Part 2: Model Area Development

CHAPTER 4 PROJECT FORMULATION

CHAPTER 4 Project Formulation

4.1 Development Directions

The basic concepts for agricultural development in the model areas are summarized as follows:

- The stabilization of the paddy production (to secure staple food).
- The introduction and promotion of the crop diversification and integrated farming.

  (The prevention of non-marketable surplus production due to monoculture of crops and risk management. To secure income and to improve the nutritional status. The practice of semi-intensive farming by producing and using home made fertilizer.)
- The promotion of household industries and the introduction of new crops.

  (Improvement of income and risk management.)

4.1.1 Basic approach in the formulation of agricultural development

(1) Land Use

The basic policies for the utilization of the existing paddy fields are summarized as follows:

- respect the present condition of the land utilization.
- realize a sustainable and stable agricultural production.
- paddy production through the maximum use of the limited water resources.

In accordance with these basic policies, typical cropping patterns are presented below. These are based on the assumption that even if the facilities to protect flooding will not be constructed the flooded areas can still be utilized by avoiding floods and through farming practices/measures.

Flood	Irrigation	Wet season	Dry season	F/S Areas
Affected	Available	Upland crop (unused)	Paddy	TN, V
Affected	A Available	Paddy (after flood)	Paddy	TN, V
Affected	No	Upland	-	TN, V
Non-affect.	Available	Paddy	Paddy	P
Non-affect.	No	Paddy	-	P

TN: Thongharb/Nakhua, V: Vangkhong, P: Phonthan

(2) Crop diversification and integrated farming (including small/cottage industries.)

The main theme of this component is sustainable farming, and, the improvement of the farmers' living

standard and the stabilization of the paddy production with provision for irrigation. At the same time, considering the specific resources and features of the areas, the introduction of crop diversification and the integrated farming will be promoted as much as possible. The idea is generally to improve the farmers' income and their nutritional status and also to disperse the risk. And when the above mentioned plans will be implemented, the following should be considered:

- Promotion of fishery culture by using the existing facilities including reservoirs and ponds.
- Promote feed crops production and small livestock raising (poultry and pig).
- Shifting of crop production from those with little or no potential for marketing to crops with high market potential and to add value to production by processing. (New potential crops will be also targeted.)

(3) Reflection on the farmers' intentions

As a basic policy in formulating the plan, the Study Team conducted several consultations to discuss and reappraise the contents of the project with the beneficiary group and project executors. In the formulation of the project, the conduct of PCM workshops and compilation of the results into PDM was adopted in order to understand the farmers' needs from their own perspective. When the PCM was implemented, the study team members participated but only as observers. They concentrated on understanding the requests and needs of the farmers without leading the farmers' opinions to a certain direction nor being bias about their opinions.

The Study Team recognized the value of the PDM made by the farmers and executors as it reflected the farmers' needs and intention. However the following points will also be given attention.

- The lack of sound technological ground.(The applied technology, the possible irrigated area, etc.)
- Inadequate examination of the necessary input requirements. (The feed production for the animal husbandry.)
- The lack of the information due to the narrowly-focused outlook. (New technology, new crops, etc.)

With PDM as one of the tools to understand the desires of the farmers (what they think they can do, what they want to do, etc.) as well as the Study Teams' observations reasonable plans including the alternative option will be elaborated. Other matters that will be considered are listed below.

- examination of the scale of development interventions
- natural and human resources.
- topographic feature, the soil, the water quality, and the climatic constraints.
- impact on the environment.

- financial capability and personnel complement of the executing agency.

The analysis of each PDM made by farmers in the Study area are presented below.:

(a) Thongharb/Nakhua

The farmers in the area hoped for the stabilization of production and the increase of their income through the introduction of a double cropping of paddy. The target yields for wet and dry seasons are 3.0 ton/ha and 4.5ton/ha, respectively. The target rate of fertilizer application is 250Kg/ha. and the use of certified seeds is planned. All of the above targets are attainable. However, for the cropping plans, some considerations on the examination of the difference between flooded areas and non- flooded areas will have to be made. Taking into consideration the marketing aspects in relation to diversification and combination of crops, the current farming system should be shifted to a more appropriate one. In addition, the areas are relatively near Vientiane and as such, other advantages of the area include its accessibility to existing training programs and to the suppliers of input, products and equipment should be given due consideration as well.

(b) Vangkhong

The farmers in the area have likewise hoped for the stabilization of the production and the increase of their income through the introduction of a double paddy cropping system. The target yields for wet and dry seasons are 2.0 ton/ha and 4.0 ton/ha, respectively. It can be observed that these targets are relatively low but at a reasonable level and that these targets are also feasible. However, in the establishment of cropping patterns, top priority should be placed on the achievement of self-sustenance through the realization of the sustainable paddy production especially in areas prone to flooding conditions. The immediate implementation of paddy production improvement plans such as double cropping will have to be avoided. The plan should also include the examination of difference between flooded areas and non-flooded areas and the shift of the crops through the introduction of feed crops.

The farmers' requests for integrated farming include the promotion of animal husbandry and fish culture. However, the nature of the requests cannot be understood well and are not clear. Moreover, the requests showed a lack of feasibility. In Vangkhong area, a fishpond is available but this facility has been left idle. Fish culture as one of the effective ways of utilizing this existing pond can be the short-term objective. The promotion of animal husbandry and poultry, which can easily achieve self-sustenance, can be the other primary short-term objective. For poultry feeding the semi-intensive farming method in which the poultry can be fed with home made feed will be introduced and implemented.

(c) Phonthan

The farmers in the area have also hoped for the stabilization of production and the increase of their income through the introduction of a double paddy cropping. The target yields for wet and dry seasons are 3.5 ton/ha and 5.0ton/ha, respectively. Judging from the current harvests, these figures are not too high. The amount of fertilizer application is 250kg/ha and the utilization of excellent seeds is reasonable.

The farmers have also planned to implement supplementary irrigation during the wet season. Therefore, it can be concluded that the level of farmers' knowledge about paddy production is quite high. The cropping plans have also included a shifting of crops.

For combined farming, the farmers strongly requested for the promotion of animal husbandry and fish farming. Compared to the other two areas, the farmers in this area maybe placed under the category of advanced farmers where earlier agriculture production measures have been adopted, hence, a more comprehensive agricultural promotion measures can be introduced.

4.1.2 Agricultural Improvement Plan

The characteristics of the approach to paddy production improvement plan for the short-term target are as follows:

(1) The key factors of the paddy production improvement plan

The main subject of the paddy production improvement plan is the stabilization of the paddy production through the introduction and improvement of the irrigation systems. The double cropping of paddy consists of ordinary double cropping in the non-flooded area and double paddy cropping after flood in the flooded area. In areas where double cropping after flood will be implemented, nursery beds outside the paddy fields will be introduced. The expected benefits with the introduction of this double cropping system are the improvement of work efficiency, the dispersion of the peak water and labor requirement and the avoidance of harvesting operation during the rainy season. Some important points of the hardware and software components from the view point of sustainable production are summarized according to:

- measures for the hardware
- improvement of the irrigation facilities.
- measures for the software

Input

- to supply certified seeds by developing seed producers among the farmers. (The formation of the APGs in which a contact farmer will become the core.)

- the improvement of fertilizer supply. (The improvement of fund distribution by APB and timely supply of the appropriate kind and amount of fertilizers.)

Management

- the practice of effective water management by the water management organization.

- the effective extension of appropriate technologies. (The utilization of TFT system and the training of farmers, the extension worker and TFT members.)

Output

- the improvement of the distribution and marketing of surplus rice. (The revitalization of FSC and the formation of selling groups.)

(2) Land use plan

The proposed land use in each area is prepared according to the basic concept wherein the non-irrigable flood affected areas are excluded from the paddy production improvement plan.

The present land use has been intensively reviewed, and then, the proposed land use under the conditions with irrigation development is prepared as follows:

Proposed Land Use Plan (Unit: ha)

Area	Without Project (Present)	With Project Proposed	Improvement
(1) Thongharb-Nakhua			
Irrigated Area	73	250.5	177.5
Rainfed Area (Improved) *1	233	233	-
(2) Vangkhong			
Irrigated Area*2	-	60	60
Rainfed Area (Improved) *1	10	10	-
(3) Phonthan			
Irrigated Area	55	90	35
Rainfed Area (Improved) *1	520	520	-

*1:non-flooded area

*2:maximum irrigable area

(3) Proposed Cropping Patterns

In Thongharb/Nakhua area, supplemental irrigation in the wet season will be ensured, while irrigation efficiency in the dry season will be improved. The double cropping of paddy after flood should be introduced in some flood affected area. The system will disperse the peak irrigation water requirement and the labor requirement and will expand the irrigable area. Sufficient irrigation water will be available during the dry season in Vangkhong, and thus farmers in this area will enjoy stable paddy cultivation in the dry season. In the future, the double cropping of paddy system after flood will be introduced in accordance with the improvement of the farmers' technology level. In Phonthan, supplemental irrigation in the wet season will be ensured, while sufficient irrigation water will be made available during the dry season.

(4) Proposed Farming Practices

The present farming practices carried out in the Study area is likely to be of extensive cultivation, due to non-application of fertilizer and agro-chemicals as well as the low input of labor force. Proper farming practices and IPM in irrigated agriculture will be adopt to promote increase of crop production The

proper application of farm inputs will likewise be encouraged. It is indispensable to apply certified seeds of high yielding varieties or improved varieties with proper dosage of fertilizer and agro-chemicals along with sufficient support services as extension, credit, research, etc., in order to create highly visible impacts from the Project. The proposed TFT system will play an important role in the effective extension delivery system.

It is not practical to recommend ideal farming practices which are entirely different from the current farming practices. Hence, each component of proposed farming practices should be formulated based on the present situation e.g. availability of machinery and animal power, labor requirement, etc., as provided in the guideline on farming practices which are proposed by the MOA, LAO IRRI NARC and recommended by PAFSO. Information dissemination on application of agro-chemicals to the farmers should be given careful attention. It is noted that farmers are aware of the effects of agro-chemicals, however most of them do not have sufficient knowledge on identification of pests and diseases as well as the proper kind and application dosage of agro-chemicals. As one of the effective extension tools, it is strongly recommended that campaigns through the puppet show team or other forms of entertainment be undertaken to effectively disseminate the proper farming practices to adults and children concerned.

The proposed farming practices of major crops is elaborated in the Master Plan and summarized as follows. The result of the labor balance analysis shows that enough labor is available under the with-project condition.

Summary of Proposed Farming Practices

	Dry season Paddy (Irrigated)	Wet season Paddy (Supplemental)	Wet season Paddy (Imp. Rainfed)
Seed amount	50 to 60 kg/ha	70 to 80 kg/ha	50 to 60 kg/ha
Fertilizer	(kg/ha)	(kg/ha)	(kg/ha)
N	90	90	60
P	30	30	30
K	20	20	20
Labor Requirement	99md	99md	90md
Others	Water Charge	Water Charge	
Plant Density	20 cm x 20 cm ~ 20 cm x 25 cm	15 cm x 15 cm	20 cm x 20 cm ~ 20 cm x 25 cm

The recommended HYV
the wet season: RD-6, 8, 10, 23, TDK-1,2,3,4, PNG-1,2, TSN-1, CR203, IR253, IR66
the dry season: RD10, 23, TDK-1,2,3, PNG-1, TNT-1, TSN-1, CR203, IR253, IR66, SK-12

(5) Expected unit yield and production

If the Project will be implemented, it is expected that the yield of paddy will be sustained at a higher level, primarily because of the proper management of irrigation water, application of appropriate farming practices, and enhancement of agricultural support services. However, in case the project will not be implemented, it is perceived that the present level on yield would not be improved, considering

the historical trend of paddy production in Laos.

The unit yield under the conditions of without and with projects is estimated as follows.

Anticipated Unit Yield (Unit: ton/ha)

Areas	Without project	With project
(1) Thongharb-Nakhua		
Irrigated paddy	2.5 – 3.0	4.5 – 5.0
Rainfed paddy (improved)	1.5 – 2.5	3.0 – 3.5
(2) Vangkhong		
Irrigated paddy	-	4.5 – 5.0
Rainfed paddy (improved)	1.0 – 2.4	3.0 – 3.5
(3) Phonthan		
Irrigated paddy	3.0 – 4.1	4.5 – 5.0
Rainfed paddy (improved)	2.8 – 3.0	3.0 – 3.5

The target yield of paddy described above was estimated, based on available information obtained from PAFSO, DAFSO and paddy production records of villages.

The production in each area under without and with project conditions is summarized as follows.

Anticipated Paddy Production (Unit: ton)

Model Area	Without Project	With Project	Increment
(1) Thongharb-Nakhua			
Irrigated Paddy	201	1,253	1,052
Rainfed Paddy (improved)	466	816	350
(2) Vangkhong			
Irrigated Paddy	-	300	300
Rainfed Paddy (improved)	18	35	17
(3) Phonthan			
Irrigated Paddy	195	450	255
Rainfed Paddy (improved)	1,508	1,820	312

Source: PAFSO, DAFSO, RRA, Farm interview survey

Notes: the flood affected areas are excluded from estimation.

4.1.3 Promotion of Integrated farming

The specific features on technique and the practice for integrated farming are presented as follows. Some important points of the hardware and software components from the viewpoint of sustainable production are also taken into account.

(1) Thongharb Nakhua

(a) Sericulture

Sericulture will be introduced and promoted as an important industry. Initially, mulberry production will be introduced as an alternative crop to be produced in terraces by which the excess crop (banana) can be

replaced.

Sericulture will be implemented during rainy season when adequate supply of mulberry leaves can be produced. Silkworm rearing will be conducted three times a year. Polyvoltine silkworms or polyvoltine x bivoltine silkworms, both of which have strong resistance against diseases will be provided by Sericulture Center in Vientiane. The planting stock of mulberries will also be provided by the and the area to be devoted to mulberry production area will be 20a /farm which is the recommended area by the Center. The production of mulberry leaves will be continuous in three years. The possibility of mulberry culture under irrigation should be considered in the future in order to produce enough leaves to support silkworms rearing up to five times a year.

The pupae as by-product, has high demand as food and can be expected to become a good income source when used effectively.

(b) Integrated farming

Small livestock like pig, poultry, duck will be promoted on semi-intensive farming scale. Semi-intensive farming means raising the stocks using a combination of complete vaccination and the use of home made feed. Feed crops cultivation will be promoted as one of the components of the crop diversification plan. The attainment of home- consumption level will be set up as the mid-term target.

(c) Small scale agro-industry (cottage industry)

As part of the diversification plan, risk management and specialization of products for income generation, agricultural processing will be introduced. Due to lack of market demand, the surplus bananas are sometimes thrown away. In order to realize additional income these bananas will be processed to dry bananas. The technique to dry bananas has already been established in the village while the NGO has implemented the necessary training program for farmers who may want to venture in this agro-industry.

(d) Mushroom culture

Mushrooms can be produced using relatively simple facilities. The production techniques for several kinds of mushrooms have already been established in the areas while extension and training programs have been implemented by the Agricultural Dissemination Center in Vientiane. Mushroom culture can also serve to the effective use of sawdust and husks as culture media which can later be used as organic fertilizers after harvesting the mushrooms.

(2) Vangkhong

(a) The introduction of poultry raising

While Vangkhong area has the highest ratio of self-sufficiency in poultry reaching about 74%, the achievement of 100% self-sufficiency of poultry in the village will be targeted as the priority objective.

The numerical target is an increase of additional 120 heads of poultry, and the total target number is about 700 heads. Their sustenance is also the target, thus, the enforcement of vaccination and the introduction of appropriate raising method by feeding on home-made feed (semi-intensive farming) should be promoted.

(b) Fish culture

The main objective of promotion of the fish culture is the utilization of the existing fish pond as a useful resource, which at present has not been used and left idle. The specification of the fishpond is presented as follows:

The water area: 1,600m2(40m×40m) (estimated),

The depth of water: 1.5-2.0m (estimated)

The fish population density is one fish per square meter under the extensive culture. The target survival rate is about 65% and the yield 520kg will be targeted on the assumption that the final weight is 500g/fish at harvesting time.

In addition to the existing fishpond, three new nursery ponds (with the same size as the existing ones) will be constructed aiming for a level at which the annual production of 2 tons will be attained. Instead of changing the fish population density, increased feeding along with the improvement of survival rate and the utilization of homemade feed will be considered as improvements in fish culture. In accordance with the degree by which the technique will be learned, fish farming with the use of floating type cage will be introduced in the Hinboun river.

(c) Increase in the production of feed crops

Along with the promotion of the integrated farming, increase in the production of feed crops in rain-fed paddy fields which are affected by flood will be targeted, in order to produce enough raw materials for home-made feed. However, the shift from rice to feed crops and the promotion of crop diversification will be examined. In case it will be economically feasible, contract production with feed manufacturers will also be examined.

