Farmer Irrigation Participation Project
in Lam Chamuak, Thailand:
Initiation Report

WMS REPORT 50
WATER MANAGEMENT SYNTHESIS PROJECT
FARMER IRRIGATION PARTICIPATION PROJECT IN LAM CHAMUAK, THAILAND: INITIATION REPORT

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WMS Report 50

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WATER MANAGEMENT SYNTHESIS II PROJECT

University Services Center
Colorado State University
Fort Collins, Colorado

In cooperation with the Thailand Royal Irrigation Department and the Consortium for International Development

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I. FARMER IRRIGATION PARTICIPATION PROJECT (FIPP)

A. BACKGROUND OF PROJECT

Several experiences with indigenous irrigation organizations in South Asia (Sri Lanka: Uphoff, 1985) and Southeast Asia (Philippines: Korten, 1982) in the past 10 years suggest that the stage of farmer involvement and the type of farmer involvement both have close association with farmer identification with the irrigation system. (See Appendix A for sources of information.) Identification with the system is synonymous with their feeling of ownership, willingness to invest in their system, and interest in protecting and preserving their system when calamities or normal wear and tear jeopardize the system's ability to serve them. The earlier that farmer/beneficiaries are involved (as with the decision to rehabilitate, planning the rehabilitation, providing feedback on design and alignment, and participating in surveying and layout), the more likely they are to have a feeling of ownership and want to protect their system. Likewise, the more that farmers contribute their time (planning, meeting, providing feedback, surveying, layout, mobilizing labor in construction) and materials (tools, aggregate, rock, bamboo, wood), the more likely they are to assume responsibility in operations and maintenance after rehabilitation.

Preliminary discussions were held in September 1983 on the advisability of including a farmer participation component in the WMSII Workplan for Research in Northeast Thailand and particularly in the ongoing Northeast Small-Scale Irrigation (NESSI) Project of the USAID Mission to Thailand. The NESSI Project was particularly advantageous to the special studies component of the WMSII activities of CSU because of the specific intention of NESSI to "establish a replicable approach and the necessary institutional capabilities for increasing agricultural incomes for poor farmers in small/medium-sized irrigation areas of Northeast Thailand" (USAID/Thailand, 1980).

A preliminary proposal for CSU/WMSII activities was drafted in Fort Collins in November 1983 and a small team from CSU visited Thailand in January and February 1984. The team discussed research and action opportunities with the Mission and the Royal Irrigation Department (RID) and visited several sites in the ongoing NESSI Project. A specific proposal was developed with corresponding institutional inputs and projected outputs, and a specific site chosen for the action research. The proposal was tabled due to a delay in the implementation schedule at the specific site chosen for WMSII/CSU/RID action research and development.
In early 1985, modified research (Freeman and Faranakian, 1985) and development implementation (Early, 1985) proposals were negotiated between WMSII/CSU and RID in the light of the renewed opportunity for the rehabilitation of Huai Khilek. Several necessary preconditions apparently were coming together at this NESSI site. These included:

1. the strong encouragement of the RID to test alternative organizational forms and procedures in the Huai Khilek Tank site.

2. the resumption of the Huai Khilek Rehabilitation in the 1986 Workplan of the RID and the NESSI Project.

3. the opening of a six-month window of opportunity for preconstruction organizational work.

4. the delineation of a relatively small (250-hectare area with approximately 100 farmers) portion of Huai Khilek in which the action organizational and research documentation work were to be focused.

The actual approval of the proposals with appropriate modifications and budgetary support were made in August 1985 by AID/Washington and USAID/Bangkok. Due to this delay, Huai Khilek was no longer an appropriate site. During a site visit in September 1985, an alternative was required.

The inputs to the farmer participation in irrigation management project include personnel, equipment, operational funds and support in kind and facilities. Detailed responsibilities for FIPP were negotiated and specified for both WMSII/CSU and RID in the publication "Thailand Irrigation Organization Project: Workplan and Proposals" printed by the Water Management Synthesis Project.

B. PURPOSE AND OBJECTIVES OF THE FARMER IRRIGATION PARTICIPATION PROJECT

The purpose of the Farmer Irrigation Participation Project is the determination of replicable, low-cost methods to achieve farmer identification with their tank irrigation system resulting in their direct involvement in, responsibility for, and control over a portion of their system in the processes of rehabilitation, operations and maintenance.

The objectives of the Farmer Irrigation Participation Project are to:

* Apply and test an alternative organizational strategy for increasing farmer participation (responsibility and authority) in irrigation rehabilitation, operations and maintenance in medium-scale tank irrigation systems in northeast Thailand.
* Initiate and institutionalize a "learning process" in the Royal Irrigation Department for the purpose of developing and testing strategies, methods and procedures for enhancing farmer identification with their system and increasing farmer involvement in irrigation system management.

* Document and evaluate the outcome of the introduction of the alternative organization strategy to draw conclusions for future testing and implementation and the development of irrigation policy by Thailand’s decisionmakers.

* Compare the experience in northeastern Thailand with similar implementation in the Philippines, Sri Lanka and Indonesia for lessons learned and the development of policy by the international donor and banking communities.

C. GOALS OF THE FARMER IRRIGATION PARTICIPATION PROJECT

The goals of the Farmer Irrigation Participation Project are to achieve the following in the project duration of two years:

1. Enhance performance of the irrigation system such that:

   * Farmers are able to generate more income through increased crop yields, increased cropping intensity, and increased irrigation service area of the tank.

   * Farmer-controlled turnout groups, with assistance on technical matters and some construction materials from the Royal Irrigation Department through the NESSI Project, will have completed the rehabilitation of their farm ditches.

   * Farmer-controlled turnout groups are successfully able to handle the scheduling, allocation, distribution and use of irrigation water in the turnout area (chak).

   * Farmer-controlled turnout groups are successfully able to handle the maintenance and minor repairs of the farm ditch infrastructure under their jurisdiction.

   * A farmer-managed irrigation association is able to successfully interface with the RID management of the Lam Chamuak Tank Irrigation System in the accumulation of water demands, scheduling of irrigation,
and distribution of water to the turnouts of the right main canal (RMC) and left main canal (LMC).

* A farmer-managed irrigation association can successfully interfere with the RID management of the Lam Chamuak Tank Irrigation System in the accumulation of water demands, scheduling of irrigation, and distribution of water to the turnouts of the RMC and LMC.

* A farmer-managed irrigation association can successfully manage routine repairs and maintenance of the LMC and RMC and the main irrigation ditches of the system.

2. Introduce the learning process approach into normal routine of problem-solving by the Royal Irrigation Department; leading to additional testing of organizational approaches, personnel characteristics and administrative strategies that are appropriate to the improvement of irrigation performance in Thailand.

3. Learn significant lessons about appropriate organizational strategy for medium-scale irrigation systems in northeast Thailand for policymakers in the Royal Thai Government, as well as for international donors and lending institutions.

D. COMPONENTS OF THE FARMER IRRIGATION PARTICIPATION PROJECT

The two basic components of the Farmer Irrigation Participation Project are implementation and research. The implementation component refers to the introduction and operationalization of the alternative organizational strategy to gain farmer identification with and ultimate control over their part of the irrigation system. The research component refers to the determination of benchmark information about the system and the farmers, the documentation of technical and organizational parameters throughout the introduction and application of the alternative organizational strategy, and the analysis of the experience and comparison of results obtained in Thailand with those obtained in other circumstances and other nearby nations.

E. APPROACH TO ORGANIZING FARMERS IN IRRIGATION

The alternative organizational strategy, which will be used in the Farmer Irrigation Participation Project, is to stimulate local water users organizations using carefully chosen and trained zonemen of the Royal Irrigation Department and short-term contract employees as catalyst agents. They will be referred to as ICOs (irrigation community organizers). Their task will be to stimulate local farmers, TOGs (turnout groups), and the Lam Chamuak Water Users Association
(WUA) to work toward solving mutual irrigation problems identified by the farmers. The ICOs will receive special training to prepare them for the catalyst position. The ICOs will not use the top-down leadership style employed in the traditional organizing strategy common throughout the region. The ICOs will live in the villages of the Lam Chamuak irrigation water community.

Emphasis will be placed on the ICOs integration with the community of irrigators served by the system. Integration will lead to ICOs asking directed questions about the system -- its strengths and weaknesses. Questioning will lead to focused discussion and ground working of key individuals in the association about the need for meetings. Additional time will be spent developing the agenda for meetings focusing on irrigation problems and farmer solutions. The local leaders are placed in the forefront of calling the meetings and determining the necessary agenda. The ICOs will remain as resource persons and catalysts only. They will not be leaders. Meetings will lead to formalization of by-laws and procedures for the TOGs and the WUAs, as well as the decisions to do something about the problems. The decisions to tackle some portion of the Lam Chamuak rehabilitation would lead to the planning process, which would include local resource inventories and scheduling of work. After these activities, the TOGs and the WUAs would likely begin the mobilization of manpower in the rehabilitation process, most likely the farm level facilities. It would also be expected that the farmers of a turnout group, by turnout group basis, would be consulted and included in the final decision-making concerning turnout location and main ditch alignment. In the farm level facilities, the farmers would likely have the final decision, within the limits of technical feasibility determined by the engineering staff. The capability built into the TOGs and WUAs during rehabilitation would lead to a similar process applied in the operations and maintenance (O&M) phase.

