

2.8.6 Agricultural Extension Services

The Department of Agricultural Extension (DOAE) has direct responsibility for providing agricultural advice to farmers. Provincial and Amphoe Extension Offices which are established in every province and Amphoe under the control of the DOAE. The Provincial Extension Office is composed of four branches, that is, Administration, Planning, Extension and Production Development, Pest Control and Eradication, and coordinates agricultural extension activities in the province. About 20 extension workers are in the Provincial Extension Office and are working for training farmers in group unit by using demonstration farms and training facilities. The Amphoe Extension Office has three branches such as Administration, Organization of Farmer Development, Production and Extension and coordinates agricultural extension activities in the Amphoe. The Amphoe Extension Office has 10 to 15 extension workers and gives guidance on agricultural production through the extension workers who contact farmers on farm level. Some of the extension workers are working as the Tambon extension worker and have meeting every months at the Amphoe Extension Office. One Tambon extension worker per 1,000 farm families is assigned in principle and is working for giving advises to farmers for cultivation of high yield paddy rice, cassava, etc., and for collecting data / information for agricultural census.

Extension services for livestock and fisheries are implemented by the Provincial Livestock Office and Provincial Fishery Office, respectively.

The number of extension workers in 4 provinces is summarized below:

Table 2.8-13 Number of Extension Workers in Four Provinces

| Province | Tambon | Village | Area (rai) | Extension Workers | Farm Households | |
|---------------|--------|---------|---------------|----------------------|-----------------|------------|
| | | | | | Total | Per Worker |
| Khon Kaen | 198 | 1,966 | 4,290,069 | 263 | 173,940 | 661 |
| Maha Sarakham | 128 | 1,593 | 2,683,107 | 176 | 113,446 | 644 |
| Sakon Nakhon | 125 | 1,192 | 1,197,345 | 187 | 103,357 | 553 |
| Mukdahan | 53 | 475 | 775,217 | 116 | 37,715 | 325 |
| Total | 504 | 5,226 | 8,945,738 | | 428,458 | 577 |

Source : DOAE, 1995

At present, ALRO has Training and Development Division, which is responsible for training and development of farmers in LRAs. This division is divided into four sub-divisions, each of which is equipped with five professional staff. One sub-division is assigned to be responsible for farmers' training in the Northeastern Region.

With expansion of LRAs, manpower of the Training and Development Division became insufficient. Therefore, network for training has been set up. The network is carried out through :

- i) Provincial Land Reform Offices Training and Development Division coordinates with provincial land reform offices (PLROs) to appoint training coordinator from PLROs' staffs. The division is to set up training curriculum and prepare training manuals.
- ii) Community Organization ALRO encourages farmer leaders in LRAs to unite and form farmers' groups. Some of these groups are strong and developed to a point that the members are capable as transferring what they achieve to the other farmers. Some of these groups could be used for demonstration fields for the farmers in the project areas to make study visit from time to time.

Normally training manuals, which are developed and published by ALRO, are sent to PLROs, and the PLROs eventually coordinate with relevant organizations in the province to invite resource persons for the training courses.

The problems in providing agricultural advice to farmers are much the same as that in strengthening people's organization and will be summarized below:

- 1) Unstable production in rainfall and declining prices for major commodity crops such as rice, cassava, etc. discourage farmers from investing for increased production. In most LRAs, it is difficult to find self-sufficient oriented agriculture and urban migration for earning money to buy goods has become customary. At present, more than half of income of most farmers is non-farm income and farmers no longer consider agriculture as their sole income source any more.
- 2) Many of farmers are not well educated and have a little self-reliance. Accordingly, it will take a long time to understand the technologies needed to grow new crops.
- 3) Lack of leaders in LRAs. Thai farmers adhere to independence, liberty, dignity and enjoyment in their daily lives. They don't adhere to collaborative activities beyond the minimum. Collaboration between villages and traditions of self-governing of villages have been largely inoperative and, accordingly, village farmers are generally incapable of organizing themselves and taking collaborative action to solve common problems. As is the case, this adherence to the liberty and dignity of each individual and the lack of collaborative spirit in society has lead to difficulties in creating efficient and effective rural leaders who can be accepted and relied on by farmers.
- 4) Insufficient number of extension workers, especially in the field of horticulture.
- 5) Insufficient integrating activities among government agencies related to agricultural extension services.

2.8.7 Agricultural Research and Experiment Stations

There are several governmental agencies involved in agricultural research and experiment activities directly or indirectly to the goal of promotion of agriculture and increased income of farmers. Among these key agencies are:

- Office of the Permanent Secretary, Ministry of Agriculture and Cooperatives
- Rice Research Institute, Department of Agriculture (DOA)
- Field Crop Research Institute, Department of Agriculture (DOA)
- Sericulture Research Institute, Department of Agriculture (DOA)
- Fresh Water Fisheries Division, department of Fisheries (DOF)
- National Aquaculture Genetic Research Institute, Department of Fisheries (DOF)
- Animal Husbandry Division, Department of livestock Development (DOL)
- Division of Animal Nutrition, Department of Livestock Development (DOL)
- Artificial Insemination division, Department of Livestock Development (DOL)
- Northeastern Veterinary research and Diagnostic Center, Khon Kaen, Department of Livestock Development (DOL)
- Land Development Regional Office, Department of Land Development (DLD)
- Land Development Committee Party Office
- Department of Land Development (DLD)
- Royal Forestry Department (RFD)

A list of these agencies is shown in Appendix F. Table F-6.

2.9 Post-Harvest Handling and Marketing

Rice in the Study Area is usually harvested manually by farmers and dried in the same field for two to three days. Harvesting is done by the family and sometimes relatives or hired labor when the work needs to be finished quickly. Almost all dried paddies is threshed in the field by hired machine with an operator for immediate sale through local traders after enough has been secured for domestic consumption. Sometimes rice is stored in a farmer's warehouse or house for timely selling.

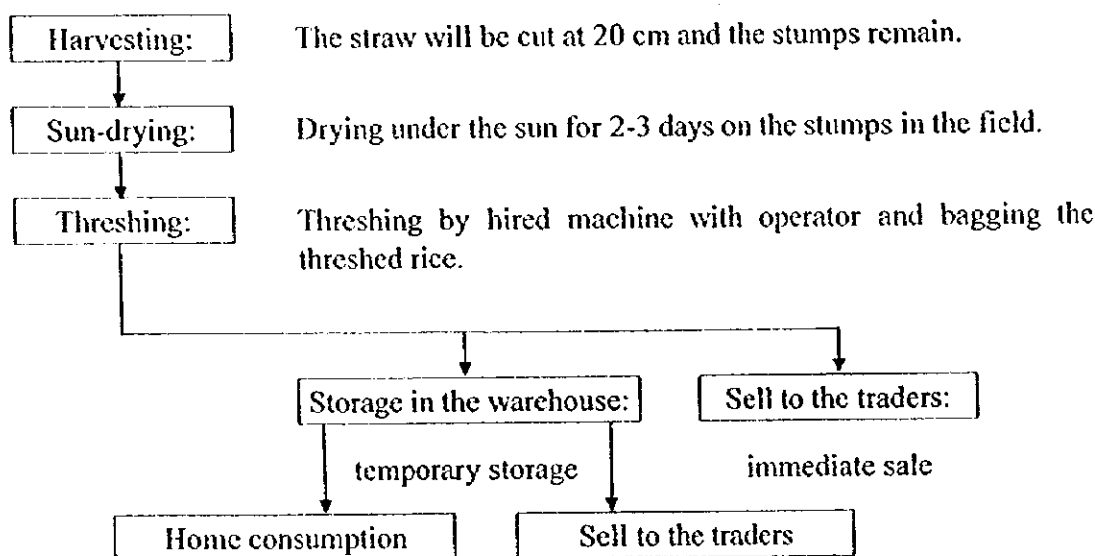


Figure 2.9-1 Flow Chart for Post-Harvest Rice Handling

In some LRAs in the Study Area especially near forest reserve areas, rice production is not enough for family consumption because of small rice field and low yield, and rice necessary for domestic consumption is almost all milled by the small rice miller in the village when necessary. The milling fee usually corresponds to the remaining rice husks and bran including a bit of milled white rice. Some rice millers ask for cash of approximately one baht per 12 kg can. A few villages have no private small rice miller and farmers in such villages have to mill using a pestle and mortar or go to a market far from the villages to buy white rice for domestic consumption.

Marketing of rice is conducted by paddy from farm to rice miller in provincial level and sometimes in regional level by local traders, middlemen and representatives of large scale rice millers. The marketing of rice is also carried out by agricultural cooperatives and the Bank of Agriculture and Agricultural Cooperatives (BAAC) for their member farmers at the provincial level. Farmers can select a buyer at any time, but, as small-scale farmers have not enough capital to transport their products, they cannot avoid selling at the field or the farm gate for an unreasonable price. As loans from the agricultural cooperatives or BAAC are of high interest and the loan regulations are severe to the small-scale farmers, they hesitate to take out loans.

Some local traders, cooperatives or even rice millers at the provincial level sell the paddy to another trader or rice miller at another provincial or central level. (refer to Figure 2.9-2)

Post-harvest handling and marketing of cassava in the Study Area is conducted in the same way as in other areas. Harvesting is done by the farmer himself and sometimes with hired labor. After harvesting, it is usually collected in the collecting house in the village and sold to traders or middle men. Harvested cassava is commonly sold immediately, not dried or not processed in the Study Area. Some farmers who produce a large volume of cassava transport it to the flour processing factories in the province or even other provinces to obtain a higher selling price.(refer to Figure F-1)

Sugarcane is generally planted on a contract farming basis. It is harvested by the farmer himself usually with help of relatives and hired labor. Harvested sugarcane is immediately loaded on a truck sent by the owner/contractor. The contract is made with farmer members and the handling of sugarcane is carried out according to the contract. Some large scale farmers handle it themselves to seek higher selling points in and around the province. (refer to Figure F-1)

Other agricultural crops such as vegetables, beans or fruits, livestock or fisheries are planted or raised in the Study Area, but, they are generally cultivated for domestic consumption. No typical post-harvest handling and marketing scheme is found because only surplus products are sometimes sold at acceptable price to traders or middle men who come to do business for other purposes.

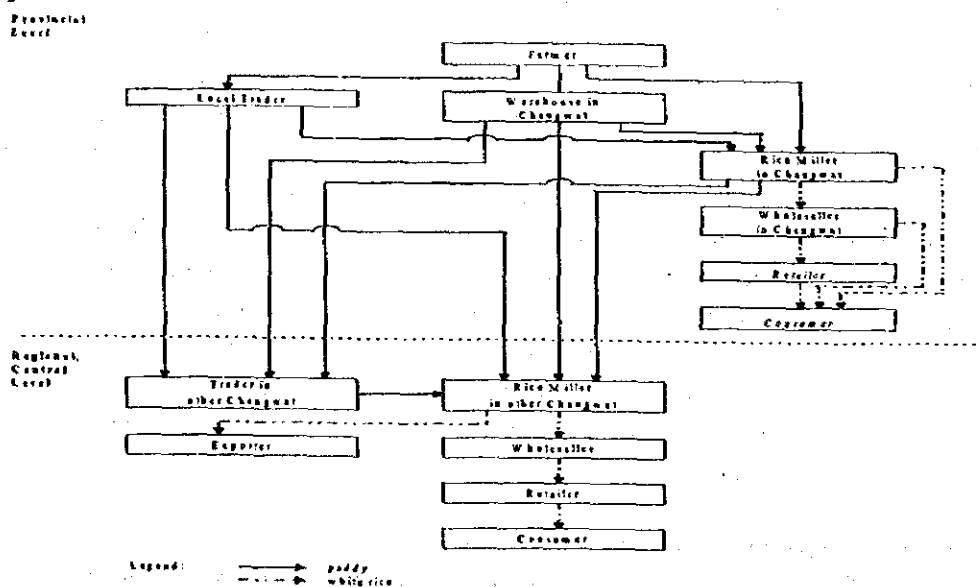


Figure 2.9-2 Marketing Channel of Agricultural Products, Rice

2.10 Farm Income and Agricultural Credit

2.10.1 Farm Income

1) Household and Farm Income / Expenditure of Changwats

Table 2.10-1 Household Income / Expenditure (Baht / Yr)

| | Whole Kingdom | N.E. Region | Mukudahan | Khon Kean | Maha sarakham | Sakhon Nakohn |
|-------------|---------------|-------------|-----------|-----------|---------------|---------------|
| Income | 98,664 | 68,220 | 51,936 | 76,452 | 53,928 | 66,492 |
| Expenditure | 96,408 | 73,608 | 62,808 | 71,892 | 71,892 | 72,852 |

(Source) : Preliminary socio-economic survey data, 1994

Table 2.10-2 Farm Income / Expenditure (Baht / Yr)

| | Whole Kingdom | N.E. Region | Mukudahan | Khon Kean | Maha sarakham | Sakhon Nakohn |
|-------------|---------------|-------------|-----------|-----------|---------------|---------------|
| Income | 57,974 | 38,175 | 32,934 | 44,067 | 32,313 | 36,013 |
| Expenditure | 59,243 | 36,977 | 31,530 | 40,759 | 32,228 | 32,377 |

(Source) : Agricultural Statistics, 1994

At the Changwat level, comparing household income of the total population with that of farms, it could be seen that farm income was 60 % of that of the total population in 1994. With economic growth mainly through industry sector in recent years, income disparity between households and farms had widened by 1996 (see Appendix G). This is based on lower growth of the agriculture sector, which recorded only 3.3% compared with 12% of the industry sector. Furthermore, as increase in consumer prices has surpassed that of the producer price for agricultural products over the last few years, expenditure has soared and the financial balance of many farms is now in the red. The reason farms can still make a living under such a situation is that their food supply depends heavily on their own produce; that is, disposal income is higher than the above figure. Comparing incomes among Changwats, farmers in Khon Kaen Province had the highest. This is because Khon Kaen Province has a large population and a large food demand, especially for vegetables and handicrafts for location convenience. As farmers in Khon Kaen Province have a big market in which to sell their produce, they engage in more commercially oriented rather than self-sufficient oriented agriculture. The rest of the Changwats don't have a big market for their agricultural produce and farmers make a living by selling part of their produce and consuming the rest themselves.

2) Farm Income / Expenditure in the Study Areas

A typical farm has 5 family members and 3 farm laborers working 20 rai. They plant 10 rai of field crops such as cassava, sugarcane, and maize which are suitable for infertile soil, 10 rai of rice, and have some domestic animals like chickens or ducks, and fruit trees such as banana and coconut. Crop varieties are not so diversified. A typical farm, which belongs to Farming Type B presented in the table below, is the most popular in the study areas. The share of Type B accounts for more than 50 % of all farms. While they plant rice mainly for self-consumption, if

they had surplus rice, it would be sold for cash. Field crops are planted as the main cash source. Also, to help with ready cash on-farm income, one of the family members usually practices handicraft work like silk weaving.

Table 2.10-3 Farming Type in the Study Area

| Type A | | Type B | | Type C | | Type D1 | | Type D2 | | Type E | |
|------------|-----|----------------------|-----|------------------------|----------|------------------------|-----|------------------------|----------|----------------|-----|
| Paddy only | | Paddy + Upland crops | | Paddy + Cattle raising | | Integrated Farming (1) | | Integrated Farming (2) | | Paddy + Forest | |
| | rai | | rai | | rai/head | | rai | | rai/head | | rai |
| Paddy | 20 | Paddy | 10 | Paddy | 10 | Paddy | 10 | Paddy | 10 | Paddy | 10 |
| | | Cassava | 10 | Cassava | 10 | Forest | 4.4 | Forest | 8 | Forest | 10 |
| | | (Sugarcane) | | Beef Cattle | 5 | Vegetables | 1 | Vegetables | 1 | (Eucalyptus) | |
| | | | | Chickens | 60 | Fruits | 3 | Ponds | 1 | | |
| | | | | | | Ponds | 1.6 | Beef Cattle | 8 | | |
| | | | | | | | | Chickens | 60 | | |

As well as Type B, under the agricultural restructuring program called Kor Por Lo, the government is encouraging crop change from cassava to fast growing trees such as eucalyptus and acacia. We could also observe Farming Type E. As this project is 3 years old, most farmers still haven't received any income from selling forest crops.

In some areas in Sakhon Nakhon Province, due to limited land resources, farms of 5 rai are planting only rice (Farming Type A). As such farms can't make a living from only on-farm income, they usually engage in non-farm work and just regard agriculture as a sub-income source.

Farming Type C is also a popular type of farming which makes effective use of resources by using rice straw for feeding beef cattle and rice for feeding chickens.

We could also observe various types of integrated farming (Farming Types D1 and D2). Farmers who had applied for the Kor Po Lor or ALRO funding in the integrated farming category will have farm ponds and receive some subsidies in kind. They breed fish for self consumption in farm ponds and plant various kinds of vegetable for both their own and commercial use and use rice straw and paddy field as beef cattle fodder and rice for feeding chickens. As the number of farmers practicing these kinds of farming (Farming Type D1 and D2) are still few, they engage only in agriculture and don't seasonally migrate to urban areas seeking off-farm income. This shows that if one farm in the Study Areas had a farm pond and farmers could use pond water whenever they wanted, it would be possible to make a living by on-farm income alone.

Table 2.10-4 Farm Income / Expenditure in the Study Area

| Baht/yr | Model A | Model B | Model C | Model D1 | Model D2 | Model E |
|-------------|---------|---------|---------|----------|----------|---------|
| Income | 45,675 | 50,430 | 66,536 | 66,595 | 82,956 | 52,450 |
| Expenditure | 32,860 | 32,770 | 48,681 | 50,518 | 63,999 | 35,033 |

(Source): Farm Survey, Feb 1997

Common characteristics in the Study Area with poor soil quality and without irrigation facilities are that farmers no longer consider agriculture as their sole income source any more. This is because income from agriculture is not enough for them to make a living. They usually go and work in Bangkok or neighboring big towns or cities to supplement their income during the dry season as construction workers, employees, drivers, scavengers etc. or work as hired labour for agricultural operation and for silk weaving. Their non-farm income accounts to 28,000 to 34,000 bahts per year on an average. In the Study Area, non-farm income exceeds income from agriculture. However, only training for silk weaving, cloth sewing, etc. is carried out poorly in order to increase non-farm income and occupational skill training is not carried out.

In terms of living standard, farmers have been living in LRAs for over several decades and have valuable assets such as houses, motorcycles, two-wheel walking tractors, and pick-up trucks regardless of not having enough cash income .

Urban migration for work has become customary. Due to this trend, there is a labor shortage even in the wet season. Many farmers are forced to hire labor for agricultural operations such as planting and harvesting each other.

2.10.2 Agricultural Credit

For promotion of integrated farming and non- farming employment program in LRAs, provision of credit service and farmers supporting fund have been one of the most essential supports of the government. As integrated farming is based on long term and sustainable point of view , farmers would need initial investment of new agricultural activities. Aside from the agricultural credit , fund for supporting non - farming employment activity is also important for securing income and absorption the surplus of farm labour in season.

At present , major source of farmers supporting fund may be classified in a typical group in accordance with main objectives and responsible agencies as follows :

Table 2.10-5 Major Sources of Farmers Supporting Fund

| Source of Fund | Main Objective | Main Responsible Agencies |
|---|--|-------------------------------|
| Agricultural Fund | | |
| Cooperative | Agricultural development | CPD |
| BAAC | Agricultural development | MOF |
| Land Reform Fund | Agricultural development | ALRO |
| Kor Po Lor Fund | Agricultural development | MOAC, BAAC |
| Non - Agricultural Fund | | |
| Production Saving Group | Solution of shortage of funds and develop mutual trust among villages. | CDD |
| Poverty Eradication Fund at household level | Provide revolving fund for poor families in village with no interest | CDD |
| Revolving Fund for Promotion of cottage industry and handicraft | Provide lending money for promotion of cottage industries and handicraft | Dept. of Industrial Promotion |

Among the agricultural credit financiers, BAAC is now a major source of borrowing in the country. Aside from the credit service provided through BAAC, the agricultural cooperatives, and ALRO are also performing lending activities to the farmers. In 1995, Land Reform Fund under ALRO disbursed 50 million baht for Land Reform Cooperative, client farmers and Land Bank projects. This amount of money is quite small compared to the total number of farmers in LRAs, moreover some farmers in LRA don't know the existence of Land Reform Fund. As for the financial assistance in non-farming activity, the budget amount provided for poverty eradication fund at household level through CDD, 280,000 baht per village, is rather insufficient, while revolving fund for promotion of cottage industry and handicraft through Department of Industrial Promotion was recently implemented and the same activities under ALRO are limited.