(d) Introduction of vegetables in the wet season.

The introduction of vegetables during the wet season (during pre-harvest period), in such system such as high-furrow production method and the rain shade production method will be introduced. Small production groups will be organized to attain some level of economies of scale for specific crops.

(3) Phonthan

(a) Fish culture

The reservoirs, which have not been used and left idle showed, be one of the main targets for fish culture

promotion. As enclosure, an inside fence to prevent fish from escaping will be attached to the reservoir. The extensive fish farming method will be conducted at a population density of 0.5 fish per square meter. Harvesting will be done during dry season. In addition to the inside-fence, culture in cages will also be introduced and artificial feeding will be conducted. The unit weight and the production will be targeted at 500g per fish and at 200kg per farmer, respectively.

Simultaneously, the improvement of existing fishponds will be carried out. The fish culture in the existing ponds, mainly using traditional methods will be improved through the introduction of semi-intensive farming. The harvest of 520kg will be targeted based on the assumptions outlined below.

Fish population density is one nursed fish per sq.km (Extensive culture)
The target survival rate is 65%.
And the target weight is 500g/fish at harvest.

(b) Integrated farming

Semi-intensive poultry farming and the introduction of pig raising will be promoted as additional sources of income.

(c) Increase in the production of feed crops

In accordance with the improvement of combined farming, the increase of feed crops in paddy fields during wet season will be targeted in order to produce enough raw materials for home made feeds. However, the shift from rice to feed crops and the promotion of crop diversification will be examined.

(d) Irrigated vegetable cropping

In irrigated paddy fields, some promising vegetables will be produced as convertible crops. Measures against marketing-related problems, such as the introduction of new farming systems including contract farming will be tried.

4.2 Farmers' Organization Strengthening Plan

(1) Farmer participation in irrigation and rural infrastructure development

In the three model areas, irrigation development and rural infrastructure development will be implemented to promote double cropping of paddy, crop diversification and integrated farming. The farmers in these areas who will benefit from the irrigation and rural infrastructure development shall own the infrastructure works after construction.

According to the elaboration of the PDM for the area, farmers will have to contribute by supplying labor and local materials (wood poles, etc.). In Thongharb-Nakhua area, farmers will have to contribute 15% of the construction cost and the remaining 85% will be shouldered by the Government. In Vangkhong area, farmers will bear 5% while the Government will contribute 65%, and the remaining 30% will be

secured from the APB's institutional loan. In Phonthan area, farmers will share 30%, Government 60% and APB 10%. In any case, government contribution will have to be recovered and collected from the beneficiaries as Village Development Funds (VDF).

In order to instill a sense of ownership of the irrigation system even at the early stage of irrigation development, farmers will be encouraged to participate in all aspects, e.g. to design, plan, implement and evaluate the construction works. The costs of construction will be budgeted and investment requirements must be kept as low as possible in order to meet the contribution capacity of the national government and the farmers' community. To reduce certain costs, participatory construction methods (communal labor, labor contribution from village craftsmen, construction by contractor with supervision of farmers) as specified in the master plan will be adoptable.

It is anticipated that the following participatory methods may be applied to irrigation and rural infrastructure improvements.

- *Communal labor:* construction of irrigation canals, maintenance and repair of irrigation canals.

- *Labor contribution from village craftsmen:* construction of irrigation structures including farm turn out at secondary, tertiary and quarterly canals.

- *Construction by contractor with CSC supervision:* construction of concrete weirs, construction of roads.

To supervise the construction and to record the actual cost of construction as well as the contributions made by each party (farmers and GoL) a village based Construction Support Committee (CSC) will be organized in each group of villages. With the support of TFT and SMS from PAFSO, the roles and duties of the CSC will be to:

- Plan the construction according to design
- Budget the construction and contribution from each party
- Select the methods of construction (communal labor, labor contribution from village craftsmen, contractor)
- Secure construction service from contractors, if needed
- Secure labor and construction materials
- Implement the construction
- Monitor and control the construction works undertaken by the contractor
- Evaluate the construction works
- Conclude the costs of investment and the contribution from each party.

The CSC will be composed of representatives from the village administrative committee (chief or deputy chief of village) and selected farmers will form the Board of the committee.

(2) Water User Organization Development

(a) Development of WUG

(i) Thongharb-Nakhua Area

For existing WUG at Ban Thongharb

The existing WUG at Ban Thongharb will be strengthened to ensure the proper operation and maintenance of the irrigation system. The organization of the WUG will change from credit unit to a block unit allocated in accordance with the layout of the canals and structures.

After the completion of the irrigation infrastructure development, the existing WUG will be divided into two different WUGs for the two pump stations located in Ban Thongharb. The process for the development of the WUGs will be conducted as specified in the master plan.

On the other hand, the organization of the WUG for the Nam Khou station will be similarly developed as in the Nam Dua station but will have 3 water blocks. The number of water blocks will increase as the expansion of irrigated areas progresses. One control committee will be established to monitor the two WUGs.

For areas with no WUG

After the completion of irrigation development in Nakhua and Nahin areas, WUGs will be organized for all pumping stations. The organization will be based on the water allocation per block designed for each system (similar to the one for Nam Dua pump station a specified above). In total, 3 WUGs will be organized in relation to improved irrigated areas. At the initial stage there will be 2 WUGs at Ban Nakhua Nai and 1 WUG at Ban Nahin. The 3 WUGs will serve the farmers from 4 villages.

(ii) Vangkhong Area

During the construction of the new irrigation system in the down stream, the existing system which can irrigate about 10 to 15 ha will be utilized. The farmers who are utilizing the irrigation water in the existing scheme will be organized into a small WUG by implementing the concept as specified in the master plan. This WUG will serve as a training platform for the future irrigation system to be constructed down stream. By considering the actual canal layout and irrigated land, 2 blocks will be established with 6 to 8 households in each block.

The pump operator will also function as the water master and will record the water consumption of each block. The process for the development of the WUG and APG will be elaborated for the farmer organization from the beginning. One APG for the production of paddy in flooded area (DC 2 type) will be organized.

After the completion of new irrigation schemes down-stream, a WUG will be organized based on the above development. A new WUG committee will be constituted through election and the additional block will be accommodated into the organization according to the layout of the irrigation canals and structures. As the organization will eventually cover more area and more members, other service functions will also be added to the organization.

(iii) Phonthan Area

The existing WUG will be strengthened to ensure the proper operation and maintenance of the irrigation system. The WUG will be organized, first to discharge all the functions needed to secure equitable water distribution by rotation and then later strengthened to support the other agricultural production activities of its members.

(b) Legalization of WUG to WUA

Additional steps will have to be made to strengthen the managerial capacity of the WUG and to establish the necessary legal framework to sustain the organization. The legal entity of the WUG will be up-graded through the establishment of WUA. This will be done through the inclusion of additional provisions in their by-laws. The by-laws of the WUG comprise of an Article of Association, an internal regulation covering water management and other issues related to operation of the organization. The submission of these legal documents will be the basis of the authority concerned for the registration of the WUO as WUA.

In Thongharb-Nakhua area, after the improvement of the irrigation facilities and after the operation of the schemes by the WUG for two years, the two WUGs will be upgraded to form one WUA. The legal process to develop WUA as specified in the master plan will be applied. In Nakhua and Nahin area, after the operation of the schemes by the WUGs for two years, the 3 WUGs will be upgraded to form one WUA.

In Vangkhong area, after one or two years of operation, additional steps will be made to strengthen the managerial capacity of the WUG and to establish the necessary legal framework to sustain the organization. The legal entity of the WUG will be up-graded through the establishment of WUA.

It is anticipated that in Phonthan area, after the improvement of the irrigation facilities and after the operation of the schemes by the WUG for one year, the farmer organization will be upgraded to form one WUA.

In any case, the legal process to develop WUA as specified in the master plan will be applied.

(c) Strengthening the capacity of WUO in Operation and Maintenance

The WUG, and then later the WUA will be continuously strengthened to assume the operation and maintenance of the irrigation system which has to be re-installed or improved in the area. The important

elements for O&M development are:

- To develop the practice of appropriate water management concepts in each irrigation system
- To introduce the concept of cost recovery, and
- To transfer O&M responsibilities and irrigation assets to the farmers' community.

As specified in the master plan, the aim is to initiate the farmers in the elaboration of water management concept (WMC) and irrigation system fee (ISF) for their irrigation scheme. The main activities for developing proper water management practices will be as follows.

- Developing an appropriate water management concept for each irrigation system.
- Water blocks (or units) will be established at each secondary turn out.
- An Irrigation Service Fee (ISF) will be calculated for each irrigation system
- The WUG will be requested to collect part of the costs for replacement of parts at the initial stage as reserve funds in the form of Village Development Funds (VDF).

Following the government's policy to transfer irrigation system to farmer organization, the project will ensure that the pump station and irrigation infrastructure in each location is correctly transferred to the WUO. In coordination with the above development activities, an IMT process as specified in the master plan will be applied to the irrigation schemes.

In relation to the IMT process, the WUO will be strengthened to assume full financial and legal responsibilities. The upgrading of WUG to WUA and from WUA to FWUA will be an important activity. A legal framework will have to be defined and a legal process be developed for the WUO during each period.

(3) Develop Farmer Capacity in Agriculture Production

As specified in the master plan, the strategy is to develop farmers' capacity in the management of their agriculture production and for them to adapt their production according to changing conditions of the market. In the model area, existing farming systems will be improved towards the development paddy production, cash crops production, and other farm income-generating activities. The farmers will have to increase their knowledge and skills to cope with the required developments in their farm. Additional knowledge will not only be in terms of farming technology but also in the field of farm management and marketing of farm products.

The development of the farmer cooperative society in the model area will be made in conjunction with the development of WUO and the development of "farmers groups" for specific agriculture development activities. Following the approach of farmer group development, agriculture production groups (APGs) will be established and strengthened. The development of the APGs will be implemented through the elaboration and application of the "group development process" as specified in the master

plan. In support to the development of APGs, agriculture credit groups (ACGs) and buying and selling groups (BSC) will also be established and strengthened (Figure 4-1).

Agriculture Production Group (APG)

Following the implementation of the group process (step 1: group preparation), alternative farming methods and production will be defined by the farmers. Farmers having the same activities will be encouraged to group themselves into APG. The size of the APG will depend on the activities and could include 7-15 members. At the initial stage it is recommended to keep a small number of members in order to fit with conditions of APB in case there is credit support. The function of the APG will then be the same as an Agriculture Credit Group (ACG).

In each model area, potential APGs will be established for:

Main Activity	Thongharb-Nakhua	Vangkhong	Phonthan
Improved rainfed rice production	Yes	Yes	Yes
Improved irrigated rice production	Yes	Yes	Yes
Small animal raising	Yes	Yes	Yes
Feed crops production	Yes	-	-
Fish Culture	-	Yes	Yes
Cash crop production	-	-	Yes
Banana production	Yes	-	-
Food processing	Yes	-	-

The development of the APG will follow the application of 4 steps of the group process. One of the most important steps is step 2: planning. In step 2, farm plans are elaborated for the APGs. With the assistance of TFT the farm plan is a tool for bottom up planning which will define the target and objectives of the APG production scheme as well as the different activities and inputs needed to ensure the production of the group. TFT will base their support services plan on the farm plans prepared by APGs. In relation to the support of the TFT to the APG, contact farmers will be identified by the TFT. At the initial stage, contact farmers will be selected from the APG leaders and from some potential individual progressive farmers.

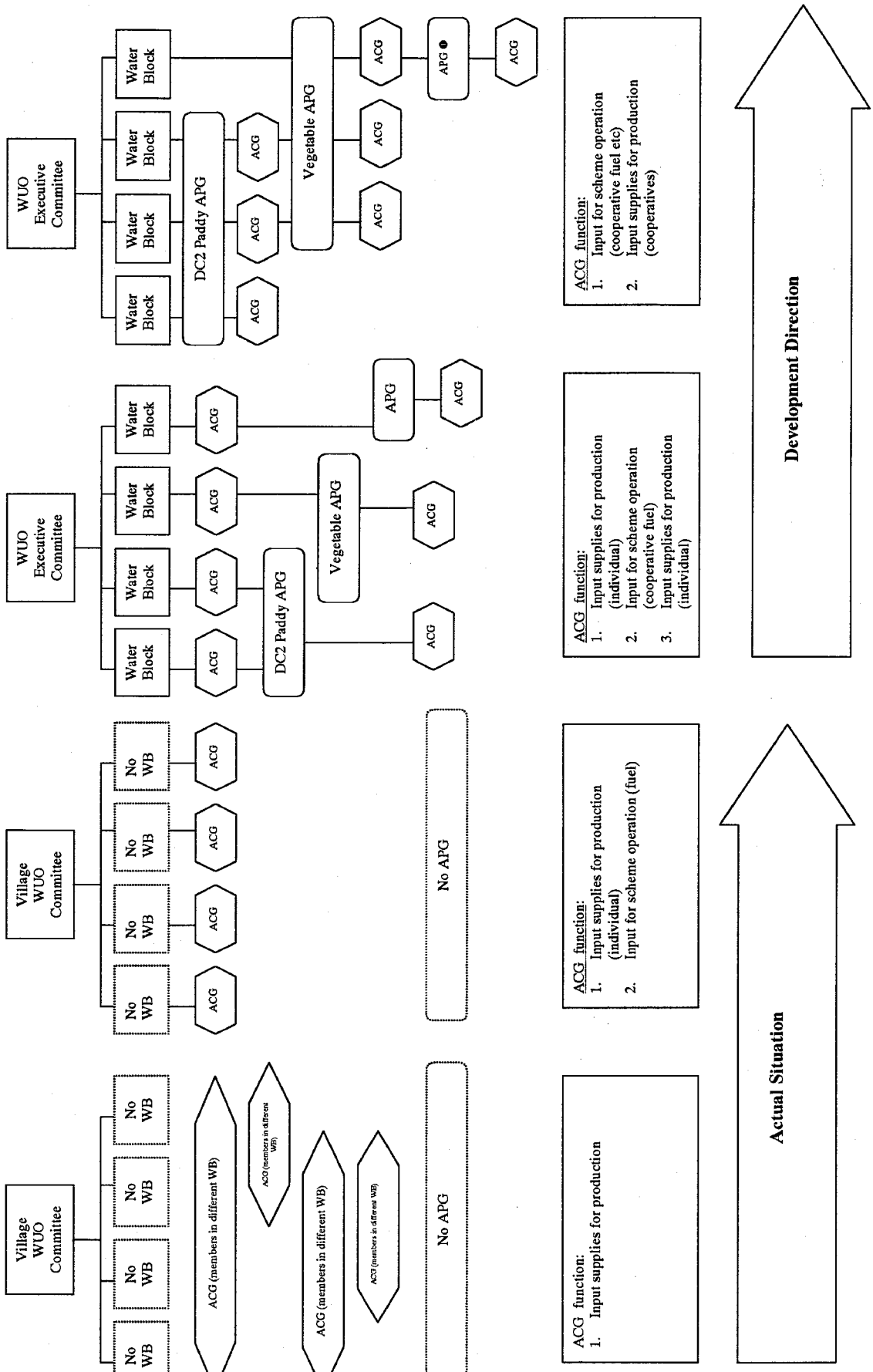
Agriculture Credit Group (ACG)

Agriculture credit groups, under the direction of APB will be promoted to increase the productivity in the area. It is anticipated that when the APG has evolved to a satisfactory level, the ACG will be incorporated in the APG organizational structure and then later to the Agriculture Cooperative Structure. If this happens, APB will directly extend loan to the cooperative as a group loan or loan to enterprises.

Buying and Selling Group (BSG)

In order to promote local trade, BSGs will be formed for the major commodity such as paddy. The formation of these groups will follow the same process as for the APG and if possible at the initial step of the group process (step 1). By doing this, farm plans will already define the producer and the buyer.

Figure 4-1 Development Direction for Farmer Production Group



BSG members will be selected among the farmers in the community and village middlemen will be encouraged to enter the group. It is foreseen that 1 BSC will be formed in each village or in each group of villages.

Develop Legal Framework for Farmer Groups through the development of Agriculture Cooperatives

It is foreseen that when the APGs have evolved to a certain level where they have enough skill and knowledge to develop their agriculture production according to the demand of the market, the development of the legal framework of APGs will be one important component. Depending on the social and economic conditions, the APGs will evolve to form formal organizations such as agriculture cooperatives.

The main objective of the WUA to be developed in the schemes is for the farmers to be able to operate and maintain the irrigation facilities by themselves. In addition, production support and marketing services as well as credit service will be also included in the WUA objectives. At the initial stage, agriculture support services to the APG will be organized under the structure of the WUA but will later evolve to the structure of Agriculture Cooperatives.

