# CHAPTER 7 CONCLUSION AND RECOMMENDATION

## 7.1 Conclusion

The GOT stipulated the direction to delegate power to local governance under the new Constitution enacted in 1997 and launched effort for decentralization. Furthermore, the GOT declared to embrace participatory development approach at the ninth NSEDP and has already proceeded with improvement of administrative system, which would support to deal with regional issues through community participation as well as decentralization on resources management. In line with such policy, introduction of CEO Governor has already started, and presently CEO Governors have been placed in the whole 76 prefectures.

Under these circumstances, the Study commenced to formulate an agricultural development master plan, with the participation of the communities to increase incomes of small-scale farmers who are suffering from drought and/or flood damages. The Study also includes technology transfer to the personnel in RID TAO and other relevant organizations on the subjects of participatory planning and surveying methods. Through the pilot project implementation, the Study verified these methods with the aims to enhance institutional capabilities of such organizations. The study commenced in October 2004 and was completed after 2 years and 4 months. The Study was carried out mainly by the Thai side, with support from the Study Team.

In order to formulate the Draft Master Plan (DMP) in the Study, RRA survey, PCM workshops at 16 Tambons, discussions at both 4 sub-basins and a whole basin were carried out with participation of all stakeholders. In the process of clearing many problems and solutions in the Study Area applying participatory development methods throughout the implementation of the study, all stakeholders have deeply understood the necessity of participatory development. Especially, many precious lessons for future planning have obtained in the Study by proposing detail hypothesis to materialize participatory development, and by verifying the institutions to support this hypothesis.

The challenges to achieve the goal and development approaches to overcome the challenges in the Study Area are shown as below as follows. These ideas are commonly understood and shared by all stakeholders participated in the Study.

| | |
|---|---|
| **Development Goal** | Agricultural incomes meet its cost. |
| **4 Challenges** | 1. Cost of agricultural inputs should be lowered,<br>2. Productivities should be raised,<br>3. Farm gate prices for markets should be raised, and<br>4. Damages on products should be lessened. |
| **8 Approaches** | 1. Water Resources<br>2. Flood<br>3. Production System<br>4. Soil<br>5. Farm Inputs<br>6. Pest and Disease<br>7. Credit<br>8. Marketing System |

On the other hand, RRA survey and PCM workshops were carried out in the pilot project to identify problems to be solved. In order to solve the problems, 3 approaches namely implementation of the irrigation, strengthening of the existing farmer's organizations and strengthening of the agricultural extension services had been formulated, and project components were implemented accordingly. As a result, the projects such as compost making, artificial breeding, revolving fund, transferring of irrigation facilities to TAO, cost sharing and study tour, etc. selected by the stakeholders themselves were realized by through their own efforts.

As intended at the beginning of the Study, many relevant agencies have participated in the formulation of the master plan as well as implementation of the pilot projects at the provincial, district and Tambon levels. Major stakeholders in the provincial and/or district levels were MOAC, RID and DOAE, and others including LDD, DOLs, DOCP and CDD. Those agencies consist as major part of the TSG. At the Tambon level, TAO and TTC were the main stakeholders and participated in several meetings and training courses for them to be able to implement the pilot project smoothly and to support the farmers. At the village level, the WUG was established in each village and received different types of technical supports. The WUG was the key stakeholder in the village to organize farmers and coordinate all activities.

Since communication is regarded as essential for institutional strengthening, frequent workshops, meetings and discussions and study tours were programmed during the execution of pilot project to maximize communication among the stakeholders. Although the stakeholders had to spend a lot of their time for the project, however, such opportunities in participatory manners have contributed largely in strengthening institutional ties.

Community people participated in the workshops requested the implementation of projects they wanted as shopping lists to the JICA Study Team, RID and other related agencies. People were much more likely to be dependent on development aid lead by the Government. However, projects selected by people themselves should be able to be implemented by the people themselves in cooperation with the Government agencies. As a good example, in the compost making implemented in the pilot project, the compost making group obtained the know-how through the study tour, and they have established the system to make compost by trial and error with support from the WUG and the TAO. Presently, the TAO is promoting the compost as One-Tambon-One-Product (OTOP).

As mentioned above, the Study has achieved significant results in presenting precious opportunities for communities to show their initiative in formulating their development with support of agencies staff during pilot project.

The master plan formulated in this report has been prepared with the concept that people themselves are main actors in the development. Based on the needs of people, the master plan reflects feedback from the results of the implementation of pilot projects. The plan includes the plans for the

construction of bank protection, medium dams, etc. which classified as public works and are not able to be implemented by community themselves. Also, the plan refers to issues as well as structural plan was considered for formulating plans and project implementation. Accordingly, Implementation of the projects formulated in the master plan are considered to contribute to the alleviation of the flood and/or drought damages as well as securing and improving peoples livelihood in the Study Area with a new framework of agricultural development.

## 7.2 Recommendation

**(1) Justification of the process of participatory development planning**

By the Study, it has been cleared that the participatory development approach is able to reflect the people's needs and effective for formulating the master plan to make it more realistic than the top-down approach. Based on such experience, the process of participatory development planning is recommended to be introduced for formulating a watershed master plan in the future. On the other hand, some literature reviews and lessons learned have been noted. Reflecting on these experiences, further process of participatory development planning is recommended as follows.

In the project area, the participatory approach is not exactly applied in the planning process although it basically flows upward from villages to Tambons, districts and provinces. In general, at first the representatives such as the village chief submit a list of project proposals to the Tambon where those proposals are prioritized, and then the results are sent to the upper levels for the same actions. The bottom, the people and villages, are rarely involved in deciding which proposals are materialized. It is therefore recommended that the development planning and implementation process be institutionalized, which stipulates that the project plans be made with the participation of people, and those be given the highest priority for implementation. This would make the officers aware how important the project planning is, and eventually be motivated in participating in the planning with the people.

In implementing projects in the future in other areas, the participatory development planning methods applied in the pilot project will be very useful as a guideline and should be utilized as much as possible. Member of TSG/TAO with the background of social development, with motivation and interest in village survey should be a facilitator to carry out the participatory planning method.

**(2) TSG's aggressively use and strengthening its function further**

It is necessary for formulating rural development plans to consider both top-down approach and bottom-up approach. However, it is not clear which agency shall act as coordinating body among the various related agencies at present. There are various requests for the development plans including top-down by central or provincial levels, bottom-up from villages or TAO levels, and also requests in combined approach. Presently, selection of projects is usually made by the CEO Governor without

sound evaluation in terms of the development direction. It is proposed, therefore, that the TSG shall be the coordinator and in charge of screening the plans before handing it over to the CEO Governor's judgment. And also RID, DOA, DOAE, etc. have tendency to execute their projects by vertical administrative structure individually.

In order to solve these problems, TSG has been established in the Study as a coordinator to act horizontally, which is the first attempt in Thailand. TSG members consist of province and district level to support farmers technically. They are expected to provide necessary advices to farmers and participate in the formulation of the projects. The significant achievement through the Study was the strengthening of the relationship between the related organizations. In order to continue the cooperation among different agencies, TSG should be used aggressively and to be strengthened its function further. TSG will be therefore under the direct control of the CEO Governor to enhance their motivation. Also, for the selection of the candidate project,

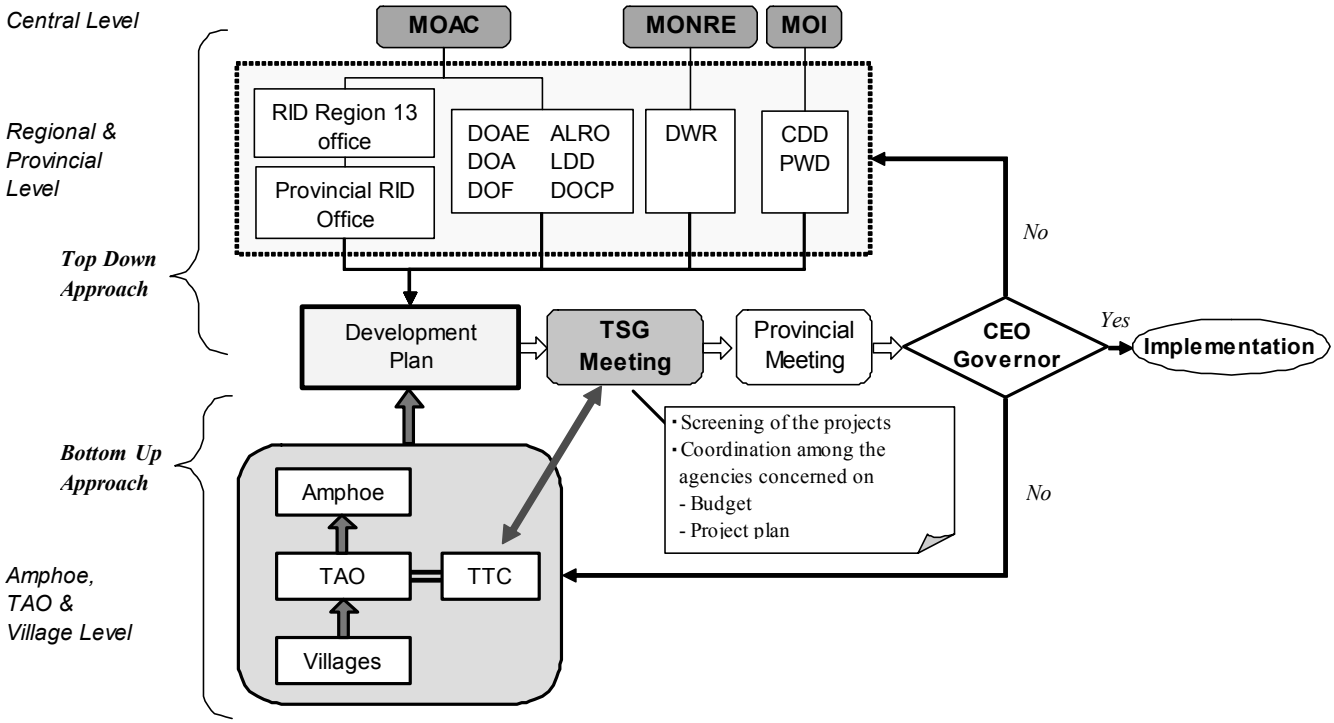



**Figure 7.2.1 Implementation structure in Future（Role of TSG）**

**(3) Budgetary allocation to realize the decentralization**

It is essential to allocate proper budget in the effort of promoting decentralization. The Government shall make an effort to increase funding sources as well as to transfer these rights to the province or TAO. A 5-year annual average annual budget of RID Regional Office and RID provincial offices in Kanchanaburi and Ratchaburi are approximately 315 million Bt and 90 to 100 million Bt, respectively. Judging from their present implementation of dam construction and irrigation projects, these offices will be able to execute sustainable water resources development and irrigation projects continuously.

On the other hand, an average annual budget of TAO in Kanchanaburi and Ratchaburi in 2002 was approximately 90 to 100 million Bt. Although the Government has a policy to transfer all small scale projects to the TAO, it will be difficult for the TAO to execute such projects unless taking into due consideration of devolving more financing sources to the TAO.

**(4) Institutional Strengthening**

*TSG: (Technical Support Group)*

A role of the TSG in the future should be as a coordinator among related agencies at provincial level. The function of the TSG is considered as significant, and such effort of TSG shall be continuously made. As mentioned above, it is necessary that a mechanism and support to TSG shall be made so that TSG can hold discussions periodically and coordinate to materialize the requests proposed by TAO, district levels, etc.

*TAO: (Tambon Administration Office)*

TAO will be required in the future to have a role to be the main actor as participatory development planner. TAO's staffs are the administrative officer with direct contact with people in the front line, therefore, rural development plan should be promoted mainly by TAO in accordance with the needs of the people. At present, almost all of the small scale irrigation facilities such as weirs, farm ponds and pump stations have been transferred to the TAO and they are responsible in operation and maintenance of these facilities. The role of the TAO will become significant as a coordinator, from the discussions and coordination with people during the planning stage up to the implementation stage coordinating all related agencies.

*TTC: (Technology Transfer Center)*

TTC members, except district agricultural office, work voluntary without pay, therefore they tend to lessen their commitments to their responsibilities. Their knowledge on agriculture is limited and therefore has difficulties to provide technical supports to the farmers. Likewise, TTC secretary nominated by the district office also has difficulty in responding to all aspects of agricultural support. Training on agricultural extension services such as compost making, etc. to the farmers are being executed by external resources in the pilot project, and such external input shall be necessary in the future. Although the role will be dependent on the direction in governmental policy, TTC should function as one-stop-service center and be supported by financial administration and technical assistance from external resources in the future. In order to realize TTC's responsibility, their member shall be paid by DOAE and by TAO in the future.

*WUG: (Water Users Group)*

The role of WUG in the future is the "main body of the O&M of irrigation facilities supported by the TAO". Collection of the irrigation water fee and management and O&M for irrigation facility in cooperation with the TAO should be their primary responsibility. And also, WUG will be the facilitator to other farmers' organization. WUG will play an important role in the future such as to manage the revolving fund properly and to return its benefit to other activities impartially and faithfully. It will be

necessary that WUG shall be continuously supported by TAO, RID province as well as TSG.

RID: (Royal Irrigation Department)

RID may not be regarded as appropriate leader to formulate comprehensive agricultural development master plan in rural area since this agency primary responsible for water resources development. Expected role of RID in the future should be concentrated to support making plans for small scale water resources and irrigation projects implemented by TAO as well as to make plans and execute middle to large water resources development plan and irrigation projects, and also to operate and maintain their facilities.

*DOAE: (Department of Agriculture and Extension)*

DOAE should be a supporter in agricultural technology to the province or TAO, when the province will be the main agency to formulate agricultural development master plan in the rural area. Therefore, expected role of DOAE in the future should be a supporter both in the rural and agricultural development master plan by provincial level, and the main implementating agency for soft component projects.

**(5) Necessity of the sustainable monitoring for the pilot project**

The activities on the pilot project are expected to be continued, to achieve required outputs continuously. Both the Government agencies including TAO and the farmers have strong motivation for its continuation. In this regard, the sustainability of the project is considered high. However, there are some key issues to be clarified in assuring the project sustainability as follows. In order to address these issues, monitoring activities mainly by RID/DOAE in central and TSG/TAO in province shall be continuously carried out.

(1) Collection of the water fee for pump irrigation
(2) Budget allocation for O&M of the irrigation systems
(3) Production and selling for compost
(4) Development of marketing strategies
(5) WUG remains as the core organization

Regarding the collection of water fee for pump irrigation, implementation of 54 numbers of pump irrigation projects by RID will be scheduled in the master plan, and it is possible that same problem of cost sharing will happen in the future. Therefore, cost sharing between TAO and WUG regarding the water fee and O&M cost for irrigation facilities shall be made clear. RID in Kanchanaburi province which is able to estimate the O&M cost and water fee shall propose to TAO and WUG the O& M fee as well as water fee on PTPW's pump irrigation facilities as soon as possible. And also, TAO and Nong Phai shall propose to WUG cost to be shared.

**(6) Expansion from spot to area <Expansion of the pilot project>**

The pilot projects were implemented in only 2 villages out of 145 villages in the Study Area. Same projects shall be implemented in other villages to expand participatory development plans based on the lessons learned from the pilot project, since RID provincial offices as well as TAOs have formulated many small scale water resources development plans in the short term of the master plan. It is

recommended that the implementation of 2 to 4 projects within the next 3years shall be in areas that were not covered by the study preferably in the middle upstream basin and middle downstream basin.

**(7) The role of the pilot project as the training place for neighboring countries**

Many achievements and lessons were obtained through the implementation of the pilot projects on institutional strengthening and improvement of farming practices. During the implementation of the project, trainees from other countries such as Sri Lanka, etc. visited the site. Considering the following aspects, it can be said that the Pilot Projects are suitable as the training place for neighboring countries where similar policy is adapted in consideration to the issues such as FTA (Free Trade Agreement), etc.

(i) It takes only 2 to 3 hours by land from Bangkok to the site with very easy access.
(ii) Cooperation systems between the Governmental agencies such as RID, DOAE, TSG, TAO, etc. and the WUG or other farmers organization lined with the policy of decentralization can be observed by visitors.
(iii) Pilot project can show actual trials on the conversion from chemical fertilizers and pesticides to organic fertilizer which is chemical free in accordance with the Government's agricultural policies adopted as '' Kitchen in the world'' and also promoting the ''Food security'' which is considered as the most important subject in the Thai Government.

**(8) Water Resources Development**

According to the Regional 13 office of RID, construction of 8 numbers of medium scale dams have been planned, consists of 2 in short term, 6 in medium term, and 1 in long term plans respectively. By the construction of such dams, it will be able to store 286 MCM of water, which is approximately 4.6 times bigger than the current stored water of 33 MCM.

In order to mitigate the flood damages as well as to reduce the drought damages and sedimentation in the existing water resource facilities, construction of the dams should be given first priority taking into careful consideration the communities consensus and the environmental aspects. As for the development of groundwater, it can not be expected that many number of well has to be constructed in the future, since 2,621 numbers of shallow wells and 2,203 numbers of deep wells have been constructed already to date.

**(9) Flood Mitigations**

The construction of food protection dike between the middle downstream and downstream of Lam Pa Chi River was given first priority at RID Regional 13 Office, and planned to be implemented in medium term plan with estimated cost of 653.2 million Bt. Before implementation of the dike, effect of water level of Khwae Noi River to Lam Pa Chi River during the flood season in September and October should be analyzed, and also the alleviation effect to the flood damages by medium size dams to be constructed in the master plan shall be studied. Taking into due consideration the flood damages occurred every year, analyses on such issues regarding the protection dike should be made in the soonest opportunity.

**Table 6.2-2 Prioritization of the Credit Approach**

| Approach / Coponents | Agencies | Role | Ability | Relation to the objective | Estimated cost | Remarks |
|---|---|---|---|---|---|---|
| 1. Credit: *to increase the access to credit with low interest rate* | | | | | | |
| | ALRO | Land possession<br>Issue land title | | | | Farmers need not to pay fee for Sor Por Kor |
| | DOL | Land possession<br>Issue land title | 1 | 0…Up | | |
| | DOT | Administrate the public's land, gov.'s land | 3<br>1 | 2…M-Up<br>3…M-Down | - | **Policy issue** |
| | MONRE | Land possession | 1 | 3…Down | | |
| | RFD | Land possession | | | | |
| | Military | Land possession | | | | |
| | The Treasury Dpt. | Administrate the king's land | | | | |
| Loans with low interest rate become available (not more than 6%/year) | BAAC | 7.5%/year | 1 | 2 | | Average interest rate for buying home is 4.5%/year. Therefore, people hope it's possible that interest rate could be lower than 6%/year. CDD provides loan 200,000B/village at maximum without or low interest rates. |
| | Saving Bank | 10~12%/year Gov. banks | 2 | 2 | | |
| | Krung Thai Bank | 10~12%/year | 0 | 0 | - | |
| | Commercial Bank | | 0 | 0 | | |
| | Fund for Rehabilitation and Development the Agriculture | 5%/year | | | | **Policy issue** |
| Cooperatives are established & functioning (at Tambon level) as lending sources | Coop.-promotion | Establish cooperatives | 2 | 2 | 45B/p/day for lunch for workshop(not include documents)- | Amphoe level cooperatives are already established at every Amphoe. Main lending sources shall be 1) BAAC, 2) D of coop. promotion, and 3) Member |
| | Coop.-auditing | Audit cooperatives | 2 | 2 | | |
| | DOAE | Coordinate among agencies (now functioning) | 0 | 0 | | |
| | CDD | Guidance for saving group & saving fund | 0 | 0 | | Training 2days & site visit 1day are necessary |
| | TAO | Alternative lending source | | | | |
| Rotation funds are established (at each village or at sub basin) | CDD | Guidance for saving group & saving fund | 3 | 3 | The target amount of the rotation fund is 2MB/village | Current village fund is 1MB/village given by CDD in Taksin gov. Farmers hope to increase the fund to 2MB. Gov. will increase the fund to 100,000 B/Village due to result of management of fund. |
| | Ag.-extension | Coordinate among agencies (now functioning) | 0 | 0 | | |
| | Coop.-promotion | Give guidance | 0 | 0 | | |
| | Village fund | Administrate (funded from CDD) | 3 | 3 | | |
| | TAO | Alternative lending source | | | | |

**Priorities of the activities**

The priorities shall be placed on the establishment of rotation funds at village or sub basin levels. The funding sources will be village funds, saving funds, TAO's funds or other current funds from the related agencies. If the amounts from the current sources are not enough, saving groups or cooperatives shall be established at Tambon level and strengthened as the lending sources.

The issues of land title deeds and loans with low interest rates require policy changes. In the master plan, the authorities concerned are requested to consider those issues. **Note : 0 = More Lower 1 = Lower 2 = Medium 3 = Higher**

**Figure 6.2-2 Implementation Plan of Credit Approach**

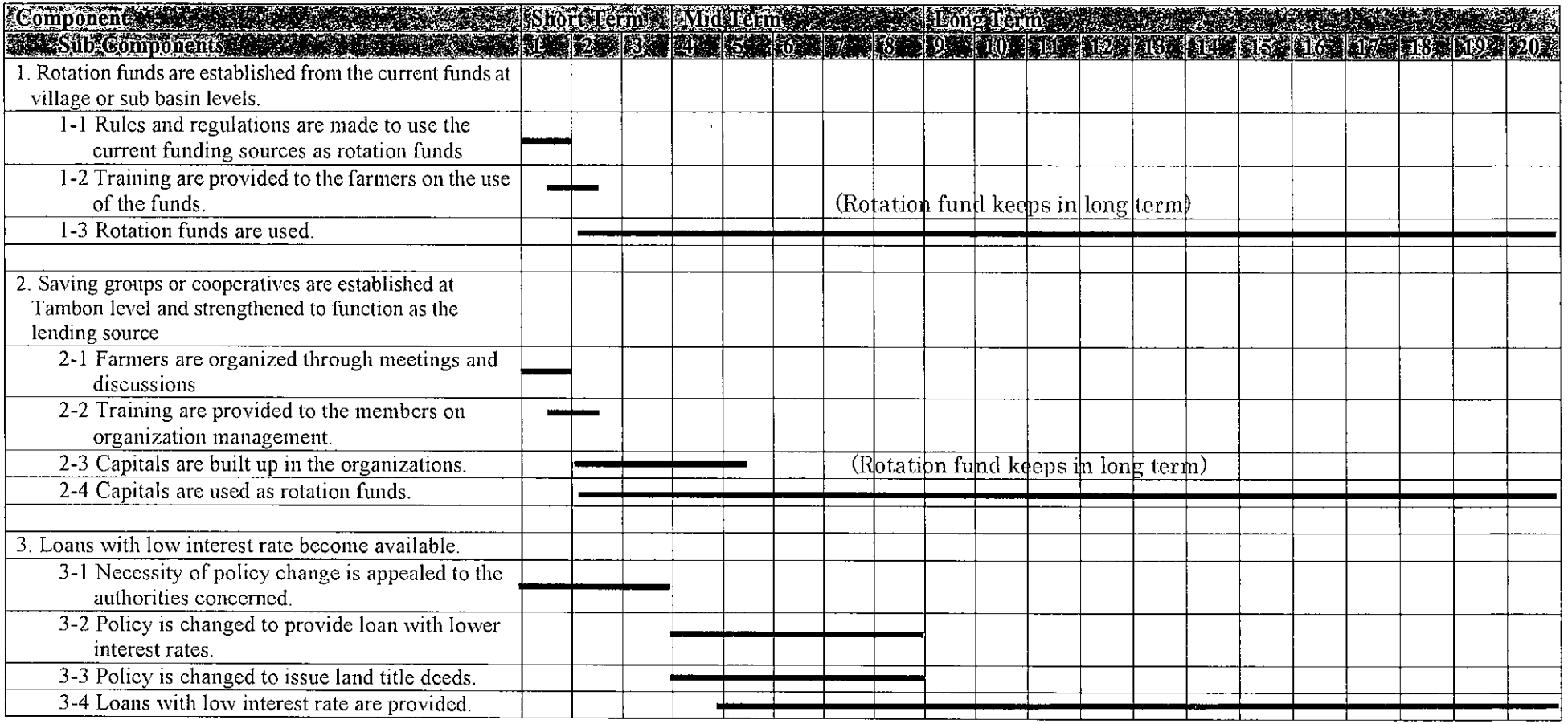


**Table 6.2-3 Prioritization of Marketing System Improvement Approach**

| Approach Components | Agencies | Role | Ability | Relation to the objective | Estimated cost | Remarks |
|---|---|---|---|---|---|---|
| **2. Marketing System:** ***to lower purchase cost & reduce the use of input, ensure or raise the selling prices*** | | | | | | |
| Farmers groups are established to purchase the input & sell the products by group (later. products are sold by contract basis) | AG extension | Establish groups/coordinate contracts/ Assist to make the contact | 3 | 3 | - | Gov. supports groups to make contract with private sector.<br>The prices of inputs can be lowered when cooperatives buy them at large volume.<br>Asparagus groups in the study area are functioning. Rice groups in the north are functioning.<br>There are so many cozy relationship between groups and agency—Some groups can get much budget through the personal relationship<br><br>BAAC loans to farmers only for agricultural purpose. |
| | Coop. promotion | Establish cooperatives | 2 | 3 | | |
| | CDD | Assist career groups house wife groups (ex. food processing) | 3 | 3 | | |
| | DOAE | Establish groups/coordinate contracts | 3 | 3 | | |
| | TAO | Coordinate | | | | |
| | BAAC | Loan | | | | |
| | ALRO | Loan max: 20,000B/HH | | | | |
| | Livestock department<br>Provincial commerce | Assist farmers to make contract | | | | |
| Government has fixed-price guarantee | Provincial commerce office | Provide price information | 0 | 2 | - | The prices of rice & sugarcane are fixed. In addition, prices of pineapple & cassava are to be fixed, although it depends upon gov. policy. |
| | Industry of works Dept. | Inspect the price of sugarcane | - | - | | |
| Registering farmer under Ag. category not to cause over production (kind of zoning) | Ag. Extension<br>O of Ag.&Eco<br>O of national statistics | Conduct survey , plan for crop zonning | 2<br>-<br>-<br>- | 2<br>-<br>-<br>- | 50,000B/5 Tambon (to conduct survey) | Conduct survey and grasp current condition to make a crop plan. Agencies have already started survey. (not plan yet) |
| Agricultural machines are procured and used by group | DOAE | Establish group | - | - | 15MB to procure Tractor & equipment | Procurement: tractor, sugarcane cutting Machine, cane collector, etc. |
| | DOA | Research new equipment | 1 | 2 | | |
| | Coop promotion | Establish group | - | - | | |
| | TAO | Coordination/funding source | - | - | | |
| Selling price are guaranteed by the government | DOAE | Analyze & estimate price to be guaranteed | - | - | | Price of rice, ,sugarcane & rubber are already guaranteed.<br>Farmers want more crop to be guaranteed.<br>**Policy issue** |
| | D of Internal trade | Inspect marketing price | 3 | 2 | | |
| | Industrial works Dpt. | Inspect agencies in marketing price | 1 | 1 | | |
| | BAAC | Buy rice at guaranteed price | 2 | 2 | | |
| Agricultural products are sold through contract | Coop promotion | Coordinate | -<br>3 | -<br>2 | | |

| Approach Components | Agencies | Role | Ability | Relation to the objective | Estimated cost | Remarks |
|---|---|---|---|---|---|---|
| | DOAE, DOL | Coordinate | 2 | 2 | | |
| | Livestock | Coordinate | 3 | 3 | | |
| Market information is collected & given to farmers (through local radio) | D of internal trade | Broadcast | | | 30,000B/5 Tambon (broadcast) | Even if farmers know market prices, they could not negotiate well with middlemen<br><br>D of public relation is providing market information through local radio at 5AM & 12AM. Time should be changed. |
| | O of Ag. & Eco. | Collect & inform market info. Make zoning policy | | | | |
| | O of Ag.&Coop | Collect & inform market info. | 2 | 1 | | |
| | O of Permanent Secretary Ag.&Coop | Collect & inform market info. | 2 | 2 | | |
| | TAO | Coordinator | 3 | 2 | | |
| | Provincial Commerce Office | Collect & inform market info. | 3 | 2 | | |
| | Chief of village | Broadcast | | | | |
| | The Public Relations Department (PRD) | Broadcast | | | | |
| Training and demonstration plots are Conducted to reduce farm input | DOCP | | - | - | Transportation, and food for training: 300B/P/T | |
| | DOAE | | - | - | | |
| | | | 2 | 3 | | |
| | | | - | - | | |

**Priorities of the activities**

The priorities shall be placed on the establishment and strengthening farmers groups (cooperatives) so that the farmers can purchase the inputs at cheaper prices and sell the products at higher prices. Market information shall be collected and given to the farmers groups when they become functional and able to negotiate effectively with middlemen. The efforts to register the farmers under agriculture category and make a crop plan shall be continued as also the first priority. The issue of fixed-price guarantee requires policy changes. In the master plan, the authorities concerned are requested to consider those issues.

**Note : 0 = More Lower 1 = Lower 2 = Medium 3 = Higher**

**Figure 6.2-3 Implementation Plan of Marketing System Improvement Approach**

| Component | Short Term | | | Mid Term | | | | | Long Term | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sub Components | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1. Farmers groups or cooperatives are established and functional to negotiate with middlemen. | | | | | | | | | | | | | | | | | | | | |
| 1-1 Farmers are organized through meetings and discussions. | | | | | | | | | | | | | | | | | | | | |
| 1-2 Training are provided to the members. | | | | | | | | | | | | | | | | | | | | |
| 1-3 Capitals are built up in the organizations. | | | | | | | | | | | | | | | | | | | | |
| 1-4 Agencies assist farmers groups to make a contract with private organizations. | | | | | | | | | | | | | | | | | | | | |
| 2. Market information is collected and given to the farmers groups. | | | | | | | | | | | | | | | | | | | | |
| 2-1 System of collecting and providing market information is established. | | | | | | | | | | | | | | | | | | | | |
| 2-2 Training are provided to the farmers. | | | | | | | | | | | | | | | | | | | | |
| 2-3 Necessary equipment and facilities for operating the marketing system are procured. | | | | | | | | | | | | | | | | | | | | |
| 2-4 The system is functioning. | | | | | | | | | | | | | | | | | | | | |
| 3. A crop plan is prepared based on the registration of the farmers. | | | | | | | | | | | | | | | | | | | | |
| 3-1 The farmers are registered under agricultural category. | | | | | | | | | | | | | | | | | | | | |
| 3-2 Survey is conducted to understand the current conditions | | | | | | | | | | | | | | | | | | | | |
| 3-3 A crop plan is prepared to avoid over production. | | | | | | | | | | | | | | | | | | | | |
| 3-4 The farmers have own crop plan and grow the crops accordingly. | | | | | | | | | | | | | | | | | | | | |
| 4. Crops are sold at guaranteed prices. | | | | | | | | | | | | | | | | | | | | |
| 4-1 Register the purchasing places | | | | | | | | | | | | | | | | | | | | |
| 4-2 Necessity of policy change is appealed to the authorities concerned. | | | | | | | | | | | | | | | | | | | | |
| 4-3 Settle the standard and produce based on that. | | | | | | | | | | | | | | | | | | | | |
| 4-4 Crops are sold at guaranteed prices. | | | | | | | | | | | | | | | | | | | | |

**Table 6.2-4 Prioritization of Pest & Disease Control Approach**

| Approach / Components | Agencies | Role | Ability | Relation to the objective | Estimated cost | Remarks |
|---|---|---|---|---|---|---|
| **3. Pest & Disease:** *to reduce damage on crops from pests & diseases* | | | | | | |
| Organic extract or quality fertilizer are used appropriately | DOAE | Implement and sell | 2 | 2 | 150,000B/SB (50,000B * 3 steps) | |
| | LDD | Research | 3 | 2 | | |
| | DOA | Research | 2 | 1 | | |
| | D of Industrial Works | Research and set standards | - | - | | |
| | KU | Research | | | | |
| High-resistance seedling & seeds are used | DOAE | Implement & sell | 2 | 3 | - | Now, private company sells high-resistance seeds & seedlings at high price. Although gov. provide seeds & seedlings at lower price, these are not good in quality. DOA now provides good seed of rice & sugarcane. Training and demonstration plot are necessary |
| | DOA | Research & sell | - | - | | |
| | MU | Problem hearing, advise, Solve problem | 2 | 0 | | |
| | KU | Research | 2 | 2 | | |
| Demonstration plots are established (for general Ag. practices) | DOAE | Implement | 2 | 2 | 40,000B/crop (2rai/plot/Tambon)*2plots*5Tambon=200,000B/SB | |
| | DOA | Research | - | - | | |
| | KU | Research | - | - | | |
| | | | - | - | | |
| Crops are planted in rotation | DOAE | Implement trainings | | | - | Farmers don't follow the advice because of the limitation of present plantation |
| | MU | Implement trainings | | | | |
| | LDD | Research (Give info. about suitable soil for each crop) | 1 | 2 | | Training and demonstration plot are necessary |
| | KU | Research | 3 | 2 | | |
| | DOA | Research | - | - | | |
| | | | 3 | 2 | | |

**Priorities of the activities**

To protect crops from the damage of pest and disease, the priorities can be placed on the promotion for the use of high-resistance seedlings and seeds. This shall be done by DOAE. Also, extension services of farming practices such as general farming skills, the use of organic extract and crop rotation shall be considered as the priority. The selection of the activities depends on the specific problems and needs of the farmers at each location. The extension services shall be provided through seminars, demonstration plots and study tours. Research on the same subjects shall also be continued as the short to long-term efforts. It will depend on the results of research and extension services what technologies and knowledge the farmers actually apply to their fields.

**Note : 0 = More Lower 1 = Lower 2 = Medium 3 = Higher**

**Figure 6.2-4 Implementation Plan of Pest & Disease Control Approach**

| Component | Short Term | | | Mid Term | | | | | Long Term | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sub Components | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1. High-resistance seedlings and seeds are used.<br>2. Organic extract is used.<br>3. Crops are rotated. | | | | | | | | | | | | | | | | | | | | |
| 1-1 Promote | ━ | ━ | ━ | | | | | | | | | | | | | | | | | |
| 1-2 Quality Control | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ |
| 1-3 Farmers use in good quality seeds & seedlings | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ |
| 1,2,3-1 Surveys is conducted to assess the situations on pest and disease in each village. | ━ | | | | | | | | | | | | | | | | | | | |
| 1,2,3-2 A work plan is prepared to reduce the pest and disease problem. | ━ | ━ | | | | | | | | | | | | | | | | | | |
| 1,2,3-3 Meetings for making an action plan are conducted with the farmers. | | ━ | ━ | | | | | | | | | | | | | | | | | |
| 1,2,3-4 Lectures are given to the farmers. | | ━ | ━ | ━ | ━ | ━ | ━ | ━ | | | | | | | | | | | | |
| 1,2,3-5 Demonstration plots are made. | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | | | | | | | | | | | | |
| 1,2,3-6 Study tours are conducted. | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| 4. Research on pest and disease is conducted. | | | | | | | | | | | | | | | | | | | | |
| 4-1 Research on the application of the above technologies and knowledge is conducted. | ━ | ━ | ━ | ━ | ━ | | | | | | | | | | | | | | | |
| 4-2 Research on the new technologies is conducted. | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ |

**Table 6.2-5 Prioritization of Soil Improvement Approach**

| Approach / Components | Agencies | Role | Ability | Relation to the objective | Estimated cost | Remarks |
|---|---|---|---|---|---|---|
| **4. Soil:** ***to improve soil conditions*** | | | | | | |
| Organic or quality fertilizers are used appropriately | DOAE | Implement | | | 150B/p/time for training | Mobile unit (LDD, RFD, DOA ,Livestock & Fishery) has been just established to give advices as a team at farm level |
| | DOA | Research | - | - | Demonstration | |
| | LDD | Implement & research | 3 | 3 | plot for natural fertilizer: | |
| | | | - | - | | |
| | | | 3 | 3 | 2,500B/5rai (plowing(3) and seeds) | LDD and office of provincial Ag. Support a part of budget to train villagers. |
| Gov. support quality seeds (bean) to improve soil | LDD | Research | 2 | 2 | 20B/kg (bean seeds) | |
| | DOAE | Implement | - | - | | |
| | | | - | - | | |
| | | | - | - | | |
| Use compost or green manure | LDD | Research | 2 | 2 | 50B/set (Agent) | 1 day training : 100B/person Material: 88B/ton |
| | DOA | Implement | 3 | 3 | | |
| | DOAE | Implement | - | - | | |
| | TAO | Coodenator | - | - | | |
| Grow leguminous crop (Demonstration) | LDD | Research | 3 | 2 | 800B/rai (Demonstration plot plowing) | The agencies are now implementing. Demonstration plot: 4,000B/5rai/place/Tambon |
| | DOA | Implement | 3 | 2 | | |
| | DOAE | Implement | 3 | 3 | | |
| | | | - | - | | |
| Grow elephant grass to prevent erosion (increase moisture contents) | LDD | Research | 3 | 1 | 1.02B/seedling | |
| | DOAE | Implement | - | - | | |
| | | | - | - | | |
| | | | - | - | | |
| Soil quality analysis | LDD | Implement | - | - | Soil analysis: 50B/sample/10rai | |
| | | | - | - | | |
| | | | 3 | 3 | | |
| | | | - | - | | |

**Priorities of the activities**

The measures such as the use of compost or green manure, grow of leguminous crops, use of quality seeds (bean) and grow of elephant grass shall be applied for improving soil conditions. The priorities shall be placed based on the specific needs and problems of the farmers at each location. The extension services shall be provided through seminars, demonstration plots and study tours. Research on the same subjects shall also be continued as the short to long-term efforts.

**Note : 0 = More Lower 1 = Lower 2 = Medium 3 = Higher**

**Figure 6.2-5 Implementation Plan of Soil Improvement Approach**

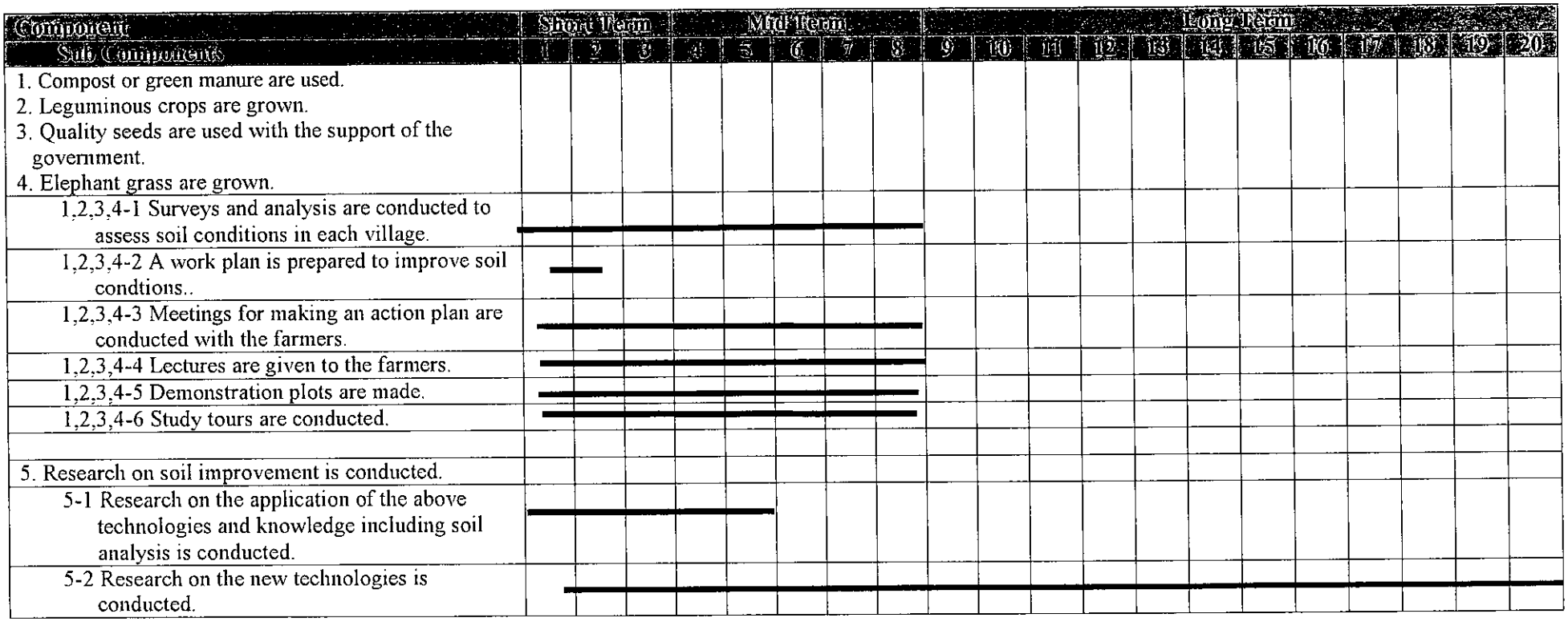


**Table 6.2-6 Prioritization of Farm Input Improvement Approach**

| Approach / Component | Agencies | Role | Ability | Relation to the objective | Estimated cost | Remarks |
|---|---|---|---|---|---|---|
| **5. Farm Input:** *to produce farm inputs by farmers* | | | | | | |
| Guidance from expert | DOAE | Implement trainings | 3 | 3 | 120,000B/450people/time/year (experts, lodging documents) =267B/person | 450people= 15village*30people/village This activity is already included in the following activities. |
| | DOA | Research | - | - | | |
| | Institute of Ag.-academy | Research | 3 | 3 | | |
| | TAO | | - | - | | |
| Fertilizers and/or Pesticides are produced by farmers themselves (Including biological fertilizer/pesticides) | DOAE | Implement | 3 | 3 | 10,000B/Tambon (Solution agents & containers) | Advanced farmers can also play a role. Material: Urea, germs, manure Liquid fertilizer made from Molas (sugarcane waste): 4-5B/kg Training/Pilot project are necessary |
| | DOA | Research | 3 | 3 | | |
| | LDD | Give advice | 3 | 3 | | |
| | Institute of Ag.-academy | Research | 3 | 3 | | |
| Promotion on animal breeding | D of Livestock | Promote and train | - | - | 125 B/P/D | Purpose is to produce breeders for strong cattle and/or swine. 10% of the population needs this activity. |
| | Institute of Ag.-academy | Promote and train | 2 | 3 | | |
| | | | - | - | | |
| Promotion on animal research to Improve livestock/fish for reproduction | D of Livestock | Research/technology transfer | - | - | 125 B/P/D | 10% of household raise livestock |
| | DOAE | Research & implement | 2 | 3 | | |
| | D of fishery | Fish culture | - | - | | |

**Priorities of the activities**

Extension services shall be provided for the self-making of fertilizers and pesticides. Research on animal shall be continued as the short to long-term efforts.

**Note : 0 = More Lower 1 = Lower 2 = Medium 3 = Higher**

**Figure 6.2-6 Implementation Plan of Farm Input Improvement Approach**

| Component | Short Term | | | Mid Term | | | | | Long Term | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sub Components | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1. Fertilizers and/or Pesticides are produced by farmers themselves. | | | | | | | | | | | | | | | | | | | | |
| 1-1 Lectures and demonstrations are given to the farmers. | ━ | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| 2. Animal Breeding is promoted. | | | | | | | | | | | | | | | | | | | | |
| 2-1 Technology transfer | ━ | | | | | | | | | | | | | | | | | | | |
| 2-2 Study tour | | ━ | | | | | | | | | | | | | | | | | | |
| 2-3 Farm demonstration | | | ━ | | | | | | | | | | | | | | | | | |
| 3. Biological fertilizer and/or pestcides are produced by farmers themselves | | | | | | | | | | | | | | | | | | | | |
| 3-1 Lectures & demonstration are given to the farmers | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ |
| 3-2 Promote | ━ | ━ | | | | | | | | | | | | | | | | | | |
| 3-3 Monitoring | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ |

**Table 6.2-7 Prioritization of Production Improvement Approach**

| Approach: Components | Agencies: Role | Agencies: Ability | Relation to the objective | Estimated cost | Remarks |
|---|---|---|---|---|---|
| **6. Production :** *to improve knowledge on farm budgeting, farming, crop planning, to obtain good seedling, produce good quality products, control production by crop planning, to promote product processing* | | | | | |
| Cropping in suitable land in terms of climate, topography and soil quality (kind of zoning) and also the market demand | DOAE | Implement training | 3 | 2 | Farmers don't follow the advice. |
| | LDD | Research and transfer | - | - | |
| | DOA | Research and transfer | - | - | - |
| | Institute of Agri-academy | Research and transfer | - | - | |
| Products are produced in good quality (Training) | DOAE, LDD | Implement training | | | Training is necessary |
| | DOA | Implement training | | | |
| | D of Internal Trade | Control the quality of Agr. product | 2 | 3 | |
| | O of Standard Control | Quality control | 3 | 3 | |
| | Export promotion | Give advice | 2 | 2 | 125 B/P/D |
| | PAO | | 3 | 3 | |
| | TAO | Coordination | | | |
| | M of Public Health | Inspect chemical contaminations | | | |
| Farmers' groups are established & functioning | Coop. Promotion | Establish cooperatives | -,2,3,- | -,2,3,- | No expenditure |
| | DOAE | Establish groups | | | Raise quality of mango & vegetables as teaching mutually in the groups |
| Making crop production plan (Publish brochure) and meet the market demand (farmer registration, farm budgeting) | DOAE | Implement training<br>Collect the farmer work plan | | | - |
| | D of Export promotion | Give advice,Public relation | 2 | 2 | Although DOAE has already made a plan, it does not consider market. Therefore, farmers don't follow the plan. DOAE needs more publication. |
| | DOA | Research and technology transfer | 3 | 3 | Half day meeting and training for planning are necessary. |
| | TAO | Coordination | 3 | 2 | MU is just established in May 2003 |
| | Mobile Unit (MU) | Implement training | 3 | 2 | |
| | LDD | Research and technology transfer | | | |
| Cash crops and feed crops are more product | DOA | Research | - | - | |
| | DOAE | Implement training | - | - | Private sector researches and produces babycorn seeds, which are used for cash & feed crops. |
| | DOL | Implement (livestock) | 2, - | 2, - | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Training in farming, fertilizer make and application, from budgeting are provided | DOAE | Implement training | - | - | | Mobile Unit(MU) promotes a production system in 3 Ampho such as Chom Bueng, Suan Phueng and Ban Kha<br>Rice & crops need 5rai/plot.<br>Vegetable need 1rai/plot for training & demonstration |
| | DOA | Research | - | - | | |
| | LDD | Implement training | 2 | 3 | | |
| | D of coop. Audit | Implement training (farm budgeting) | 3 | 2 | | |
| Products are more processed | DOAE | | - | - | | Training and pilot project are needed. 1 product/1 Tambon is cassava wine, shoes, silk, sweet potato dessert, etc. |
| | CDD | | - | - | | |
| | D of Industrial Works | | 2 | 2 | | |
| | Ag. Academy institute | | 3 | 1 | | |
| Seedlings & seeds are stored properly (Training at farmers' storages) | DOA | Research | 2 | 2. | 125 B/P/D | Farmers tend to keep hybrid-seeds for long time to use in following year because there are very expensive. |
| | DOAE (TTC) | Implement training | 3 | 2 | | |
| | LDD | Research | 2 | 3 | | |
| | MU | Implement training | - | - | | |
| | Coop. promotion | Coodination/Implement | | | | |
| | Private company | Coodination/Implement | | | | |
| | TAO | Coordinate/finding source for storage | | | | |

**Priorities of the activities**

To improve the productivities and selling prices of crops, the priorities shall be placed on the extension activities for making a crop production plan which is suitable to the area and for improving crops' quality. Agencies need to consider the market prices in selection of the crops. After the crops are selected, the farmers shall be organized and strengthened to extend the technologies and knowledge obtained to other farmers. The storage conditions of seeds and seedlings shall be improved in the short to mid term.

