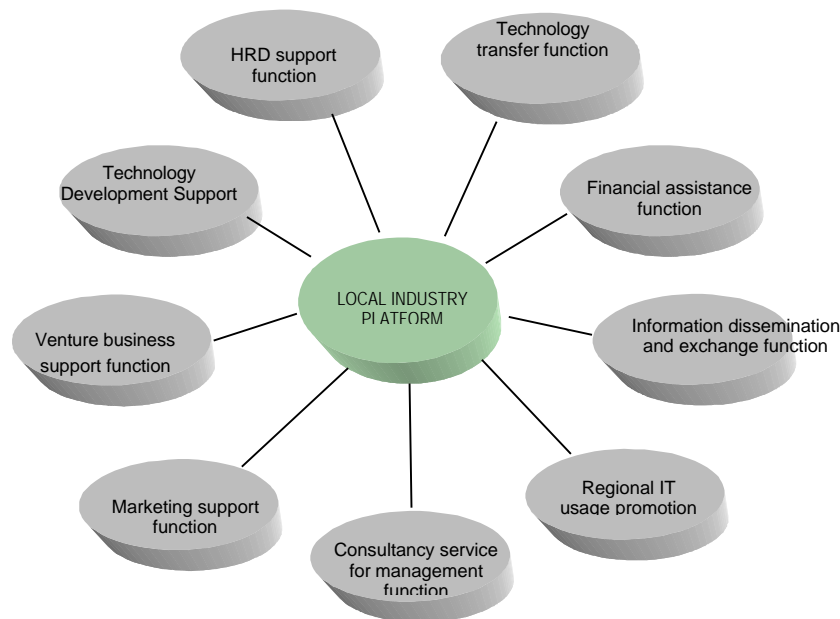


Figure 3.2 Proposed Functions of LIP

3.3.3 Business Domain

The above concept and function of LIP may be categorized into four domains of actual tasks, namely:

- Support business for the local industry;
- Support business for new-industry development;
- Support business for the nurturing of human resources and business exchange; and
- Support business for the local information system.

(1) Support Business for the Local Industry

This category of service includes:

- Technology development;
- Technology transfer;
- Promotion of cooperative relationship between industry and academe;
- Marketing;
- Management examination and advice;
- Finance arrangement;

- Rental of testing and analysis equipment; and
- Rental of laboratory.

(2) Support Business for New-Industry Development

This category of service includes:

- Excavation and nurturing of local seeds;
- Total support for business ventures including operation of incubation support system; and
- Financing arrangement.

(3) Support Business for the Nurturing of Human Resources and Business Exchange

This category of service includes:

- Training;
- Regional and business exchange;
- Matching; and
- Provision of information, data and materials.

(4) Support Business for Local Information System

This category of service includes:

- Development of local information system;
- Expansion of network;
- Systems development; and
- Popularization of local information system.

3.3.4 Facilities

To achieve the tasks identified in the previous section, LIP should have the following facilities:

- Construction site: Rajabhat Institute Site in Sakon Nakhon
- Site area: 20,000 m²
- Total floor area: 3,831 m² (Reinforced Concrete, 1,277 m² x 3F)

Table 3.1 Outlines of Facilities

| | Number of Rooms | Remarks |
|------------------------|-----------------|--------------------------|
| Incubation Room | 10 | 25 ~ 100 m ² |
| Rental Laboratory | 2 | 100 ~ 150 m ² |
| Training Room | 4 | 35 ~ 100 m ² |
| Computer Training Room | 2 | 100 ~ 180 m ² |
| Meeting Room | 5 | 25 ~ 180 m ² |

| | | |
|---------------------|---|--|
| Consulting Room | 2 | 52 ~ 68 m ² |
| Library | 1 | 180 m ² |
| Communication Salon | 1 | 128 m ² |
| Hall | 1 | 310 m ² |
| Others | | Administrative Room, Experiment Preparation Room, Warehouse etc. |

3.3.5 Project Cost

Total initial cost of 52 million baht is estimated for LIP.

Table 3.2 Construction Cost

| | Estimated Cost | Remarks |
|------------------------|-----------------------|--|
| Site Acquisition Costs | Rent (Free of Charge) | |
| Site Preparation Costs | 6,000,000 B | 20,000 m ² x @300B |
| Construction Costs | 45,972,000 B | 3,831 m ² x @12,000B |
| Total Cost | 51,972,000 B | Including related facilities and equipment |

3.4 Implementation Program

3.4.1 Project Implementation Schedule

The project needs a preparatory period of four years to cover preparation of the detailed business plan, preparation of facilities, acquisition of equipment and organizational set-up. This will be completed in 2004. LIP is then expected to be fully operational starting in 2005.

The proposed implementation schedule is shown in Figure 3.3.

| | Work Item | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | Remarks |
|----|-----------------------------------|------|------|------|------|------|------|------|------|------|------|---------|
| 1 | Preliminary Business Plan | | ■ | | | | | | | | | |
| 2 | Development of Business Packages | | ■ | ■ | | | | | | | | |
| 3 | Development of Business Network | | | ■ | ■ | | | | | | | |
| 4 | Basic Design of Facilities | | | ■ | ■ | | | | | | | |
| 5 | Final Research & Survey | | | | ■ | ■ | | | | | | |
| 6 | Final Business Plan | | | | | ■ | ■ | | | | | |
| 7 | Establishment of Organization | | | | | | | | | | | |
| 8 | Start of Sales Activities | | | | | | | | | | | |
| 9 | Business Packages & Network | | | | | | | | | | | |
| 10 | Design of Facilities | | | | ■ | ■ | | | | | | |
| 11 | Construction of Core Facilities | | | | | ■ | ■ | | | | | |
| 12 | Start of Business | | | | | | | | | | | |
| 13 | Flow Up | | | | | | ■ | ■ | ■ | ■ | ■ | |
| 14 | The First Stage of Business Doing | | | | | | ■ | ■ | ■ | ■ | ■ | |

Figure 3.3 Implementation Schedule

3.4.2 Organization

Since the performance of LIP tasks requires fairness and transparency, LIP should maintain a public status and be operated with public cooperation.

It is ideal for the management of the Platform to be handled by personnel coming from the business sector or, at least, having the experience to do business. It is necessary for the Platform to keep abreast with the rapid progress of the global economy and that of information technology. Thus, the managers of the Platform are required to have the knowledge and experience to cope with the dynamism of the economy. Target personnel include:

- Incubation manager;
- Network manager; and
- Marketing manager.

The proposed organizational chart is shown in Figure 3.4. LIP is expected to be composed of the following divisions:

- Administration division;
- Local industry support division;
- New industry development division;
- Training and information division; and
- Local information system development division.

Total number of staff is 30 persons.

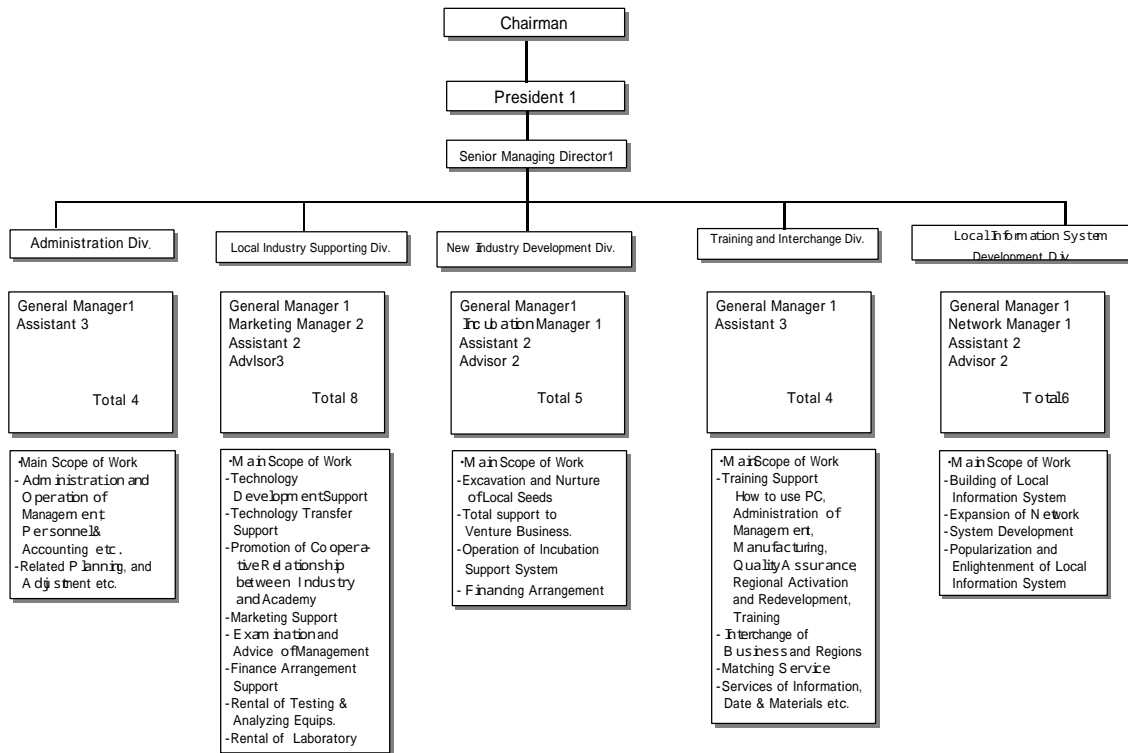


Figure 3.4 Organizational Chart of LIP

3.4.3 Financial Arrangement

(1) Revenue

Since the LIP will not be engaged in income-generating activities, it will be necessary to widely collect funds from various bodies to cover investment cost. Following are possible revenue sources:

- Fund: 50,000,000 baht from government
- Membership Fee: 1,500,000 baht from the private sector
- Income from activities as shown in Table 3.3.

An annual income of 40 million baht is expected from the regular operation of the LIP.

Table 3.3 Expected Income from LIP Activities

| Items | Expected Income (Baht) | Remarks |
|------------------------|---------------------------|------------------------|
| Operating Income | 39,000,000 | |
| Research & Survey | 3,500,000 | Business undertaken |
| Training | 3,500,000 | Fee |
| Development | 7,000,000 | Business undertaken |
| Information Technology | 25,000,000 | Service fee |
| Miscellaneous Income | 1,000,000 | Interest earnings etc. |
| Total | 40,000,000 | |

(2) Operation and Management Cost

Table 3.4 shows assumed operation and management costs. An annual operation and management cost of 40 million baht is estimated.

Table 3.4 Assumed Operation and Management Cost

| Items | Assumed Cost (baht) |
|--------------------------------|------------------------|
| Salaries/wages | 13,680,000 |
| Traveling | 4,080,000 |
| Communication & Transportation | 600,000 |
| Consumer Goods | 530,000 |
| Consultant Fee | 750,000 |
| Power & Utilities | 540,000 |
| Miscellaneous | 18,910,000 |
| Total | 39,090,000 |

3.4.4 IEE

The project entails construction in the project site located in the existing campus of Rajabhat Institute in Sakon Nakhon. No significant environmental impacts are expected except for noise and vibration during the construction period. This is reflected in the results of the IEE as shown on Table 3.5. It is necessary to consider mitigation methods for these foreseen environmental impacts.

Table 3.5 Results of IEE

| No. | Environmental Item | Evaluation | Reason |
|----------------------------|---------------------------------|------------|---|
| Social Environment | | | |
| 1 | Resettlement | D | Nobody will resettle during Project implementation |
| 2 | Economic Activities | D | Direct impacts on economic activity will not be caused by the Project |
| 3 | Traffic/Public Facilities | D | Traffic/Public Facilities problem will not be caused by the Project |
| 4 | Split of Communities | D | There is no collective village near the Project site |
| 5 | Cultural Property | D | There are no important cultural properties within the Project site |
| 6 | Water Right and Right of Common | D | Specific rights for water and fishing are not reported in the Project site |
| 7 | Public Health Condition | D | Public health problems will not be caused by the Project |
| 8 | Waste | D | Municipal waste will increase but there will be no problem. |
| 9 | Hazards (Risk) | D | Natural hazard risks will not be increased by the Project. |
| Natural Environment | | | |
| 10 | Topography and Geology | D | As the proposed new facilities are not so huge, change of topography and geology will not occur because of the Project. |
| 11 | Soil Erosion | D | Soil erosion problem will not be caused by the Project |
| 12 | Groundwater | D | Groundwater will not be used both at the construction stage and the operational stage. |
| 13 | Hydrological Situation | D | Drainage problems may be handled properly. |
| 14 | Coastal Zone | D | The project area is not near the coastal Zone |
| 15 | Fauna and Flora | D | There are no important animals or plants found in the project area. |
| 16 | Meteorology | D | Change of meteorological conditions will not be caused by the Project. |
| 17 | Landscape | D | There are no important scenic spots around the project area |
| Pollution | | | |
| 18 | Air Pollution | D | Air Pollution will not be caused by the Project |
| 19 | Water Pollution | D | Water Pollution will not be caused by the Project |
| 20 | Soil Contamination | D | Soil contamination will not be caused by the Project |
| 21 | Noise and Vibration | E | Noise and Vibration will occur during the construction period. |
| 22 | Land Subsidence | D | Land subsidence will not be caused by the Project |
| 23 | Offensive Order | D | Land subsidence will not be caused by the Project |

Note: Evaluation categories

A: Serious impact is anticipated.

B: Some impact is anticipated.

C: Extent of impact is unknown. (Examination is needed.)

D: No impact is expected. EIA is not necessary.

E: Necessary to consider mitigation method afterward.

CHAPTER 4

**IT HRD CENTER IN
RAJAMANGALA INSTITUTE OF
TECHNOLOGY,
KALASIN**

CHAPTER 4

IT HRD CENTER IN RAJAMANGALA INSTITUTE OF TECHNOLOGY, KALASIN

4.1 Background of the Project

4.1.1 Regional Higher Education Development

Human resource development is the key strategy for development of the NBR. It is very important to expand the capacity of higher education institutes in the NBR. With the future development of NBR in mind, the following courses are preferable:

- Agriculture Technology,
- Science and Technology,
- Business Administration,
- Information Technology (IT), and
- Tourism

Among the above courses, IT is the newest subject and therefore needs to be given primary attention.

4.1.2 High Demand for IT-related Courses in Higher Education

Interviews with various higher education institutes in NBR revealed that IT-related courses were quite popular among applicants as well as students. Because of their popularity and limited funds for new investment, such institutes lacked the capacity to offer additional IT-related courses. In addition to IT-related courses, students of other courses also require IT subjects. Thus, a high demand for IT is expected from students of both IT-related courses and other courses.

4.1.3 Development of Middleclass Workers

The future development of NBR relies on the formation of middleclass workers who are capable of doing work requiring advanced skills, such as engineering, designing and management. IT-related courses have the potential to develop competent middleclass workers.

4.1.4 Keys to Success in IT

The widespread use of IT holds promising potential to spread economic activity, democratic principle, wealth and social benefits across every region of the country, thus greatly enhancing the possibility of reversing the migration trend to the Bangkok Metropolis and stemming the tide of ensuing social ills.

The three fundamental prerequisites that must be in place and should function together are as follows:

- A national information infrastructure (NII);
- A well-educated populace and adequate IT manpower; and
- A dare to dream attitude and a resolve to Act.

The second prerequisite is a matter of human resource development. The country will need a population capable of generating and utilizing the information and knowledge available through the NII to the fullest extent possible.

4.1.5 Wide Applications of IT

IT not only makes what we can do today easier, quicker and more efficient. IT can also make possible new ways of working, learning, communicating, and solving problems. Generally, IT can improve the quality of life.

Through a host of new technologies: computers, data communications, and electronic media, IT offers new possibilities and opportunities to support the quest for:

- A well educated population and a content society;
- A more effective rural development and wealth distribution program;
- A better environment and natural resources conservation effort; and
- A new direction to build economic strength and social harmony.

4.1.6 Industrial Development in NBR

As described in the industrial promotion section of this report, bringing up entrepreneurs is indispensable to industrial promotion in NBR. Manpower with an IT background have

the potential to be entrepreneurs and support other entrepreneurs through the creation of an information network and database.

4.1.7 Job Opportunities

Graduates from IT-related courses currently do not have large job opportunities in NBR and get jobs in large cities like Bangkok. However, it is expected that they would be able to find good jobs in NBR in the near future in proportion to the expected industrial development in the area.

4.1.8 Assessment of Existing Higher Education Institutes in NBR

Table 4.1 summarizes the assessment of existing higher education institutes in NBR focusing on IT-related education. The situation varies from one higher education institute to another. Some institutes already have new buildings for IT-related education; others still need to start construction of such buildings; and still others do not have the resources to build such buildings. It is important to take account of such situations when an investment is made for IT-related education.