In case these two cooperative societies (WUA and Agriculture Cooperative) will be organized, the WUA will be responsible for O&M of irrigation activities, while the Agriculture Cooperative will handle the agricultural support services.

(4) Support needed

The support needed for the establishment and development of the activities as specified above will be in the form of training for farmers, contact farmers, group leaders, and WUO committee members. Additional support in terms of technical assistance will also be needed for the development of participatory construction methodologies, for facilitating of group development process, and for developing the legal framework of FWUA and agriculture cooperatives. The same support will also be needed by the 2 other model areas and will consist of the same level of training activities. However, training needs would have to be evaluated during the group development process and additional training or support could be proposed by the farmers and TFT in the course of project implementation.

Development of participatory construction

- Training in participatory construction methods
- Study tour on participatory construction

Development of WUO

- Training of WUO Executive Committee in WUO management
- Training of water block leaders in water management
- Training of pump operators
- Study tour for water block leaders

Development of APGs

- Training of farmers in group development process
- Training of farmers in the elaboration of farm plans
- Training of APGs leaders in group management and leadership
- Training and study tour for contact farmers in the establishment of model forum
- Training of farmers on food processing and production of new crops

4.3 Agricultural Finance Plan

APB is a rather a new bank considering that it was only established in 1993. While the demand for institutional loan for the dry season cropping has been drastically increasing in recent years, APB is not able to cope with the demand sufficiently, due to lack of both governmental budget and funds available in rural areas. It is considered indispensable to strengthen and then utilize the APB for promotion of agricultural and rural development in the model areas. In the PDMs prepared after discussion among villagers and government agencies concerned, there are projects which seemed feasible if financial assistance from APB is available to the villagers. In order for the APB and villagers to implement these projects and make repayments on time, the following measures are necessary and they can be achieved through the utilization of APBs own fund.

(1) Establishment of APB Field Offices

APB should establish an office (Branch and Service Unit) in the capital of three provinces, Bolikhamsai, Khammouane and Savanakhet. Of the three model areas, only Vangkhong area can receive APB's services from its field office located in the district. Other areas of Vangkhong and Phonthan rely on S.U. and Branch office located in the provincial capital, respectively. Thongharb – Nakhua area , is located about 70 Km from the Paksan S.U.; Phonthan area is about 55 Km (including 14 Km of unpaved road) from Savanakhet Branch, and Vangkhong area is located about 26 Km away from Hinboun Sub-Service Unit (S.S.U.). It is evident that with this distance, it is very difficult for APB field officers to maintain close contact with the villagers. APB should have an office close enough to maintain daily contact and be able to monitor the economic and social performance of the villagers in the area. Since APB is establishing several new S.S.U. every year, it is necessary to prioritize the establishment of new S.S.U. in Pakkading District of Bolikhamsai Province and Xayphouthong District in Savanakhet Province.

(2) Increase the Number of Field Officers and Participation to TFT Activity

This is considered as one of more important undertakings to enrich the APB's services within the framework of strengthening the farmers' support system in the model areas. It is a prerequisite that APB staff should actively participate in the TFT activities. However, the number of staff in the concerned APB offices is limited, and one staff is expected to cover about 1,000 customers. Under the situation, they are not able to allocate more time and extra effort for the development of the model areas, because they must concentrate on coping with the seasonal loan business. It is considered ideal for of one field staff to cover from 300 to 400 customers, and back-support job such as book keeping and interest

calculation must be simplified through introduction of a simple computer. It is also necessary to allocate one new staff each for Savanakhet Branch, Paksan S.U. and Hinboun S.S.U.. The role of new staff is to serve as back-support for the staff to be nominated as TFT member.

(3) Review of Utilization Policy for Institutional Loan

In Thongharb-Nakhua and Phonthan areas, dry season paddy cropping has already been practiced, and it is about to start in Vangkhong area where the installation of pump facilities is almost complete. The dry season paddy cropping definitely requires a supply of certified seeds and chemical fertilizers, for which APB's institutional loan must be allocated. On the other hand, farmers require a concessional loan for the construction and rehabilitation of irrigation facilities. At present, it is felt that the supply of BOL' fund for institutional loan is getting close to its limit, and it is about time to review the effectiveness of fund utilization under the institutional loan system.

In the model areas, it is planned to provide the necessary measures for stabilizing agricultural production, through which income of farmer-beneficiaries could be increased and stabilized. Therefore, it is forecasted that these farmers will not require any bank loan for their seasonal production cost, or will be able to utilize the APB's ordinary lending, if necessary. In this connection, it is proposed that APB should only apply its ordinary lending scheme from three years after completion of the irrigation and rural infrastructure.

(4) Monitoring of Loan

APB is basically giving loans to farmers' groups or ACG (agricultural credit group) and statistical information on lending activity is collected and compiled by ACG due to lack of APB staff. Under the current system, it is difficult to determine the loan status of individual farmer and the basic figure or parameter like classification of the loan is not clear. Even if APB would introduce MIS, problem will arise on the reliability of these figures. In this connection, APB should change to monitor individual borrowers and structure the basic figures on an individual basis. This is the absolute condition to be required if APB will request for external ODA fund or loan from international financing agencies.

(5) Monitoring and Evaluation of Farmer's Economic Condition

To monitor the loan status of individual borrowers is the reverse aspect of the monitoring and evaluation of economic condition for individual farmers. In APB field offices, this activity is carried out by using a card filled out with hand-written information which should be converted to allow mechanical processing.

(6) Improvement of Facility, Communication and Mobility of Field Offices

Hinboun S.S.U. has no telephone and fax machine because was just recent established and one motorcycle is provided for use by two field officers. Some field offices deal with a rather big amount of cash from its lending activities, and it is necessary to provide a communication network suitable for the establishment of MIS.

(7) Mobilization of Rural Fund through Deposit Promotion

APB at present is not paying special attention to deposit business, and the total deposit amount does not occupy a big share in SOCBs. However, it is increasing at higher rate as the inflation, due to monopolized financing business by APB in rural areas. APB is now facing the limitation of BOL's supply of fund source, hence, it is considered a good opportunity for APB to learn how to absorb rural fund resources. It is also possible for APB to deploy more dense financial service in the three model areas.

(8) Credit in Kind

It is customary for APB to deliver credit in kind against a seasonal loan. APB provides farmers with farm inputs including fertilizers as a loan in kind but collects the repayment in cash. The necessary input is procured from KR2 assistance from donor countries, and also from importation through the Ministry of Commerce. However, due to various reasons, farmers cannot obtain farm inputs on time, despite receipt of approval of APB's loan. While this is caused by delay in determining the selling price of the input by the government, the field officer responsible for the three model areas should do its best to secure the necessary farm inputs on time. This will be the first step to firm up the credibility of APB, eventually leading to the success of the project.

(9) Mobile Banking System

The fact that farmers can not access APB easily is considered one of limiting factors not only for APB to expand its business opportunity but also for farmers to develop their farming opportunity. There are several types of mobile banking system, the most popular type is visiting the area where no APB office exist by a vehicle with the necessary equipment. It is proposed to introduce the same mobile concept of system in Thongharb-Nakhua and Phonthan areas.

4.4 Farming System Stabilization Plan

4.4.1 Software Approach

The following table shows the relationship between the basic development direction in each model area and the necessary support services in matrix. The common development directions in all model areas are (i) stabilization of dry paddy and (ii) production of small animals. The improvement of extension system including capacity building of extension staff and farmers seems to be a very critical factor for future agricultural development.

	Thongharb/Nakua model area	Vangkhong model area	Phonthan model area	Extension Activity				Input Supply				Marketing			
				Integrated Extension by TFT	Appropriate Extension Methods	Training of Extension Staff/Farmer	Coordination with related Projects	Supply of Fertilizer and Chemicals	Supply of HYV Seed	Supply of chicklet, piglet, fingerling	Utilization of APB loan	Paddy Purchasing by FSC	Market Oriented Agriculture	Protection of Village Middleman	Marketing Information System
(1) Stabilization of dry paddy	◎	◎	○	◎	◎	◎	◎	◎	◎		◎	◎			
(2) Production of small animals	○	◎	○	◎	◎	◎	○			○	◎		○	○	○
(3) Production of feed crops	○	○		◎	◎	◎	○	○	○		○		○		○
(4) Introduction of fish culture		○	◎	◎	◎	◎	○			◎	◎		○	◎	○
(5) Introduction of food processing	◎			◎	◎	◎	○				◎		◎	○	◎
(6) Production of cash crops			◎	◎	◎	◎	○	○	○		◎		◎	○	◎

(1) Stabilization of Dry Paddy

In Thongharb/Nakhua model area, irrigated paddy production is being carried out only in Thongharb village and the past trials involving the introduction of irrigated paddy have entirely failed in the other villages mainly due to inappropriate support services. Farmers in this model area generally do not trust the extension services and are also reluctant to apply for loans for agricultural input supply. In order to win back the confidence of the farmers and to introduce the irrigated paddy effectively as well as to stabilize the wet paddy production, the farmers' support system should be improved. Achieving self-sufficiency in rice is the primary prospect in Vangkhong model area and the introduction and stabilization of irrigated paddy production is consequently the fundamental development policy in this model area. The impact of this model area is expected to be very significant, because the center of Hinboun District will be relocated to the areas adjacent to this village. This project must be successfully carried out through a perfect support system in order to avoid imparting unfavorable impression to farmers in other areas. Self-sufficiency in rice is almost achieved in Phonthan model area and there is no flood risk. The major problem for the current dry paddy production in this area is the lack of water management, both physically and institutionally. The following support services should be carried out in each model area through the activity of TFT in localized and concentrated manner.

- Securing SMS whose technical level is satisfactory for designing irrigation system and supervising construction work which has become a very keen subject in the study area.

Readily available training courses should be effectively utilized and practical training through OJT should be carried out. During the past 6 years, FIAT (Farmer Irrigated Agriculture Training) Project has been implemented under the Department of Irrigation and many trainers have been trained in central, provincial and district levels. Such trainers should be utilized as TFT members or resource persons. Various training manuals and other materials useful for technology transfer were produced under the FIAT Project and these should be utilized effectively. In order to perform effective extension services on basic technology for stabilizing paddy production such as seedling production, irrigation management, fertilization and pest control, the experiences through PEP (Pilot Extension Project) and IPM (Integrated Pest Management) should also be utilized actively. Personnel who participated in PEP as a member of DAFSO team and in the activity of farmers' field school of IPM should be involved in the organization of TFT.

- TFT should the formation of farmers group such as WUG (Water Users Group) and ACG (Agricultural Credit Group) and should select contact farmers as a chief of APG (Agricultural Production Group) according to the criteria mentioned in Master Plan. The progressive farmers in each area can be potential candidates for contact farmers. The capacity building of farmers or farmers group should thus be promoted in order to prepare them to receive the support services extended by TFT. As to the method of technology transfer to farmers, new methods such as mobile theater of the Information Ministry should be adopted.

- As to fertilizer supply system, , APB and FSC should clearly stipulate the supply procedure of fertilizer for farmers as a first step and the extension staff should be ready to consult with the farmers according to their individual requirement. DAFSO staff should assess the requirement for fertilizer according to the farm plan in each cropping season. Smooth supply including proper transportation and storage should then be carried out in collaboration with TFT members from APB and FSC. Guidance on the proper application method based on the kind of fertilizer and agro-chemicals should be conducted by TFT. In Phonthan model area, FSC supplies fertilizer through the network of middleman but this procedure is not systematic and farmers are suffering from such improper supply system. This is because, when farmers would like to purchase fertilizer in cash loan from APB and repay in cash generated from sales of their products, the transaction of money and fertilizer becomes very complicated. Therefore, an integrated system that farmers can receive fertilizer from APB and can make repayment through FSC should be examined and the trial should be carried out as a test case.

- As to the supply system of HYV seeds, the principle is to produce F1 in NARC, F2 in province level and F3 in district level. As mentioned in the Master Plan, the seed processing facility, especially the drying facility, should immediately be improved. The proposed Seed Multiplication Center should be established in Bolikhamsai and Khammouane. For these centers, the facility should be designed in order to be able to produce adequate quantities of F2 seeds required in each province. In Savanakhet, although the Tasano Seed Center is

already established where both F2 and F3 are produced, the appropriate seed supply system is not yet established. The total requirement of F2 in the whole province should be assessed and the production of such volume should be ensured. As to the production of F3, the contract farming system should be established at the district level under the supervision of DAFSO. According to the analysis in the Master Plan, the necessary area for F3 production in each village is usually less than 1 ha. It means one farmer per village is enough and the field of this farmer can be utilized as a model field for technology transfer to the surrounding farmers. Furthermore, DAFSO should be ready for processing, packing and distribution of F3 to the farmers in the district.

- As to the marketing of rice, in case of Thongharb village, the construction of access road to route-13 is indispensable and this should be included in the project. The surplus rice is mainly marketed through FSC in the study area and FSC is requesting the farmers to establish BSG (Buying and Selling Group). The system of group buying and selling should be developed under the supervision of TFT in parallel with the establishment of other farmers group. Since the rice bank system is functioning properly in Nam Dua village, this system should be improved and expanded in the area through extension activities by TFT.

(2) Production of Small Animals

According to the survey in the village of this model area, there is a high market potential for fish and small animals such as poultry, duck and pig. Although large animals such as water buffalo and cattle are also important income sources, these are rather regarded as savings. On the other hand, small animals such as poultry, duck and pig give rather quick return that makes farmer's income more stable. Farmers will be able to increase their income by promoting the production of small animals in addition to improve their nutritional condition. Since small animal raising by using artificial feed seems less profitable, the production of feed crop should also be promoted and this was mentioned in the component of feed crop production. The following support services might be needed to promote the production of small animals.

- TFT should inform farmers about the advantage of raising small animals such as poultry, duck and pig. The establishment of APG should then be promoted to farmers interested in the production of small animals. TFT should select a contact farmer as chief of APG and should make the necessary arrangements for contact farmers to participate in the training courses being carried out. Various training courses are available as shown below and breeding farms of poultry and pig at Nongteng provide not only training but also supply of chicks and piglets. Technical know-how including family operation and management system is not yet ready for transfer to farmers. TFT should therefore support farmers on operation and management with assistance from the staff of livestock division in PAFSO, other experienced personnel, for example, in Nongtheng and VVW in the village.

Training courses related to the production of small animals

Training	Duration	No. and Trainee	Note
Animal Health		Animal Health Students	Organized by National Vaccine Production Center at Nongteng
Veterinary Training Course (District Level)	3-5 days	20-25 VVW	Under DAFSO control
Veterinary Training Course (TOT, Province Level)	15 days	20-25 participants for PAFSO/DAFSO staff	Under PAFSO control
Pig keeping for family operation (proposed)	1 week course 4 courses/year	10 farmers	Under the assistance of EU
Improved Rural Poultry Production	5 days 6 nights	14 participants /course	Conducted at Nongteng Poultry Breeding Center as "Strengthening of Livestock Services and Extension Activities" by EU

- The farming system should be established using a holistic approach taking organic cycle into consideration. Maximum utilization of food residue and by-products such as rice bran and broken rice should always be considered for sustainable management. Training courses for "organic agriculture" are available at the farmers' field school of IPM project and also at the Participatory Development Training Center in Vientiane. TFT should make necessary arrangement to avail of such useful training courses for farmers and also to inform farmers about the advantage of organic agriculture from operational and environmental viewpoints.

- In the case of a farmer or farmer group who has just initiated the production of small animals, a support system should be established for farmers to obtain financial support from APB.

(3) Production of Feed Crops

During the dry season, cash crops such as sweet corn, sweet potato and other vegetables are cultivated on river levees and paddy field but the market potential of such products are very low. Instead of producing such products, the production of feed crops such as feed corn and soybean should be promoted to be utilized as feed source for the raising of small animals. Under such circumstances, State Rural Development Enterprise (Paksan) is now promoting the contract farming of feed corn in Nam Dua village. The company is now ready to distribute the seeds of feed corn to farmers and to purchase the products from farmers. This kind of contract farming should be improved in the future to be more attractive for farmers. The following support services should be carried out in order for farmers to shift from conventional crop production to feed crop production.

- TFT should make necessary arrangement for the provision of seeds, the extension of farming practices of such feed crops and the marketing of their products.

- In order to improve the contract farming system, TFT should make the following arrangement with State Rural Development Enterprise.

    - The company should clearly show the crop budget and profitability to farmers based on studies so far carried out.

- The company should provide farmers not only with seeds but also with other necessary inputs such as fertilizer and chemicals. Or the company should arrange the adequate and timely supply of inputs in coordination with APB and/or FSC.

- The company must be ready to provide 6 days training for farmers. In addition to this training, the company should make the necessary the arrangements for field level technical support in coordination with PAFSO and DAFSO.