Major agricultural credits are as follows:

1) Kor Po Lor Fund

In 1994, the government started the Kor Po Lor Fund, which is an agricultural structural adjustment program. The background to this Program is that as the negative impact of EU agricultural policy on cassava and rice might create a competitive market environment in the future and the competition would cause the price of major export crops to drop to the detriment of Thailand and farmers' incomes. This fund is, therefore, aimed at helping farmers gain a profit through low interest rate loans or subsidies. The program targets four crops: paddy on poor grade and inappropriate fields, cassava, coffee, and pepper in order to decrease planted area and to encourage cultivation of more profitable, stable crops in these fields. This program plans to provide a total of 65,824 million baht to 4.912 million rai of land for farmers from 1994 to 2010.

Basic guidelines related to our project are to promote agricultural structural adjustment by providing a long-term loan with a low interest rate of 5% for 15 years to farmers who apply for Kor Por Lor. In addition to this, there are two categories related to our project in the program. These are;

Investment Support (Improving the production system in paddy and cassava fields)

- i) providing permanent water resources for farming and raising animals
- ii) offering support and service with regard to technical matters

b) Marketing Support

- i) creating a market for selling fast growing trees, etc.
- ii) providing production plan for fruit trees and tree crops
- iii) the government purchases milk and provides imported cow through loan

In the Study Areas, some farmers received loans and subsidies for farm ponds, fertilizer or seeds from Kor Po Lor. This program seems to function well in rural areas and should be extended to more farmers who are unable to make a living from on-farm income alone.

2) ALRO Fund

ALRO also has an original fund to improve the agricultural situation in LRAs. It provided 59 deep wells, 1900 rai of forest trees, 0.9 million cubic meters of farm ponds, and various training programs for farmers in LRAs in 4 Changwats in 1996. These programs are free to farmers who applied for ALRO funds. However, compared with the number of possible future beneficiaries, these results are relatively low. Furthermore, in 1997, through agricultural institutional development, ALRO plans to provide credit for about 150 agricultural cooperatives and provide subsidies for agricultural cooperatives through marketing promotion activities. This will involve the purchase of 1,550 tons of rice and 200 tons of fertilizer as well as 100 tons of tangerines from all LRAs throughout the whole country.

Furthermore, under a credit support program, ALRO plans to provide credit of 160 million baht for production promotion for farmers at a 5% interest rate, and credit of 60 million baht for cooperative business development. The number of farmers who have received credit is only 25,000 since 1977 and the average amount of credit provided is only 13,000 baht per farmer. In expanding their agriculture in LRAs, the credit should be extended further.

3) The Bank for Agriculture and Agricultural Cooperatives

The Bank for Agriculture and Agricultural Cooperatives (BAAC) plays a key role in lending money to farmers. Total disbursement has reached 112,539 million baht as of fiscal year 1995, from which 4.65 million farms that is 82 % of all farm households borrow money. The Bank extended the operation more than double from 1991 on the lending scale.

The Bank lends money at a basic interest rate of 9 %*1 to individual clients and at a basic interest rate of 6%*2 to agricultural cooperatives and farmers associations.

Note *1 and *2 The interest rate is valid for loans not exceeding 30,000 baht

The basic types of loan are:

Table 2.10-6 Type of BAAC's Loans

| Type of loan | Repayment period | Details |
|--|------------------|---|
| Short-term loan | <12 months | For agricultural production such as land preparation, seeds, and fertilizer |
| Medium-term loan | <3 years | For investment in agricultural assets such as purchase of agri-machinery |
| Long-term loan for refinancing | <15 years | For refinancing farmers' old debts |
| Long-term loan for investment related to agriculture | <15 years | For investment in agri-fixed assets |
| Credit Cash Line | - | For short-term production loans |

(Source) BAAC Annual Report, 1995

Short-term loans and credit cash loans are the main ones. As well as the BAAC's original lending, the bank also functions as an intermediary for the Kor Por Lor and ALRO Fund.

In 4 Changwats, approximately 360,000 farmers have currently received loans amounting to a total of seven billion baht in the sphere of loans to both individual and agricultural cooperatives. One farm borrows 15,000 to 30,000 baht on average.

Table 2.10-7 Lending Operations in BAAC (fiscal year 1995) (million baht)

| | Individual farmers | | Agricultural cooperatives | | Farmers' Associations | | Total | |
|---------------|--------------------|--------------|---------------------------|--------------|-----------------------|--------------|-------------------|--------------|
| | Number of clients | Disbursement | Number of clients | Disbursement | Number of clients | Disbursement | Number of clients | Disbursement |
| Kohn Kean | 114,323 | 3,291.4 | 45,749 | 408.3 | 968 | - | 161,040 | 3,699.7 |
| Maha Sarakham | 77,148 | 1,658.2 | 27,692 | 277.6 | 419 | 5 | 105,259 | 1,940.8 |
| Mukdahan | 28,013 | 557.6 | 30,106 | 32.7 | - | - | 58,119 | 590.3 |
| Sakon Nakhon | 41,699 | 615.5 | 6,318 | 70.8 | - | - | 48,017 | 686.3 |

(Source) BAAC Annual Report, 1995

4) Informal Lender

Informal lending is also available and has a significant effect on lending to farmers in the region. Middlemen, relatives, pawnshop etc. are providing short-term loan to farmers at high interest rates of 50 to 60 %. Farmers usually use the loans to bridge the cash flow of their agricultural or lifestyle activities. As formal statistics are not published for this type of loan, it has been said that 30 % of all loans in Thailand are from informal lending unofficially.

2.11 Agricultural and Rural Infrastructure

2.11.1 Agencies Responsible and Work Procedure for Rural Infrastructure

1) Agencies Responsible

Many agencies are concerned with rural infrastructure development, such as for water resources, transport and communications, Electrification and sanitation. Table 2.11-1 shows the agencies concerned and their responsibilities.

Table 2.11-1 Rural Infrastructure Development and Agencies Concerned

| Agencies Concerned | Water Resources Development | | | | | | | | | | | Transport and Communications | | | | Health | | | | |
|------------------------------------|-----------------------------|--------------|-------------|------------------------|--------------------|-----------------|------------------------|-------------------------|-------------------------|-----------------------------------|-------------------|------------------------------|---------------|-------------|------------|-----------------------|------------|-----------------|----------------------|-----------|
| | Irrigation | | | | Rural water supply | Livestock water | Rural industrial water | Fisheries | | Flood Drainage/ Soil Conservation | | | Water quality | Road | | | Telephones | Electrification | Rural Health Centers | Hospitals |
| | Large Scale | Medium Scale | Small Scale | Hydro-power generation | | | | Large and medium swamps | Small swamps/ fishponds | Flood warning | Soil conservation | Farm drainage | | Rural Roads | Farm Roads | Forest Roads/ fencing | | | | |
| JMO | | | | | | | | | | | | | | | | | | | | |
| EGAT | | | | o | | | | | | o | | | o | | | | | | | |
| MOAC | | | | | | | | | | | | | | | | | | | | |
| RID | o | o | o | | | | | o | o | | | o | | | o | | | | | |
| DOF | | | | | | | | | | | | | | | | | | | | |
| DOL | | | | | | o | | | | | | | o | | | | | | | |
| RFD | | | | | | | | | | | | | | | | | | | | |
| DLI | | | o | | | | | | | o | | | | | | | | | o | |
| DOA | | | | | | | | | | | | | | | | | | | | |
| DOAE | | | | | | | | | | | | | | | | | | | | |
| CPD | | | | | | | | | | | | | | | | | | | | |
| ALRO | | | o | | o | | | | | | | o | o | o | | | | | | |
| MTC | | | | | | | | | | | | | | | | | | | | |
| MD | | | | | | | | | o | | | | | | | | | | | |
| Telephone Organization of Thailand | | | | | | | | | | | | | | | | | | o | | |
| MOI | | | | | | | | | | | | | | | | | | | | |
| DPW | | | | | o | | | | | | | o | o | | | | | | | |
| ARD | | | o | | o | | | | | | | o | o | | | | | | | |
| FEA | | | | | | | | | | | | | | | | | | o | | |
| MOSTE | | | | | | | | | | | | | | | | | | | | |
| DEDP | o | o | o | | | | | | | | | | | | | | | | | |
| MOE | | | | | | | | | | | | | | | | | | | | |
| MPII | | | | | | | | | | | | | | | | | | | | |
| DOH | | | | | o | | | | | | | | o | | | | | | o | |
| MH | | | | | | | | | | | | | | | | | | | | |
| DMR | | | | | o | | o | | | | | | o | | | | | | | |
| Local Administration | | | | | | | | | | | | | | | | | | | | |
| Changwat Office | | | | | o | | | | | | | | | | | | | | | |
| Amphoe Office | | | | | | | | | | | | | | | | | | | | |
| Tambon Office | | | o | | o | | | | | | | | o | | | | | | | |
| Village | | | r,o/m | | r,o/m | | | | | | | | r | | r | | | | | |
| Farmers | | | | | | | | | | | | | | | | | | | | |
| Individual Farmers | | | r,o/m | | | | | | | | | | | | | | | | | |
| Farmers' Organization | | | r,o/m | | | | | | | | | | | | | | | | | |
| Agricultural Cooperatives | | | r,o/m | | | | | | | | | | | | | | | | | |

(Note) r request, o/m responsible for operation and maintenance

2.11.2 Agricultural Infrastructure

1) General Condition of Agricultural Infrastructures

Agricultural infrastructures in the LRAs have been developed centralizing water resources development for irrigation and farm pond development at on-farm level. However, those developments are not yet enough to satisfy the needs of villagers.

On the other hand, farm roads have been developed by farmers themselves since many years. Due to rapid changes in farming from buffalo to tiller plowing and rapid expansion of heavy crops like cassava and sugarcane, traditional farm road system is not satisfactorily working for present farming. Farm road development has not been encouraged in the LRAs by the agency concerned, so that development of farm road is still at primitive level. Farm road density is about 1 to 5m per rai.

2) Irrigation Development

a) General Condition of Irrigation Development

Based on the information from the concerned agencies, 91 irrigation projects are existing in the study LRAs. However, out of 91 projects, only 46 projects are effective for the irrigation. Other 45 projects are evaluated not effective for the irrigation only for domestic consumption or limited irrigation in the surrounding area by a small private pump or a bucket. Such low effective projects are non-outlet type project such as dredging, weir or water tank type. Effective projects are the reservoir type facilitated with an outlet or the pump irrigation type in the perennial rivers. Such effective projects are well utilized by the farmers and irrigating 36,730 rai or 5,880 ha in the study LRAs that is only 2.7% of the total farmland.

Table 2.11-2 Irrigation Projects and Irrigation Area in the Study LRAs

| Province | Total Farm Land (rai) | Number of Irrigation Projects | | | | Total | RID | | DEDP | | ALRO | | Irrigation | |
|--------------|--------------------------|-------------------------------|-----------|-------------|----------------|-----------|-----------|---------------|----------|--------------|----------|----------|---------------|-------------|
| | | Effective | | | None effective | | Project | Area | Project | Area | Project | Area | Area | Ratio |
| | | MSIP | SSIP | (Sub) | | | | | | | | | | |
| Khon Kaen | 263,000 | 0 | 12 | (12) | 11 | 23 | 21 | 1,750 | 2 | 3,000 | 0 | 0 | 4,750 | 1.8% |
| Maharakham | 214,860 | 0 | 3 | (3) | 8 | 11 | 11 | 550 | 0 | 0 | 0 | 0 | 550 | 0.3% |
| Mukdahan | 470,390 | 1 | 21 | (22) | 2 | 24 | 24 | 14,530 | 0 | 0 | 0 | 0 | 14,530 | 3.1% |
| Sakon Nakhon | 409,360 | 4 | 5 | (9) | 24 | 33 | 32 | 16,900 | 0 | 0 | 1 | 0 | 16,900 | 4.1% |
| Total | 1,357,610 | 5 | 41 | (46) | 45 | 91 | 88 | 33,730 | 2 | 3,000 | 1 | 0 | 36,730 | 2.7% |

Out of total 91 irrigation projects, most projects have been conducted by RID, and 2 projects by DEDP. ALRO constructed only one project in Sakon Nakhon SKN 3-1. However, it is not so effective for irrigation due to dredging type project. There is no project by ARD in the study LRAs. Tambon Offices have also started their own irrigation projects recently and installed the weir type irrigation projects in the study LRAs. However no information is available from the Tambon Offices so that irrigation projects of Tambon Offices are not included in this study. The irrigation area of Tambon Office projects is considered still small. Effective 46 irrigation projects are composed of 5 MSIPs and 41 SSIPs

b) Irrigation Projects in Each LRA

Existing irrigation condition of each LRA is summarized in Figure 2.11-1 and Table 2.11-3. As shown in the figure, both irrigation area and ratio are very low except KK 1 in Khon Kaen and Mahasarakham. In Mukdahan and Sakon Nakhon, irrigation area and ratio are much different by the LRAs. Differences are mainly caused by the topographical conditions for construction of reservoirs. Detail list of the existing irrigation projects is reported in Table 6.1.1 of the Appendix-D.

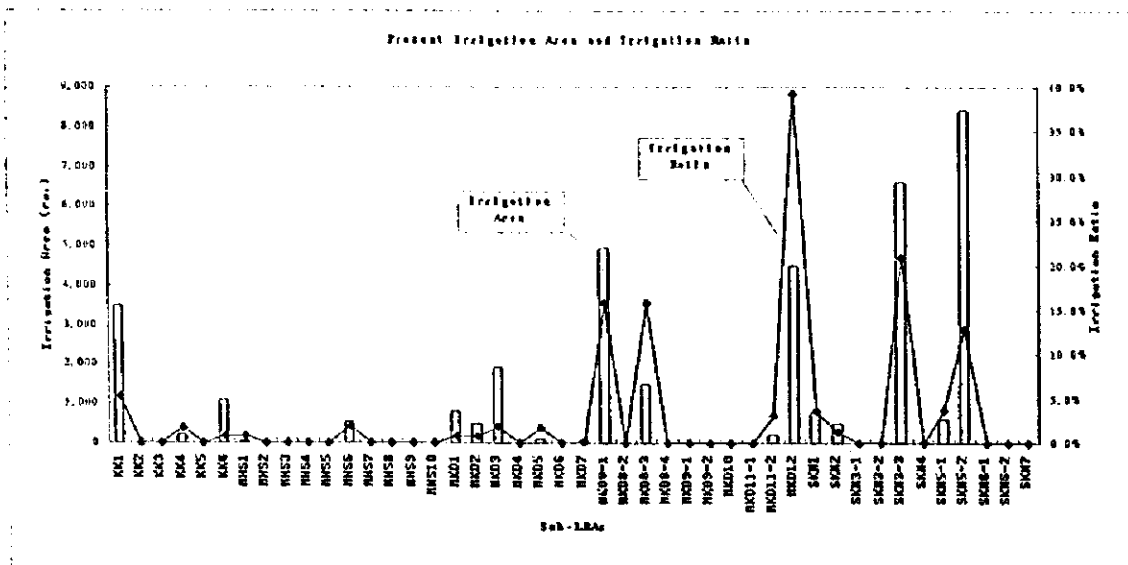


Figure 2.11-1 Irrigation Area and Ratio by Existing Projects in Each LRA

Table 2.11-3 Existing Irrigation Projects in Each LRAs

| LRAs | Farm Land (rai) | Numbers Projects | | | | | Irrigated Area | | | | | MSIP+SSIP | |
|---------|-----------------------|------------------|------------------|-------|-------|-------------------------|----------------|----------------|------------------------|----------------|-------------------------|--------------------------|-------------------------------------|
| | | Total | Well operated | MSIPs | SSIPs | Pump Irrig- ation | MSIPs (rai) | SSIPs (rai) | Pump irri- (rai) | Total (rai) | Irrigati on Ratio | Storage Cap. (MCM) | Catch ment (km ²) |
| KK1 | 65,560 | 12 | 7 | | 5 | 2 | | 480 | 3,000 | 3,480 | 5.3% | 0.318 | 6.4 |
| KK2 | 13,940 | | | | | | | | | 0 | 0.0% | 0 | 0 |
| KK3 | 17,910 | | | | | | | | | 0 | 0.0% | 0 | 0 |
| KK4 | 11,490 | 1 | 1 | | 1 | | | 200 | | 200 | 1.7% | 0.5 | 0.1 |
| KK5 | 6,180 | | | | | | | | | 0 | 0.0% | 0 | 0 |
| KK6 | 147,920 | 10 | 4 | | 4 | | | 1,070 | | 1,070 | 0.7% | 0.51 | 11.4 |
| MHS1 | 2,640 | 2 | 1 | | 1 | | | 20 | | 20 | 0.8% | 0.007 | 0.4 |
| MHS2 | 59,680 | | | | | | | | | 0 | 0.0% | 0 | 0 |
| MHS3 | 3,080 | | | | | | | | | 0 | 0.0% | 0 | 0 |
| MHS4 | 9,510 | | | | | | | | | 0 | 0.0% | 0 | 0 |
| MHS5 | 14,600 | 1 | 0 | | | | | | | 0 | 0.0% | 0 | 0 |
| MHS6 | 29,660 | 6 | 2 | | 2 | | | 530 | | 530 | 1.8% | 0.504 | 5.6 |
| MHS7 | 10,940 | | | | | | | | | 0 | 0.0% | 0 | 0 |
| MHS8 | 79,610 | 2 | 0 | | | | | | | 0 | 0.0% | 0 | 0 |
| MHS9 | 310 | | | | | | | | | 0 | 0.0% | 0 | 0 |
| MHS10 | 4,830 | | | | | | | | | 0 | 0.0% | 0 | 0 |
| MKD1 | 102,760 | 2 | 2 | | 2 | | | 800 | | 800 | 0.8% | 0.677 | 8.1 |
| MKD2 | 74,900 | 2 | 1 | | 1 | | | 500 | | 500 | 0.7% | 0.229 | 4 |
| MKD3 | 104,180 | 5 | 5 | | 5 | | | 1,900 | | 1,900 | 1.8% | 1.008 | 67.1 |
| MKD4 | 1,760 | | | | | | | | | 0 | 0.0% | 0 | 0 |
| MKD5 | 6,020 | 1 | 1 | | 1 | | | 100 | | 100 | 1.7% | 0.2 | 18 |
| MKD6 | 710 | | | | | | | | | 0 | 0.0% | 0 | 0 |
| MKD7 | 44,890 | 2 | 2 | | 2 | | | 80 | | 80 | 0.2% | 0.083 | 80 |
| MKD8-1 | 32,810 | 7 | 7 | | 7 | | | 4,950 | | 4,950 | 15.1% | 5.767 | 28 |
| MKD8-2 | 8,600 | | | | | | | | | 0 | 0.0% | 0 | 0 |
| MKD8-3 | 9,920 | 1 | 1 | 1 | | | 1,500 | | | 1,500 | 15.1% | 2.8 | 34 |
| MKD8-4 | 5,710 | | | | | | | | | 0 | 0.0% | 0 | 0 |
| MKD9-1 | 28,400 | | | | | | | | | 0 | 0.0% | 0 | 0 |
| MKD9-2 | 23,640 | 1 | 0 | | | | | | | 0 | 0.0% | 0 | 0 |
| MKD10 | 1,180 | | | | | | | | | 0 | 0.0% | 0 | 0 |
| MKD11-1 | 6,880 | | | | | | | | | 0 | 0.0% | 0 | 0 |
| MKD11-2 | 6,550 | 1 | 1 | | 1 | | | 200 | | 200 | 3.1% | 0.289 | 0.7 |
| MKD12 | 11,480 | 2 | 2 | | 2 | | | 4,500 | | 4,500 | 39.2% | 15 | 25 |
| SKN1 | 22,560 | 1 | 1 | | 1 | | | 800 | | 800 | 3.5% | 0.59 | 1.5 |
| SKN2 | 43,260 | 6 | 1 | | 1 | | | 500 | | 500 | 1.2% | 0.319 | 1.5 |
| SKN3-1 | 80,100 | 14 | 0 | | | | | | | 0 | 0.0% | 0 | 0 |
| SKN3-2 | 6,650 | | | | | | | | | 0 | 0.0% | 0 | 0 |
| SKN3-3 | 31,720 | 3 | 2 | 2 | | | 6,600 | | | 6,600 | 20.8% | 7.7 | 13.3 |
| SKN4 | 85,530 | 2 | 0 | | | | | | | 0 | 0.0% | 0 | 0 |
| SKN5-1 | 16,060 | 1 | 1 | | 1 | | | 600 | | 600 | 3.7% | 0.72 | 3.5 |
| SKN5-2 | 65,740 | 4 | 4 | 2 | 2 | | 7,500 | 900 | | 8,400 | 12.8% | 8.527 | 31.3 |
| SKN6-1 | 22,780 | | | | | | | | | 0 | 0.0% | 0 | 0 |
| SKN6-2 | 21,760 | | | | | | | | | 0 | 0.0% | 0 | 0 |
| SKN7 | 13,200 | 2 | 0 | | | | | | | 0 | 0.0% | 0 | 0 |
| KK | 263,000 | 23 | 12 | 0 | 10 | 2 | 0 | 1,750 | 3,000 | 4,750 | 1.8% | 1.3 | 17.9 |
| MHS | 214,860 | 11 | 3 | 0 | 3 | 0 | 0 | 550 | 0 | 550 | 0.3% | 0.5 | 6.0 |
| MKD | 470,390 | 24 | 22 | 1 | 21 | 0 | 1,500 | 13,030 | 0 | 14,530 | 3.1% | 26.1 | 264.9 |
| SKN | 409,360 | 33 | 9 | 4 | 5 | 0 | 14,100 | 2,800 | 0 | 16,900 | 4.1% | 17.9 | 51.1 |
| Total | 1,357,610 | 91 | 46 | 5 | 39 | 2 | 15,600 | 18,130 | 3,000 | 36,730 | 2.7% | 45.7 | 339.9 |

(Note) not including Huai Kra Choe which is under-construction.

c) Categories of the Irrigation Projects

Most of irrigation projects have been established by RID in the study area as mentioned above. According to the definition of the irrigation projects of RID, the irrigation projects are classified into three categories by size; namely Large-Scale Irrigation Project (LSIP), Medium-Scale Irrigation Project (MSIP), and Small-Scale Irrigation Project (SSIP), as shown in Table 2.11-4. Out of three scales of project, any LSIPs are not concerning for irrigation of the land in the study LRAs.