Table 4.1 Assessment of Existing Higher Education Institutes in NBR

| Province / Institute | General | IT-related Education & other topics |
|---|---|---|
| <u>Kalasin</u> Rajabhat Institute (RI) Kalasin | Science Students: 183 Teaching Staff: 5 | -This is a new campus. -Only 2-year study is being offered. The students must move to RI Mahasarakham to continue studying. |
| <u>Kalasin</u> Rajamangala Institute of Technology (RIT) Kalasin | Animal science (Dip, BA) Veterinary Technology (Dip) Plant Science (Dip, BA) Fisheries (Dip, BA) Food Technology (Dip, BA) Mechanics (Dip) Marketing (Dip, BA) Management (Dip, BA) Business Computer (Dip) Students Dip:883 BA:446 Teaching Staff: 85 | -It has a business computer course, although it is in the diploma level. - It has many applicants to business computer, but it can only educate a limited number of students due to its small capacity. - It has a plan to build an IT Building, however, it cannot be realized due to lack of budget. - It has experiences of cooperation with other Indochina peoples. |
| <u>Sakon Nakhon</u> Rajabhat Institute (RI) Sakon Nakhon | Education(BA,MA) Science & Tech. (Dip,BA, MA) Humanities & Social Science (Dip, BA) Management Science(Dip, MA) Agricuture Tech.(Dip,BA) Student Dip: 360 BA: 3541 MA:551 Teaching Staff: 200 | - Originally it was founded as a teacher training college, and gradually transformed into an institute to provide extended educational services. - It serves not only Sakon Nakhon but also its neighboring provinces; Nakhon Phanom and Mukdahan. - It has two IT-related courses in the Faculty of Science & Technology; Computer Education and Computer Science courses. - Two IT-related courses are the most popular courses among all courses of the Institute. - It has a computer center, but it is not enough for its requirements. However, it is not possible to add another computer center due to limited funds. |
| <u>Sakon Nakhon</u> Kasetsart University Chalemprakiat Sakon Nakhon Province Campus | Faculty of Natural Resource & Agro-Industry Agro-Bio Resource Food Technology Faculty of Science & Engineering Civil Engineering Electric Engineering Mechanical Engineering Faculty of Liberal Arts and Science Management Accounting General Management Student BA:477 Teaching Staff:22 | - It is the 4 th campus of Kasetsart University. - It is called IT campus, because it is equipped with distance learning, electric library, computer rooms, computerized language laboratory, etc. - Construction of IT-building will start in two months. - Currently it has many IT-related subjects for all students. - It will have new IT-related courses such as Computer Engineering, Computer Science and Information Technology. |
| <u>Sakon Nakhon</u> Rajamangala Institute of | Faculty of Agriculture (BA, Dip) Animal Science, Plant | - It was established in 1987. - It has two IT-related courses at the |

| Province / Institute | General | IT-related Education & other topics |
|--|---|---|
| Technology (RIT) Sakon Nakhon | Science, Fishery Business Administration (Dip) Technology/Engineering (Dip) Manufacturing, Auto, Electronics, Electricity, Computer Technology, Building & Construction, Civil, Product Design Student Dip:750 BA : 220 Teaching Staff: Full Time 60 Part Time 40 | bachelor level: Business Computer and Computer Science. - It also has a diploma level course in Computer Technology and plans to expand it to the bachelor level. - It has several buildings that were built recently. - It has a plan to increase bachelor level courses. To increase the number of bachelor level courses, quality of teaching staff must be improved to get more masters degree holders |
| <u>Nakon Phanom</u> Rajabhat Institute (RI) Nakon Phanom | Electronics Business English Policy of Government Education (Kinder Garden Teachers) Student BA:500 Teaching Staff 30 | - One of 5 New Rajabhat Projects that is being implemented in Northeastern Thailand. - It has a small campus. - It is the higher educational institute for the local community. |
| <u>Nakon Phanom</u> Mahasarakan University | Business Administration (BA) Management (BA) Education (MA) Student BA: 195 Technical Staff: 6 | - It is located in the temporary campus. - The new campus is under construction. |
| <u>Nakon Phanom</u> Ramkhamheang University | Law (BA, MA) Politics (BA, MA) BA: 831 MA: 134 | - It is an open university. |

Source: JICA Study Team

4.1.9 Conclusion: Necessity of the Project

- 1) It is quite important to expand the capacity of NBR's higher education institutes. Among several courses preferable to NBR, IT is the course to be focused on.
- 2) High demands are expected for IT-related courses and other courses using IT.
- 3) IT-education has the potential to generate competent middleclass workers who are the key for future development of NBR.
- 4) Manpower with IT background have the potential to be entrepreneurs as well as specialists supporting entrepreneurs. The potential is essential for industrial development in NBR.
- 5) A well-educated populace and adequate IT manpower is one of the fundamental prerequisites for IT development in the country. The country needs a population capable of generating and utilizing the information and knowledge.
- 6) Job opportunities of graduates from IT-related courses may not be so large in NBR currently, however, they will become larger in the near future.
- 7) Among several higher education institutes in NBR, Rajamangala Institute of Technology

Kalasin (RIT Kalasin) is the institute that extremely requires IT-related courses.

- 8) It is highly necessary to establish IT-related courses in RIT Kalasin.

4.2 Goals, Objectives and Strategies of the Project

4.2.1 Goals of the Project

The main goal of the project is to nurture middle-class workers who will work for IT fields or will be IT users. By having an IT human resource development center (IT HRD Center), IT-related courses can be established and short-term courses can be provided for the local community and Indochinese people. Following are the specific goals of the project:

- To increase the number of middle-class workers for IT by adding IT-related courses;
- To improve the IT education for students of existing courses;
- To set up training courses where community people can learn IT; and
- To set up training courses where Indochinese people can learn IT.

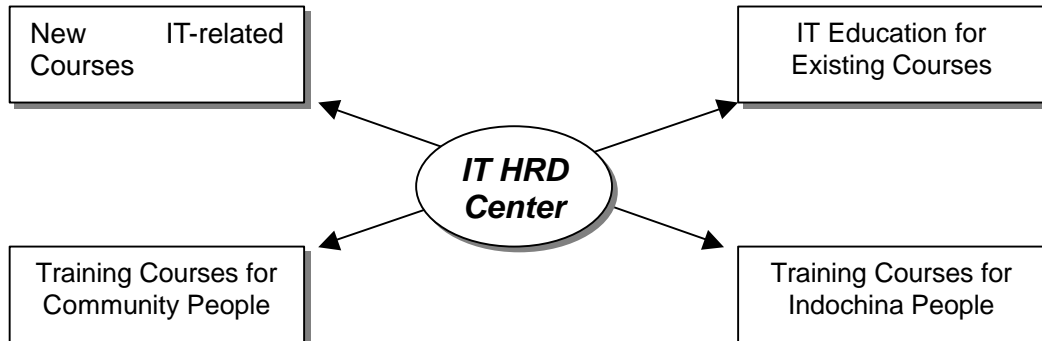


Figure 4.1 Concept of IT HRD Center

4.2.2 Objectives of the Project

The objectives of the project are identified as follows:

- To establish the IT HRD Center in the campus of RIT Kalasin;
- To set up new IT-related courses in the Economic and Business Administration Department of RIT Kalasin;

- To set up new IT short-term training courses for the local community and Indochinese people in the Training Unit of RIT Kalasin;
- To set up an appropriate curriculum for each new IT-related course;
- To develop curricula for the existing courses of RIT Kalasin;
- To set up effective curricula for new IT short-term training courses; and
- To operate the IT HRD Center through the existing organization headed by the director of RIT Kalasin.

4.2.3 Development Strategies of the Project

(1) Strategy 1: New IT-related Courses

The only IT-related course currently being offered at RIT Kalasin is the business computer course. As this course is offered only at the diploma level, most graduates wish to pursue bachelor's degrees. A limited number of applicants are admitted into the course due to the school's small operating capacity.

Thus, RIT Kalasin should expand to offer other IT-related courses at the bachelor's degree level. It is preferable that the following courses be set up, taking into consideration IT-related courses offered at other campuses of RIT.

- Computer science,
- Information system, and
- Computer education.

Rapid progress in computer technologies creates new mathematical modeling concepts such as chaotic systems and fractals, as well as algorithms, which are influencing the design of new computer architecture and software. The objective of the computer science course is to educate individuals whose imagination and intelligence could very well lead the research based on such strong interactions between mathematics and computer sciences.

IT engineers who have graduated from the faculty of engineering sometimes cannot understand information systems due to lack of knowledge on management, organization, and culture of clients. On the other, graduates from the faculties of business administration, economics, and law sometimes request impossible tasks of IT engineers due to their lack of knowledge on IT. The objective of the information system course is to educate individuals who utilize information technology or application to implement projects.

IT education is also necessary for upper secondary school students. The objective of the computer education course is to educate individuals who will be IT teachers in the upper secondary schools.

(2) Strategy 2: I T Education for Existing Courses

Information is one of the most important keywords in modern science and technology. All study programs currently being offered at RIT Kalasin require more IT education than what is being provided at present, as these students are required to function in an information-oriented society.

(3) Strategy 3: Short-term IT Training Programs for Community People

There must be a literate and well-educated population for benefits to accrue to all segments of society. Without that, the society as a whole cannot be an active generator and consumer of new knowledge and information. RIT Kalasin, as a leader of technology transfer to the community, should offer short-term IT skills training programs to members of local communities. Target trainees might be the government sector in the province, tambons (sub-district), and mu-baan (villages), as well as the private sector such as small entrepreneurs.

(4) Strategy 4: Short –term IT Training Programs for Indochinese People

For social and economic development, more priority should be placed on human resources that cope with regional development and the advanced industrial structure. A notable feature of NBR is its having the same language and culture as Laos. It is expected that the development and exchange of human resource will contribute to political stability and economic and cultural cooperation within the region. Opportunities for education initiated by the Thai side is very important from such a point of view.

RIT Kalasin's wealth of experiences in cooperating with Indochinese countries in 2001 as shown in Table 4.2, will be very useful.

Table 4.2 Cooperation Activities with Indochinese Countries in 2001

| Project Site | RIT Kalasin Roles | Budget Source | Total Project Costs |
|---|--|--|---------------------------------|
| <u>1. Curriculum Development for 2 Agricultural Schools Project in Lao PDR (2001-2003)</u> | | | |
| - LuangPraBang Agricultural School - JumPaSak Agricultural School | - Training the staff - Resource persons | International Cooperation for Development and Solidarity (CIDSE) | US\$ 202,870 |
| <u>2. Rural Development Project in Lao PDR (2001-2003)</u> | | | |
| Vientiane, Khammuon, Savannakhet | - Activities planning - Training agriculture staff - resource persons | International Cooperation for Development and Solidarity (CIDSE) | US\$1.5 million (Approximately) |
| <u>3. Indochina Human Resource Development Project for Lao, Vietnam and Cambodia</u> | | | |
| RIT, Kalasin | Organized the training workshop for training 28 agriculture staff from Lao, Vietnam and Cambodia in the end of the year 2001 | RIT Office in Bangkok | Baht 315,200 |
| <u>4. The degree courses for Lao students</u> | | | |
| RIT, Kalasin | Planned to accept 25 students from Laos without foreign student fee charge | - | - |
| <u>5. Technical support for Action Contre la Faim (ACF is French NGO supported from EU) in Sekong Province (2000-2001)</u> | | | |

Source: RIT, Kalasin

RIT, Kalasin should offer short-term IT training programs for Indochinese people and make good use of its experiences in cooperation activities.

(5) Strategy 5: IT HRD Center

The IT HRD Center should be constructed in RIT, Kalasin to fulfill the functions identified above.

4.2.4 Expected Achievement

With the IT HRD Center Project, RIT Kalasin will be able to provide regular educational courses for graduates from upper secondary schools or their equivalent, short-term training programs for the local community and Indochinese people.

Table 4.3 shows the concept of target and achievement of education services provided by the project.

Table 4.3 Expected Achievement of the Project

| Education Service | Target | Achievement |
|-----------------------------------|--|--|
| IT-related course | Graduates from Upper Secondary Schools | Acquire necessary knowledge and techniques of IT for middle-class workers |
| IT education for existing courses | Graduates from Upper Secondary Schools | Acquire necessary knowledge and techniques in various fields as where middle-class workers operate |
| IT Short-term training program | Community People | Acquire necessary techniques to cope with an information-oriented society |
| IT Short-term training program | Indochinese people | Social and economic cooperation for regional political stability |

4.3 Demand Forecast

4.3.1 New IT-related Courses

The demand for new IT-related courses is projected based on the number of applicants for the existing course on business computer, as no demand survey has been conducted for new IT-related courses.

Table 4.4 shows the number of applicants and newly enrolled students of business computer course in RIT, Kalasin for the years 1999 to 2001. Number of applicants has increased at a rate of 20% annually during the period. It is expected to increase to 630 in the year 2003.

This projection is for the business computer course to be expanded to a diploma degree program. The three IT-related courses are expected to have applicants numbering more than 630, since the institute is expected to offer bachelor degree programs that are more popular than diploma degree programs.

Table 4.4 Number of Applicants and Newly Enrolled Students in the Business Computer Course of RIT, Kalasin

| Academic Year | Prescribed Number of Student | Number of Applicants | Newly Enrolled Students (Regular Course) | Newly Enrolled Students (Irregular Course) |
|---------------|------------------------------|----------------------|--|--|
| 1999 | 60 | 320 | 68 | 60 |
| 2000 | 60 | 325 | 69 | 55 |
| 2001 | 60 | 450 | 155 | 40 |
| 2003 | | Projection 630 | | |

Source: RIT, Kalasin

4.3.2 Short-term IT Training Programs for Community People

Target trainees of short-term IT training programs are the public sector in the province, tambons (sub-district), and mu-baan (villages), as well as the private sector such as small entrepreneurs. They need to improve computer skills. According to RIT, Kalasin, the number of target trainees is estimated at approximately 40,000 persons in the Kalasin province.

4.3.3 Short –term IT Training Programs for Indochinese People

RIT, Kalasin offers short-term training programs mainly for agriculture to more than 60 Indochinese persons every year and expects that the demand for IT training would be double or triple this figure.

4.4 The Project

4.4.1 Location of the IT HRD Center

The IT HRD Center will be located in the open space that is kept in the main campus of RIT, Kalasin.

4.4.2 Project Organization

Figure 4.2 illustrates the project organization. Project implementation will be entrusted to the project working team headed by the project manager, which will be established under the RIT management.

The main objective in appointment of the project working team is to ensure that the execution of all works complies with the implementation plan and budget, and proper countermeasures are enforced in case the actual implementation work and costs deviate from the plan.

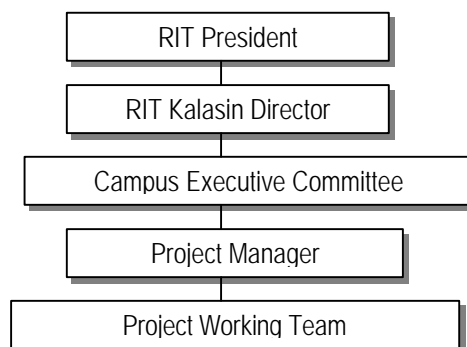


Figure 4.2 Project Organization

4.4.3 Project Components

The project consists of four components as shown below:

- Development of courses;
- Curriculum development;
- Faculty staff employment; and
- Facility development.

These components are closely linked to each other to ensure the effective implementation of the project.

4.4.4 Development of Courses

(1) IT-related Courses (Regular Courses)

The IT-related courses should be established in due consideration of demand and availability of faculty staff. The following courses have been tentatively selected based on strategy 1.

- Computer science;
- Information system; and
- Computer education.

The planned number of students is based on the demand forecast described in the report:

Table 4.5 Number of Student for New IT-related Course

| | 1 st year | 2 nd year | 3 rd year | 4 th year | 5 th year | 6 th year | 7 th year & later |
|---------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|------------------------------|
| Computer Science | 30 | 90 | 180 | 300 | 390 | 450 | 480 |
| Freshman | 30 | 60 | 90 | 120 | 120 | 120 | 120 |
| Sophomore | 0 | 30 | 60 | 90 | 120 | 120 | 120 |
| Junior | 0 | 0 | 30 | 60 | 90 | 120 | 120 |
| Senior | 0 | 0 | 0 | 30 | 60 | 90 | 120 |
| Information System | 30 | 90 | 180 | 300 | 390 | 450 | 480 |
| Freshman | 30 | 60 | 90 | 120 | 120 | 120 | 120 |
| Sophomore | 0 | 30 | 60 | 90 | 120 | 120 | 120 |
| Junior | 0 | 0 | 30 | 60 | 90 | 120 | 120 |
| Senior | 0 | 0 | 0 | 30 | 60 | 90 | 120 |
| Computer Education | 30 | 90 | 180 | 300 | 390 | 450 | 480 |
| Freshman | 30 | 60 | 90 | 120 | 120 | 120 | 120 |
| Sophomore | 0 | 30 | 60 | 90 | 120 | 120 | 120 |
| Junior | 0 | 0 | 30 | 60 | 90 | 120 | 120 |
| Senior | 0 | 0 | 0 | 30 | 60 | 90 | 120 |
| New Courses Total | 90 | 270 | 540 | 900 | 1170 | 1350 | 1440 |

(2) Short-term IT Training Program for Community People

The IT HRD Center of RIT, Kalasin will offer short-term programs featuring training on basic computer skills for community people. Target of short-term training are persons in the government sector in the province, tambons (sub-district), and mu-baan (villages), as well as the private sector such as small entrepreneurs. The training programs are scheduled as follows:

- Training hours: 20 hours/course
- Number of trainees: 30 persons/ course
- Number of courses: 2 courses/month at the 1st year of operation
3 courses/month at the 2nd year of operation and later

(3) Short-term IT Training Program for Indochinese People

The IT HRD Center of RIT, Kalasin will also offer short-term programs for trainings on basic computer skills to Indochinese people such as Lao. The training programs have been scheduled based on the past experiences in training programs offered to Indochinese people mainly for agriculture:

- Training hours: 20 hours/course
- Number of trainees: 30 persons/ course
- Number of courses: 3 courses/year at the 1st year of operation
6 courses/year at the 2nd year of operation and later

4.4.5 Curriculum Development

Curriculum development is fundamental for IT education. RIT, Kalasin should develop curricula for IT-related courses and short-term training programs by utilizing the network of Rajamangala Institutes of Technology.