- In order to keep the quality of animal feed produced from the factory, the quality of materials should be kept constant. Supervision should therefore be carried out by the company for farmers to understand the idea of quality control.

(4) Introduction of Fish Culture

The poverty level of Vangkhong village is much lower than the other two model areas and the villagers are greatly depending on collection of natural products such as fish, frog, cricket, mushroom and bamboo shoot. Among these products, fish is one of the important items that middlemen deal with. If fish can be produced constantly through fish culture activities, this will greatly contribute to the improvement of villager's life. That was the reason why the villagers already constructed the fishpond in this village. However, this fishpond is not operated at all and the arrangement for the introduction of improved fish culture activities seems very important. There are a few farmers practicing fish culture and have been successful in rather holistic manner. The water reservoir for irrigation is, however, not utilized for fish culture. In order to introduce fish culture in both model areas, the following support services should be carried out by TFT.

- As a first step, group of villagers for fish culture should be established and a contact farmer should be selected as a leader of the group under the support of TFT. TFT should then arrange for the contact farmers and even for TFT staff themselves (in case there are no SMS in PAFSO) to participate in the training courses available. At the Fish Breeding Center in Nongteng, production and distribution of fingerlings together with the training for farmers and technical staff are being carried out. At PADETC, technical transfer for fish breeding is also being carried out. Such training courses should effectively be utilized for the capacity building of local cadre.

- The support of Fish Breeding Center is also needed for the establishment of the necessary facility and the supply of necessary equipment. APB staff of TFT should make adequate arrangement for credit application to secure the initial investment.

- Fingerlings are available at the Center in Nongtheng and also at the KM6 Station in Thakhek. Another important role of TFT is to make necessary arrangement with these stations for the supply of fingerlings. Instead of purchasing fingerlings from these stations, farmers can produce fingerlings by constructing simple facilities with basic know-how. Some of the progressive farmers in Savanakhet are already producing fingerlings by themselves. To

develop a network with such progressive farmers is also considered as an important role of TFT.

- Technical support including farming system, farm management and marketing has not been satisfactorily established for transferring to farmers. The support system should, therefore, be improved through the network to be established among SMS of PAFSO, TOT participants and progressive farmers.

- In Vangkhong model area, fish culture in ponds is not the only alternative as cage culture is also applicable in Hinboun River. The necessary information for this new technology should also be collected by TFT for the group of farmers.

- In Phonthan model area, the extension system should be improved by utilizing the progressive farmers already successful in fish culture as extension volunteers. Furthermore, since the reservoir is not effectively utilized for fish culture, active releasing of fingerling and cage culture should be promoted as multi-purpose utilization of the reservoir.

(5) Introduction of Food Processing

As in the case of Nahin village of Thongharb-Nakhua model area, a considerable part of their agricultural products such as banana is wasted due to very limited market around the area. Food processing technology should be introduced in order to give additional value to such agricultural products. The plantation of mulberry trees can be introduced in this model area. The fruits can be processed to preserved food like jam and the leaves can be utilized not only for sericulture but also for tea. Furthermore, mushroom culture should also be introduced in this model area. In order to introduce various food processing related technologies mentioned above, the following support services should be developed.

- TFT should demonstrate the advantage of food processing to banana producing farmers. As a first step, support services should be carried out for farmers who showed their interest in the new technology. PADETC (Participatory Development Training Center) in Vientiane is now promoting food processing such as sun-dried banana, pineapple and mulberry tea. Farmers or the members of TFT should learn such appropriate technology in order to improve the marketability of their products.

- Sweet sun-dried banana is being produced in Sayabury since 1996 and the products have been sold in ordinary shops and special shops dealing with organic agriculture products. In 1998, 22 farm families produced 26,000 packages annually with earnings of about 66,000,000 Kip. This project is not only increasing the income of banana producing farmers but also promoting employment among villagers. The roles TFT in this project are to distribute the appropriate variety of banana, to provide information about the technology and facility for drying and packing and to transfer the technology to farmers. Mulberry tea has also been produced in Vientiane and Vang Vieng and the demands are increasing in

restaurants and hotels. Sericulture Center can support the supply of seedlings, mulberry plantation and sericulture technologies. The 45-day training course is now under planning in this center. As for the production of mulberry tea, jam and juice from fruits, various trainings are available in PADETC.

- One week training course for mushroom production is available at the Agricultural Extension Agency in Salakham for farmers and DAFSO staff. Family operation model (about 5,000 pots) is demonstrated and the spawn is available for distribution. The roles of TFT are to demonstrate the advantage of mushroom culture, to arrange the training courses for farmers who showed their interest, to provide information about necessary facilities and equipment and to transfer technology to farmers.

(6) Production of Cash Crops

In Phonthan model area, it is necessary to achieve various trials as an advanced model case for the stabilization of farm income through crop diversification including the production of cash crops in addition to feed crops. An integrated farming system should be developed towards the direction of agricultural development by combining organic crop production and livestock raising in. The components of integrated farming are stabilization of dry paddy, small animal raising, feed crop production, introduction of food processing and fish culture. But these components should be promoted in more advanced and integrated manner in this model area than in the other two model areas. The following support services might be needed for the production of cash crops and the promotion of integrated farming.

- In Phonthan, watermelon was the main cash crop in the past and there is a high potential for producing groundnuts and soybeans. But farmers are rather reluctant to grow these crops mainly due to unstable market condition. New marketing system should, therefore, be developed by introducing new farming practice such as contract farming. Moreover, the demand for groundnuts and soybeans as oil crops should be increased by activating the food processing industry.

- Although weaving and dyeing of silk and cotton are active in this model area, these activities are so far carried out on an individual level. These activities should be more or less organized and textile products should be developed. Since various materials for natural dyeing are available in the forest in this area, future textile industry seems promising. The promotion of such small-scale industry including food processing, weaving and dyeing can encourage crop diversification and also increase employment opportunity in the village.

- In order to promote a market-oriented farming in general, the establishment of information system will definitely be needed. The establishment of proper information management system has already been emphasized in the Interim Report for basic agricultural development policy. In addition to this information system, TFT is requested to manage marketing information including seasonal supply and demand balance through FSC, District Commerce

Office and middleman distributed in the villages. As one of the practical methods of market information management, a signboard should be installed adjacent to the villagers' meeting area.

- TFT should carry out a comprehensive support services for farmers including technical and institutional advice effective for the promotion of integrated farming, participation arrangement for available training courses and information services for input supply.

4.4.2 Hardware Approach

(1) Thongharb-Nakhua Area

(a) Irrigation Development

Basic Concept for Irrigation Development

The major constraint for irrigation development in the area is water shortage during the dry season, although the development target is to increase dry rice production through expansion of irrigation area. The available run-off in the dry season is very limited in Nam Dua basin. No other water resource exists except for the river, and the topographic condition is unsuitable for new water resource developments. Pumping scheme is the only effective way for village-based irrigation system development. In the PCM workshop, expansion of irrigation area was considered as one of the objectively verifiable indicators.

To promote rice production through expansion of irrigation area as planned in the PCM and under the above-mentioned conditions, a basin-wide water management concept should be introduced. It should deal with regulation and allocation of water use under the limited water resources in the five villages. As the first step, village–based water users group should be organized with TFT support to discuss water use matters and irrigation area, with an aim to foster greater cooperation among the villages in operating and managing the pump and pumping schemes.

Irrigable Area

The potential irrigable area is the key factor when setting the development target. It is generally estimated from unit water requirement and available discharge of the basin. The potential area is estimated as follow.

(i) Diversion requirement

The unit water requirement is calculated by assuming evapo-transpiration, effective rainfall and other demand factors such as percolation rate and puddle water. As a result, net water requirement for dry paddy cultivation is calculated for the proposed cropping pattern, as follows.

Net Water Requirement (l/s/ha)

Month/Village	Dec	Jan	Feb	Mar	Apr	May	Jun
Nahin	1.307	1.980	1.567	1.645	1.233	0.101	
Thongharb and other 3 villages			1.248	2.037	1.520	0.898	0.319

Diversion requirement is calculated based on net water requirement and irrigation efficiency. Irrigation efficiency is assumed to be 60 %, considering the present water management level in the villages and irrigation practice of other irrigation development plans. As the result, peak diversion requirement is 3.30 l/s/ha for Nahin and 3.40 l/s/ha for Thongharb and other villages.

(ii) Available discharge of the basin

The amount of available river discharge should be determined considering comprehensive water use condition in the river system. The minimum flow should be secured as base flow for environmental conservation and downstream water users. In this study, a minimum discharge of 0.002 m3/sec/km2 is determined as the river maintenance flow, by applying the minimum specific discharge from March to April at Nam Xam, excluding 1992 data which was an extreme drought year. As a result, available discharge is calculated as follows.

Available Discharge in the Basin (m^3/s)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Total	1.029	0.609	0.449	0.412	2.320	9.991	21.54	24.05	15.04	6.168	3.176	1.914

(iii) Estimation of irrigable area

Based on the diversion requirement and available discharge, the total irrigable area in the basin is estimated at 137 ha. This is based on various assumptions such as basin discharge and irrigation efficiency involving water loss from canal and on-farm operation. If available discharge is measured or re-estimated and water management method is improved, the size of irrigable area should change accordingly. Considering these conditions, a total of 137 ha is set as the first development target.

Irrigation system development

To secure the irrigation area, a well-managed irrigation system including pump operation and water allocation are needed.

(i) Pumping capacity

The capacity of the existing pumps is calculated as follows.

Pump	Capacity (l/s)	Irrigable area (ha)	Ave. planning area (ha)
65 HP×1	250～160	74～47	60 ha
14 HP×1	50～30	16～10	13 ha
6 HP×1	20～10	7～3	5 ha

Note: Total design head is assumed to be 10 m to 15 m.

Based on the average planning area of each pump, the irrigable areas of the pumps are calculated as follows.

Village	Pump	Pumping capacity area (ha)
Nahin	14 HP*2, 6 HP*3	40
Nakhua Nai	65 HP*1, 65 HP*1	120
Nakhua Nok		
Nam Dua		
Thongharb (north)	65 HP*2	120
Thongharb (south)	65 HP*2	120

Comparing the capacities of the pumps, the potential area for extending irrigation and the present command area of the pumps, it can be said that the existing pump still have enough capacity to irrigate the planning area. Therefore, the key factor to sustain the irrigation is the maintenance of existing pumps.

(ii) Irrigation planning area

Based on the above consideration, irrigation area is planned as follows.

Village	Existing		Plan			Remark
	Pump	Irri. area (ha)	Existing p.	New pump	Irri. area (ha)	
Nahin	14 HP*2 6 HP*3		14 HP*2 6 HP*3		137	
Nakhua Nai	65 HP*1 65 HP*1		65 HP*1 65 HP*1			
Nakhua Nok						
Nam Dua						
Thongharb (north)	65 HP*2	50	65 HP*2			
Sub-total		50			137	
Thongharb(south)	65 HP*2	30	65 HP*2		30	Existing
Total		80			167	

The planned area of 137 ha should be allocated among the five villages, based on past irrigation experience and maintenance of pumps. Adjustment of irrigation area should be conducted through cooperation among the water users groups of each village. TFT should support the water users groups' activities and give information on irrigation area limitation.

(iii) Construction of weir

To secure stable pumping, small weir should be constructed. It serves as the facility for attaining constant water level. The structure should be designed considering flood occurrence and technical management level of farmers. From the maximum discharge, design discharge is assumed at 120 m^3/s.

Establishment of water users group

Village-based water users group (WUG) who should deal with allocation of water use and adjustment of irrigation area in the Nam Dua river basin, should be organized based on the pump stations of villages. As mentioned in the present conditions, one WUG has been organized in the Thongharb village, whose work is only on operating the pumps, while no organization exists in the other villages. In the irrigation scheme, WUGs should serve as leader in the villages and coordinator among the villages to discuss the operation time of pump and the size of cropping area. Organization structure of WUG will be formed along irrigation block in the canal system. Unit of the irrigation block will basically consist of 5 to 10 farm households, considering the expected operation and management activities in the block. Water management activities such as purchase of diesel and maintenance of canal will be assigned to each block according to the instruction of WUG. Formation and regulation of WUG should be discussed through democratic procedure under farmer participation. Through the discussion, duty, role and organization structure of WUG will be defined through mutual understanding. In the discussion, TFT should provide useful information related to the performance of other WUG with diesel pump so that villagers can reflect such information into the organizing work. The duties and roles of WUG will be as follows.

- Operation and maintenance of pump facilities (purchase/storage/supply of diesel, regular check-up and repair)
- Provision and maintenance of pump station (repair of river slope, removal of sediments)
- Maintenance of canal (cleaning and reshaping of eroded slope, weeding)
- Adjustment of water use (operating time of pump in each village, size of cropping area, timing of land preparation)
- Monitoring of pump operation in each station, adjustment of rotation irrigation time
- Collection of O/M fee from farmer-beneficiaries and instruction of pump operation with diesel supply
- Arrangement of water allocation along the canal to secure equal water distribution among the field plots
- Technical training to farmers to prevent water distribution loss, encouragement of plot-to-plot irrigation to feeder canal irrigation system
- Monitoring of shifting cultivation in the watershed and propagation of watershed conservation schemes.

Expected technical support by TFT

The works for construction of irrigation system, establishment of WUG and propagation of water management sense, should be supported by TFT in terms of:

- Coordination with agencies concerned for serous works from detailed design up to construction for weir
- Technical guidance for operation and maintenance of diesel pump
- Technical guidance for management, repair, reshaping of irrigation canal
- Technical guidance for the prevention of water loss at on-farm and intake level
- Training to foster water conservation concept

Input

(a) Construction cost

Construction cost of weir at Thongharb is approximately US$ 287,000 in case of a low height fixed weir. In the concept of IMT, some portions, about 20% of the construction cost, is supposed to be paid back to the Government through WUG.

(b) Operation and maintenance cost

According to the interview survey on operation of diesel engine pump, diesel consumption is roughly calculated at 150 to 200 l/s/ha for dry season rice cultivation. Maintenance cost is also assumed at 5,000 to 6,000 kips/ha judging from past expenditure pattern for the operation and maintenance of pump irrigation area. Amount of O/M cost to be charged for each farmer, should be discussed under farmer participation and be decided through transparent democratic procedure. Established WUG should serve as the core to conduct the discussions and get mutual consent in the WUG.

(c) Strengthening of SMS and TFT

TFT should play an important role to introduce and manage the diesel pump irrigation system to each village. To secure sustainable irrigation effects under a limited water resources, TFT will serve as guide or coordinator with agencies concerned. Considering the present engineering capacity of TFT, upgrading seems inevitable so that TFT can serve to provide adequate technical support for WUG. Considering the local problems of the model area, requirement for engineering capability to deal with adjustment of water allocation and training for water management in the limited water resources, will be emphasized. To upgrade the present capacity of TFT, SMS who checks and supports engineering activities of TFT, will be also trained as engineering adviser and trainer to TFT. Training program to strengthen the technical capability of SMS and TFT, should be elaborated considering the physical and social constraints in the areas as well as engineering requirements for O/M methods of diesel pump.

Support system to WUG should be established through the implementation of a training program. Considering the present engineering capacity and financial limitation of DOI, however, training program should be supported by well-versed engineers. Expected engineering fields for training include pump irrigation planning, operation and maintenance of pump facilities, on-farm water management and trainer for organizing farmers, etc.

(d) Rural Infrastructure

For future agricultural promotion, improvement of rural road network will be required. As such the proposed development plan for the model area would take into consideration the basic infrastructure for agricultural and rural development.

Based on existing classification standards of rural road, two (2) trunk roads as the main rural road and lateral road as the secondary rural road, should be defined, with the required effective width of 5.0 m and 4.0 m, respectively. If the rural road is constructed as an all-year-round trafficable road, although it is considered as advanced plan under the present condition, safe and smooth drive can be assured for rural people. In addition, this rural road network will facilitate the construction of domestic water supply line and the electric service line.

(i) For the first group of villages: Nahin, Nakhua-Nai and Nakhua-Nok
The present roads and rut/foot path/walk-ways should be improved under the comprehensive development idea of small-scale rural road network, to ensure safe and smooth traffic for various activities within and among the villages. The main rural road should be improved by gravel pavement in all section of the existing one. Present footpaths in the forest and paddy fields should be improved as secondary rural road connecting with the main rural road.

(ii) For the second group of villages: Nam Dua and Thongharb
Thongharb village will be connected directly to the road No.13 through the paddy fields with crossing Nam Dua as a new weir-bridge. To reduce the construction cost, banking height on the existing paddy field should be set at 0.50m above the range of annual highest flooding level.

Based on the above consideration, rural road development plan is compiled as follows.