**Note : 0 = More Lower 1 = Lower 2 = Medium 3 = Higher**

**Figure 6.2-7 Implementation Plan of Production Improvement Approach**

| Component | Short Term | | | Mid Term | | | | | Long Term | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sub-Components | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1. Products are produced in good quality. 2. A crop production plan is prepared, and crops are grown according to the plan. | | | | | | | | | | | | | | | | | | | | |
| 1,2-1 Survey is conducted to assess the characteristics of the areas. | ━ | ━ | | | | | | | | | | | | | | | | | | |
| 1,2-2 Market information is collected. | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | | | | | | | | | | | | |
| 1,2-3 A crop production plan is prepared. | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | | | | | | | | | | | | |
| 1,2-4 Meetings for making an action plan are conducted with the farmers. | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | | | | | | | | | | | | |
| 1,2-5 Lectures are given to the farmers. | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | | | | | | | | | | | | |
| 1,2-6 Demonstration plots are made. | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | | | | | | | | | | | | |
| 1,2-7 Study tours are conducted. | | ━ | | ━ | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| 3. Farmers are organized and strengthened by each crop. | | | | | | | | | | | | | | | | | | | | |
| 3-1 Based on the results of market information , farmers are organized through meetings and discussions. | ━ | ━ | ━ | | | | | | | | | | | | | | | | | |
| 3-2 Training are provided to the members on crop production, farm budgeting and crop processing. | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| 4. Seeds and seedlings are stored properly. | | | | | | | | | | | | | | | | | | | | |
| 4-1 Lectures are given to the farmers. | ━ | ━ | ━ | | | | | | | | | | | | | | | | | |
| 4-2 Study tours are conducted. | ━ | ━ | | | | | | | | | | | | | | | | | | |
| 4-3 Storages are built. | | ━ | ━ | ━ | ━ | ━ | ━ | ━ | | | | | | | | | | | | |

**Table 6.2-8 Prioritization of Water Resource Development Approach**

| Approach Components | Agencies | Role | Ability | Relation to the objective | Estimated cost | Remarks |
|---|---|---|---|---|---|---|
| 7. Water: *to ensure sufficient water for production* | | | | | | |
| Irrigation System .Transmission pipeline from reservoir to every farm plot | RID/WRD<br>LDD<br>TAO | Construct<br>Construct<br>Construct | 3<br>3<br>3<br>3 | 3<br>3<br>2<br>3 | 15,000B/rai | For Tha Koei project (medium) at Ban Bueng, 172MB are estimated to construct main pipeline (exclude at farm level) to irrigate 10,000rai of farmland. |
| Dredging sediment in natural creek | TAO | Implement | 3, -,3, - | 3, -,3, - | 20B/m3 by machine | |
| Small reservoir | WRD<br>LDD<br>TAO | Policy planning<br>Construct<br>Land acquisition | 3, -<br>3, 3 | 2, -<br>3, 3 | | Farmers are responsible to construct distribution canal.<br>Farmes will provide their own land of about 20 rai for construction. |
| Farm Pond | RID<br>WRD<br>TAO<br>Coop promotion<br>LDD<br>ALRO<br>DOAE | >5rai: Land could be donated by land owners(no cost sharing)<br>Implement<br>1-2 rai at farmer's land<br>5,000B/rai of cost sharing is required from land owner<br>At farmers' land<br>Land reform area only<br>At farmer's land. Farmers have to make a group composed with at least 10HH. Each HH should pay 9,000B/pond | -<br>3<br>3<br>3 | -<br>3<br>3<br>3 | 2MB/5rai for RID, 20x40x3m for DOAE | Various agencies are concerned.<br>Farmers should construct distribution canal.<br>Ponds are for Ag. & domestic use. |
| Weir | DWR<br>LDD<br>TAO | Construct (mid & small)<br>Construct<br>Construct & coordinate land acquisitions | 3<br>3<br>3<br>3 | 2<br>3<br>3<br>3 | Depend on detailed design- | Big-scale: RID<br>Mid.-scale: RID, LDD<br>Small-scale: TAO, LDD, DWR<br>Farmers are responsible for the construction of pumping stations & canal. |
| Electric pump stations are built | RID<br>TAO | Construct<br>Land Acquisition | -,3<br>-,3 | -,3<br>-,3 | 4-5MB without distribution system | Farmers are willing to pay 90B/rai for operation cost |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Dug well or borehole | TAO | Implement | -, - | -, -, | 100,000-200,000B/ | Borehole:40-60 m |
| | | GWRD | Implement | 3, 3 | 3, 3 | borehole, | Shallow: 10-15 m |
| | | ALRO | Implement (land reform area) | | | 30,000B/shallow | |
| | Dredging sediment in reservoir, pond or canal | TAO, RID | Implement | 3 | 3 | 20B/m3 | This activity is anyway done by TAO or RID |
| | | LDD | Implement | 2 | 2 | | |
| | | PAO | Implement | 3 | 2 | | |
| | | | | 3 | 3 | | |

**Priorities of the activities**

The priorities shall be considered after approximate costs are estimated, cost-benefit analysis is done, and government priorities are confirmed. Villagers have to share for some expenditures.

**Note : 0 = More Lower 1 = Lower 2 = Medium 3 = Higher**

**Figure 6.2-8 Implementation Plan of Water Resource Development Approach**

| Component | Short Term | | | Mid Term | | | | | Long Term | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sub Component | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1. Medium scale reservoirs& weirs | | | | | | | | | | | | | | | | | | | | |
| 2. Small scale reservoirs & weirs | | | | | | | | | | | | | | | | | | | | |
| 3. Weirs by TAO | | | | | | | | | | | | | | | | | | | | |
| 4. Ponds by TAO | | | | | | | | | | | | | | | | | | | | |
| 5. Irrigation system and Transmission pipeline system | | | | | | | | | | | | | | | | | | | | |
| 6. Dredging sediment | | | | | | | | | | | | | | | | | | | | |
| 6.1 Reservoirs/ponds | | | | | | | | | | | | | | | | | | | | |
| 6.2 Natural creeks/canals | | | | | | | | | | | | | | | | | | | | |
| 7. Well | | | | | | | | | | | | | | | | | | | | |
| 7.1 Dug wells by TAO | | | | | | | | | | | | | | | | | | | | |
| 7.2 Bore holes by TAO | | | | | | | | | | | | | | | | | | | | |
| 8. Electric pump stations | | | | | | | | | | | | | | | | | | | | |

## Figure 6.2-8(1) Implementation Plan of Medium Scale Reservoirs proposed by RID

Million Bt

| Water Resources Facilities | Prio. | st. Sched. | Short Term | | | Medium Term | | | | | Long Term | | | | | | | | | | | ST | MT | LT | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | | | | |
| **Medium Scale Dam** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Upstream** | 4 | | | | | | | | | | | | | | | | | | | | | | 0.0 | 117.7 | 96.0 | 213.7 |
| Lower Huai Tha Khoei Reservoir* | 7 | 2008 | | | | | | | | | | | | | | | | | | | | | | 63.0 | | 63.0 |
| Pa Chi Resevoir* | 9 | 2010 | | | | | | | | | | | | | | | | | | | | | | 30.0 | 33.0 | 63.0 |
| Upper Lam Pa Chi | 11 | 2007 | | | | | 24.7 | | | | | | | | | | | | | | | | | 24.7 | | 24.7 |
| Lower Lam Pa Chi* | 12 | 2017 | | | | | | | | | | | | | | | | | | | | | | | 63.0 | 63.0 |
| **Middle Upstream** | 4 | | | | | | | | | | | | | | | | | | | | | | 84.1 | 129.7 | 49.0 | 262.8 |
| Ban Bo Reservoir* | 6 | 2007 | | | | | | | | | | | | | | | | | | | | | | 63.0 | | 63.0 |
| Ban Tun Laem Reservoir* | 8 | 2009 | | | | | | | | | | | | | | | | | | | | | | 42.0 | 21.0 | 63.0 |
| Ban Huai Khalum Reservoir | 10 | 2004 | 49.7 | 34.1 | 0.3 | | | | | | | | | | | | | | | | | | 84.1 | | | 84.1 |
| Huai Nam Khun | 13 | 2018 | | | | 24.7 | 28.0 | | | | | | | | | | | | | | | | | 24.7 | 28.0 | 52.7 |
| **Downstream** | 1 | | | | | | | | | | | | | | | | | | | | | | 42.0 | 21.0 | | 63.0 |
| Huai Lam Si Siat Reservoir* | 2 | 2004 | | | | | | | | | | | | | | | | | | | | | 42.0 | 21.0 | | 63.0 |
| Total | 9 | | | | 2 | | | | | 6 | | | | | | | | | | | | 1 | 126.1 | 268.4 | 145.0 | 539.5 |

* The construction cost is adopted the average value in 15dams in Ratchaburi Province estimated by RID 13 regional office.



## Figure 6.2-8(2) Implementation Plan of Small Scale Reservoirs & Weirs proposed by RID

| Water Resources Facilities | Prio. | st. Sched. | Short Term | | | Medium Term | | | | | Long Term | | | | | | | | | | | ST | MT | LT | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | | | | |
| **Middle Upstream** | 2 | | | | | | | | | | | | | | | | | | | | | | 5.0 | 2.8 | 0.0 | 7.8 |
| Ban Phu Takian Reservoir | 3 | 2005 | | | | | | | | | | | | | | | | | | | | | 4.4 | | | 4.4 |
| Ban Phu Kan Reservoir | 5 | 2006 | | | | | | | | | | | | | | | | | | | | | 0.6 | 2.8 | | 3.4 |
| **Middle Downstream** | 3 | | | | | | | | | | | | | | | | | | | | | | 21.6 | | 0.0 | 21.6 |
| Huai Phu Mhen Reservoir* | 1 | 2004 | | | | | | | | | | | | | | | | | | | | | 7.2 | | | 7.2 |
| Huai Hin Dance Weir* | 2 | 2004 | | | | | | | | | | | | | | | | | | | | | 7.2 | | | 7.2 |
| Ban Nong Pak Dong Reservoir* | 4 | 2005 | | | | | | | | | | | | | | | | | | | | | 7.2 | | | 7.2 |
| **Downstream** | 4 | | | | | | | | | | | | | | | | | | | | | | 16.0 | 4.0 | 0.0 | 20.0 |
| Huai Sam Phao Tong Weir* | 1 | 2004 | | | | | | | | | | | | | | | | | | | | | 5.0 | | | 5.0 |
| Ban Pu Tei Reservoir* | 3 | 2005 | | | | | | | | | | | | | | | | | | | | | 5.0 | | | 5.0 |
| Ban Nern Sa Wun Reservoir* | 4 | 2005 | | | | | | | | | | | | | | | | | | | | | 5.0 | | | 5.0 |
| Ban Wang Phla Reservoir* | 5 | 2006 | | | | | | | | | | | | | | | | | | | | | 1.0 | 4.0 | | 5.0 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total | 9 | | | | 7 | | | | | 2 | | | | | | | | | | | | 0 | 42.6 | 6.8 | 0.0 | 49.4 |

* Construction costs are estimated by Invento for Water Resources in Lam Pa Chi River Basin by RID

## Figure 6.2-8(3) Implementation Schedule of Weirs

| Name of Project / Tambon | Nos. | Short Term | | | Medium Term | | | | | Long Term | | | | | | | | | | | | Construction cost Million Bt | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | ST | MT | LT | Total |
| **Ratchaburi Province** | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Upstream** | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1) Ban Bueng | 5 | | | | | | | | 4 | 1 | | | | | | | | | | | 1 | 160 | 40 | 0 | 200.0 |
| 2) Ban Kha | 3 | | | | | | | | 2 | 1 | | | | | | | | | | | 1 | 0 | 70 | 35 | 105.0 |
| 3) Ta Nao Si | 2 | ..... | | 2 | | | | | | | | | | | | | | | | | | 55 | | | 55.0 |
| 4) Nong Phan Chan | 3 | | | | | | | | 3 | | | | | | | | | | | | | | 120 | 0 | 120.0 |
| 5) Yang Hak | 4 | | | 2 | | | | | 2 | | | | | | | | | | | | | 40 | 40 | 0 | 80.0 |
| **Sub Total in Upstream Basin** | 17 | | | | 4 | | | | | | | | | 11 | | | | | | | 2 | 255.0 | 270.0 | 35.0 | 560.0 |
| **Middle-upstream** | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6) Suan Phueng | 5 | ..... | | 3 | 2 | | | | 2 | | | | | | | | | | | | | 132 | 88 | 0 | 220.0 |
| 7) Tha Khoei | 7 | | | | | | | | 5 | | 2 | | | | | | | | | | 2 | 0 | 200 | 80 | 280.0 |
| 8) Pa Wai | 8 | | | | | | | | 4 | | | | | | 4 | | | | | | 4 | 0 | 75 | 75 | 150.0 |
| **Sub Total in Middle-Upstream Basin** | 20 | | | | 3 | | | | | | | | | 11 | | | | | | | 6 | 132.0 | 363.0 | 155.0 | 650.0 |
| **Middle-Downstream** | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9) Dan Thap Tako | 2 | | | 1 | 1 | | | | 1 | | | | | | | | | | | | | 40 | 40 | 0 | 80.0 |
| 10) Rang Bua | 3 | | | | | 3 | | | 3 | | | | | | | | | | | | | 0 | 40 | 0 | 40.0 |
| 11) Kaem On | 4 | | | 2 | | | | | 2 | | | | | | | | | | | | | 23 | 22 | 0 | 45.0 |
| 12) Boek Phrai | 2 | | | | | 2 | | | 2 | | | | | | | | | | | | | 0 | 15 | 0 | 15.0 |
| **Sub Total in Middle-Downstr. Basin** | 11 | | | | 3 | | | | | | | | | 8 | | | | | | | 0 | 62.5 | 116.5 | 0.0 | 180.0 |
| **Total in Ratchaburi** | 48 | | | | 10 | | | | | | | | | 30 | | | | | | | 8 | 449.5 | 749.5 | 190.0 | 1390.0 |
| **Kanchanaburi Province** | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Downstream** | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13) Nong Phai | 3 | | 1 | | | | | | 2 | | | | | | | | | | | | | 8 | 17 | 0 | 25.0 |
| 14) Dan Makham Tia | 33 | | 4 | | | | | | 8 | | | | | | 21 | | | | | | 21 | 9 | 19 | 50 | 78.0 |
| 15) Chorakhe Phuek | 10 | | 1 | | | | | | 3 | | | | | | 6 | | | | | | 6 | 15 | 45 | 90 | 150.0 |
| 16) Klon Do | 1 | | 1 | | | | | | | | | | | | | | | | | | | 25 | 0 | 0 | 25.0 |
| **Sub Total in Kanchanaburi** | 47 | | | | 7 | | | | | | | | | 13 | | | | | | | 27 | 56.8 | 80.6 | 139.6 | 278.0 |
| **Lam Pa Chi Basin in Total** | 95 | | | | 17 | | | | | | | | | 43 | | | | | | | 35 | 506.3 | 830.1 | 329.6 | 1668.0 |

Sourced by each Tambon

Note: ..... On Going Project

## Figure 6.2-8(4) Implementation Schedule of Farm Pond

| Name of Project / Tambon | Type | Nos. | Short Term 1 | 2 | 3 | Medium Term 4 | 5 | 6 | 7 | 8 | Long Term 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | Construction Cost Million Bt ST | MT | Lt | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Ratchaburi Province** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Upstream** | | | | 20 | | | | | | | | | | | | | | | | | | | | | | |
| 1) Ban Bueng | Type-A | 20 | | | | | | | | | | | | | | | | | | | | | 10.0 | | | 10.0 |
| | Type-B | | | 60 | | 20 | | | | | | | | | | | | | | | | | | | | |
| 2) Ban Kha | Type-A | 80 | | | | | | | | | | | | | | | | | | | | | 30.0 | 10.0 | | 40.0 |
| | Type-B | | | 30 | | | | | | | | | | | | | | | | | | | | | | |
| 3) Ta Nao Si | Type-A | 30 | | | | | | | | | | | | | | | | | | | | | 15.0 | | | 15.0 |
| | Type-B | | | 27 | | 13 | | | | | | | | | | | | | | | | | | | | |
| 4) Nong Phan Chan | Type-A | 40 | | | | | | | | | | | | | | | | | | | | | 13.5 | 6.5 | | 20.0 |
| | Type-B | | | 40 | | | | | | | | | | | | | | | | | | | | | | |
| 5) Yang Hak | Type-A | 40 | | | | | | | | | | | | | | | | | | | | | 20.0 | | | 20.0 |
| | Type-B | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sub Total in Upstream Basin | type-A | 210 | | | | 177 | | | | | | | | | | 33 | | | | | | | 88.5 | 16.5 | | 105.0 |
| **Middle-upstream** | | | | 30 | | | | | | | | | | | | | | | | | | | | | | |
| 6) Suan Phueng | Type-A | 30 | | | | | | | | | | | | | | | | | | | | | 15.0 | | | 15.0 |
| | Type-B | | | 25 | | | 25 | | | | | | | | | | | | | | | | | | | |
| 7) Tha Khoei | Type-A | 50 | | | | | | | | | | | | | | | | | | | | | 12.5 | 12.5 | | 25.0 |
| | Type-B | | | 25 | | | 25 | | | | | | | | | | | | | | | | | | | |
| 8) Pa Wai | Type-A | 50 | | | | | | | | | | | | | | | | | | | | | 12.5 | 12.5 | | 25.0 |
| | Type-B | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sub Total in Middle-Upstream Basin | type-A | 130 | | | | 80 | | | | | | | | | | 50 | | | | | | | 40.0 | 25.0 | | 65.0 |
| **Middle-Downstream** | | | | 36 | | | 24 | | | | | | | | | | | | | | | | | | | |
| 9) Dan Thap Tako | Type-A | 60 | | | | | | | | | | | | | | | | | | | | | 18.0 | 12.0 | | 30.0 |
| | Type-B | | | 40 | | | | | | | | | | | | | | | | | | | | | | |
| 10) Rang Bua | Type-A | 40 | | | | | | | | | | | | | | | | | | | | | 20.0 | | | 20.0 |
| | Type-B | | | 30 | | | | | | | | | | | | | | | | | | | | | | |
| 11) Kaem On | Type-A | 30 | | | | | | | | | | | | | | | | | | | | | 15.0 | | | 15.0 |
| | Type-B | | | 30 | | | 20 | | | | | | | | | | | | | | | | | | | |
| 12) Bock Phrai | Type-A | 50 | | | | | | | | | | | | | | | | | | | | | 15.0 | 10.0 | | 25.0 |
| | Type-B | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sub Total in Middle-Downstream Basin | type-A | 180 | | | | 136 | | | | | | | | | | 44 | | | | | | | 68.0 | 22.0 | | 90.0 |
| Sub-Total in Ratchaburi | type-A | 520 | | | | 393 | | | | | | | | | | 127 | | | | | | | 196.5 | 63.5 | | 260.0 |
| **Kanchanaburi Province** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Downstream** | | | | | 60 | | | | | | | | | | | | | | | | | | | | | |
| 13) Nong Phai | Type-A | 60 | | | | | | | | | | | | | | | | | | | | | 3.0 | | | 3.0 |
| | Type-B | | | | 35 | | | | | | | | | | | | | | | | | | | | | |
| 14) Dan Makham Tia | Type-A | 35 | | | | | | | | | | | | | | | | | | | | | 1.8 | | | 1.80 |
| | Type-B | | | | 40 | | | | | | | | | | | | | | | | | | | | | |
| 15) Chorakhe Phuek | Type-A | 40 | | | | | | | | | | | | | | | | | | | | | 2.0 | | | 2.0 |
| | Type-B | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16) Klon Do | Type-A | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Type-B | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sub Total in Kanchanaburi | type-A | 135 | | | | 135 | | | | | | | | | | 0 | | | | | | | 6.8 | | | 6.8 |
| Lam Pa Chi Basin in Total | type-A | 655 | | | | 528 | | | | | | | | | | 127 | | | | | | | 203.3 | 63.5 | | 266.8 |

Sourced by each Tambon

## Figure 6.2-8(5) Implementation Schedule of Irrigation System under the Dams and Weirs constructed by RID

| Name of Project / Tambon | | Beneficial Area (rai) | (ha) | Short Term 1 | 2 | 3 | Medium Term 4 | 5 | 6 | 7 | 8 | Long Term 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | Construction Cost Million Bt ST | MT | LT | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Ratchaburi Province** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Small Scale: Less 10 MCM | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Upstream** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **1) Ban Bueng** | | 6,000 | 960 | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Huai Lum Pa Reservoir | R | 600 | 96 | | | | | | | | | | | | | | | | | | | | | | 3.5 | | 3.5 |
| 2. Pog Kra Ting Bon Reservoir | R | 700 | 112 | | | | | | | | | | | | | | | | | | | | | | 4.0 | | 4.0 |
| 3. Pu Ta Kian Reservoir | R | 1,000 | 160 | | | | | | | | | | | | | | | | | | | | | | 3.5 | | 3.5 |
| 4. Huai Ma Krud Reservoir | R | 300 | 48 | | | | | | | | | | | | | | | | | | | | | | | | |
| 5. Ban Dong Yang Reservoir | R | 800 | 128 | | | | | | | | | | | | | | | | | | | | | | | 5.0 | 5.0 |
| 6. Ban Huai Nam Sai Reservoir | R | 1,300 | 208 | | | | | | | | | | | | | | | | | | | | | | | 5.0 | 5.0 |
| 7. Pong Krathing Reservoir | R | 700 | 112 | | | | | | | | | | | | | | | | | | | | | | 6.0 | | 6.0 |
| 8. Ban Rong Charoen Reservoir | R | 600 | 96 | | | | | | | | | | | | | | | | | | | | | | | 4.0 | 4.0 |
| **2) Ban Kha** | | 3,661 | 586 | | | | | | | | | | | | | | | | | | | | | | | | |
| 9. Ban Hu Key Lek Reservoir | R | 250 | 40 | | | | | | | | | | | | | | | | | | | | | | 5.0 | | 5.0 |
| 10. Ban Bueng Tai Reservoir | R | 200 | 32 | | | | | | | | | | | | | | | | | | | | | | 3.0 | | 3.0 |
| 11. Ban Bueng Nua Reservoir | R | 600 | 96 | | | | | | | | | | | | | | | | | | | | | | 3.0 | | 3.0 |
| 12. Nong Nam Kum Reservoir | R | 1,911 | 306 | | | | | | | | | | | | | | | | | | | | | | | 6.0 | 6.0 |
| 13. Huai Sai Reservoir | R | 300 | 48 | | | | | | | | | | | | | | | | | | | | | | | | - |
| 14. Huai Ma-had Weir | W | 400 | 64 | | | | | | | | | | | | | | | | | | | | | | | | - |
| **3) Ta Nao Si** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15. Huai Bo Wi Reservoir | W | 355 | 57 | | | | | | | | | | | | | | | | | | | | | 15.0 | | | 15.0 |
| **4) Nong Phan Chan** | | 2,050 | 328 | | | | | | | | | | | | | | | | | | | | | | | | |
| 16. (Upper) Huai Ma-had Tributary Reservoir | R | 800 | 128 | | | | | | | | | | | | | | | | | | | | | 3.0 | | | 3.0 |
| 17. (Lower) Huai Ma-had Tributary Reservoir | R | Dmestic | - | | | | | | | | | | | | | | | | | | | | | 6.5 | | | 6.5 |
| 18. Ban Tung Mu Ploi Reservoir | R | 1,250 | 200 | | | | | | | | | | | | | | | | | | | | | 6.5 | | | 6.5 |
| **5) Yang Hak** | | - | - | | | | | | | | | | | | | | | | | | | | | | | | |
| Sub Total in Upstream Basin | | 12,066 | 1,931 | | | | 4 | | | 7 | | | | | | | | | | | | | | 31.0 | 28.0 | 20.0 | 79.0 |
| **Middle-upstream** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **6) Suan Phueng** | | 4,970 | 795 | | | | | | | | | | | | | | | | | | | | | | | | |
| 19. Ban Tako Lang 2 Resrvoir | R | 470 | 75 | | | | | | | | | | | | | | | | | | | | | 4.0 | | | 4.0 |
| 20. Ban Tung Fek Weir | W | 4,500 | 720 | | | | | | | | | | | | | | | | | | | | | | | | |
| **7) Tha Khoei** | | 250 | 40 | | | | | | | | | | | | | | | | | | | | | | | | |
| 21. Ban Tung Ya Reservoir | R | 250 | 40 | | | | | | | | | | | | | | | | | | | | | | 4.0 | | 4.0 |
| **8) Pa Wai** | | 2,000 | 320 | | | | | | | | | | | | | | | | | | | | | | | | |
| 22. Huai Kra Chai Reservoir | R | 1,000 | 160 | | | | | | | | | | | | | | | | | | | | | 6.5 | | | 6.5 |
| 23. Ban Tung Sara Reservoir | R | 1,000 | 160 | | | | | | | | | | | | | | | | | | | | | | 6.5 | | 6.5 |
| Sub Total in Middle-Upstream Basin | | 7,220 | 1,155 | | | | 2 | | | 2 | | | | | | | | | | | | | | 10.5 | 10.5 | 0.0 | 21.0 |
| **Middle-Downstream** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **9) Dan Thap Tako** | | 1,300 | 208 | | | | | | | | | | | | | | | | | | | | | | | | |
| 24. Huai Ali Lieu Reservoir | R | 100 | 16 | | | | | | | | | | | | | | | | | | | | | | 5.0 | | 5.0 |
| 25. Rang Kai nao Reservoir | R | 1,200 | 192 | | | | | | | | | | | | | | | | | | | | | | 6.0 | | 6.0 |
| **10) Rang Bua** | | - | - | | | | | | | | | | | | | | | | | | | | | | | | |
| **11) Kaem On** | | 5,180 | 829 | | | | | | | | | | | | | | | | | | | | | | | | |
| 26. Nong Pak Chad Reservoir | R | 180 | 29 | | | | | | | | | | | | | | | | | | | | | 4.0 | | | 4.0 |
| 27. Huai Ta Chang Weir | W | 5,000 | 800 | | | | | | | | | | | | | | | | | | | | | 8.0 | | | 8.0 |
| **12) Bock Phrai** | | - | - | | | | | | | | | | | | | | | | | | | | | | | | |
| Sub Total in Middle-Downstream Basin | | 6,480 | 1,037 | | | | 2 | | | 2 | | | | | | | | | | | | | | 12.0 | 11.0 | 0.0 | 23.0 |
| Small Scale Total in Ratchaburi | | 25,766 | 4,123 | | | | 8 | | | 11 | | | | | | | | | | | | | | 53.5 | 49.5 | 26.0 | 123.0 |

| Name of Project / Tambon | | Beneficial Area (rai) | (ha) | Short Term 1 | 2 | 3 | Medium Term 4 | 5 | 6 | 7 | 8 | Long Term 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | Construction Cost Million Bt ST | MT | LT | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Medium Scale:10 - 100 MCM | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **1) Ban Bueng** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 28. Tha Khoei Reservoir | R | 10,000 | 1,600 | | | | | | | | | | | | | | | | | | | | | 86.0 | 86.0 | | 172.0 |
| **7) Tha Khoei** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 29. Chat Pa Wai Reservoir | R | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Huai Klum Weir irrigation System, King's Project | | 1,200 | 192 | | | | | | | | | | | | | | | | | | | | | 94.8 | | | 94.8 |
| Medium Scale Total in Ratchaburi Province | | 11,200 | 1,792 | | | 2 | | | | | 0 | | | | | | | | | | | | | 180.8 | 86.0 | | 266.8 |
| **Kanchanaburi Province (Small Scale only)** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Downstream** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **13) Nong Phai** | | 1,000 | 160 | | | | | | | | | | | | | | | | | | | | | | | | |
| 30. Ban Ta Payom Weir | W | 1,000 | 160 | | | | | | | | | | | | | | | | | | | | | | | | |
| **14) Dan Makham Tia** | | 2,800 | 448 | | | | | | | | | | | | | | | | | | | | | | | | |
| 31. Huai Pong Nok Reservoir | R | 500 | 80 | | | | | | | | | | | | | | | | | | | | | | | | |
| 32. Huai Lam Khlung 1 Weir | W | 800 | 128 | | | Rehabilitation | | | | | | | | | | | | | | | | | | 7.7 | | | 7.7 |
| 33. Huai Lam Khlung 2 Weir | W | 500 | 80 | | | Rehabilitation | | | | | | | | | | | | | | | | | | | | | |
| 34. Huai Lam Khlung 3 Weir | W | 300 | 48 | | | Rehabilitation | | | | | | | | | | | | | | | | | | | | | |
| 35. Huai Lam Khlung 4 Weir | W | 200 | 32 | | | Rehabilitation | | | | | | | | | | | | | | | | | | | | | |
| 36. Huai Lam Khlung 5 Weir | W | 200 | 32 | | | Rehabilitation | | | | | | | | | | | | | | | | | | | | | |
| 37. Huai Lam Khlung 6 Weir | W | 300 | 48 | | | Rehabilitation | | | | | | | | | | | | | | | | | | | | | |
| **15) Chorakhe Phuek** | | 2,500 | 400 | | | | | | | | | | | | | | | | | | | | | | | | |
| 38. Huai Lam Khlung Reservoir | R | 300 | 48 | | | | | | | | | | | | | | | | | | | | | | | | |
| 39. Huai Lam Khlung 7 Weir | W | 300 | 48 | | | Rehabilitation | | | | | | | | | | | | | | | | | | | | | |
| 40. Huai Lam Khlung 8 Weir | W | 300 | 48 | | | Rehabilitation | | | | | | | | | | | | | | | | | | | | | |
| 41. Huai Lam Khlung 9 Weir | W | 500 | 80 | | | Rehabilitation | | | | | | | | | | | | | | | | | | | | | |
| 42. Huai Lam Khlung 10 Weir | W | 300 | 48 | | | Rehabilitation | | | | | | | | | | | | | | | | | | | | | |
| 43. Huai Lam Khlung 11 Weir | W | 300 | 48 | | | Rehabilitation | | | | | | | | | | | | | | | | | | | | | |
| 44. Huai Nong Bua Weir | W | 500 | 80 | | | | | | | | | | | | | | | | | | | | | | | | |
| **16) Klon Do** | | - | - | | | | | | | | | | | | | | | | | | | | | | | | |
| Sub Total in Downstream Basin | | 6,300 | 1,008 | | | 11 | | | | | | | | | | | | | | | | | | 7.7 | | | 7.7 |
| Small Scale Dams and Weirs in Total | | 32,066 | 5,131 | | | 19 | | | | | 11 | | | | | | | | | | | | | 61.2 | 49.5 | 26.0 | 130.7 |
| Medium Scale Dams and Weirs in Total | | 11,200 | 1,792 | | | 2 | | | | | 0 | | | | | | | | | | | | | 180.8 | 86.0 | 0.0 | 266.8 |

Sourced by each RID Provincial Office

## Figure 6.2-8(6) Implementation Schedule of Dredging

| Name of Project / Tambon | Place | Short Term 1.0 | 2.0 | 3.0 | Medium Term 4.0 | 5.0 | 6.0 | 7.0 | 8.0 | Long Term 9.0 | 10.0 | 11.0 | 12.0 | 13.0 | 14.0 | 15.0 | 16.0 | 17.0 | 18.0 | 19.0 | 20.0 | Construction Cost Million Bt ST | MT | LT | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Ratchaburi Province** | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Upstream** | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1) Ban Bueng | 28 | | 6 | | | | 10 | | | | | | | | | | | 12 | | | | 21.4 | 35.7 | 42.9 | 100.0 |
| 2) Ban Kha | 16 | | | | | | 16 | | | | | | | | | | | | | | | | 15.0 | | 15.0 |
| 3) Ta Nao Si | 9 | | 2 | | | | 4 | | | | | 3 | | | | | | | | | | 1.7 | 3.3 | 2.5 | 7.5 |
| 4) Nong Phan Chan | 6 | | 3 | | | | | | | | | | | | 3 | | | | | | | 4.3 | 0.0 | 5.7 | 10.0 |
| 5) Yang Hak | 5 | | | | | | 3 | | | | | | | | | | 2 | | | | | 0.0 | 4.8 | 3.2 | 8.0 |
| **Sub Total in Upstream Basin** | **64** | | | **11** | | | | | **33** | | | | | | | | | | | | **20** | **27.4** | **58.8** | **54.2** | **140.5** |
| **Middle-upstream** | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6) Suan Phueng | 8 | | | | | | | 3 | | | | | | | 3 | | | | | | 2 | 0.0 | 4.5 | 7.5 | 12.0 |
| 7) Tha Khoei | 7 | | | | | 2 | | | | | | | 2 | | | | | | | 2 | | 0.0 | 3.4 | 8.6 | 12.0 |
| 8) Pa Wai | 6 | | | | | | | | 2 | | | | | | | 2 | | | | | 2 | 0.0 | 4.0 | 6.0 | 10.0 |
| **Sub Total in Middle-Upstream Basin** | **21** | | | **0** | | | | | **7** | | | | | | | | | | | | **14** | **0.0** | **11.9** | **22.1** | **34.0** |
| **Middle-Downstream** | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9) Dan Thap Tako | 6 | | | 1 | 1 | | | | | | | 2 | | | | | | | 2 | | | 1.3 | 1.3 | 5.4 | 8.0 |
| 10) Rang Bua | 5 | | | | | 2 | | | | | | | 2 | | | | | | | 1 | | 0.0 | 4.8 | 7.2 | 12.0 |
| 11) Kaem On | 4 | | | | | | 1 | | | | | | | 1 | | | | | | | 2 | 0.0 | 3.8 | 11.2 | 15.0 |
| 12) Boek Phrai | 5 | | | | | | | | 3 | | | | | | | 2 | | | | | | 0.0 | 4.8 | 3.2 | 8.0 |
| **Sub Total in Middle-Downstream Basin** | **20** | | | **1** | | | | | **7** | | | | | | | | | | | | **12** | **1.3** | **14.7** | **27.0** | **43.0** |
| **Sub Total in Rachaburi** | **105** | | | **12** | | | | | **47** | | | | | | | | | | | | **46** | **28.8** | **85.6** | **103.2** | **217.5** |
| **Kanchanaburi Province** | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Downstream** | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13) Nong Phai | 7 | | 1 | | | | 2 | | | | | | | | 4 | | | | | | | 7.1 | 14.3 | 28.6 | 50.0 |
| 14) Dan Makham Tia | 33 | | 5 | | | | 8 | | | | | | | | 20 | | | | | | | 7.5 | 12.0 | 30.0 | 49.5 |
| 15) Chorakhe Phuek | 3 | | 1 | | | | 1 | | | | | | | | 1 | | | | | | | 10.0 | 10.0 | 10.0 | 30.0 |
| 16) Klon Do | | | | | | | | | | | | | | | | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 |
| **Sub Total in Kanchanaburi** | **43** | | | **7** | | | | | **11** | | | | | | | | | | | | **25** | **24.6** | **36.3** | **68.6** | **129.5** |
| **Lam Pa Chi Basin in Total** | **148** | | | **19** | | | | | **58** | | | | | | | | | | | | **71** | **53.4** | **121.8** | **171.8** | **347.0** |

Sourced by each Tambon, Dreding cost is estimated at 20Bhat/$m^3$

## Figure 6.2-8(7) Implementation Schedule of Wells

| Name of Project / Tambon | | Type | Short Term Nos | 1 | 2 | 3 | Medium Term 4 | 5 | 6 | 7 | 8 | Long Term 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | Construction Cost Mill. Bt ST | MD | LT | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Ratchaburi Province** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Upstream** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1) Ban Bueng | Shallow | Type-A | 10 | | 10 | | | | | | | | | | | | | | | | | | | 1.0 | | | 1.0 |
| | Shallow | Type-B | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Deep | - | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2) Ban Kha | Shallow | Type-A | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Shallow | Type-B | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Deep | - | 10 | | 10 | | | | | | | | | | | | | | | | | | | 2.0 | | | 2.0 |
| 3) Ta Nao Si | Shallow | Type-A | 20 | | 15 | | 5 | | | | 5 | | | | | | | | | | | | | 1.1 | 0.4 | | 1.5 |
| | Shallow | Type-B | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Deep | - | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4) Nong Phan Chan | Shallow | Type-A | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Shallow | Type-B | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Deep | - | 15 | | 15 | | | | | | | | | | | | | | | | | | | 2.5 | | | 2.5 |
| 5) Yang Hak | Shallow | Type-A | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Shallow | Type-B | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Deep | - | 15 | | 15 | | | | | | | | | | | | | | | | | | | 2.5 | | | 2.5 |
| **Sub Total in Upstream Basin** | | | **70** | | | **65** | | | | | **5** | | | | | | | | | | | | **0** | **9.1** | **0.4** | **0.0** | **9.5** |
| | Shallow | Type-A | **30** | | | **25** | | | | | **5** | | | | | | | | | | | | **0** | **2.1** | **0.4** | **0.0** | **2.5** |
| | Shallow | Type-B | **0** | | | **0** | | | | | **0** | | | | | | | | | | | | **0** | **0.0** | **0.0** | **0.0** | **0.0** |
| | Deep | | **40** | | | **40** | | | | | **0** | | | | | | | | | | | | **0** | **7.0** | **0.0** | **0.0** | **7.0** |
| **Middle-upstream** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6) Suan Phueng | Shallow | Type-A | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Shallow | Type-B | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Deep | - | 10 | | 10 | | | | | | | | | | | | | | | | | | | 1.0 | | | 1.0 |
| 7) Tha Khoei | Shallow | Type-A | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Shallow | Type-B | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Deep | - | 5 | | 5 | | | | | | | | | | | | | | | | | | | 0.5 | | | 0.5 |
| 8) Pa Wai | Shallow | Type-A | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Shallow | Type-B | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Deep | - | 20 | | 20 | | | | | | | | | | | | | | | | | | | 2.0 | | | 2.0 |
| **Sub Total in Middle-Upstream Basin** | | | **35** | | | **35** | | | | | **0** | | | | | | | | | | | | **0** | **3.5** | **0.0** | **0.0** | **3.5** |
| | Shallow | Type-A | **0** | | | **0** | | | | | **0** | | | | | | | | | | | | **0** | **0.0** | **0.0** | **0.0** | **0.0** |
| | Shallow | Type-B | **0** | | | **0** | | | | | **0** | | | | | | | | | | | | **0** | **0.0** | **0.0** | **0.0** | **0.0** |
| | Deep | - | **35** | | | **35** | | | | | **0** | | | | | | | | | | | | **0** | **3.5** | **0.0** | **0.0** | **3.5** |
| **Middle-Downstream** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9) Dan Thap Tako | Shallow | Type-A | 20 | | 20 | | | | | | | | | | | | | | | | | | | 1.0 | 0.0 | | 1.0 |
| | Shallow | Type-B | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Deep | - | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10) Rang Bua | Shallow | Type-A | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Shallow | Type-B | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Deep | - | 15 | | 15 | | | | | | | | | | | | | | | | | | | 1.5 | | | 1.5 |

| Name of Project / Tambon | | Type | Short Term Nos. | 1 | 2 | 3 | Medium Term 4 | 5 | 6 | 7 | 8 | Long Term 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | Construction Cost Mill. Bt ST | MD | LT | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11) Kaem On | Shallow | Type-A | 20 | | 12 | | | 8 | | | | | | | | | | | | | | | | 1.2 | 0.8 | 0.0 | 2.0 |
| | Shallow | Type-B | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Deep | - | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12) Boek Phrai | Shallow | Type-A | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Shallow | Type-B | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Deep | - | 20 | | 12 | | | 8 | | | | | | | | | | | | | | | | 1.2 | 0.8 | 0.0 | 2.0 |
| **Sub Total in Middle-Downstream Basin** | | | **75** | | | **59** | | | | | **16** | | | | | | | | | | | | **0** | **4.9** | **1.6** | **0.0** | **6.5** |
| | Shallow | Type-A | **40** | | | **32** | | | | | **8** | | | | | | | | | | | | **0** | **2.2** | **0.8** | **0.0** | **3.0** |
| | Shallow | Type-B | **0** | | | **0** | | | | | **0** | | | | | | | | | | | | **0** | **0.0** | **0.0** | **0.0** | **0.0** |
| | Deep | - | **35** | | | **27** | | | | | **8** | | | | | | | | | | | | **0** | **2.7** | **0.8** | **0.0** | **3.5** |
| **Sub Total in Ratchaburi** | | | **180** | | | **159** | | | | | **21** | | | | | | | | | | | | **0** | **17.5** | **2.0** | **0.0** | **19.5** |
| | Shallow | Type-A | **70** | | | **57** | | | | | **13** | | | | | | | | | | | | **0** | **4.3** | **1.2** | **0.0** | **5.5** |
| | Shallow | Type-B | **0** | | | **0** | | | | | **0** | | | | | | | | | | | | **0** | **0.0** | **0.0** | **0.0** | **0.0** |
| | Deep | - | **110** | | | **102** | | | | | **8** | | | | | | | | | | | | **0** | **13.2** | **0.8** | **0.0** | **14.0** |
| **Kanchanaburi Province** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Downstream** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13) Nong Phai | Shallow | Type-A | 20 | | 20 | | | | | | | | | | | | | | | | | | | 1.0 | | | 1.0 |
| | Shallow | Type-B | | | | | | | | | | | | | | | | | | | | | | 0.0 | | | 0.0 |
| | Deep | - | | | | | | | | | | | | | | | | | | | | | | 0.0 | | | 0.0 |
| 14) Dan Makham Tia | Shallow | Type-A | 5 | | 5 | | | | | | | | | | | | | | | | | | | 0.3 | | | 0.3 |
| | Shallow | Type-B | | | | | | | | | | | | | | | | | | | | | | 0.0 | | | 0.0 |
| | Deep | - | | | | | | | | | | | | | | | | | | | | | | 0.0 | | | 0.0 |
| 15) Chorakhe Phuek | Shallow | Type-A | 20 | | 20 | | | | | | | | | | | | | | | | | | | 1.0 | | | 1.0 |
| | Shallow | Type-B | | | | | | | | | | | | | | | | | | | | | | 0.0 | | | 0.0 |
| | Deep | - | | | | | | | | | | | | | | | | | | | | | | 0.0 | | | 0.0 |
| 16) Klon Do | Shallow | Type-A | | | | | | | | | | | | | | | | | | | | | | 0.0 | | | 0.0 |
| | Shallow | Type-B | | | | | | | | | | | | | | | | | | | | | | 0.0 | | | 0.0 |
| | Deep | - | | | | | | | | | | | | | | | | | | | | | | 0.0 | | | 0.0 |
| **Sub Total in Kanchanaburi** | | | **45** | | | **45** | | | | | **0** | | | | | | | | | | | | **0** | **2.3** | **0.0** | **0.0** | **2.3** |
| | Shallow | Type-A | **45** | | | **45** | | | | | **0** | | | | | | | | | | | | **0** | **2.3** | **0.0** | **0.0** | **2.3** |
| | Shallow | Type-B | **0** | | | **0** | | | | | **0** | | | | | | | | | | | | **0** | **0.0** | **0.0** | **0.0** | **0.0** |
| | Deep | - | **0** | | | **0** | | | | | **0** | | | | | | | | | | | | **0** | **0.0** | **0.0** | **0.0** | **0.0** |
| **Lam Pa Chi Basin in Total** | | | 225 | | | 204 | | | | | 21 | | | | | | | | | | | | 0 | 19.8 | 2.0 | 0.0 | 21.8 |
| | Shallow | Type-A | 115 | | | 102 | | | | | 13 | | | | | | | | | | | | 0 | 6.6 | 1.2 | 0.0 | 7.8 |
| | Shallow | Type-B | 0 | | | 0 | | | | | 0 | | | | | | | | | | | | 0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Deep | - | 110 | | | 102 | | | | | 8 | | | | | | | | | | | | 0 | 13.2 | 0.8 | 0.0 | 14.0 |

Sourced by each tambon

## Figure 6.2-8(8) Implementation Schedule of Electric Pumping Station

| Name of Project / Tambon | Nos | Short Term | | | Medium Term | | | | | Long Term | | | | | | | | | | | | Construction Cost Mill. Bt | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | ST | MT | LT | Total |
| **Ratchaburi Province** | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Upstream** | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1) Ban Bueng | 6 | | | | | | 2 | | | | | | 2 | | | | | | 2 | | | 0.0 | 20.0 | 40.0 | 60.0 |
| 2) Ban Kha | 4 | | | | | | | | 2 | | | | | | 2 | | | | | | | 0.0 | 22.5 | 22.5 | 45.0 |
| 3) Ta Nao Si | 6 | | | | | | 2 | | | | | | 2 | | | | | | 2 | | | 0.0 | 40.0 | 80.0 | 120.0 |
| 4) Nong Phan Chan | 0 | | | | | | | | | | | | | | | | | | | | | | | | 0.0 |
| 5) Yang Hak | 2 | | | | | | | | | | 2 | | | | | | | | | | | 0.0 | 0.0 | 15.0 | 15.0 |
| **Sub Total in Upstream Basin** | **18** | | | **0** | | | | | **6** | | | | | | | | | | | | **12** | **0.0** | **82.5** | **157.5** | **240.0** |
| **Middle-upstream** | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6) Suan Phueng | 4 | | | | | | | | | | 2 | | | | | | | | 2 | | | 0.0 | 0.0 | 50.0 | 50.0 |
| 7) Tha Khoei | 4 | | | | | | | | 2 | | | | | | | | | 2 | | | | 0.0 | 22.5 | 22.5 | 45.0 |
| 8) Pa Wai | 4 | | | | | | | | 2 | | | | | | | | | | 2 | | | 0.0 | 30.0 | 30.0 | 60.0 |
| **Sub Total in Middle-Upstream Basin** | **12** | | | **0** | | | | | **4** | | | | | | | | | | | | **8** | **0.0** | **52.5** | **102.5** | **155.0** |
| **Middle-Downstream** | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9) Dan Thap Tako | 4 | | | | | | 2 | | | | | | | 2 | | | | | | | | 0.0 | 22.5 | 22.5 | 45.0 |
| 10) Rang Bua | 4 | | | | | | | | 2 | | | | | | | | 2 | | | | | 0.0 | 22.5 | 22.5 | 45.0 |
| 11) Kaem On | 4 | | | | | | | | | | 2 | | | | | | | | | 2 | | 0.0 | 0.0 | 45.0 | 45.0 |
| 12) Boek Phrai | 4 | | | | | | | | | | 2 | | | | | | | | | 2 | | 0.0 | 0.0 | 45.0 | 45.0 |
| **Sub Total in Middle-Downstream Basin** | **16** | | | **0** | | | | | **4** | | | | | | | | | | | | **12** | **0.0** | **45.0** | **135.0** | **180.0** |
| **Sub Total in Ratchaburi** | **46** | | | **0** | | | | | **14** | | | | | | | | | | | | **32** | **0.0** | **180.0** | **395.0** | **575.0** |
| **Kanchanaburi Province** | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Downstream** | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13) Nong Phai | 3 | | | 3 | | | | | | | | | | | | | | | | | | 25.0 | 0.0 | 0.0 | 25.0 |
| 14) Dan Makham Tia | 2 | | | 2 | | | | | | | | | | | | | | | | | | 50.0 | 0.0 | 0.0 | 50.0 |
| 15) Chorakhe Phuek | 1 | | | 1 | | | | | | | | | | | | | | | | | | 15.0 | 0.0 | 0.0 | 15.0 |
| 16) Klon Do | 2 | | | 2 | | | | | | | | | | | | | | | | | | 50.0 | 0.0 | 0.0 | 50.0 |
| **Sub Total in Kanchanaburi** | **8** | | | **8** | | | | | **0** | | | | | | | | | | | | **0** | **140.0** | **0.0** | **0.0** | **140.0** |
| **Lam Pa Chi Basin in Total** | **54** | | | **8** | | | | | **14** | | | | | | | | | | | | **32** | **140.0** | **180.0** | **395.0** | **715.0** |

**Table 6.2-9 Prioritization of Flood Protection Approach**

| Approach / Components | Agencies | Role | Ability | Relation to the objective | Estimated cost | REALITY (Within 5 years) Reasons | Remarks |
|---|---|---|---|---|---|---|---|
| 8. Flood: *to reduce damage on crops from flood* | | | | | | | |
| Construction of concrete embankment (especially at river curve) | RID | Construct | - | - | N/A | 2 | Flood comes 5~6times/year at Non Pai |
| | TAO | Construct (Small) | - | - | | Cost is too high | |
| | PAO | | 3 | 3 | | At Non Pai, TAO implemented | |
| | Municipality | | 3 | 3 | | at some places. | |
| Elephant grass/bamboo are grown | LDD | | - | - | Seedling 1.02B/bag 400B/rai | 1 | |
| | TAO | | - | - | | At only some places | |
| | Conservation Forest department | | 2 | 1 | | (Non Pai) | |
| | | | 2 | 1 | | | |

Conclusion of the discussion stage at Downstream Basin: (May 29 to 30, 2003), finalized by the RID and JICA study team on May 30, 2003

**Figure 6.2-9 Implementation Plan of Flood Protection Approach**

| Component / Sub Components | Short Term 1 | 2 | 3 | Mid Term 4 | 5 | 6 | 7 | 8 | Long Term 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Construction of concrete embankment | | | | | | | | | | | | | | | | | | | | |
| 1-1 Feasibility study | | | | ━ | ━ | | | | | | | | | | | | | | | |
| 1-2 Implementation | | | | | | ━ | ━ | ━ | ━ | | | | | | | | | | | |
| 2. Elephant grass/bamboo are grown | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ | ━ |

# Part 2

## *~PILOT PROJECT~*

# CHAPTER 1 INTRODUCTION

This section describes the details of the Pilot Project conducted from October 2003 to November 2004. The Pilot Project was implemented as a part of the preparation of the Master Plan.

## 1.1 Background and Objectives of the Pilot Project

The objectives of the Pilot Project have been 1) to transfer the technologies on participatory development to the community people and the Government officers, 2) to verify the recommended development approaches in the Master Plan, and 3) to obtain "lessons learned" from the implementation processes of the project. The results of the Pilot Project have been reflected to the Master Plan.

For smooth implementation of the Pilot Project, motivation of the community people to participate in the project was regarded as most important. At the proposed Pilot Project sites, the ideas of the project were explained at first by the agencies concerned for making sure the communities agree to have the project. By participating in the project from the planning stage, it was assumed the community people involved have clear understanding on the responsibilities and the roles of the stakeholders. It was also important to identify the leaders to be specifically trained as the 'change agent' for being able to transfer their experiences and knowledge to other farmers. All of those were taken into account to pursue the above objectives, and eventually to assure the sustainability of development activities.

The expected outcomes from the implementation of the Pilot Project were as follows:

(1) The stakeholders understand how participatory development approaches should be applied to similar projects.
(2) The roles and responsibilities of the stakeholders are identified for project planning, monitoring, and evaluation, and for continuation of the project activities.
(3) The effectiveness of the development approaches recommended in the Master Plan is confirmed by verifying the ways to meet the farmers' needs.