4.4.6 Faculty Staff Employment

Employment of faculty is essential for establishing new IT-related courses. In the case of RIT, Kalasin, it might be easy to employ required faculty by utilizing the network of Rajamangala Institute of Technology.

Two types of faculty need to be employed in addition to the existing staff. One type is the teacher with a master's degree or higher, the other is the assistant teacher with a bachelor's degree. Assistant teachers may be promoted to teachers after they get their master's degrees. On assumption that the ratio of students to teacher is 30 to 1, 8 teachers and 8 assistant teachers are required for each course as shown in Table 4.6.

Table 4.6 Required Number of Faculty

| | Teacher | Assistant Teacher | Total |
|--------------------|---------|-------------------|-------|
| Computer Science | 8 | 8 | 16 |
| Information System | 8 | 8 | 16 |
| Computer Education | 8 | 8 | 16 |
| Total | 24 | 24 | 48 |

4.4.7 Facility Development

This component consists of two aspects: building construction and procurement of equipment. These are estimated based on new IT-related courses and the projected number of students as presented above.

(1) Building Construction

The total space of 5,120 m² of will be required for the IT HRD Center as shown in Table 4.7. Building structure is 4-storey RC.

Table 4.7 Room List and Necessary Space for IT HRD Center

| Room Name | Number of Required | Space for One Room (m ²) | Total Space (m ²) |
|---|--------------------|--------------------------------------|-------------------------------|
| Computer Room | 15 | 200 | 3,000 |
| Server Room | 1 | 200 | 200 |
| Conference Room | 2 | 200 | 400 |
| Office Room | 2 | 200 | 400 |
| Others (corridor, staircase, toilets, open space, etc.) | - | | 1,120 |
| Total | 20 | | 5,120 |

(2) Procurement of Equipment

The procurement of equipment covers equipment and furniture to be installed in the IT HRD Center. The list of major equipment is shown in Table 4.8.

Table 4.8 List of Major Equipment

| Equipment | Room to be installed in | No. of Required per Room | No. of Rooms | Total Required |
|--|-------------------------|--------------------------|--------------|----------------|
| Computer with furniture | Computer room | 30 sets | 15 | 450 sets |
| Air conditioner | Computer room | 1 sets | 15 | 15 sets |
| Server including connections with computer rooms | Server room | 1 set | 1 | 1 set |
| Projectors, video system, computer, furniture, air conditioner, etc. | Conference room | 1 set | 2 | 2 sets |
| Furniture, computer | Office Room | 1 set | 2 | 2 sets |

4.4.8 Project Cost Estimate

(1) Assumption for Cost Estimate

The estimated project cost includes the following items:

- Building construction costs;
- Cost of equipment and furniture; and
- Physical contingency.

The project cost estimated is based on the following assumptions:

- 1) Base cost: All the base costs are base calculated based on worldwide economic conditions, including Thailand, prevailing in June 2001.
- 2) Price escalation: No price escalation is assumed
- 3) Physical contingency: 10% of the base costs is assumed
- 4) VAT: 7% of Value Added Tax is assumed for all the costs

(2) Cost Breakdown

Table 4.9 shows the project cost. The total project cost is estimated at Baht 75 million. It is estimated to cost approximately Baht 41 million for building construction, approximately Baht 24 million for procurement of equipment, and approximately Baht 10 million for VAT plus physical contingency.

Table 4.9 Project Cost

| Item | Unit Price | Required | Costs, Baht |
|--------------------------------------|---------------------------|----------------------|-------------|
| 1. Building Construction | | | |
| IT HRD Center | Baht 8,000/m ² | 5,120 m ² | 40,960,000 |
| 2. Procurement of Equipment | | | |
| 1) Computer with furniture | Baht 40,000/set | 450 | 18,000,000 |
| 2) Air conditioner in computer rooms | Baht 100,000/set | 15 | 1,500,000 |
| 3) Sever including connections | Baht 2,500,000/set | 1 | 2,500,000 |
| 4) Equipment in Conference Room | Baht 750,00/set | 2 | 1,500,000 |
| 5) Equipment in Office | Baht 100,000/set | 2 | 200,000 |
| Procurement of Equipment Total | | | 23,700,000 |
| 3. Grand Total | | | |
| 1) Base Cost | | | 64,660,000 |
| 2) VAT | 7% | | 4,526,000 |
| 3) Sub-total | | | 60,186,000 |
| 4) Physical Contingency | 10% | | 6,019,000 |
| 5) Grand Total | | | 75,205,000 |

4.5 Implementation Program

4.5.1 Implementation Schedule

(1) Pre-implementation Phase

1) Feasibility Study

A feasibility study will be conducted to arrive at definite conclusions on all the basic aspects of the project. The feasibility study will include the market study, curriculum development, conceptual design of buildings, equipment procurement plan, and cost estimates. It is scheduled for preparation from January to May in 2002.

2) Governmental Approval

Governmental approval is required after the feasibility study is carried out. A two-month period is assumed for governmental approval, although it is quite difficult to specify a fixed time.

(2) Implementation Phase

1) Selection of Contractor/Supplier

The period includes the time required for all tender processing and finalization of contract. It is expected to take two months from the beginning of June 2002.

2) Engineering

Basic design and detailed design of building will be undertaken. It is expected to take seven months from October 2002 to April 2003.

3) Construction

The construction of the IT HRD Center is expected to commence in May 2003, and be completed in March 2005.

4) Procurement of Equipment

The procurement of equipment is scheduled to commence at the same period as the construction, although it may take a shorter period to complete this activity.

5) Institutional Set-up

The institutional set-up includes organization arrangements, finalization of curriculum, and start-up operation of equipment. It is expected to take nine months from August 2004 to April 2005. Figure 4.3 illustrates the overall project implementation schedule.

(2) Financial Plan

1) Initial Investment Costs

The Thai Government will cover the initial investment costs of the project.

2) Running Costs

Running costs will be covered by governmental support, tuition fees for the new IT-related courses and short-term training programs and governmental payment of salaries for additional persons.

3) Investment Costs for Equipment Replacement

Investment costs for equipment replacement will be covered by governmental support, tuition fees for the new IT-related courses and short-term training programs and governmental payment of salaries for additional persons.

4.5.3 Financial Appraisal

(1) Costs

The project cost is estimated as shown in Table 4.10 and 4.11.

Table 4.10 Salaries of Additional Faculty Staff

| | Monthly Salary (Baht) | No. of Staff | Annual Personnel Cost (million Baht) |
|--------------------|--------------------------|--------------|---|
| Teachers | Average 30,000 | 24 | 8.64 |
| Assistant Teachers | Average 20,000 | 24 | 5.76 |
| Total | | 48 | 14.40 |

Table 4.11 Other Running Costs

| Cost Items | Basis of Estimation | Annual Cost (Million Baht) |
|------------------------------------|---|-------------------------------|
| Utility | | 5.00 |
| Administration Costs | | 3.00 |
| Savings Account | 10% on Tuition Fee | To be calculated |
| Repair and Maintenance (Equipment) | 2% on Equipment Cost = (23.70 x 1.07 x 1.1) x 0.02 | 0.56 |
| Repair and Maintenance (Building) | 0.15% on Investment = 40.96 x 1.07 x 1.1 x 0.005 | 0.72 |

(2) Revenue

The annual revenue is estimated based on the following assumptions and the results are shown in Table 4.12.

- 1) Tuition fee: 13,000 Baht/student/year for Students

- 2) Government subsidy: 3,000 Baht/student/year for Students
- 3) Fee for short course 2,000 Baht/person (20 hours)
- 4) Subsidies for Salaries: 90% of personnel costs subsidized by Thai Government

Table 4.12 Estimation of Revenue

| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 & later | |
|--|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-------|
| Basis | | | | | | | | |
| No. of Students | 13,000 | 90 | 270 | 540 | 900 | 1,170 | 1,350 | 1,440 |
| Subsidy for Students | 3,000 | | | | | | | |
| No. of Trainees (Community) | 2,000 | | | 720 | 1,080 | 1,080 | 1,080 | 1,080 |
| No. of Trainees (Indochina) | 2,000 | | | 90 | 180 | 180 | 180 | 180 |
| Salaries (Million Baht) | 14.40 | 90% | 90% | 90% | 90% | 90% | 90% | 90% |
| Estimation (Million Baht) | | | | | | | | |
| Tuition Fee | 1.17 | 3.51 | 7.02 | 11.70 | 15.21 | 17.55 | 18.72 | |
| Short-term Training for Community People | 0.00 | 0.00 | 1.44 | 2.16 | 2.16 | 2.16 | 2.16 | |
| Short-term Training for Indochinese People | 0.00 | 0.00 | 0.18 | 0.36 | 0.36 | 0.36 | 0.36 | |
| Government Subsidy for Students | 0.27 | 0.81 | 1.62 | 2.70 | 3.51 | 4.05 | 4.32 | |
| Government Subsidy for Salary | 12.96 | 12.96 | 12.96 | 12.96 | 12.96 | 12.96 | 12.96 | |
| Total | 14.40 | 17.28 | 23.22 | 29.88 | 34.20 | 37.08 | 38.52 | |

(3) Financial Feasibility

1) Basic Assumption for Calculation

Financial analysis is made based on the following assumptions:

Project Life

Project life is 30 years starting from 2003, with operation starting from 2005.

Initial Investment

The Thai Government should cover all the initial investment, because the project is really for the public interest. The current level of tuition fees for public higher institutes will not be able to cover the initial investment.

Investment for Replacing Equipment

Equipment will need to be replaced in view of their being outdated and due to deterioration. It is assumed that 20% of equipment, which amounts to 5.58 Million Baht including VAT and physical contingency, will be replaced every year from 2007, considering the rapid improvement of computers and other IT equipment.

Tax

7% of VAT will be applied for procurement of equipment and construction. However, income tax and corporate tax will be exempted since the project is for the public interest.

2) Base Case

Table 4.13 shows the results of the financial analysis for the base case. According to the analysis, the following points can be pointed out:

- Net cash flow for the four years up to 2008 will be negative, but it will become positive starting in 2009.
- FIRR is 19.0%
- Revenue obtained from the project can sufficiently cover the investment costs for replacing equipment and operating costs.
- The project involves the expansion of the existing facilities of RIT, Kalasin. Relatively good profitability is achieved by the effective utilization of existing facilities or facilities to be developed by other projects.

It is therefore concluded that the IT HRD Center in RIT, Kalasin project can materialize based on the following conditions:

- The Government covers the initial investment, taking account of the public interest and social importance of the project.
- The Government provides the project with subsidies of Baht 3,000 for every student and 90% of salary of all staff.

Aside from governmental investment and subsidies, it is very important to look into making the financial status of the project self-supporting. Efforts to offering more pay services such as the chargeable short-term training programs are substantially important for the proper management and maintenance of the IT HRD Center.

Table 4.13 Cash Flow Sheet

| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| Unit: Million Baht | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Cash Inflow | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Revenue | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tuition Fee | 1.17 | 3.51 | 7.02 | 11.70 | 15.21 | 17.55 | 18.72 | 18.72 | 18.72 | 18.72 | 18.72 | 18.72 | 18.72 | 18.72 | 18.72 | 18.72 | 18.72 | 18.72 | 18.72 | 18.72 | 18.72 | 18.72 | 18.72 | 18.72 | 18.72 | |
| Short-term Training for Community Peot | 0.00 | 0.00 | 1.44 | 2.16 | 2.16 | 2.16 | 2.16 | 2.16 | 2.16 | 2.16 | 2.16 | 2.16 | 2.16 | 2.16 | 2.16 | 2.16 | 2.16 | 2.16 | 2.16 | 2.16 | 2.16 | 2.16 | 2.16 | 2.16 | 2.16 | |
| Short-term Training for Indichina People | 0.00 | 0.00 | 0.18 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | |
| Government Subsidy for Students | 0.27 | 0.81 | 1.62 | 2.70 | 3.51 | 4.05 | 4.32 | 4.32 | 4.32 | 4.32 | 4.32 | 4.32 | 4.32 | 4.32 | 4.32 | 4.32 | 4.32 | 4.32 | 4.32 | 4.32 | 4.32 | 4.32 | 4.32 | 4.32 | 4.32 | |
| Government Subsidy for Salary | 12.96 | 12.96 | 12.96 | 12.96 | 12.96 | 12.96 | 12.96 | 12.96 | 12.96 | 12.96 | 12.96 | 12.96 | 12.96 | 12.96 | 12.96 | 12.96 | 12.96 | 12.96 | 12.96 | 12.96 | 12.96 | 12.96 | 12.96 | 12.96 | 12.96 | |
| Total Cash Inflow | 14.40 | 17.28 | 23.22 | 29.88 | 34.20 | 37.08 | 38.52 | 38.52 | 38.52 | 38.52 | 38.52 | 38.52 | 38.52 | 38.52 | 38.52 | 38.52 | 38.52 | 38.52 | 38.52 | 38.52 | 38.52 | 38.52 | 38.52 | 38.52 | 38.52 | |
| 2. Cash Outflow | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Investment for Equipment Replacement | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Operating Costs | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Salary | 14.40 | 14.40 | 14.40 | 14.40 | 14.40 | 14.40 | 14.40 | 14.40 | 14.40 | 14.40 | 14.40 | 14.40 | 14.40 | 14.40 | 14.40 | 14.40 | 14.40 | 14.40 | 14.40 | 14.40 | 14.40 | 14.40 | 14.40 | 14.40 | 14.40 | |
| Utility | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | |
| Administration Costs | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | |
| Saving Account | 0.12 | 0.35 | 0.70 | 1.17 | 1.52 | 1.76 | 1.87 | 1.87 | 1.87 | 1.87 | 1.87 | 1.87 | 1.87 | 1.87 | 1.87 | 1.87 | 1.87 | 1.87 | 1.87 | 1.87 | 1.87 | 1.87 | 1.87 | 1.87 | 1.87 | |
| Repair and Maintenance | 1.28 | 1.28 | 1.28 | 1.28 | 1.28 | 1.28 | 1.28 | 1.28 | 1.28 | 1.28 | 1.28 | 1.28 | 1.28 | 1.28 | 1.28 | 1.28 | 1.28 | 1.28 | 1.28 | 1.28 | 1.28 | 1.28 | 1.28 | 1.28 | 1.28 | |
| Subtotal Operating Costs | 23.80 | 24.03 | 24.38 | 24.85 | 25.20 | 25.44 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | |
| Total Cash Outflow | 23.80 | 24.03 | 24.38 | 24.85 | 25.20 | 25.44 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | 25.55 | |
| 3. Net Cash Flow | -9.40 | -6.75 | -6.74 | -0.55 | 3.42 | 6.07 | 7.39 | 7.39 | 7.39 | 7.39 | 7.39 | 7.39 | 7.39 | 7.39 | 7.39 | 7.39 | 7.39 | 7.39 | 7.39 | 7.39 | 7.39 | 7.39 | 7.39 | 7.39 | 7.39 | |

FIRR = 19.0%

4.5.4 IEE

The Project involves the construction of a new building to house the IT HRD Center. Computer works are expected as part of the activities in the center. According to the results of the IEE as shown in Table 4.14, there is no significant environmental impacts expected during the operational period. However, there are some negative impacts expected during the construction period such as noise and vibration, traffic accidents due to the increase in traffic. In the design phase, it is recommended to consider countermeasures for noise and traffic problems.

Table 4.14 Results of IEE

| No. | Environmental Item | Evaluation | Reason |
|----------------------------|---------------------------------|------------|---|
| Social Environment | | | |
| 1 | Resettlement | D | Nobody will be resettled during Project implementation |
| 2 | Economic Activities | D | Direct impacts on economic activity will not be caused by the Project |
| 3 | Traffic/Public Facilities | D | Traffic/Public Facilities problem will not be caused by the Project |
| 4 | Split of Communities | D | There is no collective village near the Project site |
| 5 | Cultural Property | D | Important cultural properties have not been found within the Project site |
| 6 | Water Right and Right of Common | D | Specific rights for water and fishing are not reported in the Project site |
| 7 | Public Health Condition | D | Public health problems will not be caused by the Project |
| 8 | Waste | D | A minimal increase in municipal waste is expected. |
| 9 | Hazards (Risk) | D | Natural hazard risks will not be increased by the Project. |
| Natural Environment | | | |
| 10 | Topography and Geology | D | As the proposed new facilities are not so huge, change of topography and geology will not be caused by the Project. |
| 11 | Soil Erosion | D | Soil erosion problem will not be caused by the Project |
| 12 | Groundwater | D | Groundwater will not be used both at the construction stage and the operational stage. |
| 13 | Hydrological Situation | D | Drainage problems may be handled properly. |
| 14 | Coastal Zone | D | The project area is not near the coastal Zone |
| 15 | Fauna and Flora | D | There are no important animals or plants found in the project area. |
| 16 | Meteorology | D | Change of meteorological conditions will not occur as a result of the Project. |
| 17 | Landscape | D | There are no important scenic spots around the project area |
| Pollution | | | |
| 18 | Air Pollution | D | Air Pollution will not be caused by the Project |
| 19 | Water Pollution | D | Water Pollution will not be caused by the Project |
| 20 | Soil Contamination | D | Soil contamination will not be caused by the Project |
| 21 | Noise and Vibration | E | Noise and Vibration will be considered during construction period. |
| 22 | Land Subsidence | D | Land subsidence will not be caused by the Project |
| 23 | Offensive Order | D | Land subsidence will not be caused by the Project |

A: Serious environmental impact is anticipated.

B: Environmental impact is anticipated to a certain extent.