Rural Road Development Plan

Arrangement Item	Village Name	Road type	Road Length L (m)	Road width BR (m)	New Improvement
1st group	Nahin	Trunk	1,500	5.00	Improvement-G
	Nakhua-Nai	Trunk	400	5.00	Improvement-G
	Nakhua-Nok	Trunk	1,100	5.00	Improvement-G
	Nahin	Lateral	400	4.00	New
	Nakhua-Nai	Lateral	1,700	4.00	Improvement-A
	Nakhua-Nok	Lateral	1,500	4.00	Improvement-A
	Nakhua-Nok	Lateral	200	4.00	New
Total of 1st group	3 villages	--------	6,800	5.00 & 4.00	----------
2nd group	Thongharb	Lateral	1,200	4.00	New
	Thongharb	Lateral	1,500	4.00	Improvement-A
Total of New	2 villages	Lateral	1,800	4.00	New
Total of Imp.-A	3 villages	Lateral	4,700	4.00	Improvement-A
Total of Imp.-G	3 villages	Trunk	3,000	5.00	Improvement-G
Grand Total	4 villages	T / L	9,500	5.00 & 4.00	New / Imp.-A,-G

Note: New = new construction of rural road, Improvement-A = improvement of all the part of rural road

Improvement-G = improvement of the only gravel pavement of the surface for rural road

Bridge (Box culvert and pipe)

Item	Village	Pipe Type	Box Type	Length (m)	Quantity	Total Length (m)
Drainage pipe	Nahin	P-1	-----	7.00	1	7.00
- ditto -	Nahin	P-2	-----	8.00	3	24.00
- ditto -	Nakhua-Nai	P-1	-----	7.00	5	35.00
- ditto -	Nakhua-Nok	P-1	-----	7.00	6	42.00
		P-1	-----	7.00	12	84.00
Sub Total-1	3 villages	P-2	-----	8.00	3	24.00
Drainage pipe	Thongharb	P-1		7.00	8	56.00
Sub Total-2	1 village	P-1	-----	7.00	8	56.00
				7.00	20	140.00
Grand Total	4 villages	P-1		8.00	3	24.00
		P-2	None		23	164.00

Note: Bridge (Pipe Type) P-1 : D = (600 mm)×1 piece, P-2 : D = (600 mm)×2 pieces

(2) Vangkhong Area

(a) Irrigation Development

Irrigation development area

The water resources of Hinboun river is abundant however, the expanse of irrigation development area is dependent on pump capacity, route of irrigation canal, topography of the fields and water management method. Since most of the planned irrigation area is covered with shrubs, land opening would be the first requirement for the villagers.

. In setting the development target irrigation, development area is estimated theoretically from water requirement and pump capacity.

(i) Diversion requirement

Water requirement is calculated using the same method as in Thongharb model area. The basic data such as percolation rate, puddle water and nursery area employed for Thongharb are also applied. Potential evapo-transpiration and effective rainfall are calculated by using collected meteorological data.

Based on the basic data, net water requirement of dry paddy is calculated on a monthly basis, as follows.

Season	Net water requirement	Peak month
Dry paddy	1.97 – 0.61 l/s/ha	1.97 l/s/ha (Mar.)

Irrigation efficiency of 60 % is applied, and peak diversion requirement is calculated at 3.227 l/s/ha

(ii) Pump capacity

Planned area is conservatively estimated as follows, based on pump capacity and irrigable area of each pump site.

Pump	Capacity (l/s)	Irrigable Area (ha)	Planning Area
37 kw×1	0.14～0.07	43～22	30
75 kw×1	0.29～0.15	88～44	60

Note: Head=15～30m. Irrigable area is based on the diversion water requirement q=3.277 l/s/ha.

Since two units of 75 kw pump are already installed, the maximum planned irrigation area can be set at 120 ha from pump engineering viewpoint.

(iii) Topographic constraint and irrigation development area

According to the spot elevation survey, the planned irrigation area slopes gently down to the bank of Hinboun river. Since the diversion pond of pump station is constructed in low elevated land and the route of the constructed canal also runs through the low-lying land, the irrigable area with the present canal system is limited. It might be necessary to relocate the pump to a higher land so that it can be used to irrigate an additional number of fields.

Considering such topographic constraint, the irrigable area of the present setting is roughly estimated as follows.

- Under the present main canal system ---------- 10 ha
- Under the extension of present main canal ---- 18 ha

If the irrigation target is planned to be more than 18 ha, costly investment such as introduction of portable pump and new construction of pump station will be needed.

Irrigation system development

According to the PCM workshop, the villagers envisaged an irrigation area of 60 ha as one of the development indicators. Considering the present social and physical conditions, they will face many technical and financial difficulties in attaining this target area under the present pump and canal settings. As mentioned above, irrigation development area will be very much limited under the present pump system.

Considering such conditions, the basic irrigation development direction is considered as follows.

- As an initial development stage, the target area is planned at 10 ha along the present canal. For this target water management group can be organized. After organization, water users group will have to learn about pump irrigation method through the various management activities in the direction of IMT. Since the present pump capacity is more than sufficient to provide irrigation to the initial target area (10 ha), the present pump equipment can be replaced by a smaller one especially if operation and maintenance cost becomes too much of a burden for the villagers.

- In the next stage, the irrigation area can be extended about 18 ha. To extend the area, additional canal will have to be constructed by the villagers themselves under the technical support from TFT.

- If villagers plan to extend the irrigation area to the final target of 60 ha, the following alternatives could be considered.

- To irrigate the higher elevation land, portable pumps will have to be introduced to lift water from the present canal – secondary lifting.

- To irrigate the whole target area (60 ha), the present pump station will have to be relocated from the present site to other site with high elevation enough to cover the target area as a whole. Delivery and irrigation canals for the new site must also be constructed.

The economic viability of their plans is summarized as follows.

Plan (1): Secondary lifting (Existing + booster pump)

Plan (2): Relocation of pump station (Existing + removal of pipe)

Estimate of construction cost（US$）

Plan	Existing station	Booster pump	Relocation	Total	Repayment to government
Plan(1)	115,800	13,000	-	128,800	18,700
Plan(2)	115,800	-	46,500	162,300	24,300

Note : Repayment to government is based on IMT, 15% for electrical and 10% for diesel engine pumps, for 10 years.

Approximated Annual O/M cost（million kip）

Plan	Repayment to Government	Electrical consumption	Diesel consumption	Total
Plan (1)	14.4	4.0	17.5	35.9
Plan (2)	18.2	4.0	-	22.2

Note ：Electricity 54 kip/kwh. Diesel 2000 kip/l.

Establishment of water users group

Water users group (WUG) should be organized to operate and maintain the constructed pump irrigation system. Following the participatory approach, formation of WUG should be made in a democratic process. From the engineering management aspect of WUG, it will be planned that O/M unit should be formed along the canal. In this plan, minimum size of the O/M unit will be about 5-10 households for average area of 10 ha, considering the management tasks of collection of irrigation service fee and mobilizing labor resources of farmers for O/M works. The organization of WUG will actually be formed through the discussion on the responsibilities and functions of O/M unit. Considering the final irrigation target 60 ha and the present household population of 47, the number of O/M units will be assumed from 5 to 9. In the organization structure of WUG, some engineering sections such as canal management, pump operation, finance for collection and management of irrigation service fee will be involved. Actual organizing work will be technically supported by TFT. As such, TFT should provide the necessary information on O/M activities of electric pump irrigation system so that the farmers can understand the scope of O/M works and organize themselves into WUG. For this, the TFT can generate the data and information from the past performance of other electric pump irrigation area. Expected duties and roles of WUG will be considered as follows.

- Operation and maintenance of pump facilities such as regular check, repair and spare-part replacement and environmental improvement around pump station
- Operation and management of pump in the irrigation season
- Maintenance of canals such as cleaning and reshaping of eroded slope and weeding
- Collection and application of irrigation service fee and other necessary O/M cost
- Monitoring of pump operation and execution of rotation irrigation
- Arrangement of water allocation time along the canal to ensure equal water distribution in the fields
- Coordination work for mobilizing labor resources for small scale O/M work
- Compilation of O/M cost and irrigation area, calculation of irrigation service fee

Expected technical support from TFT

- Provision of technical information on development alternatives, explanation and discussion with farmers on these alternatives
- Coordination work for fund arrangement and repayment schedule for land opening work
- Training activities for minimizing water distribution loss in newly reclaimed farm plots
- Technical guidance on regular check, repair, replacement of spare-parts of pump facilities
- Technical guidance on operation and maintenance method of pump
- Technical guidance on simple trouble-shooting of pump operation
- Technical guidance on maintenance of canal such as repair, reshaping and weeding
- Technical guidance on improvement of irrigation efficiency

Input

(i) Construction cost

Construction cost of the existing pump station was approximately US$ 115,800. As for the alternatives, construction cost for relocating the pump station is estimated at US$46,500 while land opening and canal construction cost is US$43,000.

(ii) Operation and maintenance cost

The established WUG will collect O/M fees from the members of WUG after harvesting. The amount will be determined in terms of harvested rice or cash. Although the assigned O/M fee will be based on the size of irrigated area or the number of beneficial farm households, it should be discussed with the participation of beneficial farmers. However, the TFT should prepare some information on expected O/M cost so that WUG can discuss the O/M fee to be charged on each farmer. Past expenditure for O/M activities in similar electric pump irrigation area could be presented in the discussion. According to the example compiled from other pumping projects, O/M cost has been changed year by year due to the timing of repair and replace of spare-parts and rise in electric charge. In this example, O/M cost except for administration fee and electric charge was estimated from 5,000 to 6,000 kips/ha/year. For O/M work, small-scale earthwork of canal and land reclamation should be generally executed by labor contribution from beneficial farmers

(iii) Strengthening of SMS and TFT

Considering the engineering gaps between the present and the expected levels to cope with

technical support activities required, the engineering capability of TFT staff who will serve as the coordinator and interface between development agencies concerned and villagers, should be strengthened. To foster the engineering sense of TFT staff, engineering capacity of SMS who is tasked to check the local engineering problems with TFT and serves as trainer to TFT, should be also upgraded. To secure sustainable benefits from the pump, the TFT should provide engineering advice and adequate coordination with SMS for WUG. Considering the present technical and financial limitation of DOI, technical assistance from foreign development agencies may be required to upgrade the engineering capability of SMS and TFT. Engineering fields programmed for training includes pump irrigation method, operation and maintenance method of pump facilities, canal system planning, on-farm water management and training for organizing farmers, etc.

(b) Rural Infrastructure

For agricultural and rural development, road improvement is the key to secure the safe and pleasant life for settlement people. Rural road development plan should be strongly promoted as a basic requirement.

If the rural road is fully developed as an all-year-round trafficable road, safe and smooth drive can be assured for villagers.

The basic development idea of road classification is the same as the Thongharb. As the result, trunk road and lateral road are planned with an effective width of 5.00m and 4.00m, respectively. The main rural road in the Vangkhong should be improved by gravel pavement in all parts and should be connected with the new secondary rural road constructed in the area. Considering the construction cost, banking height of the road on the existing paddy field should be set at 0.50m as well as in Thongharb. Development plan is shown as follows:

Rural Road Development Plan

Arrangement Item	Village Name	Road type	Road Length L (m)	Road width BR (m)	New Improvement
Rural Road	Vangkhong	Trunk	150	5.00	Improvement-G
		Lateral	400	4.00	New
		Lateral	350	4.00	New
		Lateral	800	4.00	New
		Lateral	700	4.00	New
Total of New	1 village	Lateral	2,250	4.00	New
Total of Imp.-G		Trunk	150	5.00	Improvement-G
Grand Total	1 village	T / L	2,400	5.00 and 4.00	New / Imp.-G

Note: New = new construction of rural road

Improvement-G = improvement of the only gravel pavement of the surface for rural road

Bridge (Box culvert and pipe)

Item	Village	Pipe	Box	Length (m)	Quantity	Total Length (m)
Drainage pipe	Vangkhong	P-1	-----	7.00	5	35.00
Drainage box	Vangkhong	-----	B-13	7.00	2	14.00
- ditto -	Vangkhong	-----	B-23	7.00	2	1400
Total	1 village	1	2	7.00	9	63.00

Note : Bridge (Pipe Type) P-1 : D =(600 mm)×1 piece

Bridge(Box Type) B-13 : (H0*B0)=(1.50m*1.50m)×3 pieces, B-23 : (H0*B0)=(2.00m*2.00m)×3 pieces

(3) Phonthan Area

(a) Irrigation Development

Basic concept of irrigation development

According to the PCM, 100 ha of irrigation area in dry season and 200 ha of supplementary irrigation area in wet season are considered as two important development indicators. To attain such development indicators, the present irrigation infrastructures should be rehabilitated, and after rehabilitation it should be managed well. Since the present pond is the only water resource, upgrading the storage capacity is the basic need for irrigation development. In parallel with upgrading the pond, canal network should be also reconstructed to cover the target irrigation fields. Water users group should also be organized in each village to operate and maintain the upgraded pond and the constructed canal system.

Considering such basic development direction, the possibility of extending dry season irrigation area through upgrading of pond capacity was first studied based on the hydrological and topographical constraints.

Rehabilitation plan of the pond

(i) Calculation of water requirement

Water requirement is calculated using the same method for Thongharb. Potential evapo-transpiration and effective rainfall and other demand were also estimated. As a result, diversion water requirement was calculated as follows.

Season	Net water requirement	Peak diversion water requirement	
		Efficiency=60%	Efficiency=70%
Dry paddy	2.07 – 0.12 l/s/ha	3.45 l/s/ha	2.96 l/s/ha
Wet paddy	1.41 – 0.15 l/s/ha	2.35 l/s/ha	2.01 l/s/ha

(ii) Available discharge from the basin

Inflow from the basin to the pond was calculated on a monthly basis as mentioned in 5.1.6. In estimating the available discharge, the amount of base flow was considered. This is the amount to be released for downstream water users and environment conservation. In the study, a discharge of 0.055 m3/s was applied by considering the past minimum discharge assumed

from the specific discharge. As a result, available discharge at the pond was calculated as follows.

Available Discharge at the Pond (m^3/s)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	A.V.
0.229	0.168	0.150	0.132	0.363	0.670	0.926	2.123	1.624	2.121	0.731	0.438	0.808

Discharge of November and December after harvesting is great enough to fill up the pond.

(iii) Water balance study of pond

To calculate the irrigable area, a rough water balance study is conducted based on the storage capacity of pond and diversion requirement of the fields.

- Case study based on the present storage capacity: As the first step, the size of irrigable area is calculated using the present storage capacity as basis. To calculate the area, water balance study is conducted by applying the present effective capacity of 320,000 m^3 and the water requirement of irrigation efficiency 60 %. As a result, the irrigable area is estimated to be 65 ha. Compared with the estimated area, the present irrigated area - 40 ha - still have same room for improvement. If the present canal system is improved systematically and water distribution is well managed, irrigation area can be extended to more than the present acreage.

- Case study of upgrading storage capacity: If the storage capacity is upgraded, the irrigable area can be increased. The relation between irrigable area and storage capacity is examined through the rough water balance analysis. Before analysis, the relation between crest height and storage capacity was estimated based on the spot elevation survey. Storage capacity can be increased with raising the crest height. The size of irrigable area is then examined for few cases of storage capacity with increased crest height. On the other hand, the possibility of raising crest height was studied considering the topographic constraints of surrounding land and engineering limitation. As a result, crest height can be raised up to maximum 1.0 m above the present lowest level. With the reshaping of crest, storage capacity will come up to about 725,400 m^3.

(iv) Rehabilitation plan of pond

To increase the storage capacity, the present pond facilities such as spillway and slope should be rehabilitated using the following design.

Rehabilitation Plan of the Pond

Item	Design	Remark
Pond crest elevation	EL. 147.0 m	
Crest width	3.0 m	
Crest length	550 m	
Slope (downstream)	1 : 2.5	
Pond capacity	936,200 m^3	
Effective pond capacity	725,400 m^3	
Design flood	25.2 m^3/s	
Water level of design flood	EL. 146.0 m	
Full pond water level	EL. 145.5 m	

Note: Elevation (EL) is based on the temporary benchmark set by the JICA Study Team.

Irrigation area

With the improvement of the pond, the effective capacity will increase to 725,400 m^3. As a result of the water balance study, the irrigable area in the case of 70% efficiency can be extended up to about 90 ha. Although this calculation is based on some assumptions, the calculated size of area is still less than the PCM target. Hence, it can be said that to attain the development target of villages, improvement of irrigation efficiency through well-managed on-farm water management is needed.

Irrigation system development

Judging from the topo-condition of agricultural land to extend the irrigation area, canal network should be reconstructed based on the ground height of each field. Route and diversion of the canal system should be discussed and designed on the map under the technical support of TFT.