The goals of the organizing process could be represented by a metaphor concerning a man (the farmer leadership collectively) driving a horse (the irrigation association)-drawn carriage (the irrigation infrastructure) (Appendix B). The traditional organizational strategy would have the infrastructure built first and the irrigation agency trying to turn over responsibility to the farmers of what is essentially a government-built and -owned system. This is equivalent to trying to put the cart in front of the horse. The horse is not likely to identify with the system and will not be persuaded to drive the system (take responsibility and authority over the system or part of the system). In the alternative organizational strategy, the farmers are organized to accomplish some type of work that will lend itself to an increased identification with the system. This is equivalent to the horse in front of the cart.

The son of a farmer on the RMC of Lam Chamuak prepared the artwork representing the alternative organizational strategy and traditional organizational strategy used in the horse-drawn cart metaphor. That illustration was used repeatedly to explain the process and why the
organizational work was to be done before the construction or rehabilitation.

F. APPROACH TO THE RESEARCH

The research conducted in the Lam Chamuak system will be focused on problem-solving and documentation of lessons learned from the implementation of the alternative organizational strategy. The research is based on the concept of the research and development process shown below:

The work begins with the identification of strengths and weaknesses within the irrigation system. With this information on strengths and weaknesses, a careful analysis is made to distinguish symptoms of problems from causes of problems. With a preliminary understanding of causes, an effort is made to search for some feasible solutions for testing with field improvement implementation trials. After trial solutions have been tested in the field, then those solutions are sent to the policy makers for decision on whether or not the field results are such that the improvements should become policy of the agency or should return to the field for further testing.

The strength and weakness identification work begins with a brief (one-day) reconnaissance of the system to be studied. This reconnaissance is used to gain an initial familiarity with the system for the further planning and design of a rapid appraisal field activity. This rapid appraisal generally has two components, a social-institutional portion and an agro-technical portion and is concluded in less than one week. The rapid appraisal is used to determine to the extent possible in the time available the causes of the symptoms observed in the system. The rapid appraisal report of system strengths and weaknesses is used as the initial focus for a workshop to begin the search for solutions to improve the performance of the irrigation system. The identification of strengths and weaknesses continues with each ensuing season and results in a seasonal diagnostic analysis report giving a greater in-depth understanding of the strengths and weaknesses. With the completion of two or more seasons of field data, the strengths and weaknesses are more thoroughly understood and the activity is referred to as a long-term study.
In the problem and constraint identification from the one-day reconnaissance and the one-week rapid appraisal, the emphasis is on observation and questioning key informants about the system. When the identification moves to seasonal diagnostic analysis and to long-term studies, greater emphasis is placed on measurements, monitoring of events, and evaluation of results. The four foci within the irrigation systems are the people, the water, the crops, and the land. The people and organizations are continuously documented by a social science participant observer. Water, land and crops are documented by irrigation technicians and engineers. Land use and crop yields, intensity and area served are measured seasonally. Water is measured daily, both in supply and demand.

G. SITE SELECTION

Since eighteen months delay occurred in the implementation of this project, the possibility of conducting it at Huai Khilek was out of the question. Various NESSI sites were discussed. It was decided that there should be a site visit to the NESSI site near Korat, Lam Chamuak for several reasons:

1. **Readily accessible.** Location of Lam Chamuak is less than 5 hours drive from Bangkok. This location provides relative ease of access to Bangkok-based CSU and RID personnel compared to the other NESSI sites (AIT, 1979).

2. **Required lead time.** Lam Chamuak is the last of the seven NESSI sites. This category of occurring last is an advantage to the FIPP, because of the needed organizing lead time.

3. **Needed farmer involvement.** The rehabilitation of Lam Chamuak is likely to run out of NESSI budget and to require an RTG supplemental budget. Therefore, Thailand Farmer Irrigation Participation Project had a great appeal to the RID/NESSI, in order to gain farmer inputs to the rehabilitation (Division of Human Settlements, AIT, 1983).

4. **Minimum continuity violation.** It was least influenced by the promises and preconstruction activities of improvement by NESSI. Besides the design, which can be taken as a tool for budgeting and some surveys, there have not been any other major NESSI activities or presence in the Lam Chamuak project area.

A field trip by CSU and RID personnel was conducted September 18 and 19 to the Lam Chamuak System. The site visit confirmed the initial
Impressions of feasibility for the alternative organizational strategy implementation. The Lam Chamuak site was chosen after discussion of the findings of the field trip and confirmation that the above criteria were fulfilled by the RID and CSU personnel in a planning meeting on September 20, 1985. (See Appendix C for the topics discussed during the Initiation Workshop held in October.)
II. THE LAM CHAMUAK TANK IRRIGATION SYSTEM (LCTIS)

A. HISTORICAL BACKGROUND AND PHYSICAL CONTEXT OF THE LCTIS

The Lam Chamuak Tank Irrigation System (LCTIS) construction was begun on October 1, 1961, and finished October 31, 1963. During this period of 25 months, the reservoir embankment and apurtenant structures were completed and 7.4 km of LMC and 13.3 km of RMC were lined. With full construction of the main canals and the secondaries, the potential irrigation service area was targeted for 10,000 rai (1,600 ha). The Lam Chamuak Water Users Association (WUA) was established by the Royal Irrigation Department (RID). It was registered on January 19, 1968, with 468 members.

The reservoir is located in Huai Talaeng District and the service area covers parts of 9 villages in Tambon Nikom and 1 village in Tambon Lueng Pradue of Pimai District. These districts are part of Nakhon Ratchasima (Korat) Province. This province is the southwest corner of the Korat Plateau, a high plain that distinguishes the northeast from other regions of Thailand.

The Lam Chamuak is tributary to Klong Mai Chamuak, Lam Wang Hin, and ultimately to the Mekong River on the border with Kampuchea. The watershed area of the reservoir is 180 km². The watershed is a cut-over, former forest with second growth and some upland cassava production.

The LCTIS service area is populated by an agrarian community of settlers, most of whom migrated from nearby provinces and Korat. Many farmers have access to both lowland fields in the service area and upland fields on the surrounding sloping lands. A diversity of crops results from this farming system. Nearly all farmers are owner-operators of their land, which averages 5 ha of combined upland and lowland. Approximately 30% of family income is derived from off-farm employment.

B. SOCIAL-INSTITUTIONAL CIRCUMSTANCES WITHIN THE LCTIS SERVICE AREA

1. Population Characteristics

The population that benefits from the project area are in Amphoe Pimai, particularly in the villages of Tambon Nikom and a village of Tambon Lueng Pradue. However, not all of the villages in the two Tambons receive water from the Lam Chamuak Project. Some of their land is rainfed and sometimes supplemented by the Chamuak stream and/or the Small-Scale Irrigation Project (Parsons-Team Consultant Task Force, 1985).
A majority of the villagers in Tambon Nikom are in the land settlement scheme of the Department of Public Welfare. These people migrated from many places within the northeast region: other parts of Amphoe Pimai, other Amphoes in Nakhon Ratchasima, and other provinces in the region. Each household in the land settlement scheme was allotted approximately 23 rai of land.

There are two ethnic groups in the project area: the old Thai or Thai Korat, and the new Thai or Thai Esan. Most of the old Thais are in the land settlement scheme, whereas the new Thais are outside. There are a few major differences between these two groups. The old Thais are of Kampuchian cultural influence. They eat non-glutinous rice and use oil for cooking. Their accents of dialect sound somewhat similar to the Kampuchian language. Their local customs are somewhat different from that of the new Thais.

The new Thais are of Laotian cultural influence. They eat glutinous rice and seldom use oil for cooking. According to our informants, there is intermarriage between people of the two ethnic groups. Some of the new Thais moved to stay with their spouses who are the old Thais and vice versa. There are about 1,275 households in the Lam Chamuak Irrigation Project area with an average number of 6.1 per household, which was close to the national average. The total population is 7,738 (Parsons/Team, 1985: LC-6). Like other villagers in northeast Thailand, more than 80 percent of the villagers in the Project area completed four years of elementary school. Occupations identified are lowland rice farming, upland cropping, silkworm raising, livestock, fruit growing, and vegetable gardening.

2. Landholding Pattern

The rapid appraisal team estimated that the average size of farm family holdings at Lam Chamuak Irrigation Project is about 30 rai. The smallest farm family holding encountered was 4 rai, while most farmers interviewed owned 20-30 rai. It should be noted that the rapid appraisal team found it very difficult to identify farmers owning under 5-10 rai. It took one-half of a day to find one farmer owning only 4 rai. Land tenancy appeared to be very rare.

These landholding statistics seem typical of northeast Thailand as a whole. They also correspond closely to Pengsawang's (1982) and Chuenyong's (1982) study of the Lam Chamuak area. Pengsawang reports the average size of farm family holding as 33 rai, with a variation from 5 to 120 rai. Chuenyong concludes that land tenancy is not a major problem at Lam Chamuak.

3. Water Users Association

The Royal Irrigation Department established a Water Users Association at Lam Chamuak in 1968. All farmers in the project command area are eligible to join. The number of members is currently reported to be between 468 and 547, with approximately 100 people attending the
yearly meeting. The WUA consists of a chairman elected by all members to a 2-year term; two vice-chairmen (one for the settlement areas, one for the non-settlement areas) appointed by the chairman; a secretary; a cashier; and a receptionist. The chairman is supposed to notify the tank caretaker when farmers require water, and the tank caretaker shall ask the project water-master to release water. The chairman is also supposed to organize maintenance activities and inform WUA members of irrigation rules and regulations. The two vice-chairmen are to assist the chairman in his duties. The secretary is to record the decisions of the meeting and report WUA expenses. The cashier is to collect money and deposit it in the bank, and he can withdraw money from the WUA account with the chairman. The receptionist announces the WUA meetings.