## 1.2 Selection of the Project Sites

### 1.2.1 Proposed Pilot Project Sites

**(1) Planned Project Components**

During the preparation of the draft Master Plan, the implementation of the Pilot Project was planned with hard and soft components as follows:

**1) Hard Component**

One of the components of the Pilot Project was planned to be construction or rehabilitation of small scale agriculture/irrigation facilities. The limitation of the budget and the possibility to have immediate effects were considered necessary for the final selection. The expected components were:

- Rehabilitation/construction of small scale weirs
- Small scale pumping station
- Farm ponds
- Shallow wells
- Conveyance canals, such as open canal/pipeline
- Others

**2) Soft Component**

Soft component was to assure that the farmers' incomes be increased hand in hand with hard component. The core problem in the area is regarded as low income and high expenditure from their agricultural activities. The problem is mainly caused by; 1) High cost of agricultural inputs, 2) Low productivities, 3) Low market prices, and 4) Damages on the products. Soft component in the Pilot Project was therefore considered to be as follows:

- To organize farmers' groups such as;
  - Farmers' water users group
  - Cooperative group
  - Production group
- To provide extension services such as;
  - Marketing
  - Disease/ pests control
  - Soil improvement
  - Diversification/Rotation farming
  - Trainings for farmers

**(2) Basis of Selections for the Proposed Pilot Project Sites**

The proposed sites were supposed to meet the following conditions to be selected as the Pilot Project sites. The selection was made through the discussion with TSG and other agencies concerned.

- The area is irrigable throughout the year.
- Because the farmers are responsible for O&M of the project, irrigation facilities to be constructed or rehabilitated are small in size.

- The area is easily accessible for conducting study tours for community people and related agency's personnel concerned.
- People have high needs for project implementation.
- People have strong will to participate in the project.
- Well-performing village organizations exist.
- There is no problem on land acquisition.

**(3) Proposed Pilot Project Sites**

Based on the above objectives, strategies, basis of selections for the project sites and assumed project components, three (3) Pilot Project sites were listed in Ratchaburi and four (4) in Kanchanaburi. The summary of the profiles of the sites are shown below, and the details are shown in Figure 1.2.1 and Table 1.2.2. The summary of the cost estimate at each candidate site is shown in Appendix.

**Table 1.2.1 Proposed Pilot Project Sites**

| Proposed Site | Main components for implementation | Beneficiaries | | Irrigable area (rai) | Cost |
|---|---|---|---|---|---|
| | | HH | people | | MBt |
| **Ratchaburi** | | | | | |
| 1.Upper Huai Mahad Res. | Piped distribution system by gravity | 183 | 780 | 1,300 | 5.01 |
| 2. Tung Moo Ploi Res. | Piped distribution system by gravity | 68 | 233 | 1,250 | 5.38 |
| 3. Huai Yai Lek Weir | Weir ,Outlet with open canal by gravity | 60 | 200 | 1,500 | 10.06 |
| **Kanchanaburi** | | | | | |
| 1. Ban Tha Phayom Weir | Pump with pipeline, Distribution Tower | 80 | 360 | 1,500 | 4.43 |
| 2. Huai Lam Khung 4 Weir | Outlet with pipeline by gravity | 50 | 80 | 500 | 4.97 |
| 3. Huai Sisiat Weir | Weir, Outlet with open canal by gravity | 90 | 145 | 1,350 | 7.38 |
| 4. Huai Lam Khung 9 Weir | Outlet with pipeline by gravity | 55 | 270 | 400 | 4.60 |


**Figure 1.2.1 Location of the Candidate Sites for Pilot Project**

**Table 1.2.2 Summary of the Pilot Project Sites**

**1.1 Ratchaburi**

| Project Name | | Upper Huai Mahad Reservoir | Tung Moo Ploi Reservoir | Huai Yang Lek Weir |
|---|---|---|---|---|
| Location | | Moon 4, Ban Nhong Jok Ban | Moon 9, Ban Tung | Moo47, Ban Pong Kea |
| | | | Moo Ploi | |
| | | TAO, Nong Phan Chan | TAO, Nong PhangChan | TAO Dan Thap Tako |
| | | Amphooe Ban Kha | Amphooe Ban Kha | Amphoe Chom Bueng |
| Coordination | | 47PNQ5011-818 Scale 1:50,000 | 47PNQ461-869 Scale 1:50,000 | 47PNQ465-034 Scale 1:50,000 |
| Beneficiaries | | | | |
| -people | | 780 | 233 | 200 |
| -house hold | | 183 | 68 | 60 |
| Project Area | Rai | | | |
| Irrigation Area | Rai | 1,300 | 1,250 | 1,500 |
| Water Resource | | Reservoir (Existing) | Reservoir (Existing) | Weir (New) |
| Available Water Use | MCM | 0.35 | 0.56 | |
| Dam Scale | m | Height=11.5m, Length=384.1m | H=9.5,L=374.0 | - |
| Beneficiaries | Rai | | | |
| Construction | Year | 1985 | 1995 | - |
| Construction Cost | Bt | 3,726,300 | 11,861,000 | New |
| -Wet Season | $m^3$/sec | | | |
| -Dry Season | $m^3$/sec | | | |
| Irrigation Area | | | | |
| -Wet Season | Rai | 1,300 | 1,250 | 1,500 |
| -Dry Season | Rai | 400 | 380 | 300 |
| Proposed Crops | | Sugarcane, Pineapple, Asparagus, Vegetable | Long Bean, Gourd, Flower Asparagus | Sugarcane, Vegetable |
| Estimation Cost Hard Comp | M. Bt | 4.55 | 4.92 | 9.60 |
| Soft. Comp | M. Bt | 0.46 | 0.46 | 0.46 |
| Total | M. Bt | 5.01 | 5.38 | 10.06 |

**Summary of the Pilot Project Sites (2/2)**

| 1.2 kannchanaburi | | | | | |
|---|---|---|---|---|---|
| **Project Name** | | **Ban Tha Phayom Weir** | **Huai Lam Khung 4** | **Huai Sisiat** | **Huai Lam Khung 9** |
| Location | | Moon 2 | Mu 6, Ban Nong Sa-no | Mu 7, Ban Nong Wai, | Mu 5, Ban Sai Thong |
| | | | Mu 3, Ban Tha Pu | | Mu 9, Ban Pu Krnag |
| | | TAO Nong Phai | TAO Jo-ra-khe-puek, D.M.T. | TAO Dan Makham Tia | TAO Dan Makham Tia |
| | | Amphoe Dan Makaham Tia | Amphoe Dan Makaham Tia | Amphoe Dan Makaham Tia | Amphoe Dan Makaham Tia |
| Coordination | | 47 PNR 451-257, Scale 1:50,000 | 47 PNR 369-305, Scale 1:50,000 | 47 PNR 399-273, Scale 1:50,0 | 47 PNR 314-277, Scale 1:50,000 |
| Beneficiaries | | | | | |
| -people | | 360 | 80 | 145 | 270 |
| -house hold | | 80 | 50 | 90 | 55 |
| Project Area | Rai | 1000 | 500 | 1,350 | 400 |
| Irrigation Area | Rai | 500 | 400 | 1,150 | 350 |
| Water Resource | | Weir/Lam Pa Chi | Weir/Huai Lam Khung | Weir/Huai Sisiat(New) | Weir/Huai Lam Khung |
| Available Water Use | | | | | |
| Weir Scale | m | Height=2.0m, Length=50.0m | Height=2.5m, Length=46.0m | - | Height=2.5m, Length=46.0m |
| Beneficiaries | Rai | | | | |
| Construction | Year | 1985 | 1993 | - | 1995 |
| Construction Cost | Bt | 2,408,000 | 3,423,000 | New | 3,704,000 |
| -Wet Season | $m^3$/sec | | | | |
| -Dry Season | $m^3$/sec | 2.00 | 1.00 | 1.00 | 1.00 |
| Irrigation Area | | | | | |
| -Wet Season | Rai | 500 | 400 | 1150 | 345 |
| -Dry Season | Rai | 300 | 100 | 250 | 100 |
| Proposed Crops | | Sugarcane, Baby Corn, Asparagus, | Sugarcane, Asparagus | Sugarcane, Asparagus | Sugarcane, Asparagus |
| | | Vegitables | Vegetables | Vegetables, Cassava | Vegetables |
| Estimation Cost Hard Comp | M. Bt | 3.97 | 4.51 | 6.92 | 4.14 |
| Soft. Comp | M. Bt | 0.46 | 0.46 | 0.46 | 0.46 |
| Total | M. Bt | 4.43 | 4.97 | 7.38 | 4.60 |

### 1.2.2 Selection of the Pilot Project Sites

**(1) Selection Criteria**

Based on the criteria on the selection of the Pilot Project proposed by the Study Team, the Provincial Offices in RID and TSG members finalized it. The criteria consisted of 11 items as below.

**Table 1.2.3 Selection Criteria for the Pilot Project**

| No | Criteria | Score | | | | | Remarks |
|---|---|---|---|---|---|---|---|
| | | 5 | 4 | 3 | 2 | 1 | |
| 1 | Land is good for farming | | | | | | |
| 2 | Irrigable area having enough water resources as supplemental | | | | | | |
| 3 | Farmers have good knowledge and skill for farming practice | | | | | | |
| 4 | Farmer's group/ organization have existed. | | | | | | |
| 5 | Good condition to demonstrate project's effects to other areas | | | | | | |
| 6 | People are willing to pay for sharing cost in project implementation and O & M costs | | | | | | |
| 7 | No problem on land acquisition | | | | | | |
| 8 | Good accessibility as study tour by rural people and agency's personnel | | | | | | |
| 9 | TSG members are committed to project implementation and willing to participate in project activities. | | | | | | |
| 10 | In order to enhance/establish farmer's organizations, persons with strong leadership should be able to participate | | | | | | |
| 11 | Peoples are willing to participate in project activities including workshops | | | | | | |

**(2) Priorities of the Candidate Sites**

**1) TSG's Recommendation**

Two Pilot Project sites were selected each from Kanchanaburi and Ratchaburi Provinces. The candidate Pilot Project sites were given priorities using the above selection criteria. According to the tables below, Upper Huai Mahad Irrigation Project in Ratchaburi obtained the highest score of 50.25 as well as Ban Tha Phayom Electrical Pumping and Water Distribute Project in Kanchanaburi with the score of 48.00. The details of the score at each site are shown in the Appendix.

**Table 1.2.4 Priority of Pilot Project Candidate Sites in Ratchaburi**

| Project Name | Average Score | Remark |
|---|---|---|
| Upper Huai Mahad Reservoir Irrigation Project | 50.25 | 1 |
| Tung Moo Ploi Reservoir Irrigation Project | 43.0 | 2 |
| Huai Yai Lek Weir Irrigation Project | 41.0 | 3 |

**Table 1.2.5 Priority of Pilot Project Candidate Sites in Kanchanaburi**

| Project Name | Average Score | Remark |
|---|---|---|
| Ban Tha Phayom Pumping and Water Distribute Project | 48.00 | 1 |
| HuaiSisiad Weir and Water Distribute Project | 39.25 | 3 |
| Huai Lam Klung No.9 Water Control and Distribute Project | 42.00 | 2 |
| Huai Lam Klung No.4 Water Control and Distribute Project | 39.25 | 3 |

**2) Study Team's Recommendation**

The Study Team reviewed and studied the candidate sites from economic viewpoint. The table below shows the result of cost-benefit analysis. According to the table below, the cost benefit ratio in Huai Sisad Project became higher than Ban Tha Phayom Project in wet season, on the contrary, that in dry season was quite reverse. The cost benefit ratios in total irrigable area showed 4,962 Bt/Rai in Ban Tha Phayom Project and 4,942 Bt/Rai in Huai Sisiat Project, both of which were nearly equal. Taking the budget limitation into consideration, the Study Team finally recommended Upper Huai Mahad Reservoir Irrigation Project and Ban Tha Phayom Electrical Pumping and Water Distribute Project as the Pilot Project sites, same as the recommendation from TSG.

**Table 1.2.6 Summary of the Evaluation of the Pilot Project Sites in Ratchaburi**

| Candidate Sites | Irrigable Area(Rai) a* | Construct. Cost (Bt) b* | Ratio b*/a*(Bt/Rai) | Priority |
|---|---|---|---|---|
| Upper Huai Mahad Reservoir Irrigation Project | 1,300 | 4,550,000 | 3,500 | 1 |
| | 1,700(400) | | 2,674 | |
| Tung Moo Ploi Reservoir Irrigation Project | 1,250 | 4,920,000 | 3,936 | 2 |
| | 1,630(380) | | 3,018 | |
| Huai Yai Lek Weir Irrigation Project | 1,500 | 9,600,000 | 6,400 | 3 |
| | 1,800(300) | | 5,333 | |

Upper: Irrigable area in rainy season, lower: Total irrigable area, and (300) shows the irrigable area in dry season

**Table 1.2.7 Summary of the Evaluation of the Pilot Project Sites in Kanchanaburi**

| Candidate Sites | Irrigable Area(Rai) a* | Construct. Cost (Bt) b* | Ratio b*/a*(Bt/Rai) | Priority |
|---|---|---|---|---|
| Ban Tha Phayom Pumping and Water Distribute Project | 500 | 3,970,000 | 7,940 | 2 |
| | 800(300) | | 4,962 | |
| Huai Sisiad Weir and Water Distribute Project | 1,150 | 6,920,000 | 6,017 | 1 |
| | 1,400(250) | | 4,943 | |
| Huai Lam Klung No.9 Water Distribute Project | 345 | 4,140,000 | 12,000 | 4 |
| | 445(100) | | 9,303 | |
| Huai Lam Klung No.4 Water Distribute Project | 400 | 4,510,000 | 11,275 | 3 |
| | 500(100) | | 9,020 | |

Upper: Irrigable area in rainy season, lower: Total irrigable area, and (300) shows the irrigable area in dry season

**(3) Details of the Selection Process**

**1) Upper Huai Mahad Reservoir Project Site**

Three candidate sites for the Pilot Project were selected by RID Provincial Office from the list of the requests of Tambons[1] to RID made in the past. The suggested budget and criteria given by the Study Team were the basis for the selection. Among three sites, TSG members finally selected Upper Huai Mahad Reservoir (UHMR) as the Pilot Project site. The following were the main reasons of the final selection.

1) Existence of water storage facility
2) Amount of available water
3) Readiness of the farmers, i.e., high-level of participation can be expected
4) Existence of sugar mill factory nearby (in the town)
5) Eagerness of cooperation from the concerned agencies

[1] The requests are made also by villages and individuals.

Prior to this process, those three and other requested sites in the list had been assessed as feasible by RID Provincial Office, and RID Regional Office had already given its approval for implementation[2]. In principle, feasibility of the requests is assessed based on i) whether adequate water volume can be made available for agriculture and drinking water development, and ii) whether expected benefits are justifiable. RID usually prioritizes those feasible requests taking into consideration of i) budgets, ii) farmers' seriousness of development, and iii) equitable distribution of the places within the area possible to obtain water.

The project of UHMR was originally proposed from the village to the Tambon, and then to RID two years ago. According to the village chief, the proposal was prepared through village meeting in which 80% of the village households participated. The proposal was made because of the expectation that yields and productions of pineapple, sugarcane and fruits be increased by irrigation. All of the households in the village rely on agriculture; however the lands cannot be expanded for agricultural purpose any more. Increase of land productivity with irrigation is considered as the key.

**2) Ban Tha Phayom Weir Project Site**

There were four candidate sites for the Pilot Project, recommended by three TAOs. Each of the TAOs with the staff from RID Provincial Office discussed on the selection of the sites with the people in its respective Tambon, and proposed those sites to TSG. They were not included in the list of the RID, but instead the areas with existing water storage facilities and irrigation development potential were selected through the discussion with those people. TSG finally selected Ban Tha Phayom Weir (BTPW) as the proposed project site. The main reason of selecting BTPW was that it was the only area where has a river (Lam Pa Chi River) with perennial water flow.

In general, RID Provincial Office places high implementation priority on large or medium scale projects among those requested to them. RID conducts a preliminary survey at the proposed project sites for making sure that the requested projects fall into RID's responsibility. Among them, the areas with no existing water storage facilities are given first priority for implementation.

[2] When a project is requested to RID, it usually conducts preliminary surveys to assess whether the requested project is feasible or not. The survey report is then sent to RID regional office for approval.

# CHAPTER 2 IMPLEMENTATION PROCESS

## 2.1 Overall Implementation Schedule

### 2.1.1 Implementation Process and Responsible Agencies

The Figure below shows the process and the responsible agencies for the implementation of the Pilot Project (PP).

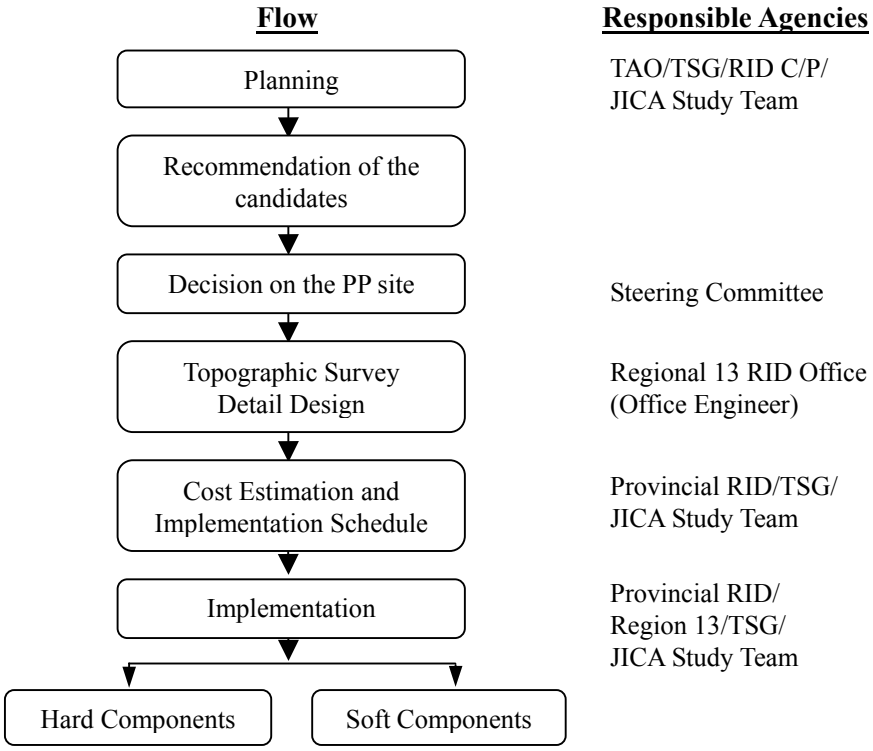



**Figure 2.1.1 Implementation Process and Responsible Agencies**

### 2.1.2 Overall Implementation Schedule

After the selection of the Pilot Project sites by the Steering Committee, topographic survey, detail design and cost estimate were undertaken by RID Regional 13 Office. Those works' period was supposed to be approximately 1 month. After that project implementation was started. The more detail is shown as below.

**Table 2.1.1 Overall Implementation Schedule of the Pilot Project at Each Province**

| Items | 2003 | | | 2004 | | | | |
|---|---|---|---|---|---|---|---|---|
| | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May |
| Decision of the PP Site | ▲ | | | | | | | |
| Topographic Survey | ▬ | ▬ | | | | | | |
| Detail Design | | ▬ | ▬ | | | | | |
| Cost Estimate & Implementation Schedule | | | ▬ | ▬ | | | | |
| Procurement | | | | ▪ ▪ ▪ | ▬ | | | |
| Implementation | | | | ▬ | ▬ | ▬ | ▪ ▪ ▪ | |

### 2.1.3 Construction Method

There were two (2) methods considered for the implementation of the Pilot Project. One was direct force account basis by RID Region 13 Office, and the other was contract basis with private contractors. Taking into account of reduction of construction costs and periods as well as RID's capability in the construction of similar water resources and irrigations facilities, the direct force account basis by RID was applied.

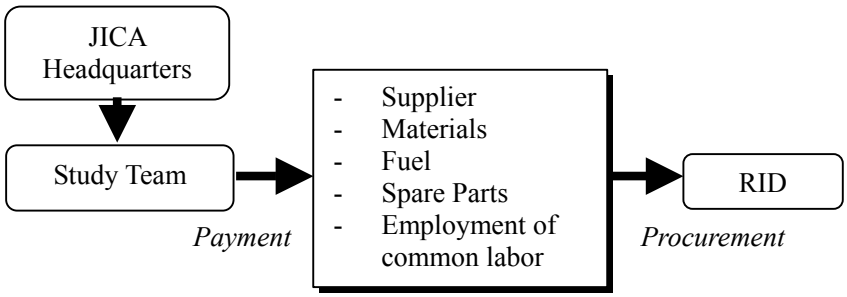



**Figure 2.1.2 Cash Flow in the Pilot Project**

## 2.2 Implementation Plan of Soft Component

### (1) Participatory Planning

The plan of the Pilot Project was prepared through the following participatory process:

**(a) PCM** <October 2003>

**Workshop**
**Objectives:** **To** prepare the detail plan of the project. (Target, Index, Activities etc.)
**Output:** Project Design Matrix (PDM), Plan of Operation (PO)

**Sight Investigation**
**Objectives:** To decide the canal alignment, location of pump station and other irrigation facilities etc. with the farmers by using the RRA tools such as Mapping
**Output:** Opinions are reflected into the design of the irrigation facilities.
Requests from the villager are reflected into the plan of hard component.

**(b) RRA (2) <January 2004~>**

**Objectives are to:**
- Grasp the current situation of the villages on qualitatively
- Find appropriate persons who could be trainers
- Train trainers on RRA method (village leaders and advanced farmers)
- Monitor the progress of hard and soft component activities
- Reflect the results of monitoring into the following activities

**Output:**
- Current situation of the villages
- Skilled trainers on RRA
- Proper project cycle management

**(2) Activities in Soft Component**

All activities in soft component were planned and implemented through PCM and discussions. The expected components at the commencement of the Pilot Project were as follows:

**(a) Study Tour (1)** <Advanced practices >: ~Learn from other advanced projects~

The visits to advanced villages in other area will be made. The farmers or leader of the villages shall cooperate with RID counterpart and TSG for preparation of the agenda and schedule of the tour. The agenda are, for example, to learn O&M of irrigation facilities, cost sharing, collection of water fee, etc.

**(b) Study Tour (2)** <Peer monitoring>: ~Learn mutually~

To learn from the progress of another Pilot Project site, the villagers shall make mutual visits. The leaders of each village shall explain their activities. After the mutual visits, joint meeting shall be held to discuss the current problems and ideas of solution. In particular, the roles of each actor and process of participatory development shall be discussed so that the results of discussion can be reflected into the Draft Master Plan.

**(c) Training:** ~Conduct technical training on various fields~

Depends upon the needs, the villagers can receive a series of training. The expected items were as follows:

| | |
|---|---|
| Leaders Training | Livestock |
| Credit | Farming practice |
| Marketing System | Soil Improvement |
| Water and soil conservation | Irrigation Management |
| Reforestation | Participatory Development |

**(d) Learning Center:** ~learn from the advanced farmers in the site~

In order to learn from successful agricultural practices, the advanced farmers shall be identified as the "learning center." Those farmers shall teach their methods to other farmers. To support this activity, the costs shall be bone from the budget of the Pilot Project, if possible.

**(e) Demonstration:** ~present the experience of the Pilot Project to the farmers from the other Tambons~

In order to have people in other villages in the study area learn from the experiences of the Pilot Project, the representatives of TAOs in each sub basin shall be invited to the site. The representatives in each village shall make presentation on their activities.

**(3) Monitoring and Evaluation**

Monitoring and evaluation were planned to be conducted throughout the process of the Pilot Project, and the results of evaluations shall be reflected on the succeeding activities as well as on the Draft Master Plan. The following were planned for monitoring and evaluation of the project at the commencement of the Pilot Project:

**(a) Participatory M&E**

Through the participatory process including PCM, monitoring shall be made in accordance with evaluation indexes. Leadership, management, relationship with the others, functions of TSG and other related agencies and household economy are expected as the evaluation indexes.

**(b) Baseline Survey**

To grasp the change of socio-economic conditions brought by the Pilot Project, the baseline survey shall be conducted before and after the implementation of Pilot Project. Twenty to thirty percent of total households in each site are recommended to be a number of the samples. All the activities on soft component shall be decided thorough PCM and PRA planning process.

# CHAPTER 3 SITUATIONS OF UHMR SITE

The following describes the situations of Upper Huai Mahad Reservoir Project (UHMR) site when the Pilot Project was started.

## 3.1 Project Site

### (1) Location

The project site is at Nong Chok village[3], which is located at about 70 km from the center of Ratchaburi Province. The road to the village is all paved, and the village lies along the concrete road. (See the location map)

### (2) Population and Areas

The population of the village is 653, and the number of the households is 158. The village area covers 9,200 rai, of which the agricultural land occupies 4,459 rai. Sugarcane and pineapple cover 3,160 rai in total. Both crops occupy the similar size of area. Other crops planted in the village are mango (160 rai) and vegetables (50 rai). There is a tendency that the area for pineapple is increasing due to its high price of selling. There are two main water resources in the village for agriculture and domestic water use; Upper and Lower Huai Mahad Reservoirs.

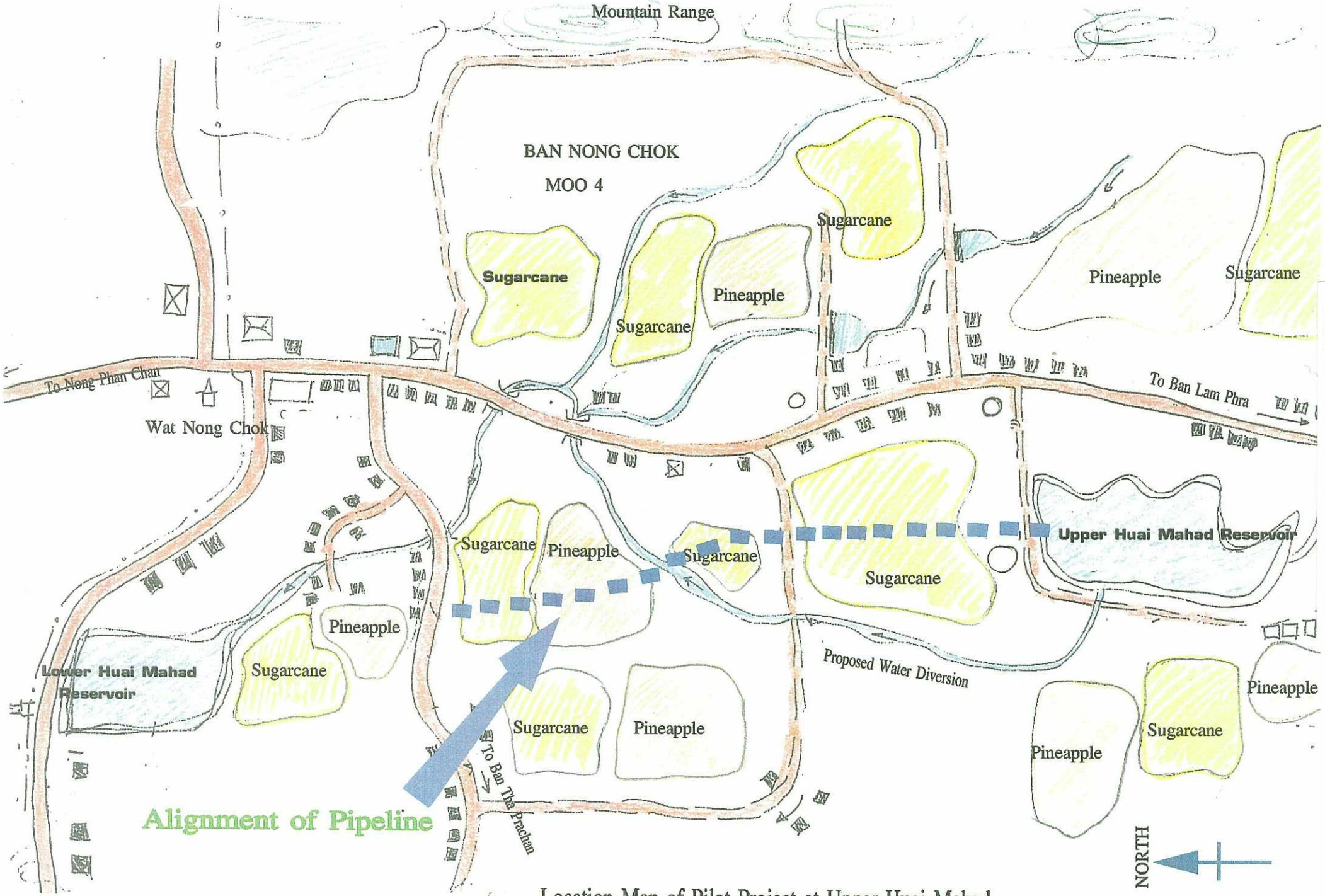
### (3) Village History

Nong Chok village was initiated in 1966. There were ten families moving into the area from Chom Bueng district in the same province, seeking for new agricultural lands. Then, they started sugarcane production after cleared the land. The main events in the village are shown below:

**Village History of Village Nong Chok**

| | |
|---|---|
| 1972 | The first road was constructed, and more people moved into the area. They cleared the land for growing cassava and other crops. The price of a land at that time ranged from 50 to 100 Bt per rai. |
| 1973 | The bigger and longer road was constructed through the village by one of the influenced man who wanted to produce sugarcane in the nearby area. |
| 1974 | A village primary school was constructed by the Border Patrol Police (BPP). Two BPPs were assigned as teachers. |
| 1979 | The village was officially named as Ban Nong Chok. |
| 1982 | Nong Chok village was divided into two villages; Number four and five villages. |
| 1983 | A village pond and a weekend market were constructed. |
| 1984 | The upper and lower Huai Mahad small-scale irrigation projects were constructed by Royal Irrigation Department (RID). |
| 1985 | Electricity was provided to the village. |
| 1989 | The primary school was transferred to the ministry of education. |
| 1997 | One of the primary school buildings was burned and new building was constructed in the same year. |
| 2002 | The headman retired and the new headman was elected. |

[3] The meaning of Nong Chok is water weed.




Location Map of Pilot Project at Upper Huai Mahad

**Figure 3.1.1 Location Map of UHMR**

**(4) Cropping Pattern, Rainfall Data and Labor Requirement**

Average yields of sugarcane and pineapple are 8 t and 4 t/rai, respectively. Cropping pattern of main crops in this area is shown below:

**Table 3.1.1 Cropping Pattern, Rainfall Data and Labor Requirement**

| Duration / Activity | J | F | M | A | M | J | J | A | S | O | N | D | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Sugarcane Production | | r | | | 9 | | | | | | | | a. Harvesting<br>b. Transplanting<br>c. Fertilizer / chemical application |
| 2. Pineapple Production | | | | | | | | | | | | | a. Transplanting<br>b. Maintenance<br>c. Chemical application<br>d. Weed control<br>e. Harvesting |
| 3. Rainfall data | | | | | | | | | | | | | |
| 4. Labor requirement | | | | | | | | | | | | | In the peak period, labors are hired from other regions. |

**(5) Markets**

Sugarcane is sold only to the Sugar Factory in Ratchaburi at 580 Bt/t[4]. Pineapple is mainly sold to Kanchanaburi Pineapple Factory at 3.1 Bt/kg while some is sold to middlemen at lower price. The small amount of pineapple is processed for can by a housewife group in the village when the price of raw product is low.

**(6) General Information of Gender**

In this village, it is said that men and women work together in the farm, and the difference of roles between genders depend on each family. There seems to be no gender difference in the forest use. The villagers say that the one who is freer in the family goes to the forest to collect bamboo shoots, mushrooms and firewood. In addition, it is said that both man and woman can become a village leader, if he or she is a good person and devotes his/her time to others.

However, in fact, there are some differences between men and women. Men can take 'heavier jobs' such as spreading agrochemicals by using heavy machines with motor in the farm, and thus in case where only husband is engaged in that sort of work, he tends to make decision on the agricultural management such as how to utilize chemical fertilizer and how much to pay for it, although the wife keeps money in the family for daily purpose in many cases. The villagers in a key informant interview said that husbands tend to receive agricultural training provided mainly by the DOAE district, while a wife participates in the training for short term when her husband is not available. Presumably the skills and technologies provided are appropriate only for men's work, although women also plow asparagus

[4] This price includes the government support of 80 Bt/t.

farm by using lighter instrument. In addition, probably many women cannot leave the house because of domestic duties and childcare, while many men are almost free from that 'work'. For details of gender division of labor in households, see the section of household interviews.

## 3.2 Village Organizations

### (1) Village Administration

The overall responsibilities of village development and administration lie under the village headman. The headman of the village was elected in 2002. Under the village headman, the village committee is organized with ten positions. There are two assistant headmen; one for peacekeeping is responsible for conflict management among the villages and village security, while another for social welfare is for village development. The responsibilities of other positions and the organizational chart are as follows:

d for growing cassava and other crops. The price of a land at that time ranged from 50 to 100 Bt per rai.

1973 The bigger and longer road was constructed through the village by one of the influenced man who wanted to produce sugarcane in the nearby area.

1974 A village primary school was constructed by the Border Patrol Police (BPP). Two BPPs were assigned as teachers.

1979 The village was officially named as Ban Nong Chok.

1982 Nong Chok village was divided into two villages; Number four and five villages.

1983 A village pond and a weekend market were constructed.

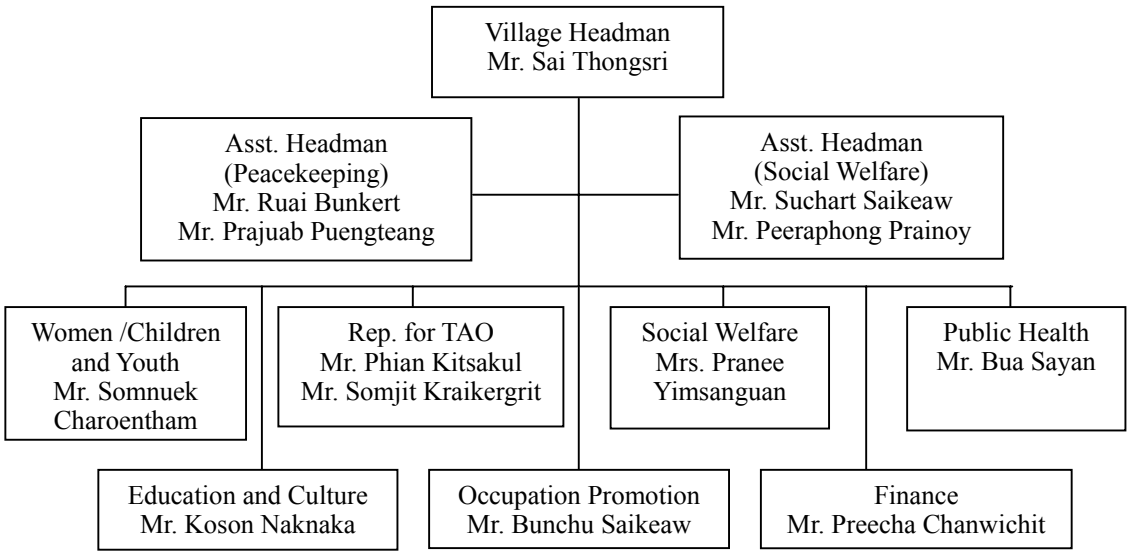



**Figure 3.2.1 Structure of the Village Committee in Village Nong Chok**

**(2) Village Groups**

There are the following seven groups in the village, supported by the different government agencies:

**Table 3.2.1 Village Groups**

| Groups | Member | Annual Budget (Bt) | Loan / Member (Bt) | Interest (%) | Main Activities |
|---|---|---|---|---|---|
| 1. Domestic Water Users | 150 | 64,000 | - | - | Secure water supply to all members |
| 2. Poverty Reduction | 62 | 280,000 | 20,000 | 6 | Provide credit |
| 3. Pineapple Producers | 103 | (To be identified) | 2,300 | 6 | Provide credit and organize the producers for selling the crop |
| 4. Sugarcane Producers | N/A | N/A | N/A | N/A | N/A |
| 5. Housewives | 78 | (To be identified) | 7,800 / month | 6 | Saving member fee of 100 Bt/member/Month |
| 6. Village Development Fund | 103 | 1,06,000 | 20,000 | 6 | Provide credit |
| 7. Community Forestry | 75 | - | - | - | Protect 742 rai of community forest |

The housewives group, pineapple producers group and domestic water users' group are active and directly related with production activities and water management. The details of each group are as follows:

**1) Pineapple Producers Group**

The Group was founded in 1994. The group received 10 t of chemical fertilizer for three years during 1994 to 1996 from the Pineapple Association because the area experienced severe drought during that time. Each member was able to buy maximum five bags at the price of 100 Bt/bag. In 1997, the group was assisted 170,000 Bt for purchasing fertilizer to be sold to the members. The paid money from the members was deposited as the group fund, and the group was able to save about 240,000 Bt by 2002. The loan can be made available to the members from this fund when they need to buy fertilizers. Interest rate is set at 6%.

The group has joined with other three pineapple groups in the same Tambon, buying the share of 102,000 Bt. Individual members do not need to pay the member fee. The purpose of making the group at Tambon level is to have stronger bargaining power when selling the products. This Tambon group can save up to 8,000 Bt/year, and 10% of the net profit has been distributed to the members every year. Currently, the numbers of the members of the Tambon group as well as the one organized at Nong Jok village are 304 and 64, respectively.

The factory gives the members the minimum price guarantee of 2 Bt/kg, and currently pays 3.1 Bt. The members are usually paid 20 days after selling their products to the factory, or they can borrow money from the group if cash is immediately needed. If borrowed, 2% is deducted when they are paid. It is allowed for the members to sell the products individually at their own risk, or 1% is collected by

the group if sold through the group. The members rent a truck to carry their products to the factory. The members prefer to sell their products to the factory since the middlemen pay only half of it and they feel they are cheated.

The average expenditures of pineapple production per rai per year are estimated at 5,300 Bt. The cost at the first year is high because those for seedling, land preparation and transplanting are needed. The details on the expenditures are shown in the following table:

**Table 3.2.2 Expenditures for Pineapple Production**

| Items | Amount (Bt) | | | |
|---|---|---|---|---|
| | 1st year | 2nd year | 3rd year | Total |
| 1. Land Preparation | 500 | - | - | 500 |
| 2. Seedling (700 pc/ rai) | 5,600 | - | - | 5,600 |
| 3. Labor for transplanting | 780 | - | - | 780 |
| 4. Herbicide | 500 | 500 | 500 | 1,500 |
| 5. Labor for spraying | 110 | 110 | 110 | 330 |
| 6. Fertilizer application (2 times) | 1,310 | 1,310 | 1,310 | 3,930 |
| 7. Labor for harvesting | 650 | 650 | 650 | 1,950 |
| 8. Transportation to the factory | 400 | 400 | 400 | 1,200 |
| (Total for three years) | | | | 15,790 |
| (Average per year) | | | | 5,263 |

According to the members, the problem concerning pineapple production is wilt. The current average yield is 5 t/rai, and the members expect it be raised to 18 t/rai[5] if water becomes available.

**2) Domestic Water Users' Group**

In 1989, the villagers were provided with the development budget from TAO for constructing ten storage tanks at the Upper Huai Mahad reservoir. A domestic water users' group was set up since then. The members paid 2 Bt/m3 of water used. Ten years later, the public health office financially supported for the construction of a new clean water supply system, and at that time the group increased the water fee to 4 Bt/m3. The members now pay according to the reading of the meter installed at every member's house. The total length of the pipeline is now 3.2 km.

Originally, it was intended to provide drinking water to the villagers through the water supply system. The villagers however feel difficult to manage the water purification process, and use the system for their domestic needs. They rely on rain for collecting drinking water.

Presently, all the villagers except six households benefit from the pipeline. The group has saved 66,292 Bt. The saving was spent not only on water-related activities but also on other social activities such as school playground, children lunch program and additional cleaning of the reservoir. The group has a committee, which is responsible for managing water and water fee. The committee structure is shown in following:

[5] It is said the farmers in Pechaburi are able to produce 18t/rai.

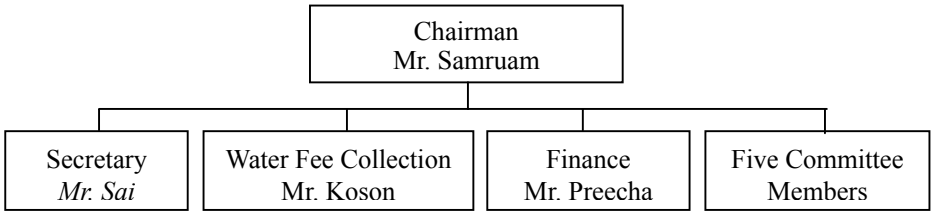



**Figure 3.2.2 Structure of the Water Users' Group**

The committee is conscious of financial transparency of group activities. Financial transactions of the group are audited at the meetings held once a month or two months. The results are then indicated on board for notifying the members. The following table is the main financial features of the group:

**Table 3.2.3 Main Financial Feature of Water Users' Group**

| Items | Figure |
|---|---|
| 1. Average amount of water fee collected | 6,000 – 8,000 Bt/month |
| 2. Average volume of water used | 2,500 $m^3$/month |
| 3. Average cost of electricity | 4,500 Bt/month |
| 4. Net saving | 2,500 Bt/month |
| 5. Salary of the water fee collector | 1,500 Bt/month |

**3) Housewives Group**

In this village, there is only one women's organization, which is called the housewives' group. The institutional profile of the group is shown below.

**Table 3.2.4 Institutional Profile: Housewives' Group**

| Foundation and Group's Goals | Management | Achievements | Problems and Difficulties | Needs |
|---|---|---|---|---|
| Founded in 1995 by Community Development Department<br><br>To coordinate for increasing income<br><br>To support health<br><br>To promote community development<br><br>To change attitudes in the village<br><br>To improve quality of leaders | Consisted of chairperson, assistant, secretary, finance and public relation<br><br>Selected by voting<br><br>78 members<br><br>Firstly pay 115 Bt for the membership, and then pay 100 Bt monthly from the next month<br><br>Meeting on the 7th of every month for getting information from the Province, District, to the village<br><br>Discuss problems and how to solve them | To participate in the village activity<br><br>To work together and look for the way to increase income<br><br>To donate for the public, e.g. temple, school<br><br>To save money to borrow with low interest rates, 1 Bt/ 100 Bt/ month<br><br>Have done activities together by volunteer | No organization comes to support them | Support for sawing activity, i.e. knowledge, market, and fund<br><br>Fund to buy equipment and modern technology for agriculture<br><br>Livestock, animal nursery, cow and pig |

The housewives' group looks active here. It has donated to the temple and school in the community by producing and selling pineapple toffee and chili paste, and its accumulated fund is an important source of credit for women's productive activity. Although women have to pay 15 Bt for the membership and 100 Bt for monthly saving in the first month, and then they have to keep paying 100 Bt every month, it still holds 78 members. By being a member, they can borrow money with low interest that is 1 Bt for 100 Bt/ month. The members are very fond of their group activity, and a woman says, 'if a woman does not like the group, she just leaves.'

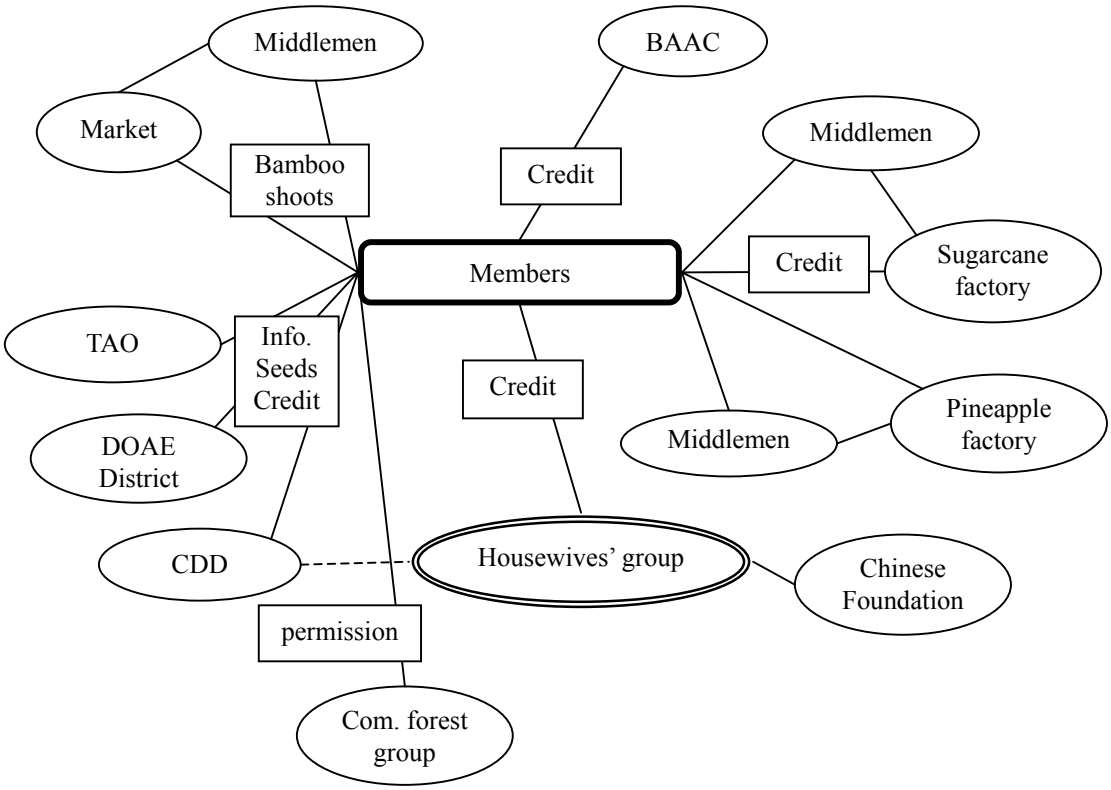



**Figure 3.2.3 Institutions related to Women's Incomes**

For their incomes, women sell sugarcane, pineapple and bamboo shoots to factories or markets, and there are many cases of selling those crops and products to middlemen with determined prices. BAAC, sugarcane factory, DOAE and housewives' group provide credit for their agricultural production. Furthermore, DOAE and other governmental institutions provide general information, agricultural techniques, seeds, seedlings and animal nursery such as chicks and calf. Women regard housewives' group as the most helpful institution and it receives financial support from a Chinese foundation. DOAE District is also seen as important for agriculture. Although it is not directly related to women's economic activity, the financial support for school is also seen as important for women, because it reduces an educational cost.

**(3) Preference of Income Generating Opportunities for the Housewives**

Eight members of the housewives' group listed up various income sources for their households as well as some income generating activities to be suggested to the group. The members compared every pair of the options one by one, and ranked which is better opportunity for income. The result is shown in the table.

Among the women, cattle-raising is the most popular opportunity for income generation. They can raise some cattle in a group, just pasture on hills, and earn large amount of money at once. Other livestock except duck is also popular, but the prices are not so high and it is necessary to take much care, especially of goats. Sawing is the second most popular way of income generation as new activity of housewives' group instead of making pineapple toffee and chili paste, but they need sawing machines for starting. However, asparagus and newly-cultivated vegetables such as white radish are relatively low in their options, because they require more inputs and the water is not so available yet. Bamboo shoots and mushrooms from the community forest are also women's source of income. The price of mushrooms is high, but it is difficult to find them, compared with bamboo shoots.

**Figure 3.2.4 Pair-wise Ranking of Better Income Opportunity by Women**

| | A | C | BS | P | M | Ch | S | D | G | PT | CP | WR | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Asparagus** | | | | | | | | | | | | | **18** |
| **Cow** | 0<br>**8** | | | | | | | | | | | | **88** |
| **Bamboo Shoot** | 2<br>**6** | 8<br>**0** | | | | | | | | | | | **26** |
| **Pig** | 0<br>**8** | 8<br>**0** | 0<br>**8** | | | | | | | | | | **72** |
| **Mushroom** | 8<br>**0** | 8<br>**0** | 4<br>**4** | 8<br>**0** | | | | | | | | | **12** |
| **Chicken** | 0<br>**8** | 8<br>**0** | 0<br>**8** | 8<br>**0** | 0<br>**8** | | | | | | | | **56** |
| **Sawing** | 0<br>**8** | 8<br>**0** | 0<br>**8** | 0<br>**8** | 0<br>**8** | 0<br>**8** | | | | | | | **80** |
| **Duck** | 8<br>**0** | 8<br>**0** | 8<br>**0** | 8<br>**0** | 8<br>**0** | 8<br>**0** | 8<br>**0** | | | | | | **0** |
| **Goat** | 0<br>**8** | 8<br>**0** | 0<br>**8** | 8<br>**0** | 0<br>**8** | 0<br>**8** | 8<br>**0** | 0<br>**8** | | | | | **64** |
| **Pineapple Toffee** | 0<br>**8** | 8<br>**0** | 0<br>**8** | 8<br>**0** | 0<br>**8** | 0<br>**8** | 8<br>**0** | 0<br>**8** | 8<br>**0** | | | | **56** |
| **Chili Paste** | 0<br>**8** | 8<br>**0** | 0<br>**8** | 8<br>**0** | 0<br>**8** | 8<br>**0** | 8<br>**0** | 0<br>**8** | 8<br>**0** | 8<br>**0** | | | **40** |
| **White Radish** | 0<br>**8** | 8<br>**0** | 8<br>**0** | 8<br>**0** | 0<br>**8** | 8<br>**0** | 8<br>**0** | 0<br>**8** | 8<br>**0** | 8<br>**0** | 8<br>**0** | | **24** |

Note: 0 / **8** ---- Point of the option at upper line / ---- Point of the option at left column

Ranking Result was as follows:

1. Cow (88 pts), 2. Sawing (80 pts), 3. Pig (72 pts), 4. Goat (64 pts), 5. Pineapple Toffee & Chicken (56 pts for each), 7. Chili Paste (40 pts), 8. Bamboo Shoot (26 pts), 9. Vegetables (e.g. white radish) (24 pts), 10. Asparagus (18 pts), 11. Mushroom (12 pts), 12. Duck (0 pts)

## 3.3 Village Households

Five farmers' households were individually interviewed. They were selected as the representatives from relatively rich, medium and poor farmers' categories in the village. The details of each household are summarized as follows.