Table 2.11-4 Definition of the Irrigation Projects by RID

| | Large-Scale Irrigation Project (LSIP) | Medium-Scale Irrigation Project (MSIP) | Small-Scale Irrigation Project (SSIP) |
|---------------------|---------------------------------------|--|---------------------------------------|
| Construction Cost | > 200 Mil. Bt | 4 - 200 Mil. Bt | < 4 Mil. Bt |
| Storage Capacity | > 100 MCM | 10 - 100 MCM | . |
| Reservoir Surface | > 15 km ² | . | . |
| Irrigation Area | > 80,000rai | . | . |
| Construction Period | > 5 years | 1 - 5 years | < 1 year |

d) Medium-Scale Irrigation Projects (MSIPs)

As shown in Table 2.11-5, 5 MSIPs are existing in the study LRAs and irrigating an area of 15,600 rai or 1.1% of the total LRAs. Irrigation area of the MSIPs will increase to 22,600 rai or 1.6% when the Huai Kra Choe dam is completed, which is under construction in Sakon Nakhon SKN 3-1. There is no MSIP in the LRAs in Khon Kaen and Mahasarakham. Out of 6 reservoirs, one is in Mukudahan and other 5 in Sakon Nakhon. Total storage capacity will be 29.3 MCM including the Huai Kra Choe reservoir.

Table 2.11-5 MSIPs in the Study LRAs

| Name of Reservoirs | Existing Medium Scale Irrigation Projects | | | | | | Under-construction | Total |
|--------------------|---|--------------------|----------------------|----------------------|----------------------|--------------------|----------------------|-----------------------|
| | Huai Rai | Phu Phok | Huai Wang Tham | Huai Kee Hin | Huai Kae | Total of Existing | Huai Kra Choe | |
| Related Sub-LRA | MKD 8-3 | SKN 3-3 | SKN 3-3 | SKN 5-2 | SKN 5-2 | 5 reservoirs | SKN 3-1 | 6 reservoirs |
| Operated by | RID | RID | RID | RID | RID | | RID | |
| Completed Year | 1982 | ? | 1981 | 1985 | 1980 | | under construction | |
| Purposes | Irrigation 1,500 rai | Irrigation 600 rai | Irrigation 6,000 rai | Irrigation 3,900 rai | Irrigation 3,600 rai | 15,600 rai | Irrigation 7,000 rai | 22,600 rai |
| Location | A. Dong | A. Phanna | A. Phanna | K.A. Phu | K.A. Phu | | A. Muang | |
| Amphoe | Luang | Nikhom | Nikhom | Phan | Phan | | | |
| Map No. | 5842-1 | 5743-II | 5743-I | 5742-I | 5742-I | | 5743-III | |
| Coordination | 430-575 | 885-037 | 793-082 | 867-625 | 885-600 | | 649-885 | |
| River | | | | | | | Huai Kra Choe | |
| Catchment Area | 34 km ² | 6 km ² | 7.3 km ² | 18 km ² | 11.7 km ² | 77 km ² | 44.5 km ² | 121.5 km ² |
| Water Level | | | | | | | 225.8 m | |
| Storage Capacity | 2.8 MCM | 2.7 MCM | 5 MCM | 4 MCM | 3.8 MCM | 18.3 MCM | 11 MCM | 29.3 MCM |

(Data Source) Database based on the information from the Provincial Offices of RID.

(Note) ?: not informed. Catchment area was measured on 1:50,000 map except Huai Kra Choe.

As shown in Table 2.11-5, storage capacity of the reservoirs ranges from 2.7 MCM to 11 MCM.

e) **Small-Scale Irrigation Projects (SSIPs)**

As shown in Table 2.11-3, 39 SSIPs are existing in the study LRAs and irrigating a land of 18,130 rai or 1.3% of the total farm land.

The basic concept of SSIPs is that they are based on the request of farmers, and transferred to farmers after completion of the project. Therefore, the existence of water users' associations or farmers' groups is essential for success of the projects. Main facilities like reservoirs and weirs are constructed by the agencies. However, canal systems to the lands are to be constructed by farmers themselves. No payment is demanded from the farmers for construction of main facilities. Water management and operation of facilities are to be conducted by farmers themselves after transfer. However, some of heavy repairs are conducted by the responsible agencies.

SSIPs are proceeded by several concerned agencies in the less developed areas, and operated by farmers. Small reservoir projects are generally constructed for multipurpose including irrigation, livestock water, fisheries, and domestic water. Following attentions are to given in the planning of SSIPs, as mentioned in the Study of "The Integrated Agriculture and Water Resources Development Project of Huai Mong, Nam Suai and Huai Luang River Basins", which was conducted by JICA in 1996.

- i) To increase soundness of project planning.
- ii) Promotion of farmers' participation at all stages of project implementation.
- iii) Major factors impeding canal construction are difficulty in getting right-of-way, absence of proper cooperation among the benefiting farmers and lack of budget. Among those factors, the proper cooperation is of most importance. Therefore, technical staffs, who are well acquainted with the local conditions and can provide technical advice in the course of the project implementation for the benefiting farmers, should be assigned in the Provincial Office.

f) **Pump Irrigation Project**

DEDP is proceeding the pump irrigation projects utilizing the electric pumps. RID is also conducting the pump projects but mainly for drainage purposes for the wet lands. There are no RID pump projects in the study LRAs. There are two pump irrigation projects only in KK 1 of Khon Kaen in the study LRAs. The projects are operated taking water from the Chi River and irrigating a land of 3,000 rai.

As the concept of pump irrigation project, the project is limited within 1 km distance from the stream and within 20 m high from the river. Therefore, the pump irrigation project is limited only along the perennial rivers. (Detail concepts of the pump irrigation project are described in Table 4.1-2, Appendix D.)

Water users' association is obliged for this project, and 50% of electric fee have to be paid by the association as water fee (0.60B/kwh). The association has to adjust the start of

cultivation among farmers in order to rationalize the water usage. The project aims to realize the cultivation through out the year, and farmers are to agree to comply with it. However, dry season cultivation is recently on the decline due to increase of migrant work to outside.

g) Other Irrigation Projects

ARD is also proceeding the irrigation projects mainly excavating a larger pond in swampy lands based on the request of farmers. This pond is also utilized for domestic purposes as well as irrigation. Irrigation is conducted by a hose utilizing a small engine driven pump or a bucket from a pond. However, the irrigation development by ARD is not reported in the study LRAs.

On the other hand, Tambon Offices have also started their own irrigation projects recently and installed the weir type irrigation projects in the study LRAs. However no information is available from the Tambon Offices so that irrigation projects of Tambon Offices are not included in this study. The irrigation area of Tambon Office projects is considered still small.

3) Farm Pond

It is estimated that there exist about 1,490 new type farm ponds under the restructuring agricultural production program for the integrated farming in the study LRAs based on RID information. Provision ratio of this type pond is considered to be only at 1.9% at present. Among four provinces, provision ratio may be highest in Khon Kaen as 3.1%, and lowest in Maha Sarakham and Sakon Nakhon as 1.3%. If one farm pond was provided to each farmer, about 77,000 ponds will be necessary additionally.

Table 2.11-6 New Type Farm Ponds for Integrated Farming

| LRAs | House Holds | Existing Farm Pond | | Required Future Provision | LRAs | House holds | Existing Farm Pond | | Required Future Provision |
|--------|-------------|--------------------|-----------------|---------------------------|--------|-------------|--------------------|-----------------|---------------------------|
| | | Number | Diffusion Ratio | | | | Number | Diffusion Ratio | |
| KK-1 | 3,382 | 118 | 3.5% | 3,264 | MKD-5 | 357 | 9 | 2.7% | 348 |
| KK-2 | 875 | 9 | 1.0% | 866 | MKD-6 | 41 | 1 | 2.7% | 40 |
| KK-3 | 800 | 48 | 6.0% | 752 | MKD-7 | 2,786 | 62 | 2.2% | 2,724 |
| KK-4 | 724 | 6 | 0.8% | 718 | MKD-8 | 3,453 | 22 | 0.7% | 3,431 |
| KK-5 | 335 | 6 | 1.8% | 329 | MKD-9 | 3,095 | 69 | 2.2% | 3,026 |
| KK-6 | 6,167 | 194 | 3.1% | 5,973 | MKD-10 | 70 | 0 | 0.6% | 70 |
| MHS-1 | 436 | 3 | 0.7% | 433 | MKD-11 | 796 | 5 | 0.6% | 791 |
| MHS-2 | 2,877 | 31 | 1.1% | 2,846 | MKD-12 | 680 | 4 | 0.6% | 676 |
| MHS-3 | 363 | 3 | 0.8% | 360 | SKN-1 | 1,055 | 5 | 0.5% | 1,050 |
| MHS-4 | 559 | 9 | 1.6% | 550 | SKN-2 | 1,689 | 66 | 3.9% | 1,623 |
| MHS-5 | 1,641 | 9 | 0.5% | 1,632 | SKN-3 | 10,840 | 73 | 0.7% | 10,767 |
| MHS-6 | 1,158 | 30 | 2.6% | 1,128 | SKN-4 | 4,354 | 56 | 1.3% | 4,298 |
| MHS-7 | 772 | 6 | 0.8% | 766 | SKN-5 | 5,595 | 76 | 1.4% | 5,519 |
| MHS-8 | 4,007 | 69 | 1.7% | 3,938 | SKN-6 | 2,026 | 41 | 2.0% | 1,985 |
| MHS-9 | 16 | 0 | 0.0% | 16 | SKN-7 | 423 | 15 | 3.5% | 408 |
| MHS-10 | 535 | 5 | 0.9% | 530 | KK | 12,283 | 381 | 3.1% | 11,902 |
| MKD-1 | 6,136 | 132 | 2.2% | 6,004 | MHS | 12,364 | 165 | 1.3% | 12,199 |
| MKD-2 | 4,493 | 120 | 2.7% | 4,373 | MKD | 28,424 | 612 | 2.2% | 27,812 |
| MKD-3 | 6,407 | 184 | 2.9% | 6,223 | SKN | 25,982 | 332 | 1.3% | 25,650 |
| MKD-4 | 110 | 3 | 2.8% | 107 | Total | 79,053 | 1,490 | 1.9% | 77,563 |

(Note) Number of farm ponds has been estimated based on the area proportion of LRA in each Amphoe in that number of farm ponds are reported by RID.

2.11.3 Rural Infrastructure

1) Rural Road Development

Rural road development is advanced by DOH, ARD and ALRO mainly for the improvement of the existing traditional cart roads by asphalt or laterite pavement or widening for the convenience of traffic. Responsibility of each agency is summarized as below:

DOH: to provide the national highways and the provincial highways to link provincial capitals and district capital towns respectively.

ARD: to provide the village link roads to link the villages and to the provincial highway.

ALRO: to provide the village link roads and the farm roads in the LRAs.

New road provision is not so important because traditional road networks are already linking the villages and the routes to the main road system.

Table 2.11-7 Definition of Roads

| Class of Roads | | Responsible Agency | Definition |
|------------------|--------------------|--------------------|--|
| National Highway | National Highway | DOH | (1) Road linking provincial (Changwat) capitals up to three-digit numbered roads. (2) Width : more than 8 m. (3) Asphalt pavement. |
| Rural Road | Provincial Highway | DOH | (1) Roads linking district (Amphoe) capitals with four-digit numbered. (2) Width : 8 m. (3) Asphalt pavement. |
| | Village Link Road | ARD | (1) Road between villages and linked with Provincial Highways. (2) Width: 6 m. (3) Asphalt pavement. |
| Farm Road | Main Farm Road | ALRO | (1) same as above, but only for village relating to LRAs. (2) Width: 6 m. (3) Laterite pavement in general. |
| | | ALRO | (1) Farm road linking a village and farm land area. (2) Width: 4 m. (3) Laterite pavement in general. |
| | On-farm Road | ALRO | (1) Farm road in the farm land area. (2) Width: 2 m (passable with a tiller attached with a cart.) (3) Laterite pavement in general. |

According to the information, improvement of about 300 km has so far been conducted by DPW and ALRO in the study LRAs. However, it is difficult to grasp actual present improvement of rural roads, because of no information from ARD, which is a main agency for this work. Improvement of the rural roads is not yet reaching the satisfactory level. From the field observation, some 2 km improvement will be necessary for each village in average in the areas.

Table 2.11-8 Rural Road Improvement in the Study LRAs

| Province | DPW | | ALRO | | ARD | | Total | |
|--------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|
| | Number of roads | Length (km) | Number of roads | Length (km) | Number of roads | Length (km) | Number of roads | Length (km) |
| Khon Kaen | 5 | 4.400 | 12 | 70.250 | - | - | 17 | 74.650 |
| Maharakham | 0 | 0.000 | 5 | 18.100 | - | - | 5 | 18.100 |
| Mukudahan | 11 | 58.942 | 7 | 19.246 | - | - | 18 | 78.188 |
| Sakon Nakhon | 35 | 94.095 | 6 | 34.834 | - | - | 41 | 128.929 |
| Grand Total | 51 | 157.437 | 30 | 142.430 | - | - | 81 | 299.867 |

(Data Source) Provincial Offices of DPW, ALRO, and ARD.

(Note) Improvement length in each LRA is presented in Appendix-D.

2) Electrification and Communications

Rural electrification is implemented by PEA. The 8th National Plan (1997-2001) plans to electrify whole households in the country within the period of this plan. In the study LRAs, some LRAs such as KK 5, SKN 4 and MKD 12 are reported as not being satisfactorily electrified by the Kor Chor Chor 2 Khor 2537 as shown in Section 2.15.1. However, through the field check of such villages, it was found that they were already electrified by the recent activity of electrification. Electrification in the study LRAs, therefore, has been provisionally completed.

The rural telephone network is now rapidly expanded after electrification. The future subject on electrification in the area is to stabilize the supply of electricity strengthening the power network against storms and lightning. A public telephone system is rapidly expanding in the LRAs, so that a considerable number of villages in LRAs will soon be connected to a public telephone system.

3) Rural Water Supply

a) Present Condition of the Rural Water Supply

The rural water supply works, especially village water supply works, are now rapidly carried out in the study LRAs. The diffusion ratio of the village water supply works in the study LRAs has reached 79% that is higher than the target of 8th National Development Plan of 70%. The diffusion ratio in Khon Kaen and Mukudahan is already extremely high over 90%, while it is little less than 70% in Maharakham and Sakon Nakhon.

Table 2.11-9 Diffusion Ratio of the Village Water Supply Works in the Study LRAs

| Province | Total Number of Villages | Villages not diffused | Diffusion Ratio |
|--------------|--------------------------|-----------------------|-----------------|
| Khon Kaen | 123 | 5 | 96% |
| Maharakham | 163 | 58 | 64% |
| Mukudahan | 108 | 6 | 94% |
| Sakon Nakhon | 92 | 33 | 64% |
| Total | 486 | 102 | 79% |

(Note) Detail diffusion ratio of each LRA is presented in Table 3-2, Appendix D.

However, village water supply works are mostly utilized only for domestic purposes due to unfavorable water quality especially on taste. Villagers prefer to drink rainwater stocked in a rainjar than supply water of waterworks so that rainwater will be remained and utilized for

drinking purpose even after equipped with a village water supply system. Serious hygienic problems are not reported on rainwater in the interview conducted in the study LRAs.

Main water source of the village water supply works is groundwater or pond water. Water is treated and pumped up to the elevated tank for distribution to each household through the distribution pipes. According to the sample survey in 44 villages, subscription ratio of village water supply works was about 70% in average. Some households, such as far from village or having own shallow well, have not membership of the water works in some cases.

b) Definition of the Rural Water Supply Works

Rural water supply works are largely classified into two water supply works, namely the rural city water supply works and the village water supply works as shown in Table 2.11-10. The former water works are implemented for the amphoe cities by PWA. On the other hand, the latter water works are for the villages by many agencies such as DOH, PWD, ARD, DOLA. ALRO also implements the latter water works in the LRAs.

Table 2.11-10 Definition of the Rural Water Supply Works

| Class of Rural Water Supply Works | | Responsible Agency | Definition |
|-----------------------------------|--|--|---|
| Rural City Water Supply Works | Tap Water Supply System | PWA | (1)Waterworks supplying water to the Amphoe city. (2)Water quality: following the DOH Drinking Water Standard. (3)piped to the individual households. (4)Operated by PWA |
| Village Water Supply Works | Tap Water Supply System | DOH PWD ARD DMR DOLA Changwat Office Tambon Office ALRO (*) | (1)Waterworks supplying water in the villages. (2)Water quality: following the DOH Drinking Water Standard. (3)piped to the individual households. (4)Operated by a village association. (5)Water source: groundwater, pond water (6)Facilities: pump, treatment facility, elevated tank, distribution pipes (7)Water charge: B 3 to 4/m ³ (8)Operating energy: electricity |
| | Domestic Water Supply System (Note): not encouraged recently. | ARD Tambon Office ALRO (*) | (1)Public wells or hydrants supplying water to villagers for other than drinking purposes. (2)Water quality: not concerned. (3)supplied by deep wells or hydrants. (4)Operated by a village association. (5)Water source: groundwater, spring (6)Facilities: deep well and hand pump, or pipe and hydrant (7)Water charge: free (8)Operating energy: manual or gravity |

(Note) (*): limited only for the villages in the LRAs.

4) Hospitals and Health Centers

According to the Kor Chor Chor 2 Khor 2537, evaluation of public health services is low in the study LRAs except Mukudahan. On the other hand, provision of health centers can

be evaluated to be insufficient in Khon Kaen and Mahasarakham from the results of investigation based on the data from DOI. According to the interview survey, public health services is not satisfied by villagers also in Sakon Nakhon mainly due to insufficiency of staffs and medicines.