Farmers are asked to pay 20 baht to join the WUA, and farmers receiving water are also asked to contribute 2 baht/rai for WUA officers' travel expenses. This money is deposited in the local Thai Farmer Bank and at least two officers are required to be present to make withdrawals. The present chairman stated that no collection of money has been made this year because he does not have the time.

Each turnout along the right and left main canals should also have a turnout group and turnout group leader elected by farmers along that ditch. This turnout group leader is supposed to allocate water along the ditch. There are approximately 50 turnouts along the two main canals, and the number of farmers along each ditch vary from 2 to about 24.

Farmers did voice some complaints regarding the WUA. Some complained that the association was too big and unresponsive to their needs. Communication within the WUA appeared to be infrequent, with turnout group leaders and association officers not knowing one another. The WUA appears to have no written or informal rules or regulations for behavior, and its purpose is vague to the farmers. The association has a form, but no function, and neither farmers nor officers are sure what their roles should be. It was also reported that in the past, financial irregularities occurred within the association. Some farmers stated that local village headmen would often take over the organizational activities of the irrigation system when the WUA failed to perform. Pengsawang (1982) also reports in her study that the Lam Chamuak WUA is not functioning effectively.

C. AGRICULTURE AND THE RESOURCE BASE

Most of the cropping at the LCTIS service area is limited to the rainy season (May to October). During this season, lowland rice is grown throughout the area, using traditional varieties. Less than 20 percent of the wet season cropped area is cultivated in the dry season. Crops grown in the dry season include groundnut, sesame, mungbeans, and vegetables. Rice is not currently grown in the dry season. Cassava is
an important upland crop harvested in the dry season. Most of the rice and other crops are grown for market, with small amounts of appropriate harvests held for home consumption.

Most households in the area keep one or two buffalo or other cattle. Most also raise chickens or ducks. Fishing is practiced in the canal, stream and reservoir.

Soils of the LCTIS are loamy sand to sand in texture. The average percentages of sand, silt and clay are 67%, 25% and 8%, respectively. As a result of the texture, the soils have low water retention and high permeability (Parsons-Team, 1984b). The chemical properties are represented by an average pH of 6.6, 0.9% organic matter, 0.06% total nitrogen, 0.08 ppm available phosphate and 31 ppm available potassium. The soils are classified as vertic tropaquepts according to the USDA scheme and hydromorphic by the national scale. The irrigated soils close to the stream Lam Chamuak are flat alluvial flood plains. The upper soils closer to the RMC and LMC have slopes approaching 1%. The soils are medium to shallow in depth over a gray, semi-consolidated, impermeable substratum referred to by the local people as "elephant brains."

D. AGROMETEOROLOGY, HYDROLOGY AND EFFICIENCY OF LCTIS

The LCTIS service area receives rainfall from two distinct rainfall phenomena (Hydrology Branch of the Royal Irrigation Department). The first is the effect of the southwest monsoon from May to September. The second is the period of the tropical cyclones that originate in the South Pacific and reach Thailand in October and November. The irregularity of these two influences results in large fluctuations in year to year and month to month rainfall. At the Lam Chamuak tank site, the rainfall varies from less than 100 mm/month for December through March to more than 200 mm/month for July and August. The tropical cyclones can deposit more than 100 mm in one or two days and cause serious problems for RID and for farmers in September, October and November.

1. Precipitation

The average annual rainfall of Lam Chamuak Tank is about 1,100 mm (average over 10 years). The actual annual rainfall is mostly close to the average amount. The minimum annual rainfall in 1975 was 857.3 mm, whereas the maximum annual rainfall in 1980 is 1,375.2 mm.

2. Evaporation

The monthly evaporation rate, according to data collected by means of class A pan from a meteorological station in Regional Irrigation Office 6 situated 70 km from the tank, is about 130-170 mm.
3. **Storage and Intake**

The annual storage rating is between 12-20 mcm. The capacity at design storage level (+176.300 MSL) is 23.445 mcm. Increasing water surface level starts from late August and ends in October. Rapid increasing of water level during this period has been experienced in some years. The water level in those years exceeds the design storage level. The unusual surplus amount is drained via the spillway. In 1983, the water level reached to the level 0.70 m above the design level. Depletion of storage occurs between December and April. An extremely low level was experienced during December 1975 and September 1976. The water level in the reservoir was even lower than the lower edge of the outlet (Parsons-Team, 1984a).

4. **Water Delivery**

Only the delivery records dated back to 1983 are available. The wet season delivery starts in June and continues until November. The amount of delivery is approximately 2.0 mcm/month. Delivery for off-season crops is performed between January and April in the amount of 0.6 mcm/month, approximately.

5. **Water Utilization Efficiency and Cropping Intensity**

In irrigated rice farming systems, as in the case of Lam Chamuak, the efficiency of operations in the system are estimated on the basis of the water requirements of the rice crop. Experience in other tank irrigation systems in northeast Thailand (Juntharasri and Early, 1980) and with the production of upland crops (Enayet Ullah and Early, 1980) have led to estimates of the consumptive use requirements of lowland rice and upland crops shown in Table 1. From the farmers' reported area of crops irrigated and the records of reservoir releases and rainfall measured by the RID, the total water available to the rice farming system is calculated. For this cropping situation, water utilization efficiency (WUE) is defined as the total water demand divided by the total water input to the system as follows:

\[
WUE = \frac{LP + ET + S&P}{R+I} \times 100
\]

where

- LP = the land preparation water requirement
- ET = the consumptive use of the crops
- S = net seepage out of the rice field (in this case, assumed to be zero)
- P = deep percolation out of the rice crop root zone
Table 1. Lam Chamuak Estimated Water Utilization Efficiency and Cropping Intensity For 1984

<table>
<thead>
<tr>
<th>Crop</th>
<th>Cultivation Area (Rai)</th>
<th>Water Required For Land Preparation</th>
<th>Water Requirement For ET + P* (mcm)</th>
<th>Sub-Total Requirement (mcm)</th>
<th>Reservoir Water Supply (mcm)</th>
<th>Annual Rainfall (R)</th>
<th>% Water Utilization Efficiency (WUE) **</th>
<th>Cropping Intensity *** (CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>5,454</td>
<td>2.618</td>
<td>14.529</td>
<td>17.147</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sesame</td>
<td>800</td>
<td>0.064</td>
<td>0.396</td>
<td>0.46</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mungbean</td>
<td>600</td>
<td>0.048</td>
<td>0.270</td>
<td>0.318</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peanut</td>
<td>50</td>
<td>0.004</td>
<td>0.036</td>
<td>0.040</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cucumber</td>
<td>50</td>
<td>0.004</td>
<td>0.020</td>
<td>0.024</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stringbean</td>
<td>50</td>
<td>0.004</td>
<td>0.020</td>
<td>0.024</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7,004</strong></td>
<td><strong>2,741,920</strong></td>
<td><strong>15.272</strong></td>
<td><strong>18.014</strong></td>
<td><strong>18.994</strong></td>
<td><strong>10.834</strong></td>
<td><strong>60.4%</strong></td>
<td><strong>117%</strong></td>
</tr>
</tbody>
</table>

Remarks: Assumed water needed for land preparation for rice is 300 mm, and for field crops and vegetables is 50 mm on sandy loam soil.

- ET of Rice is 776 m³/rai
- Sesame is 496 m³/rai
- Mungbean is 450 m³/rai
- Peanut is 720 m³/rai
- Cucumber is 400 m³/rai
- Stringbean is 400 m³/rai

* Percolation (P) was assumed to be 50% of ET for rice cultivation
** WUE = \( \frac{ET + P}{I + R} \) x 100
*** Irrigated area = 6,000 rai = 960 hectares; CI = \( \frac{Total \ Area \ Cropped}{Total \ Area} \) x 100
R = annual total rainfall
I = annual total water release

All of the above figures are presented in the units of million cubic meters (mcm). The estimate of project-level water use efficiency for 1984 is 60%, an exceptionally good efficiency for a lowland rice system.

In the same year, the irrigated area of the project was known to be 960 ha and the total area irrigated of all crops was 1,121 ha. This provides a cropping intensity of 1.17 or 117%. This level of cropping intensity reflects the low level of water use that is common in irrigated areas of northeast Thailand (Chatchawalwong and Early, 1980).

E. THE IRRIGATION INFRASTRUCTURE OF LCTIS

The irrigation infrastructure of the LCTIS consists of two types: those constructed by the RID and those constructed by the farmers. The reservoir and the left and right main canals and appurtenant structures as constructed by the RID are listed in Table 2. The original construction of the LMC and RMC were not completely lined. The portion of earthen canal on the right bank beyond station 13+00 was abandoned and obliterated due to the sandy nature of the soil. As a result, the actual service area is substantially less than the nominal 1,600 ha listed.

The irrigation infrastructure constructed by the farmers consists entirely of the farm ditches below the oriface turnouts from the RMC and LMC. These ditches are narrow and follow property boundaries to minimize the land lost to cultivation.

F. SYSTEM OPERATION AND MAINTENANCE

Water use from the Lam Chamuak reservoir has traditionally been for supplemental rice irrigation in the rainy season. Additional uses include domestic household use and livestock watering. Vegetable production is practiced on small tracts on the perimeter of the reservoir and in the more favorable locations within the LCTIS service area. Most of this vegetable irrigation is accomplished by hand sprinkling.