**(1) Mr. Sanga Sinwongket (Poor)**

Mr. Sanga (70) and his wife (55) have six children. All of them completed primary school only. Three of the children are women. Four of them are already married and stay out. The family bought totally 42 rai of land at 250 Bt/rai when they started living at the current place. Each child was then given five rai from the parents, and therefore the rest of 12 rai remains for Mr. Sanga. The household incomes and expenditures are as follows:

| Activities | Incomes (Bt) | Expenditures (Bt) |
|---|---|---|
| 1. Pineapple Production | 60,000/ year | N/A |
| 2. Working as daily labor | 150/ day | |
| 3. Loan from the poverty alleviation fund | 10,000/ year | 10,000 Bt/year with 6 % interest |
| 4. Loan from the village development fund | 2,000/ year | 2,000 Bt/year with 6 % interest |
| 5. Running a small repair shop (motorcycle) | 2,500/ month | 1,500/ month |
| 6. Household consumption | | 150/ day |
| 7. Water fee | | 40/ month |
| 8. Electricity | | 300/ month |

He received extension services mainly from the Royal Irrigation Department (RID), Land Development Department (LDD), and the Agricultural Land Reform Office (ALRO). However, he is not satisfied with the services because the qualities were not high.

**(2) Mr. Koson Naknakha (poor)**

Mr. Koson (41) is married and has two children. One son is 13 year old and studies at Ban Kha secondary school. His daughter is 9 years old studying in the village primary school. Mr. Koson owns 50 rai of the land where he cultivates 28 rai of sugarcane, 4 rai of pineapple, some bamboo and vegetables. The family incomes and expenditures in 2002 are as follows:

| Activities | Incomes (Bt/year) | Expenditures (Bt/year) |
|---|---|---|
| 1. Pineapple Production | 21,169 | N/A |
| 2. Sugarcane Production (286 tons) | 146,307 | 100,598 |
| 3. Mango Production | 1,000 | - |
| 4. Vegetable Production | 2,000 | N/A |
| 5. Salary for collecting Water Fee | 1,500 | - |
| 6. Loan from BAAC | 150,000 | 150,000 (*) |
| 7. Loan from the village development fund | 15,000 | 15,000 (*) |
| 8. Loan from the pineapple group | 1,300 | 1,300 (*) |
| 9. Loan from the sugarcane factory | 20,000 | 20,000 (*) |
| 10. Loan from World Vision | 4,000 | 4,000 (*) |

Note (*): Repayment with 6% interest.

He hires labor from January to April for harvesting sugarcane, paying 60 Bt/100 sugarcanes. It takes 8 days to harvest all in 28 rai with 10 labors. He takes sugarcane and pineapple to the factory and middlemen, respectively. Some vegetables are sold to middlewomen in the village.

The family belongs to the groups of (i) domestic water users', (ii) village development fund, (iii) pineapple producers, (iv) sugarcane producers, (v) BAAC, (vi) World Vision, (vii) Public Health, and (viii) housewives. He receives extension services from the following agencies; DOAE, ALRO, Fishery Department, RID and Public Health.

The family needs water pump since they will not benefit from the irrigation system to be constructed by the Pilot Project. They also need to improve soil fertility. The agricultural activities the family wants to try in future are fruit tree growing and fish raising in net.

**(3) Mrs. Suphaporn (rich)**

Mrs. Suphaporn (39) is one of four family members. One son already completed school, and a daughter is now at the last year of primary school. Mrs. Suphaporn owns two farm plots with total area of 25 rai. She also rent in another 25 rai.

The agricultural activities in the first half of 25 rai are; sugarcane, fishpond and a pond of reserving water. Another half of 25 rai is used for growing five rai of longan and seven rai of pineapple. The rent plot is totally used for sugarcane growing. The family head is trained as the soil improvement technician. The family can produce up to 16 t of sugarcane per rai where the soil is improved. She claimed that sugarcane yield could be increased up to 19 t / rai if water is available.

Mrs. Suphaporn belongs to five groups namely; housewives group, pineapple production, domestic water users, BAAC and village development fund. She receives extension services from Land Development Department, sugarcane factory and the Rural Development Department.

The following table is the family incomes and expenditures:

| Activities | Incomes (Bt/year) | Expenditures (Bt/year) |
|---|---|---|
| 1. Pineapple Production | - | 49,000 (1st year) |
| 2. Sugarcane Production | 120,000 | 50,000 |
| 3. Running a small food/input supply shop | 100/ day (net profit) | - |
| 4. Sold six goats | 30,000 | - |
| 5. Bought 10 goats | - | 30,000 |
| 6. Loan from BAAC | 200,000 | 150,000 |

**(4) Mr. Samruam (rich)**

Mr. Samruam (61) had been the village head for 20 years. He was one of those who moved into the village at first. He owns four plots of land with total 131 rai. His agricultural activities are cow raising (31 cows), goat raising (35 goats), fish raising, pasture production and some fruit production. He obtained extension services from DOAE, LDD, Livestock Department, Rural Development, and RID. He thinks that after the irrigation system is constructed, the farmers will grow vegetable crops to gain immediate incomes. He also suggested the benefit of having one bull for breeding purpose.

His main income is from selling cows at 15,000 to 20,000 Bt/head. Other livestock with promising market is goat. The live goat costs 60 Bt/kg. The details of the family's main incomes and expenditures are as follows:

| Activities | Incomes (Bt/year) | Expenditures (Bt/year) |
|---|---|---|
| 1. Sold five cows | 75,000 | - |
| 2. Vaccination | | 1,000 |
| 3. Bought hay | | 13,000 |

**(5) Mrs. Nuan Phimpha (middle)**

She is 46 years old and a mother of two children. Her daughter graduated recently and now works at TAO. She owns 25 rai of agricultural land[6], in which 10 rai of pineapple and 15 rai of sugarcane were cultivated. She received similar extension services with other villagers; for example, ALRO, BAAC, Public Health and DOAE. Last year, the family earned net income from sugarcane production at 70,000 Bt and another 200,000 Bt from pineapple[7]. The total production volume and yield of sugarcane were 130 t and 9 t/rai, and those of pineapple were 50 t and 5 t/rai, respectively.

| Activities | Incomes (Bt/year) | Expenditures |
|---|---|---|
| 1. Pineapple Production | 20,000 (net profit) | 6,930 Bt/rai |
| 2. Sugarcane Production | 70,000 (net profit) | 4,000 Bt/rai |
| 3. School fee for daughter | - | 2,000 Bt/month |
| 4. Household consumption | - | 150 Bt/day |

## 3.4 Gender in Agricultural Work at Household Level

The participants were asked in the group interview to classify the villagers into 3 levels of living conditions: upper; middle; and lower. The households were then selected from each level for household interview. In addition, the 'good producers' were also selected for the interview about gender. Though some of them did not participate in the group interview, all female interviewees are the members of the housewives' group. They are able to pay some fees for monthly saving of the group, and thus are considered to be better-off than non-members. The stories of each interviewee are described below.

[6] She also rent in 28 rai of pineapple and sugarcane production.

[7] The selling prices of sugarcane and pineapple were 580 Bt per ton and 4 Bt per kg, respectively.

**(1) Good producer (1)**

This 35-year-old woman seems to be a very active member of the housewives' group. She is a member of TAO. She has a 36-year-old husband, one son (15 years old) and one daughter (2 years old). She and her husband cultivate pineapples in 4 rai of their land and in other land rented. As the sources of income, she makes pineapple toffee and collects bamboo shoots from the forest. She used to have 2 cattle, but she sold them to buy a motorcycle. In addition, she receives money as the TAO member. At the moment of the interview, her husband just has gone to a neighboring province to capture shrimps by chartered vehicle for 2 days.

She is busy with pineapple care in October and November. She usually gets up at 5:30am, prepares breakfast and then washes dishes and cloths. She works on weeding from 8:00 to 11:00, but she is also responsible for childcare. When she has a monthly meeting, she goes to TAO at 9:00 and the meeting continues up to 12:00 or even 14:00. When she goes to the farm, she works from 12:00 to 17:00. After coming home, she steams rice and has dinner. She checks daily news on TV at 8:00pm, and goes to bed at 9:00pm. She is relatively not busy from March to May. When it is permitted, she goes to the community forest to collect bamboo shoots at 3:00am. She usually finishes collecting them at 6:00am, but in case where good places are already occupied, she continues to work in the forest until 9:00am or 10:00am.

She says that she keeps household money and makes decision on how to use it. However, she discusses farming management with her husband. She explains that the major difference between husband and wife in labor is that the husband works on construction and goes far to work. Because they have a small child, she cannot leave it alone in a house. It is heavy work for her to carry many pineapples and seedlings in the farm. DOAE District provides many inputs and other services, but she says they are not appropriate for pineapple. She is still struggling for income, and when she does not have enough money, she asks her family and friends for wage labor.

**(2) Good producer (2)**

In this family, the wife is 31 years old and the husband is 36 years old. They have a 9-year-old daughter and a 5-year-old son. In addition to them, the wife's younger brother, his wife and their son live in the same household.

They earn incomes from the pineapple cultivation and wage labor in the farm. They cultivate pineapples in 5-6 rai of their land and additional rented land. The husband says that they cannot cultivate sugarcane because they need to hire labor. The wife used to saw sacks for agricultural use with women's group, but quitted 4 or 5 months ago because they became busy with other works. Moreover, they can prepare canned bamboo shoots for selling. The price of bamboo shoots is 190 Bt / can, but they can sell them more than 200 Bt during dry season.

Their working patterns are shown below. They are busier from May to September for taking care of pineapples, but both of them cannot identify when the slack season is for them. They are almost

always busy, but take a rest when they have no work. The husband tends to work longer and earns more money than the wife, because they say that the wife is responsible for house work and childcare and it is too hard for the woman to work when it is very hot. It is heavy for the wife to carry pineapples from the farm and to spread agrochemicals by using machine with motor. As a result, the husband is responsible for when, how much and how to utilize agrochemicals. Although the wife keeps money for daily use, the husband makes decision on buying agricultural inputs.

DOAE District provides them with training on how to use fertilizer and other chemicals twice a year. Both of them can participate in the training, but the husband tends to attend more. DOAE organized a problem-solving group in the village 5 years ago, and it examines the request from farmers for agricultural inputs. Because this household is regarded as 'good producer', extension staff of DOAE visits and asks them what they need for the production. The pineapple producers' group and housewives' group are also good channels for them to get credit.

In the husband's opinion, the wife's sub-income can be increased by women's group activity. Because they sell the canned bamboo shoots only by word of mouth, they need a new market or person to buy them. Concerning pineapple as their main crop, they need a mini-factory, of which the plan was disappeared before, near the village. Now they are thinking on introduction of new crops such as jackfruits in their farm.

**Figure 3.4.1 Daily Activities of Wife and Husband in Busy Season (May-September)**

| Wife's Dairy Activity | Husband's Daily Activity |
|---|---|
| | |
| 5:00 breakfast<br>Wash dishes & cloths | **4:00 Spread agrochemicals** |
| **7:00 farming**<br>**(in different farm from husband)**<br>**(e.g. wife – their own land, husband – wage labor)** | 5:30 take a rest<br>Have meal brought to the farm |
| 11:00 lunch | **8:00 farming**<br>**Spread weed-killer, fertilizer, etc.** |
| Take more rest when it is too hot | 12:00 take a rest at home |
| **15:00 farming** | **13:00 farming** |
| 17:00 cook | 17:30 take a rest & bath, TV |
| | 19:30 dinner |
| 20:00-21:00 go to bed | 21:00-22:00 Go to bed |

**(3) Upper level woman**

This 43-year-old woman lives with her 45-year-old husband. Their daughter and son are studying in Bangkok now, and come home during vacation. She has 80 rai of land, but she rents it out for others. Instead, she works in 80 rai of her father's farm for pineapple and sugarcane farming. When bamboos shoot out, she goes to the forest to take them for selling.

She is busy with harvesting sugarcanes from January to April or May, but it is impossible to say when she is busy with pineapple cropping because it takes 14 months to grow. While she is harvesting sugarcane, she gets up at 5:30am, steams rice and washes dishes. After that, she works in the farm from 6:30am, and employs 4-5 villagers to cut and tie up sugarcanes to send the factory. When the farming activity is very busy, she employs up to 10 villagers for harvesting. She says that she cannot be employed for other farms, because she is a large land owner and there is some pressure on her to hire wage labor in her farm. Although she takes a rest from 11:00am to 2:00pm, she works in the farm until 5:30pm. After coming home, she cooks, watches TV, takes a rest, and then goes to bed at 10:30pm.

She says that she and her husband work together in the farm. For her, it is heavy task to carry pineapples from the farm to the vehicle. Although her husband sometimes cooks, she is mainly responsible for domestic tasks, and she feels that the woman is busier and even more tired than the man. However, the wife keeps money and makes decision for daily use. Since she started to work in agriculture 2 years ago – she used to sell vegetables in the market of another town – she cannot remember which institution helped her in agricultural production. She says that it is easier to work in commerce, because she can earn more income with less cost. She feels that more care is needed for agriculture especially in terms of management such as when to plant crops or how much money to save for investment. For the agricultural development, she says that it is necessary to stabilize the prices of products, but she expects that the Pilot Project with irrigation will help the production of pineapple toffee.

**(4) Middle level woman (1)**

This 49-year-old woman lives with her 43-year-old husband and 7-year-old grandchild. Their first daughter, who is mother of the child, and their son are working in Bangkok, and the second daughter is married and lives separately in the village. They cultivate 15 rai of sugarcane and 15 rai of pineapple. Both husband and wife work in other farms for wage, and they make canned bamboo shoots, too.

They say that both husband and wife do the same work together, because they take a pick-up track for going the wage work. The husband explains that he gets up at 6:00am, and after having breakfast quickly, he goes to the farm to harvest sugarcanes from December to April. The lunch time is generally from 11:00 to 12:00, but when it is very hot, he takes a rest until 14:00, and then works until 18:00. After coming home, he has dinner, watches TV (but he does not watch drama), and goes to bed at 8:00pm. The wife agrees that she does the same work as the husband, but actually prepares for meals

before her husband eats. He sometimes washes cloths, but normally he does not undertake domestic work. The daughters used to help domestic duties before, but now the wife has to be responsible for them. In addition, the wife does not spread agrochemicals in the farm. They say that the wage of farming labor is the same between men and women, but in this household, the husband keeps and controls money because, they say, the wife forgets easily and the husband decides when to spread agrochemicals. The husband participates in the training of how to utilize fertilizer and pesticides by DOAE District once a year, and he says that about 30 persons attend the training in the village. He sees it relatively useful, but the wife does not like the activity of housewives' group. Women get together and discuss problems in the meeting, but she feels that they just discuss and do not find the solution.

**(5) Middle level woman (2)**

This 53-year-old woman lives with her 57-year-old husband and granddaughter whose mother is divorced and works in a computer factory in the neighboring province. Her 30-year-old son is married and lives separately near her house. She cultivates 20 rai of pineapple and 3 rai of sugarcane with her husband. She also goes for wage work in other farms, and takes bamboo shoots for selling during the season. She explains that pineapple can be cultivated in every season, but it is good to plant it in January. She plants pineapples every 5 rai/ month from January, so that they can be harvested in different months, and thus she is busy until June. She does all farming activities such as weeding and even fertilizing, but her husband helps her use heavy items such as sword and hoe (See the Wife's Daily Activity – Middle Level 2). Her husband also goes fishing and catch shrimps in the river of the different province. However, he does not undertake domestic tasks, and her granddaughter washes cloths.

In the family, the wife keeps money, but she and her husband discuss and decide together how to use the money. However, she says that her husband makes decision on large amount of cost. They sometimes complain each other on agricultural management, such as when they should stimulate pineapples by hormone. It is heavy for the wife to carry their products from the farm, so they sometimes hire laborers, too. She has been engaged in agriculture for 26 years and likes to learn and try various things. Her husband was vice-chairperson of the village, and thus she can be informed any trainings and extension services through him. That is why she attends every meeting of agricultural services, especially of DOAE District, and has learned how and when to cultivate crops. She used to cultivate asparagus, too, but she stopped because the quality of the products is required to be too high.

She says that the young people whose parents have no land go to the city to work. In addition, the young people who go to the university do not continue agriculture. She explains that it is necessary to hold large size of land to make livelihood by agriculture now, and hopes that it can be done in small land with better quality of products. However, there are lots of problems and she cannot identify what to do in order.

**(6) Lower level woman**

This 39-year-old woman was ranked as poorer, probably because she is divorced and small land-holder. She has one son (20 years old) and two daughters (17 and 9 years old), and the son is doing military service. She cultivates 5 rai of pineapple and 5 rai of sugarcane, and also works as wage laborer for 120 Bt/day. The heavier work is paid for 130 Bt/day, but women usually cannot take it. As the Wife's Daily Activity (Lower Level) shows, she works in housekeeping at a shop in the village for 20Bt/hour, as well as in farming. When she is busy with sugarcane harvesting from December to March, she works from 7:00 to 11:00 in the morning and from 2:00 to 6:00 in the afternoon. It is hard for her to cut sugarcanes and carry pineapples, and it becomes much harder to work and take responsibility for livelihood management. Her elder daughter is still in high school. When she has no class, she earns 60 Bt and 100 Bt/day by babysitting and by housekeeping respectively in order to eat at school and to use motorcycle.

The mother received the training on how to utilize leguminous plants as natural fertilizer by DOAE District 5 years ago. However, there is no additional service for her after that. Her land is far from the water, and is not covered by the Pilot Project. It is difficult for her to rent the land near the water; because it is necessary to pay 300 Bt/rai/year at once (generally 3 years are needed for pineapple which requires 14 months to grow). In addition, it is necessary to buy fertilizers and other inputs and to rent machines and vehicles, which she cannot afford by herself, for agricultural production. BAAC and the housewives group are available for her to borrow money. Although it is hard for her to find money for the monthly payment of the housewives' group, she can take more advantage than disadvantage by being a member.

**Figure 3.4.2 Wife's Daily Activity in Busy Season (Middle Level 2 and Lower Level)**

| |
|---|
| 5:00 breakfast, send child to school |
| **7:00 farming**<br>**Planting, weeding, fertilizing** |
| 11:00 lunch |
| **14:00 farming** |
| 18:00 Prepare for meal<br>cleaning |
| 20:00 go to bed |

**Middle Level 2-**Busy Season (Jan. - June)

| |
|---|
| 5:00 breakfast<br>send children to school |
| **8:00 work as housekeeper** |
| **10:00 farming** |
| 11:00 lunch<br>take a rest |
| **13:00 farming**<br>**weeding** |
| **17:00 work as housekeeper** |
| 19:00 dinner<br>Wash dishes<br>TV |
| 22:30 go to bed |

**Lower Level-**Busy Season (Oct. – Nov.)

# CHAPTER 4 SITUATIONS OF BTPW SITE

The following describes the situations of Ban Tha Phayom Weir Project (BTPW) site, when the Pilot Project was started.

## 4.1 Project Site

### (1) Location

The project site is at Ban Tha Phayom village, Tambon Nongphai, Dan Makham Tia district. It is located at 29 km from Kanchanaburi city. It takes about one hour drive from the city on the paved road. The village is located five kilometers from the center of Dan Makham Tia district.

### (2) Population and Area

The population of the village is 620, and the number of households is 129. Total area covers 3,950 rai, of which the agricultural land covers some 3,900 rai. The villagers grow sugarcane (2,000 rai), sweet corn (300 rai), babycorn (300 rai), varieties of vegetable (300 rai) and asparagus (10 rai). Most of the farmers use ground water to irrigate their crops. There are total 112 deep wells in the village.

### (3) Village History

Before 1957, some 10 families settled in this area. They opened forests to make charcoal and obtain lands for growing crops. Later, seven more families moved in the area to form a village. The reasons of selecting this location were good soil fertility, sufficient water and large agricultural land without owners. The chronological events are:

**Village History in Ban Tha Payorm**

| | |
|---|---|
| 1957 | Farmers joined together as a village. |
| 1961 | The first village head was elected (Mr. Som Siriming) |
| 1965 | The village was officially set up under Tambon Dan Makham Tia. Villagers grew soybean and other crops for oil, making timber and hunted. |
| 1969 | Forests were opened. Farmers started to grow sugarcane and cassava. |
| 1971 | Outbreak of grasshoppers (1971-1975). Farmers sought assistant from DOAE district. |
| 1975 | Agricultural area was flooded. It took long time until the water level reduced to normal. Since then, flooding occurred almost every year. |
| 1976 | Military and RID constructed water resource facilities |
| 1983 | Thaphayorm weir was constructed |
| 1987 | New village head was elected (Mr. Samchai Jonghormkhachorn) |
| 1997 | Outbreak of worms destroyed sugarcane |
| 1998-now | Flooding remains as main problem |

**(4) Cropping Pattern**

There are at least five main types of crops cultivated in the area.

- **Sugarcane** is cultivated in middle of May when rain starts. Harvesting period is from January to February.
- **Asparagus** is put in the nursery bed for two months before transplanting. After transplanting, it takes four months for growing. During this period the farmers apply fertilizer, irrigate and prepare supports so that the stem will not fall down. Then harvesting lasts two months. After that leaves became brown and recess. Shoots are taken away. Roots are still under the ground waiting to produce new shoots.
- **Sweet Corn, Baby Corn and other vegetables** are cultivated all year round except flood period.

The following table shows more details:

**Table 4.1.1 Cropping Pattern**

| Duration / Activity | J | F | M | A | M | J | J | A | S | O | N | D | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sugarcane | | **a** | | | b | | | | c | | | | a: harvesting<br>b: transplanting<br>c: crop maintenance |
| Asparagus | | a | | | b | | | c | | d | e | | a: nursing<br>b: growing<br>c: harvesting<br>d: recession/ fertilizer<br>e: harvesting |
| Baby corn | a | | b | | c | | d | | | | e | | a-e Each stage takes 2 months. |
| Sweet corn | | | | | | | | | | | | | All year round except flood period |
| Vegetables* | | | | | | | | | | | | | All year round except flood period |

*/ Vegetables: Eggplant, Chili, Cucumber, Long bean etc.

September to October: stagnant flood

**(5) Markets**

Since the farmers in the village grow various crops, markets are also various. The main markets of sugarcane are two sugarcane factories in Kanchanaburi. Baby corn and sweet corn are sold to three local middlemen. Asparagus is sold to Siam Taniyama Company. Vegetables are sold to the village middleman.

**(6) Input Supply**

Farmers obtained credit and some inputs from the middlemen and sugarcane factories.

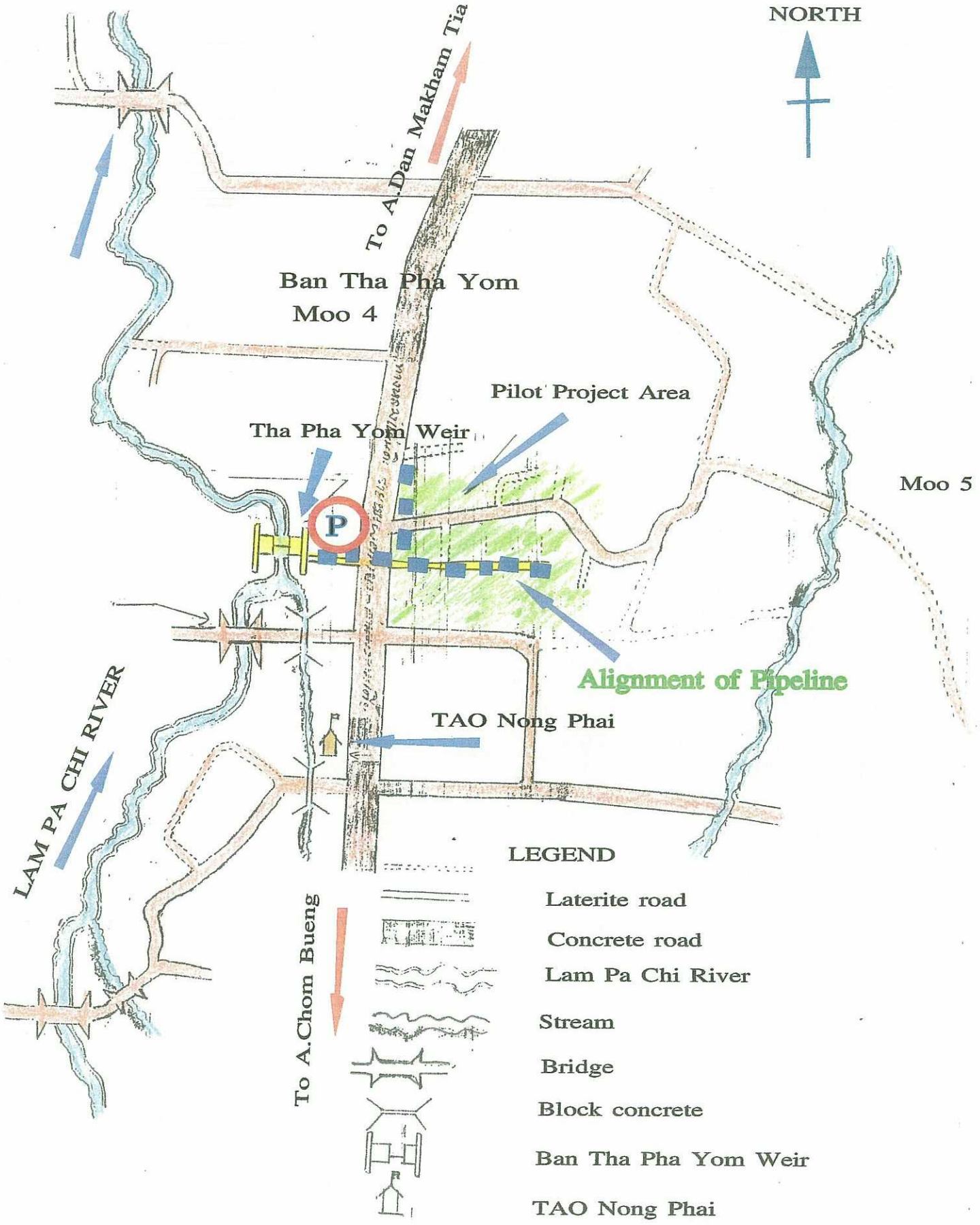



**Figure 4.1.1 Location Map of Ban Tha Phayom Weir Project**

## 4.2 Village Organizations

### (1) Village Organization

The overall responsibility of the village development is under the village head. He was elected in 1987 as the second headman of the village. The village committee is organized comprising of nine positions namely; village head, deputy village head and members of the committee. Among these ten positions, two women are elected as the committee member. List of them is in the following table:

**Table 4.2.1 List of Village Committee**

| Name | Position |
|---|---|
| Mr.Somchai Jonghormkhachorn | **Village Head** |
| Mrs. Sawang Butrdee | Deputy Village head |
| Mrs Sai Seangsai | Member |
| Mr. Somwang In-Osod | Member |
| Mr. Amnuai In-Osod | Member |
| Mr. Pharai Talakham | Member |
| Mr. Rachan Weankrue | Member |
| Mr. Thawee Janeaphitam | Member |
| Mr. Samrerng Ienrikhan | Member |

### (2) Village Incomes

Main income of the village is from agriculture. Main crops are babycorn, sweet corn, asparagus, sugarcane and vegetables. Furthermore, livestock such as cow, pig, fish and chicken are found in the village. Middlemen play an important role to directly collect agricultural products from the farmers. Additionally, some farmers take their produces by themselves to sell at Sri Muang Market, Ratchaburi province. Fishery is considered as a source of family consumption but not for commercial. The following diagram shows different sources of income of the village.

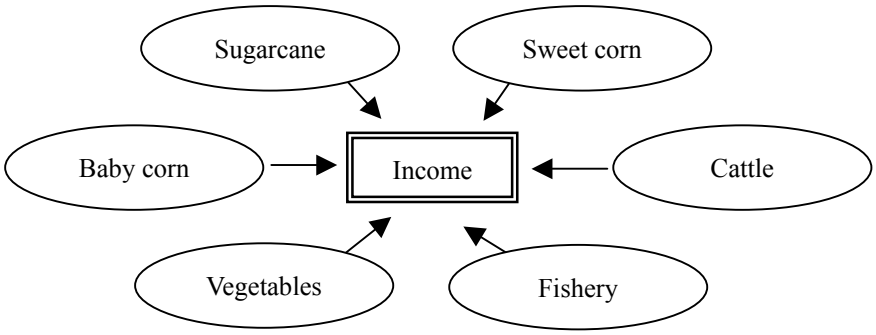



**Figure 4.2.1 Main Income Source of the Village**

Information regarding each crop is summarized in the following table:

**Table 4.2.2 Profile of Main Crops and Animals**

| Crops | Area (rai) | Source of input supply | No. of growers | Market | Price Bt/kg |
|---|---|---|---|---|---|
| Baby corn | 300 | middlemen | 35 | 3 local middlemen | 2.30 Bt/kg |
| Sugarcane | 2,000 | factories | 50 | 8 factories | 580 Bt/t |
| Sweet corn | 300 | farmers and middlemen | 70 | middlemen | 2.50-5.00 Bt/Kg |
| Asparagus | 10 | farmers | 3 | Siam Taniyama | 5-58 Bt/kg depend on quality |
| Varieties of vegetable | 300 | farmers and middlemen | 100 | Middlemen/Srimuang vegetable market in Ratchaburi | 5-20 Bt/kg |
| Cattle | 500 heads | farmers | 50 | Local market | 10,000 Bt /head |

**(3) Production Groups in the Village**

Some of the production groups in the village were interviewed. They are considered as the potential groups for development. The detail of each group is discussed and summarized below:

**(a) Sugarcane Group**

In Ban Tha Phayom, the sugarcane growing area covers about 2,000 rai. There are about 50 growers. The average yield is 4 t/rai. The growers claim that they could raise the production up to 10t/rai with irrigation. Sugarcane was sold to eight different factories. However, two main factories, Wangkhanai and Prajuab sugar factories were told to be the biggest markets. Both of them are located in Kanchanaburi province. The selling price is at 500 Bt/t plus 80 Bt/t subsidized by the government.

The growers faced some disease and worms problems such as white leaf (Rokbaikhao) and bucks (Duang). Even though there are about 50 growers, they do not work as a group but separated into three quotas. The head of the quota played the role of middlemen between the growers and the factories. He provided loan (Kiew) to the member of his quota. Average input cost is 3,700 Bt/rai. Sugarcane can last for three years after planting.

The farmers said only big farmers will grow sugarcane in the future because of high input cost and long duration needed for the production. The sugarcane association told the farmers that sugarcane production might be reduced in this area since the government promoted sugarcane in the Northeast. A certain amount of sugarcane production is now allowed for the growers. The production exceeding the allowed amount would get lower price. The guaranteed price of the year is indicated by the end of November. The cost of inputs for sugarcane production is shown in the table.

**Table 4.2.3 Input Cost for Sugarcane Production**

| Input | Cost (Bt/rai) |
|---|---|
| 1. Plowing | **750** |
| 2. Seedling | 600 |
| 3. Labor for growing | 650 |
| 4. Soil covering | 130 |
| 5. Labor for applying fertilizer | 70 |
| 6. Herbicide cost and labor | 600 |
| 7. Apply second time two types of fertilizer | 900 |
| Total | 3,700 |

**(b) Baby Corn Group**

There are 35 babycorn growers with totally about 300 rai of the land. The size of farm range is from 3 to 14 rai. Average yield is 1.2 t/rai. Production period is two months with 7-10 days harvesting. There are three middlemen buying babycorn. The biggest one is from Thamaka district in Kanchanaburi. The other two are from the village nearby. In the harvesting period, the middlemen visited farmers' plots every day to pick up the produces. Instead of paying cash, they give a bill of the quantity to the farmers everyday. At the last day of the harvest, total amount is calculated based on the bunch of bills. After deducting the cost of the advance input supply such as fertilizers and/or agricultural chemicals, total amount should be paid at once.

The reasons why the farmers sell only to middlemen are 1) price is not so bad, and 2) the cost for advance supply is not so high (10 to 20 Bt higher than the market price per item). It is also the fact that they have no other options for marketing their products. The farmers also take loan from the middlemen about 1,000 Bt/rai. The price of babycorn is 2.3 Bt/kg. The proper size of ear is 8-10 cm. The farmers sell stem to cattle raiser at 400 Bt/rai. Most of the growers use deep well as the main source of irrigation. The growers said they could increase yield by the following means: 1) Improve soil condition using compost from corn stem and rice hull, 2) appropriate land level, and 3) sufficient water.

The farmers need to have the demonstration farms so that they can learn how to make compost and increase yield. Two farmers offered to prepare their lands for the demo. farms (Mr. Somchai Suksawat and Mr. Precha Saengsai). The farmers prefer babycorn to sweet corn since babycorn requires slightly less cost than sweet corn, and its market price is much more stable than sweet corn. Input cost of baby corn production is shown in the following table.

**Table 4.2.4 Input Cost for Babycorn Production**

| Input | Cost (Bt) |
|---|---|
| Seed | 328Bt/bag (4kg)/rai (quota 1) or 360Bt/bag (quota 2, 3), bought from quota |
| Labor | 130Bt/rai for seeding (take 2~3hours/rai)<br>Family labor: 2~3hours/day to take care of babycorn |
| Pesticide/Herbicide | 150Bt/rai |
| Fertilizer | Urea 46-0-0 (370~395Bt/rai),<br>Nitrogen21-0-0(240Bt/rai), 15-15-15 (440Bt/rai)<br><Labor cost>: 30Bt/fertilizer 1bag (50kg), 2bags/rai = 60Bt/rai |
| Gasoline for pump | 150Bt/rai |
| Labor for harvest | 600Bt/t (labors from this village) |
| Pump | Pump (4,000Bt/unit for 7rai---last 7 years), maintenance: 50Bt/year, Pipeline (1,000Bt/rai---last 4years) Watering once/3days (riding irrigation) |
| Total Input Cost | 1,800~2,000Bt/rai |

**(c) Vegetable Production**

There are about 100 vegetable growers and totally 300 rai of the land. The size of vegetable field ranges from 4 to 13 rai. Various types of vegetables are cultivated such as Chinese lettuce, eggplant, chili, and others. Yield per rai of vegetable ranges from 3 to 5t. Most of the produces are sold to the middlemen; some are sold at Sri Muang vegetable market in Ratchaburi province. Harvesting period of each crop lasts about 10 days. The farmers will get their income at the end of harvesting. The general input cost of vegetable shows in the table.

**Table 4.2.5 Input Cost for Vegetables**

| Activities | Cost (Bt/rai) |
|---|---|
| Land Preparation | 250 |
| Ridging | 250 |
| Seed | 1,000 |
| Herbicide/Insecticide | 2,000 |
| Fertilizer | 1,000 |
| Electricity | 1,200 |
| Labor cost | 4,000 |
| Total Input Cost | 5,000-10,000 |

**(d) Asparagus Group**

There are three farmers growing asparagus. They were interviewed because the villagers see that there is a good potential for making profit with this crop, since market is stable and price is guaranteed. Collection point belongs to the Asparagus Group. The farmers have to pay 1% of their sales as the fee to the group. Siam Taniyama Company comes to pick up the products by the cold-storage-truck every day. The group can get payment once every three weeks. Average yield is 1,200 kg/rai/one harvesting season (2month). Total income is 36,000 Bt/rai/2months. Harvesting cycle is 3.5 times/year. The farmers sell their products at Dan Makham Tia district. The prices range from 35 to 58 Bt/kg depending on quality or grade. The lower grade produces are sold at local market at 5-30 Bt/kg. Input cost and price of asparagus is in the following tables:

**Table 4.2.6 Input Cost for Asparagus**

| Input | Cost (Bt/rai) |
|---|---|
| Seed preparation: <2~2.5 months> | Subtotal 880 Bt |
| 1.1 Seed | |
| (100grams produces 2,500~3,000 seedlings) | 300 |
| 1.2 Plastic bag | 160 |
| 1.3 Fertilizer: 15-15-15 (20kg) | 200 |
| 1.4 Plow: /rai for plot nursing | 200 |
| Plot preparation <A few days> | Subtotal 2,200 Bt |
| 2.1 Plow | 500 |
| 2.2 Ridging | 200 |
| 2.3 Manure (1.5 t) | 1,500 |
| Crop Maintenance <4 months> | Subtotal 10,638 Bt |
| 3.1 Labor for transplanting | 500 |
| 3.2 Fertilizer: 240kg of 15-15-15 | 2,400 |
| 3.3 Insecticide: (3 times/month) | 1,800 |
| 3.4 Labor for weeding | 300 |
| 3.5 Supporting Stick:(2Bt/stick) | 888 |
| 3.6 String | 350 |
| 3.7 labor for soil covering | 500 |
| 3.8 Compost | 2,500 |
| 3.9 Application of rice hull | 1,000 |
| 3.10 Electricity for pumping up of water | 400 |

| Input | Cost (Bt/rai) |
|---|---|
| Harvest <2months> | Subtotal 6,000 Bt |
| 4.1 Labor cost | 3,000 |
| 4.2 Fertilizer application | 3,000 |
| Recession <1 month> | Subtotal 5,180 Bt |
| 5.1 Labor for removing the stems | 480 |
| 5.2 Labor for soil covering | 600 |
| 5.3 Fertilizer | 1,150 |
| 5.4 Compost (1t/rai) | 2,500 |
| 5.5 Insecticide | 450 |
| Grand Total of Expenditure per rai | 24,898 Bt |

**Table 4.2.7 Price of Asparagus in Each Grade**

| Grade | Price (Bt/kg) |
|---|---|
| A | 58 |
| B | 45 |
| C | 35 |
| Lower quality | 5-30 |

## 4.3 Village Households

Five farmers were interviewed. They were selected from the relatively rich, medium and poor farmers. The detail of each farmer is summarized below.

**(1) Mr. Somyot (Medium farmer)**

Mr. Samyot, 37, completed primary school. His wife, 36, also completed primary school. They have two sons of eleven and nine years old. The family owns 18 rai of land divided into 2 plots. They grow 10.3 rai of sugarcane, one rai of chili, one rai of eggplants and two rai of asparagus. Water resource is from ground water. Chili could be harvested weekly and every two days for egg plant. Mr. Samyot belongs to some groups namely, village committee, village development fund, production group, village bank (from PTT) and Dan Makham Tia cooperatives. He faces the following problems in production:

1) Flooding: Because the area is low, flooding is always a problem. Ditch cleaning is necessary to remove the dirt and better flow of water.
2) Water Quality: If water quality is bad such as high contents of salt, it causes diseases for asparagus. Irrigation water from river may be better.
3) Production & marketing of vegetable: High input cost, disease and pest problem. Prices rarely are the subject of negotiation.
4) Income: Income doesn't meet with expenditure. Lack of local materials to produce organic fertilizer.

The family income is mainly from agriculture such as sugarcane, chili and asparagus. The expenditure is mostly on the agricultural production and also the following items:

**Family Income**

| | Item | Net Income |
|---|---|---|
| 1. | Sugarcane | 30,000 Bt/year |
| 2. | Chili | 200 Bt/week |
| 3. | Asparagus | 70,000 Bt/5years |

**Family Expenditure**

| | Item | Expenditure |
|---|---|---|
| 1. | Electricity | 500 Bt/month |
| 2. | School fee | 4,000 Bt/year |
| 3. | Interest | 15,000 Bt/year |
| 4. | Gasoline | 500 Bt/month |
| 5. | Food | 3,000 B/month |
| 6. | Telephone use | 300 Bt/month |
| 7. | Water | 80 Bt/month |

**(2) Mrs Suganda (Poor farmer)**

Suganda, 27, is married. Her husband, 30, works as labor at 200 Bt/day (25 days/ month). The family has no land. They own a motorcycle, TV, and a refrigerator. They constructed one house on their relatives land. Suganda used to work at the ceramic factory, but left it because of her poor health condition. She earned small income from sewing cloth. She plans to rent a piece of land in irrigated area to grow vegetable. She also wants to work with other small farmers on cloth making. Her main incomes and expenditures are as follows:

**Expenditure**

| | Item | Expenditure |
|---|---|---|
| 1. | Food | 1,500 Bt/month |
| 2. | Electricity | 200 Bt/month |
| 3. | Water | 50 Bt/month |
| 4. | gasoline | 50 Bt/month |
| | Total | **1,800 Bt/month** |

**Income**

| | Item | Income |
|---|---|---|
| 1. | Labor work | 5,000 Bt/month |
| 2. | Sewing | 250 Bt/month |
| | Total | 5,250 Bt/month |

**(3) Mrs. Saiyon (Rich Farmer)**

Mrs. Saiyon, 56, is considered as rich farmer. Her husband is 57 years old. They have five daughters. Two of them are married and stay out with their husbands. One daughter lives with the parents and the others work in town. This family owns eight plots of farmland. Total area is 199 rai. They grow ten rai of babycorn and the rest of land is for sugarcane.

Most of her sugarcane filed was rain fed area. She faces some disease problem like white leaf and bucks. Sugarcane production is 6 t/rai without irrigation. She said the yield could be improved with irrigation. She sells sugarcane to Prajuab sugar factory in Tha Makha, the closest factory. Her main expenditure is the input cost for sugarcane and babycorn production, repayment of debt to sugarcane factory (300,000 Bt/year) and BAAC (500,000 Bt/year).

**Family Income**

| | Item | Net Income |
|---|---|---|
| 1. | Sugarcane (3,100 t/year) | 300,000 Bt/year |
| 2. | Baby corn | 5,000 Bt/year |
| 3. | Gas station | 36,000 Bt/year |
| | Total | 341,000 Bt/year |

**(4) Mr. Suraphon Sindeanthong (Medium farmer)**

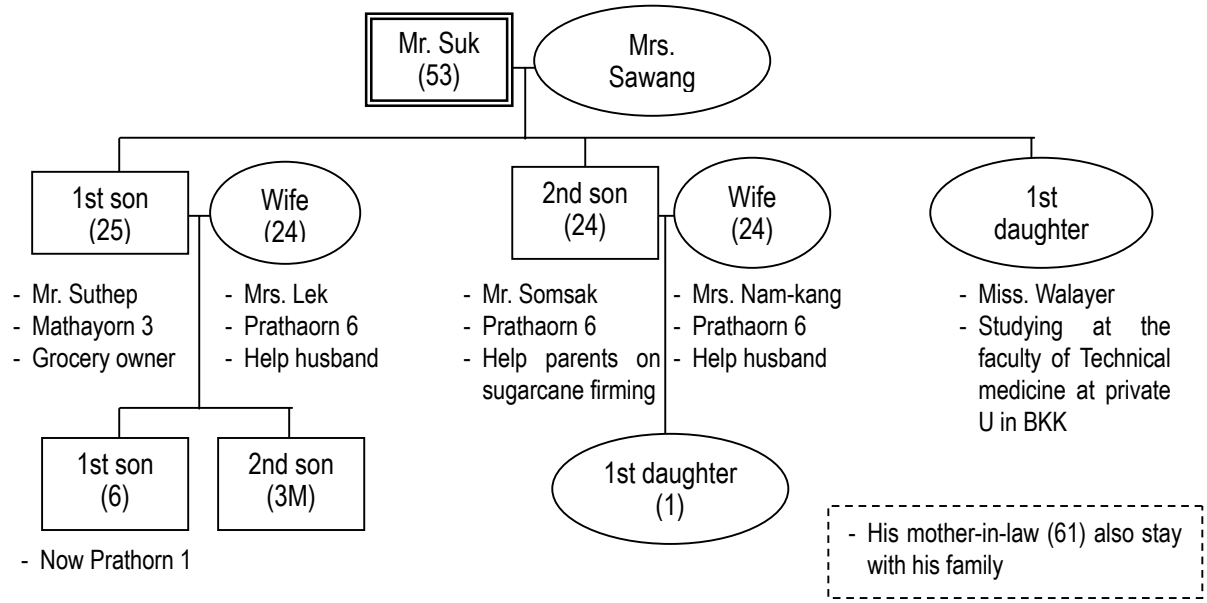
Mr. Suraphon, 39, is married. He has two sons. He owns 10 rai of land splitting into two plots. He grows about eight rai of sweet corn. His main expenditures are input cost of sweet corn production. He earned annual income from sweet corn production at 40,000 Bt. He said he could reduce the input cost and raise production by improving soil quality using compost. He also wants to improve the irrigation system in his farm even though it may cost him some 30,000 Bt in doing so.

**Expenditure on Sweet Corn**

| | Item | Expenditure |
|---|---|---|
| 1 | Plowing | 250Bt/rai |
| 2 | Ridge making | 200Bt/rai |
| 3 | Seed | 600Bt/rai |
| 4 | Weed Control | 100Bt/rai |
| 5 | Chemical fertilizer | 450Bt/rai |
| 6 | Nitrogen fertilizer | 240Bt/rai |
| 7 | Urea | 365Bt/rai |
| 8 | Harvesting | 250Bt/rai |
| | Total | 2,455Bt/rai |

**(5) Mr. Suk Bood-dee (Rich farmer)**

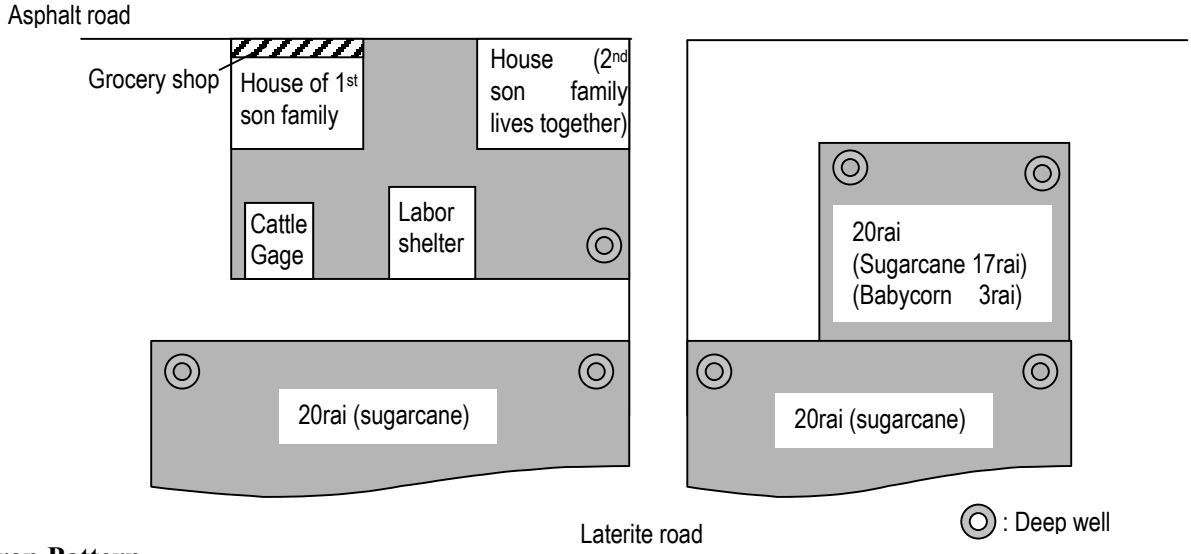
The family tree of Mr. Suk is shown below:




**Land Properties**

1) Moo 1 Tambon Nong-Phai: 20rais <sugarcane>
2) Moo 4 Tambon Nong-Phai: 15rais <sugarcane>+<donated for village tap water 0.5rai>
3) Moo 4 Tambon Nong-Phai: 5rais <sugarcane>
4) Moo 5 Tambon Dan Makham Tia: 40rais <cow breading – 30heads>

The houses and farms of the family are located as follows:




**Crop Pattern**

The cropping patterns and other information of sugarcane and baby corn are as follows:

**Sugarcane**

March: Start transplanting:
10 month-old-seedling <K-200, K-92> (8,000Bt/rai)---Transplant 10rai
Seedlings are bought in this area.