Present conditions of health affairs were surveyed by the interview in 44 villages in the study LRAs. From this survey, it is found that medical care services like periodical health care or preventive hygiene activities are carried out positively. On the other hand, following problems were reported in the interview:

- i) Number of doctors is not enough in the health centers.
- ii) Medicine is not enough in the health centers.
- iii) Health centers are unable to keep good health services due to rapid increase of population .
- iv) Villagers generally do not keep medicine in their homes.
- v) Access from health centers to main hospitals is poor due to poor telecommunication systems in the villages.

5) Rural Sewage

All households have their own individual sewage system, and generally dipped by the public or private services when a septic tank becomes full. There is no custom of using human sewage as manure for agricultural purposes. Raw sewage is disposed and spread in the forests, which locates in enough distance from villages and rivers. Therefore, this service is evaluated as reasonable and good for environment of forest, if disposal does not exceed natural resolution. Septic tank is generally constructed with the RC-pipe as shown in Figure 2.11-5. Standard size of a septic tank is 1.5 to 2.0 m depth and 0.60 m diameter.

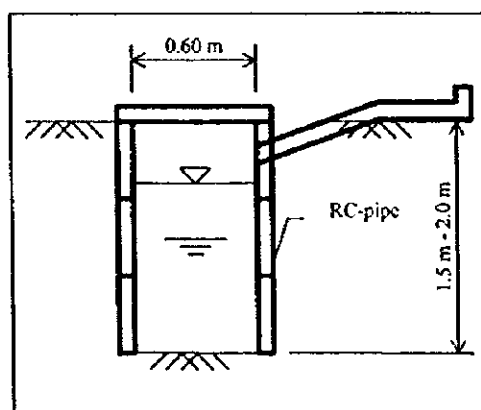


Figure 2.11-2 Standard Structure of Septic Tank

2.11.4 Work Procedure in ALRO for the Infrastructure Development

Works for the development of infrastructure are proceeded in ALRO as shown in Figure 2.11-3.

1) Works and Selection

As shown in Figure 2.11-3, infrastructure development by ALRO basically based on the requests from the farmers in the LRAs. Other than requests from the farmers, Maintenance and repairing of the existing infrastructures and continuing work from past years are to be carried out. Beside above works, groundwater development, special program under the agricultural lands reform policy, and the requests from House of Representatives are also considered.

Those works are evaluated and analyzed by the Engineering Division for selecting the priority projects, which can be carried out within the annual budget. Through this procedure, annual operation plan is prepared for appraisal of the Budget Bureau through the Finance Division. After approval, survey and detail design are carried out by the Engineering Division. It takes generally three years for the newly requested project to complete it after request as shown in Figure 2.11-3.

2) Implementation of the Construction

Based on the survey and detail design, cost for implementation is estimated by the Engineering Division and informed to the Budget Bureau for approval of payment. Beside the cost estimation, specification of the work is also prepared for proper implementation of the infrastructure.

Construction of the infrastructure is implemented by two different ways. One is force account basis and the other is contract basis. In case of contract basis, bidding is held for selecting a contractor for implementation. Much more works are recently carried out by the contract basis to reduce the over-burden in ALRO and to economize the implementation works. Through the implementation and at the completion of the work, progress reports and completion report are prepared.

3) Problems in the Work of Infrastructure Development in ALRO

Although procedure of the works is well organized as mentioned above, there are several problems as below:

- a) Most works for the infrastructure development are based on the request basis, so that the plan of ALRO is likely in short term.
- b) Therefore, there is no adequate information such as database regarding to the existing conditions of the concerned villages for establishing a long term plan.
- c) There is no enough information concerning to the future plan from other agencies, so that well organized development among agencies is rather difficult.
- d) More engineering staffs will be necessary to proceed the infrastructure development, of which necessity will more increase in compliance with the progress of declaration of land.

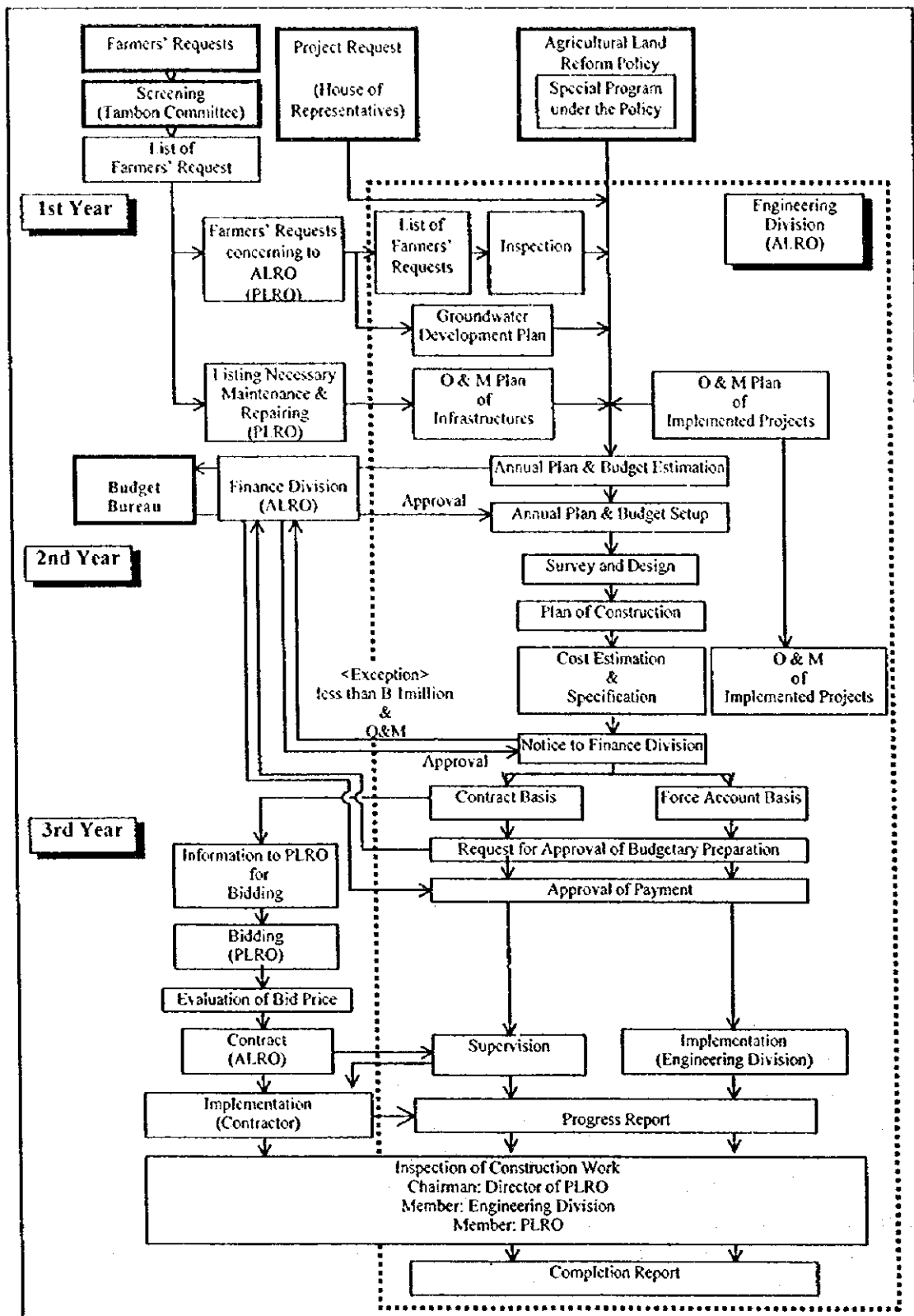


Figure 2.11-3 Engineering Procedure for Infrastructure Implementation in ALRO

2.12 Rural Organization

The Rural Sector is important for all society because if it is not strong and self-reliant in the long term, it will lead to an unsustainable society. Moreover, rural people are the center of rural development since people are the final deciding factor indicating the success of development programs. For eradication of poverty and to distribute development results in rural areas, a rural development program has been designed based on rural organization as the nucleus of program implementation.

In general, rural organization in LRAs may be divided into two major groups namely, government organization and people's organization. Details of each group follow:

2.12.1 Government Organization

In rural areas, provinces, and districts are the centers of government administration and public services, but these offices are still too great a distance away for the people to have any real understanding. Tambons and villages are not by nature merely official government units, they also serve as primary social institutions of the rural community. Hence, Tambons and villages are obviously closer to rural people and they are the first official administrative units that villagers come into contact with for advice and help in time of difficulty. Government organization in Tambon level and village level is as follows:

1) Village Committees

A Village Committee is the lowest level in a rural area. The committee is composed of members by position and members by election. Major functions of the Village Committee are an assistant to the Phu Yai Ban in development and administration of the village and administrative role at the village level for rural development programs.

2) Tambon Councils

A Tambon Council is composed of committees by position and committees by election. The major functions of a Tambon Council are administrative at Tambon level, approve Tambon development plans, solve problems and difficulties encountered in Tambon projects, and implementation of rural development programs. However, Tambon Councils also carry out works assigned by the Governor.

3) Tambon Administration Organization

According to the Tambon Council and Tambon Administration Act, 1994, an existing Tambon Council can be upgraded to a Tambon Administration Organization, if the average of annual revenue over the past three years is more than 150,000 baht. The major functions are all kinds of development in the Tambon concerning economic, social and cultural matters, and it can implement rural infrastructure development programs at Tambon level. In addition to the above mentioned functions, a Tambon Administration Organization is also responsible for other

activities according to official assignment.

The organizational structure of Tambon Council and Tambon Administration Organization is shown in Figure 2.12-1.

2.12.2 People's Organization

Many people's organizations are involved in agriculture development and socio-economic development in rural areas. The major people's organization in LRAs may be summarized as follows:

1) Cooperative Systems

A cooperative is the ultimate goal of farmers' institutions. It means a group of people who cooperate with each other without any profit. At present, there are 6 major kinds of cooperatives namely, Agricultural Cooperatives, Land Settlement Cooperatives, Fishery Cooperatives, Consumers' Cooperatives, Thrift and Credit Cooperatives, and Service Cooperatives. Among these cooperatives, Agricultural Cooperatives are district level cooperatives and they are the largest kind.

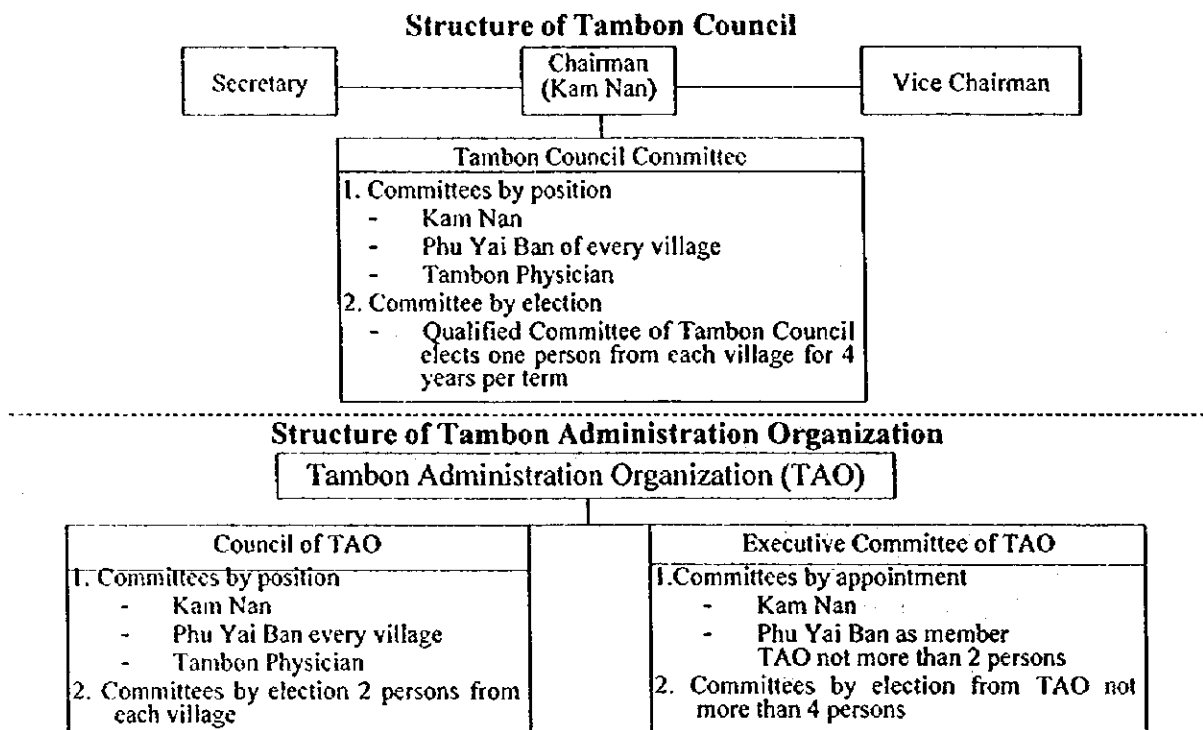


Figure 2.12-1 Organizational Structure of Tambon Council and Tambon Administration Organization

2) Land Reform Agricultural Cooperatives

According to the Agricultural Land Reform Act, Land Reform Agricultural Cooperatives are promoted by ALRO under cooperation and coordination with the Cooperative Promotion Department (CPD). In 1995 there were 106 Land Reform Agricultural Cooperative units altogether, with a total member of 46,065 consisting of 24 units in the North, 40 units in the Central plain, 2 units in the South and 40 units in the Northeast. In the Study Area, there is one Land Reform Agricultural Cooperative in Khon Kaen and one unit Mahasarakham. According to a 1995 ALRO report, eighty seven Land Reform Agricultural Cooperatives gained benefit of 16.76 million baht in total and 59% of the Cooperative member who borrowed money from the Cooperatives repaid within the time of payment.

3) Farmers' Groups

In order to improve the agricultural productivity of farmers and develop their leadership performance, farmers' groups such as groups for rice cultivation, upland crop cultivation, horticulture, livestock breeding, fishery, etc. are promoted by the DOAE. As of 1995, there were 4,013 farmers' groups with a total membership 502,619 out of which 14.8% of this total is active operation performance, 49.6% of the total is moderate level and 35.6% of the total is inactive performance.

In addition, DOAE is also promoting Farmers' Housewives Groups in order to disseminate knowledge on agriculture, handicraft making from agricultural by-products, and to promote agro-processing and cottage industries. Starting in 1953, DOAE also initiated Young Farmers' Groups composed of youths from farming families in rural areas.

4) Water Users' Organization

Water Users' Organizations, mainly organized by RID and CPD, were established to create better understanding among water users and between water users and water operation authorities regarding operation and maintenance of irrigation systems. Water Users' Organizations can be classified into 3 kinds namely, Water Users' Groups, Water Users' Associations and Water Users' Cooperatives. Water Users' Associations and Water Users' Cooperatives are legitimate Water Users' Organizations supported by RID and CPD respectively.

5) Productive Thrift Groups

A Productive Thrift Group is promoted by CPD in order to solve the problem of shortage of funds for their occupational activities. As of 1994, it was reported to have 10,030 groups with a total membership of 775,826. Among these, active operation performance amounted to 7.98% of the total, 10.20% of the total is moderate performance and 81.82% of the total is inactive performance.

In general, there is very few successful peoples' organization. The reasons are the same as that in implementing agricultural extension services listed in Chapter 2.8.5 and are as follows:

- a) Many of farmers no longer consider agriculture as their sole income source any more. They usually go and work in big town to supplement their income during the dry season.
- b) Many of farmer have a little self-reliance.
- c) Lack of leaders inLRAs

Table 2.12-1 shows the member and membership of cooperatives, farmers' groups, farmers' housewives and young farmers' groups by Amphoe related to the Study Area.

Table 2.12-1 Number and Membership of Cooperatives, Farmer's Groups, Farmer's House Wives, and Young Farmer's Groups by Amphoe related to the Study Area (1/2)

| Province | Agricultural Cooperative | | Fisheries Cooperatives | | Land Settlement Cooperatives | | Thrift and Credit Cooperatives | | Consumer Cooperatives | | Service Cooperatives | | Farmer's Group | | Farmer's House Wives Group | | Young Farmer's Group | |
|--------------------|--------------------------|---------|------------------------|--------|------------------------------|--------|--------------------------------|--------|-----------------------|--------|----------------------|--------|----------------|--------|----------------------------|--------|----------------------|--------|
| | Number | Member | Number | Member | Number | Member | Number | Member | Number | Member | Number | Member | Number | Member | Number | Member | Number | Member |
| Khon Kaen | 14 | 110,533 | 1 | 17 | - | - | 17 | 31,159 | 4 | 16,303 | 2 | 252 | 6 | 3,621 | 9 | 319 | 7 | 167 |
| Muang Khon Kaen | 5 | 6,586 | - | - | - | - | 1 | 494 | 1 | 1,655 | 4 | 269 | 3 | 527 | 22 | 776 | 4 | 128 |
| Ban Phai | 1 | 4,181 | - | - | - | - | 1 | 95 | 1 | 99 | - | - | na | na | 22 | 771 | 8 | 174 |
| Phon | 3 | 7,033 | - | - | - | - | 4 | 1,368 | 1 | 481 | - | - | na | na | 28 | 751 | 16 | 323 |
| Nam Pong | 2 | 2,418 | - | - | - | - | 2 | 388 | - | - | - | - | na | na | 8 | 272 | 15 | 60 |
| Manchakiri | 1 | 1,247 | - | - | - | - | - | - | - | - | - | - | 3 | 1,103 | 15 | 612 | 7 | 173 |
| Nong Song Hong | 2 | 2,592 | - | - | - | - | - | - | - | - | - | - | 5 | 444 | 21 | 712 | 15 | 72 |
| Chonnabot | 4 | 2,595 | - | - | - | - | - | - | - | - | - | - | 1 | 188 | 16 | 414 | 10 | 201 |
| Wang Noi | 2 | 867 | - | - | - | - | - | - | - | - | - | 1 | 96 | 13 | 428 | 3 | 60 | |
| Wang Yai | 1 | 1,214 | - | - | - | - | 1 | 29.5 | - | - | - | - | na | na | 9 | 517 | 3 | 74 |
| Ban Fang | 1 | 914 | - | - | - | - | - | - | - | - | - | - | na | na | 12 | 377 | 3 | 66 |
| Puai Noi | 2 | 417 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| King A. Phochai | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Mahasarakham | 12 | 67,931 | - | - | - | - | 4 | 13,341 | 2 | 1,960 | 1 | 152 | 7 | 717 | 34 | 1,265 | 14 | 326 |
| Muang Mahasarakham | 2 | 5,180 | - | - | - | - | - | - | - | - | - | - | 3 | 572 | 20 | 626 | 9 | 140 |
| Chiang Yun | 9 | 3,557 | 1 | 60 | - | - | - | - | - | - | - | - | 6 | 503 | 19 | 1,050 | 11 | 578 |
| Kosum Phisai | 1 | 7,566 | - | - | - | - | - | - | 1 | 667 | - | - | 8 | 882 | 13 | 864 | 7 | 181 |
| Borabu | 6 | 1,910 | - | - | - | - | 3 | 178 | 1 | 356 | - | - | 7 | 721 | 19 | 730 | 11 | 294 |
| Wapi Pathum | 3 | 4,650 | - | - | - | - | - | - | - | - | - | - | 1 | 83 | 30 | 1,134 | 17 | 379 |
| Na chuak | 4 | 873 | - | - | - | - | - | - | - | - | - | - | 2 | 610 | 34 | 1,439 | 7 | 144 |
| Na Dun | na | na | na | na | na | na | na | na | na | na | na | na | 3 | 499 | na | na | na | na |
| King A. Kut Rung | na | na | na | na | na | na | na | na | na | na | na | na | na | na | na | na | na | na |

Table 2.12-1 Number and Membership of Cooperatives, Farmer's Groups, Farmer's House Wives, and Young Farmer's Groups by Amphoe related to the Study Area (2/2)

| Province | Agricultural Cooperative | | Fisheries Cooperatives | Land Settlement Cooperatives | | Thrift and Credit Cooperatives | Consumer Cooperatives | | Service Cooperatives | Farmer's Group | | Farmer's House Wives Group | | Young Farmer's Group | | |
|--------------------|--------------------------|--------|------------------------|------------------------------|--------|--------------------------------|-----------------------|--------|----------------------|----------------|--------|----------------------------|--------|----------------------|--------|--------|
| | Number | Member | | Number | Member | | Number | Member | | Number | Member | Number | Member | Number | Member | Number |
| Sakon Nakhon | 6 | 66,103 | - | - | 9 | 13,791 | 4 | 2,910 | 1 | 76 | 4 | 443 | 26 | 712 | 12 | 353 |
| Muang Sakon Nakhon | 3 | 1,579 | - | - | 1 | 50 | - | - | - | - | 2 | 138 | 12 | 284 | 10 | 177 |
| Kut Bak | 1 | 730 | - | - | - | - | - | - | - | - | 1 | 108 | 1 | 197 | 5 | 93 |
| Nikhom Nam Oon | 7 | 2,553 | - | - | - | - | - | - | - | - | 1 | 55 | 27 | 774 | 18 | 583 |
| Phanna Nikhom | 2 | 5,083 | - | - | - | - | 1 | 1,124 | 1 | 163 | 6 | 496 | 45 | 1,249 | 17 | 306 |
| Sawang Daen Din | 1 | 559 | - | - | - | - | - | - | - | - | 1 | 78 | 4 | 188 | 3 | 71 |
| Charoon Silp | 3 | 2,368 | - | - | - | - | - | - | - | - | 5 | 514 | 15 | 465 | 12 | 190 |
| Waritch Phum | 1 | 719 | - | - | - | - | - | - | - | - | na | na | 18 | 478 | 11 | 324 |
| Kham Takla | 1 | 1,411 | - | - | 1 | 265 | - | - | - | - | na | na | 24 | 686 | 15 | 360 |
| Ban Muang | 1 | 73 | - | - | - | - | - | - | - | - | 1 | 63 | 12 | 393 | 3 | 72 |
| K.A Phu Phan | | | | | | | | | | | | | | | | |
| Mukdahan | 13 | 21,803 | - | - | 4 | 4,641 | - | - | - | - | 1 | 65 | 16 | 354 | 16 | 304 |
| Muang Mukdahan | 2 | 1,170 | - | - | - | - | - | - | - | - | 1 | 79 | 15 | 413 | 9 | 112 |
| Dong Luang | 6 | 1,124 | - | - | - | - | - | - | - | - | 1 | 44 | 13 | 391 | 5 | 131 |
| Don Tan | 4 | 1,554 | - | - | 1 | 127 | - | - | - | - | 4 | 349 | 17 | 415 | 6 | 161 |
| Nikhom Khom Soi | 2 | 1,598 | - | - | - | - | - | - | - | - | 1 | 121 | 22 | 826 | 12 | 282 |
| Kham Chai | 2 | 1,518 | - | - | - | - | - | - | - | - | - | - | 12 | 679 | 8 | 204 |
| Nong Soong | | | | | | | | | | | | | | | | |

Source: Cooperative Statistics of Thailand, January 1, 1996, CPD, and DOAE.