Dry season water releases are made to approximately 500 ha. The mode of release is accomplished at the request of the water users association to the water master or to the gatekeeper. On several occasions, the farmers are reported to have used their own initiative to obtain irrigation releases and have caused significant damage to the system infrastructure.
<table>
<thead>
<tr>
<th></th>
<th>Description of Lam Chamuak Tank Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Construction:</td>
</tr>
<tr>
<td></td>
<td>Started - October 1, 1961</td>
</tr>
<tr>
<td></td>
<td>Finished - October 31, 1963</td>
</tr>
<tr>
<td>2.</td>
<td>Watershed area:</td>
</tr>
<tr>
<td>3.</td>
<td>Water surface area:</td>
</tr>
<tr>
<td>4.</td>
<td>Depth at storage level:</td>
</tr>
<tr>
<td>5.</td>
<td>Storage level capacity:</td>
</tr>
<tr>
<td>6.</td>
<td>Effective capacity:</td>
</tr>
<tr>
<td>7.</td>
<td>Dam length:</td>
</tr>
<tr>
<td>8.</td>
<td>Dam crest width:</td>
</tr>
<tr>
<td>9.</td>
<td>Dam height:</td>
</tr>
<tr>
<td>10.</td>
<td>Dam crest elevation:</td>
</tr>
<tr>
<td>11.</td>
<td>Spillway type:</td>
</tr>
<tr>
<td>12.</td>
<td>Spillway inlet size:</td>
</tr>
<tr>
<td>13.</td>
<td>Bottom drains:</td>
</tr>
<tr>
<td>14.</td>
<td>Level of spillway bottom drain:</td>
</tr>
<tr>
<td>15.</td>
<td>RMC head regulator orifice size:</td>
</tr>
<tr>
<td>16.</td>
<td>LMC head regulator orifice size:</td>
</tr>
<tr>
<td>17.</td>
<td>Storage level:</td>
</tr>
<tr>
<td>18.</td>
<td>Bottom level of head regulator:</td>
</tr>
<tr>
<td>19.</td>
<td>Length of RMC:</td>
</tr>
<tr>
<td>20.</td>
<td>Length of LMC:</td>
</tr>
<tr>
<td>21.</td>
<td>Irrigation area:</td>
</tr>
<tr>
<td>22.</td>
<td>Construction cost:</td>
</tr>
<tr>
<td>23.</td>
<td>Cost rate:</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The RID maintains records on several important aspects of reservoir operations. A sample of two years' record is provided in Table 3. These include records of the a) reservoir water level, b) irrigation quantity released, c) the quantity of water spilled through the morning glory spillway, and d) rainfall occurring at the tank. The water released from the tank over the most recent five years averaged only 1.85 mcm compared to the capacity of 5.54 mcm, a quotient of only 33%. In the period 1979-1984, the last six years for which records are available, spills of the reservoir occurred only in September to December 1980, totalling 13.6 mcm, and October to December 1983, totalling 19.0 mcm. These two infrequent spills totalled 32.6 mcm, or 140% of the capacity of the tank. These events accompanied rainfall of 550 mm and 480 mm in the respective periods. These occurrences highlight the reservoir manager's dilemma. September is the end of the wet season and is the time when the reservoir volume should be topped off at a maximum. The late season cyclonic rainfall events occurred from September onward and resulted in significant spills to the Lam Chamuak tributary of the Hin River.

The fact that there was no measured spill in 1979, 1981, 1982 and 1984 is also significant. There is a strong likelihood with this frequency of spill, that the reservoir is oversized for the watershed yield capabilities. The extra capacity would be a significant drought deterrent, with the capability for the storage of water from wet years forward into dry years to reduce the risk of water shortage.

In the same period, the relative minimum reservoir levels reached 8.8 mcm in April 1980, 5.6 mcm in October 1981, 2.15 mcm in July 1982, 12.3 mcm in July 1983, 16.5 mcm in May 1984, and 3.0 mcm in August 1985. These extremes present great difficulty to the tank system to supply water reliability for irrigation, even during the so-called rainy season. These extremes are indicated for the years 1981-1984 and half of 1985 in Figure 1. The corresponding annual rainfall accumulated for the April through March hydrologic years for 1975-1985 are shown in Figure 2. The difference between the annual accumulation for 1981 and 1980 is an example of the range of conditions experienced at Lam Chamuak Tank. The minimum was 800 mm in 1981 and the maximum was 1385 mm providing a range of 585 mm or 73% in excess of the minimum rainfall. Reservoir and irrigation management are difficult under these extreme rainfall conditions.
<table>
<thead>
<tr>
<th>Year</th>
<th>Rainfall for period (mm)</th>
<th>Reservoir water level</th>
<th>Storage at the beginning of period</th>
<th>Evaporation (mm)</th>
<th>Intake discharge (outflow)</th>
<th>Spillout flow</th>
<th>Storage at the end of period</th>
<th>Inflow</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981</td>
<td>54.0 66.0 46.1 134.7 85.0 268.7 98.7 45.0 0 0 0 0</td>
<td>145.22 175.02 146.45 176.24 173.79 173.32 143.07 172.88 142.47 172.62 142.21 142.21</td>
<td>17.100 15.565 14.405 13.000 10.280 6.440 5.580 4.910 4.610 4.220 3.240</td>
<td>144.13 159.99 154.00 165.10 138.88 141.33 140.80 156.56 153.43 160.50 124.44 151.48</td>
<td>- - - - - - - - - - - -</td>
<td>15.630 16.460 13.050 10.446 6.360 6.680 5.610 9.940 6.610 4.200 3.240 3.240</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1982</td>
<td>135.8 59.7 91.0 155.5 195.6 513.3 35.3 0 0 0 0</td>
<td>141.82 171.77 177.47 171.60 171.88 176.36 176.07 175.80 175.61 175.42 175.22 175.08</td>
<td>2.450 7.480 2.390 2.405 2.110 2.550 24.000 21.586 19.330 18.000 16.850 15.690</td>
<td>159.00 160.30 121.52 151.02 142.68 129.66 156.36 151.40 147.76 145.56 137.18 159.92</td>
<td>- - - - - - - - - - - -</td>
<td>15.630 16.460 13.050 10.446 6.360 6.680 5.610 9.940 6.610 4.200 3.240 3.240</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Remark: * Million cubic meters
* Estimate inflow calculated from daily report
Figure 1. Monthly Lam Chamuak Reservoir Water Level for 1981-1985
Figure 2. Annual Lam Chamuak Rainfall Accumulations for 1975 to 1985
III. STRENGTHS AND WEAKNESSES OF THE LAM CHAMUAK TANK IRRIGATION SYSTEM (LCTIS)

A. THE RAPID APPRAISAL CONCEPT

In the past 5 to 10 years, there has been a growing gap between academic researchers who wish to study irrigation systems over a period of years, and development policy and decisionmakers, who need quick information to solve problems at hand. Rapid appraisal (RA) was designed in an attempt to bridge the gap between expensive, time-consuming, long-term studies, and less accurate, extremely short-term "windshield surveys."

Rapid appraisal is a method of systematically scanning an irrigation system to better understand its operation, weaknesses, strengths, and resources. It explicitly requires interdisciplinary teams and active farmer involvement during the study. Depending on the size and complexity of the irrigation system, a rapid appraisal could take from two days to two weeks to complete (Appendix D).

Rapid appraisal of irrigation systems is not an end in itself. Rather, it is a part of a larger process, which might include later long-term studies. A RA is simply used to gain an initial, relatively superficial overview of the system. This information then can be used to develop programs which examine and attack specific problems.

B. RAPID APPRAISAL PROCEDURES

Rapid appraisal procedures to study irrigation systems have sometimes been described as "quick and clean" methods of analysis to replace "long and dirty" methods used in the past. The procedures are primarily qualitative in nature, and at least initially involve examining system documents, including research reports, evaluation studies, or progress reports.

Social scientists on a RA team do not use a detailed questionnaire, but rather develop a short checklist of key issues to address. The social scientist particularly emphasizes purposive sampling procedures to interview farmers from a number of different social strata: head and tail farmers, rich and poor, landlord and tenant, young and old, male and female. Engineers on a RA team make simple measurements of the water input to the system, as well as simple observations of crops, condition, land use, and soil quality. All of the RA procedures for an irrigation system avoid the biases of "development tourism"; i.e., interviews and measurements at sites close to towns, roads, and population centers. By carefully planning what
measurements are needed in advance, and having flexibility to add or delete measures as the circumstances dictate, RA procedures can be an effective tool for describing irrigation systems.

C. SOCIAL-ORGANIZATIONAL STRENGTHS AND WEAKNESSES

There are two major social-organizational strengths at Lam Chamuak Irrigation Project, as well as two major weaknesses. The strengths include the presence of irrigation organizations, which could be improved and built upon and the expressed willingness of the Lam Chamuak farmers to participate in system improvement activities. The major weaknesses include an organizational breakdown of present irrigation associations and the resulting inequitable distribution of water.

1. Strengths

a. Presence of Existing Irrigation Organizations

* The present water users association and, in particular, the turnout groups could be built upon and used to make these organizations truly farmer organizations, instead of RID organizations.

* The existing WUA and turnout groups do have some structure and do perform some functions; i.e., conduct meetings, collect money for travel expenses. The form and function, however, need strengthening.