Establishment of water users group

Water users group (WUG) should be organized in the three villages. Formation of WUG will be considered on the newly constructed canal and the present irrigated plots. Irrigation block will be considered as the minimum operation and management unit of WUG. Assuming the size of land holding of farm household, as an example, one block will be include of 5-10 farm households or an average of 10-15 ha. The organization will be formed with several irrigation management blocks and some engineering aspects such as water allocation, canal management, intake gate operator and maintenance of pond. The formation will be elaborated following a democratic process through discussion and mutual understanding on the functions of WUG. The TFT should provide the necessary information so that the farmers can appreciate the formation of WUG. The expected roles and duties of WUG will be as follows.

- Check and repair of irrigation pond (slope, spillway, weeding and vegetation, removal of sedimentation)
- Operation and maintenance of intake gate for equal water distribution to the field plots
- Cleaning of canal, restoration of damaged irrigation canal and road

- Monitoring of water distribution along the canal, training for the prevention of water distribution loss
- Adjustment of water allocation among farmers to ensure equal water distribution
- Coordination work of labor contribution for maintenance work of irrigation pond
- Collection of O/M fee from beneficial farmers and management of them
- Monitoring the land use change of the watershed and fostering common sense of water conservation and basin management

Expected technical support from TFT

Following the participatory approach, the farmers are expected to execute rehabilitation of pond and construction of canal system. Hence, technical support from TFT to WUG will be needed in the following subjects.

- Coordination among agencies concerned and the farmers for the rehabilitation of pond from detailed design up to construction.
- Technical guidance on planning and construction of canal system
- Technical guidance on water allocation method from intake to on-farm distribution
- Technical guidance on check and repair of irrigation facilities
- Technical guidance on improvement of irrigation efficiency
- Technical support to establish and manage WUG

Input

(i) Construction cost

The required cost for the rehabilitation of pond and construction of canal is estimated at US$ 130,000. According to the guidelines of IMT, some portions of the cost should be paid back to the government. In the case of irrigation pond, it is set at 20 %, so that about US$22,200 will be considered as repayment to the government.

(ii) Operation and maintenance cost

The established WUG will collect the O/M fee from beneficial farmers. The amount may be determined based on the irrigated size or the number of beneficial farmers. It will be collected in cash or rice after dry season harvesting. The fee to be collected from each farmer should be discussed in the WUG and be decided under mutual consent among farmers. To the support

discussion and decision-making. TFT should prepare necessary data and information of O/M expenditure obtained from the other similar irrigation area with pond. In the guideline of IMT, for example, 80 kg/ha is set as O/M fee in case of electric pump scheme. In another example of electric pump irrigation area, O/M cost of canal, US$1.0/ha was roughly estimated. Small-scale earthwork for O/M should be generally executed through labor contribution of beneficial farmers

(iii) Strengthening of SMS and TFT

The TFT should play the important role as coordinator among agencies concerned and farmers to execute the irrigation development plan mentioned above. However, considering the engineering gaps between present and expected levels of TFT, capacity for engineering of TFT should be upgraded especially in such activities as canal system planning and gravity irrigation management method with pond. On the other hand, during the project implementation stage, SMS will serve as inspector or adviser to TFT in engineering fields such as rehabilitation of pond, construction of canal system and O/M. Considering the engineering staff constraints in the PAFSO/DAFSO, the engineering capacity of SMS will also be upgraded. Under the present technical and financial limitation of DOI, some well-versed experts hired from engineering development institutions, may be required to train the staff of SMS and TFT. Envisaged engineering fields for training activities may include engineering works such as detail design, construction, irrigation planning, facility design, cost estimate, supervise of construction work, on-farm water management and training for organizing WUG, etc.

(b) Rural Infrastructure

Improvement of rural road is the basic need for rural people for the effective implementation of agricultural activities and promotion of safe rural life. Hence, the rural road development plan in this model area will be considered as a significant model to attain the development target which is almost the same as the other two model areas.

The road is classified into two types, trunk road (main rural road) and lateral road (secondary rural road), with the effective road width of 5.0 m and 4.0m. The rural roads between Nakham and the pond passing through Phonthan village should be improved, by extending to the next village B Nake, as the key route for various agricultural and rural activities.

The main rural road should be improved by gravel pavement in whole sections. Roads with narrow road-width in the forests should be also improved as the secondary rural road connecting with the main rural road in Phonthan. Banking height on the paddy field is planned at 0.5 m above the range of flooding level.

Based on the present road conditions, the proposed development plan is summarized as follows.

Rural Road Development Plan

Arrangement Item	Village Name	Road type	Road Length L (m)	Road width BR (m)	New Improvement
Rural Road	Nakham –	Trunk	1,200	5.00	Improvement-G
	Phonthan	Trunk	200	5.00	Improvement-G
	Phonthan	Trunk	300	5.00	Improvement-A
	Phonthan	Lateral	500	4.00	Improvement-A
	Phonthan	Lateral	700	4.00	Improvement-A
	Phonthan	Lateral	300	4.00	Improvement-G
	Phonthan	Lateral	1,000	4.00	Improvement-A
	Phonthan – Nake				
Total of Imp.-G	3 villages	Trunk	1,400	5.00	Improvement-G
		Lateral	300	4.00	Improvement-A
Total of Imp.-A		Trunk	300	5.00	Improvement-G
		Lateral	2,200	4.00	Improvement-A
Grand Total	3 villages	T / L	4,200	5.00 & 4.00	Imp.-A / Imp.-G

Note: Improvement-A = improvement of all the part of rural road

Improvement-G = improvement of the only gravel pavement of the surface for rural road

Bridge (Box culvert and pipe)

Item	Village	Pipe	Box	Length (m)	Quantity	Total Length (m)
Drainage pipe	Phonthan	P-1	-----	7.00	6	42.00
- ditto -	Phonthan	P-1	-----	8.00	2	16.00
- ditto-	Phonthan	P-23	-----	8.00	1	8.00
Drainage box	Phonthan	-----	B-4	8.00	2	16.00
Total	1 village	3	1	8.00 , 7.00	11	82.00

Note : Bridge (Pipe Type) P-1 : D =(600 mm)×1 piece, P-23 : D=(1,000 mm)×4 pieces
Bridge (Box Type) B-4 : (H0*B0)=(1.00m*1.00m)×4 pieces
(To make the well wall of reinforcement by concrete structures: 1 Box Culvert =2.00m*2.00m, L=1.00m),
(To construct the wooden bridge between the well and the reservoir dike: 1 wooden bridge, L=10.00m)

4.5 Environmental Consideration

4.5.1 Thongharb-Nakhua Area

(1) Environmental Conservation

Since the health programs (RDF and IBN) are being planned or will be conducted in the model areas, no special development plan is incorporated into the project components except for the introduction of the IPM program and proper water management.

(2) Environmental Screening and Scoping

Environmental screening and scoping was undertaken to identify and assess the potential adverse impacts of each project on the environment. The following box shows the results of the screening and scoping, and the potential impacts are explained in the following sections.

Positive Impacts:	1. Increase of farm income (+++)
	2. Increase regional economic benefit (++)
	3. Reduction of shifting cultivation (++)
	4. Poverty alleviation (++ - +++)
Negative Impacts:	1. Conflict among communities (+)
	2. Effects on income sources due to agrochemical use (+)
	3. Contamination of groundwater (+)
	4. Health hazard (+)

Remarks: Significance of impact: (+) : minor, (++) : moderate, (+++) : major

(3) Positive Impacts

Items	Summary
a) Impact on Farm Economy	Farm income will directly increase through stabilization of paddy production and improvement of marketing system. Promoting cash crop production will also contribute to stabilization of farm economy.
b) Impact on Regional Economy	The project works will generate incremental employment of casual labors at the construction stage, though not permanently. In addition, the increase in agricultural production will increase economic activities in other sectors through linkage effect.
c) Poverty Alleviation	Since the project aims to stabilize the paddy production in the sites, the food shortage will be reduced, and the poverty situation in the area will eventually be alleviated.
d) Reduction of Shifting Cultivation	Villagers in B. Nam Dua are presently engaged in operating shifting cultivation because they do not have enough paddy fields. Although the irrigation development of B. Nam Dua may not be implemented in the course of the project, the outputs of the project will contribute to promoting the new irrigation scheme and leading it to its success. Furthermore, the TFT to be organized and trained in the project will also bring proper extension services.

(4) Negative Impacts and Mitigation Measures

(a) Conflicts among Communities

Since several (5 or 6) pump stations are located in Nam Dua river basin, the significant attention should be paid on the distribution of water. Water discharge of Nam Dua river and its tributary (H. Maxai) is not considered abundant for irrigating all the paddy fields in the area during dry season. However, the main theme of the project in Nam Dua River Basin is to establish a model for proper water management in a river basin. Therefore, unequal water distribution will be minimized.

(b) Adverse Effects on income sources due to Agrochemical Use

Through the introduction of irrigated farming, the farmers will employ intensive farming practices with periodical pesticide use. Since the IPM method will be a key component of the extension work of TFT, the adverse effects caused by agrochemical use will be minimized. However, the effects on frogs and

crickets may be unavoidable. The villagers in the area significantly depend on frogs and crickets for other income and food sources in rainy season.

Although it is considered that the reduction of frogs and crickets in fields are reasonable trade-off with stabilization of farm income through increase of paddy production, the following recommendations are considered in order to minimize the negative impact on farm economy.

1. to put emphasis on the preventive measures rather than curative measures
2. to utilize products (agrochemical) that are less effective to aquatics
3. to minimize frequency of application and to promote most effective dosage
4. to use natural pesticides, such as extracts from botanical pesticides

(c) Pollution of Groundwater

Intensive farming and cash crop farming will be introduced in the model area. It is therefore considered that dosage and frequency of agro-inputs application may also increase. Since environmental-friendly agriculture and introduction of IPM are the main concepts of the project, the possibility of contamination by agro-inputs in groundwater is considered less. However, periodic monitoring work is required to avoid any incidental adverse effects.

(d) Health Hazard

The farmers in the area are not familiar with the use of agro-chemicals. Along with the expansion of dry season irrigated fields, especially for cash crops field, the possibility of mishandling and improper application of agrochemical will increase. It is, therefore, essential that extension work should be closely supervised by the proposed TFT and the technique and knowledge on agrochemical application should be taught and instilled into the farmers in the area.

4.5.2 Vangkhong Area

(1) Component on Environmental Conservation

(a) Outline of components

As components of environmental conservation, the IBN and RDF programs are introduced in the project, in addition to the introduction of basic concepts of IPM program and environmental friendly agriculture. The outlines of both programs are summarized as follows:

Program	Item	Quantity
IBN	Mosquito net	100 net
	Insecticide	3 lit.
	Dipping set	1 set
RDF	Medicine	1 set
	Shelf	1 box

(b) Estimated Project Cost

Actual activity and management of the health programs will be done by the Provincial/District Public Health Service Office. However, the initial cost for the programs shall be borne by the project. The project cost is estimated at about US$ 850 as shown below.

Program	Items of expense	Cost (USD)
IBN in Vangkhong	Direct cost	591
	Indirect cost	24
	Total	615
RDF in Vangkhong	Direct cost	228
	Indirect cost	6
	Total	234
Ground Total		849

Source: Provincial Public Health Service Office

The costs for IBN programs were estimated in a conservative manner where estimation was done under the assumption that all of the villagers would require new mosquito net. However, if they already have their own nets, the cost for IBN program could be reduced.

(2) Environmental Screening and Scoping

Environmental screening and scoping were undertaken to identify and assess the potential adverse impacts of the project on the environment. The following box shows the results of the screening and scoping, and the potential impacts are explained in the following sections.

Positive Impacts:	1. Increase of farm income (+++)
	2. Increase regional economic benefit (++)
	3. Poverty alleviation (++ - +++)
Negative Impacts:	1. Effects on income sources due to agrochemical use (+)
	2. Contamination of groundwater (+)

Remarks : Significance of impact: (+) : minor, (++) : moderate, (+++) : major

(3) Positive Impacts

Items	Summary
a) Impact on Farm Economy	Farm income will directly increase through stabilization of paddy production and improvement of marketing system. Promoting cash crop production will also contribute to stabilization of farm economy.
b) Impact on Regional Economy	The project works will generate incremental employment of casual labors at the construction stage, though not permanently. In addition, the increase in agricultural production will increase economic activities in other sectors through linkage effect.
c) Poverty Alleviation	Since the project aims to stabilize the paddy production in the sites, the food shortage will be reduced, and the poverty in the area will be eventually alleviated.

(4) Negative Impacts and Mitigation Measures

(a) Adverse Effects on income source due to Agrochemical Use

Through the introduction of irrigated farming, the farmers will employ intensive farming practices with periodical pesticide use. Since the IPM method will be a key component of the extension work of TFT, the adverse effects caused by agrochemical use will be minimal. However, the effects on frogs and crickets can be unavoidable. The villagers in the area significantly depend on frogs and crickets for other income and food source in the rainy season.

Although the reduction of frog and cricket in fields are the reasonable trade-off with stabilization of farm income through increase of paddy production, the following recommendations are considered in order to minimize the negative impact on farm economy.

i) to put emphasis on the preventive measures rather than curative measures
ii) to utilize products (agrochemical) that are less detrimental to aquatics
iii) to minimize frequency of application and to promote most effective dosage
iv) to use natural pesticides, such as extracts from botanical pesticides

(b) Pollution of Groundwater

Through the project, intensive farming and/or cash crop farming will be introduced in the model area. It is considered, therefore, that the dosage and frequency of agro-inputs application may also increase. Since environmental-friendly agriculture and introduction of IPM are the main concepts of the project, the possibility of contamination by agro-inputs in groundwater is considered less. However, periodic monitoring work is required to avoid any incidental adverse effects.

(c) Health Hazard

As mentioned above, the farmers in the area are not familiar with usage of agrochemicals. Along with the expansion of dry season irrigated fields the possibility of mishandling and improper application of

agrochemical will increase. It is, therefore, essential that extension work should be closely supervised by the proposed TFT and the technique and knowledge of agrochemical application should be taught and instilled into the farmers in the area.

4.5.3 Phonthan Area

(1) Component on Environmental Conservation

(a) Outline of components

As the development component of environmental conservation, the IBN program is introduced in the project. The outline is summarized as follows.

Program	Items	Quantity
IBN	Mosquito net	800 net
	Insecticide	27 lit.
	Dipping Set	3 sets

(b) Estimated Project Cost

Actual activities and management of the health program will be undertaken by the Provincial / District Public Health Service Offices. However, the initial cost for the program shall be borne by the project. The project cost is estimated at about US$ 4,000.

Program	Items of expense	Cost (USD)
IBN in three villages	Direct cost	3,995
	Indirect cost	43
	Total	4,038

Source: Provincial Public Health Service Offices

The costs for IBN programs were estimated conservatively under the assumption that all of the villagers would require new mosquito net. However, they already own nets, the cost for IBN program would be reduced.

(2) Environmental Screening and Scoping

Environmental screening and scoping was undertaken to identify and assess the potential adverse impacts of each project on the environment. The following box shows the results of the screening and scoping, and the potential impacts are explained in the following sections.

Positive Impacts:	1. Increase of farm income (+++)
	2. Increase regional economic benefit (++)
	3. Poverty alleviation (++ - +++)
Negative Impacts:	1. Conflict among villagers in B Phonthan and communities (++)
	2. Rising water level in the reservoir (+ - ++)
	3. Contamination of groundwater (+ - ++)
	4. Health hazard (+)

Remarks Significance of impact: (+) : minor, (++) : moderate, (+++) : major

(3) Positive Impacts

Items	Summary
a) Impact on Farm Economy	Farm income will directly increase through stabilization of paddy production and improvement of marketing system. Promoting cash crop production will also contribute to stabilization of farm economy.
b) Impact on Regional Economy	The project works will generate incremental employment of casual labors at the construction stage, though not permanently. In addition, the increase in agricultural production will increase economic activities in other sectors through linkage effect.
c) Poverty Alleviation	Since the project aims to stabilize the paddy production in the sites, the food shortage will be reduced, and the poverty in the area will be eventually alleviated.

(4) Negative Impacts and Mitigation Measures

(a) Conflicts among Communities

Some of the villagers are discontented with the present situation in which irrigation benefit is enjoyed only by some 'privileged' beneficiaries. One of the reasons of discontent is that decision-making regarding water use is solely the 'right' of the villagers in B Phonthan.

The benefited area will be extended and the number of beneficiaries will increase through the implementation of the project. However, attention should be paid to equitable benefit distribution and decision-making through full-consensus of all the beneficiaries in order to avoid future social conflicts. The following options should be considered.

(i) Restructuring WUG and sharing the dry season irrigated fields

(ii) Restructuring WUG and introduction of crop rotation system

(b) Adverse Effects caused by Rising Water Level in the Reservoir

By raising the water level of the reservoir, several adverse effects are predicted as described below. Since the extent of submergence is not clear at this stage only qualitative assessment is emphasized.