2.13 Environmental Conditions

2.13.1 Social Environment

1) Socio-economic Conditions

The number of children who attend secondary school as of 1995 is almost reached the target of 85 % for 1996 - 2000 in Khon Kaen, Maha Sarakham and Sakon Nakhon, but only 66.6 % of children attend secondary school in Mukdahan.

Child labor of 13 - 14 years old is 32.4% for males and 30.4% for females in the Northeastern Region. This is the highest rate in the whole country (Refer to Appendix H, Table H-2).

In some villages where the field survey was carried out, ponds were constructed by the villagers themselves or by the government and fish are raised there. Various kinds of vegetable are cultivated near the ponds even in the dry season. Some villagers who do not have a pond work away from home in Bangkok or Khon Kaen.

Family planning is generally accepted and more than 80% of families follow these practices out of the four provinces. This has resulted in the achievement of a target of 77% for 1996 - 2000. In 1996, the population growth rate was 1.01 in Khon Kaen, 1.27 in Maha Sarakham, 1.27 in Mukdahan and 1.14 in Sakon Nakhon.

Food is cooked using mainly charcoal and fuelwood. Gas is using in few households in the villages of the Study Area. Fuelwood is collected from around houses or from forested areas 1 - 3 km away.

2) Health and Sanitary Conditions

In the four provinces, the main leading causes of patients seeking medical help are diseases of the respiratory and the digestive systems. The main causes of death are cancer, heart disease and traffic accidents. According to interviews conducted in the villages in the study areas, the most frequent ailments are diarrhea and fever. (Refer to Appendix H, Table H-3)

Traditional rain jars are used in almost all villages to collect drinking water and some families have a concrete tank with a faucet for rainwater. The water quality of concrete tanks is better than traditional rain jars with regard to the accumulation of bacteria. In many villages, water supply facilities have been constructed and connected to each house. The villagers, however, use this water only for washing because of its bad taste. In two villages among the villages where the field survey was carried out, the water supply facilities are used as drinking water because the water has a good taste. (Refer to Appendix H, Table H-6)

2.13.2 Natural Environment

There are two National Parks in Khon Kaen (Phu Khao - Phu Phan Kham and Phu Wiang), two in Mukdahan (Mukdahan and Phu Sa Dok Bua) and two in Sakon Nakhon (Huai Huat and Phu Phan). Various kinds of wildlife inhabit these National Parks as described in Appendix H, Table H-8. The National Park Act prohibits land-ownership, clearing and burning, cattle raising, removal of flora and fauna and diversion of waterways in National Parks as shown in Appendix H, Table H-9.

According to information from DLD, deterioration of soil fertility, soil erosion and soil salinization are the main problems in the Northeastern Region. Soil salinization mainly afflicts lowland paddy fields and is not found in the study areas.

Forested areas are rapidly decreasing over the whole country because of logging despite its having been banned by law since 1988. Forested areas in the four provinces of Khon Kaen, Maha Sarakham, Mukdahan and Sakon Nakhon are also decreased by up to about 12 % of the total land area in spite of efforts toward forest conservation and afforestation. (Refer to Appendix H, Figure H-1)

The main species of tree aimed at afforestation is *Eucalyptus* in Khon Kaen and Maha Sarakham because it is fast-growing and markets exist for it, that is a pulp factory. Details of *Eucalyptus* plantation are given in Appendix H.5. Various kinds of species are planted in Mukdahan and Sakon Nakhon; *Wrightia tomentosa* Roem. & Schult., *Cassia ciamea*, *Petrocarpus macrocarpus*, etc.

According to Forestry Statistics for 1995, most of the wood produced was illegal and confiscated in Khon Kaen, Mukdahan and Sakon Nakhon. (Refer to Appendix H, Table H-17)

2.13.3 Environmental Activities

1) Activities of Ministry of Agriculture and Cooperatives

Since 1995, a national competition to find the best farmer with regard to afforestation has been held once a year by RFD. Reports by farmers are examined and a certificate is given to the winner. This competition is successful in promoting awareness of the need for, and the improvement of afforestation.

Forest Village Projects were promulgated as detailed in Appendix H, Table H-24. Some problems remain, for example land area has decreased for farmers and they are worried about future income.

"The Reforestation and Extension Project in the Northeast of Thailand" (REX) has benefited from the cooperation of JICA from 1992 to 1997. Four nursery centers have so far been constructed, in Maha Sarakham, Udonthani, Yasothon and Nakhon Ratchasima. 30 - 40 species are being cultivated and the total number of seedlings for the four centers was 14,008,000 trees in 1995. Species of seedling are shown in Appendix H.4.

RFD takes part in seedling production and provision in the same way as it does for forest fire control and law enforcement including the confiscation of illegal logs and logging machinery. One of the main problems of RFD is lack of staff and budget. The organization of RFD Provincial Offices is shown in Appendix H, Figure H-5.

The Department of Land Development (DLD) is deeply involved in training of farmers, conservation of soil, and the constructions of ponds. Various legumes are encouraged to seed such as *Sanow African*, *Tuapra* and *Porthuang* in damaged soil. In Sakon Nakhon, *Vetiver Grass*, who has a root length of 3 m, is cultivated by DLD for the conservation of slopes against soil erosion and it has been planted on 500 rai of land per year.

The Agricultural Extension Office (AEO) trains farmers and provides them with improved rice seeds. Construction of rice storage facilities is encouraged at the village level and seeds are being provided free of charge for the first time.

2) Activities of NGOs

Some NGOs work effectively in the Northeastern Region; the Asia Children's Education Center, the Northeast Rural Development Association, the Population and Community Development Association, Plan International, etc. (Refer to Appendix H.7)

They have enough energy and perseverance for the sustainable development of rural life including afforestation of native trees and fruit trees. Their basic concept is training of project leaders in the villages and support of villagers by regular visits.

The Asia Children's Education Center works for the plantation of fruit trees in elementary schools. They accept the failure of villagers because of no care for the first year and they continue the support for three years until the villagers understand fruit growing. When they visit the school for children's education, their parents also come to the school to attend the class.

One of the activities of the North East Rural Development Association is to encourage villagers to grow forest of 200 indigenous species on 6 rai of their land. They have prepared a guidebook of useful plants with their photos. They had a budget from New Zealand for the Community Forest Training Project from 1991 to 1997. They also got a budget from Ministry of Science, Technology and Energy for the project in three Provinces including Sakon Nakhon.

The farmers lived in Bun Bua village located in No. 3 LRA in Sakon Nakhon province established a farmers' group namely In-Paeng Network for conservation and rehabilitation of forest areas, and set a target to expand such activities in other areas. The 8th Plan has been envisioned for enlarging the role of NGOs in community development and providing financial assistance to NGOs. ALRO has recognized limitation of its own capacity in developing communities in LRAs, and intends to cooperate with NGOs who have a long experience of working with local communities. In the Huai Kha Khaeng Buffer Zone Project mentioned in Chapter 1.3, ALRO has cooperated with NGOs (Save the Children, Nongkhayang Foundation).

2.14 Results of Social Assessment

2.14.1 Gender Role in Development

The policies on women in Thailand were appeared for the first time in the Third National Economic and Social Development Plan (1971 - 1975). However, a major concern from this plan was in population control and family planning. After the United Nations Declaration, 1975 as the International Women's Year and during the United Nations Decades for Women (1976 - 1985), the Government had promoted women's development activities and the delegates were sent to attend the United Nation's Meetings and World Conferences on Women's Development. Moreover, the Government also established a National Commission on Women's Affairs and a Task Force to assess the status of Thai women and preparing the twenty year plan (1982 - 2001) for Women's Development in the National Development Plans which was completed in 1981. Women in agriculture have been identified as one of the women's groups for development. The plan objective was provided for the rural women with basic social services, job opportunities, protection in employment and labor-saving devices for domestic work.

The National Commission on Women's Affairs has become a permanent organization under the Prime-Minister's Office since March 1989. The Committee members are representatives from government and non-government agencies and resource persons from the academic institutions. Its roles comprise of coordination, promotion of women's development activities and women data provision for research and planning.

The Fourth National Economic and Social Development Plan (1976 - 1980) was included the women development program putting the main interest on the training programs for the rural women to improve their status and reduce the inequalities between men and women. The training activities were carried out by the Department of Community Development and to strengthen the women's role as housewives. The training curricula consisted of food preparation, nutrition, home industries, family planning conforming to the stereotype that proper women should perform the duties competently by taking care of their families and homes.

Under the Fifth National Economic and Social Development Plan (1981 - 1985), most women development activities included were the programs for the poverty eradication. Special attentions were given to the income generating activities, vocational and skill training, increase of job opportunities both inside and outside home. In order to release burden, men were encouraged to join and help with daily chores and child care. The Government also provided day-care, health and other social service centers.

In the Sixth National Economic and Social Development Plan (1986 - 1990), both men and women were participated in all development activities. Although, they are responsible for their survival of the households while men usually assume to be the main income earners and the heads. To achieve such a successful women farmers, they were developed by resource persons from the relevant agency i.e. top administrator, planners, policy makers, etc. National and Regional Workshops concerning to the roles of women farmers were organized, for example, "Directions for Strengthening the Role of Women Farmers" and "Planning and Implementation Aspects of Programs and Projects Assisting Women Farmers in ASEAN Countries". The latter was the workshops for all delegates from participating countries, which reflected their government's recognition to the Women's roles in the national development.

In Thailand, the Women Development Plans and Policies in Agriculture and Rural Development Activities were committed by Ministry of Agriculture and Cooperatives (MOAC) in 1990 and later incorporated in the Seventh National Economic and Social Development Plan (1991 - 1996). As shown for the first time that women are recognized as agricultural practitioners with their skills and they must be encouraged to participate in all agricultural activities, side by side with men farmers. From the successful implementation, the significant data for planning such as the women's farmers needs, composition of household income, decision making to household expenditures and investment and community profiles particularly on the gender division of labor etc. are followed.

The Eighth National Economic and Social Development Plan (1997 - 2001) focuses on people-centered development by women to give equal opportunities as men to increase their knowledge and capabilities as well as women's participation to decision making in economic, social, environmental and political development.

From gender analysis, the field data on the gender role in agriculture, for instances, are collected and concluded that with men and women working together in the rice field, the activities e.g. land preparation, seedling, fertilizer application belong to male tasks. The money saving is in charge for women farmer and the mutual tasks are harvesting and marketing.

For the upland cropping, the land preparation, planting, irrigation and marketing are the male tasks. Both men and women are engaged in harvesting. In some households, men help

the land preparation and women in charge of seedling, planting, irrigating, harvesting and marketing.

To the question of what kind of the handicraft or household industry which men and women are involved in the dry season, the findings from the respondents resulted that both men and women are engaged in the handicraft mainly for the household uses. The activities such as bamboo weaving and making charcoal belong to the male duty and cloth and silk weaving to the female duty.

2.14.2 Level of Development and Quality of Life

The Northeast Region of Thailand is the largest and most populated area. The Region's water shortage and poor soils resulted in its low agricultural production. Consequently its per capita income is the lowest in the country. The Government has allocated a large amount of budget to help solving the basic problems of the Region since the First Phase of National Economic and Social Development Plan. As a result, the number of villages below development line decreased by about half during 1992 to 1994. Table 2.14-1 presents the comparison of level of development in the Northeast during 1992-1994. The number of villages within the development level and beyond development level increase from 47 per cent to 57 per cent, and from 7 per cent to 20 per cent respectively.

Table 2.14-1 Comparison of Level of Village Development in The Northeast 1992-1994

| Level of Development | Number of Villages | | | |
|----------------------------|--------------------|----------|--------|----------|
| | 1992 | | 1994 | |
| 1. Below development line | 11,575 | (45.38%) | 6,002 | (22.94%) |
| 2. Within development line | 12,314 | (47.53%) | 14,838 | (56.70%) |
| 3. Beyond development line | 1,835 | (7.08%) | 5,325 | (20.35%) |
| Total | 25,906 | | 26,161 | |

Source : NESDB Rural Thailand Situation 1994

For every group of indicators, level of development of four provinces in the Study Area on the average is 2 that are within development line. It is obvious that farm produce either rice or upland crop is below development line.

The following problems were found in the four provinces that affect the people's quality of life.

- a) Poverty: their annual income is less than 15,000 baht.
- b) Inadequate clean drinking water: the minimum requirement is 2 liters per person a day.
- c) Children 5 years old or less are malnourished.
- d) No occupation training for out of school children.

- e) Household members feel unsafe.
- f) A family has more than two children.
- g) House is provided with poor sanitation.

The poverty and debt problem is not only affecting the quality of life but is also has a long term affect on the development of the area. Unless the farmers in the study areas change their pattern of cropping from monoculture to integrated farming, they will not ever get out from heavy and lasting debt.

2.14.3 Farmer Participation

A participatory strategy for promoting sustainable agricultural and rural development proceeds on assumption that rural people have more to contribute to a process of development planning and natural resources management. The recognition of rural people as equal partners within the development process contributes to a climate of trust between change agents and rural people and among heterogeneous people, based on mutual trust.

In the 8th NESDB Plan, the main focus is on human development. People and environment are the point of departure for development planning. People are encouraged to organize at all levels to provide a mechanism for participation in development plans.

Participation approach is used to improve communications and understanding among all partners. It helps to integrate the importance of social and cultural aspects of the farmer-led technology development into its own activities and those of the partners.

According to the social assessment in the selected villages in the Study Area, the result are summarized as follows:

- a) Providing information for planning
- b) Land devotion for construction
- c) Contribution of money ranging from 200 baht to 500 baht

However, a majority (94 per cent) said it is not possible for them to contribute labor. The reason may be that their income is low and they have to spend their time for earning a living. More than half of them (57 per cent) said they could afford to contribute money at the amount of 200 baht or less.

Since, their first priority need expected from the government is solving the problem of water shortage, the respondents were asked their possibility to participate in the project. Their contribution is ranked possible as the following.

When asked whether or not the respondents are interested in participation in the government reforestation program and in the community forest projects, about 91 and 94 per cent respectively said they are. They also are interested in attending the training projects on the following topics, according to their need priorities.

- a) Integrated farming
- b) Technology transfer on improving soil
- c) Method of growing crop to meet the market demand

Other training programs mentioned by the respondents include skilled labor for the youngsters as construction, mechanics, electronics, dress making, hairdressing, flower making and others.

2.14.4 Forest Products Collection

One of the Eighth National Economic and Social Development Plan's goal is to achieve a conservation forest area of 25 per cent of the country starting in 1997. One problem in the Northeast was the encroachment by the people into national forest reserves: the reason being that there is a low productivity, so they sought new land to cultivate according to increase of population. The respondents were asked whether or not they themselves or their household members practiced upland cropping on land that they do not own or rent the land. The result was that almost all of them (96 per cent) said "no". Only one and twelve persons in Sakon Nakhon and Mukdahan respectively said they did but none in Mahasarakham and Khon Kaen.

The villager in the buffer zones in Sakon Nakhon and Mukdahan depend their livelihood on the surrounding forest. The respondents reported that Forestry Department officials have promised that the villagers that no trees would be felled and that they would be allowed to continue gathering food in the forest. Food collected in the buffer zones includes several kinds of mushroom, bamboo shoots, herbs and vegetables.

The respondents usually collect fuel wood at their farmland since they are not allowed to fell trees in the forest. Dry branches fallen from the trees are collected. Some respondent's own gas stove and it is expected that in the long run, the number of villagers who use gas stoves will increase.

Some respondents depend on the forest for food both in the wet and dry seasons. One respondent mentioned that one time he saw people from another province that went into the forest and loaded bamboo shoots until full into his pickup truck and then drove to the local market.

2.14.5 Farmer's Opinion on Changing Pattern of Cropping

The team survey data presented in Table 2.14-2 indicate that a majority of respondents (89 per cent) are interested in changing pattern of cropping from monoculture to integrated farming. However, some of them in Mukdahan, Sakon Nakhon and Khon Kaen are still skeptical about integrated farming.