* Farmers appear to want organizational improvement in the WUA and turnout groups. They want some widely accepted rules to be established and would like to see these organizations enjoy success.

b. Farmers Willingness to Participate in System Improvement

* The social structure of Lam Chamuak, including population characteristics and landholding patterns, should not hinder improved organizational activities.

* Farmers' attitudes appear to be very conducive to effective participation. During the RA, farmers continually made statements concerning their willingness to become involved in an organized fashion, and they often specifically stated that farmers could and should work together for system improvement.

* More importantly, farmers' behavior indicates that effective participation already exists at Lam Chamuak. In the local communities, farmers already work together to construct temples, roads, bridges,
and roadside rest areas. This work is often supervised by monks, who sometimes have taken a lead in development activities. Along some turnouts, farmers have worked together for system maintenance, cleaning not only the ditches, but the main canal as well. Some turnout group leaders also stated that farmers will also cooperate in water distribution.

* During the RA, the chairman of the WUA was available as a key informant. One morning he called a very early WUA committee meeting (about 7:00 AM) with the secretary and cashier of the WUA. They composed a statement covering three main areas: 1) problems of the WUA, 2) proposed guidelines for implementation after the system is rehabilitated, and 3) potential benefits from the rehabilitation of the Lam Chamuak project (see below at end of section for the complete statement). This signed statement was then presented to the RA team and has been translated in Appendix E.

The Parsons-Team Consultant Task Force (1985) concluded that Lam Chamuak farmer institutions were stronger than in other NESSI sites and there was a high rate of farmer participation. The task force stated that farmers had a positive attitude towards participation and "...it should not be difficult to induce them to participate more in irrigation" (LC-32). Abeyrama and Weber (Division of Human Settlements, 1983) from AIT researched the Lam Chamuak area and concluded that "The emerging underlying pattern...is active participation...[The] population in the area of Lam Chamuak...had the kind of potential that planners, as well as project managers, would usually look for..." (1975-76).

2. Weaknesses

a. Organizational Breakdown

* The RA team could find no widely accepted, well-known rules or regulations for system operation and maintenance at Lam Chamuak. Most irrigation activities were performed ad hoc, and even though sometimes effective, were not coordinated with other irrigation activities.

* There is a lack of communication and knowledge within the farmers' association and between the associations and irrigation authorities. Most farmers contacted did not know who the WUA officers were, and the officers did not
know the farmers. Irrigation officials also had a lack of knowledge of farmers and farmers' groups.

* Fishing and cattle bathing in the canals contributed to the poor condition of some of the canals, and to maldistribution of water.

* The election of WUA officials involved only one or two villages.

3. **Inequitable Distribution of Water**

* Our observations and farmer reports indicated that the tail end of the Lam Chamuak system suffers greatly from lack of water.

* Farmers also reported that those people owning land close to the canals would often not allow water to pass through their fields to other fields lower in the system. Field-to-field irrigation appeared to contribute to this inequitable water distribution.

* There is considerable water theft throughout the system as farmers struggle to receive water in their fields. A number of short-term conflicts result, and farmers must guard their water at night, particularly during times of water scarcity.

D. **AGRO-PRODUCTION STRENGTHS AND WEAKNESSES**

A brief interview of farmers at the head, middle and tail of right main canal and left main canal identified several major strengths and weaknesses of the agro-production component of the Lam Chamuak System.

1. **Strengths**

The farmers have a clear perception of the distinct roles and responsibilities of the RID zoneman, head of ditch, and farmers in the water distribution activity. The RID supplies water throughout the main canal, the head of the ditch is to divide and distribute the water equitably, and the farmers are to irrigate their fields and operate their own ditches. All three are dependent on practicing good communications. The few farmers who irrigate in the dry season report ability to do so on a demand system of water appropriation for their crops. Farmers report some conflicts but are able to settle these problems by compromising among themselves.

Farmers report being able to achieve rice yields of 3.5 t/ha in the Lam Chamuak Tank Irrigation System. The average yield is 2.3 t/ha, well above the national average yield. Sesame was the most important dry season crop, with average yields of only 300 kg/ha. Maximum yields were 625 kg/ha. Technical advice on crop production and institutional
credit was reportedly used by some farmers. Half of the farmers reported using some fertilizer and pesticides, but for rice production only.

Farmers are well aware of their responsibility in farm ditch maintenance and repair, and are active in participation in these activities. Members who share a given ditch report collectively spending 9 to 27 days per year cleaning silt, cutting vegetation, and improving dikes, depending on the number of members and the size of the ditch. In some problem areas, the farmers even have a history of helping the RID clean the main canal.

Farmers had the attitude that the LCTIS provided fair to good services and the performance of the WUA was fair to good. The farmers expressed areas of hope in which the system could be improved and the functions of the WUA could be strengthened.

2. Weaknesses

Farmers reported that they did not always receive all the water that they needed or at the right time. Some received water continuously, others only intermittently. Some farmers expressed dissatisfaction with the inability of the system to deliver water in the dry season. Conflict on water distribution related to the sequence of irrigation and water blockage in the main canal. Water supply to the tail reach was said to be difficult because of non-concrete (earthen) lining, destruction of the canal cross-section resulting in leakage, and upstream checking by other farmers.

Production of crops was generally below practical potential yields. Cropping intensity was only about 117%, whereas 140% should be possible under the LCTIS circumstances. Actual cropped area was 960 ha compared to the nominal area of 1500 ha in RID records. Use of fertilizer inputs and insecticides was very low, perhaps corresponding to the reliability of water use.

The maintenance of farm facilities was not exceptional. The channels were viewed as functional but not beautiful. Lack of effective communication by the WUA officers was seen as a weak aspect of the WUA. The WLIA was viewed as weak participant or non-participant in irrigation management.

E. STRENGTHS AND WEAKNESSES OF THE FARM LEVEL IRRIGATION INFRASTRUCTURE

The farm level irrigation infrastructure has the following strengths and weaknesses.
1. **Strengths**

* Farmers constructed their farm ditches (jointly) and field ditches (individually) at their own initiative.

* The intensity of farm ditches is approximately 23 m/ha (RMC) to 26 m/ha (LMC), an adequate density. With the main canal added, but without the field ditches, this quotient reaches 44 m/ha and 46 m/ha for LMC and RMC, respectively. The threshold of 50 m/ha is considered adequate but includes the within farm field ditches, which were not estimated in the rapid appraisal.

* Farmers have a tradition of collective maintenance once per year on the farm ditch which serves their area.

* Sixty percent (LMC) and eighty percent (RMC) of ditches were estimated in good condition by visual inspection.

2. **Weaknesses**

* The Lam Chamuak service area lacks drainage channels to the Lam Chamuak stream (natural main drain).

* Much of irrigation distribution is practiced by paddy-to-paddy flow which lacks a systematic application and a potential for conflict over water when farmers in the gravity flow sequence have differing cropping calendars.

* Two of 51 turnout structures are non-functional and all lack permanent gates for water control. None of the turnouts have measuring structures.

F. **STRENGTHS AND WEAKNESSES OF THE MAIN SYSTEM IRRIGATION INFRASTRUCTURE**

The main irrigation system infrastructure has the following strengths and weaknesses.

1. **Strengths**

   * The width of main canal embankments is sufficient.

   * The freeboard appears to be sufficient.

   * The concrete channel construction appears to have been good.
2. **Weaknesses**

* The lining of the LMC has many broken sections. The RMC is in better condition, but the earthen section disappears after less than 1 km.

* Some of berm length is covered with trees and weeds retarding flow.

* Part of the LMC and RMC lack a farm road for access to the canal.

* The LMC and RMC lack cross drainage and/or water capture structures for the runoff from areas outside the main canal.

3. **OPPORTUNITIES FOR IMPROVEMENT IN THE LAM CHAMUAK TANK IRRIGATION SYSTEM**

The opportunities for improvement of the Lam Chamuak Tank Irrigation System are presented in Table 4. There are three categories of such opportunities: RID/NESSI responsibility; farmer, turnout groups, or water user association responsibility; and joint responsibility of RID/NESSI and farmer, turnout groups, or water user associations.

RID/NESSI will be responsible for construction, rehabilitation, operation, and maintenance of the main canals and main ditches, as well as the farm turnout structures. These infrastructures are defined as the main system. In addition, the NESSI will be in charge of institutional supporting activities; that is, agricultural extension services, land conservation and development, credit and marketing, farmer leader training and technical support. These institutional supporting activities will be collaborated with other line agencies: the Department of Agricultural Extension, the Department of Land Development, the Bank for Agriculture and Agricultural Cooperatives, and the Department of Cooperative Promotion.

The individual farmer in the project area will be responsible for the farm layout and improvement, the observation and communication of problems to the RID personnel, and, in particular, for improvement of the operation and maintenance system. The farmer leaders who have undergone the NESSI training program are supposed to transfer information and technology to the other farmers. The turnout groups or the water user association, on the other hand, will be responsible for operation and maintenance at the farm level, which is defined as infrastructures beyond the turnout from the main canal or the main ditch. Moreover, the turnout group or the water user association is expected to establish rules and regulations on water use, as well as to enforce these rules and regulations.
However, there are some other activities that will be the joint responsibility of the RID/NESSI and the farmer, the turnout groups, or the water user association. These activities include: the ditch rehabilitation, the decision-making in the turnout location and the ditch layout, the main system maintenance, and the NESSI institutional supporting activities, as already mentioned. The water users are expected to participate in all these activities to meet the objectives of rehabilitation of the Lam Chamuak Tank Irrigation System.