C: Extent of impact is unknown. (Examination is needed.)

D: No impact is anticipated. EIA is not necessary.

E: Necessary to consider mitigation method afterward.

CHAPTER 5

**NEW RAJABHAT INSTITUTE,
MUKDAHAN**

CHAPTER 5

NEW RAJABHAT INSTITUTE, MUKDAHAN

5.1 Background of the Project

5.1.1 Higher Education in NBR

In NBR, there are eight higher education institutes that offer bachelor's degree programs. Among the eight higher education institutes, five institutes are newly established and under development. Table 5.1 shows the magnitude of higher education institutes offering bachelor degree programs or more. Every province in NBR has a much lower number of students per 1,000 population than the average in the Kingdom. It may therefore be concluded that the number of students in NBR's higher education institutes is quite small, even if an increase is taken account of as a result of the on-going developments in NBR.

Table 5.1 Higher Education Institutes Offering Bachelor's Degree Programs or More

| | Whole Kingdom | NBR Total | Mukdahan | Nakhon Phanom | Sakon Nakhon | Kalasin |
|-----------------------------------|---------------|-----------|----------|---------------|--------------|---------|
| No of Institutes | 165 | 8 | 0 | 3 | 3 | 2 |
| No. of Students | 1,445,938 | 6,552 | 0 | 1,335 | 4,789 | 428 |
| Population (1,000) | 60,816 | 3,081 | 326 | 704 | 1,077 | 974 |
| No. of Students / 1000-population | 23.8 | 2.1 | 0 | 1.9 | 4.4 | 0.4 |

Of note is the fact that Mukdahan does not have a higher institute of learning that can offer bachelor's degrees. Thus, it is necessary for students in the area to earn their bachelor's degrees from schools in other provinces and live apart from their parents. This obliges their parents to pay extra costs for education. Others resort to not allowing their children to pursue bachelor's degree programs.

5.1.2 Human Resource Development for NBR

Social and economic development requires human resources who are well adapted to regional industrial development and changes in the industrial structure. The development of such human resources is the important issue for NBR. In Mukdahan, with no higher education institute that offers bachelor's degree program, a high priority should be given to establishing such institutes for higher education.

5.1.3 Offer of Education Opportunity Based on Common Language and Culture

It is significant to note that both the NBR and Laos share a common language and culture. This is a special feature of the region. Strengthening this character through human resource development can only result in political stability, better peace and friendship, and wider exchanges of social and economic activities. In addition, Mukdahan may eventually function as an eastern "gateway town" to Laos via the Second International Bridge.

It is very important for Thailand to take the initiative to establish a higher education institute in Mukdahan, and provide educational opportunities for Laos.

5.1.4 Rajabhat Institutes

In Thailand, there are 36 Rajabhat Institutes (RIs) of public higher education. They were originally founded as teacher training colleges, and gradually transformed into institutes for higher education meet the demands of a growing populace and community seeking greater educational challenges in a rapidly changing technology-based world. The Institutes are governmental entities (?) supervised by the Office of the Rajabhat Institutes Council (ORIC) under the Ministry of Education. It is expected that the existing network of 36 RIs will be utilized for establishing a new higher institute in Mukdahan.

5.1.5 Five New Rajabhat Institutes in the Northeastern Region

In addition to overseeing the existing 36 Institutes, ORIC is implementing five projects of the new Rajabhat institute in the Northeastern Region. Five new campuses are located in Nakhon Phanom and Kalasin in NBR, as well as Roiet, Si Saket, and Chaiyaphum in other parts of the Northeastern Region. Projects are under the implementation period that is scheduled from 2000 to 2002, after the preparation period completed during 1997 and 1999. The projects aim to:

- Increase the number of graduates in the subject areas needed for local community development;
- Provide opportunities in higher education to the community and the underprivileged sector;
- Enhance research development by choosing local examples and case studies to

solve problems;

- Establish an academic center for local development;
- Establish a center to support and preserve the local religion, arts and culture;
- Establish an institute to improve, develop and transfer new technologies to the community; and
- Establish an institute for training teachers to serve the community.

It should be noted that there is no plan to establish RI in Mukdahan.

5.1.6 Conclusion: Necessity of the Project

It is highly necessary to establish the Rajabhat Institute, Mukdahan in order to provide educational opportunities in higher education for the Lao people as well as members of the local community.

5.2 Goals, Conceptual Framework and Strategies of the Project

5.2.1 Goals of the Project

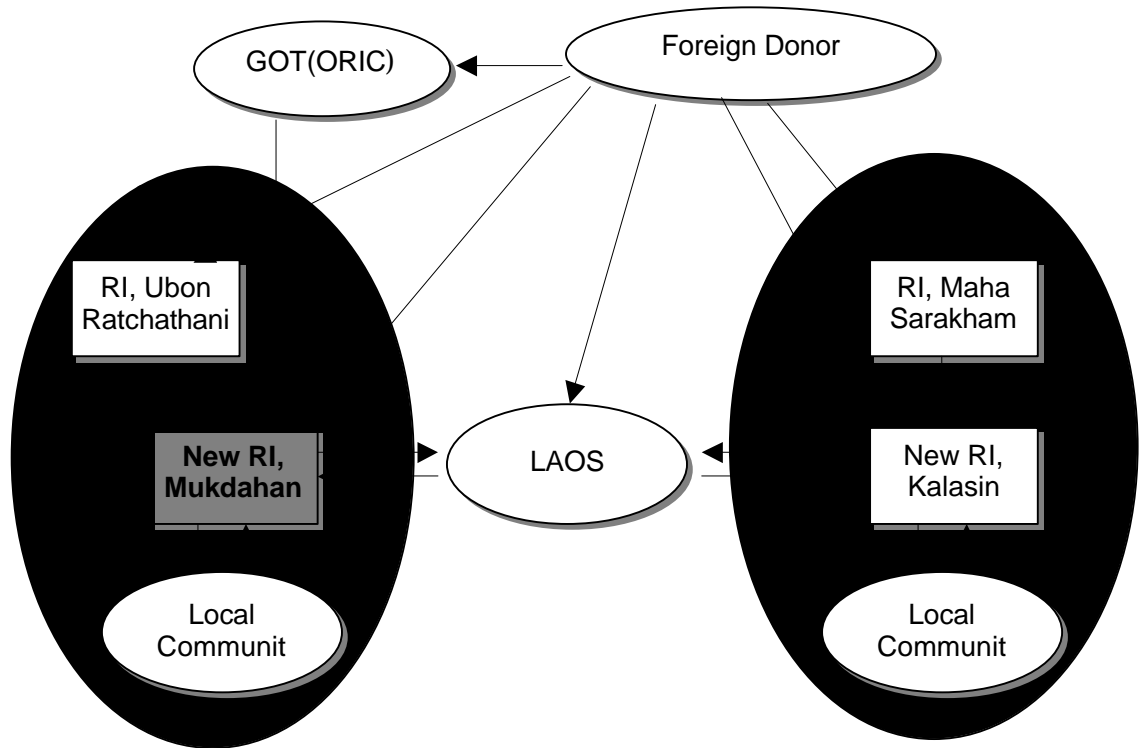
The goal of the project is to nurture middle-class workers who will work for local development, and Lao people under an international cooperation scheme. By having the new Rajabhat Institute in Mukdahan, several courses can be established for community members and Lao people. Specifically, the project hopes to achieve the following goals:

- To increase the number of graduates in Mukdahan province where local community development is demanded;
- To provide opportunities for higher education to the local community and the underprivileged sector;
- To establish an academic center for local development;
- To establish an institute in order to improve, develop and the new technologies to the community;
- To establish an institute for training teachers to serve the community;
- To provide opportunities for higher education to Lao people; and
- To strengthen the relationship of Thailand with Laos through human resource development.

5.2.2 Conceptual Framework of the Project

Figure 5.1 illustrates the conceptual framework of the project. The project is divided into two phases. For the first phase, new RI, Kalasin, one of the five new Rajabhat Institutes already established, will provide higher education opportunities to Lao people in addition to the current educational services to the local community, prior to establishing New RI, Mukdahan. For the second phase, New RI, Mukdahan, which will

be established by the project, will provide higher education opportunities to the local community and Lao people.



(Note: this section looks like it doesn't belong here!)

- . Providing oversea training of teachers / dispatching external experts to Thailand
- . Providing soft loan for New RI, Mukdahan construction, if Thai Government requires
- . Awarding a scholarship to Lao students in New RI, Kalasin and New RI, Mukdahan
- . Providing higher education to Lao students
- . Receiving Lao students (with payment by using scholarship)
- . As the sister institute for New RI, Kalasin or New RI, Mukdahan dispatching teachers and providing technical support
- . Providing human resource for local development and cooperation to community development such as technical training and support to Tambon people
- . Receiving students from the province will be the first priority
- . Establishing New RI, Mukdahan

Figure 5.1 Conceptual Framework of New Rajabhat Institute, Mukdahan Project

5.2.3 Development Strategies of the Project

(1) Strategy 1: Supplying Excellent Middleclass Workers to Community

The future development of NBR relies on the development of middleclass workers who are capable of doing work requiring advanced skills, such as engineering, designing and management. It is quite important for new RI, Mukdahan to provide a good educational environment for supplying excellent middleclass workers to the community.

(2) Strategy 2: Promoting Friendship Between Thailand and Laos

Promoting friendship between Thailand and Laos is one of the major objectives of the project. It is important to set up an environment for promoting such friendship in and out of the new RI, Mukdahan. Scholarships awarded to Lao students in New RI, Mukdahan and New RI, Kalasin will enable them to easily access opportunities for higher education. This is one of the recommended measures to foster friendly relations with Laos.

(3) Strategy 3: Utilizing RI's Network

Utilizing RI's network is a key to the success of the project. Two particular aspects have been identified:

The first aspect is to appoint RI, Ubon Ratchathani as the sister institute for New RI, Mukdahan. RI, Ubon Ratchathani will dispatch teachers and provide technical support to New RI, Mukdahan in the same manner as RI, Maha Sarakham is currently doing to New RI, Kalasin. RI, Ubon Ratchathani is considered the best candidate for New RI, Mukdahan's sister institute, because it is located close to Mukdahan and one of the largest RIs in the Northeastern Region.

The second aspect is to request New RI, Kalasin to receive Lao Students in the first phase of project, before New RI, Mukdahan has this capability.

(4) Strategy 4: Relying on International Support

The project is expected to generate high public interest. It will also be useful for promoting good international ties between Thailand and Laos. International support may be generated for the following components:

- Teacher training program for the four RIs in Maha Sarakham, Kalasin, Ubon Ratchathani, and Mukdahan (to provide overseas training of teachers and to dispatch external experts);
- Providing soft loan for construction of New RI, Mukdahan; and
- Award of scholarship to Lao students in New RI, Kalasin and New RI, Mukdahan.

It may be noted that the first and second components will contribute to both to Thai and Lao people, while the third component will contribute only to Lao people.

5.2.4 Expected Achievement

With the variety of educational courses and activities, New RI, Mukdahan is envisioned to provide regular educational courses for graduates from upper secondary school or its equivalent in Mukdahan and Laos. Short-term training programs will largely benefit local administration staff and community members such as Tambons people. Technology development services may also be provided for the community.

Table 5.2 shows the concept of target and achievement of education services provided by New RI, Mukdahan.

Table 5.2 Expected Achievement of New RI, Mukdahan

| Education Service | Target | Achievement |
|-----------------------------|--|---|
| Regular Course | Graduates from Upper Secondary Schools in Mukdahan | Acquire necessary knowledge and techniques for middleclass workers of Mukdahan, and provide teachers to Mukdahan |
| | Graduates from high school in Laos | Provide necessary knowledge and techniques for middleclass workers of Laos and provide teachers for Laos |
| Short-term training program | Local administration staff | Acquire necessary techniques and knowledge required for their job in terms of IT, English and Japanese. |
| | Local community (Tambons) people | Acquire necessary techniques and knowledge required for community development in terms of agriculture, environment, tourism, IT, English and Japanese, etc. |
| Technology development | Community | Improve, develop and transfer technology to the community |

5.3 Demand Forecast

In order to project the demand for New RI, Mukdahan, a demand survey is required to be conducted later. Here, only a rough projection is made for Mukdahan Province based on the present number of students taking up bachelor's degrees or post graduate degrees.

Table 5.3 shows the distribution of higher education institutes offering bachelor's degree programs or other post graduate degree programs. It is believed that 23.8

students per 1,000-population in the whole Kingdom is quite a high value, comparable to Japan.

The demand for bachelor's degrees and other post graduate programs is projected at approximately 3,900 in Mukdahan on the assumption that the number of student per 1,000-population is 12.0, almost half of the whole Kingdom.

Table 5.3 Higher Education Institutes Offering Bachelor's Degrees or Other Post Graduate Degrees

| | Current State | | | Projection |
|-----------------------------------|---------------|-----------|----------|------------|
| | Whole Kingdom | NBR Total | Mukdahan | Mukdahan |
| No of Institutes | 165 | 8 | 0 | 1 |
| No. of Students | 1,445,938 | 6,552 | 0 | 3,912 |
| Population (1,000) | 60,816 | 3,081 | 326 | 326 |
| No. of Students / 1000-population | 23.8 | 2.1 | 0 | 12.0 |

5.4 The Project

5.4.1 Location of New RI, Mukdahan

The selection of a project location for the New RI, Mukdahan is very important as this should help lighten the burden of parents in the area. The following points should be taken into account for selecting the location:

- Proximity to the residential area of candidate students;
- Proximity to the eastern gateway to Laos via the Second International Bridge;
- Availability of land expected to be donated; and
- Availability of basic infrastructure.

5.4.2 Project Components

(1) First Phase

In the first phase, New RI, Kalasin will receive Lao students with support from its sister institute, RI, Maha Sarakham. This will enable RI to receive Lao students even before New RI, Mukdahan starts operation.

The first phase consists of four components as shown below:

- Overseas training of teachers of New RI, Kalasin and RI, Maha Sarakham;
- Dispatching external experts to New RI, Kalasin from abroad;
- Awarding scholarships to Lao students in New RI, Kalasin; and
- Receipt of Lao students by New RI, Kalasin.

(2) Second Phase

In the second phase, New RI, Mukdahan will be established with support from its sister institute, RI, Ubon Ratchathani. This aims to develop human resources for local development. Lao students will also be accommodated.

The second phase consists of seven components as shown below:

- Establishment of New RI, Mukdahan;
- Facility development in New RI, Mukdahan;
- Curriculum development for New RI, Mukdahan;
- Overseas training of teachers of New RI, Mukdahan and RI, Ubon Ratchathani;
- Dispatch of external experts to New RI, Mukdahan from abroad;
- Award of scholarships to Lao students in New RI, Mukdahan; and
- Receipt of Lao students by New RI, Mukdahan.

These components are closely linked to each other for the effective implementation of the project.

(3) Overseas Teachers' Training for New RI, Kalasin and RI, Maha Sarakham

Teachers of New RI, Kalasin and its sister institute, RI, Maha Sarakham will be trained in a foreign country to obtain updated knowledge for the following fields:

- IT-related subjects;
- Tourism especially hotel management;
- Marketing for local products;
- Food processing; and
- Japanese language.

(4) Dispatch of External Experts to New RI, Kalasin from Abroad

It is expected that external experts will be sent to New RI, Kalasin from a foreign donor. The required specialties of experts are almost the same as those fields that will be offered for the overseas teachers' training program. The number of experts and the duration of dispatch will be discussed during a later stage.

(5) Award of Scholarships to Lao Students in New RI, Kalasin

Scholarship will be useful to encourage Lao students to come to Thailand to study. This will be linked with the next component, receipt of Lao students by New RI, Kalasin. For this component, foreign aid is expected. The scholarship will cover the tuition fee, dormitory fee, and reasonable amount for the living expenses of Lao students. The expected number of recipients is 10 to 15. They will be selected through an entrance examination conducted by New RI, Kalasin. This scholarship system will be continued until a scholarship program is offered by New RI, Mukdahan.

(6) Receipt of Lao Students by New RI, Kalasin

New RI, Kalasin will welcome all recipients of scholarships, provide dormitory type accommodations for them and provide higher education together with Thai students.

5.4.3 Establishment of New RI, Mukdahan**(1) Faculty and Department**

Faculties and departments must be established based on community needs and regional development directions. New RI, Mukdahan aims to train middleclass workers from the local community and establish the following faculties and departments. All the faculties will offer bachelor's degree programs.

Faculty of Education

- Department of English
- Department of Mathematics
- Department of Sciences
- Department of Social Sciences

Faculty of Science and Technology

- Department of Computer Science
- Department of Civil Engineering
- Department of Environment
- Department of Agriculture
- Department of Fisheries
- Department of Food Processing

Faculty of Humanities and Social Sciences

- Department of Japanese
- Department of Community Development

Faculty of Management Science

- Department of Business Administration (including product marketing)
- Department of Business Computer
- Department of Tourism (including hotel management)

(2) Students

The number of students for a year is 375, on assumption that each of the 15 departments have an average of 25 students per year. The total projected number of students is 1,500 for four years.

The number of Lao students is assumed at 15 per year and 60 in total. The number of Thai Students is 1,440, accounting for 37% of the demand in Mukdahan.

Table 5.4 Number of Students in New RI, Mukdahan

| Number of Students | RI, Mukdahan total | Thai Students | Lao Students |
|-------------------------|--------------------|---------------|--------------|
| Students in one year | 375 | 360 | 15 |
| Total enrolled students | 1,500 | 1,440 | 60 |

(3) Staff

New RI, Mukdahan needs 75 teachers, assuming a teacher-student ratio of 20 to 1. In addition to these teachers, joint teachers will participate from other RIs especially from RI, Ubon Ratchathani.