(i) Submergence of the existing paddy fields located in upper reach of the reservoir

It is projected that some of the paddy fields will be submerged because of rising water level. The value of the land is estimated at about 0.75 ton of paddy per ha as shown below.

Basis of Estimation	Summary
Cropping pattern :	Lowland rice (rainfed) – fallow
Average yields:	0.74 ton/ha

The land users in the upper reach have no objection to the project and they are willing to relocate their paddy fields to other areas, if they are compensated for opening new paddy fields. According to the farmers, the cost for developing 1 ha is equivalent to the cost of 6 ton of rice.

(ii) Inundation of forests (VHC and PF) along the reservoir

Inundation of some of the forestland is also projected because of the rising water level. The following table shows the present condition of the forestland and the value of forest.

Basis of Estimation	Summary
VC F	
(1) Forest type:	Mixed Deciduous Forest
(3) BA and stem volume in ha:	Total BA: 55 m2 and Total volume : 840 m3/ha
(5) Values per ha:	US$ 13,080
PF & VF	
(1) Forest type:	Mixed Deciduous Forest to Unstocked Forest
(3) BA and stem volume in ha:	PF: 15 m2 and 37 m3/ha, VF: 22 m2 and 21 m3/ha
(5) Values per ha:	US$ 1,570 and US$ 1,100

The values of the potential inundated areas are estimated at about $13,000/ha in the village conservation forest (VCF) and about $1,100 – 1,600/ha in the private and village forest (PF & VF). According to the farmers, if the forestland is inundated by the expansion of the reservoir, they will cut and sell the trees in the inundated area. The income from the sale of trees belongs to the landowner (individuals or village).

(iii) Submergence of the shrine in the VHC along the reservoir

On the other hand, the value of the shrine cannot be estimated in monetary value, since it is a spiritual symbol of the villagers. It must be relocated to another place, in case the location of shrine is submerged. The villagers are willing to relocate it to other site in the conservation forest by themselves.

Taking the above situation into account, the adverse effect caused by expanding the storage capacity of the reservoir is a reasonable trade-off for the villagers, if sufficient compensation can be made to the affected villagers.

(c) Pollution of Groundwater

Through the project, intensive farming and cash crop farming will be introduced in the model area. It is

considered, therefore, that the dosage and frequency of agro-inputs application may also increase. Since environmental-friendly agriculture and introduction of IPM are the main concepts of the project, the possibility of contamination by agro-inputs in groundwater is considered less. However, periodic monitoring work is required to avoid any incidental adverse effects.

(d) Salinity hazard

It is known that Savanakhet province is under laid with a salt-bearing layer. According to the villagers in B Phonthan, the water in dug wells in the village tends to be salty in dry season. Downward seepage during irrigation forms a continuous link between irrigation water and underground water, and with upward capillary action in dry season salt in the underlying salt layer is brought to the surface. Expansion of irrigated fields might cause the underlying salt to accumulate on the surface, resulting in salinization of the soils. However, a good drainage system, coupled with monitoring of the ground water quality and depth, is necessary in order to predict the salinization process.

(e) Health Hazard

The farmers in the area are relatively familiar with usage of agrochemical. However with the expansion of dry season irrigated fields, especially cash crop fields, the possibility of mishandling agrochemical and improper application of agrochemical may increase. It is therefore essential that close extension work should be conducted by the proposed TFT and technique and knowledge of agrochemical application should be instilled into the farmers in the area.

Part 3: Recommendation

CHAPTER 1

PROJECT EVALUATION AND PRIORITIZATION

Part 3: Recommendations

Chapter 1 Project Evaluation and Prioritization

1.1 Identified Project and Scheme

1.1.1 General Description

One of the major themes in this Study is to examine and to identify a possible way to address the issues and constraints in the area (poverty alleviation and improvement of rural environment) by means of available input level (financial resource and technology) of farmers. In this connection, main topic is how to ensure the sustainability of existing pumping irrigation schemes and those under construction or planning, with minimum additional investment requirement in accordance governmental policy. At the conclusion of the Study, it is also considered possible to solve the issues and constraints by upgrading the capacity of governmental officials/staff or beneficial farmers.

In order to realize sustainability and wider coverage of the existing irrigation schemes, and further spread its effect to other areas, it is considered a prerequisite to build the capacity of human resources and make it effective. For the purpose of implementing a capacity building program for farmers as well as staff in the public agencies as support institutions, the master plan has been formulated to give more attention to education and training of stakeholders concerned with the Study. By setting a target for the respective stakeholder and proposing means for attaining the target, it is expected to bring about a motivation towards the next step and build solidarity in a group or an organization. In this context, it is essential to introduce the so-called target-management method to evaluate one's performance in relation to the degree of attaining the set target. In addition, the target-management method must be applied for SMS and TFT members on individual capacity building, and it is considered possible to introduce a system of incentives to all concerned.

Taking into consideration the situation mentioned above and the financial situation of Laotian government, it is quite important to adopt a policy by which the limited resources (human, financial and physical) available domestically must be efficiently utilized. In order to comply with the said policy, the following development principles shall be fully considered:

- Basic and Intensive Development
- Project Planning using a Participatory Approach
- Cross-sectoral Development Method and Reinforcement/Expansion of TFT Concept

In the implementation of every possible project, it is necessary to maintain harmony among "farmers' organization", "agricultural finance" and "stabilization of farming", which are the basic pillars of the Study as shown below.

In relation to Model Areas it was observed these three pillars were not given the same level of priority

nor the farmers recognize all of them in implementing their projects. For instance, Thongharb-Nakhua area concerns more with "agricultural finance" and "stabilization of farming", Vangkhong does "stabilization of farming" and "farmers organization", and Phonthan does "farmers organization" and "agricultural finance".

In order to implement the projects and schemes identified and formulated under the master plan, both the wider area approach and the strategic/intensive area approach are required in the whole Laos or the Study area and the model areas, respectively.

1.1.2 Wider Area Approach (Whole Laos/Master Plan Area)

(1) Farmers' Organization

Facilitation of Establishing and Strengthening of Farmers' Organization in Model Areas

(a) Provision of Legal Framework for Farmers' Group (WUA and APG)

(b) Expansion of Education and Training for Farmers (Group Leaders) and Supporter (DAFSO staff)

(c) Deployment of Community Development Organizer at PAFSO level

The primary objective in organizing farmers into groups is (a) to expedite efficiency of receiving supporting services, (b) to evenly share the limited local resources and (c) to strengthen bargaining power, especially in terms of price negotiation for agricultural input as well as agricultural product through joint purchase and sale activities. While tested approaches and processes for the establishment and strengthening of farmers' group and organization will be practiced in the model areas, the wider area activity will emphasize on addressing common issues extending over the model areas, which includes education and training of the concerned staff on participatory development approach and community development methods. In order to make joint procurement of agricultural input efficient, it is also desirable to unify the supply sources. In this connection, it is necessary to facilitate adequate coordination between the Ministry of Commerce and APB.

Furthermore, it is an urgent matter for the successful implementation of IMT to ensure sustainability of the irrigation schemes through organizing farmers like WUO, which is one of the important agricultural policies of Lao government.

(2) Agricultural Finance

Concrete Plans for Improvement of Financial System

(a) Improvement of Accounting System in Banking Business

(b) Establishment of Financial Market on Short-term Basis

(c) Liberalization of Interest Rate and Opening of Branch/Field Offices

(d) Improvement of BOL's Training Compound

Out of the above listed items. Item (a) Improvement of Bank Accounting System is quite an urgent matter, and basic interventions to improve the system have been pointed out in the Study, specifically those requiring involvement of services provided by the experts. The necessary human input for the improvement is 6 man-months of both international and domestic experts. The preparation of computerized accounting system also requires the same input as above, with total cost of US$306,000. On the other hand, since the items (b) and (c) fully relate to the basic financial policy of Lao government, countermeasures will be considered whenever the Lao side would recognize the necessity of such findings. As for item (d), it is predicted that more number of banks' staff including APB need to be trained, and the upgrading of existing training facilities should be accorded with high priority, costing about US$200,000.

Strengthening of APB as source of Two-step Loan

(a) Improvement of Accounting System

(b) Restructuring of Head Office

(c) Training of Staff (Executive, Backbone Staff, Liaison staff)

(d) Strengthening of MIS and Upgrading Mobility of Field Staff

The improvement of accounting system is a major concern for the Laotian financial system as a whole and APB should follow the BOL's guidance if improvements in its accounting system must be realized promptly. In this improvement activity, it is also necessary to provide APB with management system for fixed asset and stock as a sub-system. Another major concern is for APB not only to increase its capital to 6 billion Kip (4% of the total asset in end 1999), but also to deploy more staff to the auditing division and to carry out the auditing by an external institution with publication of the audited results so as to keep transparency of APB's business.

In order to reform the staff's sense of the financial system, staff training from the executive level to the liaison level is considered urgent. It is appropriate from cost effectiveness viewpoint to implement such training activities in BAAC of Thailand. As an initial plan, 10 executive staff shall be sent and trained in BAAC for two months with cost of US$86,000. After reviewing the performance of the initial program, further training schedules will be planned.

Under the situation where the seasonal production loan for the dry season is drastically increasing, it is an urgent matter to upgrade the mobility of field staff. Equally important is the need to enhance data processing capacity of APB through strengthening of MIS and to reinforce the existing communication network among Head Office, branch offices and S.U.

(3) Stabilization and Increase of Agricultural Production

Strengthening of Support System (Linking with same activities in Model Areas)

(a) Cross-sectoral Unification of Extension System

(b) Establishment of Staff Database

(c) Technical Guidance and Training of SMS and TFT Members

(d) Inventory of Irrigation Schemes

It is desirable to unify the current extension system like NAFRI, under which sectoral experimentation systems has been consolidated. Items (b), (c) and (d), shall be carried out in complementation with similar programs designed for Model Areas, within a period of three years and human input of 7, 20 and 10 man-months for international, regional and domestic expertise, respectively. These activities would entail a total cost of US$310,000.

1.1.3 Basic/Intensive Area Activity

(1) Farmers' Organization

Establishment and Strengthening of Farmers' Groups/Organization

(a) Thongharb-Nakhua Area

(b) Vangkhong Area

(c) Phonthan Area

In order to encourage the establishment and strengthening of a WUG, and then upgrading the WUG to a WUA as well as the paddy based farming with a crop diversification and an integrated farming, the establishment and strengthening of APG and ACG will also be carried out taking into consideration the specific condition in each model area. A group leader as a contact farmer shall play a major role to receive the support services provided by PAFSO/DAFSO. In addition, a WUO shall also play an important role in the collection of ISF and in the proper maintenance of irrigation facility as well as water management, and creation of a Village Development Fund, which are the main subjects of the IMT (Irrigation Management Transfer). This activity will be attained in coordination with the activities of TFT in each model area.

(2) Agricultural Finance

Strengthening of APB Branch/SU/SSU (New Staff Mobilization)

(a) Paksan Service Unit

(b) Hinboun Sub-Service Unit

(c) Savanakhet Branch

The participation of the respective APB staff in the various activities of the virtual TFT during the field survey in Phase 2 was not satisfactory, the reason was that they were also busy with the daily

job in their respective offices. In view of APB's recruitment of about 50 new staff every year, it is proposed that APB should mobilize an additional staff in each concerned office (Branch/SU/SSU) to reduce the volume of work of the staff designated to TFT. The very wide coverage of APB's field offices has become one of bottlenecks for APB's limited financing activities in rural areas. To introduce a mobile office by using a vehicle in each province is considered as an alternative instead of establishing a new office. However, various outstanding issues like how to maintain security could not be identified and solved in the Study, hence, the mobile office concept shall be proposed for further consideration.

(3) Stabilization and Increase of Agricultural Production

Strengthening of Support System (Capacity Building with Infrastructure Development)

(d) Thongharb-Nakhua Area

(e) Vangkhong Area

(f) Phonthan Area

It is recognized that to upgrade technical level of SMS as technical support group and DAFSO technical staff as a generalist is a prerequisite. To cope with the objective strengthening the support group, capacity building of the stakeholders will have to be attained efficiently and effectively by introducing "on-the-job training" system through a project cycle of conceptualization - investigation - planning/designing - implementation of the proposed infrastructure schemes. In the early stages, it may require external assistance of both technical and financial nature for the support system to grow and become independent, and later on be replicated in other areas. The required input is summarized below:

	Human Resource Input (M/M)			Financial Input (US$)		
	International	Regional	Domestic	Expert	Others	Total
Thongharb-Nakhua	9	26	13	368,500	50,000	418,500
Vangkhong	7	20	10	285,000	50,000	335,000
Phonthan	12	34	17	486,500	50,000	536,500

In the two model areas, except Phonthan area, pump irrigation is being practiced using river flow, and the important issue is how to ensure the durability of pump equipment (generally 15 to 20 years with proper maintenance and repairing). Therefore, it is necessary to sufficiently educate and train beneficial farmers about proper allocation of irrigation water as well as water management through strengthening the WUO.

This scheme is planned to commence from Phonthan area, followed by Thongharb-Nakhua area and then Vangkhong area until a wider area is covered.

Rehabilitation/Improvement of Small Scale Irrigation Facility

(a) Thongharb-Nakhua Area: Construction of weir in Thongharb and land reclamation-

US$287,000

(b) Vangkhong Area: Transfer of existing pump, canal construction and land reclamation-US$205,300

(c) Phonthan Area: Elevating the reservoir dike & canal extension-US$130,000

The sustainability of the existing irrigation facilities is a must for the Study area, as most of farmers rely on paddy cultivation. In addition, in order for these facilities to attain sustainability, strengthening the farmer support system in combination with the development of rural/farm roads mentioned below, shall be given due consideration.

Development of Rural/Farm Road (Medium/Long-term)

(a) Thongharb-Nakhua Area (US$119,000)

(b) Vangkhong Area (US$112,300)

(c) Phonthan Area (US$90,000)

The road network connecting each Model Area with the capital area of the concerned district or province play a vital role to ensure access to market for agricultural input as well as farm products. However, it is rather difficult to properly identify the beneficiary of these road, considering that the proposed project should be implemented in areas with higher priority under the concerned district or provincial office of which budget could have a surplus.

Figure 1-1 shows the implementation schedule for the proposed projects and schemes mentioned above.

1.2 Project Evaluation

The projects and schemes identified and formulated both in the wider area and strategic/intensive area activity are comprehensively evaluated by applying the following parameters:

Evaluation Item	Applied Parameter
Economic Aspect:	EIRR (15% or more, 10-15%, Below 10%)
Financial Aspect:	Affordability of Investment Cost by Farmers and Public Agency (Yes, partly yes/no)
Environmental Aspect:	Impact on Natural Environment (None, small, big)
	Impact on Rural Community (None, small, big)
Organizational Aspect:	Maturity of Existing Farmers' Group/Organization (High, Medium, Low)
	Acceptance Ability for Cross-sectoral Approach (High, Medium, Low)
Social Aspect:	Extent of Poverty Alleviation (High, Medium, Low)
	Extent of Understanding of Participatory Development Approach

(High, Medium, Low)

Institutional Aspect: Acceptance Base for Basic Development Principle (High, middle, low)

Replicability in Other Areas (High, Medium, Low)

The evaluation results of the wider area and the strategic/intensive activity are given in Table 1-1 and Tables 1-2 to 1-4, respectively. In these tables, the smaller aggregated figures (simple average) for these parameters means the higher priority.

1.3 Prioritization

In connection with the short-term target of the projects and schemes identified above, priority of each model area is assessed by taking into consideration the present condition and the future perspective of the model areas (Figure 1-2). The target level for the development of the priority projects/schemes is described below:

Target Level

(a) Self-sufficiency in rice: attainment of self-sufficiency in rice in the model area;

(b) Technical level of farmers: Farmers understand the recommended paddy cultivation practices (making efforts to cope without necessarily spending money);

(c) Infrastructure: Properly utilized of irrigation facility;

(d) Agricultural extension: The extension activity is carried out as required by the AEA;

(e) Farmers Organization: Existence of WUG and other farmer groups which are active and functional; and

(f) Agricultural finance and marketing: Farmers receive loans and procure agricultural inputs at the proper time.

Development Target of Priority Projects/Schemes: Priority development target should be selected from the 6 items, earlier identified, i.e, self-sufficiency rice, farmers' technical level, infrastructure, agricultural extension, farmers' organization and agricultural finance/marketing considering the distinct characteristics of each area. The development of the model area shall be pursued by strengthening the specific target level selected in the above process.