Table 4. Opportunities for Improvement in the Lam Chamuak Tank Irrigation System*

<table>
<thead>
<tr>
<th>RID/NESSI Responsibility</th>
<th>Joint Responsibility</th>
<th>Farmer, TOG &amp; Association Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction, rehabilitation and maintenance of main system</td>
<td>Participation in ditch rehabilitation</td>
<td>Farm layout and improvement</td>
</tr>
<tr>
<td>Agricultural extension services</td>
<td>Joint decision-making in turnout location and ditch layout</td>
<td>O&amp;M layout and improvement</td>
</tr>
<tr>
<td>Land development activities</td>
<td>Participation in main system maintenance</td>
<td>WUA rules and regulations</td>
</tr>
<tr>
<td>Credit and marketing</td>
<td>Participation in AES, LDA and C&amp;M</td>
<td>Observing and communicating system problems to the RID personnel</td>
</tr>
<tr>
<td>Farmer leader training and technical support</td>
<td></td>
<td>Farmer leaders transferring technology to other farmers</td>
</tr>
</tbody>
</table>

* See Appendix F for further details on group responsibilities.
IV. DESIGN AND PLANNING OF TENTATIVE SOLUTIONS FOR IMPLEMENTATION

A. THE SEARCH FOR SOLUTIONS PROCESS

Rapid appraisal is not an end in itself. Rapid appraisal can generate some understanding of the irrigation system and can also suggest some hypotheses to test. Based on rapid appraisal studies and long-term studies designed to diagnose more fully the constraints and strengths of a system, a search for solutions process can be started (Appendix G).

The search for solutions process builds upon the knowledge gained from rapid appraisals and diagnostic analysis. Based on the new knowledge, what solutions would be most appropriate? The development of the solutions uses the two essential elements employed by rapid appraisals and diagnostic analysis — interdisciplinary teamwork and farmer involvement. Working together on common problems, professionals from a variety of disciplines work with concerned farmers to develop the most appropriate solutions. See Table 5 or the framework of an alternative organizational process.

Table 5. Framework of an Alternative Organizational Process

<table>
<thead>
<tr>
<th>Stage</th>
<th>ICO Activity</th>
<th>Leader/Farmer Activity</th>
<th>TOG Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Integration</td>
<td>Move into village &amp; become a part of the community.</td>
<td>Host ICO as a paying guest in home of farmer.</td>
<td></td>
</tr>
<tr>
<td>2. General discussion</td>
<td>Ask questions about agriculture and irrigation in system.</td>
<td>Participate in discussion.</td>
<td></td>
</tr>
<tr>
<td>3. Special discussion</td>
<td>Ask questions specifically about irrigation problems.</td>
<td>Participate in discussion.</td>
<td></td>
</tr>
<tr>
<td>4. Decision to hold meeting of TOG</td>
<td>Ask questions toward consensus of TOG leaders and members to meet on irrigation issues.</td>
<td>Leader calls meeting with consensus of TOG farmer members.</td>
<td></td>
</tr>
</tbody>
</table>
Table 5. (continued)

<table>
<thead>
<tr>
<th>Stage</th>
<th>ICO Activity</th>
<th>Leader/Farmer Activity</th>
<th>TOG Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Prepare for meeting</td>
<td>Ask questions to promote consensus of TOG membership on meeting agenda.</td>
<td>Leader gets a consensus on agenda with TOG members thru informal discussion.</td>
<td></td>
</tr>
<tr>
<td>6. Groundworking key farmers</td>
<td>Ask questions &amp; talk individually with key members to solidify support for meeting goals.</td>
<td>Leader gets concerns from TOG members &amp; gets consensus on the goals for the meeting.</td>
<td></td>
</tr>
<tr>
<td>7. Structured meeting</td>
<td>Attend meeting as observer and as expert on organizational matters for TOG.</td>
<td>Leader (head of ditch) conducts meetings with fixed agenda and specific goals.</td>
<td>TOG holds meeting or a series of meetings to get decisions.</td>
</tr>
<tr>
<td>8. Plan work of TOG</td>
<td>Ask questions on how TOG can organize, set goals, &amp; assign responsibilities.</td>
<td>Leader gets consensus on leaders' duties, goals of TOG and assigns responsibilities.</td>
<td>TOG plans for the rehabilitation program of the chak.</td>
</tr>
<tr>
<td>9. Mobilize resources</td>
<td>Ask questions about skills available, money and materials available and help to arrange technical assistance and outside skills from nearby villages.</td>
<td>Leader gets consensus on resource mobilization, arranges technical assistance from RID/NESSI and special carpentry/masonry skills and outside skills.</td>
<td>TOG mobilizes resources within membership, technical assistance, and outside skills.</td>
</tr>
<tr>
<td>10. Rehabilitation implementation -survey -design -scheduling -supervision</td>
<td>Asks questions about technical assistance, helps arrange interactive survey and interactive design.</td>
<td>Leader arranges interactive surveying, interactive design, and gets construction schedule by TOG leadership.</td>
<td>TOG completes pre-construction phase prior to rehabilitation of farm-level facilities.</td>
</tr>
</tbody>
</table>
B. PREREQUISITES FOR AN EFFECTIVE TEST OF THE ALTERNATIVE ORGANIZATIONAL STRATEGY

1. Management of the Organizational Process

The management of the organizational process is important to the success of the test of the process. This includes the recruiting of ICO's with appropriate background and training on the process and procedures of organization of farmers, and assignment and direction of ICO's focused on the enhancement of farmer participation in irrigation system rehabilitation in preparation of system management in the future.

2. Adequate Lead Time

The test of the organizational strategy requires adequate lead time before the beginning of construction. The enhancement of farmer organizations requires nine months to a year before construction begins.

3. Responsiveness and Support of the Technical Staff

The organization process testing requires great flexibility on the part of the rehabilitation managers. The process, since it is a learning process, is filled with many unknowns. The technical staff must be expected to communicate frequently with the farmer leaders, negotiate over the location of right-of-ways of the main ditches and farm ditches, and compromise frequently with farmers on the location of turnouts. The processes of communication, negotiation, and reaching agreements are tedious and time consuming and will require extra patience from the technical staff. If the farmers' organization is to be effective in the operations and maintenance stage later, these small decisions must be made by farmers. The management effectiveness of the group must be built strong at these early preconstruction and rehabilitation stages.

C. GOALS FOR IMPLEMENTATION OF ORGANIZATIONAL STRATEGY

The goals for the organizational component are closely related to the overall project goals. The project itself is to introduce effective farmer organizations into one RID site in northeastern Thailand.

1. Organizational Goals

   a. The project is to introduce a participatory organizational approach to the Lam Chamuak Irrigation Project by using ICOs as catalyst agents.
b. The project is also to establish effective participatory turnout groups and water users associations at Lam Chamuak Irrigation Project. These turnout groups and water users associations could be based on the already existing groups in the area or they might be entirely new organizations established by the farmers.

D. DEVELOPMENT OF THE ORGANIZATIONAL STRATEGY AND PLAN OF ACTION

1. What is the focus of organizing?

* To jointly participate in decision-making of the ditch layout and location of the turnouts.

* To participate in construction of the ditches.

* To establish rules and regulations of water use and to enforce those rules and regulations.

* To observe and to communicate positive feedback report essential for the RID O&M.

* To participate in O&M at the main ditches and the main canals.

* To operate and maintain the on-farm system.

* To participate in allocation of water when scarcity occurs; particularly in agricultural extension, land conservation, and development credit and marketing.

2. Who are the organization clients?

The target population will be all farmers in the command area.

3. What approach should be used?

The ICO approach (Appendix H) will be tested in the project area. Eight ICOs will be trained before action - 3 RID zonemen, 1 RID agricultural extension agent, and 4 newly recruited employees. These ICOs will work in pairs -- RID personnel and newly recruited employees.

4. What resources are required?

* To inform local government officials about the project and plan of work.
* Technical data:
   - map scaled at 1:4,000
   - census of water users by letter of registration
   - census of water users by farmland code
   - census of water users by turnout group

* Survey of literature review of what other government agencies have been doing.

* Asking for cooperation and coordination with other government agencies.

5. How are ICOs to be trained?

ICO training courses will be developed during November 11-23, 1985.

6. How will ICOs be fielded?

ICOs will move into the villages to be part of the communities.

7. What are the activities of ICOs?

The activities of ICOs during the preconstruction period are as follows:

- Move into the villages to be part of the communities.
- Search for data and problems.
- Stimulate the organization of water users.
- Help prepare the meeting.
- Help structure the meeting.
- Give suggestions on turnout groups and water users responsibility.
- Mobilize local resources; e.g., labor, skill, tools.
- Stimulate group action to meet the objectives of organizing water users items 1-4 (see 1).

E. GOALS FOR SOCIAL AND TECHNICAL DOCUMENTATION OF LCMTIS

The research component of the Farmer Irrigation Participation Project should contribute to the overall project goals. The research, then, will not be purely academic or theoretical, though the research should be of quality that academicians could use. Rather, the research component will generate valuable data that project personnel can use as part of the learning process. The learning process, in turn, will help to begin effective farmer participation at Lam Chamuak.
1. **Research Goals for FY86**

   a. Begin to understand the social structure of the Lam Chamuak area including migration patterns, occupational behavior, and intermarriage between ethnic groups.

   b. Begin to understand farmer and ICO organizational behavior; i.e., process documentation (Appendix I).