Number of other staff is estimated as shown in Table 5.5.

Table 5.5 Required Staff for New RI, Mukdahan

| Staff | Number of Required |
|--|--------------------|
| Teachers | 75 |
| Academic support staff (such as technicians) | 30 |
| Administrative staff (such as financial officers, and accountants) | 25 |
| General service (such as janitors, drivers and security) | 30 |
| Total | 160 |

(4) Short-term Program

In addition to the regular academic program, New RI, Mukdahan will offer short-term programs for various people in the area. The following programs are proposed:

- Computer courses for local administration (e.g. Province, Tambon);
- Computer course for local community members , small entrepreneurs, etc; and
- English course for local community members, small entrepreneurs, etc.

5.4.4 Facility Development of New RI, Mukdahan**(1) Land Acquisition**

It is necessary to acquire land with an area of 500 Rai or 80 ha for the construction of New RI, Mukdahan. In the acquired land, the area of 130.6 Rai or 20.9 ha is required for the development of buildings, playgrounds, car parking, parks and roads.

(2) Building Construction

Required rooms and spaces to implement higher education, short-term training and research work for local development have been planned prior to the investigation of buildings and equipment.

As a result of the investigation, the building construction is proposed as shown in Table 5.6. Proposed building construction covers 13 buildings with a total space of 60,300 m².

Table 5.6 Building Floor Area of New RI, Mukdahan

| Building / Room | No. of Rooms | Space per Room (m ²) | Total Space (m ²) |
|---|--------------|----------------------------------|-------------------------------|
| Main Building (4-story Building) | | | |
| Library | 1 | 250 | 250 |
| Conference Room (for 400 persons) | 1 | 800 | 800 |
| Conference Room (for 60 person) | 2 | 120 | 240 |
| Language Room (for 30 persons) | 4 | 120 | 480 |
| Computer Room (for 30 persons) | 10 | 150 | 1,500 |
| Server Room | 1 | 150 | 150 |
| Administration Office | 2 | 150 | 300 |
| Meeting Room | 2 | 60 | 120 |
| President 's Room | 1 | 60 | 60 |
| Others | | | 960 |
| Main Building Total | 22 | | 6,000 |
| Lecture Building (4-story Building) | | | |
| Lecture Room (60 persons) | 8 | 150 | 1,200 |
| Lecture Room (30 persons) | 34 | 80 | 2,720 |
| Others | | | 780 |
| Lecture Building Total | 42 | | 4,700 |
| Student Union (1-story Building) | | | |
| | | | 1,500 |
| Sports Arena (1-story Building) | | | |
| | | | 4,000 |
| Laboratory Building(3-story Building) | | | |
| Laboratory | 6 | 400 | 2,400 |
| Others | | | 600 |
| Laboratory Building Total | 6 | | 3,000 |
| Hotel for Practice (3-story Building) | | | |
| Guest Room | 40 | 40 | 1,600 |
| Restaurant | 1 | 300 | 300 |
| Office | 1 | 100 | 100 |
| Exhibition Hall | 1 | 1,000 | 1,000 |
| Other space | | | 600 |
| Hotel for Practice Total | 43 | | 3,600 |
| Teacher's Residence (1) (3-story Building) | | | |
| Family Use | 50 | 100 | 5,000 |
| Others | | | 1,000 |
| Teacher's Residence (1) Total | 50 | | 6,000 |
| Teacher's Residence (2) (3-story Building) | | | |
| Single Use | 25 | 50 | 1,250 |
| Others | | | 250 |
| Teacher's Residence (2) Total | 25 | | 1,500 |
| Dormitory (1) (3-story Building) | | | |
| Single Use | 140 | 35 | 4,900 |
| Others | | | 1,100 |
| Dormitory (1) Total | 140 | | 6,000 |
| Dormitory (2) (Same as Dormitory (1)) | | | |
| | | | 6,000 |
| Dormitory (3) (Same as Dormitory (1)) | | | |
| | | | 6,000 |
| Dormitory (4) (Same as Dormitory (1)) | | | |
| | | | 6,000 |
| Dormitory (5) (Same as Dormitory (1)) | | | |
| | | | 6,000 |
| Ground Total | | | 60,300 |

In the proposed plan, the space for five dormitories is 30,000 m², which accounts for almost half of the buildings. It is assumed that 700 students, which accounts for 47% of the total students, will occupy the dormitory. The number of dormitories to be built will

depend on the location of New RI, Mukdahan. If it is located in a convenient location, required rooms in dormitories may be reduced. Site selection should be made taking this into account.

(3) Procurement of Equipment

The procurement of equipment covers equipment and furniture to be installed in the buildings proposed above. The list of major equipment is shown in Table 5.7.

Table 5.7 List of Equipment

| Location | Equipment | No. of Required |
|---------------------------|--|---|
| Library | E-library system and furniture | 1 set |
| Conference rooms | Presentation equipment and furniture | 3 sets |
| Language rooms | Language laboratory system and furniture | 4 sets (each set for 30 persons) |
| Computer rooms | Computer with furniture | 10 sets (each set consists of 30 computers) |
| Server room | Server | 1 |
| Administration offices | Furniture and computer | 2 sets (1 set for each room) |
| President room | Furniture and computer | 1 set |
| Teacher's room | Furniture and computer | 38 sets (1 set for each room) |
| Lecture room (60 person) | Furniture | 8 sets (1 set for each room) |
| Lecture room (30 person) | Furniture | 34sets (1 set for each room) |
| Student Union | Miscellaneous facilities | 1 set |
| Sports arena, playgrounds | Sports facilities | 1 set |
| Laboratories | Laboratory equipment | 6 set |
| Hotel, guest rooms | Furniture for guest rooms | 40 sets |
| Hotel, restaurant | Furniture and kitchenware | 1 set |
| Hotel, office | Computer and furniture | 1 set |
| Hotel, exhibition hall | Display cases and miscellaneous goods | 1 set |
| Hotel, others | Furniture for lobby | 1 set |

5.4.5 Curriculum Development of New RI, Mukdahan

Curriculum development is fundamental for higher education. In order to develop the curriculum for New RI, Mukdahan, full utilization of the network of Rajabhat Institutes is recommended.

5.4.6 Project Cost Estimate

(1) Assumption for Cost Estimate

The estimated project cost includes the following items:

- Land acquisition costs;
- Site development and infrastructure costs;
- Building construction costs;
- Cost of equipment and furniture; and

- Physical contingency.

The project costs estimated are based on the following assumptions:

Base costs: All the base costs are base calculated based on worldwide economic conditions prevailing in June 2001.

Land acquisition: It is expected that land will be donated to New RI, Mukdahan.

Site development & Infrastructure:

This cost covers site development, fence, gates, roads, drainage, power supply, telecommunication, water supply and storage, parking, landscape, etc. for an area of 130.6 Rai or 20.9 ha. The costs are assumed at Baht 300 / m².

Building construction: Building construction costs are estimated using the unit cost, Baht 8,000 / m², and building space listed in Table 6.

Cost of equipment and furniture:

A rough estimation has been made for the cost of equipment and furniture as shown in Table 5.8.

Price escalation: No price escalation is included in the costs.

Physical contingency: 10% of the base costs plus price escalation is assumed

VAT: 7% of Value Added Tax is assumed for all the costs

(2) Cost Breakdown

Table 5.8 shows the cost of equipment to be installed in New RI, Mukdahan. The total equipment cost is estimated at Baht 84.7 million.

Table 5.8 Costs of Equipment

| Location | Equipment | No. of Required | Unit Cost, Million Baht | Cost, Million Baht |
|---------------------------|--|-----------------|-------------------------|--------------------|
| Library | E-library system and furniture | 1 set | 1.00 | 1.00 |
| Conference rooms | Presentation equipment and furniture | 3 sets | 0.80 | 2.40 |
| Language rooms | Language laboratory system and furniture | 4 sets | 3.00 | 12.00 |
| Computer rooms | Computer with furniture | 10 sets | 1.30 | 13.00 |
| Server room | Server | 1 | 2.50 | 2.50 |
| Administration offices | Furniture and computer | 2 sets | 0.50 | 1.00 |
| President room | Furniture and computer | 1 set | 0.20 | 0.20 |
| Teacher's room | Furniture and computer | 38 sets | 0.10 | 3.80 |
| Lecture room (60 person) | Furniture | 8 sets | 0.10 | 0.80 |
| Lecture room (30 person) | Furniture | 34sets | 0.05 | 1.70 |
| Student Union | Miscellaneous facilities | 1 set | 5.00 | 5.00 |
| Sports arena, playgrounds | Sports facilities | 1 set | 4.00 | 4.00 |

| | | | | |
|------------------------|---------------------------------------|---------|------|--------------|
| Laboratories | Laboratory equipment | 6 set | 4.00 | 24.00 |
| Hotel, guest rooms | Furniture for guest rooms | 40 sets | 0.20 | 8.00 |
| Hotel, restaurant | Furniture and kitchenware | 1 set | 3.00 | 3.00 |
| Hotel, office | Computer and furniture | 1 set | 0.30 | 0.30 |
| Hotel, exhibition hall | Display cases and miscellaneous goods | 1 set | 1.00 | 1.00 |
| Hotel, others | Furniture for lobby | 1 set | 1.00 | 1.00 |
| Total | | | | 84.70 |

Table 5.9 shows the project cost. The total project cost is estimated at Baht 823.67 million. Approximately Baht 63 million is estimated for site development, Baht 483 million for building construction, Baht 85 million for procurement of equipment, Baht 10 million for project operating cost, Baht 60 million for consultant fee and Baht 123 million for VAT plus physical contingency.

Table 5.9 Project Cost

| Item | Unit Price | Required | Costs, Baht Million |
|-----------------------------|---------------------------|-----------------------|---------------------|
| 1. Land Acquisition | To be donated | | |
| 2. Site Development | Baht 300/ m ² | 209,000m ² | 62.70 |
| 3. Building Construction | Baht 8,000/m ² | 60,300m ² | 482.40 |
| 4. Procurement of Equipment | | | 84.70 |
| 5. Project Operation Cost | | | 10.00 |
| 6. Consultant Fee | | | 60.00 |
| Base Cost Total | | | 699.80 |
| VAT | 7% | | 48.99 |
| Sub-total | | | 748.79 |
| Physical Contingency | 10% | | 74.88 |
| Grand Total | | | 823.67 |

5.5 Implementation Program

5.5.1 Implementation Schedule

(1) Pre-implementation Phase

1) Feasibility Study

A feasibility study will be conducted to arrive at definite conclusions on all the basic aspects of the project. The feasibility study will include the market study, curriculum development, conceptual design of buildings, equipment procurement plan, and cost estimates. Its preparation is expected to take one year starting from the 4th quarter of 2001.

2) Foreign Support

It is expected that foreign support will be used for the overseas training of teachers, dispatch of external experts, and scholarship for Lao students. It is necessary to make the necessary applications and undertake required actions for such foreign support after completion of the feasibility study.

3) Loan Arrangement

If it is necessary to use a soft loan for construction of New RI, Mukdahan, the loan arrangement should be made after the feasibility study. Loan arrangement should be made between the fourth quarter of 2002 and the middle of 2003. In this period, the following activities will be done:

- Appraisal by a financial institution;
- Pledge by a foreign country;
- Exchange of notes; and
- Loan agreement.

(2) Project Implementation Phase

1) Selection of Consultants

The selection of consultants for the New RI, Mukdahan construction is scheduled from the middle to the end of 2003. The following activities should be done in this period:

- Preparation of TOR, short listing;
- Proposal preparation;
- Evaluation of proposal;
- Concurrence of the financial institution; and
- Contract negotiation and signing.

2) Engineering Service

The period includes the time required for curriculum development, detailed design, making a procurement plan, and tender document preparation. It is expected to take nine months from the beginning of 2004.

3) Selection of Contractor/Supplier

The period includes the time required for all tender processing and finalization of contract. It is expected to take three months from October 2004.

4) Construction

Construction of New RI, Mukdahan is expected to commence in January 2005, and will be completed in December 2006.

5) Procurement of Equipment

Procurement of equipment is scheduled during the same period as the construction.

6) Institutional Set-up and Test-run

Institutional set-up includes organization arrangements and finalization of curriculum. It is expected to take nine months from the middle of 2006. Test-run of equipment will be done simultaneously during this period from January to March 2007.

7) Operation

The institute is expected to start operation by the middle of year 2007.

Overall schedule of the project is shown in Figure 5.2.

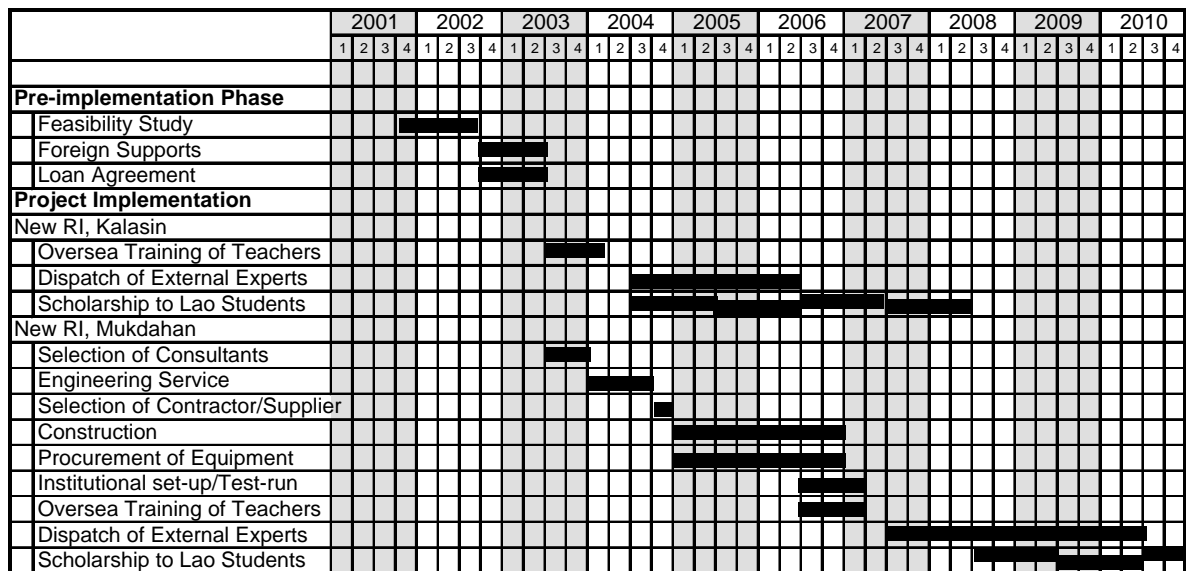


Figure 5.2 Overall Project Implementation Schedule

5.5.2 Operation and Management

Figure 5.3 illustrates the organization for New RI, Mukdahan. A president will be appointed at New RI, Mukdahan to be responsible for general affairs and management, maintenance of equipment, regular course education and short-term training programs. Under the president, five vice presidents and four deans of faculties will be assigned for the management of the institute.

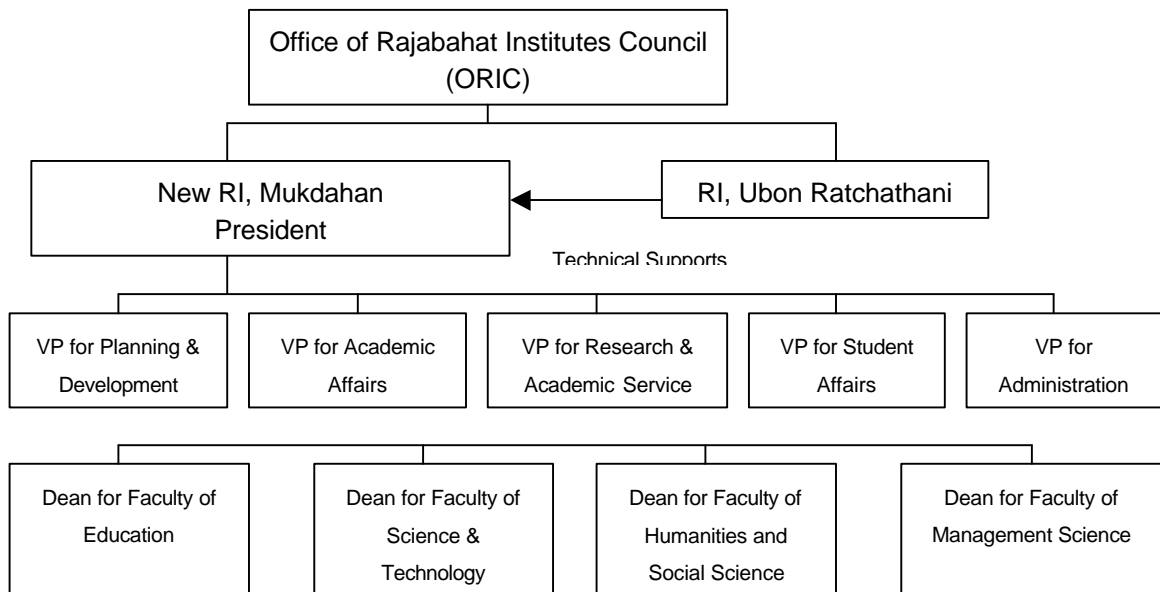


Figure 5.3 Proposed Organization of New RI, Mukdahan

5.5.3 Financial Plan

(1) Initial Investment Costs

The Thai Government will cover the initial investment costs of the project.