Table 2.14-2 Farmers' Opinion on changing Pattern of Cropping

| Opinion | Sakon Nakhon | Mukdahan | Mahasarakham | Khon Kaen | Total |
|---|---------------|----------------|---------------|---------------|----------------|
| Are you interested in changing pattern of cropping from monocropping to integrated farming? | | | | | |
| No | 13 (10) | 21.1 (23) | - (-) | 8.8 (8) | 11.2 (41) |
| Yes | 87 (67) | 78.9 (86) | 100.0 (91) | 91.2 (83) | 88.8 (324) |
| Total | 100.0 (77) | 100.0 (109) | 100.0 (91) | 100.0 (91) | 100.0 (368) |

2.15 Inventory of LRAs in the Study Area

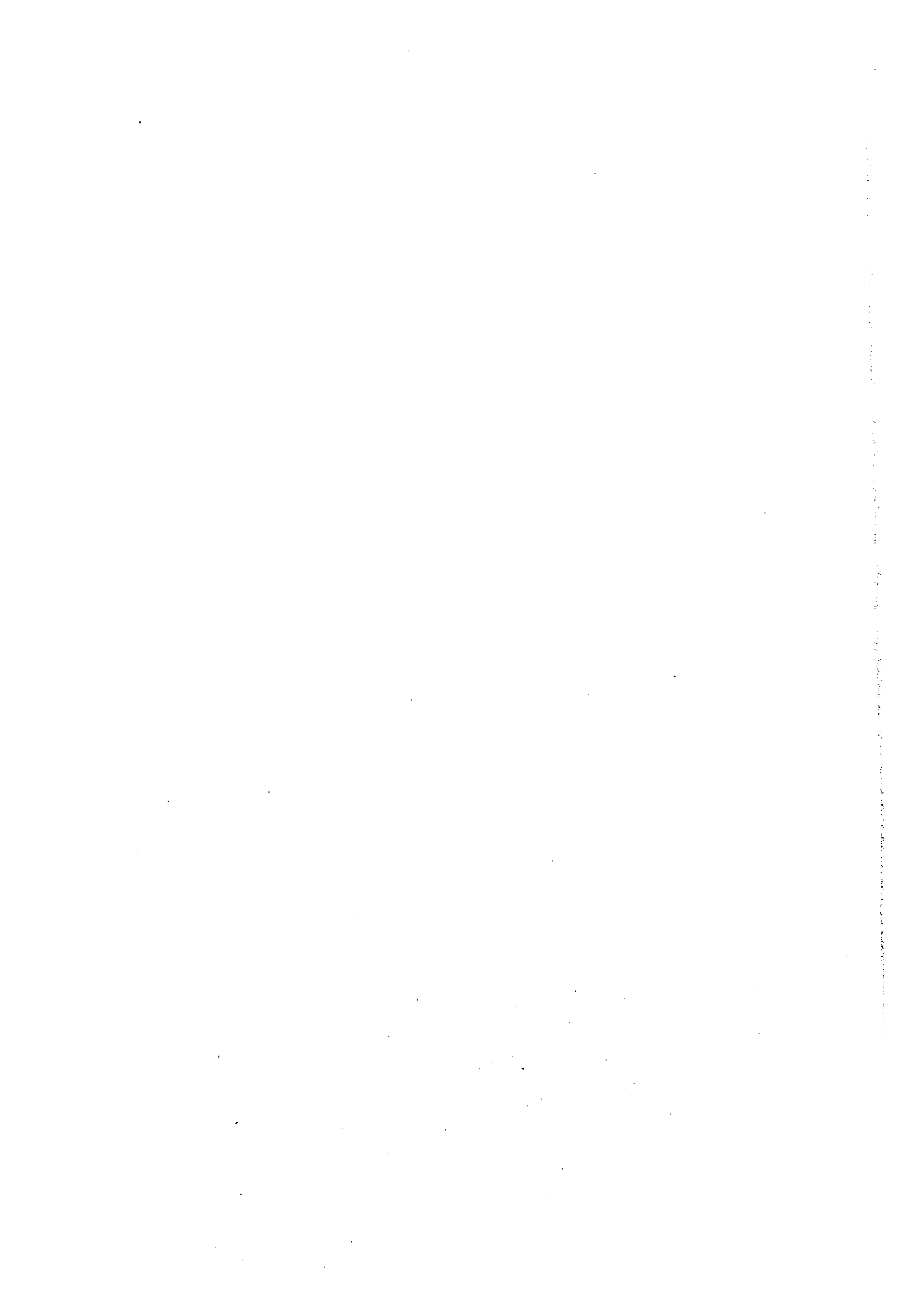
2.15.1 Introduction of Inventory

An inventory has been prepared for grasping the present condition of LRAs in the study area. The inventory covers the evaluation result of the Kor Chor Chor 2 Khor 2537 (Information System for Village Development 1994) and the data which are newly obtained in each LRA by this study such as meteorology, topography, acreage, population, households, rural infrastructures, etc.. Table 2.15-1 shows the results of inventory of each study LRA.

2.15.2 Inventory based on the Kor Chor Chor 2 Khor 2537

1) Evaluation Criteria of the Kor Chor Chor 2 Khor

The Kor Chor Chor 2 Khor has been carried out for each village through the country once every two years by the National Rural Development Committee since 1982. It is evaluated from 37 items by certain evaluation criteria. There are three (3) levels of score for evaluation, and one of three scores is given to each item after evaluation. Score 3 is given to higher evaluation, and Score 1 to lower evaluation. Score 2 is given to moderate level of evaluation. After taking all the scores of 37 items into consideration, the level of development of each village is evaluated based on the number of the items, which are evaluated as Score 1. The greater the number of Score-1s there is, the lower the level of development. Development priority is given to villages with a low level of development. 9 selected key items out of 37 and the level of development have been compiled in the inventory. The criteria for evaluation are summarized as follows:



a) Infrastructure condition

a-1 Electrification

| Score | Description |
|-------|--|
| 3 | Over 50 % of total households have electricity. |
| 2 | Less than 50 % of total households have electricity. |
| 1 | No electricity available. |

a-2 Transportation

| Score | Description |
|-------|--|
| 3 | (a) 4 wheel trucks have access during wet season within 10 minutes to Amphoe, or (b) Over 60 % of total households have a motorcycle, or (c) Less than 15 minutes to Amphoe by boat or train, or less than 25 minutes by other ways. |
| 2 | (a) 4 wheel trucks have access not so often during wet season. within 15 minutes to Amphoe, or (b) 40 - 60 % of total households have a motorcycle, or (c) 15-30 minutes to Amphoe by boat or train or 25-40 minutes by other ways. |
| 1 | (a) No access in wet season, or (b) Less than 40 % of total households have a motorcycle, or (c) Over 30 minutes to Amphoe by boat or train or over 40 minutes by other ways. |

a-3 Wood and Fuel Sources

| Score | Description |
|-------|---|
| 3 | Most people use charcoal or firewood. Wood source not over 5 km and not from the reserved forest. |
| 2 | Most people use charcoal or firewood. Wood source 6-10 km and not from the reserved forest. |
| 1 | Most people use charcoal or firewood. Wood source over 10 km and from the reserved forest. |

b) Income, production and employment

b-1 Income Level

| Score | Description |
|-------|--|
| 3 | The percentage of households with annual income of more than 30,000 baht is over 70%. |
| 2 | The percentage of households with annual income of more than 30,000 baht is 50% to 70%. |
| 1 | The percentage of households with annual income of more than 30,000 baht is less than 50%. |

b-2 Paddy Yield

| Score | Description |
|-------|---|
| 3 | Most households produce paddy over 371 kg/rai. |
| 2 | Most households produce paddy 271 - 370 kg/rai. |
| 1 | Most households produce paddy less than 270 kg/rai. |

b-3 Upland Crop Yield

| Score | Description | | | | | | | | | | |
|-----------------------------|--|-------------------------|-------------------------|---------------------------|---------------------------------|-----------------------------|-------------------------------|-----------------------------|--------------------------|--------------------------|-------------------------|
| 3 | Yield of the first ranking crops grown by majority of households are as by the following criteria: <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">Maize: > 450 kg/rai</td> <td style="width: 50%;">Sesame: > 120 kg/rai</td> </tr> <tr> <td>Soybean: > 250 kg/rai</td> <td>Sugarcane: > 9,000 kg/rai</td> </tr> <tr> <td>Mung bean: > 120 kg/rai</td> <td>Cassava: > 2,400 kg/rai</td> </tr> <tr> <td>Groundnut: > 250 kg/rai</td> <td>Cotton: > 200 kg/rai</td> </tr> <tr> <td>Millet: > 240 kg/rai</td> <td>Kenaf: > 220 kg/rai</td> </tr> </table> | Maize: > 450 kg/rai | Sesame: > 120 kg/rai | Soybean: > 250 kg/rai | Sugarcane: > 9,000 kg/rai | Mung bean: > 120 kg/rai | Cassava: > 2,400 kg/rai | Groundnut: > 250 kg/rai | Cotton: > 200 kg/rai | Millet: > 240 kg/rai | Kenaf: > 220 kg/rai |
| Maize: > 450 kg/rai | Sesame: > 120 kg/rai | | | | | | | | | | |
| Soybean: > 250 kg/rai | Sugarcane: > 9,000 kg/rai | | | | | | | | | | |
| Mung bean: > 120 kg/rai | Cassava: > 2,400 kg/rai | | | | | | | | | | |
| Groundnut: > 250 kg/rai | Cotton: > 200 kg/rai | | | | | | | | | | |
| Millet: > 240 kg/rai | Kenaf: > 220 kg/rai | | | | | | | | | | |
| 2 | <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">Maize: 380 - 450 kg/rai</td> <td style="width: 50%;">Sesame: 100- 120 kg/rai</td> </tr> <tr> <td>Soybean: 200 - 250 kg/rai</td> <td>Sugarcane: 7,000 - 9,000 kg/rai</td> </tr> <tr> <td>Mung bean: 100 - 120 kg/rai</td> <td>Cassava: 2,100 - 2,400 kg/rai</td> </tr> <tr> <td>Groundnut: 200 - 250 kg/rai</td> <td>Cotton: 160 - 200 kg/rai</td> </tr> <tr> <td>Millet: 200 - 240 kg/rai</td> <td>Kenaf: 180 - 220 kg/rai</td> </tr> </table> | Maize: 380 - 450 kg/rai | Sesame: 100- 120 kg/rai | Soybean: 200 - 250 kg/rai | Sugarcane: 7,000 - 9,000 kg/rai | Mung bean: 100 - 120 kg/rai | Cassava: 2,100 - 2,400 kg/rai | Groundnut: 200 - 250 kg/rai | Cotton: 160 - 200 kg/rai | Millet: 200 - 240 kg/rai | Kenaf: 180 - 220 kg/rai |
| Maize: 380 - 450 kg/rai | Sesame: 100- 120 kg/rai | | | | | | | | | | |
| Soybean: 200 - 250 kg/rai | Sugarcane: 7,000 - 9,000 kg/rai | | | | | | | | | | |
| Mung bean: 100 - 120 kg/rai | Cassava: 2,100 - 2,400 kg/rai | | | | | | | | | | |
| Groundnut: 200 - 250 kg/rai | Cotton: 160 - 200 kg/rai | | | | | | | | | | |
| Millet: 200 - 240 kg/rai | Kenaf: 180 - 220 kg/rai | | | | | | | | | | |
| 1 | <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">Maize: < 380 kg/rai</td> <td style="width: 50%;">Sesame: < 100 kg/rai</td> </tr> <tr> <td>Soybean: < 200 kg/rai</td> <td>Sugarcane: < 7,000 kg/rai</td> </tr> <tr> <td>Mung bean: < 100 kg/rai</td> <td>Cassava: < 2,100 kg/rai</td> </tr> <tr> <td>Groundnut: < 200 kg/rai</td> <td>Cotton: < 160 kg/rai</td> </tr> <tr> <td>Millet: < 200 kg/rai</td> <td>Kenaf: < 180 kg/rai</td> </tr> </table> | Maize: < 380 kg/rai | Sesame: < 100 kg/rai | Soybean: < 200 kg/rai | Sugarcane: < 7,000 kg/rai | Mung bean: < 100 kg/rai | Cassava: < 2,100 kg/rai | Groundnut: < 200 kg/rai | Cotton: < 160 kg/rai | Millet: < 200 kg/rai | Kenaf: < 180 kg/rai |
| Maize: < 380 kg/rai | Sesame: < 100 kg/rai | | | | | | | | | | |
| Soybean: < 200 kg/rai | Sugarcane: < 7,000 kg/rai | | | | | | | | | | |
| Mung bean: < 100 kg/rai | Cassava: < 2,100 kg/rai | | | | | | | | | | |
| Groundnut: < 200 kg/rai | Cotton: < 160 kg/rai | | | | | | | | | | |
| Millet: < 200 kg/rai | Kenaf: < 180 kg/rai | | | | | | | | | | |

b-4 Dry Season Farming

| Score | Description |
|-------|---|
| 3 | Over 50 % of households are cultivating the following crops: paddy - paddy, or paddy - short term field crops in dry season |
| 2 | 20 - 50 % of households are cultivating above crops: |
| 1 | Less than 20 % of households are cultivating above crops: |

c) Water resource

c-1 Potable Water

| Score | Description |
|-------|--|
| 3 | Over 95% of total households in the village have adequate potable water through the year. |
| 2 | 63 - 94% of total households in the village have adequate potable water through the year. |
| 1 | Less than 63% of total households in the village have adequate potable water through the year. |

c-2 Water for Agriculture

| Score | Description |
|-------|---|
| 3 | Farmers practice dry season farming and use surface water or ground water or have adequate water for second cropping. |
| 2 | Farmers practice dry season farming and use the water remaining in the form of rain or do not practice/use water or no problem of water for short/long life field crops, vegetables or flowering/ornamental orchards or fruit orchards. |
| 1 | There is a problem with inadequate water for second cropping, short/long life field crops, vegetable plantation or flowering/ ornamental and fruit orchards. |

d) Level of Development

d-1 Level of Development

| Score | Description |
|-------|--|
| 3 | Out of 37 items, 0 to 5 have a score of 1. |
| 2 | Out of 37 items, 6 to 10 have a score of 1. |
| 1 | Out of 37 items, 11 to 37 have a score of 1. |

2) Inventory of the Kor Chor Chor 2 Khor 2537

Given scores of 9 items have been revised by subtracting 2 from the score to vary in a range between -1 and +1 for better illustration for understanding. After revision of the score, each village has been sorted and arranged into the relevant LRA. Average values have been calculated for each item in 35 LRAs.

On the other hand, score of the development level was not revised, and utilized as the same score of the original evaluation.

Above results are described in Table 2.15-1 as the inventory. The results of Kor Chor Chor inventory are illustrated in Figure 1-1 to Figure 1-11 in Appendix-I.

Kor Chor Chor 2 Khor 2537 was surveyed in 1994 so some data are already old due to rapid development in recent years. The major results of analysis of Kor Chor Chor are as follows:

< Major Results of Analysis of Kor Chor Chor Data >

- a) Electrification is evaluated more than medium level but not satisfied in some LRAs in Kor Chor Chor. However, electrification has been provisionally completed in the study LRAs by recent electrification program. electrification data of Kor Chor Chor may be little old for the study.
- b) Transportation is evaluated more than medium level except few LRAs in Mukudahan, but rural road network is now rapidly improved by the agencies concerned.
- c) Manner of collection of wood fuel is not accepted by Kor Chor Chor from an environmental viewpoint in the LRAs in Mukudahan and Sakon Nakhon where reserve forests are nearby the villages.
- d) Income level is more than medium level in most LRAs except few LRAs in Sakon Nakhon.
- e) Both yields of paddy rice and upland crop are evaluated quite low in most LRAs except few. But the evaluation is not well corresponding to the present irrigation condition. Effect of outside irrigation like as Nong Wai Irrigation Project in case KK-5 may be counted in Kor Chor Chor data.
- f) Dry season farming is at quite low level in all LRAs except KK-5, where effect of Nong Wai Irrigation Project may be counted.
- g) table water is not adequate especially in Mukudahan and Sakon Nakhon to secure water through the year according to Kor Chor Chor. However, village water supply works are rapidly expanded by the agencies concerned in recent years. Present diffusion ratio is estimated at 79% in average in the study LRAs by information from the agencies.
- h) Water for agriculture is quite limited in most LRAs except some LRAs. However, the evaluation for exceptional LRAs is not corresponding to the irrigation condition investigated by data from the concerned agencies.

2.15.3 Inventories of Natural, Social and Rural Conditions

Other than the Kor Chor Chor 2 Khor, newly obtained data for each LRA have been also compiled in the inventories of natural, social and rural conditions. They are also compiled in Table 2.15-1 in the form of an inventory. These results are also illustrated in Figure 1-12 to Figure 1-18 in Appendix-I.

2.16 Development Constraints and Factors affecting Development Plan of each LRA

2.16.1 Development Constraints and Planning Consideration

Integrated agricultural development in LRAs should be implemented in order to meet the increasing requests for early implementation. However, there are some constraints against this integrated agricultural development, which can be commonly encountered in LRAs in the Northeastern Region, as listed in Table 2.16-1. Some items that should be considered in planning development projects will be derived from the constraints as shown in Table 2.16-1.

Table 2.16-1 Development Constraints and Planning Considerations (1/5)

| Constraints | Planning Considerations |
|---|--|
| 1) Natural Constraints 1.1 The soils are infertile | a) Application of green manure techniques, organic compost and crop diversification b) Formulate appropriate agricultural land use plan c) Introduce soil conservation techniques on steeply sloping sandy soils |
| 1.2 Climate is clearly classified with a rainy season from May to October and a dry season. Rainfall is deficient and poorly distributed seasonally. 1.3 Water resources for irrigation are deficient in the dry season due to: - No perennial rivers (rapid runoff in the wet season) - No runoff in the dry season - Lack of sufficient storage reservoir sites | a) Storage dam construction in high potential water resources areas and farm pond excavation on rainfed agricultural land will be necessary for dry season irrigation. b) The quantity of water resources to be developed in the Study Areas will be limited. Therefore, the following items should be considered in planning the projects. - Optimum use of irrigation water. - Improvement of irrigation efficiency. |
| 1.4 Groundwater resources are limited, and groundwater withdrawal is very expensive for irrigation | a) Groundwater development is not feasible for extensive irrigation |
| 2) Agro-economic Constraints 2.1 Declining prices for traditional commodity crops such as rice, cassava, etc., combined with higher incomes obtainable in non-agricultural employment, discourage farmers from investing for increased production. | a) Restructuring will be recommended to focus on diversified cropping and integrated farming, which will need to strengthen agricultural extension services and to train farmers. b) Rural industry based on the products of diversified cropping and integrated farming should be developed to stem migration from rural areas. c) Movement of farmers to local non-agricultural employment should be facilitated. d) Support farmers who are engaged in sustainable farming in the Study Area and encourage farmers to adopt sustainable farming practices. |

Table 2.16-1 Development Constraints and Planning Considerations (2/5)

| Constraints | Planning Considerations |
|---|---|
| <p>2.2 Low productivity of crops, due to lack of irrigation water supply and low soil fertility.</p> <p>2.3 Difficulty of perennial cropping, except cassava and sugarcane. During the dry season, cropping is totally dependent on irrigation. Expansion of perennial cropping such as fruit culture will be difficult due to lack of assured dry season irrigation.</p> | <p>Same as 1.1, 1.2, and 1.3</p> |
| <p>2.4 Low farm income, poverty and income disparity</p> <p>2.5 Small land holding</p> <p>2.6 Farmers are not well educated and have a little self-reliance.</p> | <p>a) It is considered absolutely necessary, for betterment of standard of living of the poor, to promote and enhance integrated agricultural development projects in IRAs where poor rural people are concentrated so as to achieve increase in income for them and to attain improvement of the quality of their lives in parallel with governments efforts in general for creation of job opportunities as well as securing of sources of income in the Regions and rural areas.</p> <p>b) At the same time, some political measures for more equitable income distribution and sound price control for agricultural products are required to reduce the number of very poor people in the short term in addition to policies and development efforts made by the government as above.</p> <p>c) Further, it is noted that the quality of education in rural areas at present remains at low level, and therefore, poor rural people often have access only to jobs with low pay even if job opportunities are increased in rural areas as a result of government efforts as mentioned above. It is then necessary to end the unfavorable cycle of poverty-low quality education-low income-poverty, by introducing an advanced education system which allows even poor people access to higher quality education, taking into consideration the absolute need to realize well-balanced and equitable education both in urban and rural areas which are prerequisites for modernized agriculture and sustainable economic development for the nation as a whole.</p> |

Table 2.16-1 Development Constraints and Planning Considerations (3/5)

| Constraints | Planning Considerations |
|---|--|
| <p>2.7 Ageing of agricultural labor force, rural depopulation and feminisation of agriculture</p> | <p>a) Labor availability in LRAs is becoming increasingly female. There will be a trend towards female-orientated activities in horticulture, livestock and cottage industries. Supporting services for such activities will be necessary, and gender roles in farming activities should be analyzed for formulating realizable development plans.</p> |
| <p>3) Institutional Constraints</p> <p>3.1 Indefinite Target for Development</p> <p>The role and responsibilities of ALRO are to carry out "land distribution" and "development". At present, the target for land distribution is set at more than 1.8 million rai or 100,000 farm families per year. In 1996, ALRO distributed about 1.8 million rai of land to 109,000 farm families.</p> <p>Development to match the progress of land distribution is expected, but, a target for LRA development seems not to have been defined yet. The 1996 budget for income-generating activities and restructuring of agricultural production, which would be expended to increase farmers' income in LRAs, was only 108 million baht corresponding to 60 baht per unit area (rai) of the LRAs, to which it was distributed. ALRO excavated about 5,900 farm ponds in 1996 for about 5% of the farm families who were allocated land in the same year.</p> | <p>a) ALRO should be responsible for development program in LRAs.</p> <p>b) A master plan for developing all LRAs should be prepared in the near future.</p> <p>c) Because Thailand has been experiencing an acute economic crisis, budgetary allocation to new development projects might not be possible.</p> |