      * **Participation** in irrigation organizational activities. The research will document how the participation process is progressing. It will concentrate on collective, rather than individual, behavior.

      * **ICO** interaction with farmers. This part of organizational behavior will document the ICOs' integration into the community and the beginning of group action.

      * **Organizational** behavior of the turnout groups. As the ICOs will initially direct their attention to the turnout groups, this research will examine how the turnout groups are behaving and performing.

   c. Begin to understand farmer and RID irrigation behavior.

      * **Different tasks.** The research will focus on three tasks which must be performed in any irrigation system: water allocation/distribution, system maintenance, and conflict management.

      * **Different levels.** These three tasks will be examined at three different organizational levels: main system, local command area, and farm level. In essence, a 9-cell research table will be constructed.

   d. Begin to understand irrigation and agricultural performance throughout the system.

      * **Equity.** The research will focus on whether or not water is distributed throughout the system and the relative equity of access.

      * **Uniformity.** Another research topic will examine whether or not water is distributed uniformly at selected locations in the system.

      * **Flexibility.** Do RID and farmer groups have the capacity to be flexible in allocating water throughout the system?
* **Efficiency.** Research will also examine water conveyance and application efficiencies including water losses.

* **Crop Yields.** Standard crop cutting methods will be used to determine the yields for both dry season and wet season crops using representative samples of 1 m² from a predetermined sample of farms in the system.

F. DEVELOPMENT OF RESEARCH STRATEGY AND PLAN OF ACTION

The research strategy and plan of action for the Farmer Irrigation Participation Project is based upon the different irrigation and agricultural activities that take place during the year. That is, the various research activities will correspond to the particular time of year; i.e. yield data will be collected during harvesting.

The general research plan of action for FY86 is presented below.

**November 1985** - During this first month of field activities, the social-organizational process documentor will settle in the local community and continue to refine the research design with the research sociologist posted in Bangkok. Two junior engineers will be posted at the project site, and they will begin to collect yield data from the 1985 paddy crop.

**December 1985** - As there will be no irrigation in December, the process documentor will begin studies of organizational behavior and agricultural practices at Lam Chamuak. He will also begin examining the social structure of the areas. The agro-technical team will continue their work with the yield data and plan their dry season irrigation study.

**February 1986** - As dry season irrigation will begin late in the month, the process documentor will continue the organizational study and begin the irrigation behavior study. The agro-technical team will begin their in-depth studies of water equity, uniformity, flexibility, and efficiency for dry season irrigation. These studies will continue through February, March, and April 1986.

**January 1986** - As dry season irrigation will begin late in the month, the process documentor will continue the organizational study and begin the irrigation behavior study. The agro-technical team will begin their in-depth studies of water equity, uniformity, flexibility, and efficiency for dry season irrigation. These studies will continue through February, March, and April 1986.

**May 1986** - The social-organizational and agro-technical team will write a dry season report detailing their findings from the dry season. As system maintenance activities will be particularly important at this time, the process documentor will emphasize maintenance studies. The junior engineers will plan their wet season irrigation study and collect crop yield data from the dry season.
June 1986 - This month will begin a very important part of the research strategy as the wet season irrigation study begins. The process documentor will begin his irrigation and organizational behavior studies, while the agro-technical team will conduct wet season studies of water equity, uniformity, flexibility, and efficiency. These studies will continue throughout July, August and September.

September 1986 - This final month of FY86 will include an end-of-the-year workshop for project personnel, which will review the progress of the project and plan for FY87.

1. Personnel

There will be five people involved in the research component of the Farmer Irrigation Participation Project (Appendix J). Two junior engineers will devote 100 percent of their time to the project, supervised by a field research engineer (Khun Kittichai), who will devote 50 percent of his time to the project. A social science process documentor (Khun Petch) will be at the site 100 percent of his time, supervised by a research social scientist (Dr. Kanda) devoting 50 percent of her time to the project.

G. INSTITUTIONAL COMMITMENTS TO THE FARMER IRRIGATION PARTICIPATION PROJECT

Institutional commitments to this project will be by two major organizations: RID/NESSI and WMSII/CSU.

1. RID/NESSI

RID/NESSI, in collaboration with WMSII/CSU, has already chosen the site for building farmers' organizations and conducting research -- Lam Chamuak Irrigation Project in northeastern Thailand.

RID/NESSI will also provide research personnel: one RID coordinator part-time, one research engineer supervisor half-time, and two junior field engineers at the site full-time.

RID/NESSI will also provide organizational personnel. This will include an organization coordinator part-time, an ICO supervisor at the site full-time, and eight ICOs at the site full-time.

RID/NESSI will provide transportation in the form of a four-wheel-drive vehicle and motorcycles.

RID/NESSI will provide equipment. This will include current meters, staff gauges, cutthroat flumes, a rain gauge, and an evaporation pan.

RID/NESSI will also provide local travel and per diem, as well as supplies and expendables.
2. WMSII/CSU

WMSII/CSU will provide a social science researcher from Kasetsart University half-time and an institutional process documentor at the site full-time.

WMSII/CSU will also provide a microcomputer with word processor, communications package, and Lotus 1-2-3 at the site.

WMSII/CSU will also be responsible for international travel and per diem, local travel and per diem, supplies and expendable equipment, and WMSII/CSU personnel for 4 weeks per year.
V. REFERENCES


VI. APPENDICES
APPENDIX A: SOURCES OF INFORMATION

1. RID key informants
   - RID Director of O&M
   - Provincial irrigation officer
   - Water master of Lam Chamuak Tank Irrigation Project
   - Tank caretaker

2. NESSI key informants
   - NESSI field manager
   - NESSI engineer

3. WUA key informants
   - Chairman
   - Heads of turnout groups

4. Local organizational informants
   - Head of the village
   - Head of the tambon

5. Water users

6. Former RID tank caretaker
APPENDIX B: THE ALTERNATIVE AND TRADITIONAL ORGANIZATIONAL STRATEGIES ILLUSTRATED

Alternative Organizational Strategy

Traditional Organizational Strategy
APPENDIX C:

FARMER IRRIGATION PARTICIPATION PROJECT, INITIATION WORKSHOP
OCTOBER 23, 1985 - LAM CHAMUAK TANK SITE

Background on FIPP - Mr. Nukool Thongthawee

The research and development process - Dr. Alan Early

Strength and weakness identification (opportunities)
Search for and testing of solutions
Implementation of feasible solutions

The context of rapid appraisal in the R&D process - Dr. Alan Early

Reconnaissance (walk-through) of the Lam Chamuak System - Group

LUNCH BREAK

Objectives of the Farmer Irrigation Participation Project -
Dr. Alan Early & Group

General discussion of project timetable - Group

Planning of the rapid appraisal - Group

Assignment of responsibilities - Mr. Nukool Thongtawee

Discussion by groups of responsibilities:
- Social-institutional team
- Agro-production team
- Farm level facilities appraisal team
- Main system facilities appraisal team

Discussion by groups of the assignment and use of available resources

Closure

Attendees:

Mr. Nukool Thongtawee
Dr. Alan Early
Dr. Robby Laitos
Mr. Mongkol Kalaynruan
Mr. Prasert Kanoksing
Dr. Kanda Paranakian
Mr. Prasert Singnol
Mr. Arun Poonpat
Mr. Wararat Prawal Patsmakul

Mr. Kittichai Kratithong
Mr. Banchong Sanpinit
Mr. Petch Ansaart
Mr. Kamol
Mr. Somsak (I)
Mr. Somsak (II)
Mr. Satitpong
Mr. Yongyut
Mr. Chatchavan
APPENDIX D:

THE RAPID APPRAISAL SCHEDULE AND TEAM

October 23 - Begin general "Reconnaissance of Lam Chamuak Irrigation System. Walk the left main canal.

October 24 - Four RA teams (see below for list of teams) begin work. Entire day spent in field taking measurements and interviewing farmers.

October 25 - Continuation of field activities by the 4 teams. Teams meet informally to exchange data.

October 27 - Continuation of field activities by the 4 teams. Teams meet informally to exchange data.

Agro-Technical Team

Mr. Kittichai
Mr. Supan
Mr. Rangsun

Farm-Engineering Team

Mr. Worarat
Mr. Banchong
Mr. Satispong
(5 local employees of RID)

Social-Organizational Team

Dr. Robby Laitos
Dr. Kanda
Mr. Petch
Mr. Somsak
Mr. Arun
Mr. Sao
Mr. Yougyut
Mr. Prakong

Main System Engineering Team

Mr. Sontaya
Dr. Alan Early
APPENDIX E: PROBLEMS OF THE WUA, PROPOSED GUIDELINES FOR IMPLEMENTATION, AND POTENTIAL BENEFITS OF REHABILITATION

The following is the statement prepared by some officers of the Lam Chamuak WUA and presented to the rapid appraisal team.