April: Apply fertilizer (15-15-15)---soil covering
- Fertilizer: 500Bt/bag (50kg)/rai + Labor cost <buffalo> 150Bt/rai
- Labor cost 30Bt/bag (50kg)
- Apply fertilizer only once for one cropping

January: Harvest
- Labor cost (from Northeast) 95Bt/t
- Yield ~10t/rai
- Selling price: ~500Bt/t at Wang Kanai Sugar Factory (Amphoe Tha Muang): ~ 1,300t at Prachaub Sugar Factory (Amphoe Tha Maka): ~ 3,200t

**Babycorn**

November:
- Land Preparation: use his own tractor
- Transplanting <Variety No.414> 320Bt/bag (4kg)/rai. ~3 times/year
  He usually buys from Amphoe Tha Maka
- Application of fertilizer (15-15-15) 500Bt/bag (50kg)/rai (Labor fee 30Bt/bag)
- Application of herbicides 170Bt/bag (800g)/3rai, 150Bt/bottle (1L)/rai

December: Harvest
- Labor fee 0.5Bt/kg
- Yield 1t/rai
- Selling price 2.30Bt/kg to middleman
- Stems are sewed as food for his own cattle

**Income (net)**

The family's incomes (net) from crop productions are as follows:

| | | |
|---|---|---|
| 1) | Sugarcane | 600,000Bt/year *1 |
| 2) | Babycorn | 10,000Bt/year *2 |
| 3) | Selling cow | 300,000Bt/year *3 |
| 4) | Selling farm input to his sub-quota | 100,000Bt/year |
| 5) | Renting tractor to his sub quota | 100,000Bt/year |
| 6) | Total | 1,110,000Bt/year |

The details of the above calculation are as follows:

***1/ Sugarcane**:
Growing by himself 100rai
+ sub quota 300rai= Total 400rai

| | |
|---|---|
| Income: 4,600t/year ×500Bt/t=2,300,000Bt/year | |
| Expense: | 1,700,000Bt/year |
| Net income (1st year) | 600,000Bt/year |
| Net income (2nd year) | 1,000,000Bt/year |
| Net income (3rd year) | 1,000,000Bt/year |

***2/ Baby corn**: Total 3rai

| | |
|---|---|
| Yield 1t/rai ×3times/year= 9t/year | |
| 9t/year×2.30Bt/kg= | 20,700Bt/year |
| Expense: | 10,700Bt/year |
| Net income | 10,000Bt/year |

***3/ Cow breeding**

| | |
|---|---|
| (Expense) | |
| Labor fee | 4,000Bt/month |
| Food | 4,000Bt/month |
| Breeders (30heads) | 30,000Bt/head |
| Medicine | 100Bt/time |
| Cage | 100,000Bt/30Heads |
| Electricity arrangement | 25,000Bt/30Heads |
| Pipe arrangement | 10,000Bt/30Heads |
| Pond digging | 10,000Bt |

Selling Price:

| | |
|---|---|
| 10,000~ 15,000Bt/head ×30heads =400,000Bt/year | |
| Expense: | 100,000Bt/year |
| Net Income | 300,000Bt/year |

**Additional Expenses**

- Education for daughter 120,000Bt/year
- Food/domestic water supply
  1,500Bt/month 18,000Bt/year
- Gas
  2,000Bt/month 24,000Bt/year

**Additional Information**

Through the interview, the following information was additionally obtained.

1) He has saving accounts at the Siam Commercial Bank, Krung Sri Syutthaya Bank and BAAC.
2) He is a chairman of the village waterworks group, a member of the village million Bt fund, a member of Nong Phai Tambol Administration Organization, and village committee.
3) He rarely contacted with TTC. The developed techniques are from "learning by doing."
4) If this project can provide more water, he would plant to grow more babycorn, long bean and reduce area of sugarcane.
5) He satisfies in his current status, the relationship among villagers is good.
6) His wife also helps making a decision in the family
7) Problems are low price of sugarcane and high cost of growing babycorn

## 4.4 Gender in Agricultural Work at Household Level

For the household interview, it was asked in the group interview that women classified themselves into 3 levels of living conditions: upper; middle; and lower. However, the female participants in the group interview hesitated to do that, and they said that 'there is only middle class in the village'. When the village chief (male) came to the women's session and advised the participants, finally they suggested 2 households for each category from the group members, mainly based on land-holding size. Regarding that the membership of housewives' group is not so large, however, those households might be better-off than non-members. The stories of each interviewee are described below.

**(1) Upper level woman (1)**

This 52-year-old woman is the chairperson of the housewives' group. She has 54-year-old husband, two sons and one daughter. Her daughter is 23 years old, and she is studying science at university in Bangkok. Her elder son is 27 years old, and lives with his wife and children at the house next to his parents. The younger son is married, too. He is 26 years old and lives together with his parents, wife and baby, helping his parents' work.

This household has 120 rai of sugarcane farm and 40 cattle. The husband manages farming and animal raising activities 'as household head', but the wife also sells agricultural chemicals as her own business. For both wife and husband, the busiest season in a year is from January to March. They are busy with harvesting sugarcane, but they employ wage laborers. The husband takes other farmers to his sugarcane farm by his truck, leaves them for cutting and tying up sugarcanes, and then transports sugarcanes to the factory. As shown above, the wife also goes to the farm with the husband and supervises the workers. While she is working in the farm, her daughter-in-law takes domestic work at home.

**Figure 4.4.1 Wife's Daily Activity (Upper Level 1)**

| Busy Season (January - March) | Slack Season (October - December) |
|---|---|
| **5:00 go to farm with husband** | 6:00 cooking, washing dishes, cleaning<br>**Open the shop of fertilizers and chemicals** |
| 12:00 lunch<br>Take a rest | Have lunch when she has time |
| **14:00 farming** | **17:30 Close the shop** |
| 18:00 dinner<br>TV | Dinner<br>TV |
| 21:00 go to bed | 22:00 go to bed (up to the movie) |

For the couple, the slack season is from October to December. During this season, she gets up slightly later than the busiest time, and works in her agrochemical shop after the domestic duty until the evening. She stays up a little later for watching movie on TV, and then goes to bed. The husband employs wage laborers for cattle-raising, too. In slack season, he supervises the workers' job such as giving food and water and counting the number of cattle for 2 hours per day on average felt.

Comparing with the husband, the wife seems to get up earlier and goes to bed later, because she has domestic duty – though now her daughter-in-law is more responsible for it – and the husband gets more tired from farming activity. The husband says he goes farming more often and even earlier than the wife. He gets more income from larger business of sugarcane and cattle than the wife, but the wife keeps money for daily use. They discuss together what they are going to do for deciding how to use money, but the husband says he is stronger in decision-making than the wife. Nevertheless, the wife manages an agrochemical shop and negotiates how much to buy and sell in what prices. Although the prices of sugarcane cannot be negotiated, the husband can negotiate those of cattle. Such management activity is the hardest work for them.

They remember that 5 years ago, 'Miyazawa Fund' came from the government to provide agricultural inputs. However, the Fund came to the village just one time, and there is no follow-up activity until now. They can receive training on sugarcane cropping by DOAE District once a year, and the sugarcane factory also provides funding.

For both of them, water is the biggest problem in their agricultural production. The water floods affect their farm almost every year, and only those who are close to the water source can irrigate their farms. Although they feel that the largest flood occurred 4 years ago, that of this year severely affected their land. They lost harvests of vegetables, corn and sugarcane of 80 rai, and in case where the land is seriously damaged, they have to buy new land. They hope that they can get more income from the land by selling in the market in the future, and repay loans to the bank.

**(2) Upper level woman (2)**

This 44-year-old woman lives only with her husband. She has 3 daughters: the first is married and lives in another village; the second has just finished the university and now works in Bangkok; and the third is studying at university in Bangkok. The first daughter sometimes leaves her children in her parents' house, so the woman takes care of them instead of her daughter.

She has 7 cattle now. Before the water flood, there were more up to 20, but after the flood damaged the grass (looks like sugarcane) planted for feeding cattle, she sold many. In addition to cattle, she has 30 rai of corn in the village where her father lives. It takes 2 hours to reach there by car, so she never comes home for lunch when she works there. When she is busy with peeling corn during June and July, she starts to work in the farm at 8:00am, instructs the farming activity to the employees, and then works until 5:00pm. Her husband is a driver of public transportation. He shuttles a bus between the

village and the city twice a day, and one service takes 4 hours. He works on the shuttle service in rotation, and thus his working hour is not fixed daily.

The woman explains that her husband earns more money than she does, because he works without holiday. Nevertheless, she keeps all household money for daily use, and when there is necessity of large use, the wife and the husband discuss together. The wife sells her agricultural products at her own risk, but the prices of corn cannot be negotiated. Those of cattle are negotiable in the market, and they are favorable for her at present. For her, it is the hardest work to carry corn from the farm to the vehicle.

She says she has never received agricultural extension service. She participates in the village meeting at TAO once a month, but it is just for information sharing. When the water flood damaged her corn, DOAE District provides new seedlings for compensating the loss of harvest. Her grass for feeding cattle is also damaged. Although she knows how to take care of cattle, she wants to improve animal raising skills.

**(3) Middle level woman (1)**

The village chief's household was ranked as 'middle class' and was interviewed, too. The wife is 44 years old, and she produces sugarcane, corn, bean, banana, chili, eggplant, mushroom, etc. in 46 rai of her husband's land. At this moment, she is harvesting eggplants and mushrooms, and in fact, a pair of woman and man came to buy eggplants as 'middlemen' by vehicle during the interview. In addition, a woman came to the house for selling her mushrooms to the village chief. Their chili was damaged by the flood this year.

Her husband (48 years old) has income from the work as the village chief, but he is always busy with that job and moves within the village for the meetings with TAO and villagers. That is why the wife starts to work in the farm earlier than the husband even during the busiest season (December-February), although both of them get up at 5:00am. They sometimes employ wage laborers for the farming activity, and supervise cutting and sending sugarcane. After lunch break generally from 12:00 to 14:00 (or 15:00), they start to work again and come home at 5:00pm or 6:00pm. The wife steams rice and prepare for dinner, and after dinner, she washes dishes and cloths. Because it is too hot in the daytime, she says it is better to wash cloths in the evening. After watching TV news, they go to bed at about 9:00pm. However, the husband stays up very late – even until 1:00am – when he is busy with village meetings.

Because the husband often goes to the village meeting, the wife works alone in the farm. It is hard for her to carry tools and products, and to spread agrochemicals with heavy equipment. The wife usually keeps money from agricultural production, but the husband keeps his income as village chief with him. They discuss how to use the money, and the wife sometimes asks the husband for money. The farming management is also a topic, and for instance, they discuss where the labor is available.

The husband always participates in trainings provided by DOAE District, and introduces the knowledge to his wife. One of them is about organic fertilizer, but he says it was not so effective in this village. He wants to know more about how to manage household, for example, in agricultural investment, saving and raising income. The wife says she wants more labor for farming.

They have 2 sons. The elder son works in seafaring after the university. The younger son is studying agricultural science at university now. Though the wife does not want them to keep farming, but the younger son might work as agricultural scientist near the village, and she wishes that the family live together in the future.

**(4) Middle level woman (2)**

This 43-year-old woman has 5 family members: husband (48 years old); daughter (22 years old); son (20 years old); her nephew (her younger sister's son aged 15); and her husband's mother (86 years old). She cultivates 14 rais of sugarcane, 2 rais of corn, and some vegetables such as eggplant and bean. She raises 4 buffaloes and 2 chickens, too (but she says she cannot produce chick). Her daughter and son go to school in Kanchanaburi city by motorcycle, and they help farming on Saturday and Sunday. Thus basically she and her husband work in the farm.

She is the busiest with harvesting sugarcane from January to March. During the busy season, she works in the farm from 7:00am to 7:00pm with one-hour lunch break. She hires cutting machine from the sugarcane factory, and then the factory worker cuts sugarcane by her instruction. Her husband works in spreading agrochemicals in the farm, because it is heavy duty. However, the wife works almost all farming activities except spreading chemicals, and even cuts sugarcane for harvesting.

Her husband goes to sell their agricultural products by car, but she says that the wife keeps money from the sale. For the daily use of money, the wife decides how to spend, and is stronger in decision making than the husband. However, they discuss together on large amount of costs.

The wife says that DOAE District is the most helpful agency for agricultural production by providing fertilizer that is generally expensive for her, seedlings and credit. It provides demonstration, too, and women also can participate. However, in reality, the husband participates in the village meeting which women's group is not invited to. Instead of her, her daughter attends the meeting of the housewives' group on Saturday and Sunday.

**Figure 4.4.2 Wife's Daily Activity (Middle Level 2)**

| |
|---|
| 5:00 steam rice, cook, wash dishes |
| **7:00 go to farm**<br>**Factory worker cuts sugarcane by machine** |
| 12:00 lunch, rest |
| **13:00 farming** |
| 19:00 cook, wash cloths |
| 22:00 go to bed |

**Busy Season (January - March)**

| |
|---|
| 5:00 steam rice, cook, wash dishes<br>clean floor, wash cloths<br><br>go to chat |
| 12:00 cook lunch |
| **13:00 take buffaloes to the water**<br><br>17:00 children come home |
| 18:00 dinner<br>TV |
| 22:00 go to bed |

**Slack Season (October – November)**

In addition, BAAC provides credit, and PTT also sometimes come to the village for asking people's needs and supporting them. The wife feels that she is working harder than before because they need more education fee for 3 children. Now she is preparing the land for nursery so that they can harvest and sell crops before the next flood. She expects the children to finish the college and to get job in good company with good salary, because the village life and agriculture are very hard to live.

**(5) Lower level woman (1)**

This woman is 52 years old. Her husband is 55 years old, and has problem of high blood pressure. Thus he works in the farm only when he feels better, and their married son aged 27 is assisting them. 24-year-old daughter has not entered higher education, and undertakes domestic work with the daughter-in-law aged 22.

She bought 80 rai of land, but has paid only for the half. She has cultivated sugarcane and rice, but it takes more than 1 year to obtain income by producing sugarcane. That is why she has cultivated chili and corn for this year. As shown in the 'Wife's Daily Activity (Lower Level 1), she is busy with taking care of chili and corn during January to March or April, and sells products in May. She is usually not busy from October to December, but now she is busy with land preparation due to the water flood. When she is busy, she starts to work at 8:00am, and has lunch at 11:00 or 12:00. Her farm is divided into some places, so when she goes far, she takes boxed lunch to the farm. She takes more rest when it is too hot around the noon. In that case, she works until later in the evening.

She has problem with her heel, and thus she cannot carry heavy things. She says that men work in heavy agricultural activities such as spreading chemicals and preparing land, and women work in

weeding and putting lighter fertilizer. She sometimes works as wage laborer in other farms, too. Her products of chili and corn are sold to middlemen in board price, which is already set in the market. The wife keeps money and decides how to spend for daily purpose. She says that her husband's opinion is stronger than hers in money use, but she is like an advisor to him.

The most helpful institution for her agricultural production, she says, is BAAC to get loans. PTT and the village money fund also provide credit in lower rates, and DOAE District provides training and seedlings. However, because it is not good for her to walk in a long distance, her daughter, son or daughter-in-law attends the meeting actually.

**Figure 4.4.3 Wife's Daily Activity in Busy Season**

**Wife's Daily Activity (Lower Level 1)**

| |
|---|
| 5:00 clean the floor |
| 7:00 breakfast |
| **8:00 farming** |
| 11:00 lunch<br>Carry small lunch to the far place<br>Take more rest when it is too hot |
| **14:00**<br>**farming**<br><br>17:00 Work until later if takes more rest |
| 18:00<br>Prepare for food with daughters<br>Wash dishes<br>TV (stay up later in case of interesting one) |
| 22:00 go to bed |

**Busy Season (January - April)**

**Wife's Daily Activity (Lower Level 2)**

| |
|---|
| 5:00 steam rice, cook, breakfast<br>Wash dishes and cloths |
| **8:00 farming**<br>**Watering by sprinkler, fertilizing, weeding, etc.** |
| 12:00 lunch<br>Take a rest |
| **14:00 farming** |
| 17:00 steam rice, cook<br>TV |
| 20:00 go to bed |

**Busy Season (December – January)**

Although it is good that she has still worked in agriculture for a long time of her life, the prices of corn, sugarcane and chili are not stable. It costs a lot to buy good seedlings, but the prices of products are very low. She wants to improve the quality of her products, and especially to prevent the disease of sugarcane.

**(6) Lower level woman (2)**

A 28-year-old woman lives with her husband aged 30, her younger sister, and her father. She cultivates soybean and corn in 7 rai of land inherited from her father, and has no livestock. She is busy with taking care of soy bean and corn in December and January. As shown in the 'Wife's Daily Activity (Lower Level 2), she gets up at 5:00-5:30am, and takes domestic duties such as preparing meal and

washing. Then she goes farming. During the busy season, she gives water by sprinkler twice a week in different plot in rotation, fertilizes and weeds the farm. After lunch break, she starts to work again, and then goes home at 5:00pm. She prepares a meal again, and after watching TV she goes to bed at 8:00pm.

She says that she and her husband undertake almost the same work except spreading agrochemicals in the farm. However, her husband tends to work longer because the wife is responsible for the domestic work. She says her husband does not share domestic jobs, and instead of it, he works in hard job such as construction. Her 65-year-old father also sometimes helps agricultural work, and goes to take mushrooms to sell in the forest.

The income from the farm and the husband's income from construction work are passed to the wife. She decides the daily use of money alone, but in case of large costs, she and her husband discuss together. However, her father is also an authority to make decision in the family. For instance, he used to have 19 rai of land, and gave 7 rai to her. The wife and the husband discuss the management of this size of land, but 12 rai of farm still remains with the father. The father and the unmarried younger daughter cultivate 12 rai, and the daughter sells their products.

In addition, although the wife feels that DOAE District is the most helpful to obtain seedlings, seeds and information of how to grow crops, her father attends the village meeting and introduces the information to the family. BAAC provides loan, but it is difficult for her to repay. Therefore she suggests that the prices of agricultural inputs such as fertilizer be decreased, and then the amount of inputs be increased.

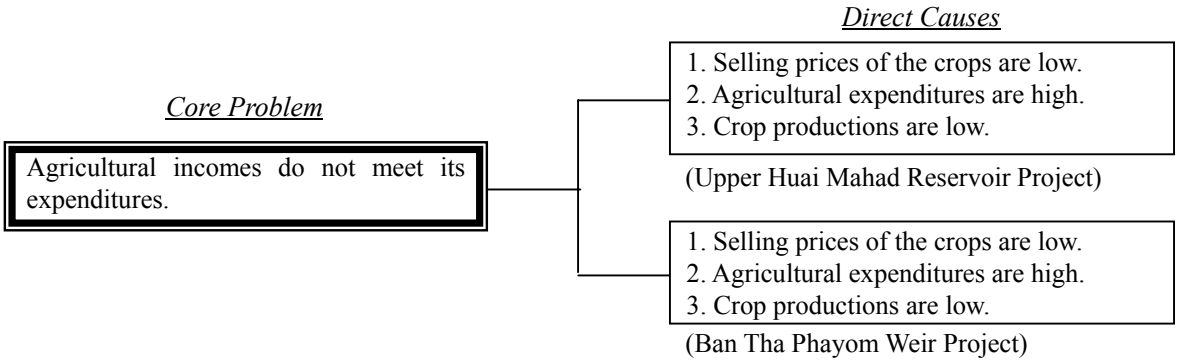
Although she thinks that the life has become better and more comfortable than before because of the availability of road and electricity, she wants to increase production of bean and corn and thus agricultural incomes.

# CHAPTER 5 PROJECT DESIGN

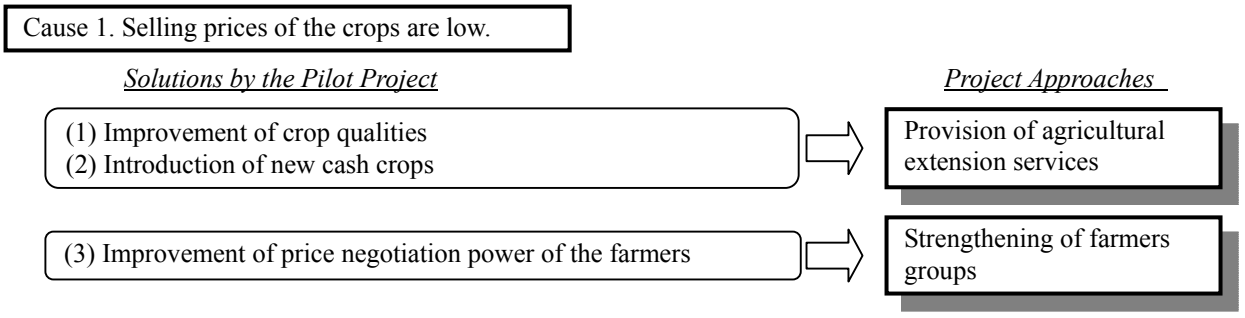
## 5.1 Project Approaches and Activities

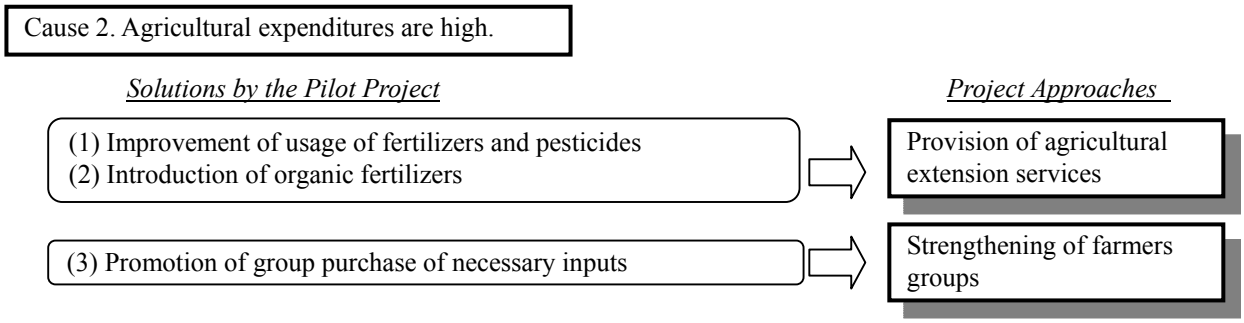
After the RRA surveys, the framework of the Pilot Project was discussed with the villagers in the workshop held in two villages. As the goal of the development for the Lam Pa Chi River Basin is defined as "agricultural incomes meet its costs" in the draft Master Plan, the Pilot Project was designed with the same objective. The participants of the workshop discussed the problems and solutions of the agriculture in the area, and selected the possible approaches to be included in the Pilot Project. The details of the discussions are summarized in the problems trees, objectives trees and PDMs.

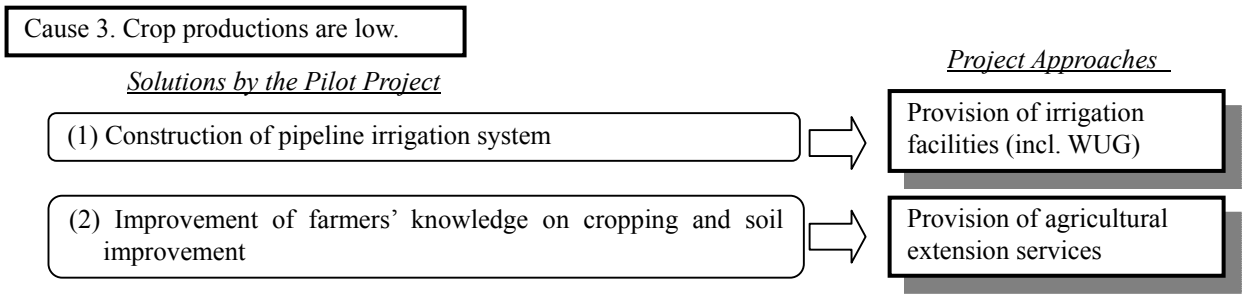
Through the discussions, the following relationship with the core problem was identified:




As shown above, the direct causes of the core problem are the same in two sites and can be divided into three. The possible solutions to each cause, and the approaches to be included in the Pilot Project, were identified in the following ways:






The project was therefore designed to have the above three approaches so as to tackle the core problem and its causes. In addition, the project intended to strengthen the public supporting system for the farmers, focusing particularly on the TTCs and TSGs, which were the key stakeholders to ensure the smooth implementation of the project activities as well as the project sustainability.

Through the workshop, the farmers, TSG members and the Study Team discussed and agreed to include the following activities in the project.

| *Project Approaches* | *Project Activities* |
|---|---|
| Provision of agricultural extension services | - Establishment of demonstration plots<br>- Conduct of study tours<br>- Provision of trainings on crop planning, quality and quantity improvement, introduction of new crops, use of fertilizers and pesticides, making of organic fertilizers, livestock rearing |
| Provision of irrigation facilities (incl. WUG establishment) | - Establishment and provision of trainings to WUG (water users' group) on O&M of irrigation system and water management<br>- Discussion on pipeline alignment<br>- Survey, design and cost estimate on construction<br>- Construction of irrigation facilities<br>- Discussion and provision of trainings to WUG on group management |
| Strengthening of farmers groups | - Establishment and management of the WUG fund as a revolving fund, saving strengthening<br>- Facilitation of group activities<br>- Strengthening collaboration between WUG and other farmers groups |
| Strengthening of the TSGs and TTCs | - Meeting with TSG and TTC members on project planning, monitoring and evaluation<br>- Provision of TOT trainings on project management and institutional strengthening |

## 5.2 PDMs and POs

The PDM (0) and PO (0) were prepared based on the results of the workshops and discussions among the farmers, TSG members and JICA Study Team, and finalized by TSG members in December 2003. Then, they were refined to the PDM (1) and PO (1) in February 2004 through further discussions among the same stakeholders, by including the project details such as the schedules, budgets and responsible persons and organizations for each activity. The PDM (1) and PO (1) were considered as the core of the project design. The project design was slightly modified based on the results of the monitoring in May 2004, and reflected into the PDM (2) and PO (2) as attached in Appendix.

## 5.3 Monitoring and Evaluation Indicators

### (1) Monitoring and Evaluation Schedule

The monitoring was planned not only to observe the problems arising day by day, but to make the project implementation smooth especially when the project faces difficulties. After the selection of the project sites, budget allocation and the preparation of the PDM and PO, the monitoring was started by the Study Team in cooperation with the agencies concerned. Even during the Study Team's absence from June to October 2004, a local consultant and RID counterparts conducted the monitoring with the farmers once a month. The final monitoring (=evaluation) was conducted in November 2004 based on the results of the evaluation workshop and the baseline survey by the Study Team, RID counterpart, other agencies concerned and the farmers. The monitoring activities are shown as below.

**Table 5.3.1 Schedule of the Monitoring for Pilot Project**

| No. | Time | Surveyor | Output |
|---|---|---|---|
| 1. | April,'04 | Social Dev. Specialist | Monthly Progress Report |
| 2 | May, '04 | -ditto- | Monthly Progress Report |
| 3 | May 24, 26,'04 | Study Team, RID C/P | Workshop for Monitoring, Progress Report (2-2) |
| 4 | June to October,'04 | Social Dev. Specialist | Monthly Progress Report |
| 5 | November,'04 | Study Team, RID C/P | Technology Transfer Seminar, Progress (3) |

### (2) Evaluation Index

The evaluation index were prepared based on the PDM (1) and PO (1) prepared in February 2004. The proposed evaluation index is shown in the following table:

**Table 5.3.2 Indicators of UHMR in Ratchaburi**

**Target Area**: Nong Chok Village, Tambon Nong Phan Chan, Ban Kha District, Ratchaburi
**Project Period**: From November 2003 to November 2004 (from the planning to evaluation stages)

Prepared: May 25, 2004

| Items | Indicators | Groups to be asked |
|---|---|---|
| **(1) Overall goal**<br>The living standards, improved? | Total debts are decreased by 5% by 2006.<br>Average agricultural incomes are increased by 5% by 2006.<br>The number of migrant workers is increased by 5% by 2006. | WUG |
| **(2) Project Purpose**<br>Agricultural incomes, increased to meet expenditures? | 5% of average agricultural incomes are increased. | WUG |
| **(3) Outputs**<br>1. Pineapple | Average selling price is more than 2kg/Bt.<br>Average expenditures for farming are reduced by 10 %.<br>Average yield is increased from 4 to 6 tons/rai | WUG, DOAE |
| 2. Sugarcane | Average selling price is increased from.580Bt/t to 600Bt/t or higher, by improving the CCS rate<br>Average expenditures for farming are reduced by 10 %.<br>Average yield is increased from 10 to 12 tons/rai. | WUG, DOAE |
| **(4) Activities**<br>**1 Water Users Group** (WUG). | Number of Participants, Activities with other groups, Role & Regulation, Water Fee, Collection of water fee, O & M system, WUG's fund | WUG, RID, DOCP |
| **2. Demonstration plots**<br>Sugarcane, pineapple and vegetables. | Average yield, Improvement of farming (organic fertilizer, pesticides, herbicides, cropping calendar, water management for irrigation, impacts | Advanced farmers (WUG), DOAE |
| **3. Study Tours**<br>3.1 The study tours by WUG<br>3.2 The study tours from other Tambons. | Places, Times, Participants, impression & impacts<br>Times, Participants, impression & impacts, ripple effect | WUG<br>DOAE, RID/Study Team |
| **4. Trainings**<br>4.1 TTC members.<br>4.2 TSG members<br>4.3 Improvement of qualities of pineapple& sugarcane.<br>4.4 Improvement of selling prices of pineapple.<br>4.5 Use of fertilizers and pesticides.<br>4.6 Produce and use of organic fertilizer | Participants, Training contents, Impression & impacts<br>-ditto-<br>Places, Times, Participants, Trainings are useful or not.<br>Places, Times, Participants, Trainings are useful or not<br>Participants, Times, Expenditure, Effectiveness<br>Participants, Times, Expenditure, Effectiveness<br>Participants, Time, expenditure, Effectiveness | TTC<br>TSGs<br>Pine DOAE, WUG<br>DOAE, WUG<br>DOAE, WUG<br>LDD, WUG |

| Items | Indicators | Groups to be asked |
|---|---|---|
| **5. Joint purchasing**<br>5.1Fertilizers,pesticides, herbicides and tractors | Number of groups, Effectiveness | WUG, DOAE |
| **6. Irrigation Facilities**<br>6.1 Plan of main and secondary pipelines | Activity of survey, design, implementation schedule and cost estimate, cost sharing,, Explanation & Discussion to WUG | RID province, WUG |
| 6.2 Installation of Main and secondary pipelines. | Joint Inspection | RID, WUG |
| 6.3 Installation of Tertiary pipelines. | Cost sharing including land acquisitions, Implementation Schedule | WUG, RID |
| 6.4 Trainings for water management and O&M | Purchasing cost, Implementation,<br>Times, Participants, Technology transfer, for water management and O&M | DOCP, RID, WUG |
| **7. Monitoring**<br>7.1 TTC<br>7.2 TSG | TTC meeting, Monitoring survey Monthly Report<br>Monitoring survey and Monthly Report | TTC<br>TSG |

**Table 5.3.3 Indicators of BTPW in Kanchanaburi**

**Target Area:** Tha Phayom Village, Tambon Nong Phai, Dan Makham Tia District, Kanchanaburi
**Project Period:** From November 2003 to November 2004 (from the planning to evaluation stages)

Prepared: May 25, 2004

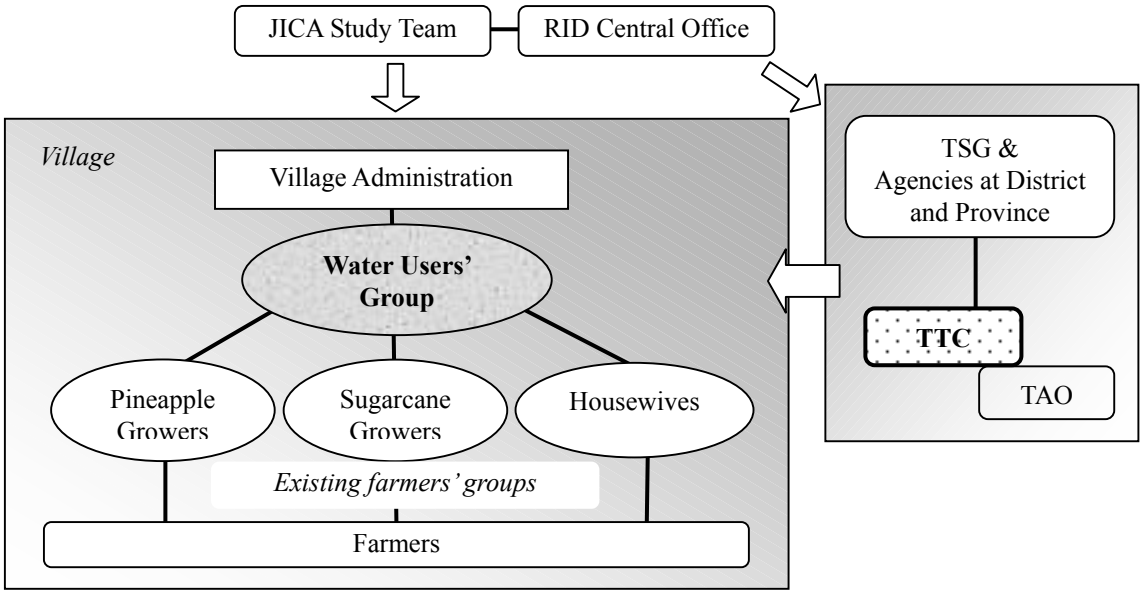
| Items | Indicators | Persons to be asked |
|---|---|---|
| **(1) Overall goal**<br>The living standards of the farmers, improved? | Total debts are decreased by 20%by 2006.<br>The values of high-value assets (car, house, land) are increased by 10% by 2006.<br>Number of migrant workers is increased by 10%by 2006.<br>Higher education of children is increased by 10% by 2006. | WUG |
| **(2) Project Purpose**<br>Agricultural incomes, increased to meet expenditures? | Average agricultural incomes are increased by 5%.<br>Average agricultural expenditures are decreased by 5%. | WUG |
| **(3) Outputs**<br>1. Sweet Corn | Average selling price is increased from3.50Bt/kg to.4.0Bt/kg or higher<br>Average expenditures are reduced to 2,200Bt/rai<br>Average yield is increased from 1.5 to 2 t/rai. | WUG/DOAE |
| 2. Baby Corn | Average selling price is increased from 2.3Bt/kg to 3.0Bt/kg or higher<br>Average expenditures are reduced to 1,600Bt/rai.<br>Average yield is increased from 1.2 to 1.5 t/rai. | WUG/DOAE |
| 3. Long Bean | Average selling price is increased from 7Bt/kg to 10Bt/kg or higher | WUG/DOAE |

| Items | Indicators | Persons to be asked |
|---|---|---|
| 4. Eggplant | Average selling price is increased from 5Bt/kg to .7Bt/kg or higher<br>Average expenditures are reduced to 700Bt/rai.<br>Average yield is increased from 200 to 300 kg/rai. | DOAE/WUG |
| **(4.) Activities**<br>1. Water Users Group (WUG) | Number of Participants, Activities with other groups, Role and Regulation, Water Fee, Collection of water fee, O & M system, WUG's fund | WUG, RID, DOCP |
| 2. Demonstration Plots<br>2.1 Baby Corn<br>2.2 Sweet Cone<br>2.3 Other Vegetable | Average yields, Improvement of farming (organic fertilizer, pesticides, herbicides, cropping calendar, water management for irrigation, impacts | Advanced Farmers, DOAE |
| 3. Study Tours<br>3.1 Study tour by WUG<br>3.2 Study tour from other Tambons | Places, Time, Participants, Impression & impacts<br>Places, Time, Participants, Impression & impacts, ripple effect | WUG<br>DOAE, RID/Study Team |
| 4. Trainings<br>4.1 TTC members<br>4.2 TSG Members<br>4.3 Compost Training<br>4.4 Improvement of qualities and quantities of crops.<br>4.5 Chemical free vegetable production<br>4.6 Artificial breeding | Place, Time Participants, Training contents, Impression & impact<br>- ditto -<br>- ditto -<br>- ditto -<br>- ditto -<br>- ditto- | TTC<br>TSG<br>DOAE, LDD,<br>WUG<br>DOAE, WUG<br>DOAE, WUG<br>DOL,<br>Farmers |
| 5. Irrigation Facilities<br>5.1 Plan of pump, main and secondary pipelines<br>5.2 Construction of pump, main and secondary pipelines<br>5.3 Installation of Tertiary pipelines<br>5.4Trainings for water management and maintenance | Activity of survey, design, implementation schedule and cost estimate, cost sharing, Joint Inspection with WUG<br>Cost sharing including land acquisition, Implementation Schedule,<br>Purchasing cost, Installation know haw, Implementation,<br>Times, Participants, Technology transfer, for water management and O&M including electricity fee for pump | RID, WUG<br>RID, WUG<br>RID, WUG<br>DOCP, RID, WUG |
| 6. Qualities Check<br>Qualities of groundwater and soil study | Study quality of groundwater and soil. | LDD, WUG |
| 7. Monitoring<br>7.1 TTC<br>7.2 TSG | TTC meeting, Monitoring survey, Monthly Report<br>Monitoring survey and Monthly Report | TTC<br>TSG |

## 5.4 Implementation Structure and Accounting System

### (1) Implementation Structure

The project implementation structure was established as follows:




The project was implemented in collaboration with the villagers, government agencies and JICA Study Team. In the villages, the WUG, established by the project, was responsible for coordinating and managing all the project activities under the supervision of the village administration. The existing farmers' groups, such as pineapple growers group, sugarcane growers group, housewives group, etc., were located under the WUG. For example, the WUG acted as the coordinating body for the whole village when an agency conducted trainings. The WUG, in collaboration with the farmers' groups, discussed the project plans and monitored the project activities at the village level. In addition, the WUG is supposed to collect and manage the water fees as well as the WUG fund. The water fees are the fund to be used for O&M of the irrigation facilities, and therefore shall be collected from the WUG members. The WUG fund is considered as a revolving fund for facilitating the group activities by making loans with low interest rates available, and shall be collected and used by the farmers themselves.

The necessary supports were provided to the farmers by the public agencies, such as TTC, TAO, TSG and other agencies at the provincial and district levels. JICA Study Team together with the RID central office provided necessary guidance, and financial and technical supports. This structure, besides JICA Study Team and RID central office, is considered as permanent for ensuring the project sustainability, and shall be applied to other villages in the area when conducting similar development activities.

The following describes the general characteristics of the key agencies such as TTC and TAO in the implementation structure:

**a) Technology Transfer Center (TTC)**

As an extension arm of Department of Agricultural Extension, the Technology Transfer Centers (TTCs) were established at all Tambons of the country in 2000 (announced on November 21, 2000). In principle, TTC members are selected by the villages and officially appointed by the district chiefs, besides the secretary who is a district agricultural extension officer. In this Tambons in the project area, Tambon Nong Phan Chan in Ratchaburi and Nong Phai in Kanchanaburi, the numbers of the current TTC members are 15 each. For Tambon Nong Phan Chan, the listed members are all men, from various institutions such as TAO, village administration, or village production groups, or they are simply advanced farmers. For Tambon Nong Phai, the TTC was recently reorganized with the new members. The reasons were to have the members more evenly from all the villages by selecting the equal number from each village, and to make sure the Pilot Project is smoothly implemented with more active members. Most of the TTC members are TAO staff.

Among the members of TTC, only the secretary is paid salary as a government officer. All the members are however paid Bt. 50 a time when they participate in TTC meeting. When a district officer comes to a village for providing training to the farmers, he/she is generally given allowance of 80 to 90Bt/day and cost of fuel. When a farmer becomes an instructor, 300Bt/day is paid. In general, each TTC makes an activity proposal for the next year, simply by selecting some activities from the list prepared by the provincial DOAE. The DOAE then allocates the budgets to all TTCs based on those proposals. TTC's activities are therefore decided and implemented based on their proposals and the budgets are allocated from the province.

**b) Tambon Administration Organization (TAO)**

The Tambons are classified from Class 1 to 5 depending on the size of their annual revenue. In principle, their revenues are mainly from i) tax revenue from the area, ii) allocation from the Ministry of Interior, and iii) project funds from various public agencies.

Tambon Nong Phang Chan in Ratchaburi has the annual and 5-year development plans. In principle, the Tambon receives development proposals from each village, and then an annual development plan, necessary budgets for implementation and project priorities for the whole Tambon are discussed at the Tambon's assembly meetings held twice a year. The TAO has 18 staff, 3 supporting staff, and 12 permanent and 10 temporary labor. Among those 18 staff, 3 staff are responsible for administration and 15 staff are the members of the assembly. This Tambon is classified as Class 5, and its budget sources and amounts in this year are as follows:

1. Income (tax revenue): Baht 3.8 million
2. Ministry of Interior: Baht 2.08 million
3. Various public agencies: Baht 10 million (approx.)

Tambon Nong Phai in Kanchanaburi has 12 villages within its jurisdiction, and each village has proposed three priority projects for its development. Those proposals, in total 36 projects, have been

included in the 5-year development plan for 2001 to 2006. To prioritize them, site conditions and necessary costs are mainly taken into account. The budget sources and amounts of this Tambon are as follows:

1. Income (tax revenue): Baht 3 million
2. Ministry of Interior: Baht 2 million
3. Various public agencies: Baht 50 million (approx.)

**(2) Project Accounting System**

In order to operate the project properly, the Study Team proposed a procurement and payment system, which is shown in following page. According to the suggestion of the representative from RID headquarters, the bank accounts were separated for hard component and soft component in order to avoid complication. The Study Team, then, explained the system to TSG, responsible for the activities of both hard component and soft component. In the discussion, TSG suggested to have several agencies manage the bank account of soft component in order to secure fairness and transparency through the careful observation. Then, TSG opened bank accounts for hard and soft component separately and nominated a few responsible persons on the accounting.

In UHMR project, the representative of RID provincial office took care of every procurement and payment for hard component while soft component was managed by both DOAE and RID provincial. In the case of BTPW project, three parties such as TAO, WUG and the Study Team were nominated as the responsible organizations for the accounting of soft component. The following figure shows the responsible organizations on accounting.

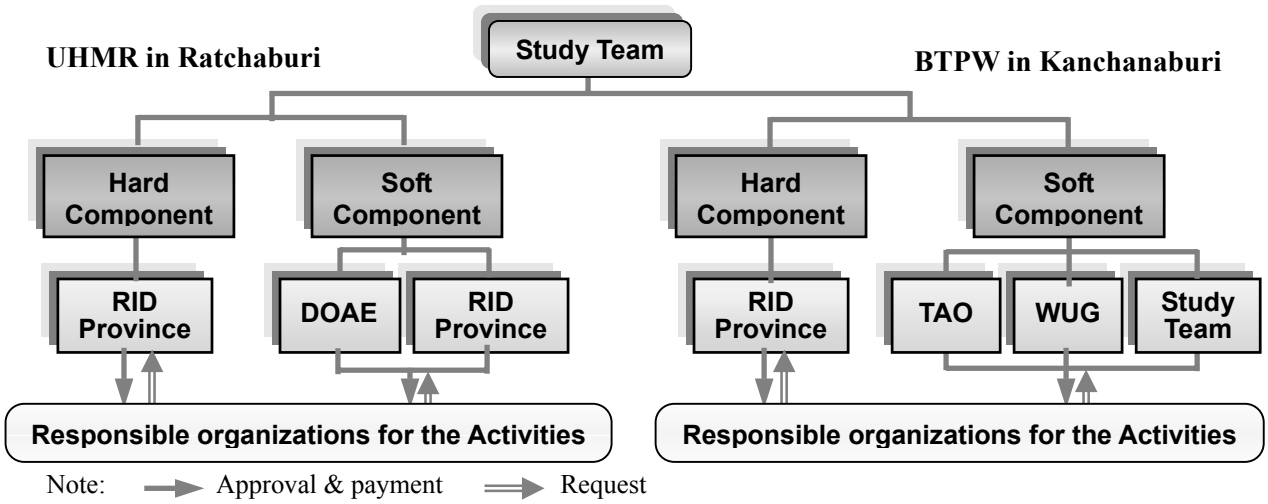



**Figure 5.4.1 Responsible Organizations for Accounting in the Pilot Project**

In the payment process of soft component in UHMR, for example, the responsible organizations for specific activities requested some budget to DOAE and RID province. DOAE and RID province, then, approved the request, withdrew the cash from the bank account and paid it to the responsible organizations. This payment process was applied to all the activities in the project.

**Figure 5.4.2 Procurement and Payment Guideline for the Pilot Project**

## Procurement and Payment Guideline for the Pilot Project

Procurement and payment for the Pilot Project (PP) implementation under the Study on Application of Participatory Planning in Rural and Agricultural Development Project in Lam Pa Chi River Basin shall follow the procedure as stated below:

◆ **Basic Principle:**

JICA supports main part of the budget for implementation of the PP.

RID implements the PP by the manner of Force Account.

◆ **Items**:

| Items JICA may support | Items JICA may not support |
|---|---|
| ○ Materials/ Equipment | × Per diem for agencies |
| ○ Labor fee for construction | × Transportation for agencies |
| ○ Trainers (Fee/ Per diem) | |
| ○ Transportation only for study tour | |
| ○ Fuel for construction equipments | |

◆ **Procedure:**

Agencies submit Detail Plan (for soft component) and B/Q (for hard component) to RID province

↓

RID province concludes Detail Plans and Monthly Disbursement Schedule

↓

RID Province sends the Plan, B/Q and invoices to JICA Study Team and RID central for approval

↓

JICA Study Team transfers money to the bank a/c of both TSG (soft) & RID (hard)

↓

For soft component, TSG distributes money to the agencies

↓

**Conduct the activities according to the plan**
~ Each Agency procures the materials and employs the labor ~

↓

Agencies send the receipts to RID Province

↓

RID Province collects all the receipts and send them to JICA Study Team (weekly)

◆ **Receipt**

The Receipts are to be used for the reimbursement from JICA Headquarters. Therefore, the receipts must satisfy the following condition.

1) Receipts should NOT be issued by government agencies but suppliers or labor only
2) The attention should be to the name of "Sanyu Consultants Inc."

## Table 5.4.4 Implementation Schedule in UHMR Project in Ratchaburi

unit:Bt

| | Activities | Responsible Agencies | Total Budget | 2004 (2547) Jan. | Feb. | Mar. | Apr. | May | Jun. | Jul. | Aug. | Sep. | Oct. | Nov. | Dec. | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-2 | PDM(0) and PO(0) are reviewed with major stakeholders. | JICA Study Team | 3,000 | | | | | | | | | | | | | 3,000 |
| 0-3 | The meetings are held to establish the Water Users Group (WUG). | RID | 10,000 | | | | | | | | | | | | | 10,000 |
| 0-4 | The meetings are held between the WUG and village groups. | DOAE | 10,000 | | | | | | | | | | | | | 10,000 |
| 0-5 | The WUG fund is established and accumulated. | WUG | 150,000 | | | | | | | | | | | | | 150,000 |
| 0-6 | The demonstration plots are established for sugarcane, pineapple and vegetables | DOAE, WUG | 40,000 | | | | | | | | | | | | | 40,000 |
| 0-7 | The study tours by WUG are conducted. | DOAE, WUG | 63,000 | | | | | | | | | | | | | 63,000 |
| 0-8 | The study tours to the village from other Tambons are conducted | DOAE, WUG | 30,000 | | | | | | | | | | | | | 30,000 |
| 0-9 | Meetings are conducted with TTC members. | | 13,250 | | | | | | | | | | | | | 13,250 |
| 0-10 | Trainings are conducted to TTC members on TOT | JICA Study Team | 20,000 | | | | | | | | | | | | | 20,000 |
| 0-11 | Trainings are conducted to TSG members on TOT | JICA Study Team | 20,000 | | | | | | | | | | | | | 20,000 |
| 1-1 | Trainings are conducted for the improvement of qualities of pineapple and | DOAE, WUG | 20,000 | | | | | | | | | | | | | 20,000 |
| 1-2 | Trainings are conducted for the improvement of selling prices of pineapple | DOAE, WUG | 10,000 | | | | | | | | | | | | | 10,000 |
| 2-1 | Trainings are conducted on the use of fertilizers and pesticides. | DOAE, WUG | 15,000 | | | | | | | | | | | | | 15,000 |
| 2-3 | Trainings are conducted on the make and use of organic fertilizers. | LDD, WUG | 21,000 | | | | | | | | | | | | | 21,000 |
| 3-3 | Main and secondary pipelines are installed | RID,WUG | 3,110,909 | | | | | | | | | | | | | 3,110,909 |
| 3-5 | Trainings are conducted for water management and maintenance | RID,WUG | 10,000 | | | | | | | | | | | | | 10,000 |
| | Soft Component | | 435,250 | | | | | | | | | | | | | 435,250 |
| | Hard Component | | 3,110,909 | | | | | | | | | | | | | 3,110,909 |
| | Contingency 10% in Hard Component | | 311,091 | | | | | | | | | | | | | 311,091 |
| | Contingency 8% in Soft Component | | 34,820 | | | | | | | | | | | | | 34,820 |
| | Soft Component | | 470,070 | | | | | | | | | | | | | 470,070 |
| | Hard Component | | 3,422,000 | | | | | | | | | | | | | 3,422,000 |
| | Total | | 3,892,070 | | | | | | | | | | | | | 3,892,070 |

## Table 5.4.5 Implementation Schedule in BTPW Project in Kanchanaburi

unit:Bt

| | Activities | Responsible Agencies | Total Budget | 2004 (2547) Jan. | Feb. | Mar. | Apr. | May | Jun. | Jul. | Aug. | Sep. | Oct. | Nov. | Dec. | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-2 | PDM(0) and PO(0) are reviewed with major stakeholders. | JICA Study Team | 3,000 | | | | | | | | | | | | | 3,000 |
| 0-3 | The meetings are held to establish the Water Users Group (WUG). | RID | 10,000 | | | | | | | | | | | | | 10,000 |
| 0-4 | The meetings are held between the WUG and village groups. | DOAE | 10,000 | | | | | | | | | | | | | 10,000 |
| 0-5 | The WUG fund is established and accumulated. | WUG | 150,000 | | | | | | | | | | | | | 150,000 |
| 0-6 | The demonstration plots are established for sugarcane, pineapple and vegetables | DOAE, WUG | 13,000 | | | | | | | | | | | | | 13,000 |
| 0-7 | The study tours by WUG are conducted. | DOAE, WUG | 63,000 | | | | | | | | | | | | | 63,000 |
| 0-8 | The study tours to the village from other Tambons are conducted | DOAE, WUG | 30,000 | | | | | | | | | | | | | 30,000 |
| 0-9 | Meetings are conducted with TTC members. | | 13,250 | | | | | | | | | | | | | 13,250 |
| 0-10 | Trainings are conducted to TTC members on TOT | JICA Study Team | 20,000 | | | | | | | | | | | | | 20,000 |
| 0-11 | Trainings are conducted to TSG members on TOT | JICA Study Team | 20,000 | | | | | | | | | | | | | 20,000 |
| 1-1 | Trainings are conducted for the improvement of qualities of pineapple and sugarcane | DOAE, WUG | 3,000 | | | | | | | | | | | | | 3,000 |
| 1-2 | Trainings are conducted for the improvement of selling prices of pineapple | DOAE, WUG | 30,000 | | | | | | | | | | | | | 30,000 |
| 2-1 | Pump irrigation System is constructed | RID,WUG | 3,220,909 | | | | | | | | | | | | | 3,220,909 |
| 2.2 | Qualities of groundwater and soil are studied | LDD, WUG | 10,000 | | | | | | | | | | | | | 10,000 |
| 2-3 | WUG is trained on O & M of the system | RID, WUG | 10,000 | | | | | | | | | | | | | 10,000 |
| 3.1 | Producton of each crop is planned | DOAE, WUG | 10,000 | | | | | | | | | | | | | 10,000 |
| 3-2 | Trainnig are conducted for the improvement of qualities and quantities of crops | DOAE, WUG | 20,000 | | | | | | | | | | | | | 20,000 |
| 3-3 | Trainnig are conducted on chemical free vegetaable production | DOAE | 10,000 | | | | | | | | | | | | | 10,000 |
| 3-4 | Training on artificial breeding of cow and feed preparation are conducted. | DOL | 10,000 | | | | | | | | | | | | | 10,000 |
| | Soft Component | | 435,250 | | | | | | | | | | | | | 435,250 |
| | Hard Component | | 3,220,909 | | | | | | | | | | | | | 3,220,909 |
| | Contingency 10% in Hard Component | | 322,091 | | | | | | | | | | | | | 322,091 |
| | Contingency 8% in Soft Component | | 34,820 | | | | | | | | | | | | | 34,820 |
| | Soft Component | | 470,070 | | | | | | | | | | | | | 470,070 |
| | Hard Component | | 3,543,000 | | | | | | | | | | | | | 3,543,000 |
| | Total | | 4,013,070 | | | | | | | | | | | | | 4,013,070 |

## 5.5 Implementation Schedule

Based on the PO (1), the detailed implementation schedule of each activity up to November 2004 was discussed and finalized in the TSG meetings in Ratchaburi and Kanchanaburi respectively. To decide the schedule, the conditions such as ability of the organization, limited budgetary allocation, etc were taken into consideration by each responsible agency. The implementation schedules for each Pilot Project are shown in the tables in the following pages.