Table 2.16-1 Development Constraints and Planning Considerations (4/5)

| Constraints | Planning Considerations |
|---|--|
| <p>3.2 Strengthening ALRO's Capabilities</p> <p>From now on, most of ALRO's development projects will be carried out in the form of a project under the program named Rural Development and Decentralization of Growth to Regions and Localities. Under this program, a Provincial Development Committee, consisting of a Governor as Chairperson, the Directors of Provincial Offices of governmental organizations, etc. will be responsible for planning, implementation and administration of development projects. Accordingly, PLROs should play an important role in the smooth implementation of the development of LRAs. However, the activity of PLROs is mainly devoted to the activities of "land distribution" and PLROs capabilities with regard to "development" are very limited.</p> | <p>a) It will be necessary for ALRO's ability to carry out development in LRAs to be strengthened. However, the Thai Government intends to control the number of officials available, and an increase in new officials by more than 2 per cent will not be permitted except in exceptional cases.</p> <p>b) It is said repeatedly that there are many insufficient integrating activities among government agencies of Thailand. In the case that ALRO implements development projects in LRAs, ALRO should coordinate with other agencies through organization for project coordination to be established newly.T</p> |
| <p>3.3 ALRO Database</p> <p>ALRO is one of the agencies responsible for the implementation of rural infrastructure development and is responsible for their maintenance. However, there is no adequate database to cover such works to be carried out throughout the whole country. LRAs are generally located in remote areas, and villagers are accustomed to a poor lifestyle. The Kor Chor Chor database (Information System for Village Development) is not efficiently utilized by ALRO for planning and implementation of the development work required.</p> | <p>a) At present, ALRO is developing a database system.</p> <p>b) A Kor Chor Chor database should be used for planning the development projects in LRAs. (refer to Guideline (1)).</p> |
| <p>3.4 There is an inadequate information system on demand for agricultural products and marketing.</p> | <p>a) Setting up systems to inform of present demand and prices of agricultural products to the farmers will be necessary to encourage farmers for agricultural investment.</p> |
| <p>3.5 There is an inadequate fund for credit at a low interest rate for poor people.</p> | <p>a) Provide long-term soft loans to facilitate agricultural restructuring.</p> <p>b) Increase the lending capacity of the Land Reform Fund to cope with future development project requirements.</p> |

Table 2.16-1 Development Constraints and Planning Considerations (5/5)

| Constraints | Planning Considerations | | | | | | | | |
|---|--|-------|--------|----------------------------|----------|-----------------------|-----------------|--------------------|--------------|
| <p>3.6 There is insufficient support for farmers during and after the implementation of the development projects.</p> | <p>a) Promote farmers' participation in all stages of the development processes, from planning to implementation and monitoring, because farmers are the main players and also beneficiaries of the development. b) Encourage NGOs to play a greater role in the implementation of the development projects.</p> | | | | | | | | |
| <p>3.7 People's Organizations</p> <ul style="list-style-type: none"> - There is inadequate performance due to lack of leaders with proper management capabilities and experience of business development. - There are weaknesses in marketing | <p>a) Promote training and development of administration and management capabilities of leaders of people's organizations. b) Promote marketing and provide up to date marketing information related to market demand of each type of product.</p> | | | | | | | | |
| <p>4) Irrigated Farming</p> | <p>a) There are not many irrigation projects in LRAs, but the following items should be considered when such projects are planned for LRAs.</p> <ul style="list-style-type: none"> - Diversified cropping - Participation by farmers in water allocation and in on-farm water management - Optimum use of irrigation water and assured water supply - Increase in irrigation efficiency - Establishment of Water Users' Organizations | | | | | | | | |
| <p>5) Rural Infrastructure</p> <ul style="list-style-type: none"> 5.1 Rural Roads 5.2 Rural Water Supply 5.3 Hospitals and Health Centers 5.4 Electrification | <p>a) Rural infrastructure should be upgraded. b) Targets set under 8th plan are as follows:</p> <table border="0" style="margin-left: 40px;"> <thead> <tr> <th style="text-align: left;">Items</th> <th style="text-align: left;">Target</th> </tr> </thead> <tbody> <tr> <td>- Rural road construction:</td> <td>3,700 km</td> </tr> <tr> <td>- Rural water supply:</td> <td>70% of villages</td> </tr> <tr> <td>- Electrification:</td> <td>all families</td> </tr> </tbody> </table> | Items | Target | - Rural road construction: | 3,700 km | - Rural water supply: | 70% of villages | - Electrification: | all families |
| Items | Target | | | | | | | | |
| - Rural road construction: | 3,700 km | | | | | | | | |
| - Rural water supply: | 70% of villages | | | | | | | | |
| - Electrification: | all families | | | | | | | | |

2.16.2 Factors affecting Development Plan of each LRA

Factors affecting development plan of each LRA are shown in Table 2.16-2.



Table 2.16-2 Factors affecting Development Plan of Each LRA

| LRA | Farm Land (rai) | Buffer Zone | Economic Zone | Ratio of Cassava Field (%) | Paddy Sufficiency (%) | Paddy (t) | Cassava (t) | Sugarcane (t) | Other Crops (%) | Development Level | Income Level | Average Level | Paddy Productivity | Upland Crop Productivity | Area Slope ≤2% (%) | Area Slope ≥5% (%) | Potential Irrig. Area (ha) | Ratio Irrig. Area | Land Holding (rai) | Household (H.H) (Nos.) | Population | Buffaloes (head/H.H) | Cattle (head/H.H) | Power Tillers (Nos./H.H) | Pumps (Nos./H.H) | Lowland Type Soil (%) | Upland Type Soil (%) | Gravelly Soil (%) | Paddy Field/Lowland Soil | |
|--------------|-----------------|-------------|---------------|----------------------------|-----------------------|-----------|-------------|---------------|-----------------|-------------------|--------------|---------------|--------------------|--------------------------|--------------------|--------------------|----------------------------|-------------------|--------------------|------------------------|------------|----------------------|-------------------|--------------------------|------------------|-----------------------|----------------------|-------------------|--------------------------|--|
| KK-1 | 65,560 | | ⊙ | 76.9% | 65.9% | 17.0% | 60.1% | 18.0% | 4.9% | 2.0 | 3.0 | 2.5 | 1.1 | 1.2 | 61.6% | 1.7% | 8,140 | 12.4% | 20 | 3,382 | 16,910 | 0.89 | 2.17 | 0.28 | 0.15 | 6.5% | 93.5% | 0.0% | 2.54 | |
| KK-2 | 13,940 | | ⊙ | 61.9% | 38.6% | 12.1% | 51.1% | 31.5% | 5.2% | 2.0 | 3.0 | 2.5 | 1.3 | 1.3 | 59.3% | 0.0% | 740 | 5.3% | 16 | 875 | 4,380 | 0.79 | 1.25 | 0.37 | 0.29 | 42.0% | 58.0% | 0.0% | 0.28 | |
| KK-3 | 17,910 | | ⊙ | 63.9% | 112.5% | 25.1% | 45.0% | 25.5% | 4.4% | 2.0 | 2.0 | 2.0 | 1.3 | 2.3 | 19.7% | 0.0% | 1,140 | 6.4% | 23 | 800 | 4,000 | 1.13 | 2.14 | 0.40 | 0.16 | 50.0% | 50.0% | 0.0% | 0.49 | |
| KK-4 | 11,490 | | ⊙ | 29.8% | 20.7% | 6.5% | 26.2% | 61.7% | 5.6% | 3.0 | 3.0 | 3.0 | 1.4 | 1.5 | 35.0% | 5.0% | 690 | 6.0% | 16 | 724 | 3,620 | 0.76 | 0.88 | 0.28 | 0.27 | 30.0% | 70.0% | 0.0% | 0.21 | |
| KK-5 | 6,180 | | ⊙ | 23.1% | 56.3% | 15.2% | 18.4% | 61.3% | 5.0% | 3.0 | 3.0 | 3.0 | 1.2 | 1.0 | 7.8% | 0.0% | 0 | 0.0% | 19 | 335 | 1,670 | 0.59 | 1.22 | 0.58 | 0.26 | 50.0% | 50.0% | 0.0% | 0.30 | |
| KK-6 | 147,920 | | ⊙ | 78.0% | 70.9% | 14.8% | 62.5% | 17.6% | 5.0% | 1.0 | 2.0 | 1.5 | 1.2 | 1.3 | 31.6% | 0.0% | 4,810 | 3.3% | 24 | 6,167 | 30,830 | 1.08 | 1.65 | 0.35 | 0.15 | 27.0% | 73.0% | 0.0% | 0.54 | |
| MHS-1 | 2,640 | | ⊙ | 91.0% | 0.0% | 0.0% | 88.3% | 5.7% | 6.1% | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 5.0% | 0.0% | 20 | 0.8% | 6 | 436 | 2,180 | 0.82 | 0.77 | 0.29 | 0.04 | 100.0% | 0.0% | 0.0% | 0.00 | |
| MHS-2 | 59,680 | | ⊙ | 89.6% | 0.0% | 0.0% | 84.2% | 9.8% | 6.0% | 3.0 | 1.0 | 2.0 | 1.6 | 1.1 | 6.3% | 6.7% | 270 | 0.5% | 21 | 2,877 | 14,380 | 0.76 | 2.93 | 0.48 | 0.23 | 5.5% | 94.5% | 0.0% | 0.00 | |
| MHS-3 | 3,680 | | ⊙ | 91.1% | 0.0% | 0.0% | 88.6% | 5.5% | 5.8% | 3.0 | 2.0 | 2.5 | 1.4 | 1.0 | 49.9% | 0.0% | 0 | 0.0% | 8 | 363 | 1,810 | 1.09 | 1.40 | 0.25 | 0.13 | 2.6% | 97.4% | 0.0% | 0.00 | |
| MHS-4 | 9,510 | | ⊙ | 91.7% | 0.0% | 0.0% | 89.1% | 4.9% | 6.0% | 3.0 | 2.0 | 2.5 | 1.8 | 1.0 | 39.9% | 0.0% | 0 | 0.0% | 17 | 559 | 2,800 | 1.13 | 1.41 | 0.25 | 0.12 | 10.0% | 90.0% | 0.0% | 0.00 | |
| MHS-5 | 14,600 | | ⊙ | 71.5% | 113.8% | 45.8% | 33.0% | 12.9% | 8.3% | 2.0 | 1.0 | 1.5 | 1.2 | 1.5 | 14.3% | 0.0% | 310 | 2.3% | 12 | 1,641 | 5,880 | 1.43 | 1.44 | 0.27 | 0.09 | 10.0% | 90.0% | 0.0% | 3.68 | |
| MHS-6 | 29,660 | | ⊙ | 88.6% | 140.2% | 27.4% | 60.5% | 7.8% | 4.3% | 3.0 | 3.0 | 3.0 | 1.3 | 1.6 | 47.0% | 3.0% | 650 | 2.2% | 25 | 1,458 | 5,790 | 1.58 | 1.34 | 0.29 | 0.15 | 24.0% | 76.0% | 0.0% | 1.13 | |
| MHS-7 | 10,910 | | ⊙ | 98.6% | 202.3% | 71.4% | 26.5% | 0.4% | 1.7% | 2.0 | 3.0 | 2.5 | 1.5 | 1.4 | 75.0% | 0.0% | 0 | 0.0% | 14 | 772 | 3,860 | 1.39 | 1.47 | 0.23 | 0.05 | 10.0% | 90.0% | 0.0% | 7.13 | |
| MHS-8 | 79,610 | | ⊙ | 97.8% | 50.2% | 12.6% | 80.3% | 1.8% | 5.2% | 2.0 | 2.0 | 2.0 | 1.6 | 1.2 | 7.9% | 8.9% | 820 | 1.0% | 20 | 4,007 | 20,010 | 1.28 | 1.93 | 0.35 | 0.07 | 5.5% | 94.5% | 0.0% | 2.30 | |
| MHS-9 | 310 | | ⊙ | 93.1% | 0.0% | 0.0% | 87.1% | 6.5% | 6.5% | 2.0 | 3.0 | 2.5 | 1.4 | 1.4 | 0.0% | 0.0% | 0 | 0.0% | 19 | 16 | 80 | 1.47 | 1.44 | 0.38 | 0.19 | 6.5% | 93.5% | 0.0% | 0.00 | |
| MHS-10 | 4,830 | | ⊙ | 93.9% | 23.5% | 13.0% | 76.8% | 5.0% | 5.2% | 2.0 | 3.0 | 2.5 | 1.1 | 1.0 | 40.0% | 0.0% | 0 | 0.0% | 9 | 535 | 2,680 | 0.82 | 0.77 | 0.29 | 0.04 | 100.0% | 0.0% | 0.0% | 0.13 | |
| SKN-1 | 22,560 | | ⊙ | 91.4% | 53.2% | 12.5% | 74.8% | 7.0% | 5.7% | 1.0 | 3.0 | 2.0 | 2.5 | 1.0 | 50.0% | 0.0% | 1,170 | 5.2% | 22 | 1,055 | 5,280 | 1.05 | 0.83 | 0.41 | 0.08 | 0.0% | 100.0% | 0.0% | - | |
| SKN-2 | 43,260 | | ⊙ | 68.2% | 181.1% | 36.0% | 40.8% | 19.0% | 4.2% | 1.0 | 1.0 | 1.0 | 2.0 | 1.1 | 95.1% | 0.0% | 2,550 | 5.9% | 26 | 1,689 | 8,450 | 0.91 | 0.76 | 0.40 | 0.12 | 25.0% | 75.0% | 0.0% | 1.43 | |
| SKN-3 | 118,470 | ⊙ | ⊙ | 96.0% | 51.1% | 23.4% | 68.8% | 2.9% | 5.0% | 1.0 | 2.0 | 1.5 | 1.7 | 1.2 | 66.6% | 5.1% | 15,460 | 13.0% | 11 | 10,840 | 51,200 | 1.19 | 1.14 | 0.28 | 0.11 | 43.2% | 56.8% | 0.0% | 0.53 | |
| SKN-4 | 85,530 | ⊙ | ⊙ | 97.6% | 100.5% | 25.6% | 67.9% | 1.7% | 4.9% | 2.0 | 2.0 | 2.0 | 2.1 | 2.2 | 51.7% | 0.0% | 410 | 0.5% | 20 | 4,354 | 21,770 | 1.19 | 0.80 | 0.28 | 0.12 | 50.0% | 50.0% | 0.0% | 0.51 | |
| SKN-5 | 81,800 | ⊙ | ⊙ | 97.9% | 11.4% | 3.9% | 87.9% | 1.9% | 6.3% | 1.0 | 1.0 | 1.0 | 2.1 | 1.0 | 9.8% | 29.3% | 10,500 | 12.8% | 16 | 5,595 | 27,980 | 0.92 | 0.77 | 0.28 | 0.12 | 0.0% | 97.2% | 2.8% | - | |
| SKN-6 | 44,540 | ⊙ | ⊙ | 93.0% | 221.5% | 50.1% | 43.1% | 3.3% | 3.3% | 2.0 | 1.0 | 1.5 | 2.0 | 1.0 | 54.2% | 18.1% | 330 | 0.7% | 22 | 2,026 | 10,130 | 1.69 | 1.56 | 0.26 | 0.14 | 53.4% | 22.4% | 21.2% | 0.93 | |
| SKN-7 | 13,200 | | ⊙ | 100.0% | 147.2% | 23.6% | 71.4% | 0.0% | 5.0% | 1.0 | 1.0 | 1.0 | 2.0 | 1.0 | 70.0% | 0.0% | 1,000 | 7.6% | 31 | 423 | 2,120 | 1.47 | 1.00 | 0.36 | 0.15 | 0.0% | 100.0% | 0.0% | - | |
| MKD-1 | 102,260 | ⊙ | ⊙ | 57.3% | 77.4% | 23.1% | 41.2% | 30.7% | 4.9% | 2.0 | 2.0 | 2.0 | 1.6 | 1.4 | 41.6% | 10.5% | 4,080 | 4.0% | 17 | 6,136 | 30,680 | 2.79 | 1.29 | 0.18 | 0.14 | 25.0% | 65.0% | 10.0% | 0.92 | |
| MKD-2 | 74,900 | ⊙ | ⊙ | 57.7% | 36.2% | 10.9% | 48.1% | 35.3% | 5.7% | 2.0 | 1.0 | 1.5 | 1.4 | 1.4 | 38.8% | 3.7% | 5,270 | 7.0% | 17 | 4,493 | 22,460 | 2.12 | 1.40 | 0.24 | 0.15 | 0.0% | 100.0% | 0.0% | - | |
| MKD-3 | 104,180 | ⊙ | ⊙ | 40.3% | 101.0% | 31.1% | 26.0% | 38.5% | 4.4% | 1.0 | 1.0 | 1.0 | 1.4 | 1.5 | 86.7% | 3.2% | 5,250 | 5.0% | 17 | 6,407 | 32,040 | 1.73 | 1.20 | 0.23 | 0.16 | 0.0% | 95.0% | 5.0% | - | |
| MKD-4 | 1,760 | ⊙ | ⊙ | 77.9% | 47.3% | 14.8% | 61.9% | 17.6% | 5.7% | 1.0 | 1.0 | 1.0 | 1.3 | 3.0 | 0.0% | 36.6% | 610 | 34.7% | 17 | 110 | 550 | 1.60 | 1.61 | 0.30 | 0.15 | 0.0% | 65.1% | 34.9% | - | |
| MKD-5 | 6,020 | ⊙ | ⊙ | 76.0% | 69.8% | 20.8% | 56.3% | 17.8% | 5.1% | 3.0 | 1.0 | 2.0 | 2.1 | 1.7 | 0.0% | 28.9% | 640 | 10.6% | 17 | 357 | 1,790 | 1.66 | 1.80 | 0.26 | 0.13 | 0.0% | 70.0% | 30.0% | - | |
| MKD-6 | 710 | ⊙ | ⊙ | 75.4% | 28.6% | 8.5% | 64.8% | 21.1% | 5.6% | 3.0 | 1.0 | 2.0 | 2.2 | 1.8 | 0.0% | 42.0% | 0 | 0.0% | 17 | 41 | 210 | 1.66 | 1.89 | 0.26 | 0.13 | 0.0% | 70.0% | 30.0% | - | |
| MKD-7 | 41,890 | ⊙ | ⊙ | 86.9% | 145.0% | 45.2% | 41.6% | 6.7% | 3.5% | 3.0 | 3.0 | 3.0 | 2.1 | 1.6 | 15.9% | 17.3% | 6,840 | 15.2% | 17 | 2,786 | 13,930 | 1.62 | 1.50 | 0.23 | 0.11 | 45.0% | 45.0% | 10.0% | 0.96 | |
| MKD-8 | 57,040 | ⊙ | ⊙ | 80.6% | 10.0% | 12.3% | 68.2% | 15.9% | 5.6% | 1.0 | 1.0 | 1.0 | 1.4 | 1.5 | 18.6% | 8.7% | 16,140 | 28.3% | 17 | 3,453 | 17,260 | 0.91 | 0.78 | 0.17 | 0.04 | 0.0% | 90.8% | 9.2% | - | |
| MKD-9 | 52,040 | ⊙ | ⊙ | 47.4% | 53.3% | 15.9% | 37.5% | 41.4% | 5.4% | 1.0 | 3.0 | 2.0 | 1.1 | 1.2 | 57.8% | 9.5% | 2,780 | 5.3% | 17 | 3,095 | 15,470 | 3.16 | 1.32 | 0.18 | 0.16 | 0.0% | 95.5% | 4.5% | - | |
| MKD-10 | 1,180 | ⊙ | ⊙ | 80.4% | 180.0% | 53.4% | 34.7% | 8.5% | 3.4% | 3.0 | 3.0 | 3.0 | 1.5 | 1.5 | 99.5% | 0.0% | 510 | 43.2% | 17 | 70 | 350 | 0.91 | 0.78 | 0.17 | 0.04 | 0.0% | 100.0% | 0.0% | - | |
| MKD-11 | 13,430 | ⊙ | ⊙ | 80.6% | 17.2% | 14.0% | 61.9% | 15.6% | 5.5% | 2.0 | 2.0 | 2.0 | 1.6 | 1.6 | 46.1% | 9.8% | 2,720 | 20.3% | 17 | 796 | 3,980 | 0.91 | 0.78 | 0.17 | 0.04 | 0.0% | 100.0% | 0.0% | - | |
| MKD-12 | 11,180 | ⊙ | ⊙ | 80.6% | 0.0% | 0.0% | 75.4% | 18.1% | 6.4% | 1.0 | 1.0 | 1.0 | 1.5 | 1.0 | 0.0% | 11.3% | 4,500 | 39.2% | 17 | 680 | 3,400 | 0.91 | 0.78 | 0.17 | 0.04 | 0.0% | 90.0% | 10.0% | - | |
| KK | 263,060 | 0 | 6 | 72.4% | 66.6% | 15.1% | 43.9% | 35.9% | 5.0% | 2.17 | 2.67 | 2.42 | 1.30 | 1.43 | 39.4% | 0.7% | 15,520 | 5.9% | 19.7 | 12,283 | 61,110 | 0.87 | 1.55 | 0.38 | 0.21 | 31.3% | 65.8% | 0.0% | 0.61 | |
| MHS | 214,860 | 0 | 10 | 92.6% | 56.0% | 17.0% | 71.4% | 6.0% | 5.5% | 2.30 | 2.10 | 2.20 | 1.39 | 1.22 | 19.3% | 5.5% | 2,100 | 1.0% | 15.1 | 12,361 | 59,500 | 1.18 | 1.49 | 0.31 | 0.11 | 27.4% | 72.6% | 0.0% | 1.27 | |
| SKN | 109,360 | 4 | 6 | 91.0% | 71.1% | 25.1% | 65.0% | 5.1% | 4.9% | 1.29 | 1.57 | 1.43 | 2.06 | 1.07 | 52.3% | 9.0% | 31,420 | 7.7% | 21.1 | 25,982 | 129,930 | 1.20 | 0.98 | 0.32 | 0.12 | 24.5% | 71.6% | 3.9% | 0.74 | |
| MKD | 170,390 | 12 | 2 | 59.9% | 73.1% | 20.8% | 51.8% | 22.3% | 5.1% | 1.92 | 1.67 | 1.79 | 1.60 | 1.60 | 46.8% | 8.5% | 49,340 | 10.5% | 17.0 | 28,424 | 142,120 | 1.66 | 1.25 | 0.21 | 0.11 | 5.8% | 82.2% | 12.0% | 2.21 | |
| Total | 1,337,610 | 16 | 24 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Average | 38,789 | | | 77.8% | 69.9% | 19.0% | 58.7% | 16.5% | 5.2% | 1.94 | 1.91 | 1.94 | 1.58 | 1.36 | 37.3% | 7.4% | 2,811 | 8.5% | 17.7 | 2,259 | 11,227 | 1.30 | 1.32 | 0.29 | 0.13 | 20.6% | 74.5% | 4.9% | 0.95 | |
| S. Deviation | 39,053 | | | 19.7% | 61.5% | 16.9% | 20.5% | 15.7% | 1.1% | 0.79 | 0.86 | 0.67 | 0.37 | 0.40 | 28.6% | 11.0% | 4,108 | 11.3% | 1.9 | 2,439 | 12,219 | 0.55 | 0.49 | 0.09 | 0.06 | 26.8% | 26.8% | 9.6% | 1.61 | |
| Variation | 1.01 | | | 0.25 | 0.88 | 0.86 | 0.35 | 0.95 | 0.22 | 0.26 | 0.29 | 0.22 | 0.12 | 0.13 | 0.77 | 1.48 | | 1.32 | 0.28 | 1.08 | 1.09 | 0.42 | 0.37 | 0.31 | 0.50 | 1.30 | 0.36 | 1.96 | 1.69 | |
| Weight | | | | 0.153 | 0.430 | 0.033 | 0.120 | 0.026 | 0.001 | | | | | | 0.107 | 0.008 | | 0.010 | | | | | | | | 0.055 | 0.200 | 0.005 | | |