(2) Running Costs

Running costs will be covered by tuition fees and governmental support for Thai students, fee for short-term training programs and governmental payment of salaries for staff.

5.5.4 Financial Appraisal

(1) Cost

Project cost is estimated as shown in Table 5.10 and 5.11.

Table 5.10 Disbursement Schedule of Initial Investment

| (Million Baht) | | | | | | |
|----------------|------|-------|--------|--------|------|--------|
| 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | Total |
| 1.18 | 1.18 | 23.54 | 354.36 | 434.01 | 9.42 | 823.66 |

Table 5.11 Personnel Costs

| | Monthly Salary (Baht) | No. of Staff | Annual Personnel Cost (million Baht) |
|----------------------|--------------------------|--------------|---|
| Teachers | Average 20,000 | 38 | 9.12 |
| Assistant Teachers | Average 15,000 | 37 | 6.66 |
| Academic Support | Average 10,000 | 30 | 3.60 |
| Administration Staff | Average 10,000 | 25 | 3.00 |
| General Service | Average 6,000 | 30 | 2.16 |
| Total | | 160 | 24.54 |

Table 5.12 Other Running Costs

| Cost Items | Basis of Estimation | Annual Cost (Million Baht) |
|---|--|-------------------------------|
| Utility | | 3.00 |
| Administration Costs | | 10.00 |
| Repair and Maintenance (Equipment) | 2% on Equipment Cost = $(84.70 \times 1.07 \times 1.1) \times 0.02$ | 2.00 |
| Repair and Maintenance (Site Development & Building) | 1.5% on Investment = $(62.70 + 482.40) \times 1.07 \times 1.1 \times 0.015$ | 9.62 |
| Total | | 24.62 |

Remarks: A half for the year 2007, and 100% for the year 2008 and later

(2) Revenue

Table 5.13 shows the number of enrolled students and students in dormitories. These figures were used for the calculation of tuition fee, governmental subsidy for students, and dormitory fee.

Table 5.13 Number of Students for Revenue Calculation

| | 2007 | 2008 | 2009 | 2010 | 2011 & later |
|------------------------------------|------------|------------|--------------|--------------|--------------|
| Enrolled Students | | | | | |
| Thai Students | | | | | |
| Freshman | 360 | 360 | 360 | 360 | 360 |
| Sophomore | 0 | 360 | 360 | 360 | 360 |
| Junior | 0 | 0 | 360 | 360 | 360 |
| Senior | 0 | 0 | 0 | 360 | 360 |
| Thai Students Total | 360 | 720 | 1,080 | 1,440 | 1,440 |
| Lao Students | | | | | |
| Freshman | 0 | 15 | 15 | 15 | 15 |
| Sophomore | 0 | 0 | 15 | 15 | 15 |
| Junior | 0 | 0 | 0 | 15 | 15 |
| Senior | 0 | 0 | 0 | 0 | 15 |
| Lao Students Total | 0 | 15 | 30 | 45 | 60 |
| Total Enrolled Students | 360 | 735 | 1,110 | 1,485 | 1,500 |
| Resident in Dormitory | | | | | |
| Thai Students | 160 | 320 | 480 | 640 | 640 |
| Lao Students | 0 | 15 | 30 | 45 | 60 |
| Total Students in Dormitory | 160 | 335 | 510 | 685 | 700 |

Annual revenue is estimated based on the following assumptions and the results are shown in Table 5.14.

| | |
|------------------------------|---|
| <u>Tuition fee:</u> | 13,000 Baht/student/year for Thai Students 16,000 Baht/student/year for Lao Students |
| <u>Government subsidies:</u> | 3,000 Baht/student/year for Thai Students |
| <u>Fee for short course:</u> | 2,000 Baht/person (20 hours) |
| <u>Personnel costs:</u> | 100% of personnel costs subsidized by Thai Government |
| <u>Dormitory fee:</u> | 3,000 baht/student/year |

Table 5.14 Estimation of Revenue

| | | 2007 | 2008 | 2009 | 2010 | 2011 & later |
|---|---------------------|--------------|--------------|--------------|--------------|--------------|
| <u>Tuition Fee</u> | | | | | | |
| | Baht/student/year | | | | | |
| Basis | | | | | | |
| Thai Students (students) | 13,000 | 360 | 720 | 1,080 | 1,440 | 1,440 |
| Lao Students (students) | 16,000 | 0.00 | 15.00 | 30.00 | 45.00 | 60.00 |
| Estimation | | | | | | |
| Thai Students (Million Baht) | | 4.68 | 9.36 | 14.04 | 18.72 | 18.72 |
| Lao Students (Million Baht) | | 0.00 | 0.24 | 0.48 | 0.72 | 0.96 |
| Estimation (Million Baht) | | 4.68 | 9.60 | 14.52 | 19.44 | 19.68 |
| <u>Governmental Subsidiary for Thai Students</u> | | | | | | |
| | Baht/student/year | | | | | |
| Basis | 3,000 | 360 | 720 | 1,080 | 1,440 | 1,440 |
| Estimation (Million Baht) | | 1.08 | 2.16 | 3.24 | 4.32 | 4.32 |
| <u>Dormitory Fee</u> | | | | | | |
| | Baht/student/year | | | | | |
| Basis | 3,000 | 160 | 335 | 510 | 685 | 700 |
| Estimation (Million Baht) | | 0.48 | 1.01 | 1.53 | 2.06 | 2.10 |
| <u>Short-term Training Fee</u> | | | | | | |
| | Baht/Person/Program | | | | | |
| Basis | 2,000 | 720 | 720 | 720 | 720 | 720 |
| Estimation (Million Baht) | | 1.44 | 1.44 | 1.44 | 1.44 | 1.44 |
| <u>Governmental Subsidiary for Personnel Costs</u> | | | | | | |
| | Million Baht/year | | | | | |
| Basis | 24.54 | 0.5 | 1.0 | 1.0 | 1.0 | 1.0 |
| Estimation (Million Baht) | | 12.27 | 24.54 | 24.54 | 24.54 | 24.54 |
| Total Revenue | | 19.95 | 38.75 | 45.27 | 51.80 | 52.08 |

(3) Financial Feasibility

1) Basic Assumption for Calculation

The financial analysis was made based on the following assumptions:

Project Life

Project life is 30 years starting from 2003. Operation of New RI, Mukdahan will commence in 2007.

Initial Investment

The Thai Government should cover all the initial investment because the project is for the public interest. The current level of tuition fee of public higher institutes cannot cover the initial investment cost.

Additional Investment for Replacing Equipment

Equipment will be replaced at some interval due to deterioration, and outdatedness of equipment. The following replacement frequencies are assumed for equipment, which is divided into three categories for convenience.

Table 5.15 Category of Equipment Replacement Frequency

| Category | Type of Equipment | Replacement Frequency | Share of Equipment Costs | Equipment Costs including VAT, physical contingency (Million Baht) |
|----------|------------------------|-----------------------|--------------------------|--|
| 1 | Computer, server, etc. | 5 years | 20% | 19.94 |
| 2 | Other equipment | 10 years | 60% | 59.81 |
| 3 | Furniture | 15 years | 20% | 19.94 |
| Total | | | 100% | 99.69 |

The Thai Government should cover all the additional investment for the same reason as the initial investment.

Tax

7% of VAT will be applied for procurement of equipment and construction. However, the project will be exempt from income tax and corporate tax since it is for public interest.

2) Base Case

Table 5.16 shows the results of the financial analysis for the base case. According to the analysis, the following points can be pointed out:

- Net cash flow for the three years up to 2009 will be negative, but it will become positive from 2010; and
- FIRR is 9.9%.

It is therefore concluded that the New RI, Mukdahan project is feasible, based on the following condition:

- The Government covers the initial investment and additional investment for replacing equipment, taking into account the public interest and social importance of the project; and
- The Government provides the project with subsidies of Baht 3,000 for every Thai student and salary of all staff.

Aside from governmental investment and subsidies, it is very important to undertake efforts to make the project self-supporting. Efforts on offering more pay services such

as chargeable short-term training programs are substantially important for the management of New RI, Mukdahan. In addition to such efforts, it is recommended that dormitories, which will account for half of building construction costs and a large portion of repair and maintenance costs, be minimized by reducing the number of students to be housed in them . This may be achieved by selecting a convenient site for the campus.

Table 5.16 Cash Flow Sheet

Unit: Million Baht

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
|--------------------------------------|-------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1. Cash Inflow | | | | | | | | | | | | | | | | | | | | |
| Revenue | | | | | | | | | | | | | | | | | | | | |
| Tuition Fee | 4.68 | 9.60 | 14.52 | 19.44 | 19.68 | 19.68 | 19.68 | 19.68 | 19.68 | 19.68 | 19.68 | 19.68 | 19.68 | 19.68 | 19.68 | 19.68 | 19.68 | 19.68 | 19.68 | 19.68 |
| Dormitory Fee | 0.48 | 1.01 | 1.53 | 2.06 | 2.10 | 2.10 | 2.10 | 2.10 | 2.10 | 2.10 | 2.10 | 2.10 | 2.10 | 2.10 | 2.10 | 2.10 | 2.10 | 2.10 | 2.10 | 2.10 |
| Short-term Training Fee | 1.44 | 1.44 | 1.44 | 1.44 | 1.44 | 1.44 | 1.44 | 1.44 | 1.44 | 1.44 | 1.44 | 1.44 | 1.44 | 1.44 | 1.44 | 1.44 | 1.44 | 1.44 | 1.44 | 1.44 |
| Government Subsidy for Thai Studer | 1.08 | 2.16 | 3.24 | 4.32 | 4.32 | 4.32 | 4.32 | 4.32 | 4.32 | 4.32 | 4.32 | 4.32 | 4.32 | 4.32 | 4.32 | 4.32 | 4.32 | 4.32 | 4.32 | 4.32 |
| Government Subsidy for Salary | 16.36 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 |
| Total Cash Inflow | 24.04 | 38.75 | 45.27 | 51.80 | 52.08 | 52.08 | 52.08 | 52.08 | 52.08 | 52.08 | 52.08 | 52.08 | 52.08 | 52.08 | 52.08 | 52.08 | 52.08 | 52.08 | 52.08 | 52.08 |
| 2. Cash Outflow | | | | | | | | | | | | | | | | | | | | |
| Investment for Equipment Replacement | | | | | | | | | | | | | | | | | | | | |
| Operating Costs | | | | | | | | | | | | | | | | | | | | |
| Salary | 16.36 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 | 24.54 |
| Utility | 2.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 |
| Administration Costs | 6.67 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 |
| Repair and Maintenance | 7.75 | 11.62 | 11.62 | 11.62 | 11.62 | 11.62 | 11.62 | 11.62 | 11.62 | 11.62 | 11.62 | 11.62 | 11.62 | 11.62 | 11.62 | 11.62 | 11.62 | 11.62 | 11.62 | 11.62 |
| Subtotal Operating Costs | 32.77 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 |
| Total Cash Outflow | 32.77 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 | 49.16 |
| 3. Net Cash Flow | | | | | | | | | | | | | | | | | | | | |
| | -8.73 | -10.41 | -3.89 | 2.64 | 2.92 | 2.92 | 2.92 | 2.92 | 2.92 | 2.92 | 2.92 | 2.92 | 2.92 | 2.92 | 2.92 | 2.92 | 2.92 | 2.92 | 2.92 | 2.92 |

FIRR = 9.9%

5.5.5 IEE

The Project involves the construction of a new institute in Mukdahan. In the campus, there are no activities that are expected to cause environmental impacts. The location of the institute is in the suburban area of Mukdahan and no important fauna and flora are within the site. Accordingly, there is no significant environmental impacts expected during the operational period. However, according to the results of the IEE, there are some negative impacts to be expected during the construction period such as noise and vibration, traffic accidents due to the increase of traffic. This is shown in Table 5.17. In the design phase, it is recommended to consider countermeasures for noise and traffic problems.

Table 5.17 Results of IEE

| No. | Environmental Item | Evaluation | Reason |
|----------------------------|---------------------------------|------------|---|
| Social Environment | | | |
| 1 | Resettlement | D | Nobody will be resettled as a result of Project implementation |
| 2 | Economic Activities | D | Direct impacts on economic activity will not be caused by the Project |
| 3 | Traffic/Public Facilities | D | Traffic/Public Facilities problem will not be caused by the Project |
| 4 | Split of Communities | D | There is no collective village near the Project site |
| 5 | Cultural Property | D | Important cultural properties have not been found within the Project site |
| 6 | Water Right and Right of Common | D | Specific rights for water and fishing are not reported in the Project site |
| 7 | Public Health Condition | D | Public health condition problems will not be caused by the Project |
| 8 | Waste | D | A minimal increase in municipal waste is expected. |
| 9 | Hazards (Risk) | D | Natural hazards/ risks will not be increased by the Project. |
| Natural Environment | | | |
| 10 | Topography and Geology | D | As the proposed new facilities are not so huge, change of topography and geology will not occur as a result of the Project. |
| 11 | Soil Erosion | D | Soil erosion problems will not be caused by the Project |
| 12 | Groundwater | D | Groundwater will not be used both at the construction stage and the operational stage. |
| 13 | Hydrological Situation | D | Drainage problems may be handled properly. |
| 14 | Coastal Zone | D | The project area is not near the coastal Zone |
| 15 | Fauna and Flora | D | There are no important animals or plants found in the project area. |
| 16 | Meteorology | D | Change of meteorological conditions will not occur as a result of the Project. |
| 17 | Landscape | D | There are no important scenic spots around the project area |
| Pollution | | | |
| 18 | Air Pollution | D | Air Pollution will not be caused by the Project |
| 19 | Water Pollution | D | Water Pollution will not be caused by the Project |
| 20 | Soil Contamination | D | Soil contamination will not be caused by the Project |
| 21 | Noise and Vibration | E | Noise and Vibration will be considered during construction period. |
| 22 | Land Subsidence | D | Land subsidence will not be caused by the Project |
| 23 | Offensive Order | D | Land subsidence will not be caused by the Project |

A: Serious environmental impact is anticipated.

B: Environmental impact is anticipated to a certain extent.

C: Extent of impact is unknown. (Examination is needed.)

D: No impact is anticipated. EIA is not necessary.

E: Necessary to consider mitigation method afterward.

CHAPTER 6

MUKDAHAN GOODS DISTRIBUTION AND PROCESSING CENTER

CHAPTER 6

MUKDAHAN GOODS DISTRIBUTION AND PROCESSING CENTRE

6.1 Introduction

As one of the priority projects under the Local Industrialization Promotion Program, a goods distribution and processing center project has been identified to take advantage of the Second Mekong Bridge.

The objective of this project is to develop an industrial area with a truck terminal and light industry base. It is planned for environment-friendly industries with a zero-emission concept. The cluster development method, which is a stepwise (?) development according to the demand situation, is applied to the industrial area to reduce cost. It is expected to induce the construction of standard factories, warehouses, information centers, and related common service facilities.

Physically, the project is composed of three major components:

- Truck terminal for local distribution and collection;
- Inland container depot for international cargo; and
- Goods processing center for local products and materials.

This preliminary feasibility study focuses on the first two items. A traffic demand forecast was carried out mainly based on previous studies done for the Second Mekong Bridge, and was referred to the revealed effects of the construction of the Mekong River Friendship Bridge.

6.2 Project Definition

6.2.1 Rationale

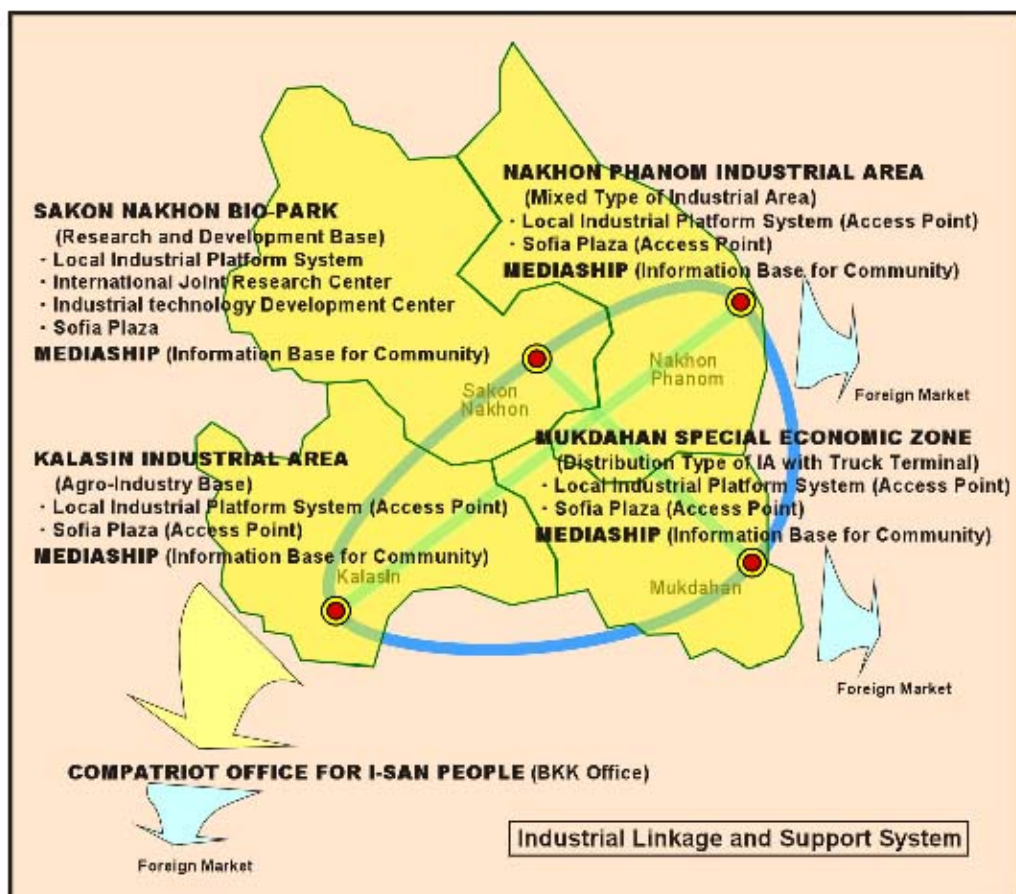
The location of Mukdahan is very advantageous due to its proximity to Lao PDR and Vietnam. Its potential will be further improved with the opening of the 2nd International

Mekong Bridge in 2004. Selection of the target industry for Mukdahan area has been carried out by considering such future potential. Finally, introduction of a transportation related industry has been decided for Mukdahan area. The selected target industries are summarized as follows:

- Truck Terminal and Logistic related services Industry (Forwarder, Vehicle Maintenance, Guest House)
- Warehousing, Stockyard
- Construction and Civil Work Materials, Assembly of Furniture Components
- Precise Precutting of Wooden Products
- Mixture and Packaging of Balanced Compound Feeds and Fertilizer
- Labeling and Packaging of Daily Sundry Goods
- Gas Filling , Bottling, Packaging
- Decomposition of Machinery and Recycling

In the near future, Mukdahan is expected to be a major “Gateway City” to Laos/Vietnam/People’s Republic of China through the 2nd Mekong Bridge and its role as a distribution manufacturing center is expected to materialize. Figure 6.1 shows the concept of distribution of industrial function of NBR.