## 5.6 Project Cost

Based on the PO (1), the revised cost for implementation was estimated. For UHMR, the estimated costs for hard component and soft component were 3,422,000Bt and 470,070Bt respectively. For BTPW, the cost for hard component was estimated at 3,543,000Bt, and that for soft component was at 470,070Bt. The summary of each project cost is shown in the table below, and the breakdown is shown in following pages.

| Project Name | Hard Component | Soft Component | Total |
|---|---|---|---|
| UHMR Project | 3,422,000 | 470,070 | 3,892,070 |
| BTPW Project | 3,543,000 | 470,070 | 4,013,070 |
| Total | 6,965,000 | 940,140 | 7,905,140 |

## Table 5.6.1 Project Cost for UHMR Project in Ratchaburi

unit:Bt

| | Activities | Responsible Agencies | Total Budget | 2004 (2547) | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Jan. | Feb. | Mar. | Apr. | May | Jun. | Jul. | Aug. | Sep. | Oct. | Nov. | Dec. | |
| 0-2 | PDM(0) and PO(0) are reviewed with major stakeholders. | JICA Study Team | 3,000 | 3,000 | | | | | | | | | | | | 3,000 |
| 0-3 | The meetings are held to establish the Water Users Group (WUG) | RID | 10,000 | | | 4,600 | 5,400 | | | | | | | | | 10,000 |
| 0-4 | The meetings are held between the WUG and village groups. | DOAE | 10,000 | | 10,000 | | | | | | | | | | | 10,000 |
| 0-5 | The WUG fund is established and accumulated. | WUG | 150,000 | | | | | | 150,000 | | | | | | | 150,000 |
| 0-6 | The demonstration plots are established for sugarcane, pineapple and vegetables. | DOAE, WUG | 40,000 | | | | | 40,000 | | | | | | | | 40,000 |
| 0-7 | The study tours by WUG are conducted. | DOAE, WUG | 63,000 | | | | | 31,500 | | | | | | 31,500 | | 63,000 |
| 0-8 | The study tours to the village from other Tambons are conducted | DOAE, WUG | 30,000 | | | | | 15,000 | | | | | | 15,000 | | 30,000 |
| 0-9 | Meetings are conducted with TTC members. | | 13,250 | | 1,325 | 1,325 | 1,325 | 1,325 | 1,325 | 1,325 | 1,325 | 1,325 | 1,325 | 1,325 | | 13,250 |
| 0-10 | Trainings are conducted to TTC members on TOT | JICA Study Team | 20,000 | | | 20,000 | | | | | | | | | | 20,000 |
| 0-11 | Trainings are conducted to TSG members on TOT | JICA Study Team | 20,000 | | | 20,000 | | | | | | | | | | 20,000 |
| 1-1 | Trainings are conducted for the improvement of qualities of pineapple and sugarcane. | DOAE, WUG | 20,000 | | | | | | 20,000 | | | | | | | 20,000 |
| 1-2 | Trainings are conducted for the improvement of selling prices of pineapple | DOAE, WUG | 10,000 | | | | | | | 10,000 | | | | | | 10,000 |
| 2-1 | Trainings are conducted on the use of fertilizers and pesticides. | DOAE, WUG | 15,000 | | | | | | | 15,000 | | | | | | 15,000 |
| 2-3 | Trainings are conducted on the make and use of organic fertilizers. | LDD, WUG | 21,000 | | | | 18,400 | 2,600 | | | | | | | | 21,000 |
| 3-3 | Main and secondary pipelines are installed | RID,WUG | 3,110,909 | | | 1,500,000 | 1,500,000 | 110,909 | | | | | | | | 3,110,909 |
| 3-5 | Trainings are conducted for water management and maintenance. | RID,WUG | 10,000 | | | 10,000 | | | | | | | | | | 10,000 |
| | Soft Component | | 435,250 | 3,000 | 11,325 | 55,925 | 25,125 | 90,425 | 171,325 | 26,325 | 1,325 | 1,325 | 1,325 | 47,825 | 0 | 435,250 |
| | Hard Component | | 3,110,909 | 0 | 0 | 1,500,000 | 1,500,000 | 110,909 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3,110,909 |
| | Contingency 10% in Hard Component | | 311,091 | | | | | | 100,000 | 100,000 | 111,091 | | | | | 311,091 |
| | Contingency 8% in Soft Component | | 34,820 | | | | | | 10,000 | 10,000 | 14,820 | | | | | 34,820 |
| | Soft Component | | 470,070 | 3,000 | 11,325 | 55,925 | 25,125 | 90,425 | 181,325 | 36,325 | 16,145 | 1,325 | 1,325 | 47,825 | 0 | 470,070 |
| | Hard Component | | 3,422,000 | 0 | 0 | 1,500,000 | 1,500,000 | 110,909 | 100,000 | 100,000 | 111,091 | 0 | 0 | 0 | 0 | 3,422,000 |
| | Total | | 3,892,070 | 3,000 | 11,325 | 1,555,925 | 1,525,125 | 201,334 | 281,325 | 136,325 | 127,236 | 1,325 | 1,325 | 47,825 | 0 | 3,892,070 |

## Table 5.6.2 Project Cost for BTPW Project in Kanchanaburi

unit:Bt

| Activities | | Responsible Agencies | Total Budget | 2004 (2547) | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Jan. | Feb. | Mar. | Apr. | May | Jun. | Jul. | Aug. | Sep. | Oct. | Nov. | Dec. | |
| 0-2 | PDM(0) and PO(0) are reviewed with major stakeholders. | JICA Study Team | 3,000 | 3,000 | | | | | | | | | | | | 3,000 |
| 0-3 | The meetings are held to establish the Water Users Group (WUG) | RID | 10,000 | | | 10,000 | | | | | | | | | | 10,000 |
| 0-4 | The meetings are held between the WUG and village groups | DOAE | 10,000 | | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | | 10,000 |
| 0-5 | The WUG fund is established and accumulated. | WUG | 150,000 | | | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 | 150,000 |
| 0-6 | The demonstration plots are established for sugarcane, pineapple and vegetables | DOAE, WUG | 13,000 | | | 13,000 | | | | | | | | | | 13,000 |
| 0-7 | The study tours by WUG are conducted. | DOAE, WUG | 63,000 | | | | | 31,500 | | | | | | 31,500 | | 63,000 |
| 0-8 | The study tours to the village from other Tambons are conductec | DOAE, WUG | 30,000 | | | | | 15,000 | | | | | | 15,000 | | 30,000 |
| 0-9 | Meetings are conducted with TTC members. | | 13,250 | | 1,325 | 1,325 | 1,325 | 1,325 | 1,325 | 1,325 | 1,325 | 1,325 | 1,325 | 1,325 | | 13,250 |
| 0-10 | Trainings are conducted to TTC members on TOT | JICA Study Team | 20,000 | | | 20,000 | | | | | | | | | | 20,000 |
| 0-11 | Trainings are conducted to TSG members on TOT | JICA Study Team | 20,000 | | | 20,000 | | | | | | | | | | 20,000 |
| 1-1 | Trainings are conducted for the improvement of qualities of pineapple anc | DOAE, WUG | 3,000 | | 3,000 | | | | | | | | | | | 3,000 |
| 1-2 | Trainings are conducted for the improvement of selling prices of pineapple | DOAE, WUG | 30,000 | | | 3,750 | 3,750 | 3,750 | 3,750 | 3,750 | 3,750 | 3,750 | 3,750 | | | 30,000 |
| 2-1 | Pump irrigation System is constructed | RID,WUG | 3,220,909 | | | 1,500,000 | 1,500,000 | 220,909 | | | | | | | | 3,220,909 |
| 2.2 | Qualities of groundwater and soil are studied | LDD, WUG | 10,000 | | | 10,000 | | | | | | | | | | 10,000 |
| 2-3 | WUG is trained on O & M of the system | RID, WUG | 10,000 | | | | | 1,700 | 1,700 | 1,700 | 1,700 | 1,700 | 1,500 | | | 10,000 |
| 3.1 | Producton of each crop is planned | DOAE, WUG | 10,000 | | | 2,500 | 2,500 | 2,500 | 2,500 | | | | | | | 10,000 |
| 3-2 | Trainnig are conducted for the improvement of qualities and quantities of | DOAE, WUG | 20,000 | | | 2,500 | 2,500 | 2,500 | 2,500 | 2,500 | 2,500 | 2,500 | 2,500 | | | 20,000 |
| 3-3 | Trainnig are conducted on chemical free vegetaable production | DOAE | 10,000 | | | 1,250 | 1,250 | 1,250 | 1,250 | 1,250 | 1,250 | 1,250 | 1,250 | | | 10,000 |
| 3-4 | Training on artificial breeding of cow and feed preparation are conducted. | DOL | 10,000 | | | 1,250 | 1,250 | 1,250 | 1,250 | 1,250 | 1,250 | 1,250 | 1,250 | | | 10,000 |
| Soft Component | | | 435,250 | 3,000 | 5,325 | 101,575 | 28,575 | 76,775 | 30,275 | 27,775 | 27,775 | 27,775 | 27,575 | 63,825 | 15,000 | 435,250 |
| Hard Component | | | 3,220,909 | 0 | 0 | 1,500,000 | 1,500,000 | 220,909 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3,220,909 |
| Contingency 10% in Hard Component | | | 322,091 | | | | | | 100,000 | 100,000 | 122,091 | | | | | 322,091 |
| Contingency 8% in Soft Component | | | 34,820 | | | | | | 10,000 | 10,000 | 14,820 | | | | | 34,820 |
| Soft Component | | | 470,070 | 3,000 | 5,325 | 101,575 | 28,575 | 76,775 | 40,275 | 37,775 | 42,595 | 27,775 | 27,575 | 63,825 | 15,000 | 470,070 |
| Hard Component | | | 3,543,000 | 0 | 0 | 1,500,000 | 1,500,000 | 220,909 | 100,000 | 100,000 | 122,091 | 0 | 0 | 0 | 0 | 3,543,000 |
| Total | | | 4,013,070 | 3,000 | 5,325 | 1,601,575 | 1,528,575 | 297,684 | 140,275 | 137,775 | 164,686 | 27,775 | 27,575 | 63,825 | 15,000 | 4,013,070 |

# CHAPTER 6 PROJECT DETAILS AND OUTCOMES

## 6.1 Detail Plans of the Responsible Agencies

According to the PO (1) revised in February 2004, the agencies in TSG such as RID, DOAE and DOL prepared the detail plan of each activity for which they are responsible. In the detail plans, each agency made clear the persons in charge, steps to be taken, the expected number of participants, etc.

The example of the detail plans in BTPW project in Kanchanaburi is shown below. This was prepared by DOCP, the responsible agency of activity 0-3, "Establishment of Water Users Group". The plan shows the steps how to establish and strengthen the group. Based on the detail plans, the responsible agencies carried out the activities. All the detail plans of the activities in both BTPW and UHMR are attached in Appendix.

**Table 6.1.1 Example of the Detail Plan**

| Objective | Responsible person | Organi zation | Steps | No. partic ipant | Budget Requested (Baht) | Other major stakeholder | Date of request |
|---|---|---|---|---|---|---|---|
| Water Users are able to manage irrigation water effectively | Mr. Sayan Ketphan | DOCP | 1. Explain objectives<br>2. Establishment of WUG<br>3. Selection of committee<br>4. Establishment of rules and regulation<br>5. Development of plan<br>6. Water User group meeting to explain all above | 20 | 10,000 | Study Team<br>TTC | 23/02/04 |

Note: Information is the example from the activity "0-3: Establishment of Water Users Group"

## 6.2 Plans of Institutional Strengthening

To enhance the sustainability of the project, one of the most important aspects is the capability of the implementing organizations such as RID, DOAE and DOL and "grass root level organizations" such as women's group and WUG. In addition, effective coordination among them is also important for the sustainability. In the Pilot Project, the Study Team proposed the Implementation Structure as described in Chapter 5. In the Implementation Structure, TSG, TTC and the farmers organizations were supposed to play the main roles for implementing each activity. To strengthen such organizations, some activities were planned as shown in the following:

◆ <u>For Administrative Organizations:</u>

a) Training on Trainers (TOT) for TSG
b) Training on Trainers (TOT) for TTC
c) TTC meeting

◆ <u>For Grass Root Level Organization:</u>

d) Water Users Group (WUG) meeting

◆ <u>For coordination among the party concerned:</u>

e) TSG meeting (among government agencies)
f) Joint meeting with WUG and other farmers' group (among farmers groups)
g) Joint monitoring workshop (between government agencies and farmers groups)

These approaches for institutional strengthening are visualized in the Figure 6.2.1.

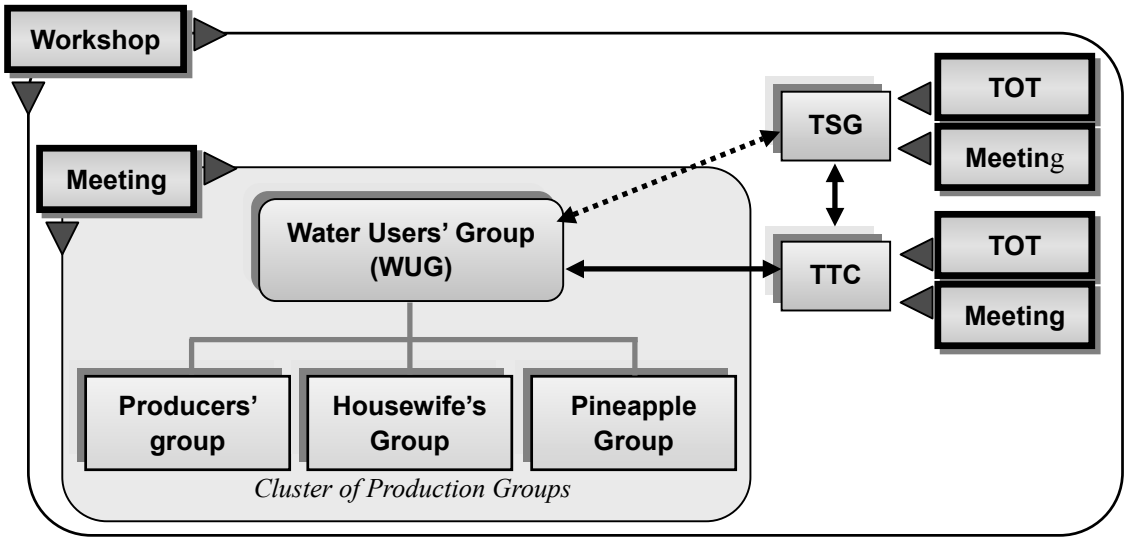



**Figure 6.2.1 Approaches on Institutional Strengthening**

**a) Training on Trainers (TOT) for TSG**

The TSG's strengthening was one of the most important issues, since this organization was just established by this study, and their roles and responsibilities were not so clear to the member in the stage of project implementation. Since the TSG is composed of several government organizations, most challenging issue was to strengthen cooperation among them. Although various activities were already done in the process of planning the Draft Master Plan, more trainings were needed for TSG.

**Objectives of the TOT for TSG**
- To understand participatory approach and how to apply it in the provincial CEO plan
- To understand project approach
- To be able to prepare the support plan for TTC and the farmers
- To learn how to be a good trainer

Accordingly, two-day training for TOT was planned for the members of TSG. The objectives of the TOT are shown in the right box. Through the TOT, TSG was expected to learn what they should do as the main actor for project implementation and for implementing participatory approach in future's projects. They were also expected to learn how to collaborate with and support other government agencies especially TTC.

**b) Training on Trainers (TOT) for TTC**

Through the course of the Study, it was found that TTCs, in general, are not functioning well as expected. However, in the Pilot Project, the roles of TTC were crucial for supporting the farmers so as to reach the project goals. Two-days TOT was therefore planned for TTC with the participation of some farmers. The objectives of the TOT for TTC are shown in the box.

**Objectives of the TOT for TTC**
- To understand the roles and responsibilities of the TTC
- To be able to prepare the support plan for farmers
- To learn how to be a good trainer

**c) TTC Meeting**

TTCs are in charge of providing extension services related to agriculture, fishery and livestock. It is one of the most important tasks for TTCs to provide the services to the communities constantly. However, due to the lack of human resources and budget, TTCs face difficulties to provide expected services to the farmers. Given the fact, in the Pilot Project, periodical meeting was proposed to monitor their performances by themselves. The periodical meeting was believed to provide good opportunities to the members to understand their roles and responsibilities.

**d) Water Users Group Meeting**

One of the main components of the Pilot Project was irrigation development in both UHMR project and BTPW project. After the completion of the Pilot Project, the farmers should operate and manage the irrigation facilities. Water Uses Group (WUG) was therefore planned to be established in the Pilot Project. WUG was then empowered through On-the-Job-Training (OJT) in the series of activities.

**e) TSG meetings**

Since TSG was established for this study, its members were not quite sure of their roles and responsibilities. Moreover, since the members were consisted of the representatives from the different agencies, the capacities of each member as well as the TSG as a whole were yet to be understood. The Study Team therefore conducted a series of TSG meetings for improving those issues.

**f) Joint meeting with WUG and other farmers' group <Self Monitoring & Evaluation>**

In order to monitor the progress of each activity constantly, it was proposed that the members of WUG, Housewives' Group, and other production groups have a meeting monthly. WUG was supposed to lead the meetings as the core organization. In the meetings, the participants were supposed to report the progress of each activity and discuss how to improve it. Through this process, it was considered that the ownership of the farmers towards the project would be cultivated.

**g) Joint workshop for monitoring and evaluation**

Monitoring workshop was planned with the farmers, TSG, TTC and the Study Team. Its main objective was to monitor the progress of each activity and revise the plan, if necessary. In terms of "institutional strengthening", it was supposed to facilitate the process in which main stakeholders sit at the same table and discuss the issues. Through the discussions from various points of view, the stakeholders were expected to learn the different ideas of the other people. The relationships among the stakeholders were also expected to be deepened.

## 6.3 Achievements of the Pilot Project

### 6.3.1 Progresses and Performances of the Project Activities

All of the project activities, except one in progress, proposed in POs (2) in UHMR and BTPW were completed by November 2004 as shown in Table 6.3.1.

**Table 6.3.1 Progress of the Project Activities**

| Project | Completed | Not completed | Nothing is done | Total |
|---|---|---|---|---|
| **As of May 2004 (Monitoring)** | | | | |
| UHMR | 12 | 4 | 6 | 22 |
| BTPW | 6 | 5 | 10 | 21 |
| Total | 18 | 9 | 16 | 43 |
| **As of November 2004 (Evaluation)** | | | | |
| UHMR | 22 | 0 | 0 | 22 |
| BTPW | 20 | 1 | 0 | 21 |
| Total | 42 | 1 | 0 | 43 |

**(1) UHMR**

**1) Progress of each activity**

*Hard Component*

The irrigation facilities were constructed all by RID Ratchaburi. Eight (8) farmers out of twenty six (26) installed tertiary pipes on their farms. The other farmers will install it after the existing crops such as sugarcane and pineapple are harvested. It should be noted that one of the beneficiary farmers installed an electric pump in his tertiary pipes so as to further bring up irrigation water to his farmland where the land level is higher than the water level of the reservoir. According to RID Ratchaburi, some farmers are willing to introduce vegetables and fruits trees.

*Soft Component*

All the soft component activities were completed as scheduled. The demonstration plots for sugarcane, pineapple and vegetables were established, and the training for irrigation water management was conducted. The farmers had a chance to visit the project site of BTPW. In that occasion, they recognized that the activities of compost making were very attractive. The farmers from UHMR asked the details of compost making, and the farmers of BTPW agreed to send one of the ingredients necessary for compost, which is available at reasonable price in the village. Through this way, the link between both areas was established. It also should be noted that RID Ratchaburi established a demonstration plot of sugarcane with their budget. The progress of each project activity in UHMR is shown in Table 6.3.2.

**Table 6.3.2 Progress of Each Activity in UHMR**

| No. | Activities | Responsible Persons | Progress |
|---|---|---|---|
| 0-1 | The baseline survey | JICA, RID | ○ |
| 0-2 | PDM (0) and PO (0) reviewed with major stakeholders | JICA, TSG, Farmer | ○ |
| 0-3 | The meetings held to establish the Water Users Group (WUG) | RID, Farmer | ○ |
| 0-4 | The meetings held between the WUG and village groups | WUG, DOAE | ○ |
| 0-5 | The WUG fund established and accumulated | WUG | ○ |
| 0-6 | The demonstration plots established for sugarcane, pineapple and vegetables | WUG, DOAE | ○ |
| 0-7 | The study tours conducted by WUG | DOAE, WUG | ○ |
| 0-8 | The study tours to the village from other Tambons | DOAE, WUG | ○ |
| 0-9 | Meetings conducted with TTC members | DOAE | ○ |
| 0-10 | Trainings conducted to TTC members on TOT | JICA | ○ |
| 0-11 | Trainings conducted to TSG members on TOT | JICA | ○ |
| 0-12 | The monitoring and evaluation surveys | JICA, TSG | ○ |
| 1-1 | Trainings conducted for the improvement of qualities of pineapple and sugarcane | DOAE, WUG | ○ |
| 1-2 | Trainings conducted for the improvement of selling prices of pineapple | DOAE, WUG | ○ |
| 2-1 | Trainings conducted on the use of fertilizers and pesticides | DOAE, WUG | ○ |
| 2-2 | Fertilizers, pesticides, herbicides and tractors obtained by groups | DOAE, WUG | ○ |
| 2-3 | Trainings conducted on the make and use of organic fertilizers | LDD, WUG | ○ |
| 3-1 | Alignment of main and secondary pipelines discussed and fixed | RID, Village Head | ○ |
| 3-2 | Survey, design and cost estimates for pipeline installation | RID, Village Head | ○ |
| 3-3 | Main and secondary pipelines installed | RID, WUG | ○ |
| 3-4 | Tertiary pipelines installed | WUG | ○ |
| 3-5 | Trainings conducted for water management and maintenance | RID, WUG | ○ |

Note: ○: Completed, △: Some activities are done but not completed, ×: Nothing is done

**2) Performances of each activity**

The performances of the project activities planned in PO (2) were observed from the planning stage in November 2003, through the monitoring stage in May 2004, to the evaluation stage in November 2004. The results are shown in the table below.

**Table 6.3.4 Performances of Each Activity in UHMR**

| Activities | Expected Results | Performances |
|---|---|---|
| (0-1) The baseline survey is conducted. | - Baseline information of 50 households (24 beneficiary households from pipeline irrigation and other 26) | The baseline survey was conducted. 50 households were interviewed on socio economic situations, and the report was prepared. Information was used for the project evaluation. |
| (0-2) PDM (0) and PO(0) are reviewed with major stakeholders. | - PDM(1) and PO(1) | PDM(0) and PO(0)were reviewed with major stake holders in January 2004, and PDM(1) and PO(1) were prepared. PDM(1) and PO(1) were revised during the monitoring survey in May 2004 with major stake holders, and PDM(2) and PO(2) were prepared. More detailed information was asked to the responsible agencies to prepare and submit. |
| (0-3) The meetings are held to establish the Water Users Group (WUG). | - Group structure, leader selection, regulations, work plan, etc. | RID took incharge of WUG's establishment and strengthening. Group structure and the committee were established, and rules and regulations were prepared. The group was registered at the district governor's office as the certified group. The best performance of RID staff resulted in strong water user group. |

| Activities | Expected Results | Performances |
|---|---|---|
| (0-4) The meetings are held between the WUG and village groups. | - Regulations, work plan, monitoring reports of project activities, etc. | The meeting was organized between WUG and other village groups for discussing project plans, progresses and necessary countermeasures. |
| (0-5) The WUG fund is established and accumulated. | - Revolving fund with low interest rates for group activities | Revolving fund was developed and managed by the WUG and housewife group. 100 farmers benefited from the activity. 600 bags of fertilizer were purchased and distributed equality to all the members. All the members paid 100 Bt as the member fee.<br>The revolving fund was the mean to reduce input cost of the farmers in crop production. Each member could save 186 Bt by obtaining chemical fertilizer from group. The WUG plans to increase amount of fund in the future. |
| (0-6) The demonstration plots are established for sugarcane, pineapple and vegetables. | - 2 plots (1 rai/plot) from 2 households<br>- 0.5 rai for vegetables | One rai of sugarcane, one rai of pineapple and half rai of vegetable were planted as demonstration plots. They were used as the learning sites of the villagers and people from outside the area. Most of the results of the demonstration farms can be observed after the harvest time in 2005. |
| (0-7) The study tours by WUG are conducted. | - Pineapple growers in Chonburi province.<br>- Advanced WUG in other areas | Farmers visited the pineapple grower in Phetchaburi province. They could observe the high yield of pineapple with irrigation. Farmers said the soil quality in Ban Nongchok is better than in Phetaburi. If they improved their management and irrigation, they could easily increase pineapple yield. |
| (0-8) The study tours to the village from other Tambons are conducted. | - Achievements of hard & soft components are presented<br>- The comments of the participants are collected on implementing structure & activities<br>- Potential expansion of the similar project to other areas as discussed | Study tour was conducted by WUG and RID under the supervision of the Study Team. The representatives from 16 Tambons in the Lam pa chi area were invited. Participatory irrigation development process was explained by RID officer. Irrigation system was visited. Demonstration plots were also used as the learning station for participants. Participants understood that the irrigation system contributed a lot to the crop production. Process of budget request for project implementation was also discussed among the TAO. |
| (0-9) Meetings are conducted with TTC members. | - Regulations, roles and responsibilities<br>- Progress reports | TTC members organized monthly meetings to discuss on the progress of activities. The member of water user group was also the member of TTC. He could report the project's progress to TTC members. TTC chairman participated regularly in meetings and training. Therefore, he was able to communicate with the farmers effectively. |
| (0-10) Trainings are conducted to TTC members on TOT. | - TTC members can facilitate farmers' meetings. | TTC members participated in TOT training with the TTC members of Kanchanaburi. The role of TTC in the project was the facilitator and coordinator for technical support. Therefore, training course on "Training of the Trainers" was organized. The roles and responsibilities of TTC were identified by the participants. Work process of the TTC was also prepared. Some skills such as how to be be a facilitator, how to organize farmer meetings were explained. After training, the participants were more confident to work with WUG and coordinate with government agencies. The evaluation results indicated that the participants felt the improvement of their skills as the change agent. They requested three days training instead of two. The trainers suggested that the full TOT course should cover five days. |

| Activities | Expected Results | Performances |
|---|---|---|
| (0-11) Trainings are conducted to TSG members on TOT. | - TSG members can facilitate farmers' meetings. | TOT training was also conducted for TSG members. The roles and responsibilities of TSG were identified by the participants. The CEO plan of Ratchaburi province was analyzed, and the participants accepted that it was important to include the PO in the provincial development plan in order to integrate technical support from government agencies at the provincial level. Some skills such as how to be a facilitator, how to organize farmer meetings were explained.<br>Duration of the training was mentioned too short. The participants requested three days instead of two. |
| (0-12) The monitoring and evaluation surveys are conducted. | - Monitoring and evaluation reports | The monitoring and evaluation surveys were conducted in May and November 2004 respectively. The results of the survey were analyzed and summarized in the reports. |
| (0-13) Irrigation system is transferred to TAO tentatively | - Roles & responsibility of TAO & WUG<br>- O&M manual<br>- Spec of the facilities<br>- Official letter<br>- Water fee | Irrigation system was transfer to TAO Nong Phan Chan. Necessary document were prepared by RID. The process of irrigation transfer by the Pilot Project could be the model for this type of projects in the future. |
| (1-1) Trainings are conducted for the improvement of qualities of pineapple and sugarcane. | - Improvement of selling prices of pineapple and sugarcane | The DOAE officer from provincial office organized training course on how to improve quality of pineapple and sugarcane. |
| (1-2) Trainings are conducted for the improvement of selling prices of pineapple. | - Improvement of selling prices of pineapple | The training was conducted for the improvement of selling prices of pineapple, but actual outcomes are yet to be seen. |
| (2-1) Trainings are conducted on the use of fertilizers and pesticides. | - Improvement of use and costs of fertilizers and pesticides | Farmers learned better how to apply fertilizer effectively. |
| (2-2) Fertilizers, pesticides, herbicides and tractors are obtained by groups. | - Improvement of costs of fertilizers, pesticides, herbicides and tractors | Chemical fertilizer was obtained by group approach. It could be a good example for the farmers to organize themselves in group for obtaining inputs at lower cost. |
| (2-3) Trainings are conducted on the make and use of organic fertilizers. | - Improvement of use and costs of fertilizers | The farmers were trained on compost making. They are able to produce compost now. There is a tendency that the farmers replace chemical fertilizer with compost. |
| (3-1) Alignment of main and secondary pipelines is discussed and fixed. | - Alignment of main (L=1,675m) and secondary pipelines | Completed |
| (3-2) Survey, design and cost estimates for pipeline installation are conducted. | - Design and cost estimates | Completed |
| (3-3) Main and secondary pipelines are installed. | - Main and secondary pipelines installed | Completed and operational. |

| Activities | Expected Results | Performances |
|---|---|---|
| (3-4) Tertiary pipelines are installed. | - Tertiary pipelines installed | Six farmers already installed tertiary pipes in their farm. The remaining farmers will install after harvesting their crops. |
| (3-5) Trainings are conducted for water management and maintenance. | - Rules of water management and maintenance | One day training was organized on water management and maintenance. |

**(2) BTPW**

**1) Progress of each activity**

*Hard Component*

Although the progress was slower than the plan at the time of monitoring in May 2004, the construction of the irrigation facilities was completed. The pump station, main and secondary pipelines as well as supplementary facilities were installed by RID in due location. However, only seven (7) farmers out of twenty one (21) have connected their tertiary pipes with the main system. The other farmers are still anxious that the fee of pumping irrigation from Lam Pa Chi River may not be reasonable.

*Soft Component*

The activities of "Training on Artificial Breeding" and "Training on Compost Making" are worth describing. Promoted by the project, an artificial breeding center was established in TAO Nong Phai, where Tha Phayom village locates. Also, through the activity of compost making, the WUG started to make profits. The demand on compost is increasing, and the farmers are willing to expand its production. The progress of each activity in BTPW is shown in Table 6.3.4.

**Table 6.3.4 Progress of Each Activity in BTPW**

| No. | Activities | Responsible Persons | Progress |
|---|---|---|---|
| 0-1 | The baseline survey | JICA, RID | ○ |
| 0-2 | PDM (0) and PO (0) reviewed with major stakeholders | JICA, TSG, Farmer | ○ |
| 0-3 | The meetings held to establish the Water Users Group (WUG) | RID, Farmer | ○ |
| 0-4 | The meetings held between the WUG and village groups | WUG, DOAE | ○ |
| 0-5 | The WUG fund established and accumulated | RID, WUG | ○ |
| 0-6 | The demonstration plots established for baby corn, sweet corn and other vegetables | WUG, DOAE | ○ |
| 0-7 | The study tours by WUG | DOAE, WUG | ○ |
| 0-8 | The study tours to the village from other Tambons | DOAE, WUG | ○ |
| 0-9 | Meetings conducted with TTC members | DOAE | ○ |
| 0-10 | Trainings conducted to TTC members on TOT | JICA | ○ |
| 0-11 | Trainings conducted to TSG members on TOT | JICA | ○ |
| 0-12 | The monitoring and evaluation surveys | JICA, TSG | ○ |
| 1-1 | Farmers trained on how to make compost | LDD, WUG | ○ |
| 1-2 | Compost made and used by the group | DOAE, LDD, WUG | ○ |
| 2-1 | Pump Irrigation System constructed | RID, WUG, Village Head | ○ |
| 2-2 | Qualities of groundwater and soil studied | LDD, WUG | △ |
| 2-3 | WUG trained on operation and maintenance of the system | RID, WUG | ○ |

| No. | Activities | Responsible Persons | Progress |
|---|---|---|---|
| 3-1 | Production of each crop planned | DOAE, WUG | ○ |
| 3-2 | Trainings conducted for the improvement of qualities and quantities of crops | DOAE, WUG | ○ |
| 3-3 | Trainings conducted on chemical free vegetable production | DOAE | ○ |
| 3-4 | Training on artificial breeding of cow and feed preparation | DOL | ○ |

Note: ○: Completed, △: Some activities are done but not completed, ×: Nothing is done

**2) Performances of each activity**

The performances of the project activities are shown in the table below.

**Table 6.3.5 Performances of Each Activity in BTPW**

| Activities | Expected Results | Performances |
|---|---|---|
| (0-1) The baseline survey is conducted. | - Baseline information of 50 households | The baseline survey was conducted. 30 households were interviewed on socio economic situations, and the report was prepared. Information was used for the project evaluation. |
| (0-2) PDM(0) and PO(0) are reviewed with major stakeholders. | - PDM(1) and PO(1) | PDM(0) and PO(0)were reviewed with major stake holders in January 2004, and PDM(1) and PO(1) were prepared. PDM(1) and PO(1) were revised during the monitoring survey in May 2004 with major stake holders, and PDM(2) and PO(2) were prepared. More detailed information was asked to the responsible agencies to prepare and submit. |
| (0-3) The meetings are held to establish the Water Users Group (WUG). | - Group structure, leader selection, regulations, work plan, etc. | WUG was established at the beginning of the project implementation in March 2004. The group structure was decided including the leader, asst. leader, accountant and public relation. The rules and regulation were prepared. The WUG used PO as the work plan. Book keeping and how to manage the group were trained by DOCP. (Since there were only 24 members, the group may not be registered as a cooperative yet. At least 50 members were required. Since the group had to maintain and operate the irrigation system, RID and TAO were requested to supervise it.) The group once collected pumping cost and paid for electricity. The accountant was capable in managing account and also supervised the members in book keeping and preparation of farm records. The WUG leader was confident that the WUG, at this moment, could perform its tasks. |
| (0-4) The meetings are held between the WUG and village groups. | - Regulations, work plan, monitoring reports of project activities, etc. | The existing production groups in the village usually worked directly with the quota heads. This relationship existed already long time. Members of production groups obtained inputs from the heads on credit. After selling products, inputs costs are deducted. Those situations were intended to change.<br><br>Besides the existing groups, two new groups were established during the project implementation; compost making group (40 members) and baby corn production group (20 members). WUG worked intensively with these groups. Some members of these groups are also members of WUG. WUG paid the leading role in organizing meetings, preparation of the production plan, coordination between farmers and government agencies and mobilizing financial resources from the project, DOAE, village development fund and other sources. |
| (0-5) The WUG fund is established and accumulated. | - Revolving fund with low interest rates for group activities | 150,000 Bt was allocated by the project as the revolving fund for compost making. The fund was accumulated by collection of member fee (total 6,000 Bt), village development fund (18,000 Bt) and compost making activity (30,000 Bt). Storage house was constructed with the fund. Necessary equipments, tools and raw materials were purchased. As a result, six tons of compost were already produced and sold to the members. According to the |

| Activities | Expected Results | Performances |
|---|---|---|
| | | WUG leader, 14 tons of compost per month could be produced by the group. The rules and regulations of the revolving fund were prepared. Bank account was opened. DOCP supervised on book keeping and business development while LDD supervised on compost making and quality control. |
| (0-6) The demonstration plots are established for baby corn, sweet corn and other vegetables | - 100 rai for baby corn (by DOAE)<br>- 1 rai for sweet corn<br>- 0.5 rai for other vegetables | 1). DOAE provided in total 400 kg of baby corn seeds to 20 farmers. Each farmer grows five rai. Each rai of baby corn produced on average 1.3 ton. Total production was 130 tons. The price of baby corn was 2.30 Bt per kg. Net profit of baby corn production per rai was 850 Bt. The farmers earned total income of 85,000 Bt.<br><br>2). One rai of sweet corm was cultivated in the demonstration plot. The investment cost of sweet corn is 2,500 Bt. It was harvested only one time. Total income was 3,868 Bt. The plot was damaged after the first harvest.<br><br>3.) 0.5 rai of yard bean was produced in the demonstration plot. The investment cost is the 4,500 Bt. After harvesting some products, the crop was damage by flood.<br><br>All demonstration plots showed good yields. It can be used as the learning sites for the villagers. During harvesting there was big flood and the two demonstration plots were damaged. Therefore, suitable planning for crop production was recommended in order also to avoid loss from flood. |
| (0-7) The study tours by WUG are conducted. | - Advanced agricultural areas<br>- Advanced WUG in other areas | Study tour was organized during July 2-3, 2004 to visit advanced compost making group in Nakhonratchasima province, Northeast Thailand. About sixty participants were from TAO, TTC, WUG and compost making group. Compost making was demonstrated there. Compost was being produced by the members of the group on rotation basis. Group management was also discussed. Chemical free vegetable production was also visited. Then, home stay was organized in the target village.<br><br>After the study tour, the compost making group of BTPW developed and is using its own production and management techniques. With those techniques, only two labors are needed to produce compost. The members of the group could order it as much as they wanted, and the group committee prioritized the orders and supplied compost accordingly.<br><br>The participants learned about compost making and enjoyed the hospitality from the home stay. DOAE staff accepted the study tour with home stay could be a model for future study tour for the farmers. Study tour is also considered good for building up a relationship among the participants. |
| (0-8) The study tours to the village from other Tambons are conducted. | - Achievements of hard & soft components are presented<br>- The comments of the participants are collected on implementing structure & activities<br>- Potential expansion of the similar project to other areas as discussed | The study tour to the village from other Tambons was conducted on September 28, 2004. The representatives from 16 Tambons were invited. TAO Nongphai, DOAE Dam Makham Tia district, and WUG organized the activity under the coordination and supervision of the Study Team. Three learning stations were prepared; artificial breeding, compost making and vegetable production. Dam Makham Tia district governor was invited to open the study tour. Performance of irrigation and agricultural activities were presented. The discussion and presentation in each station were fruitful. The farmers representatives presented their achievement while the government agencies supported the presentation.<br><br>The opinions of the representatives from other Tambon were obtained only informally during the field demonstration. They accepted the participatory irrigation development could meet farmers' needs. The participatory approach and implementing structure could also be practiced in their areas. The success of organizing the study tour depended very much on the good cooperation of the stakeholders within Tambon. |

| Activities | Expected Results | Performances |
|---|---|---|
| (0-9) Meetings are conducted with TTC members. | - Regulations, roles and responsibilities<br>- Progress reports | TTC members were revised. The TAO members became the TTC members. The main reason was the TTC worked under TAO. Since they were the same members, TTC could more easily receive support from TAO. However, WUG claimed that the members of TTC were so busy with the TAO workload and could not coordinate effectively for technical support to WUG.<br><br>Therefore, the roles of TTC should be more clearly specified. Capacity building was also needed.<br><br>In the future, TAO is responsible for the budget allocation and supervision of TTC. Therefore, its roles should become clearer and more specific. |
| (0-10) Trainings are conducted to TTC members on TOT. | - TTC members can facilitate farmers' meetings. | TTC members participated in TOT training with the TTC members of Ratchaburi. The role of TTC in the project was the facilitator and coordinator for technical support. Therefore, training course on "Training of the Trainers" was organized. The roles and responsibilities of TTC were identified by the participants. Work process of the TTC was also prepared. Some skills such as how to be a facilitator, how to organize farmer meetings were explained. After training, the participants were more confident to work with WUG and coordinate with government agencies. The evaluation results indicated that the participants felt the improvement of their skills as the change agent. They requested three days training instead of two. The trainers suggested that the full TOT course should cover five days. |
| (0-11) Trainings are conducted to TSG members on TOT. | - TSG members can facilitate farmers' meetings. | TOT training was also conducted for TSG members. The roles and responsibilities of TSG were identified by the participants. The CEO plan of Kanchanaburi province was analyzed, and the participants accepted that it was important to include the PO in the provincial development plan in order to integrate technical support from government agencies at the provincial level. Some skills such as how to be a facilitator, how to organize farmer meetings were explained.<br>Duration of the training was mentioned too short. The participants requested three days instead of two. |
| (0-12) The monitoring and evaluation surveys are conducted. | - Monitoring and evaluation reports | The monitoring and evaluation surveys were conducted in May and November 2004 respectively. The results of the survey were analyzed and summarized in the reports. |
| (0-13) Irrigation system is transferred to TAO tentatively | - Roles & responsibility of TAO & WUG<br>- O&M manual<br>- Spec of the facilities<br>- Official letter<br>- Water fee | The pump irrigation system was transferred officially to TAO in September 2004 after the completion. |
| (1-1) Farmers are trained on how to make compost | - 20 farmers are able to produce compost. | LDD organized training course for 20 farmers on compost making. The participants became able to produce compost. |
| (1-2) Compost is made and used by the group. | - A group of 20 members is established.<br>- 50 tons of compost is produced. | Compost making group was established. They could benefit from being in a group in order to mobilize resources.<br><br>The budget of this activity was integrated in the revolving fund (0-5), and compost was produced. Six tons of compost was already produced. 14 Tons of compost could be produced per month. There was high demand for compost in the area due to the high cost of chemical fertilizer and the government policy to promote organic farming. |

| Activities | Expected Results | Performances |
|---|---|---|
| (2-1) Pump Irrigation System is constructed | - 1 pump irrigation system is constructed. | One pump system was constructed and operational. |
| (2-2) Qualities of groundwater and soil are studied. | - Qualities of groundwater and soil are identified<br>- Means to improve water and soil quality are suggested. | Soil quality was tested by the LDD. Results were sent to WUG. Suggestions were to improve soil quality by using compost. Ground water quality testing was under processing.<br><br>WUG and compost making group developed its skills in testing qualities of water and soil. In the future, they could provide supports to other farmers on how to improve soil for specific crop production. |
| (2-3) WUG is trained on operation and maintenance of the system | - WUG is able to operate and maintain the system | WUG is now able to operate and maintain the system. |
| (3-1) Production of each crop is planned | - Training needs are identified.<br>- Production plans are made. | Six farmers only use the irrigation now, and it is difficult to prepare a production plan covering the whole project area. However, WUG and TTC start to plan together, and baby corn production group planed for production effectively. In the future when more farmers use water from the pump system, the production plan at the project level can be made.<br><br>It is recommended to prepare a production plan as the farmers in this area suffer from flood. Good planning could avoid damage. The plan will also help the farmers not to overproduce the same crops. |
| (3-2) Trainings are conducted for the improvement of qualities and quantities of crops. | - Selling prices of crops become higher.<br>- Production volumes of crops become higher. | Training was conducted for the improvement of qualities and quantities of crops. The farmers learned how to apply fertilizer through the irrigation system in order to save time on fertilizer application and amount of fertilizer used. By this method the farmers could save at least fifty percent of fertilizer. |
| (3-3) Trainings are conducted on chemical free vegetable production. | - An organic vegetable group is established.<br>- Chemical free vegetables are produced.<br>- Production costs become lower.<br>- Selling prices of crops become higher. | WUG and compost making group visited the advanced farmers to learn organic farming techniques. This technique will become one of the important strategies of the area for future crop production. |
| (3-4) Training on artificial breeding of cow and feed preparation are conducted. | - 3 farmers are able to breed cows artificially.<br>- Cow feed is produced by the trained farmers. | Training on artificial breeding was one of the most successful activities in the Pilot Project. The farmers within and outside the project area participated in the training. The artificial breeding center was established to provide permanent services to the farmers. The farmers already started to have the benefits from this activity. |

### 6.3.2 Institutional Strengthening

As it was the intention of the project, many relevant agencies participated in the project implementation at the provincial, district and Tambon levels. Major stakeholders in the provincial and/or district levels were MOAC, RID and DOAE, and others including LDD, Livestock department, DOCP and CDD. Those agencies shared the major part of the TSG. At the Tambon level, TAO and TTC were the main stakeholders and participated in several meetings and training courses for them to be able to implement the project smoothly and support the farmers. At the village level, the WUG was established in each village and received different types of technical supports. The WUG was the key stakeholder in the village to organize the farmers and coordinate all the activities.

Communication is essential for institutional strengthening, and the Pilot Project facilitated the communication among the stakeholders by frequent workshops, meetings and discussions. Some of the study tours are also considered as useful for not only learning technical issues but also building a team by spending time together. Although the stakeholders had to spend a lot of their time for the project, as it is the nature of participatory approach, this was able to contribute largely to strengthen institutional ties.

As a result, the following achievements can be pointed out in terms of institutional strengthening:

1) The link between the government agencies and the farmers has been strengthened. In BTPW, the WUG in Tha Phayom feels they now know to which organizations and whom they contact when the farmers have technical difficulties.
2) The TAO Nong Phai involved intensively in the project activities and closely working with the WUG in Tha Phayom village. The TAO is already responsible for the O&M of the irrigation system of BTPW. The commitment of the TAO towards the project will help strengthen the WUG and assure the continuation of the project activities.
3) The compost making group in Tha Phayom village has been recognized by the district chief. This will raise their chance in receiving financial support for continuation and expansion of the activities.
4) The WUG in Tha Phayom was given the task to manage the project budget with the TAO, since the TSG Kanchanaburi had difficulties to handle it. The WUG had to keep account books and be able to explain all the transactions, and this eventually contributed to build their management capacities to some extent. The WUG in Nong Chok together with the housewife group have been responsible for managing the revolving funds. By the same token, their management capacities have been strengthened.
5) The WUG in Nong Chok has been recognized by the villagers as the core of agricultural development, not only water management for irrigated fields, but also coordination of all agricultural activities conducted by various farmers' groups in the village. This will help strengthen the WUG further.

6) The Kamnan (Tambon's leader) of Tambon Ban Kha was actively involved in the project activities, especially in meetings and workshops. He is also the head of TTC Ban Kha as well as the head of the pineapple growers group of 4 Tambons. The chief and the ex-chief of Nong Chok village are also the members of the same TTC, which makes the TTC functional, though to some extent. The TTC with the Kamnan as the head will therefore further support the WUG for the continuation of the project activities.
7) TSG members were acting as the coordinators at the provincial level as well as the providers of technical support to the farmers. To strengthen the capacities of the TSG, they were given TOT trainings besides the meetings and workshops. It is proved in both sites that the TSG members were able to facilitate the development process such as constructing the facilities, organizing the training courses and the study tours as well as being resource persons on certain topics like water management. This will help continue the project activities in both areas and expand the similar activities to other areas.

### 6.3.3 Number of the Beneficiaries

The numbers of the beneficiaries from the project were various activity by activity. It ranged from three farmers by the demonstration plots (excluding demonstration effects to other farmers) to 100 farmers by the revolving funds. In most of the activities, more than 30 farmers participated and benefited. As it was intended, the direct beneficiaries of the project were much beyond the direct beneficiaries of the irrigation systems. The project activities attracted more farmers than originally expected as follows:

- Study tours to advanced areas
- Exchange visits between two sites
- Revolving funds
- Training on artificial breeding
- Training on compost making

### 6.3.4 Handing Over of the Irrigation Systems

Handing over the ownership of the project irrigation system from RID to the local organization is remarkable achievement of the Pilot Project in terms of participatory irrigation development. RID policy indicates that small scale irrigation projects shall be transferred to local organizations once they are completed. The Study Team realized this policy and suggested to RID, TAO and WUA, during the project monitoring in May 2004, the transfer of the system by the end of the Pilot Project. It was intended to further strengthen WUG and draw the commitment from TAO by facilitating the transfer. Since then, RID provincial offices in both areas took necessary steps for the handing over.