Note: #1) Ratio = Cassava Field / (Cassava Field + Sugarcane Field), #2) Average Level = (Development Level + Income Level)/2
 Variation = Standard Deviation/Average but Standard Deviation/3 for Development Level, Income Level, Average Level, Paddy Productivity and Upland Crop Productivity
 Weight = Average * Standard Deviation (only items expressed in %)

**CHAPTER 3 NECESSITY OF DEVELOPMENT AND
DEVELOPMENT STRATEGIES**

CHAPTER 3 NECESSITY OF DEVELOPMENT AND DEVELOPMENT STRATEGIES

3.1 Necessity of Agricultural Development

About two-third of average income of farm families in the Study Area is non-farm income. However, opportunity for earning non-farm income is limited and about 40% of all farmers in LRAs have no income during the dry season. The of implementation of integrated agricultural development in rural areas is therefore recognized to be necessary in order to lower the number of absolute poverty people, and to rectify the income disparity existing between urban and rural areas.

Thailand has been experiencing an acute economic crisis as well as unemployment. Laid-off workers, who had migrated to Bangkok from rural areas such as LRAs, have now returned to these areas. It is assumed that the ratio of poor people has been increasing and the degree of poverty has been becoming more serious. Because it is difficult to take non-farming jobs at present, the implementation of integrated agricultural development projects, which leads the way to absorb the workers laid off and returned to rural areas through its job creation in the dry season and to boost the livelihood of LRAs, should be promoted without delay with due consideration on the social benefits to be derived.

In addition, environmental degradation of the forest reserve areas adjacent to LRAs has been recognized. Deforestation is frequently related poverty. Therefore, the integrated agricultural development projects to be implemented in order to increase farmers' income can contribute considerably for reducing human impacts on forest and the environment.

Because of small land holding of the farm families in addition to as least favorable natural conditions in terms of low and unstable production of crops under rainfed, low fertility, sandy soil, it is obvious that the implementation of integrated agricultural development in rural areas alone cannot result in reducing the number of absolute poverty people or improving the income disparity problem. It is required to expand the economic activities of other sectors in the Region and its rural areas.

3.2 Agricultural Development Policy

1) National Agricultural Development Policy

The average growth target for the agricultural sector under the implementation of the 8th Plan has been set at 2.9% per annum. During the 8th Plan, the main objectives of agricultural development can be summarized as follows:

- a) To maintain the capacity for competitiveness of agricultural commodities in the world market through advances in production efficiency, improving the quality of produce to satisfy market demand.

- b) To conserve natural resources through sustainable development without destruction of natural resources and the environment.
- c) To develop and strengthen human resources and farmers' organizations, and to upgrade standard of living leading to better quality of life.

2) Provincial Development Policy

Considering the geographic location, natural resources and development potential of the provinces involved, the strategies for the provincial development plan for the four provinces in the Study Area during the implementation of the 8th Plan can be summarized as follows:

Strategies of Provincial Development Plan

| Items | Khon Kaen | Maha Sarakham | Sakhon Nakhon | Mukdahan |
|--|---|--|--|--|
| Policy for Vocational Training, etc. | <ul style="list-style-type: none"> - People's participation in development activities - Increase of capability of government officials | <ul style="list-style-type: none"> - Expansion of educational opportunities - Promotion of technical college for technician | <ul style="list-style-type: none"> - Development as a center of education including the establishment of vocational training center | <ul style="list-style-type: none"> - Development as an education center and expansion of skilled labor training institute |
| Agricultural Development Policy, etc. | <ul style="list-style-type: none"> - Development of domestic and agricultural water resources - Expansion of marketing and opportunity of employment | <ul style="list-style-type: none"> - Promotion of production of livestock, poultry, crops for agro-processing and fast growing trees | <ul style="list-style-type: none"> - Development of a small scale agro-industry and modern agriculture | <ul style="list-style-type: none"> - Encouragement of agricultural water resource - Increase of non-farm employment - Development of freshwater fisheries |
| Development Policy peculiar to each Province | <ul style="list-style-type: none"> - Increase of the security through formulation and implementation of accelerated comprehensive development projects - Eradication of narcotics | <ul style="list-style-type: none"> - Promotion of cottage industries - Upgrade of local industries - Development of tourism | <ul style="list-style-type: none"> - Conservation of natural resources and the environment - Development of tourism | <ul style="list-style-type: none"> - Development as a center of a communication system linked with Indochinese countries - Development of tourism |

3.3 Needs of Farmers and Social Aspects to be Considered

3.3.1 Needs of Farmers

The farmers in LRAs suffer from many constraints such as no opportunities of dry season farming, unstable production of major rice on rainfed agricultural land and declining prices for major crops such as rice, cassava, etc. Under such conditions, the majority of farmers in LRAs have need of:

- Water for agriculture required for supplementary irrigation for rice cultivation on rainfed agricultural land, dry season farming, etc., and
- Village link roads and farm roads construction and improvement

However, about 60 per cent of the farmers in LRAs have not a knowledge of ALRO's development projects. ALRO has expended about 70 per cent of the budget for infrastructure development to the rural road construction and improvement work. In most

LRA, wet season traffic is possible, but road surfaces have still not been paved.

According to the results of social assessment, the majority of farmers (about 90%) are interested in changing pattern of cropping from monocropping to integrated farming, and farmers' expectation to governmental agencies for both rice farming and upland crops farming are as follows:

| Farmers' Expectation to Governmental Agencies | |
|--|--|
| Rice Farming | Upland Crops Farming |
| 1. Water for agriculture (88%) | 1. Water for agriculture (85%) |
| 2. Keeping good price (86%) | 2. Improvement of soil fertility (80%) |
| 3. Improvement of soil fertility (84%) | 3. Application of high yield variety (80%) |
| 4. Application of high yield variety (83%) | 4. Marketing of products (78%) |
| 5. Providing loan or credit (64%) | 5. Providing loan or credit (58%) |

(88%): per cent of farmers who expect each item.

The assistance that farmers expected to governmental agencies for dry season cropping are prioritized as follows:

| Farmers Expectation for Dry Season Cropping |
|---|
| 1. Water for agriculture (95%) |
| 2. Training on method of cropping as demanded by the market (93%) |
| 3. Improvement of soil fertility (88%) |

Further constraints to increasing animal production listed farmers include : water shortage, disease, shortage of natural grazing, poor advice, poverty of farmers, lack of markets, etc.

3.3.2 Social Aspects to be Considered

In discussing national development, there will be no genuine and sustainable development for the nation as a whole without enhancing the development of rural areas, where majority of the national population live, in parallel with development activities in urban areas. Development is economic transition and at the same time requires change of people's life-styles. Under agricultural development planning, planners used to suppose a model modern farmer with a strong desire for new technology and willing to make every effort to achieve his production target; or another model farmer who has sufficient understanding of cooperative activities with which he can increase his income and improve his standard of living. However, in any planning for agricultural development, it is of vital importance to confirm that farmers do indeed share these beliefs or not.

Former Professor Present Yamklifung, Chulalongkorn University, pointed out the characteristics of Thai society as mentioned below;

In Thai society, each individual is allowed to have a wide-range of selections and make his own decisions. In other words, Thai society is very tolerant of various individual characteristics and there is no strict social punishment. Thai farmers adhere to independence,

liberty, dignity and enjoyment in their daily lives. They don't adhere to collaborative activities beyond the minimum. In the North Region where geographical conditions resemble those of Japan, collaborative activities have been regularly practiced for construction and O&M of irrigation facilities, but collaboration has never been extended to other aspects of their daily lives and in terms of discipline, the spirit of collaboration has never been the basic concept or value underlying society. Moreover, collaboration between villages and traditions of self-governing of villages have been largely inoperative and, accordingly, village farmers are generally incapable of organizing themselves and taking collaborative action to solve common problems.

As is the case, this adherence to the liberty and dignity of each individual and the lack of collaborative spirit in society has led to difficulties in creating efficient and effective rural leaders who can be accepted and relied on by farmers. The concept of collaborative activity as a means to solve rural poverty and the need for implementation of rural development has often been spoken of on many occasions but the solving of problems has been rather limited because of the farmers' sense of values prevailing in general as mentioned above.

In view of the foregoing, in the formulation of an integrated agricultural development plan, such basic concepts should be adopted in principle so as to enable each individual farmer to practice farming by his own lights and not to force him to participate in collaborative activities above the minimum required in the development plan.

Aside from the basic concepts discussed above, during the course of implementation of the development plan, a lack of proper coordination among the government agencies concerned and the need for further improvement was pointed out. However, it will take considerable time in realizing improvement and it is necessary to formulate the development plan by paying due attention to this time factor.

3.4 Objectives, Strategies and Development Components

3.4.1 Objectives

The characteristics of the LRAs are shown below:

- a) Most LRAs are still less well developed areas and located in the poorest areas of Thailand due to the following reasons:
 - No dry season farming under rained condition
 - Low and unstable production of crops under infertile and sandy soil
 - Farmers' small land holding
 - Declining prices for rice and cassava

- b) Most LRAs are on encroached forest reserve areas transferred to ALRO from RFD. Some such LRAs have a buffer zone, which is an area adjacent to a forest reserve area, and ALRO has recognized environmental degradation of the adjacent forest reserve areas.

Considering the circumstances mentioned above and the national policy for rural development, the main objectives of the development related to the Study will be as follows:

- a) To increase farmers' income,
- b) To conserve the forest reserve areas adjacent to LRAs, and
- c) To satisfy basic human needs.

3.4.2 Strategies

To accomplish the development objectives, a requisite will be as follows:

- a) Stabilizing and increasing paddy and upland crop production in the wet season, change in farming practice from cassava cultivation and rice production in unsuitable farmland, introduction of diversified cropping.
- b) Ensuring stable income for farmers in the dry season.
 - Introduction of dry season farming (including integrated farming, livestock breeding, fruit trees cultivation, plantation of fast growing trees).
 - Promoting rural industries and cottage industries
- c) Improving agricultural production through better farming practices, agricultural supporting services, etc.
- d) Conserving the adjacent forest reserve areas through the promotion of sustainable agricultural practices in the buffer zone areas, and training in environmental conservation, especially conservation of forest.
- e) Providing rural infrastructure.

The following direction of agricultural development will be derived from the requisite mentioned above and the development constraints.

Declining prices for rice and cassava cultivated on about 75% of all farm land and unstable production of crops under rainfed condition discourage farmers from investing for increased production. Under such conditions, it is deemed that large-scale development is not possible and should not be introduced for LRAs where natural conditions are least favorable in term of production potential. For such LRAs, small-scale integrated farming, ecological farming, agro-forestry, fruit tree cultivation, plantation of fast growing trees, livestock breeding, etc. should be adapted in order to reduce cassava fields, to increase farmers' income and capacity of subsistence farming, and to stabilize crop production. To this

end, it is noted that introduction of dry season farming by providing small farm pond and the development of agriculture with various kinds of crops selected to suit with the regional conditions, eco-systems, and the various backgrounds of each farmer and so on, is of greater importance in this planning.

The development strategies will be ALRO's development activities necessary to satisfy the requisite above and can summarize as follows :

- a) Promoting introduction of integrated farming, livestock breeding, fruit trees cultivation, plantation of fast growing trees to reduce cassava fields and diversified cropping in irrigated areas.
- b) Implementation of agricultural infrastructure development plan to make a) above possible according to farmers' request.

The first priority of the farmers' needs is to secure water for agriculture and the majority of farmers (about 90 %) are interested in changing cropping pattern from monoculture to integrated farming. However, possibility of farm pond construction is limited physically and it is impossible to provide a farm pond for all farmers who intend to practice integrated farming. Introduction of integrated farming depends on the possibility of farm pond construction.

- c) Provision of training course of progressive farmers required for successful implementation of a) and b) above, including training for crop production, training for providing support to farmers in forming, managing and strengthening farmers' organization, training in environmental conservation, etc.
In addition, necessary loan with low interest should be provided for farmers who intend to practice the agricultural production activities mentioned in 1) above.
- d) At the same time as the implementation of a) and b) above, training for cloth weaving, dyeing, small-scale agro-processing, sewing, etc. should be provided under systematic and effective collaboration among various relevant agencies, I.e. ALRO, DOAE, the Department of Industrial Promotion, etc. if necessary.
- e) Providing rural infrastructure.

3.4.3 Development Components and Organizations Concerned

The development components for the Study Area will be established as shown in Table 3.4-1 based on the development objectives and strategies listed above.

Table 3.4-1 Development Components and Organizations Concerned

| Development Components | Major organizations Concerned |
|--|--|
| 1. Agricultural Infrastructure Water Resources Development Irrigation and Drainage Facilities Roads (within I RAs) Land Consolidation Soil Conservation Post-Harvest Handling, Marketing | ALRO, RID, DEDP ALRO, RID ALRO, RID ALRO DID ALRO, BAAC, CPD, OAE |
| 2. Agricultural Production Activities Cropping pattern Planning, Extension Services Farming planning Improvement of Agricultural Input and Marketing Systems Agricultural Credit System Strengthening of Farmers' Organization | DOAE, DOA, DOL DOAE, DOA, DOL BAAC, CPD BAAC, ALRO (Land Reform Fund) ALRO, CPD, BAAC |
| 3. Rural Infrastructure Rural Water Supply Rural Electrification Health/Medical care Education Community Facilities | ALRO, ARD, PWA, DOH, DMR FEA Ministry of Public Health Ministry of Education Provincial Governments |
| 4. Others Rural industries Cottage Industry/Handicrafts Access Roads Environmental Considerations O & M of Facilities by Farmers | Provincial Offices of MOI ALRO, DOAE, Provincial offices of MOI ALRO, ARD OEPP (MOSTE), RFD, Project Imp. Agencies CPD, ALRO |

3.5 Composition of Basic Development Plan

Based on the study mentioned above, it can be said that a basic development plan should consist of plans to develop the following items:

- a) Land use and agricultural development plans to restructure agricultural production through the introduction of integrated farming, agro-forestry, etc.
- b) Agricultural infrastructure development to make the agricultural development as listed above a) possible
 - Water resources and irrigation development in the high potential water resources areas.
 - Farm pond excavation in rainfed agricultural land
 - Farm road construction, remodeling of field lots, etc.
- c) Employment promotion activities.
- d) Strengthening of peoples' organizations.
- e) Upgrading of rural infrastructure. (Rural infrastructure development)
- f) Supporting services for farmers.
- g) Conservation and rehabilitation of natural resources. (Environmental Consideration)
- h) Marketing and Agricultural Credit

- i) Project Implementation Program
- j) Plan Justification.
- k) Project implementation program
- l) Recommendation for Basic Development Plan

In formulating an integrated agricultural development plan, special attention should be paid to the following;

- a) Support for farmers who are presently engaged in integrated farming, agro-forestry, etc. in the Study Area. They are expected to be leaders in the expansion of a sustainable agriculture in LRAs.

b) Farmers' Participation

Farmers are generally incapable of organizing themselves and taking collaborative action to solve common problems. However, such action would have many benefits to the farmers and would also be necessary for effectively developing limited natural resources at a low cost. In the early stages of the projects, the development plan should be carefully studied to see whether its plan, such as a plan formulated based on collaborative use of irrigation facilities, is suited to the subject area by checking farmers' opinions, readiness, possibility of collaborative action, etc.

c) Gender Roles in Development

Gender roles in development should be analyzed for formulating realizable development plans. In the Study Area, an ageing agricultural labor force, rural depopulation and feminization of agriculture will occur in the near future, and there will be a trend towards female-orientated activities in horticulture, livestock and cottage industries. Supporting services for such activities will be necessary.

d) Collaboration with NGOs in Development

Development activities such as poverty eradication, conservation of natural resources, introduction of integrated farming, etc. failed to succeed without staff who could work in rural communities for a long time. To enlarge the role of NGOs, who have long experience of work with rural communities and knowledge of developing poor areas such as LRAs and financial support for such NGOs will be essential for successful implementation of the development projects in LRAs.