Figure 6.1 Location of Projects, Programs and Linkage



6.2.2 Location

Three locations were considered as candidate locations for this project. Figure 6.2 shows the three locations:

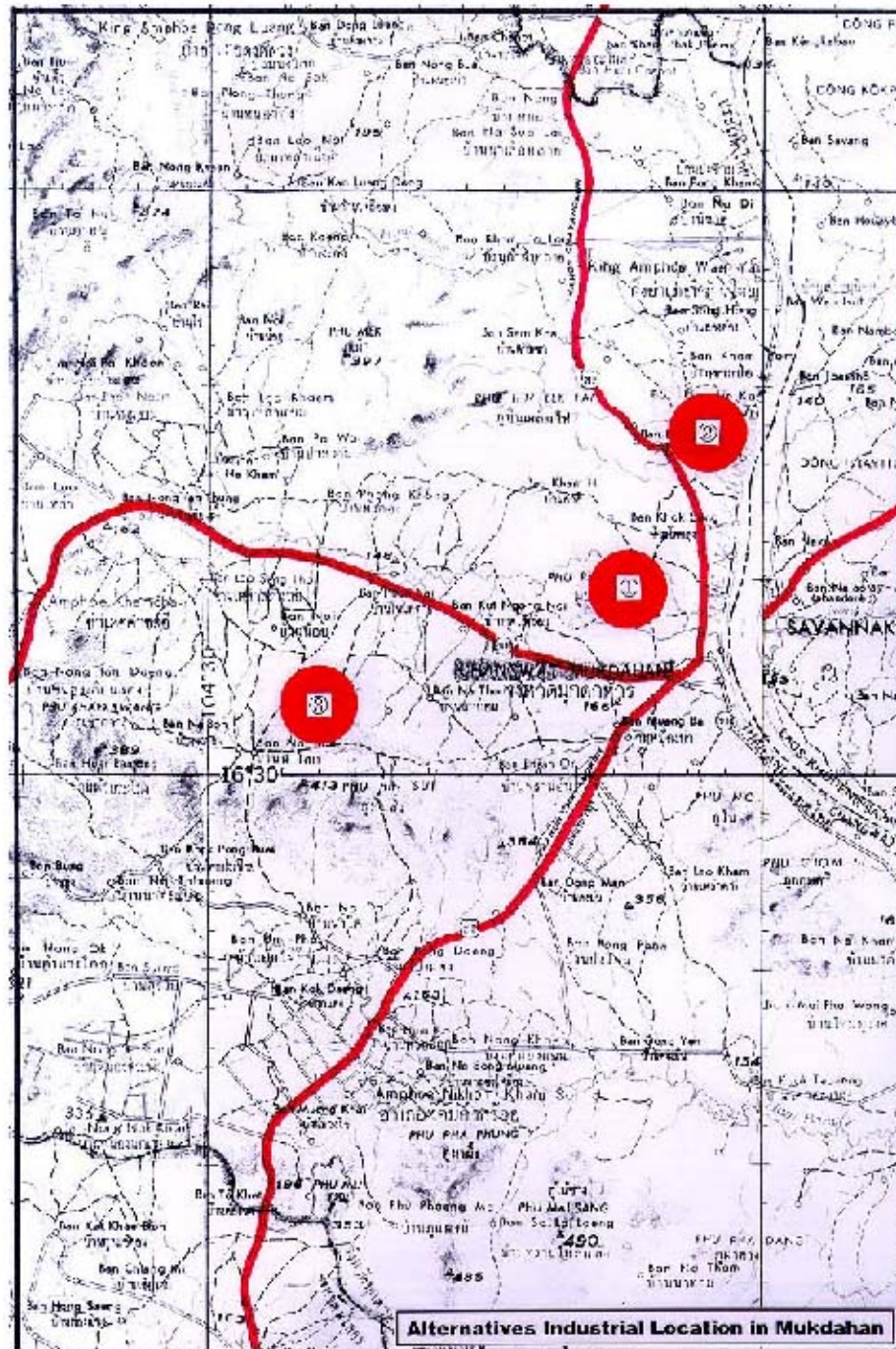


Figure 6.2 Alternative Locations of the Projects

These three locations were investigated based on the following criteria:

- Accessibility from residential area of Mukdahan (workers from municipal area);
- Accessibility from Nakhon Phanom (from factories in Nakhon Phanom);
- Accessibility to the National Highway No.2 (trunk route in the Northeast region);
- Accessibility from the Second Mekong Bridge; and
- Environmental impact on the surrounding area.

Among the above criteria, accessibility to the Second Mekong Bridge was the most important factor because the ICD is plied by both Thai and Lao trucks. Considering these factors and field investigation, location No.1 has been selected for this pre-feasibility study.

6.3 Traffic Demand Forecast and Capacity Determination

6.3.1 Demand Forecast of Cargo Handling Volume

According to the study on "Demand Forecast for Future Traffic" prepared under a "Special Assistance for Project Formation (SAPROF) for the Thai-Lao Second Mekong International Bridge Construction Project" (Mar. 1998, JBIC), there will be a traffic volume of 2,435 heavy trucks per day for inter-regional and international transportation by year 2020, if a high growth rate of traffic is considered.

Table 6.1 Long Distance (Interregional and International) Truck Forecasts (High Growth)

(unit: Heavy trucks / a day)

| Year | By Ferry Operation | By the Tai-Lao Second Mekong Int'l Bldg. | Total |
|------|--------------------|--|-------|
| 2005 | 182 | 210 | 392 |
| 2010 | 336 | 385 | 721 |
| 2020 | 1,135 | 1,300 | 2,435 |

Source: Special Assistance for Project Formation (SAPROF) for the Thai-Lao Second Mekong International Bridge Construction Project (Mar. 1998, JBIC)

Out of 2,435 heavy trucks, 1,950 or as much as 80% of the total will go to the Truck Terminal of MGDPC, loading an average 6 tons of inbound or outbound cargo by year 2020. The total volume of inbound and outbound cargo is estimated at 11,700 tons by year 2020, the target year.

6.3.2 Facility Formulation and Sizes

Major components of the truck terminal are berth (cargo handling area) and parking spaces. Other necessary facilities are administration building, operation office, and vehicle service facilities, such as a gas station, repair shop, car washing shop, and truck scale.

Lodging facilities for the drivers and assistants of pick-up/delivery trucks are separately designed from the administration building. The warehouse for temporary use is also planned as a considerable demand from forwarders is expected.

This section describes the design process for the berthing space.

The required number of berths is calculated from the forecasted cargo demands and daily cargo handling capacity.

Daily cargo handling capacity is determined by the working hours, working efficiency, and the mechanized level of the cargo handling operation. Taking regional conditions into account, 20 tons per a day for a berth, which is 20 percent lower than 25 tons, the basic standard for Japan, is considered as appropriate handling capacity for Thailand.

Based on the abovementioned background, the lowest required number of truck berths by year 2020 is calculated as follows,

$$11,700 \text{ (ton)} / 20 \text{ (ton/day/berth)} = 585 \text{ (berth)}$$

Thus the required number of berths for the Truck Terminal is 600 by year 2020.

6.4 Preliminary Design and Cost Estimates

MGDPC consists of two zones, namely, Goods Distribution Zone and Goods Processing Zone. The Goods Distribution Zone has two main facilities-- the Truck Terminal and Inland Container Depot.

This section describes the basic design process of MGDPC, from preliminary design of Truck Terminal to basic layout plan of MGDPC for the Truck Terminal.

6.4.1 Design Standard of Truck Terminal

The Study prepared a list of facilities with recommended size and layout plan. The layout plan has been designed to be applicable to any public truck terminal for standard line-haul trucks and collection/delivery trucks for a 13-16 ton truck terminal. These are shown in Figure 6.3.

The public truck terminal has the following five facilities; 1) platform, 2) apron, 3) parking, 4) administration building, 5) service station (repair shop, gas station, car washing facility).

Of the facilities above, the calculation method of appropriate size as well as the layout plan are explained in this section. Design conditions of each facility, especially design

conditions on earth works, pavement, platform, structure, drainage and water supply are described. Figure 6.3 shows the design of the platform.

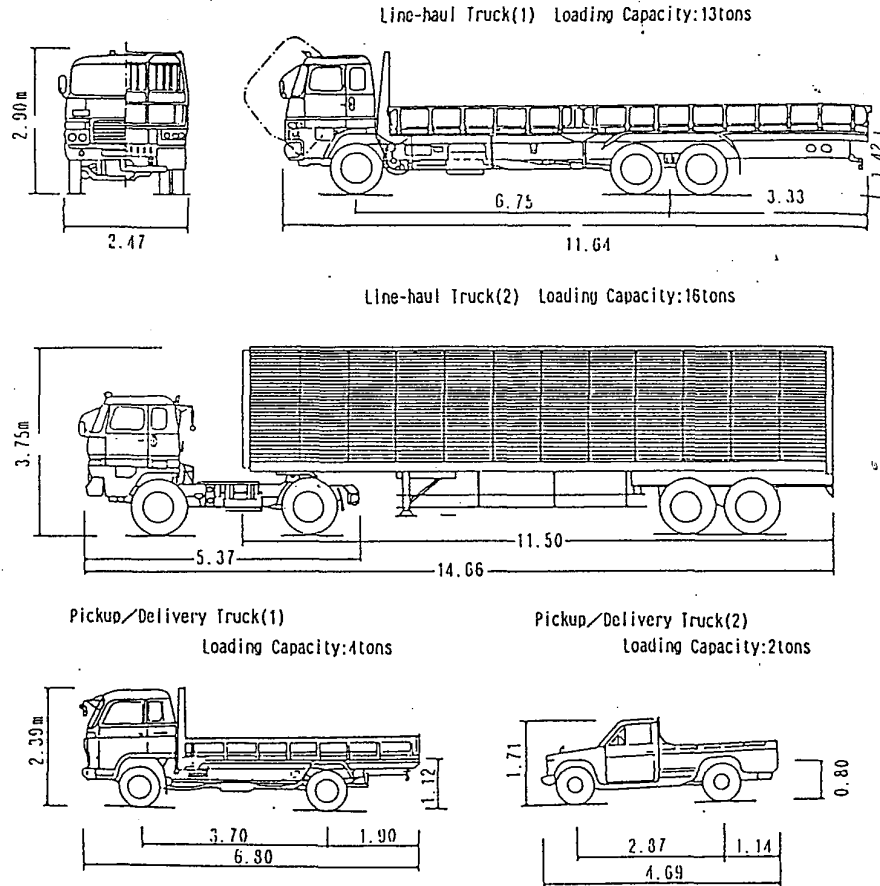


Figure 6.3 Dimensions of Line-haul Truck and Collection/Delivery Truck

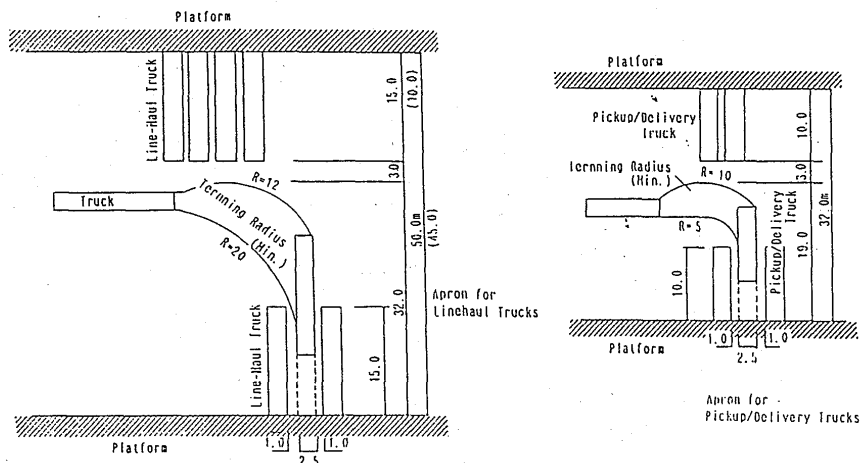


Figure 6.4 General Dimensions of Truck Berth and Spacing between Platforms

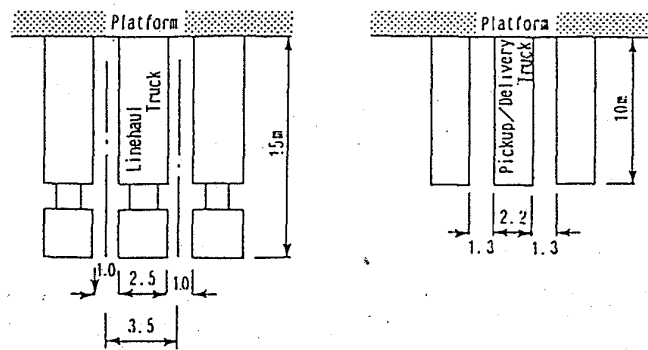
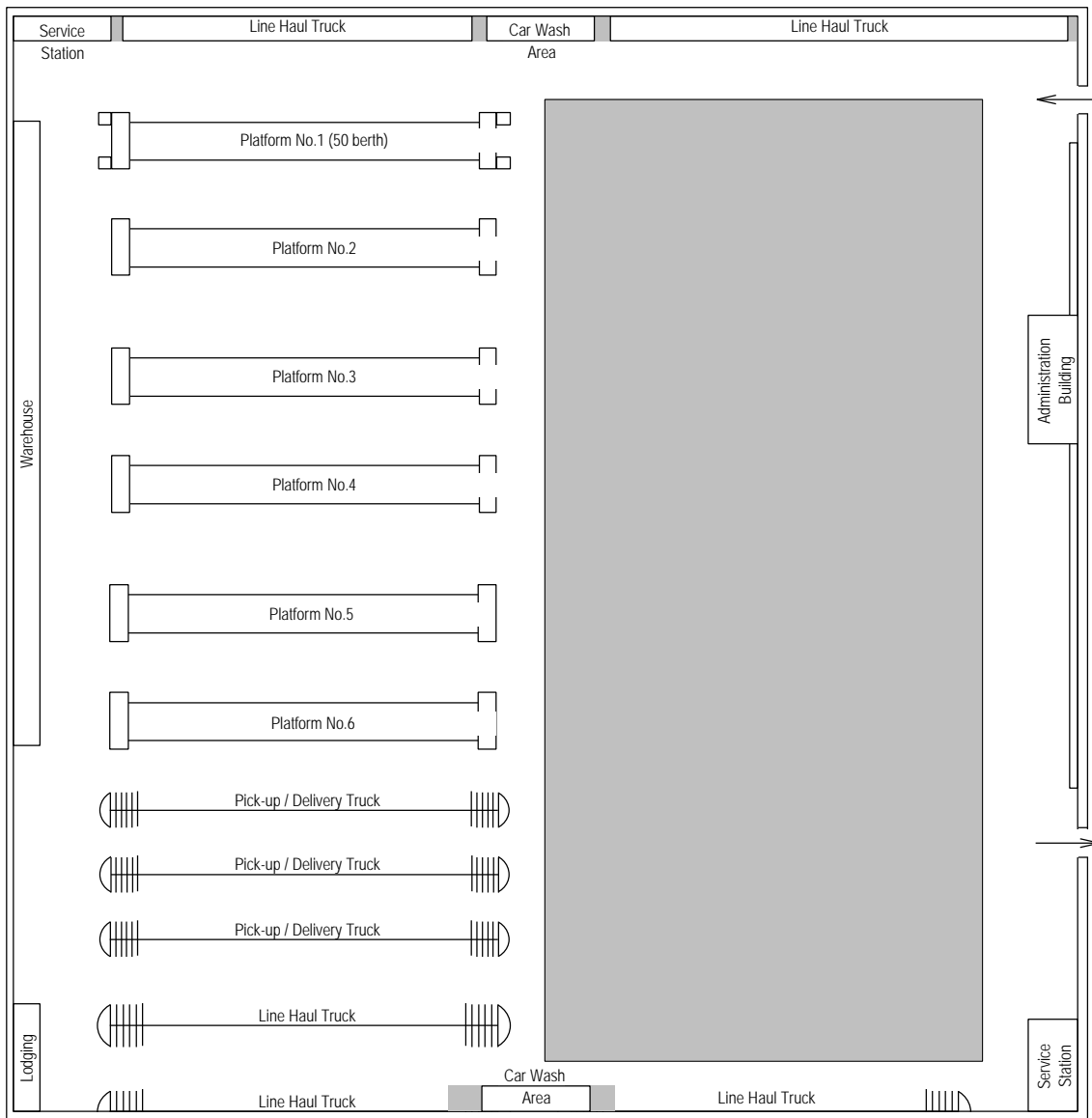


Figure 6.5 Berth Dimensions for Trucks

6.4.2 Preliminary Design of Truck Terminal

The preliminary design of the truck terminal is examined in terms of facility area, land area, construction cost, operation and administration. The berth, which is the main facility of the truck terminal will be constructed in two phases as shown in Figure 6.6.