In BTPW, the pump irrigation system was transferred to Nong Phai TAO immediately after completion in September. RID Kanchanaburi claimed that the TAO and WUG should be responsible for the payment of the pumping cost right after construction. TAO Nong Phai has an experience in adopting a

pump irrigation system, when one existing pump station was transferred from RID to TAO. Moreover, the public health department transferred a water pipe system to the TAO as well. Through those experiences, the TAO is considered to have enough capacity to manage the project's pump irrigation system. The WUG in Ban Tha Phayom also demonstrated their responsibilities by being able to collect and pay all the pumping cost covering four months of operation.

In UHMP, RID Ratchaburi prepared the detail documents on the system design, operation manual, water user group development and participatory irrigation development process as well as the sugarcane demonstration plot. Before the transfer, WUG meeting was held to discuss on it and WUG decided to receive the irrigation system. TAO Nongphanchan also agreed to receive the system.

The handing over ceremony was then organized as one session of technology transfer seminar on November 18, 2004. All parties concerned for the irrigation system such as RID Ratchaburi and Kanchanaburi, WUG leaders, village headmen, TAO chairmen and the leader of the Study Team cosigned the covering letter

The following is some lessons useful for small scale irrigation:

- Firstly, irrigation system must be completed and operational before the transfer. If local organization and water user group see some problems in the system, they should request for repair.
- Secondly, WUG should be established at the beginning of the development for them to be able to participate in all steps of irrigation development. In case of UHMR, WUG participated in planning the alignment of the pipeline, and more farmers were able to benefit from the system. The members of WUG observed the installation of main pipe and the construction of major facilities of the system. They were also trained on operation and maintenance, and the operation manual was prepared. Through those activities, WUG is expected to be able to maintain the system in future. In BTPW, WUG was established in March 2004. WUG members provided local knowledge on the flood water level to RID. As a result, the pump station was constructed much higher than the plan and was actually protected from heavy flood in May. They also participated in planning the alignment and obtained prior consent from the beneficiaries before construction. They were trained on operation and maintenance of the system as well.
- Thirdly, the rules and regulations should allow the handing over to local organizations. TAOs as the local organization is now authorized by law to receive infrastructures constructed by any agencies within their responsible areas. Then, they can secure their annual budget or request additional budget from the district chief or provincial administration organization to maintain the system. The tasks of TAO should include the supports of the responsible farmer groups for operating the system.
- Finally, RID must take necessary steps to transfer the system, such as the preparation of necessary documents and trainings of WUG on operation and maintenance of the system.

## 6.4 Expenditures and Cost Sharing

### 6.4.1 Expenditures

In this section, actual expenditures are compared with the budget. The budget was originally prepared in PO (1) in December 2003 and approved by JICA in January 2004. In UHMR, total 3,451,902 Bt was disbursed for hard component against the budget of 3,422,000 Bt. For soft component, total 439,202 Bt was disbursed against the budget of 470,070 Bt. In BTPW, total 3,542,850 Bt was disbursed for hard component against the budget of 3,543,000 Bt. For soft component, total 42,6801 Bt was disbursed against the budget of 470,070 Bt. As a whole, the entire budget was disbursed in due course. The summary of the budgets and expenditures is shown in the following table.

**Table 6.4.1 Budgets and Expenditures of the Pilot Project <Conclusion>**

| Project | Item | Hard Component | Soft Component | Total |
|---|---|---|---|---|
| UHMR | Budget | 3,422,000 | 470,070 | 3,892,070 |
| | Expenditure | 3,451,912<br>101% | 439,302<br>93% | 3,891,214<br>100% |
| | Balance | △29,912 | 30,769 | 856 |
| BTPW | Budget | 3,543,000 | 470,070 | 4,013,070 |
| | Expenditure | 3,542,850<br>100% | 426,801<br>91% | 3,969,651<br>99% |
| | Balance | 150 | 43269 | 43419 |
| Total | Budget | 6,965,000 | 940,140 | 7,905,140 |
| | Expenditure | 6,994,763<br>100% | 866,103<br>92% | 7,860,865<br>99% |
| | Balance | △29,763 | 74,038 | 44,275 |

Unit: Bt

Note: Although activity of "Trainings of Trainers (TOT)" was conducted jointly with UHMR and BTPW, the expenditure is halved in the table above.

In terms of the disbursement, the following remarks and lessons were obtained:

a) Accounting System

In order to operate the Pilot Project properly, a special accounting system was set up. In particular, the bank accounts were opened separately for hard and soft component, and the account of soft component was managed by several government agencies. As a result of evaluation on this peer accounting system, it can be said that the system enabled to secure certain levels of fairness and transparency for soft component.

b) Budget planning in hard component

Regarding hard component, almost hundred percent of the budget was properly disbursed in line with the construction schedule and estimated cost. It was reconfirmed that RID has enough experiences in implementing this kind of irrigation projects and therefore was able to estimate the project cost precisely. It is concerned if TAO can perform the same when it becomes responsible for executing small scale irrigation development in future.

c) Budget planning for soft component

Different from hard component, the cost of soft component was roughly estimated at the time of planning PO. Given the actual disbursement, it was found that some budget items were overused and some were not used at all. In particular, the trainers' fees were much higher than expected. Given the fact, it is suggested to make a budget plan more specifically. Regarding the shares of the budget, soft component took about 11.0% of the total budget or 12.4% of hard component. Thus, in future, budget of soft component could roughly be estimated at 10% to 15% of hard component, if the components and scale of the project are similar to the Pilot Project.

d) Cost reduction

To conduct a series of trainings and meetings, certain amount of budget should be used for using a meeting place. In the Pilot Project, the public utilities such as elementally school were used for the meetings. Since it can reduce the project cost, public utilities should be more exploited.

e) Compensation for non-beneficiary farmers

During the initial stage of implementation in UHMR, some compensation was paid to non-beneficiary farmers in order to install the main pipeline under their farmlands. To excavate for the pipes, it was necessary to cut their pineapples. To this end, RID made an agreement with the farmers to provide compensation for the excavations necessary for installation and maintenance of the pipes for the coming three years.

The details of the expenditures in both UHMR and BTPW are summarized in the following tables:

## Table 6.4.2 Expenditure for UHMR

| | Activities | Responsible Agencies | Total Budget | 2004 (2547) | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Jan. | Feb. | Mar. | Apr. | May | Jun. | Jul. | Aug. | Sep. | Oct. | Nov. | Dec. | |
| 0-1 | Baseline survey in the pilot project | Local consultant | By study team on Dec 2003 | | | | | | | | | | | | | |
| 0-2. | PDM(0) and PO(0) are reviewed with major stakeholders. | JICA Study Team | 3,000 | | 3,000 | | | | | | | | | | | 3,000 |
| | | | | | | | | | | | | | | | | **0** |
| 0-3. | The meetings are held to establish the Water Users Group (WUG). | RID | 10,000 | | | 4,600 | 5,400 | | | | | | | | | 10,000 |
| | | | | | 200 | | | | | | | | | | | **200** |
| 0 4. | The meetings are held between the WUG and village groups. | DOAE | 10,000 | | 10,000 | | | | | | | | | | | 10,000 |
| | | | | | | 0 | | | | | | | | | | **0** |
| 0-5. | The WUG fund is established and accumulated. | WUG | 150,000 | | | | | | 150,000 | | | | | | | 150,000 |
| | | | | | | | **152,400** | | | | | | | | | **152,400** |
| 0-6 | The demonstration plots are established for sugarcane, pineapple and vegetables. | DOAE, WUG | 40,000 | | | | | 40,000 | | | | | | | | 40,000 |
| | | | | | | | | | | | **30,000** | **10,000** | | | | **40,000** |
| 0 7. | The study tours by WUG are conducted. | DOAE, WUG | 63,000 | | | | | 31,500 | | | | | | 31,500 | | 63,000 |
| | | | | | | | **41,875** | | | | | | | **6,500** | | **48,375** |
| 0-8 | The study tours to the village from other Tambons are conducted | DOAE, WUG | 30,000 | | | | | 15,000 | | | | | | 15,000 | | 30,000 |
| | | | | | | | | | | | **15,055** | **3,851** | | | | **18,906** |
| 0-9. | Meetings are conducted with TTC members. | TTC | 13,250 | | 1,325 | 1,325 | 1,325 | 1,325 | 1,325 | 1,325 | 1,325 | 1,325 | 1,325 | 1,325 | | 13,250 |
| | | | | | | | | | | | | | | **13,268** | | **13,268** |
| 0-10. | Trainings are conducted to TTC members on TOT | JICA Study Team | 20,000 | | | 20,000 | | | | | | | | | | 20,000 |
| | | | | | | **12,575** | | | | | | | | | | 12,575 |
| 0-11 | Trainings are conducted to TSG members on TOT | JICA Study Team | 20,000 | | | 20,000 | | | | | | | | | | 20,000 |
| | | | | | | **16,425** | | **50,000** | | | | | | **43,902** | | **110,327** |
| 1-1. | Trainings are conducted for the improvement of qualities of pineapple and sugarcane. | DOAE, WUG | 20,000 | | | | | | 20,000 | | | | | | | 20,000 |
| | | | | | | | | | | | | **13,000** | | | | **13,000** |
| 1 2. | Trainings are conducted for the improvement of selling prices of pineapple | DOAE, WUG | 10,000 | | | | | | | 10,000 | | | | | | 10,000 |
| | | | | | | | | | | | | | | **4,000** | | **4,000** |
| 2-1. | Trainings are conducted on the use of fertilizers and pesticides. | DOAE, WUG | 15,000 | | | | | | | 15,000 | | | | | | 15,000 |
| | | | | | | | | | | | | | **10,500** | | | **10,500** |
| 2-3. | Trainings are conducted on the make and use of organic fertilizers. | LDD, WUG | 21,000 | | | | 18,400 | 2,600 | | | | | | | | 21,000 |
| | | | | | | | | **9,000** | | | | | | | | **9,000** |
| 3-3. | Main and secondary pipelines are installed | RID,WUG | 3,422,000 | | | 1,500,000 | 1,500,000 | 110,909 | | | | | | | | 3,110,909 |
| | | | | | **6,845** | **180,987** | **435,933** | **2,662,477** | **670** | **165,000** | | | | | | 3,451,912 |
| 3-5 | Trainings are conducted for water management and maintenance. | RID,WUG | 10,000 | | | 10,000 | | | | | | | | | | 10,000 |
| | | | | | | **6,750** | | | | | | | | | | **6,750** |
| | Soft Component, Schedule | | 435,250 | **0** | **14,325** | **55,925** | **25,125** | **90,425** | **171,325** | **26,325** | **1,325** | **1,325** | **1,325** | **47,825** | **0** | **435,250** |
| | Soft Component,Actual | | | **0** | **200** | **35,750** | **194,275** | **59,000** | **0** | **0** | **45,055** | **26,851** | **10,500** | **67,670** | **0** | **439,301** |
| | Hard Component | | 3,422,000 | 0 | 0 | 1,500,000 | 1,500,000 | 422,000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3,422,000 |
| | Hard Component | | | | **6,845** | **180,987** | **435,933** | **2,662,477** | **670** | **165,000** | | | | | | **3,451,912** |
| | Contingency 8% in Soft Component | | 34,820 | | | | | | 10,000 | 10,000 | 14,820 | | | | | 34,820 |
| | ***Total in Actual*** | | | **0** | **7,045** | **216,737** | **630,208** | **2,721,477** | **670** | **165,000** | **45,055** | **26,851** | **10,500** | **67,670** | **0** | **3,891,213** |
| | ***Accumulative in Total*** | | | **0** | **7,045** | **223,782** | **853,991** | **3,575,467** | **3,576,137** | **3,741,137** | **3,786,192** | **3,813,043** | **3,823,543** | **3,891,213** | | **3,891,213** |
| | **Ratio (%)** | | | **0.00%** | **0.18%** | **5.75%** | **21.95%** | **91.89%** | **91.90%** | **96.14%** | **97.30%** | **97.99%** | **98.26%** | **100.00%** | | |

Note: Upper: Plan. Lower: Actual

## Table 6.4.3 Expenditure for BTPW

unit:Bt

| | Activities | Responsible Agencies | Total Budget | 2004 (2547) Jan. | Feb. | Mar. | Apr. | May | Jun. | Jul. | Aug. | Sep. | Oct. | Nov. | Dec. | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-1 | Baseline survey in the pilot project | Local consultant | By study team on Dec 2003 | | | | | | | | | | | | | 0 |
| 0-2 | PDM(0) and PO(0) are reviewed with major stakeholders. | JICA Study Team | 3,000 | 3,000 | | | | | | | | | | | | 3,000 |
| | | | | | | | | | | | | | | | | 0 |
| 0-3 | The meetings are held to establish the Water Users Group (WUG). | RID | 10,000 | | | 10,000 | | | | | | | | | | 10,000 |
| | | | | | | | | | | | | | 10,929 | | | **10,929** |
| 0-4 | The meetings are held between the WUG and village groups. | DOAE | 10,000 | | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | | 10,000 |
| | | | | | | | 7,093 | | | | | | | | | **7,093** |
| 0-5 | The WUG fund is established and accumulated. | WUG | 150,000 | | | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 | 150,000 |
| | | | | | | | | | | | | 145,601 | 3,490 | | | **149,091** |
| 0-6 | The demonstration plots are established for sugarcane, pineapple and vegetables. | DOAE, WUG | 13,000 | | | 13,000 | | | | | | | | | | 13,000 |
| | | | | | | | 13,175 | | | | 1,300 | | | | | **14,475** |
| 0-7 | The study tours by WUG are conducted. | DOAE, WUG | 63,000 | | | | | 31,500 | | | | | | 31,500 | | 63,000 |
| | | | | | | | | | 405 | 43,475 | | | | | | **43,880** |
| 0-8 | The study tours to the village from other Tambons are conducted | DOAE, WUG | 30,000 | | | | | 15,000 | | | | | | 15,000 | | 30,000 |
| | | | | | | | | | | | 3,150 | 7,295 | 414 | | | **10,859** |
| 0-9 | Meetings are conducted with TTC members. | | 13,250 | | 1,325 | 1,325 | 1,325 | 1,325 | 1,325 | 1,325 | 1,325 | 1,325 | 1,325 | 1,325 | | 13,250 |
| | | | | | 3,396 | | | | | | | | | 7,500 | | **10,896** |
| 0-10 | Trainings are conducted to TTC members on TOT | JICA Study Team | 20,000 | | | 20,000 | | | | | | | | | | 20,000 |
| | | | | | | 12,575 | | | | | | | | | | **12,575** |
| 0-11 | Trainings are conducted to TSG members on TOT | JICA Study Team | 20,000 | | | 20,000 | | | | | | | | | | 20,000 |
| | | | | | | 16,425 | | 50,000 | | | | | | 43,903 | | **110,328** |
| 1-1 | Trainings are conducted for the improvement of qualities of pineapple and sugarcane | DOAE, WUG | 3,000 | | 3,000 | | | | | | | | | | | 3,000 |
| | | | | | | | | | 1,700 | | | | | | | **1,700** |
| 1-2 | Trainings are conducted for the improvement of selling prices of pineapple | DOAE, WUG | 30,000 | | | 3,750 | 3,750 | 3,750 | 3,750 | 3,750 | 3,750 | 3,750 | 3,750 | | | 30,000 |
| | | | | | | | | | 3,614 | 100 | | | 9,000 | 1,460 | | **14,174** |
| 2-1 | Pump irrigation System is constructed | RID,WUG | 3,543,000 | | | 1,500,000 | 1,500,000 | 543,000 | | | | | | | | 3,543,000 |
| | | | | | | | | 1,114,573 | 184,825 | 2,243,452 | | | | | | **3,542,850** |
| 2-2 | Qualities of groundwater and soil are studied | LDD, WUG | 10,000 | | | 10,000 | | | | | | | | | | 10,000 |
| | | | | | | | | | | | | | | | | **0** |
| 2-3 | WUG is trained on O & M of the system | RID, WUG | 10,000 | | | | | 1,700 | 1,700 | 1,700 | 1,700 | 1,700 | 1,500 | | | 10,000 |
| | | | | | | | | | | | 2,180 | | | | | **2,180** |
| 3-1 | Producton of each crop is planned | DOAE, WUG | 10,000 | | | 2,500 | 2,500 | 2,500 | 2,500 | | | | | | | 10,000 |
| | | | | | | | | | | | | 5,000 | | | | **5,000** |
| 3-2 | Trainnig are conducted for the improvement of qualities and quantities of crops | DOAE, WUG | 20,000 | | | 2,500 | 2,500 | 2,500 | 2,500 | 2,500 | 2,500 | 2,500 | 2,500 | | | 20,000 |
| | | | | | | | | | | | | | | 20,325 | | **20,325** |
| 3-3 | Trainnig are conducted on chemical free vegetaable production | DOAE | 10,000 | | | 1,250 | 1,250 | 1,250 | 1,250 | 1,250 | 1,250 | 1,250 | 1,250 | | | 10,000 |
| | | | | | | | | | | | | | 6,215 | | | **6,215** |
| 3-4 | Training on artificial breeding of cow and feed preparation are conducted. | DOL | 10,000 | | | 1,250 | 1,250 | 1,250 | 1,250 | 1,250 | 1,250 | 1,250 | 1,250 | | | 10,000 |
| | | | | | | 7,081 | | | | | | | | | | **7,081** |
| Soft Component Schedule | | | 435,250 | 3,000 | 5,325 | 101,575 | 28,575 | 76,775 | 30,275 | 27,775 | 27,775 | 27,775 | 27,575 | 63,825 | 15,000 | 435,250 |
| Soft Component Actual | | | | 0 | 3,396 | 36,081 | 20,268 | 50,000 | 5,719 | 43,575 | 6,630 | 157,896 | 30,048 | 73,188 | 0 | 426,801 |
| Hard Component Schedule | | | 3,543,000 | 0 | 0 | 1,500,000 | 1,500,000 | 543,000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3,543,000 |
| Hard Component Actual | | | | 0 | 0 | 0 | 0 | 1,114,573 | 184,825 | 2,243,452 | 0 | 0 | 0 | 0 | 0 | 3,542,850 |
| Contingency 8% in Soft Component | | | 34,820 | | | | | | 10,000 | 10,000 | 14,820 | | | | | 34,820 |
| ***Total in Actual*** | | | | **0** | **3,396** | **36,081** | **20,268** | **1,164,573** | **190,544** | **2,287,027** | **6,630** | **157,896** | **30,048** | **73,188** | **0** | **3,969,651** |
| ***Accumulative in Total*** | | | | **0** | **3,396** | **39,477** | **59,745** | **1,224,318** | **1,414,862** | **3,701,889** | **3,708,519** | **3,866,415** | **3,896,463** | **3,969,651** | | |
| **Ratio (%)** | | | | | **0.09%** | **0.99%** | **1.51%** | **30.84%** | **35.64%** | **93.25%** | **93.42%** | **97.40%** | **98.16%** | **100.00%** | | |

Note: Upper: Plan, Lower: Actual

### 6.4.2 Cost Sharing

The principles of the cost sharing among the stakeholders were set prior to the Pilot Project as shown below. JICA was to support the materials and cost for construction; the farmers were to undertake operation and maintenance; RID was to implement hard component; and other related agencies were to provide extension services to the farmers. Basically, the costs of the Pilot Project were shared according to the principles. The result of the cost sharing is summarized in the table below.

**Table 6.4.4 Results of Cost Sharing**

| Stakeholders | Principles | Results |
|---|---|---|
| Farmers | - Operation & Maintenance (O&M) | - O&M of the irrigation system will be undertaken by TAO and WUG with support from RID. WUG will collect water fee for O&M.<br>- Ownership of the irrigation facilities were already handed over to the TAOs |
| | - Construction of tertiary pipelines | - Some farmers installed on farm level irrigation facilities and connected with secondary pipelines<br>- Other farmers are yet to install:<br>*Waiting for harvest of sugarcane and pineapple in UHMR<br>*Waiting for the amount of electric fees to be actually paid |
| | - Land Acquisition for facilities | - All the beneficiary farmers provided their lands for construction of irrigation schemes<br>- Compensation was provided for non-beneficiary farmers in UHMR |
| RID | - Topographic survey | - Topographic survey was conducted by RID |
| | - Detail Design/ Cost Estimation | - Detail design and cost estimation were conducted by RID<br>- Detail design was revised according to the farmers' requests in BTPW |
| | - Construction (direct account) | - Construction of irrigation facilities were completed with the materials, labor and fuel supported by JICA<br>- Pumps and supplemental materials were installed by contract basis |
| | - Others | - Training on water management was provided to the farmers<br>- Demonstration plot was established by RID |
| Private sector | - Loan for farmers | - No loan was given by the private sector as a part of the Pilot Project activities, there is little incentive for sugar factory to invest small scale project |
| Other related agencies | - Provide extension services and support strengthening the farmers organizations | - A series of trainings were provided by DOAE, DOL, LDD, and DOCP |
| | - Others | - Artificial Breeding Center was established in BTPW<br>- Additional training was provided |
| JICA | - Materials, Labor fee, Fuel | - All the construction materials, necessary equipments for soft components, labor, fuel were provided by JICA |

Regarding the cost sharing, the followings results are noticeable.

Positive Results

- ✓ In parallel with the project activities in BTPW, DOL established an Artificial Breeding Center in TAO Dan Makham Tia by its own budget. One permanent staff of DOL has been assigned to provide the services in and around the project area.
- ✓ DOAE provided an additional training for the farmers in BTPW by inviting the chief provincial officer of DOAE Ranong Province.
- ✓ DOAE provided total 400 kg of baby corn seeds in BTPW (20 kg/ 5 rai/ person×20person)
- ✓ DOAE secured 70,000 Bt of budget to provide the extension services to the farmers
- ✓ RID established 3 rais of the demonstration plot for sugarcane in UHMR
- ✓ RID provided a series of trainings on irrigation water management upon the request from the farmers in UHMR
- ✓ The compost making group was financed by the Village Development Fund in BTPW

Negative Results

- ✓ Compensation was provided to non-beneficiary farmers in UHMR from JICA's budget
- ✓ Transportation was provided to the farmers and the related agencies in order to conduct trainings
- ✓ The pump and supplemental materials were installed by contract basis in BTPW

## 6.5 Impacts

The impacts which were not expected or foreseen at the beginning of the Pilot Project were seen. There are the following 11 events identified as the project impacts:

(1) TAO Nong Phai Selected as the Best TAO in the Province For Two Years
(2) Compost as One-Tambon-One-Product (OTOP)
(3) Incorporated the Project Plan in the CEO plan (Ratchaburi)
(4) Establishment of Artificial Breeding Center
(5) DOAE's Intensive Area for Chemical-Free Vegetable Production in BTPW
(6) DOAE's Support to Baby Corn Production in BTPW
(7) RID's Support to Establish Sugarcane Demonstration Plot in UHMR
(8) Gender Issues Concerned
(9) Promotion of Environmental-friendly Agriculture
(10) Link with An Advanced Farmer for Technical Advice & Marketing
(11) Save the Farming Time with Irrigation

**(1) TAO Nong Phai Selected as the Best TAO in the Province For Two Years**

The TAO Nong Phai is one of 96 Tambons in Kanchanaburi province. It was selected as the best TAO and won "the Good Governance TAO" prize in 2003. In 2004, it was selected again. The criteria of selecting the best TAO are comprised of seven items, namely;

1) Justice - Rules and regulations must be prepared based on the TAO's tasks and the necessity of the area.
2) Responsibility - TAO must respond to the complaints or requests of the people promptly with proper actions.
3) Transparency - The management of the budget must be transparent and can be audited for the last two years.
4) Participation - People's participation must be promoted in identifying problems or needs, preparation of the action plan, implementation, monitoring and evaluation of activities.
5) Efficiency - Budget should be spent efficiently.
6) Natural resource management - Natural resources should be protected and managed properly with participation of all stakeholders.
7) Promotion of income generating activities - Income generating activities must be promoted.

In order to apply for the best TAO, the proposal explaining each of the seven items in details must be prepared and submitted to the provincial office. A committee was established comprising of the officers at the provincial level, university lecturers and NGOs' staff to carefully read the proposals and prepared the short lists of the best TAOs. The committee visited the TAOs to examine actual situations and finalized the results. Finally, The TAO Nong Phai was announced as the best TAO in good governance. As the prize, total budget of Bt 1.6 million was allocated by Kanchanaburi provincial governor.

In the proposal, the TAO Nong Phai referred the participatory development process of the Pilot Project as the good example of how the TAO supported the farmers. The TAO coordinated the meetings, participated in the study tours and trainings. Moreover, the TAO office was used as the meeting place for the WUG, TTC and other production groups. The pictures taken during the planning process of the Pilot Project were used in the proposal.

**(2) Compost as One-Tambon-One-Product (OTOP)**

In Tha Phayom village, compost has been produced by the compost making group under supervision of the WUG and the TAO Nong Phai. The ingredients of compost are available in Kanchanaburi province. Six tons of compost were already produced and distributed to the group members at Bt 100 per bag (50 kg). The production capacity of compost is 14 tons per month, and at the moment there is higher demand even from outside the village. The farmers who used compost have been satisfied with the quality. The Land Development Department will conduct the standard test of compost quality and certify it according to the results. If certified, the farmers will be more confident to use compost, and it will also stimulate its selling.

The TAO now wants to promote the compost as OTOP, and will discuss with the compost making group about the production plan. If the volume of production should be increased, it will need more budgets. The TAO may provide part of the budgets and also assist the group for marketing. When it becomes the OTOP, compost bag will be designed with the names of the compost making group, the TAO Nong Phai and LDD.

**(3) Incorporating the Project Plan into the CEO plan (Ratchaburi)**

The project plan of UHMR was included in the provincial development plan, so called the CEO plan. The CEO plan is important because the provincial governor uses the plan as the basic strategies to develop the area. The government agencies in the province therefore have responsibilities to integrate their efforts under the CEO plan.

Some of the government agencies at the provincial level were assigned as the members of TSG. The TSG supported the project, and it is important now for the project to have been incorporated in the CEO plan for its continuation with the support from the province.

**(4) Establishment of Artificial Breeding Center**

Since many farmers in Tambon Nong Phai raise cows as one of the main sources of income, the service of artificial breeding was strongly requested by them, and the project supported to conduct the training. In the past, they had to call for the service from other districts and it cost between 500 Bt and 2,000 Bt. Through the Pilot Project, the TAO and Livestock Department decided to establish the artificial breeding center at the TAO office to provide the service for the farmers within the Tambon and the nearby areas. Livestock Department provided necessary facilities and a technician while the TAO provided the office space. After the establishment, the technician provides the service at 150 Bt per one time and this cost is much cheaper than the service in the past. This activity started in June 2004, and it is expected the concrete impacts be observed after March 2005 when the cows start to deliver.

It is expected that the center will be more useful for the farmers in future, because not only artificial breeding but also animal health care will be provided to them.

**(5) DOAE's Intensive Area for Chemical-Free Vegetable Production in BTPW**

In Tha Phayom village, there are advanced farmers producing different types of high value vegetables with compost, natural herbs as pesticide, and effective irrigation. Given the existing conditions, the village is considered as the high-potential area for high value vegetables, and the DOAE district selected this village as the intensive area for chemical-free vegetable production. It was included in the DOAE district's three year development plan.

**(6) DOAE's Support to Baby Corn Production in BTPW**

DOAE provided inputs and training to 20 farmers in BTPW to produce baby corn. All farmers already harvested and sold it. The promotion of baby corn production was DOAE's initiative in order to increase the farmers' incomes. The net income of the farmers from this activity was estimated at 85,000 Bt in total, as shown in the table below. The baby corn producers are one of the production groups to be coordinated under the WUG for water allocation and compost buying.

**Information on Baby Corn Production Supported by DOAE**

| Items | Number |
|---|---|
| Total farmers participated | 20 farmers |
| Total area of production | 100 rai |
| Production area per farmer | 5 rai |
| Average yield per rai | 1.4 ton |
| Total baby corn produced | 140 tons |
| Price of baby corn per kg | 2.3 Bt |
| Gross Income | 322,000 Bt |
| Total net profit of 20 farmers* | 85,000 Bt |
| Net profit per rai | 850 Bt |

*: Based on the interview to the farmer

**(7) RID's Support to Establish Sugarcane Demonstration Plot in UHMR**

RID Ratchaburi initiated and coordinated the establishment of the demonstration plot of sugarcane in UHMR with Maeklong Irrigation Demonstration Center. RID Ratchaburi was responsible for the financial support of this establishment. The objective of the demonstration plot is to demonstrate proper irrigation and water-saving methods for sugarcane production. The size of the plot covered three rai. The activity is currently ongoing, and it is expected that the WUG learn useful techniques to increase sugarcane production and apply it in their plots.

This activity was not included in the original PO because at the beginning the RID Ratchaburi was not sure if the resource person was available. After it was established, it was being used as the learning site for the farmers and the representatives from other Tambon within the Lam Pha Chi River Basin for the effective use of irrigation in sugarcane production. It shows clearly that the RID Ratchaburi not only concentrates on construction of facilities but also promotion of irrigated agriculture. It is believed that, with effective irrigation, the farmers could increase the yield of sugarcane to be higher than 15 tons per rai.

The Maeklong Irrigation Demonstration Center is going to be the good source of information. If the farmers need to learn more on sugarcane varieties, production, and appropriate technologies, they could contact the center for information. In short, the establishment of this sugarcane demonstration plot benefits the farmers in and outside of the project area in term of technical assistance, and it will be benefiting them also in future.

**(8) Gender Issues Concerned**

During the project planning women groups in both villages were interviewed. Their main concerns were high input costs for crop production for both villages, and also low soil quality for BTPW. These concerns were seriously considered by the Pilot Project, and as a result, the revolving fund was established in UHMR and used to purchase chemical fertilizer by group at the price lower than market. 100 families became the members of the revolving fund, and each family was able to save some Bt 186 of fertilizer cost by joining the members. The housewife group was given the task to collect the member fee, and also participated in preparing rules and regulations of the revolving fund. During the project implementation, they actively participated in all the activities such as training. They were also able to indicate the places to purchase chemical fertilizer with lower price.

In BTPW, the women group suggested the Study Team to promote compost making for improving soil quality. The revolving fund was therefore established and used to promote compost making. Some of the study tours were organized based on the women's needs, and therefore many women participated; for example, the study tour to the advanced area of pineapple production from Nong Chok village, and another tour to the compost making area from Tha Phayom village attracted many women to participate. The number of the WUG members in UHMR is 25, and the men/women ratio is 15 to 10. Each of them represents the beneficiary households from the irrigation system, and therefore the women's opinions could easily be collected regarding the O&M of the system. Through the Pilot Project, it was acknowledged that the women in the project area play important roles in many different tasks; particularly managing the revolving fund, facilitating group activities, replacing chemical inputs with compost, operating & managing the irrigation system, and reducing agricultural expenditures.

**(9) Promotion of Environmentaly-friendly Agriculture**

The farmers in Ban Tha Phayom have been using chemical fertilizer and insecticide for over 20 years. They realized that the quality of soil was getting poorer. Soil improvement using compost and other herbal liquid was identified by the Pilot Project as the farmers' needs. In addition, the use of compost will help the production of chemical-free vegetables. The compost making group considers that in near future chemical fertilizer will be reduced and finally totally replaced with compost.

**(10) Link with An Advanced Farmer for Technical Advice & Marketing**

During the project implementation, training was conducted on chemical-free vegetable production. The advanced farmer, Mr. Lek Malakawong, was invited to train the farmers on appropriate technologies. He is the owner of large scale crop production farm in Kanchanaburi province. He trained the farmers on how to grow organic vegetables, how to prepare production plans and how to promote agro-tourism to the farmers' field. The farmers also visited his field to see actual practices. He promised to further provide the farmers with technical advice for compost making and production planning if the WUG needs. In addition, he proposed the farmers to sell him their organic products at Bt 10 per kg for any kind. One of the marketing channels was made by the project.

**(11) Save the Farming Time with Irrigation**

One member of the WUG in Ban Tha Phayom grew different types of vegetables using the project irrigation system. He mentioned that time spent on irrigation was now much shorter compared to groundwater pumping. He used to pump groundwater for one and a half hour but now only 30 minutes with the project system. The high pressure of the pumps also enables him to spray herbal pesticide and chemical fertilizer together with irrigation with much shorter time. As a result, he was able to save his farming time, and this can be applied for many other farmers once irrigation is started to full scale.

## 6.6 Expectations at the Harvest Time

The Pilot Project included the activities intending to produce the expected results at or after the harvest time. Those activities are the establishment of the demonstration plots; the conduct of the study tours; and the trainings on the improvement of crop qualities and quantities, the use of fertilizers, and the improvement of selling prices of pineapples. However, since the Pilot Project ended in the middle of cropping seasons, some of the expected results are yet to be seen.

The expected results are shown as the Indicators in the PDM, and according to the assessment at the evaluation time, the following can be expected at the harvest time:

**Table 6.6.1 Expectations at the Harvest Time (UHMR)**

| Project Purpose and Outputs | Indicators in the PDM | Expectations at the Harvest Time |
|---|---|---|
| **Project Purpose**<br>**Agricultural incomes of the target farmers are increased to meet expenditures.** | **Average agricultural incomes of 20 target farmers' households are increased by 5%.** | **Fruit trees (papaya) have been planted in the irrigated area, which may be supplemental to the incomes.** |
| **Outputs**<br>**1. The crops are sold at higher prices for the target farmers.** | **1-1. Average selling price of pineapple is more than 2 Bt/kg. (to be forecasted)** | **The selling price of pineapple was more than 2 Bt/kg at the evaluation. However, it was more than 3 Bt/kg at the monitoring time (May-June, 2004).**<br><br>**The selling price of pineapple at the harvest time is therefore yet to be seen, as it largely depends on market. WUG strengthening is still needed for them to have more negotiation power with middlemen.** |
| | **1-2. Average selling price of sugarcane is increased from 580 Bt/ton to 600 Bt/ton or high, by improving the CCS rate (to be forecasted)** | **The selling price of sugarcane was determined at 620 Bt/ton by the government. The CCS rate improvement depends on the last two months of growing period.**<br><br>**Irrigation will raise the possibility to improve the CCS rate, and therefore the selling price is expected to be more than targeted if no serious damage takes place.** |
| **2. Agricultural expenditures are reduced for the target farmers.** | **2-1. Average expenditures necessary for pineapple growing are reduced by 10%.**<br><br>**2-2. Average expenditures necessary for sugarcane growing are reduced by 10%.** | **The group purchase of fertilizer reduced its costs from 1,710 Bt to 1,524 Bt (11% reduction) per household.**<br>**As a result, production cost of pineapple was reduced 540 Bt/rai/year from average expenditure of 5,300 Bt/rai/year.**<br>**In the long run, the farmers want to replace chemical fertilizer and pesticide with compost and organic pesticide.**<br><br>**After the harvest, the members farmers of the revolving funds should repay for the fee of fertilizer at 10 Bt higher than the purchased price. This enabled to reduce the payment of interest rate compared with the loan with middlemen.** |
| **3. Crop productions are increased for the target farmers.** | **3-1. Average yield of pineapple is increased from 4 to 6 t/rai (to be forecasted)**<br><br>**3-2. Average yield of sugarcane is increased from 10 to 12 tons/rai (to be forecasted)** | **Since irrigation becomes possible, and by the observation at the field, the yield increment can be expected higher than targeted.**<br><br>**The farmers mentioned the study tours to the advanced areas are useful to increase the yields.**<br><br>**Irrigation development was much appreciated since the farmers face serious draught this year.** |

**Table 6.6.2 Expectations at the Harvest Time (BTPW)**

| Project Purpose and Outputs | Indicators in the PDM | Expectations at the Harvest Time |
|---|---|---|
| **Project Purpose**<br>**Agricultural incomes of the target farmers are increased to meet expenditures.** | **1. Average agricultural incomes of 20 target farmers' households are increased by 5%.**<br><br>**2. Average agricultural expenditures of 20 target farmers' households are decreased by 5%.** | **Artificial breeding activities have been producing the number of the cows with higher rate and with lower costs. The quality improvement can also be expected.** |
| **Outputs**<br>**1. The crops are sold at higher prices for the target farmers.** | **1-1. Average selling price of sweet corn is increased from Bt. 3.50 Bt/kg to 4 Bt/kg or high**<br><br>**1-2. Average selling price of baby corn is increased from 2.3 Bt/kg to 3Bt/kg or high (expected value)**<br><br>**1-3. Average selling price of eggplant is increased from 5 Bt/kg to 7 Bt/kg or high (expected value)** | **The recent selling prices were as follows:**<br>**- sweet corn = more than 3.5 Bt**<br>**- baby corn = more than 2.3 Bt**<br>**- egg plant = 4 Bt**<br><br>**The selling prices of vegetables still largely depend on market (including middlemen). The suggestions are:**<br>**- promote high-value crops**<br>**- conduct more study tours to learn crop rotation**<br>**- identify suitable markets, including making contract between producers and buyers with expected stronger negotiation power of the WUG**<br><br>**The farmers mentioned the following benefits from the project will increase the selling prices:**<br>**- higher quality of water (irrigation water from the river) which will raise the quality of crops**<br>**- improved knowledge by study tour and other trainings on quality; for example, now can grow chemical-free and good quality of eggplant** |
| **2. Agricultural expenditures are reduced for the target farmers.** | **2-1. Average expenditures necessary for baby corn are reduced to 1,600 Bt/ rai.**<br><br>**2-2. Average expenditures necessary for sweet corn are reduced to 2,200 Bt/rai.**<br><br>**2-3 Average expenditures necessary for eggplant are reduced to 700 Bt/rai.** | **The farmers felt the expenditures for vegetable productions are reduced mainly because of partial replacement of chemicals with compost and organic pesticide.**<br><br>**Other input costs, such as seeds, gasoline, plow, labor, chemicals are still expensive. In addition, the farmers are now afraid of high cost of irrigation. The suggestions are:**<br>**- reduction of the use of chemical inputs, including adoption of appropriate farming technologies**<br>**- reduction of pumping cost (effective use of water)**<br>**- improvement of soil quality**<br>**- invent or find appropriate tools to reduce time & labor**<br><br>**The following activities are useful for the farmers:**<br>**- improved knowledge by study tours and other trainings on compost making** |

| Project Purpose and Outputs | Indicators in the PDM | Expectations at the Harvest Time |
|---|---|---|
| **3. Crop productions are increased for the target farmers.** | **3-1. Average yield of baby corn is increased from 1.2 t/rai to 1.5 t/rai (expected yield)**<br><br>**3-2. Average yield of sweet corn is increased from 1.5 to 2 t/rai (expected yield)**<br><br>**3-3 Average yield of eggplant is increased from 200 to 300 kg/rai (expected yield)** | **- reduced irrigation time (compared with ground water pumping) which will lead to the reduction of labor costs**<br>**- prepared crop plan for sweet corn**<br><br>**The yields of some vegetables will be increased with irrigation. The following are the forecasts of the three crops:**<br>**- baby corn = between 1.2 and 1.8 t/rai**<br>**- sweet corn = between 0.8 to 1.2 t/rai**<br>**- eggplant = between 50 to 400 kg/rai**<br><br>**The selection of the varieties and improvement of farming practices are suggested to assure the yield improvement.**<br><br>**The farmers mentioned the following project activities will contribute to increase crop productions:**<br>**- trainings on appropriate use of fertilizers and how to improve soils with organics** |

Besides the above, the quality of the farm soils could be improved in the long run if the use of compost is spread and continued. This will contribute to improve land productivity, and as a result, to increase the production. In particular, the compost is prepared based on the results of soil tests in Tha Phayom village, which would raise the effectiveness of the compost for the soil improvement.

One of the promising factors for the future is the group activities facilitated by the revolving funds. The main functions of the revolving funds are the reduction of the production costs, and the enhancement of group management capacities. By looking at the impacts, more farmers are now being interested to be the members, and as a result, the amount of the revolving funds has been increasing.

## 6.7 Necessary Improvement on the Current Activities

Although the achievements and impacts of the Pilot Project have been recognized as mentioned above, some of the project activities should be improved: The following can be pointed out:

(1) Calculation and Agreement of Irrigation Fee for BTPW
(2) Installation of Tertiary Pipes
(3) WUG Strengthening
(4) Reduction of the Input Costs by Group Purchase
(5) Planning of Crop Production
(6) Institutional Strengthening

**(1) Calculation and Agreement on Irrigation Fee for BTPW**

The ownership of the irrigation system of BTPW has already been transferred from the RID Kanchanaburi to TAO Nong Phai, because, the RID Kanchanaburi needed to release the responsibility of electric fee payment to the users at the earliest time. On the other hand, the irrigation fee necessary for operating and maintaining the irrigation system, which the farmer users should bear, has neither been calculated nor been indicated. It should therefore be calculated, discussed and agreed as early as possible by the RID Kanchanaburi, TAO and WUG. The failure to reach an agreement on the fee would lead to the early termination of the system operation because of i) the lack of the farmers using the system, and ii) the lack of the fund accumulation necessary for O&M of the system.

Irrigation may contribute to increase crop productions; however, at the same time may increase the farmers' expenditures for production, which was stated as fear by the farmers. It will also be contradictory to the objective of the Pilot Project, if their expenditures are increased. Therefore, it is necessary to clearly indicate to the farmers how their incomes could be increased with irrigation and meet its costs. The farmers will pay it if they see profits.

It seems no appropriate guideline exists for calculating irrigation fee based on the actual costs necessary for operation and maintenance of the system. It is therefore suggested the RID central find some skillful technicians for facilitating the process. The following is some examples to be shown which will help explain to the farmers in BTPW on the profits of irrigation:

1) Difference in yields between with and without irrigation - the proposed production plans of each crop should be indicated in case of irrigation
2) Difference in electric charges between the BTPW and the current groundwater irrigation
3) Difference in time necessary to irrigate between BTPW and groundwater irrigation
4) Difference in water qualities between the river (BTPW) and the underground which they currently use

**(2) Installation of Tertiary Pipes**

In Nong Chok village (UHMR), the number of the farmers installed the tertiary pipes is 8 among 24 expected direct beneficiaries of the irrigation system. The villagers mentioned the pineapple and vegetable growers installed it, but the sugarcane growers are still waiting until their crops are harvested. In Tha Phayom village (BTPW), there are 7 farmers among 21 installed the tertiary pipes. The main reasons of this low installation rate are i) the farmers are not sure how much the irrigation fee will be, and therefore some of them are afraid they might have to bear high costs, ii) some farmers are not yet able to recover from last year's flood, and iii) the Pilot Project was proceeded too fast for some farmers to catch up with.

The same as the above (1) should be suggested to BTPW for increasing the number of the farmer users in the irrigation system as well as increasing the effectiveness of the irrigation.

**(3) WUG Strengthening**

The WUGs in both villages have been newly established. The one in Nong Chok is already active since i) there are strong leaders in the village, ii) the village has an experience in forming and maintaining some village organizations, and iii) the WUG is recognized by the villages as the core of agricultural development of the village. Improvement is however necessary on the linkage between the TAO and the WUG, as the TAO was not intensively involved in the project. The WUG in Tha Phayom is getting active but still only several members are involved. Their activities should further be upgraded to the whole village level.

It should be recognized that the WUGs in both villages are still in need of the governmental support, for them to be able to fulfill their responsibilities, such as i) operation and management of the irrigation system, ii) management of the revolving funds, iii) coordination with other village groups for agricultural development which includes the preparation of crop planning, and iv) price negotiation when buying inputs and selling crops. The below is the summary of the expected outputs and the contributions from WUG strengthening.

**Table 6.7.1 Expected Outputs and Contributions from WUG Strengthening**

| Expected Outputs | Ways to Produce the Outputs | Expected Roles of the WUG |
|---|---|---|
| 1. Agricultural expenditures are reduced. | | |
| **1) Reduction of interest rates** | **Establishment of the (revolving) funds** | **Organizing the farmers, collection of the fees, and management of the fund** |
| **2) Reduction of input costs** | **Group purchase of inputs (fertilizers, etc.)** | **Organizing the farmers, collection of the fees, and price negotiation** |
| 2. Productions are increased. | | |
| **1) Effective use of irrigation water** | **Water management and O&M of the irrigation system** | **Organizing the farmers, rule-making and execution** |
| **2) Improvement of farmers' knowledge on productions** | **Extension of necessary skills and knowledge to as many farmers as possible** | **Organizing the farmers, preparation of crop planning, and coordination with the authorities of technical supports** |
| 3. Selling prices are increased. | | |
| **1) Improvement of selling prices of crops** | **Group selling of crops** | **Organizing the farmers, and price negotiation** |
| **2) Improvement of farmers' knowledge on qualities** | **Extension of necessary skills and knowledge to as many farmers as possible** | **Organizing the farmers, and coordination with the authorities of technical supports** |
| Overall | | |
| **The farmers have the capacities on planning, monitoring and evaluation** | **Facilitate discussions and meetings among the farmers** | **Organizing the farmers, and coordination with the authorities** |

To make the management of the revolving fund's group successful, the following is suggested:

1) If a person wants to be a member of the revolving fund's group, he/she shall:
   a) pay the member fee when registering for the group, and
   b) understand and agree to follow the rules and regulations of the group

2) The rules and regulations of the group shall be set by the members. The ceiling amounts per borrowing, durations, interest rates, etc. shall be included
3) The leaders, to be in charge for managing the revolving funds and its group, shall be selected by the members. The terms of the leaders shall be decided by the members.
4) The leaders shall be responsible for, or shall assign an account to be responsible for, financial management of the group. The financial records shall be opened to the members whenever needed.

**(4) Reduction of the Input Costs by Group Purchase**

As was seen in the case of UHMR, the price of fertilizer was lowered from 5,700 Bt to 5,080 Bt per ton by purchasing large quantity (600 bags=30,000 t) for the members. One household received 6 bags (=300 kg), which makes the cost of fertilizer 186 Bt (11%) lower for each of them. The reduction of the input costs for seeds and pesticides could also be possible by the same way since the WUG together with the housewife group and TTC have already leant the procedure. For BTPW, this activity was not yet seen. It is suggested for both villages that i) the WUG be further strengthened to be able to negotiate the prices, and ii) the government agencies support the WUG to identify the markets for purchasing the inputs.

**(5) Planning of Crop Production**

For BTPW, the activity to prepare the production plan, intending mainly to increase crop productions, was scheduled and implemented as a half-day training by an advanced farmer from outside the village. The farmers also visited the advanced farmer's farm through the study tour for learning chemical-free vegetable production. Those activities were assessed as useful by the farmers. It was mentioned, however, the production plan was not really prepared, and eventually the crops were damaged by flood. The farmers understood now that the plan is necessary even for reducing the crop damage.

The plan will also be important for effective use of irrigation water. It is therefore suggested to prepare the production plan for main crops before irrigation practice prevails.

**(6) Institutional Strengthening**

The institutional strengthening was one of the key issues for the Pilot Project. The main purpose was to establish the institutional system for continuing the project activities in and outside of the village even after the project is terminated. There are some achievements as already mentioned, but on the other hands the following still needs to be improved:

1) Involvement of TAO Ban Kha for the continuation of the activities for UHMR: The TAO Ban Kha was rarely involved in UHMR (the reason is not known), which is a contrast to TAO Nong Phai, although the TSG, TTC, Kamnan and WUG were active. It is suggested to let the TAO be in the system, as they are responsible for O&M of the irrigation system as well as the development of the villages.

2) Strengthening of WUG for BTPW: The leader and a few members were actively involved in the Pilot Project and showed their strong commitments to the project. On the other hand, other farmers were not quite active for the project. As a result, some WUG members had to bear a lot of responsibilities. There is a necessity for the WUG to have more members and become capable to facilitate the activities at the whole village level.

3) Rearrangement of TTC: The TTC's involvement to the Pilot Project was limited in both areas. It was observed that the current form of TTC is not promising if the TTC should function as one-stop-service center. The main reason would be that the members but the district agricultural officer are not paid, which might lessen their commitments to their responsibilities. They are also not really knowledgeable for agriculture and therefore have difficulties to provide technical supports to the farmers.

The following points are suggested to be considered for reviewing the form of TTC.

- The number of TTC members should be limited, and the members should be composed of the knowledgeable persons. The advanced farmers could be considered as the members.
- Or, the number of TTC members could be minimal (2-3 members only), and work as the coordinators to link the farmers with the advanced farmers in the area.
- TTC members should be paid by DOAE, and by TAO in future.
- The members but the core members can be recruited by contract basis. They are paid for the outputs they produce, such as village development plans, but not the number of the meetings they have attended.

4) Roles of TSG: The TSGs assisted the Pilot Project by various ways. In particular, the project was supported by the TSGs when the meetings were held at the provincial level to discuss the project plans, monitoring and evaluation results, and problems and solutions at each stage. Coordination among the different agencies at the provincial level was taken care only by the TSGs. On the other hand, the roles of the TSGs were minimal when implementing the project activities at sites. It was observed only a few provincial staff participated to the workshops and meetings at the villages or provided technical supports to the farmers. The main reasons could be i) the budgets of coming to the villages were limited, and ii) the provincial officers have many other tasks. Therefore, it is suggested the roles of TSG be limited to the meetings, discussions and coordination at the provincial level, and on-site activities and technical supports to the farmers be left to the district, Tambon or farmers level.