1. Problems and obstacles of WUA:
   * Regular droughts
   * Low yields
   * Inefficient water delivery system (inadequate and unreliable)

2. Proposed guidelines for implementation after the system is rehabilitated:
   * Maintenance of both the main and farm system
     - to cooperate with one another so that the systems are in good condition
     - to establish rules and regulations for maintaining the irrigation infrastructure
   * Management of the water so that the users obtain equitable and reliable water
   * Planning multiple cropping systems and labor use for both the wet and dry seasons
   * Increase agricultural production

3. Potential benefits from rehabilitation of the project:
   * Farmers are aware of methods of efficient use of water and maintenance of the main and farm systems
   * Equitable, t'imey, and regular distribution of water
   * Increased yield per rai and intensive use of farm-land (at least twice a year)
   * Intensive use of labor
   * Rate of payment of water fee is higher

Signature __________________________
(Mr. Supan Chompolsa/Secretary)

Signature __________________________
(Mr. Sao Sungkamanee/Chairman)
APPENDIX F:

RESPONSIBILITIES OF RID/NESSI, FARMERS, TOGs, AND ASSOCIATIONS

RID/NESSI RESPONSIBILITIES

1. Construction, rehabilitation maintenance, operation of main system
2. Agricultural extension services
3. Land development activities
4. Credit and marketing
5. Farmer training and technical support

The workshop has decided that the following topics are to be under the responsibility of RID and NESSI.

1. The implementation of construction, rehabilitation, and the operation and maintenance of the main system as well as those of main ditches (including the farm turnout structures).

   The main system is defined as all the infrastructure including the farm turnout structures. The parts beyond the turnout are defined as farm level.

2. All activities concern with agricultural extension services carried on by the Department of Agricultural Extension (DOAE).

3. Land development activities under the role of Department of Land Development (DLD).

4. Credit and marketing which are supported by Bangkok for Agricultural and Agricultural Cooperatives (BAAC) and the Department of Cooperative Promotion (DCP).

5. Farmer training and technical support under the responsibility of every related agency.
JOINT RESPONSIBILITIES

1. Participation in ditch rehabilitation.
2. Joint design-making on ditch layout and turnout location.
3. Participation in main system maintenance.
4. Participation in AES, LDA, and C&M.

The following topics are decided by the workshop to be implemented jointly by both components.

1. Participation in ditch rehabilitation. Detailed descriptions would be discussed after more information has been learned.

2. Decision-making on ditch layout and turnout location. This is to combine the technical know-how and the local experience to result in a better outcome.

3. Participation in main system maintenance. The farmers may contribute labor to some sort of job that may occur occasionally.

4. Participation in agricultural extension services, land development activities, credit, and marketing. Specific farmers are supposed to handle certain responsibilities assigned occasionally.
FARMERS/TOG/IWUA RESPONSIBILITIES

1. Farm layout improvement.

2. O&M at farm level (beyond the turnout from the main ditch or main canal).

3. WUA rules and regulations.

4. Observing and communicating problems to RID.

5. Farmer leaders "training" farmers.

The farmers are, according to the decision of the workshop, supposed to pay responsibilities to:

1. Farm layout improvement. Each individual farmer should carry out improvements recommended by responsible agencies on their own farm.

2. O&M at the farm level (beyond the turnout from the main system or main ditch). Responsible tasks would be indicated more specifically after some more necessary information are learned.

3. Water user association (WUA) rules and regulations. Rules and regulations for each WUA are supposed to be issued and implemented by the members of that WUA themselves.

4. Observing and communicating problems to RID. The farmers may contribute information about problems and recommend solutions, as well as some emergency events, to responsible agencies.

5. Farmer leaders "training" farmers. Distribution of information and knowledge (provided by the responsible agencies) to farmers are to be handled by the farmer leaders.
APPENDIX G:
SEARCH FOR SOLUTIONS WORKSHOP AT LAM CHAMUAK
WEDNESDAY, OCTOBER 30, 1985

AGENDA/SCHEDULE

Morning Session - Moderator: Mr. Prasert Kanoksing

Opening Remarks: Mr. Nukool Thongthawee

The Rapid Appraisal Concept: Dr. Alan Early

The Rapid Appraisal Methodology: Dr. Alan Early

Report of the Rapid Appraisal Findings:
  Social Institutional Strengths and Weaknesses: Dr. Kanda Paranakain and Dr. Robby Laitos
  Agro-Production Strengths and Weaknesses: Mr. Worarat
  Main System Strengths and Weaknesses: Mr. Sontaya

COFFEE BREAK

Opportunities for Improvement in the Lam Chamuak System:
  Dr. Robby Laitos and Dr. Kanda Paranakian
  - Improvement that farmers, turnout groups and Irrigation Association can make
  - Improvements that the Royal Irrigation Department and NESSI can make

Indicators of Informal Cooperation in the Lam Chamuak Irrigation Services Communities: Prerequisites for an Effective Implementation of the Organization Strategy: Dr. Alan Early

Afternoon Session - Moderator: Dr. Robby Laitos

The Components of a Research Plan of Action: Mr. Prasert Kanoksing

The Components of an Organizing Plan of Action: Dr. Alan Early

Setting of Goals for the Research Group in Small Meeting: Group

Setting of Goals for the Organizational Group in Small Meeting: Group
Workshop of Small Groups in Separate Meetings: Groups A and B
(see lists below)

Report of Small Groups to the Assembly:

- The Research Plan of Action for FY86: Spokesperson for Group A
- The Organizational Plan of Action for FY86: Spokesperson for Group B

Institutional Commitments to FY86 Research Plan of Action:
Mr. Nukool Thongthawee
Dr. Alan Early

Institutional Commitments of FY86 Organizational Plan of Action:
Mr. Nukool Thongthawee
Dr. Alan Early

Thursday, October 31

AM Report Writing:

Topics in the Search for Solutions Workshop
The Research Plan of Action
The Organizational Plan of Action
Institutional Commitments

Attendees:

<table>
<thead>
<tr>
<th>Group A - Organizational Focus</th>
<th>Group B - Research Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr. Nukool</td>
<td>Mr. Prasert K.</td>
</tr>
<tr>
<td>Dr. Kanda</td>
<td>Mr. Yongyut</td>
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<tr>
<td>Dr. Early</td>
<td>Dr. Laitos</td>
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<tr>
<td>Mr. Veera</td>
<td>Mr. Rungsun</td>
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<td>Mr. Worarat</td>
<td>Mr. Kittichai</td>
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<td>Mr. Pailin</td>
<td>Mr. Chatchavan</td>
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<td>Mr. Banchong</td>
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<td>Mr. Satitpong</td>
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<td>Mr. Pairoj</td>
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APPENDIX II

TENTATIVE CURRICULUM FOR ICO TRAINING

Objectives:

1. To provide ICOs understanding of the nature and problems of irrigation water management in Thailand.

2. To provide ICOs skill in interacting with water users and stimulating water user groups for rehabilitation of the Lam Chamuak Tank Irrigation System.

November 18-22 - Orientation

November 25

8:30 - 9:45 Opening remarks

Coffee Break

10:00 - 12:00 Irrigation Development in Thailand

Lunch Break

13:00 - 16:30 Nature of Irrigation System and Water Management in Thailand (videotape will be borrowed from Kasetsart University - 20 minutes)

November 26

8:30 - 12:00 Irrigation Laws in Thailand

Lunch Break

13:30 - 16:30 Problems of Irrigation Management in Thailand

November 27

8:30 - 12:00 Local Government in Thailand

Lunch Break

13:30 - 16:30 Significance of Water User Participation in Irrigation System Rehabilitation and Management
November 28
8:30 - 12:00  Role and Responsibility of ICOs
Lunch Break
13:30 - 16:30  Psychology of Adult Learning

November 29
8:30 - 12:00  Techniques of Public Relations
Lunch Break
13:30 - 16:30  Techniques of Persuasion

December 2-6  Field Practices

December 6
15:00  Closing Remarks

Audio-visual aids:
1 - Overhead projector
2 - Slide projector
3 - Video
APPENDIX I:

PRACTICAL QUESTIONS FOR THE DEVELOPMENT OF PARTICIPATION POLICY BY RTG AGENCIES

What is the benefit of organizing farmers to take a greater role in the rehabilitation, operation and maintenance of irrigation systems? Does this improve system performance?

Does the transfer of responsibility and authority over water operations of small- and medium-scale irrigation systems or parts of medium-scale systems represent the transfer of responsibility from the government to the private sector? If this transfer really exists and is recognized as such, then we are assuming that the irrigation water users associations (IWUAs) are legally recognized entities and, hence, are a part of the private sector as they are in many other countries.

If the transfer of responsibility is considered appropriate and the IWUAs in control of their own systems or portion of systems can improve the performance of irrigation and make it more responsive to the needs of the farmers, what are the most appropriate ways within the Thai administrative framework and the Thai culture to achieve this transfer?

If the ICO catalytic agent approach is used to build up local organizations or IWUAs, what is the most appropriate and effective administrative approach for RID to implement this program?

- Using ICOs who are government employees; i.e., zonemen or junior engineers
- Using short-term contractual employees (ICOs on personal service contracts)
- Using an organizational contract between a private organization and RID
- Using an organizational contract between two government agencies

If the ICO catalytic agent approach is used to build local organizations (IWUAs), what is the most appropriate educational and experience background for the recruitment of ICO's?

- Technical school graduates
- Irrigation school graduates
- College graduates (social science, agricultural or technical background)
- High school graduates
- Male ICOs versus female ICOs
- Young persons versus older ICOs

If the approach when adapted to northeastern Thailand is found useful, what is the most appropriate method of organization?

- What is the required lead time before rehabilitation? O&M?
- What should be the focus of organization? I.e., what work activity?
- What should be the intensity of ICO assignment to achieve the building of effective organizations in the required lead time?
- What is the appropriate intensity versus duration relationship?
  - For the intensive preconstruction and construction phases?
  - For maintaining the organization?
  - For rehabilitation?
  - For operations and maintenance?
  - For other functions of the farmer organization?