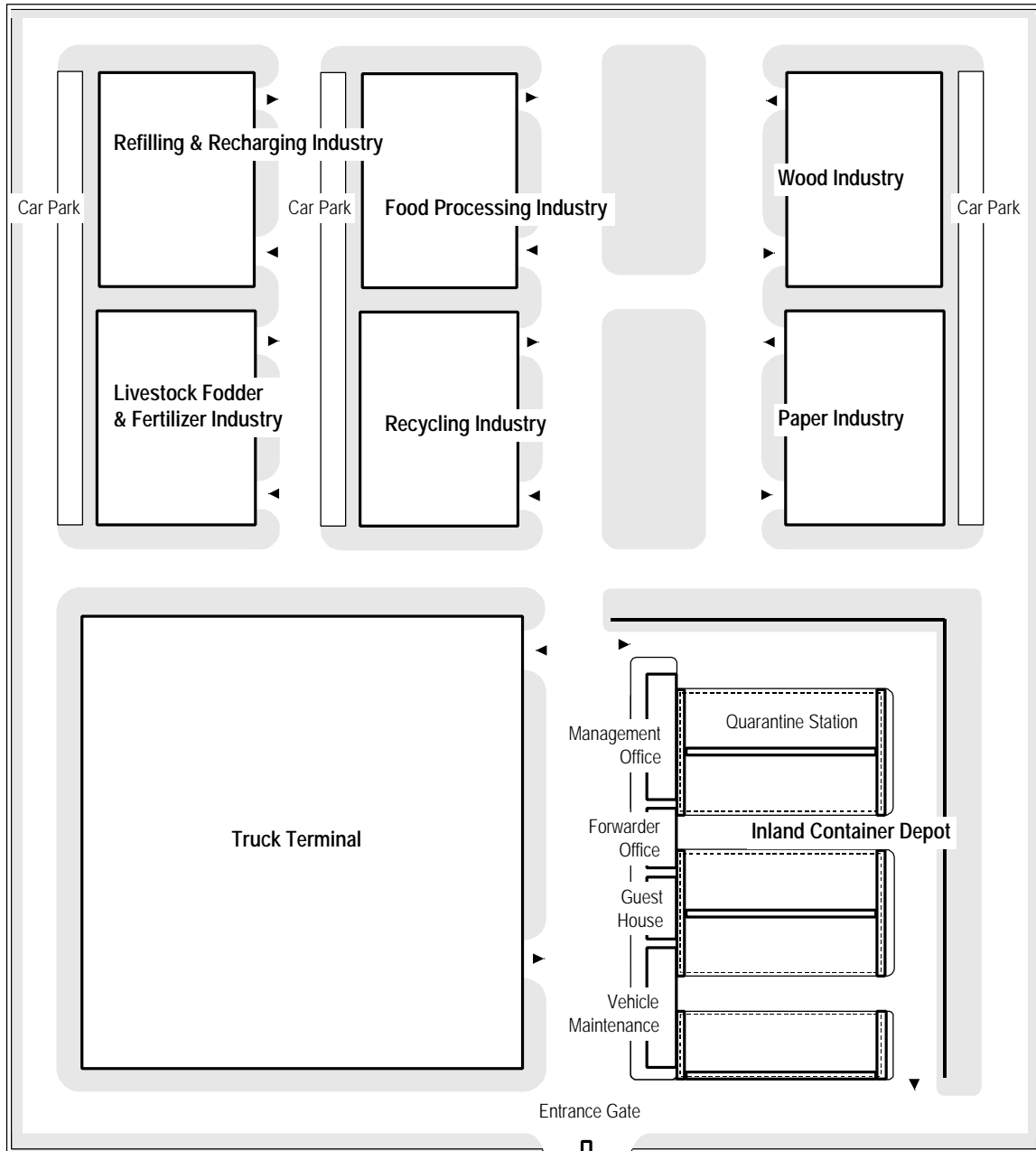
0 50 100 m

: First Phase
 : Second Phase

Figure 6.6 Preliminary Design of the Truck Terminal

6.4.3 Basic Layout Plan of MGDPC

As mentioned earlier, the MGDPC shall consist of a Goods Distribution Zone and Goods Processing Zone. The Goods Distribution Zone will have two facilities, Truck Terminal and Inland Container Depot, while the Goods Processing Zone will have six types of light industries, as shown in Figure 6.7.



0 100 200 m

Figure 6.7 Basic Layout Plan of MGDPC

Table 6.2 Necessary Space for Each Facility in MGDPC

(unit: sq. meter)

| | |
|-------------------------|--------------------------|
| Goods Distribution Zone | 960,000 |
| Truck Terminal | 315,650 |
| Inland Container Depo | 230,100 |
| Green Belt | 175,720 |
| Road and others | 238,530 |
| Goods Processing Zone | 840,000 |
| Processing Plant | 310,800 |
| Green Belt | 176,160 |
| Road and others | 353,040 |
| Grand-Total | 1,800,000 (1,125 Rai) |
| Land Acquisition Area | 1,854,400 (1,159 Rai) |

Note: Construction requires the right of way with width of 10 meters around the project site.

6.4.4 Cost Estimates

The project cost for the Goods Distribution Zone, MGDPC is shown in Table 6.3.

Table 6.3 Project Cost for the Goods Distribution Zone, MGDPC

| Project | Item | Cost |
|------------------------|--------------------|-------|
| Truck Terminal | | 109.4 |
| | Enigneering | 8.8 |
| | Construction | 89.0 |
| | Supervision | 4.4 |
| Inland Container Depot | Tax(7%) and others | 7.2 |
| | | 73.0 |
| | Enigneering | 6.0 |
| | Construction | 59.2 |
| Miscellaneous | Supervision | 3.0 |
| | Tax(7%) and others | 4.8 |
| | | 6.0 |
| Grand Total | | 188.4 |

6.5 Financial Appraisal

6.5.1 General

The principle aim of the analysis below is to ascertain the financial viability of the implementation of the construction, operation and maintenance of the Mukdahan truck terminal and ICD project as a sub component of the Mukdahan Goods Distribution and Processing Center Project. The financial modeling and analyses were carried out according to the overall project framework as detailed in the Implementation Program and based on the project costs detailed in section 6.4.

The main assumptions and conditions in the financial model are highlighted in the next section, followed by a brief summary of the implementation schedule as utilized in the financial evaluation. This is followed by a presentation of the revenue, total investment costs and financing requirements. Lastly, the results of the financial evaluation are summarized.

6.5.2 Basic Assumptions and Conditions

The basic assumptions and conditions followed in the financial evaluation are itemized below:

| <u>Item</u> | <u>Definition/Assumption</u> |
|--------------------------|---|
| <u>Cost Items</u> | |
| A. Project Cost | |
| • Engineering Services | As per cost estimate in section 6.4 |
| • Construction | As per cost estimate in section 6.4 |
| • O & M cost | 5% of the initial construction cost per year |
| • Tax & Duty | 7% of the initial construction cost |
| • Miscellaneous | As per cost estimate in section 6.4 |
| • Total | Sum of (A1) to (A5). |
| B. Land Acquisition Cost | 50 Baht per sq. meter |
| C. Financial Cost | No financial cost is assumed for this preliminary analysis. |
| E. Total Investment Cost | Sum of (A) to (C) |

Revenue Items

| | |
|--------------------|--------------------------------|
| Unit charging rate | 7,000 Baht per month per berth |
|--------------------|--------------------------------|

Loading factor Due to the traffic demand forecast

All of cost are expressed in the year 2000 currency term.

6.5.3 Implementation Schedule

The financial evaluation was carried out according to the implementation schedule presented below:

| <u>Year</u> | <u>Activities</u> |
|-------------------|---|
| Middle of 2003 | Land acquisition, engineering review design and tender process begin. |
| End of 2003 | Construction begins (Phase 1: Truck terminal 200 Berth and ICD). |
| Middle of 2004 | Installation of ICD facilities and others |
| Beginning of 2005 | Operation starts |
| 2010 | Phase 2 construction (200 Berths) |
| 2015 | Phase 3 construction (200 Berths) |
| 2003-2028 | Analysis period |

6.5.4 Cash Flow Analysis and Feasibility Indicators

The Projected revenue and investment costs are summarized in Table 6.4. As shown in the table, the project is expected to achieve a positive cumulative net profit in the year 2014, or 10 years after initial operation (phase 1)

The results of the financial evaluation indicate a Project Return of 15.3%. The Net Present Value of the net profit 41.7 million Baht or Benefit Cost ratio is 1.38 at 12 percent discount rate.

The above results indicate that the implementation of the project will be basically feasible. For the next step of the analysis, a more detailed cost estimation and consideration for funding arrangement will be necessary.

Table 6.4 Cash Flow Analysis of the Goods Distribution Center

Unit: million Baht

| Year | Land Acquisition | Truck terminal | ICD | O&M | Revenue | Net Profit | Cumulative net profit |
|------|------------------|----------------|------|------|---------|------------|-----------------------|
| 2003 | 48.0 | | | | | -48.0 | -48.0 |
| 2004 | | 18.2 | 36.5 | | | -54.7 | -102.7 |
| 2005 | | | | 0.09 | 7.94 | 7.8 | -94.9 |
| 2006 | | | | 0.09 | 8.96 | 8.9 | -86.0 |
| 2007 | | | | 0.09 | 10.12 | 10.0 | -76.0 |
| 2008 | | | | 0.09 | 11.42 | 11.3 | -64.7 |
| 2009 | | | | 0.09 | 12.89 | 12.8 | -51.9 |
| 2010 | | 18.2 | | 0.09 | 14.55 | -3.8 | -55.6 |
| 2011 | | | | 0.18 | 16.43 | 16.2 | -39.4 |
| 2012 | | | | 0.18 | 18.55 | 18.4 | -21.0 |
| 2013 | | | | 0.18 | 20.94 | 20.8 | -0.3 |
| 2014 | | | | 0.18 | 23.63 | 23.5 | 23.2 |
| 2015 | | 18.2 | | 0.18 | 26.68 | 8.3 | 31.4 |
| 2016 | | | | 0.27 | 30.12 | 29.8 | 61.3 |
| 2017 | | | | 0.27 | 34.00 | 33.7 | 95.0 |
| 2018 | | | | 0.27 | 38.38 | 38.1 | 133.1 |
| 2019 | | | | 0.27 | 43.33 | 43.1 | 176.2 |
| 2020 | | | | 0.27 | 49.14 | 48.9 | 225.1 |
| 2021 | | | | 0.27 | 52.09 | 51.8 | 276.9 |
| 2022 | | | | 0.27 | 55.21 | 54.9 | 331.8 |
| 2023 | | | | 0.27 | 58.53 | 58.3 | 390.1 |
| 2024 | | | | 0.27 | 62.04 | 61.8 | 451.8 |
| 2025 | | | | 0.27 | 65.76 | 65.5 | 517.3 |
| 2026 | | | | 0.27 | 69.71 | 69.4 | 586.7 |
| 2027 | | | | 0.27 | 73.89 | 73.6 | 660.4 |
| 2028 | | | | 0.27 | 78.32 | 78.0 | 738.4 |

| | |
|-------|-------|
| FIRR= | 15.3% |
| B/C= | 1.38 |
| NPV= | 41.70 |

6.6 IEE

6.6.1 Objectives

The first objective of the Initial environmental examination (IEE) is to identify possible significant environmental items/elements (screening) and consider the magnitude of each impact (scoping) caused by Project implementation. The second objective is to decide the necessity for an environmental impact assessment (EIA), which is a detailed impact study that will be conducted at a later stage. If an EIA is needed, the important environmental elements will be identified.

6.6.2 Results and Conclusion

The project involves the construction of a new truck terminal and inland container depot in Mukdahan. The location of the project is in the outskirts of the municipal area of Mukdahan and close to the Second Mekong Bridge. Due to the nature of the project, traffic related environmental impacts have been identified. These include air pollution by heavy vehicles (especially by old heavy vehicles from Lao and Vietnam side to ICD), noise and vibration during the construction period and after operation those caused by heavy vehicles are anticipated. Resettlement arrangements will also be required in a limited area close to the project site to build the access roads and related facilities. Therefore, in the further detailed study, it is recommended to consider countermeasures for these impacts. Table 6.5 summarizes the results of the IEE for this project.

Table 6.5 Results of IEE

Social Environment

| No. | Environmental Item | Evaluation | Reason |
|-----|---------------------------------|------------|--|
| 1 | Resettlement | C | There are only a very limited number of residents in the project area. |
| 2 | Economic Activities | D | Direct impacts on economic activity will not be caused by the Project |
| 3 | Traffic/Public Facilities | D | Traffic/Public Facilities problem will not be caused by the Project |
| 4 | Split of Communities | C | Some traffic accidents may happen to residents around this area. |
| 5 | Cultural Property | D | Important cultural properties are not found within the Project site |
| 6 | Water Right and Right of Common | D | Project has no effect. |
| 7 | Public Health Condition | D | Project has no effect. |
| 8 | Waste | C | Minimal increase in waste is expected |
| 9 | Hazards (Risk) | D | Natural hazard risks will not be increased by the Project. |

Table 6.5 Results of IEE (continued)

Natural Environment

| | | | |
|----|------------------------|---|---|
| 10 | Topography and Geology | D | As the proposed new facilities are not so huge, change of topography and geology will not occur as a result of the Project. |
| 11 | Soil Erosion | D | Soil erosion problems will not be caused by the Project |
| 12 | Groundwater | D | Groundwater will not be used both at the construction and the operational stage. |
| 13 | Hydrological Situation | C | Drainage problems should be handled properly. |
| 14 | Coastal Zone | D | The project area is not near the coastal Zone |
| 15 | Fauna and Flora | D | There are no important animals or plants found in the project area. |
| 16 | Meteorology | D | Change of meteorological conditions will not occur as a result of the Project. |
| 17 | Landscape | D | There are no important scenic spots around the project area |

Pollution

| | | | |
|----|---------------------|---|--|
| 18 | Air Pollution | C | Exhaust emissions from trucks may cause air pollution |
| 19 | Water Pollution | D | Water Pollution will not be caused by the Project |
| 20 | Soil Contamination | D | Soil contamination will not be caused by the Project |
| 21 | Noise and Vibration | B | There will be noise from the construction site at the construction stage, and from transportation trucks at the operational stage. |
| 22 | Land Subsidence | D | Land subsidence will not be caused by the Project |
| 23 | Offensive Order | D | Land subsidence will not be caused by the Project |

Note: Evaluation categories

A: Serious impact is expected.

B: Some impact is expected.

C: Extent of impact is unknown. (Examination is needed.)

D: No impact is expected

E: Necessary to consider mitigation method afterward.

6.7 Implementation Program

6.7.1 Basic Conditions

The basic assumptions to be considered in preparing the implementation plan are as follows:

- Consultant is to be selected by the end of December 2002;
- Definitive basic design will be prepared by the Consultants within 6 months;
- Tender process is scheduled tentatively to be completed within 4 months; and
- Construction of each package is estimated taking into account the work volume and project conditions.
 - Package 1 (Truck terminal) 8 months
 - Package 2 (ICD) 10 months
 - Package 3 (Access roads and others) 3 months

6.7.2 Implementation Schedule

The responsible government agency will make efforts to accelerate the procedures necessary for the implementation of the project. Completion date of the project is targeted for December 2004.

| Actions | 2002 | 2003 | 2004 | 2005 |
|-----------------------------|------|------|------|------|
| Land Acquisition | | ■ | | |
| Design | | ■ | | |
| Tendering | | ■ | | |
| Earth work | | ■ | | |
| Access roads | | ■ | | |
| Infrastructure | | | ■ | |
| Truck Terminal construction | | | ■ | |
| ICD construction | | | ■ | |
| Operation | | | | → |

Figure 6.8 Implementation Schedule

6.7.3 ECT EXECUTING AGENCY

The Industrial Estate Authority of Thailand (IEAT) is a candidate organization to implement this project. The Customs department will also be involved in the ICD project. These two organizations will jointly oversee the execution of project. It should be noted that there is a possibility to invite the private sector to undertake the operation and maintenance of the facility.

Role and responsibilities of concerned Government agencies and the Consultant for each work component is shown below:

(1) Survey and Detail Design

- IEAT: Approval
- Consultant: Prime work (Design)

(2) Tendering

- IEAT and Custom Department: Prime work (Tender) and to obtain approval
- Consultant: Assistant work

(3) Construction Supervision

- IEAT: Approval
- Consultant: Prime work (Supervision)
- Contractor: Construction and procurement of ICD facility