## 6.8 Issues to Be Further Considered as the Next Steps

Although the Pilot Project was terminated, the project activities are supposed to continue. As the next step of the project (the would-be-second phase of the project), the following issues should be considered.

(1) Marketing and Processing
(2) Diversification of the Crops in Nong Chok Village
(3) Balance on the Use of Water from UHMR
(4) Expansion of the Direct Beneficiaries of the Pump System
(5) Effective Use of Irrigation Water
(6) Soil Improvement in Nong Chok Village

**(1) Marketing and Processing**

The level of farmers' satisfaction towards the Pilot Project shows that the marketing issue remains as one of the biggest challenges. For improving and facilitating the marketing activities, the following are suggested:

1) To conduct a market survey on the areas nearby the villages as well as on the national level, intending to identify suitable market places (including middlemen) and crops with probable selling prices. The focus should not be given to large and far-away markets as the quantity of selling will be small at the early stage.
2) To prepare marketing strategies including the improvement of crop production system, and the establishment of price information system for the village
3) To implement the marketing strategies with the agencies concerned. The roles of each agency as well as the farmers should clearly be indicated

The processing of the crops and dairy products is also suggested to consider. The group fund (revolving fund) can be used for facilitating the processing activities.

**(2) Diversification of the Crops in Nong Chok Village**

Since Nong Chok village relies largely on the production of pineapple and sugarcane, it is suggested to diversify the crops, particularly to some kinds of vegetables for maintaining and increasing the farmers' income. For example, the price of pineapple was high at the time of monitoring, which did not attract the farmers to grow new crops. However, the price has been falling much lower than expected, and the farmers now see the necessity of crop diversification.

The Pilot Project had some activities intending to increase the selling price of the crops, such as i) strengthening the WUG for better negotiation power, and ii) improving the crop qualities. Introduction of new crops was also conducted for Nong Chok village. With all those efforts, however, it was recognized by the key stakeholders at the evaluation that the increase of selling price was the most difficult issue among three expected outputs of the project, and the farmers gave the lowest score of their satisfaction. Therefore, further trials, including the introduction of new cash crops, are strongly suggested.

**(3) Balance on the Use of Water from UHMR**

The water from the UHMR is used for not only irrigation but also domestic water needs of the village. It is necessary to assure that the discussion is held and concluded among the villagers on the balance of the use of the water between two purposes. The TAO and RID Ratchaburi are suggested to support it.

**(4) Expansion of the Direct Beneficiaries of the Pump System**

Nong Chok village has proposed RID to extend the pipeline up to the school so that the school and the households around the line may also be benefited from the irrigation system. This could be possible, if water is assessed available and the capacity of the pump is enough. Accordingly, the relevant study, including the above issue mentioned in (3), should be necessary. The cost of pipeline would be born by the RID and/or TAO together with some contribution from the school and the farmers.

**(5) Effective Use of Irrigation Water**

Water for irrigation should be used effectively and efficiently in both villages. For Nong Chok village, water in the reservoir shall be used for both irrigation and domestic use. In addition, the extension of the pipeline is requested by the village. For Tha Phayom village, electric fees are charged to the users for every use of water. It is suggested the RID provincial offices conduct or identify suitable instructors to conduct, with coordination of the responsible TAOs, further O&M training on the effective and efficient use of irrigation water.

**(6) Soil Improvement in Nong Chok Village**

It is commonly stated by the agencies and the farmers that the quality of farm soils in Nong Chok village is poor, which affects the productivity and limits the selection of the crops. As one of the reasons to degrade soil quality is believed to be overuse of chemical fertilizer, the use of organic fertilizers is worth consideration. The villagers were trained how to make and use compost, and now want to produce it to large extent by themselves.

This could be possible by using the revolving fund as Tha Phayom Village has been doing. The continuous support is suggested.

## 6.9 Project Sustainability

Although the Pilot Project was terminated soon, the project activities are expected to continue and produce the desired outputs as long as it can. At the time of the evaluation, both the government agencies including TAO and the farmers were well motivated for its continuation. In this regard, the project sustainability was considered as high. There are however some key issues to be fulfilled for assuring the project sustainability as follows:

(1) Collection of Irrigation Water Fee for BTPW
(2) Budget Allocation for O&M of the Irrigation System
(3) Collection of Fertilizer Fee for UHMR
(4) Production and Selling of Compost for BTPW
(5) Development of Marketing Strategies
(6) WUG Remains as the Core Organization
(7) Continuation of Supports

**(1) Collection of Irrigation Water Fee for BTPW**

Once the irrigation water fee for BTPW is agreed by the RID Kanchanaburi, TAO and WUG, all the beneficiary farmers are expected to pay it as scheduled for assuring proper operation and maintenance of the irrigation system.

Since the TAO Nong Phai, now responsible for O&M of BTPW, was actively involved in the project and understood the importance of water fee collection, it can be expected that the TAO handle it. However, close supervision by the district chief shall be necessary.

**(2) Budget Allocation for O&M of the Irrigation System**

The irrigation facilities require the costs of O&M, which in principle should be born by the TAO and the farmer users. Besides collecting the water fee from the farmers, necessary budgets should be allocated by the TAOs for both UHMR and BTPW according to the regulations.

**(3) Collection of Fertilizer Fee for UHMR**

For UHMR, the group activity by purchasing fertilizer was facilitated with the revolving fund. The fund was used to purchase fertilizer, and the members are supposed to repay it in April 2005 when they harvest crops. It should be confirmed all of the members repay as decided so that the revolving fund may continuously exist and be used for future activities.

**(4) Production and Selling of Compost for BTPW**

For BTPW, the group activity of producing compost was initiated and expanded with the revolving fund. The demand of the compost is getting higher not only by the members but also from outside of the village. The profit from the selling of compost will be able to expand the group activities, and will eventually contribute to increase the incomes of the farmers.

Along with the government policies, the demand of compost can generally be expected to increase further. Therefore, the efforts should be made to keep producing and selling compost, and its quality will be the key to keep attracting the customers.

**(5) Development of Marketing Strategies**

The marketing of crops remains as the main issue for the project. Moreover, once the farmers' incomes start increasing, the farmers will further be getting involved in market economy, and therefore market-oriented strategies will be necessary. The strategies will require the farmers some investment for expanding agricultural activities, and even at that stage, the development objective will remain the same as the Pilot Project; i.e., "agricultural incomes meet its expenditures." For that purpose, the production of high-value crops such as chemical-free vegetable should be taken into consideration.

**(6) WUG Remains as the Core Organization**

The WUG at both villages should remain as the core organization in the village for the continuation of the project activities. The key members of the WUG should be well committed to the activities, and also have to be respected by other farmers. The WUGs should be able to fulfill the following responsibilities:

- Planning and implementation of the activities for agricultural development
- Financial transaction with transparency
- Request and coordination of technical and other supports to the authorities concerned
- Facilitation of group activities with motivating other farmers to join
- Conflict resolution within the village

**(7) Continuation of Supports**

The institutional links between the government agencies and the farmers through the WUG should be maintained and strengthened, since the farmers are still in needs of technical and other supports. The following is suggested:

1) DOAE central continuously allocates some budgets for the continuation of the activities and provides technical supports through provincial or district DOAE.
2) The provincial government provides technical supports particularly when district or Tambon cannot meet technical needs of the farmers. The provincial government can also coordinate their needs at the provincial level or let the different villages cooperate for implementing some activities such as the study tours. It is expected that the project activities be incorporated in the provincial development plan, and placed under the responsibilities of the provincial governor. Ratchaburi province has already included the project activities in its CEO Plan.
3) The TAO provides administrative and other on-site supports to the farmers. It is expected that the 3-year development plan of the TAO include the project activities, which enables the TAO to propose the necessary budgets to higher authorities. The TTC provides technical supports; however, the TTC's structure should be modified as mentioned.

4) To supplement the government supports, the farmer-to-farmer links should be developed and expanded. As it was conducted in the Pilot Project, the advanced farmers can effectively support the other farmers. In addition, it is also important to link the farmers with the private entities which are actively engaged in economic activities such as the companies related to marketing.

# CHAPTER 7 PROJECT JUSTIFICATION

The implementation of the Pilot Project can be justified from the following aspects:

(1) Application of Participatory Development Approach
(2) Compliance with the Policies/Strategies
(3) Meeting with the Farmers' Needs
(4) Effectiveness of the Project
(5) Project Efficiency (Costs and Benefits)

## 7.1 Application of Participatory Development Approach

At the onset of the Study, the objectives for applying participatory development approach were discussed with the RID and recognized as follows:

- The project should be able to meet the farmers' needs, and therefore the farmers should participate from the planning stage.
- To raise the project sustainability, the beneficiary farmers should have the sense of ownership on the project facilities provided, and feel their responsibility for operation and maintenance of it. To make it sure, the farmers should participate in the project and bear some costs.
- The government policies now strongly insist that the beneficiaries be actively involved into development process. For example, the new constitution prepared in 1997 urges that participatory development be facilitated.

The Pilot Project is considered as justifiable by meeting the above objectives with the following reasons:

- The number of the beneficiaries was increasing. Through the involvement of the villagers in the workshops and discussions, they were able to express their needs and reflect them into the project plan. The project was tailor-made, to some extent, for as many farmers as possible. Moreover, during the project implementation, the farmers felt easy to participate in the activities as the beneficiaries as they had already been familiar with the project.
- The various government agencies participated in the project and discussed the activities among themselves. This enabled to avoid overlapping of the same activities and overload to the farmers by the different agencies at the village level, which is often seen due to the lack of communication.

Even though the amount of the time that many stakeholders spent for the project was huge, as it is the nature of participatory development approach, there are more reasons to justify the project's approach. Those could be considered as trade-off for this sort of the approach as follows:

- The beneficiary and non-beneficiary farmers participated quite intensively from the planning to evaluation stages. This enabled that the project was planned and implemented with the farmers to make the project the farmers' needs oriented.
- The cost-sharing was introduced in the Pilot Project as a form of participation, and accordingly the farmers bore part of the project costs as agreed. The WUG have then understood that they have the responsibility of O&M of the irrigation system and other facilities provided by the project (the ownership of the irrigation system belongs to the TAO as specified in the regulations).

Transfer of the irrigation system from RID provincial offices to the TAOs in both sites was much earlier than usual, and actually it was not intended when the Pilot Project was started. This indicates the efforts of the key institutions such as RID, TAO and WUG, and the participatory approach is considered to have contributed largely to the realization of early transfer of the system.

## 7.2 Compliance with the Policies/Strategies

Justification of the Pilot Project is also referred to the compliance with the government policies. The first policy is the one related to the promotion of participatory development approach. As mentioned above, the Pilot Project has supported its movement quite positively.

The second policy is "food safety" which the government is now keen to strengthen, and the Pilot Project has promoted chemical-free agricultural productions by trying to replace chemicals with compost and organic pesticide. Those value-added productions will attract markets more and more, and eventually contribute to the increase of the farmers' incomes.

The third is the integration of the project plans into the CEO plans in case of Ratchaburi province. The provincial government is now the core to promote the development of the area, and needs to integrate various development approaches in the CEO plan. Having been integrated in the CEO plan, the Pilot Project was recognized as appropriate and compliance with the development strategies of the province.

## 7.3 Meeting with the Farmers' Needs

As the project was participatory and involved the farmers from the planning stage through RRA, PCM workshops, discussions and various meetings, the opportunities to exchange opinions with the farmers were abundant, and therefore it became possible that their needs were listened and met. The farmers' needs are changing along with their development, and therefore it is necessary to keep discussing with the farmers and adjusting the strategies accordingly.

## 7.4 Effectiveness of the Project

The effectiveness means how effective the project is considered to be, in other words, how logical the project was planned and implemented for meeting its purpose. In the Pilot Project, the logicality was ensured through the construction of problem trees and the PDM at the planning stage, and then the project was implemented in accordance with the PO. More concretely, the most important problem of the farmers was identified as "agricultural incomes do not meet its costs", and three expected outputs and their related activities were planned and implemented as mentioned in the PDM.

As shown in the achievements, the Pilot Project was able to produce some of the expected results; and there are also some issues need to be improved as mentioned. By keep improving those issues, the effectiveness will further be enhanced.

## 7.5 Project Efficiency (Costs and Benefits)

### 1) UHMR

#### a) Beneficiary area

The table below shows the current farming practices of main crops and vegetables in the beneficiary area according to the Baseline Survey results. It is remarkable that main crops (sugarcane and pineapple) have been planted in the area of 866.55 rai or 95.6% of the total area.

**Table 7.5.1 Current Farming Practices in UHMR**

| Crops & Vegetables | Current farming | | | Ratio of Area (%) |
|---|---|---|---|---|
| | Grower | rai/HH | Total (rai) | |
| **A. Main Crops** | | | | |
| 1. Sugarcane | 17 | 29.01 | 493.17 | 54.4 |
| 2. Pineapple | 21 | 17.78 | 373.38 | 41.2 |
| Sub-total | | | 866.55 | 95.6 |
| 3. Maize | 3 | 5.5 | 16.50 | 1.9 |
| Total | | | 883.05 | 97.5 |
| **B. Vegetables** | - | - | | |
| 1. Asparagus | 2 | 1.50 | 3.00 | 0.3 |
| 2. Cucumber | 1 | 4.00 | 4.00 | 0.4 |
| 3. Galingle | 1 | 4.00 | 4.00 | 0.4 |
| 4. Lemon Grass | 1 | 2.00 | 2.00 | 0.2 |
| 5. Pumpkin | 1 | 4.50 | 4.50 | 0.5 |
| Total | | | 16.00 | 1.8 |
| **C. Fruits/Perennial** | | | | |
| 1. JackFruit | 2 | 1.00 | 2.00 | 0.1 |
| 2. Mango | 1 | 5.00 | 5.00 | 0.6 |
| Total | | | 7.00 | 0.7 |
| Grand Total | | | 906.05 | 100 |

Note: The project area is all under rain-fed farming

The irrigation area could not be identified because the farmers have not yet applied irrigation water to their farms. The farmers are still waiting for the next planting season for sugarcane and pineapple in March or April 2005. Due to the limitation of budgetary allocation in the project, the capacity of the intake pipe and pipeline length was adjusted to the budget. Consequently, the irrigable area was estimated at 400 rai by the project. Because of those reasons, the irrigable area for each crop was estimated based on the current ratio of the planted areas as bellow.

**Table 7.5.2 Estimated Beneficiary Area in UHMR**

| Estimated crops for Irrigation | Ratio of Area (%) | Estimated Irrigable Area (rai) |
|---|---|---|
| Total | 100.0 | 400.0 |
| 1. Sugarcane | 54.4 | 217.6 |
| 2. Pineapple | 41.2 | 164.8 |
| 3. Others | 4.4 | 17.6 |

**b) Unit Benefit**

At the beginning of the implementation of the Pilot Project, the beneficiary farmers planned to cultivate sugarcane, pineapple and some kinds of vegetables such as long bean, eggplant, etc. with irrigation water. Based on the evaluation survey results, the yield of sugarcane would increase up to 12 to 16 t/rai with irrigation. The current yield was confirmed through the baseline survey at 11.53 t/rai, and therefore is expected to increase by 2.47 t/rai with the project. As for pineapple, the current yield is 4.7 t/rai without the project, and it is expected to increase by about 6% to be 5.00 t/rai with project. The expected increase of pineapple's yield is small because of poor quality of the soil. It is noted that the productivities of sugarcane and pineapple are still the estimated figures because no concrete ones can be obtained until the farmers harvest in March to April 2005.

**Table 7.5.3 Unit Benefit with Increase of Productivity of Main Crops in UHMR**

| Crops/Vegetables | Without Project (A) | With Project (B) | Increase (C)=(A)-(B) | Unit Price (D) | Unit Benefit (E)= (C) *(D) |
|---|---|---|---|---|---|
| 1. Sugarcane (t/rai) | 11.53 | 14.00 | 2.47 | 580 | 1,432.6 |
| 2. Pineapple (t/rai) | 4.7 | 5.0 | 0.3 | 3,000 | 900 |
| 3. Vegetables (kg/rai)* | 200 | 300 | 100 | 5 | 500 |

*) eggplant is used for estimation of the unit benefit for vegetables.

**c) Economic Value of the Benefit**

Based on the beneficiary area and unit benefit, the total economic value of the benefit in the whole beneficiary area was estimated at 468,853 Bt as shown in the table below.

**Table 7.5.4 Estimated Benefit in UHMR**

| Crops and Vegetable | Unit Benefit (A), Bt/rai | Beneficiary Area (B), rai | Benefit (C)=(A)*(B), Bt |
|---|---|---|---|
| 1. Sugarcane | 1,432.6 | 217.6 | 311,733 |
| 2. Pineapple | 900 | 164.8 | 148,320 |
| 3. Vegetables | 500 | 17.6 | 8,800 |
| Total | | 400.0 | 468,853 |

**d) Annual Cost of the Pilot Project**

Annual cost was estimated at 181,223 Bt as shown in the table below. The total cost for the Pilot Project was divided by the lifetime of the irrigation facilities. Judging from the character of the PVC pipe installed as main pipeline, the lifetime of the facilities was estimated at 20 years. As for the O & M cost, it was assumed that the cost occur mainly for repairing the main pipe and its ancillary facilities, when they deteriorate through operation.

**Table 7.5.5 Annual Cost of the Pilot Project in UHMP**

| Project Cost (A) | Lifetime of the facilities (B) | Annual Cost (C)=(A)/(B) |
|---|---|---|
| 3,451,912 Bt | 20 years | 172,596 Bt/year |
| O & M Cost (5%/year) | | 8,627 Bt/year |
| Annual Cost | | 181,223Bt/year |

Note: The construction cost of UHMR constructed in 1989 was not included in the project cost.

**e) Cost-Benefit Ratio**

The Cost-Benefit ratio was estimated at 2.59 as shown in the table below. The benefit was estimated only from the possible increase of productivity on main crops and vegetables based on the results of the evaluation survey. The estimated ratio of 2.59 is high enough to justify the feasibility of the Pilot Project, but the total benefit should not be referred as such due to the above reason. To increase the accuracy of the estimation, the further study should be made taking into consideration of the farmers' inputs and expenditures after they harvest sugarcane and pineapple.

**Table 7.5.6 Cost-Benefit Ratio in UHMR**

| Estimated Benefit (A) | Annual Cost (B) | Benefit/Cost (A/B) |
|---|---|---|
| 468,853 Bt/year | 181,223 Bt/year | 2.59 |

**2) BTPW**

The farming practices in Ban Tha Phayom Project site are quite different from that in Upper Huai Mahad Reservoir Project site. Pineapples are not seen, and instead of this, vegetables such as asparagus, beans, and corns, etc. are planted widely using groundwater taken by their own small scale irrigation facilities. Compared to the monoculture of sugarcane and pineapple in UHMR, there seems to be more opportunities of the benefits from newly establishment of irrigation systems, the series of extension services and supporting companies. The farmers in the area will also benefit by using surface water for irrigation instead of groundwater to increase the productions and productivities on sugarcane and many kinds of vegetables.

The shift from groundwater to surface water goes along with the government policy. In addition, the participants of the PCM workshops referred chemical fertilizers and pesticides as the causes of polluting ground water. Together with the problem of the excessive use of groundwater in the area, the participants proposed the shift from groundwater to surface water. The test on quality of groundwater was therefore included in the Pilot Project. The economic value of the shift from groundwater to surface water cannot be calculated at this stage, but the further study is recommended in future.

**a) Beneficiary area**

The table below shows the current farming practices of each crop and vegetable based on the baseline survey results. Almost all of the crops and vegetables are under irrigation by groundwater. Due to limited water volume of shallow water, the planted areas are less than 5 rai/farmer.

**Table 7.5.7 Current Farming Practices in BTPW**

| Crops & Vegetables | Current Farming | | | Ratio of Area (%) |
|---|---|---|---|---|
| | growers | rai/HH | total area (rai) | |
| **A. Main Crops** | | | | |
| 1. Sugarcane(a) | 8 | 23.13 | 185.04 | 52.9 |
| 2. Sweet Corn (a)* | 1 | 5.00 | 5.00 | 1.4 |
| Sweet Corn (b)** | 7 | 5.00 | 35.00 | 10.0 |
| 3. Baby Corn (a) | 2 | 5.75 | 11.50 | 3.3 |
| Baby Corn (b) | 7 | 5.75 | 39.90 | 11.4 |
| 4. Sticky Corn(a) | 1 | 2.50 | 2.50 | 0.7 |
| 5. Paddy (a) | 1 | 3.00 | 3.00 | 0.9 |
| subtotal | | | 281.94 | 80.7 |
| **B. Vegetables** | - | - | - | |
| 1. Asparagus | 1 | 2.00 | 2.00 | 0.6 |
| 2. galingale | 1 | 4.00 | 4.00 | 1.2 |
| 3. Eggplant | 4 | 1.90 | 7.60 | 2.1 |
| 4.Lemon Grass | 1 | 2.00 | 2.00 | 0.6 |
| 5. Lettus | 2 | 22.00 | 44.00 | 12.6 |
| 6. Chili | 4 | 1.31 | 5.24 | 1.5 |
| 7. Long bean | 1 | 2.00 | 2.00 | 0.6 |
| subtotal | | | 66.84 | 18.1 |
| **C. Ornamental** | 1 | 0.75 | 0.75 | 0.2 |
| Total | | | 349.53 | 100 |

Note: (a) * shows rain fed farms, (b)** shows irrigated area
Vegetables are all under irrigation by groundwater.

The irrigable area under the project was estimated at 300 rai, taking due consideration of the river discharge as well as the limited budgetary allocation. The concrete figures could not be obtained because some farmers have not yet installed pipes, waiting for the next planting season for sugarcane as the case in UHMR. To estimate the project benefit, the irrigable area for each crop was estimated based on the current ratio of the planted areas. As a result, 158.7 rai of sugarcane, 4.2 rai of sweet corn, 9.9 rai of baby corn could be benefited from pump irrigation.

**Table 7.5.8 Estimated Beneficiary Area in BTPW**

| Estimated crops for Irrigation | Ratio of Area (%) | Estimated Beneficiary Area (rai) |
|---|---|---|
| Irrigable area | | 300.0 |
| 1. Sugarcane | 52.9 | 158.7 |
| 2. Sweet corn | 1.40 | 4.2 |
| 3. Baby corn | 3.30 | 9.9 |
| 4. Sticky corn | 0.7 | 2.1 |
| 5. Paddy | 0.9 | 2.7 |
| Total | 59.2 | 177.6 |

**b) Unit Benefit**

According to the baseline survey and evaluation survey results, the yields of sugarcane without and with project would be changed from 9 or 10 t/rai to 12 t/rai. The other crops were also calculated as below.

**Table 7.5.9 Unit Benefit from Increase of Productivity of Main Crops in BPTW**

| Crops | W/out Pjt. Yield (A) | With Pjt. Yield (B) | Increase (C)=(A)-(B) | Unit Price (D) | Unit Benefit (E)=(C)*(D) |
|---|---|---|---|---|---|
| 1. Sugarcane (t/rai) | 9.50 | 12.00 | 2.50 | 580 | 1,450 |
| 2. Sweetcorn (t/rai/year) | 3.60 | 4.71 | 1.11 | 3,500 | 3,885 |
| 3. Baby corn (t/rai/year) | 4.50 | 4.83 | 0.83 | 2,300 | 1,909 |
| 4.Sticky corn (t/rai/year) | 1.20 | 1.3 | 0.10 | 1,000 | 100 |
| 5.Paddy (t/rai/year9 | 0.5 | 0.9 | 0.40 | 6,000 | 2,400 |

**c) Economic Value of the Benefit**

Based on the beneficiary area and unit benefit, the total economic value of the benefit in the whole beneficiary area was estimated at 272,021 Bt as shown in the table below.

**Table 7.5.10 Estimated Benefit in BTPW**

| Crops and Vegetable | Unit Benefit (A), Bt/rai | Beneficiary Area (B), rai | Benefit (C)=(A)*(B), Bt |
|---|---|---|---|
| 1. Sugarcane | 1,450 | 158.7 | 230,115 |
| 2.Sweetcorn (t/rai/year) | 3,885 | 4.2 | 16,317 |
| 3.Babycorn (t/rai/year) | 1,909 | 9.9 | 18,899 |
| 4.Stickycorn (kg/rai/year) | 100 | 2.1 | 210 |
| 5.Paddy (t/rai/year) | 2,400 | 2.7 | 6,480 |
| Total | | 177.6 | 272,021 |

**d) Annual Cost of the Pilot Project**

While gravity irrigation system is applied for UHMR, electrical pumps were introduced for BTPW. By assuming the O&M cost for pipeline and pumping facilities at 5% of the project cost, the annual cost of the project was estimated at 208,024 Bt, which is about 15% higher than UHMR.

**Table 7.5.11 Annual Cost of the Pilot Project in BTPW**

| Project Cost (A) | Lifetime of the facilities (B) | Annual Cost (C)=(A)/(B) |
|---|---|---|
| 3,450,660 Bt | 20 years | 172,533 Bt/year |
| O & M Cost (5%/year) | | 8,626 Bt/year |
| Pump Maintenance Cost | | 26,865 Bt/year |
| Annual Cost | | 208,024Bt/year |

**e) Cost-Benefit Ratio**

Although the benefit was estimated only from the increase of the productivity on the main crops in the area, the B/C ratio was turned out at 1.31. Due to high maintenance cost of the pumping system, the B/C ratio is only 50% of UHMR. However, this figure is still at the satisfactory level to justify the project.

**Table 7.5.12 Cost-Benefit Ratio in BTPW**

| Estimated Benefit (A) | Annual Cost (B) | Benefit/Cost (A/B) |
|---|---|---|
| 272,021 Bt/year | 208,024 Bt/ywar | 1.31 |

As mentioned above, the economic feasibilities of the Pilot Project both in Ratchaburi and Kanchanaburi have been proved, with the assumption of irrigable areas for each crop. However, it should be noted again that the calculation was made only to justify the project, and that further verification is recommended for more precise judgment after harvesting crops and vegetables produced under irrigation.

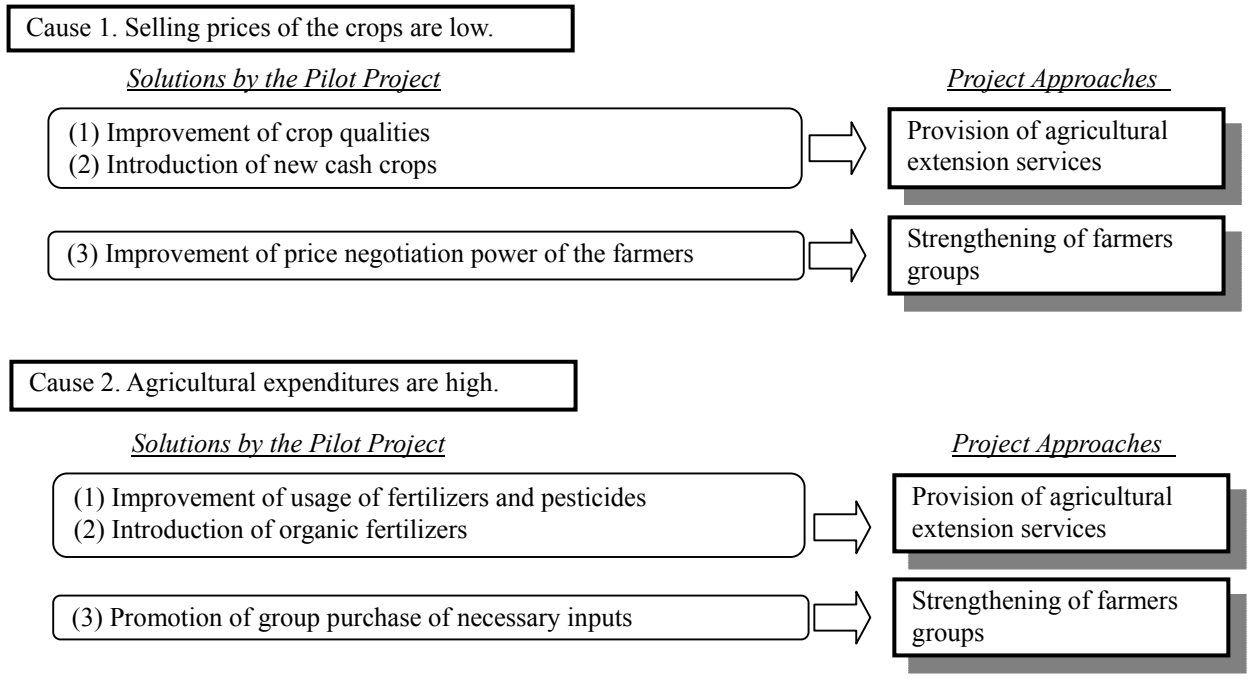
# CHAPTER 8 CONCLUSIONS AND RECOMMENDATIONS

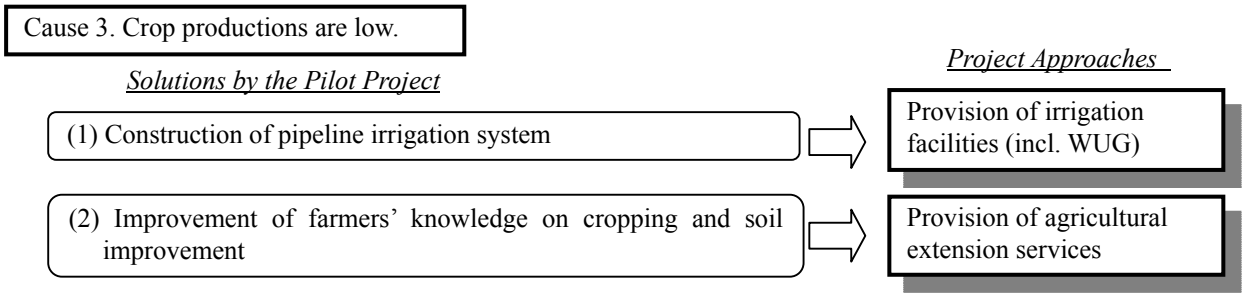
The purposes of the Pilot Project have been 1) to verify whether the development plans recommended in the Draft Master Plan (hereinafter referred to as DMP） could meet the farmers' needs, 2) to transfer the technologies on participatory development as well as to recommend a suitable organizational structure to the project stakeholders, and 3) to reflect the lessons learned from the planning and implementation of the Pilot Project on DMP. The conclusions and recommendations for the future are presented below:

## 8.1 Whether the Development Plans Recommended in DMP can Meet the Farmers' Needs

The most important issue (the core problem) for the farmers is indicated in DMP as "agricultural incomes can not meet its costs". First of all, it is necessary to verify, based on the lessons learned from the Pilot Project, whether the solutions shown in DMP are appropriate to address the core problem. In DMP, the four direct causes of the core problem are pointed out, such as; 1) selling prices of crops are low, 2) agricultural expenditures are high, 3) crop productions are low, and 4) damages of crops are severe, and an improvement in the above four situations is recommended for solving the core problem. As "damages of crops are severe" is the problem of the limited areas and not identified in the target villages of the Pilot Project, the other three causes have been taken into account in the Pilot Project.

In the Pilot Project, the following three approaches; the provision of agricultural extension services, the strengthening of the farmers groups, and the construction and provision of irrigation facilities (including WUG) have been taken so as to tackle the direct causes:






Each approach included the following project activities:

| *Project Approaches* | *Project Activities* |
|---|---|
| Provision of agricultural extension services | - Establishment of demonstration plots<br>- Conduct of study tours<br>- Provision of trainings on crop planning, quality and quantity improvement, introduction of new crops, use of fertilizers and pesticides, making of organic fertilizers, livestock rearing |
| Provision of irrigation facilities (incl. WUG establishment) | - Establishment and provision of trainings to WUG (water users' group) on O&M of irrigation system and water management<br>- Discussion on pipeline alignment<br>- Survey, design and cost estimate on construction<br>- Construction of irrigation facilities<br>- Discussion and provision of trainings to WUG on group management |
| Strengthening of farmers groups | - Establishment and management of the WUG fund as a revolving fund, saving strengthening<br>- Facilitation of group activities<br>- Strengthening collaboration between WUG and other farmers groups |
| Strengthening of the TSGs and TTCs | - Meeting with TSG and TTC members on project planning, monitoring and evaluation<br>- Provision of TOT trainings on project management and institutional strengthening |

Based on the chapters 6 and 7, the outcomes of those project activities are summarized below:

1) As an overview, it can be said that the farmers' needs, "increase in agricultural incomes and decrease in expenditures", will be met through the following three approaches; the provision of agricultural extension services; the strengthening of farmers groups; and the construction and provision of irrigation facilities (including WUG). The indicators in PDM, however, need to be adjusted according to the circumstances because many project activities are still underway.

2) Agricultural extension services showed their effectiveness in various trainings including the demonstration plots and the study tours. In particular, through the trainings, compost making and use have been spread to the community, and artificial insemination of livestock have been more accepted by the farmers, which shows those trainings have responded to the farmers' needs. Expecting such positive outcomes, DOAE and RID expanded the demonstration plots by their

own budgets to support the project. However, one of the direct causes, "selling process of the crops are low", have been improved only partly, and therefore further efforts are needed through the trainings such as the improvement of crop qualities and the strengthening of farmers groups.

3) As for the construction and provision of irrigation facilities (including WUG), the facilities were planned and constructed with the participation of the farmers as intended. Accordingly, irrigation farming has begun, and an increase in production is expected. The production of value-added crops such as vegetables has also started. On the other hand, in spite of applying a participatory approach, some issues are necessary to be improved. For example, water fees have not been determined yet and only a half of the farmers installed tertiary pipelines. If time had permitted, the construction should have commenced after setting up the rules of irrigation including water fees. Since water fees generally increase farmers' expenditures, irrigation farming could not meet the farmers' needs unless its incomes surpass the expenditures. In order to address this issue, the introduction of new cash crops, crop planning, market development, etc. have been recommended. The stakeholders need to collaborate more closely in supporting the farmers for accomplishing those recommendations.

4) As for the strengthening of the farmers groups, WUG were founded and started to function in both villages. WUG played a central role in facilitating the participation of the farmers to the project and the communication between the farmers and government agencies or the Study Team. It has been effective to have WUG be the base of development activities and function as the coordinator among the other many existing farmers groups so as to push the project forward and enhance its sustainability. Furthermore, founding the revolving funds has a remarkable effect on reducing interest, cutting expenditures for agricultural inputs, and promoting group activities. However, the capability of WUG is not yet sufficient to fulfill their responsibilities, and thus they need to be reinforced furthermore through a series of trainings. In particular, they left several tasks for the future such as i) an increase in selling prices of the crops as a result of strengthening the capacity of negotiation power with the market including middlemen, ii) the formulation of crop production plans for the whole villages, etc.

5) TSG fulfilled a role of the coordinator among the stakeholders at the provincial level. Although only some of them participated to the planning process of the Master Plan including the workshops at the sites, many of them participated at the implementation stage of the Pilot Project. Especially, smooth communication among the stakeholders and good progress of the project were observed in Ratchaburi province at which the project plan was incorporated into the provincial CEO plan. However, technical supports to the farmers were provided by only the limited agencies such as RID and the livestock department. Therefore, it is appropriate to consider that government agencies at district and Tambon levels, which are closer agencies to the farmers than the provincial government, support the farmers directly at the sites. Nevertheless, regardless of whether the name of TSG will continue to exist, the commitment of government at the provincial

level remains strongly needed, expecting them to play a "realistic" role taking into account the lessons learned from the Pilot Project. For further strengthening TSG, it is necessary to coordinate its agencies under the provincial governor in pursuing the common target, attainment of the CEO plan. The opportunities to facilitate active communication among them, such as TOT or meetings, should therefore be made repeatedly.

6) The introduction and strengthening of TTC are included in the government policy, but it is still on the stage of formulating a substantial strategy to meet its concept. TTC has also been considered as one of the central bodies to support the farmers in the Pilot Project, and several activities for strengthening TTC were included in the project. As a result, the chairman of TTC, the secretary of TTC which is the additional post of a district agricultural officer, and some members participated into the project activities enthusiastically, but contributions from TTC as an organization have been limited. It would be difficult for TTC to be functional as "one stop service center" as the government expects if the current form of TTC continues, and thus further review of its suitable form and try & error shall be needed.

## 8.2 Technology transfer of participatory development approach

Secondary, it is verified whether the project transferred the technologies on participatory development approach and suggested the suitable organizational structure to the people concerned with the project:

1) Participatory development approach has been put into practice through the Pilot Project. The participation of the farmers and government officers in charge was facilitated at all stages from the project planning, implementation to evaluation. The transfer of the technologies to them was conducted through various methods such as RRA, PCM and discussions in those processes. The Study Team has also recommended the organizational structure which consists of TSG, TTC and WUG at the core, and tried to establish it through implementing the Pilot Project. Since one of the purposes of the study is "the application of a participatory approach", many stakeholders were requested to participate in the project. Hence, they ought to have been engaged for the project relatively longer hours comparing to other projects. Although there are several merits in the participatory approach as mentioned in chapter 7, it is still important that the recipient side understands those merits and accept the approach if the technology transfer should go successfully. In other words, the matter is whether the long time engagement, which is the key characteristic of the approach, can be justified by the parties concerned.

2) The farmers in the target villages of the study and the staff of RID central actively participated to the project during the formulation of the development plans. The Study Team intensively discussed with the RID staff and local consultants, and substantially transferred the concept and use of a participatory approach to them. However, RID might not be engaged in development

planning but concentrate on construction of the facilities in near future as a sequel to a public administration reform, and therefore RID will no longer be an appropriate body as a recipient of technology transfer of participatory development. It is quite unfortunate that technology transfer was designed, at the commencement of the study, to target RID staff assuming they were in charge of development planning.

3) Although the government staff at the provincial, district, and Tambon levels were also designated as the counterparts of the technology transfer, their participation in the project was not so active at the stage of development planning. Lack of their motivation was not clearly observed as a reason, meanwhile the following two reasons must have affected this issue; 1) they actually did not have sufficient time and budget to participate in a particular project, and 2) they did not recognize well how important the participation in development planning is. In short, they did not find enough value to participate in the project at that stage. However, after the commencement of the implementation, the officers at the provincial and lower levels increased their participation sharply. It indicates that they started to understand the significance of participatory development and see the value of participating in the project since then.

4) It is worth to mention, as one of the success cases by the application of participatory development approach, that the government agencies concerned finally have come to pay attention to the farmers' needs and to provide a comprehensive cross-boundary support to the farmers beyond the government's vertical administrative barrier. Though the reorganization of TTC remains to be reviewed, the new organizational structure with its concept, recommended by the Study Team, seems to have been accepted by the project stakeholders. In the evaluation workshops, the government officers and farmers concerned expressed their impressions that "a participatory approach is time consuming, but we have finally realized its value at this stage". Thus, it can be expected that participatory development approach and necessary institutional strengthening will take root gradually by themselves.

5) Regardless of whether a participatory approach or others, an incentive is important for making the recipients be motivated to accept the technology to be transferred. The possible incentives for the participatory approach might be; the beneficiaries can easily reflect their needs on the project, the supporting side can have more concrete information on the conditions of the farmers, and accordingly render more appropriate services. In the Pilot Project, those incentives seem to have worked particularly on the farmers and the government staff directly supporting the farmers. Assuming there was no project implementation - only the planning was conducted in the study -, the technology transfer of participatory development approach should have been difficult because of lack of the incentives. Therefore, despite of its small scale, implementation of the Pilot Project was significant for pursuing the purpose, namely, the technology transfer of participatory development approach.

6) The above statement indicates an important lesson that the officers at the provincial and lower levels can be motivated to participate in the planning stage when they recognize "the plans they prepare are implemented." In the project area, the participatory approach is not exactly applied in the planning process although it basically flows upward from villages to Tambons, district and provinces. In general, at first the representatives such as the village chief submit a list of project proposals to the Tambon where those proposals are prioritized, and then the results are sent to the upper levels for the same actions. The bottom, the people and villages, are rarely involved in deciding which proposals are materialized. It is therefore recommended that the development planning and implementation process be institutionalized, which stipulates that the project plans be made with the participation of people, and those be given the highest priority for implementation. This would make the officers aware how important the project planning is, and eventually be motivated in participating in the planning with the people.

7) The below summarizes the lessons learnt from the application of the participatory development approach regarding its advantages, its applicability to development, and the suggestions and recommendations for its effective use.

- ***RRA method***: The staff of RID central actively participated in the planning of the Master Plan, and discussed with the Study Team on the effectiveness and applicability of the RRA method after they used it in the villages (refer to the RRA survey report for the details). TSG members also participated in the planning of the Pilot Project though it was limited. It can be said, based on their opinions as well as general understandings, the RRA method is quick and effective method to understand deeply the situations, problems and needs of the farmers. In the Pilot Project, the RRA survey was conducted for five days in each village, and the duration is considered appropriate. Regardless of the duration, however, it would not be much useful for the surveyors to participate in the RRA survey if they are not willing to listen and understand the farmers. This suggests how important the selection of the surveyors is. Besides, a RRA survey team is consisted of only several members, and therefore the representatives of TSG can participate in it even if TSG involves a number of the agencies. Thus, it is recommended that the RRA survey team be organized with the staff with the background of social development, and motivation and interest in village surveys, or ideally a special unit be established in TSG or at the provincial level for being engaged in the village survey and planning.

- ***PCM method***: Based on the feedback from the participants and general remarks, the PCM method is considered as effective for facilitating the process of discussion on problems as well as project plans by gathering a number of the stakeholders at one place. The method seems to be accepted by the farmers and officers, after seeing some positive outcomes of the Pilot Project, as they had rarely made project plans together before they participated in the project. In addition, the PO prepared through the workshop became the common tool among TSG, TTC and the farmers, and considered useful particularly for monitoring the project

progress. Regarding the duration of the PCM workshop, it was originally planned to conduct each for five days, but it was reduced to a couple of days according to the request from the officers and the farmers as "they are busy". Nevertheless it was observed that the PCM method was still effective since the stakeholders were eventually able to discuss on the problems and needs in certain depth. It should also be noticed that a lot of the opportunities of communication among the stakeholders was made during the implementation, which must have contributed to raise the effectiveness of the method. Regarding the PCM workshops conducted in 16 tambons for the preparation of the Master Plan, it is considered enough to conduct it only in two villages where the Pilot Project was implemented, if a number of the farmers participated in and spent their time only for the planning workshops is taken into consideration. It is suggested to reconfirm that the PCM method be used within the project cycle which involves not only planning but also implementation and evaluation.

- ***Discussions***: It is considered that a series of the discussions in the Pilot Project was able to facilitate communication among the stakeholders, which must have contributed to solve many problems and issues. It was however observed in several times that no action was actually taken even though they had seemed to agree and accept the requests in the discussions. This might come from one characteristic of Thai society; "basically not harm but accept others (even if it is just on the surface)." It should therefore be noticed that an agreement in the discussions is not necessarily led to substantial action. For overcoming this, it is suggested that the responsible persons be made clear for every action to be taken, and their progresses be monitored regularly. Another issue of the discussions is that there were the participants to considerably a large extent never expressed themselves. This is more obvious when the scale of the discussions is big. To improve this, an opportunity should be made for those non-speakers to be able to speak out by dividing the participants in smaller groups as far as time permits, or their opinions should be collected in advance. In general, a lot of problems happens due to lack of communication, and the discussions are highly useful to solve or avoid those problems if they are conducted effectively by paying attention to the above issues.

## 8.3 Lessons learned to the Master Plan

Except for the above, the lessons learned to be reflected to the development plans in DMP are summarized below:

**(1) Agricultural production improvement plan**

- Farmers' demand on compost was unexpectedly high for it's effectiveness not only for improving soil fertility as expected in the plan but also for decreasing the expenditures by replacing expensive chemical fertilizer. Compost is gaining importance in the current policies. For example,

compost has been selected as an OTOP for the Tambon, and its use has been promoted as one of the development strategies of Kanchanaburi province. Therefore, more active promotion of the production and use of compost should be included in the plan.

- Soil and water quality tests were carried out, and the results showed suitable compositions of compost, the varieties of fertilizer, and pH of irrigation water, all of which are necessary for soil improvement. Therefore, such tests should be included in the project activities.
- Although there was no specific plan for livestock development in DMP, an artificial insemination service by the livestock department was found to be effective and inexpensive. As an artificial insemination center established by the department will be able to provide the service to the farmers in several Tambons, this should be a part of the plan.
- It is already pointed out that the study tours were effective for the farmers to learn new technologies, and therefore it should be emphasized as one of the project activities.

**(2) Micro-credit plan**

- The project provided a start-up-fund to the revolving funds, and then the farmers began the group purchase of fertilizer and compost making with the funds. Such activities can reduce the expenditures for interest and agricultural inputs, and thus the farmers pay strong attention to the activities and the number of the participants has been increasing. As the profits generated from such activities should return to the funds, the amount and effect of the fund are expected to grow. Therefore, the micro credit plan should involve support to initiate micro enterprises as a group activity and to make them sustainable.

**(3) Other items to be mentioned**

- TOT was conducted to the members of TSG, TTC, and farmers groups, and it was effective. In particular, there were such opinions from the participants that TOT was highly informative for them to be able to learn how to consider agricultural development for their areas, how to act by themselves, and how to lead the other members through exchanging ideas with the other participants. Therefore, TOT should be a part of the project activities.
- In the Pilot Project, the Study Team conducted the monitoring of the project for the confirmation of the progress, the discussion of the problems, and the revision of the plan. It built awareness among the stakeholders that periodical monitoring is indispensable for carrying forward the project smoothly. Such monitoring is expected to be conducted by the government agencies for the future. In such monitoring, it is necessary to prepare “a guideline” which stipulates organizations and persons to be in charge of the monitoring, how to report the results, and how to respond it. It should be underlined that such guideline be formulated at a provincial level and strictly enforced.

## 8.4 Rural and agricultural development in the Lam Pa Chi River Basin in future

The development plans were formulated and implemented in only two villages through the Pilot Project, out of 145 villages in the entire Lam Pa Chi basin. After the Pilot Project, in order to develop the whole basin, it is necessary to expand the same activities to the other villages. Suggestions during such expansion in future are outlined below:

**(1) Implementation Structure**

1) It is desirable that development is taken charge at the provincial level. This is in line with the current decentralization policy of Thai government and can also be justified based on the experiences from the Pilot Project. Even if a development plan is prepared for a village, it will be most effective when the plan is incorporated in a Tambon development plan and a provincial CEO plan to keep consistency with the provincial policies. Concerning an organizational structure for implementation, all organizations concerned at the provincial level should be under the supervision of a provincial governor. At the district and Tambon levels, the staff of district offices of the related organizations and Tambon offices should directly support the farmers under the supervision of a district governor. According to the current policies, Tambon office will take a responsibility at the field level for the implementation of development under the supervision of a district governor. It is desirable that the supports such as extension services be through TTC after being reorganized. (see Chapter 6 about reorganization)

2) Though central government agencies' involvement is obviously necessary, RID and DOAE ought to be the core of support for the farmers when the support is based on the use of water resources as this project did. Other agencies will also be involved depending on policy's priorities and development plan of each province. Coordination among central government agencies should be based on the intension of a province, but not the will of the central.

3) It is desirable that a farmers' organization most closely related to agricultural development for a village, such as WUG, is designated and takes the initiative in communicating with governmental support agencies, organizing the farmers into a group, and facilitating project activities at the village level. In Thailand, it is often observed that several farmers' organizations, formulated by different government agencies and companies, operate similar activities in the same village. Such overlapping is not only inefficient but also a heavy burden upon the farmers. Therefore, one organization, most trusted by the villagers, should play a role of an organizer and coordinator administrating the other groups in the village's development.

4) Cooperation among the farmers in and outside of a village should be promoted. The farmers recognized through the Pilot Project that lots of useful technologies exist close to them. Accordingly, it is practical and cost effective that the advanced farmers in the same areas play a leading role in supporting the other farmers. The supporting organizations, such as the government agencies, are expected to facilitate interregional exchanges of technologies among the

farmers rather than to introduce and disseminate technologies from the outside of the area.

**(2) Project activities**

1) It is desirable that the projects for the other villages in the basin be implemented maintaining a good combination of soft and hard components as did in the Pilot Project. It is observed that other completed reservoirs and ponds are left unused in the basin as seen in the Pilot Project area. An effort is needed to minimize such "inefficiency in development" as so called an adverse effect of vertically divided public administration. Even in the two villages where the Pilot Project was implemented, there are still many issues to be followed up such as; an improvement in effective use of irrigation water, the strengthening of the farmers groups, and marketing promotion by enhancing the value of products.

2) The activities of the project can be applicable to the outside areas of the basin and to the other nations than Thailand. Firstly, it should be referred that application of participatory development approach and establishment of implementing structures for it. There are many applicable practices to the other areas, such as how to grasp farmers' needs by a bottom up approach, how to formulate a development plan harmonizing the needs with government policies, how to facilitate the participation of government agencies and to have them support farmers efficiently. In addition, since Thai government is now promoting "food safety" with a vigorous effort, compost making and chemical-free farming conducted in the project are to assist the policy. Moreover, promoting high-value crops and organizing farmers' groups with the use of the revolving funds, are advanced approaches and worth referring.

3) Thus, it is appropriate that the Lam Pa Chi river basin is further developed as presented above, and is utilized as a training place for the farmers from outside the basin as well as neighboring countries. This idea is in line with the current intension of Thai government to locate the country as a base of South-South cooperation. As the Master Plan of the basin has already been completed, it is highly desirable to make good use of it for contributing to the development of both inside and outside of the basin.