Each project or scheme should try to attain the following target level:

(a) Self-sufficiency in rice: to produce surplus rice in the area, and to become the rice granary area in Laos;

(b) Farmers' technical level: farmers do not only understand the recommended paddy cultivation practice, but also adopt it, and to increase their income through introduction of diversified farming and integrated farming;

(c) Infrastructure: existence of the facility (new or rehabilitation) which was carefully planned, verified and supervised by an expert engineer using reliable technology;

(d) Agricultural extension: should be undertaken to train and upgrade the technical level of SMS and to provide technical assistance with TFT support;

(e) Farmers organization: WUG and other organization exist, in which the role and responsibility of its members is clarified with regards to the aspects of water management, agricultural finance and marketing of farm products, and cooperate with the support system; and

(f) Agricultural finance/marketing: it is possible for farmers to receive institutional loan and procure agricultural input in proper time, and marketing channels for farm products is explored, and furthermore, these activities are carried out by the farmers organization without any constraints.

There is no doubt on putting the highest priority on human resource development (capacity building) of the stakeholders who bear the risks and implement the development interventions in each model area. Of course it takes a rather long time to fully develop the capacity of human resources. The Study is therefore attempting to reduce that period and to realize the efficient utilization of human resource through (a) Basic and Intensive Development, (b) Project Planning under Participatory Approach and (c) Cross-sectoral Development Method and Reinforcement/Expansion of TFT Concept. Therefore, highest priority should also be given to strengthening of support system, followed by agricultural finance to provide necessary fund for the seasonal farming expenses and capital investment, and then the improvement of the hardware including the rehabilitation and new construction of irrigation facilities (Table 1-5).

Each model area selected as the strategic/intensive area activity has its own development approach and these models are prioritized in terms of the present condition and the future perspective (Figure 1-2 and Table 1-5) as shown below:

Prioritization of Model Area (Ranking)

Model Area	Development Approach	Farmer Organization			Agricultural Finance	Stabilization of Farming			Overall Evaluation
		WUG	APG	Integrate		Software	Hardware	Integrate	
Thongharb-Nakhua	Basin-wide Water Management & Improving Agr. Finance	1	2	1	2	2	2	2	2
Vangkhong	Integrated Irrigation Development & Poverty Alleviation	3	3	3	3	3	1	3	3
Phonthan	Advanced Farming and Basin Conservation	2	1	2	1	1	3	1	1

Note: Priority: 1=High, 2=Middle, 3=Low

Figrure 1-1 Implementation Schedule of Priority Project/Schemes

	1st	2nd	3rd	4th	5th
1. Wider Area Approach (Whole Laos/Master Plan Area)					
1.1 Agricultural Finance					
1.1.1 Improvement of Financial System					
- Improvement of Accounting System					
* Accounting System Improvement					
* Computerization of Accounting System					
* Dissemination and Training					
- Establishment of Financial Market on Short-term					
- Liberalization of Interest Rate & Branch Office					
- Renovation of BOL's Training Center					
1.1.2 Strengthening of APB					
- Improvement of Accounting System					
- Restructuring of Head Office					
- Staff Training					
* Executive officers					
* Backbone staff					
* Liaison officer					
- Establishment of MIS					
1.2 Farmers Organization					
- Provision of Legal Framework					
- Education & Training of Farmer and Supporter					
- Deployment of Community Organizer					
1.3 Stabilization and Increase of Agricultural Production					
- Cross-sectoral Unification of Extension System					
- Establishment of Staff Database					
- Technical Guidance/Training of SMS & TFT					
- Preparation of Inventory of Irrigation Schemes					
2. Strategic/Intensive Area Activity					
2.1 Agricultural Finance					
- Strengthening of APB Branch/SU/SSU					
* Paksan Service Unit					
* Hinboun Sub-service Unit					
* Savanakhet Branch					
2.2 Farmers' Organization					
- Establishment/Strengthening of Group/Organization					
* Thongharb-Nakhua Area					
* Vangkhong Area					
* Phonthan Area					
2.3 Stabilization/Increase of Agricultural Production					
- Strengthening of Supporting System					
* Thongharb-Nakhua Area					
* Vangkhong Area					
* Phonthan Area					
- Rehabilitation/Improvement of Irrigation Facility					
* Thongharb-Nakhua Area					
* Vangkhong Area					
* Phonthan Area					

Table 1-1 Wide Area Activity : Project Formulation and Evaluation

			Farmers Organization		Agricultural Finance				Stabilization of Farming/Production Increase	
			To assist Establish & Strengthen Groups		Improvement of Financial System		Strengthen of APB		Strengthening of Support System	
Project Scope			3 Model Areas		Whole Laos		APB Head Office		3 Model Areas	
Contents of Project	Outline		Prepare Legal Framework for farmer group Training of farmers & support staff Establish CDO		Improving account system Establish Short-term Financial Market Liberalization of Interest Rate and Business Branch Renovation of BOL Training Center		Improving of account system Restructuring of Head Office Staff Training Strengthening of MIS		Cross-sectoral unification of extension system Preparation of staff database Guidance & training of SMS & TFT members Preparation of inventory for existing irrigation scheme	
	Implementing Body		Ministry of Agriculture & Forestry		BOL		APB		MAF & Each Department	
	Implementing Period		2001-2003 (3 years)		2001-2005 (5 year)		2001-2004 (4 years)		2001-2003 (3 years)	
	Project Cost		None		US$506,000		US$86,000		US$310,000	
Priority			Middle		Middle		Middle		High	
Project Benefit			Stability & self-independence of rural areas Reduction of government financial burden		Contribution for market economic system Diversification of agr. finance		Capacity building Increase of competitiveness with other banks Stable supply of agr. loan Diversification of fund source		Capacity building of concerned staff Stabilization/self-sufficiency of farm products Extension of best practices to other area Reduction of government financial burden	
Project Evaluation	Economic	EIRR	-	-	-	-	-	-	-	-
	Financial	Farmer's Affordability	-	-	-	-	-	-	-	-
		Governmental Affordability	-	-	None	3	None	3	None	3
	Environmental	Natural Negative Impact	None	1	None	1	None	1	None	1
		Social Negative Impact	Small	2	None	1	Small	2	Small	2
	Organizational	Maturity of Exist. Organiza'n	Middle	2	Middle	2	Middle	2	Middle	2
		Acceptance Ability of Cross-sectoral Approach	Low	3	-	-	-	-	Middle	2
	Social	Poverty Alleviation	Middle	2	Middle	2	High	1	Middle	2
		Understanding Participatory Approach	Low	3	Low	3	Middle	2	Middle	2
	Institutional	Acceptance of Dev't Principle	Middle	2	Low	3	Middle	2	Middle	2
		Expandability to other area	High	1	Middle	2	Middle	2	High	1
	Overall Evaluation (Average)		2.00		2.13		1.88		1.89	

Table 1-2 Thongharb-Nakhua Area Development : Project Formulation and Evaluation

			Farmers Organization		Agricultural Finance		Stabilization of Farming and Incremental Production					
			Establish/Strengthen Groups		Strengthen APB Field Office		Strengthen Supporting System		Rehabilitation of irrigation		Rural/Farm Road	
Project Scope			Pakkading District		Bolikhamsai Province		Pakkading District		Thongharb Village (83 hh)		Whole model area	
Contents of Project	Outline		Establish WUG & up-grade to WUA Establish APG/ACG Creation of VDF		Increase of one additional staff to Paksan SU		Establishment of staff data base Training of SMS/ TFT Implement PCM approach Support for TFT		Construction of Weir in Nam Dua		New: 1.8km Rehabili. : 4.7km Pavement : 3.0km Box culvert: 23	
	Implementing Body		PAFSO Bolikhamsai		APB Paksan SU (APB Head Office)		PAFSOBolikhamsai		PAFSO ﾎﾞﾘｶﾑｻｲ		PAFSO／MCTPC Bolikhamsai	
	Implementing Period		2003-2004(2 years)		2003 (1 year)		2003-2004 (2 years)		2003-2004 (2 years)		2006-2007 (2 years)	
	Project Cost		None		None		US$418,500		US$287,000		US$119,000	
Priority			Middle		High		High		Middle		Low	
Project Benefit			Simplification of APB Loan Business Strengthen Bargaining Power		Improvement of Loaning Capacity Participation to TFT		Capacity building Extension of best practices to other area		Increment of Farm Products		Reducing transport cost for input & output Speed-up information transfer	
Project Evaluation	Economic	EIRR	-	-	-	-	-	-	Middle	2	-	-
	Financial	Farmer's Affordability	-	-	-	-	Middle	2	Low	3	-	-
		Governmental Affordability	-	-	Yes	1	None	3	None	3	Partly	2
	Environmental	Natural Negative Impact	None	1	None	1	None	1	None	1	Small	2
		Social Negative Impact	Small	2	None	1	Small	2	Small	2	None	1
	Organizational	Maturity of Exist. Organiza'n	Middle	2	Middle	2	Middle	2	Middle	2	-	-
		Acceptance Ability of Cross-sectoral Approach	Middle	2	Low	3	Low	3	Middle	2	-	-
	Social	Poverty Alleviation	Middle	2	Middle	2	Middle	2	Middle	2	High	1
		Understanding Participatory Approach	Middle	2	Low	3	Middle	2	High	1	Middle	2
	Institutional	Acceptance of Dev't Principle	Middle	2	Low	3	Middle	2	Middle	2	Middle	2
		Expandability to other area	High	1	High	1	High	1	High	1	Middle	2
	Overall Evaluation (Average)		1.75		1.89		2.00		1.91		1.71	

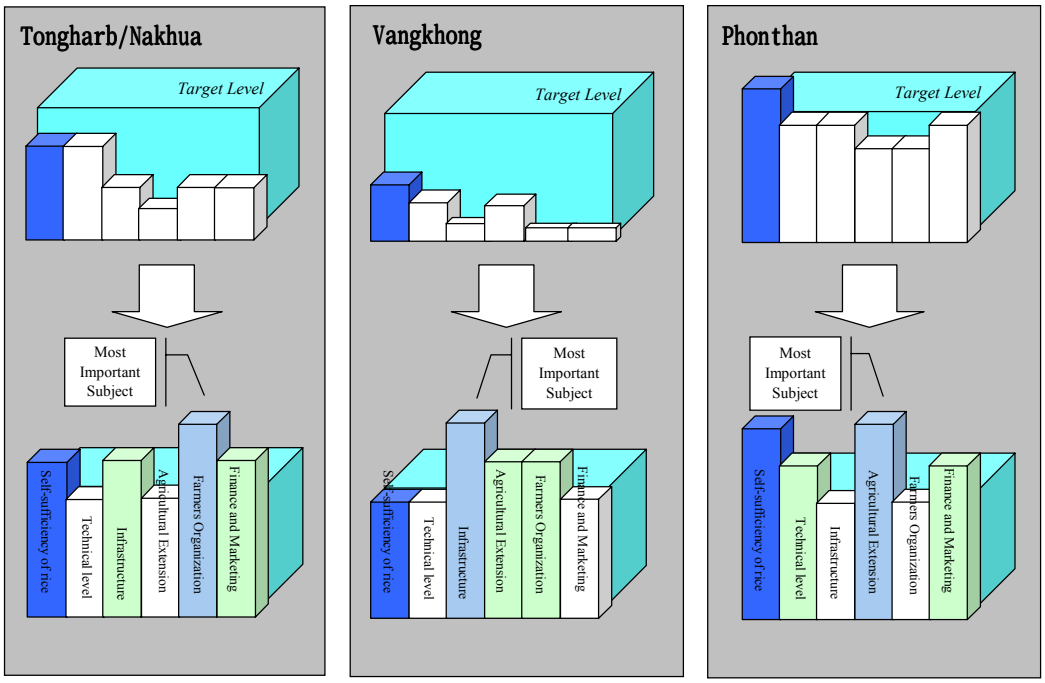
Table 1-3 Vangkhong Area Development: Project Formulation and Evaluation

			Farmers Organization		Agricultural Finance		Stabilization of Farming and Incremental Production					
			Establish/Strengthen Groups		Strengthen APB Field Office		Strengthen Supporting System		Rehabilitation of irrigation		Rural/Farm Road	
Project Scope			Hinboun District		Hinboun District		Hinboun District		Vangkhong Village (47 hh)		Whole model area	
Contents of Project	Outline		Establish & Strengthen WUG Establish APG/ACG Creation of VDF		Increase of one additional staff to Hinboun SSU		Establishment of staff data base Training of SMS/ TFT Implement PCM approach Support for TFT		Transfer of Existing Pump Station along Hinboun River, Land Reclamation and Canal Construction		New : 2.3km Rehabili. : - Pavement : 150m Bridge : 4 Box culvert : 7	
	Implementing Body		PAFSO Khammouane		APB Hinboun SSU (APB Head Office)		PAFSO Khammouane		PAFSO Khammouane		PAFSO/MCTPC Khammouane	
	Implementing Period		2003-2004(2 years)		2003 (1 year)		2003-2004 (2 years)		2003-2004 (2 years)		2006-2007 (2 years)	
	Project Cost		None		None		US$335,000		US$205,300		US$112,300	
Priority			Middle		High		High		Middle		Low	
Project Benefit			Simplification of APB Loan Business Strengthen Bargaining Power		Improvement of Loaning Capacity Participation to TFT		Capacity building Extension of best practices to other area		Increment of Farm Products		Reducing transport cost for input & output Speed-up information transfer	
Project Evaluation	Economic	EIRR	-	-	-	-	-	-	Middle	2	-	-
	Financial	Farmer's Affordability	-	-	-	-	Middle	2	Low	3	-	-
		Governmental Affordability	-	-	Yes	1	None	3	None	3	Partly	2
	Environmental	Natural Negative Impact	None	1	None	1	None	1	None	1	Small	2
		Social Negative Impact	Small	2	None	1	Small	2	Small	2	None	1
	Organizational	Maturity of Exist. Organiza'n	Low	3	Middle	2	Low	3	Middle	2	-	-
		Acceptance Ability of Cross-sectoral Approach	Low	3	Low	3	Low	3	Middle	2	-	-
	Social	Poverty Alleviation	High	1	Middle	2	High	1	Middle	2	High	1
		Understanding Participatory Approach	Low	3	Low	3	Middle	2	High	1	Middle	2
	Institutional	Acceptance of Dev't Principle	Middle	2	Low	3	Middle	2	Middle	2	Middle	2
		Expandability to other area	High	1	Middle	2	Middle	2	High	1	Middle	2
	Overall Evaluation (Average)		2.00		1.89		2.10		2.00		1.71	

Table 1-4 Phonthan Area Development : Project Formulation and Evaluation

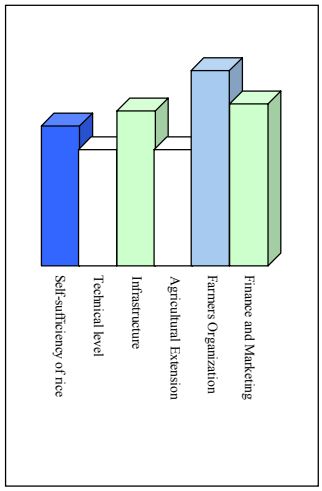
			Farmers Organization		Agricultural Finance		Stabilization of Farming and Incremental Production					
			Establish/Strengthen Groups		Strengthen APB Field Office		Strengthen Supporting System		Rehabilitation of irrigation		Rural/Farm Road	
Project Scope			Whole model area		Savanakhet Province		Xayphouthong District		Whole model area (412 hh)		Whole model area	
Contents of Project	Outline		Establish WUG & up-grade to WUA Establish APG/ACG Creation of VDF		Increase of one additional staff to Paksan SU		Establishment of staff data base Training of SMS/ TFT Implement PCM approach Support for TFT					
	Implementing Body		PAFSO Savanakhaet		APB Savanakhet Branch (APB Head Office)		PAFSO Savanakhet		PAFSO Savanakhet		PAFSO/MCTPC Savanakhet	
	Implementing Period		2001-2002 (2 years)		2001 (1 year)		2001-2002 (2 years)		2001-2002 (2 years)		2006-2007 (2 years)	
	Project Cost		None		None		US$536,500		US$130,000		US$90,000	
Priority			Middle		High		High		Middle		Low	
Project Benefit			Simplification of APB Loan Business Strengthen Bargaining Power		Improvement of Loaning Capacity Participation to TFT		Capacity building Extension of best practices to other area		Increment of Farm Products (Paddy, Cash Crops)		Reducing transport cost for input & output Speed-up information Transfer	
Project Evaluation	Economic	EIRR	-	-	-	-	-	-	Middle	2	-	-
	Financial	Farmer's Affordability	-	-	-	-	High	1	High	1	-	-
		Governmental Affordability	-	-	Yes	1	None	3	None	3	Partly	2
	Environmental	Natural Negative Impact	None	1	None	1	None	1	Small	2	Small	2
		Social Negative Impact	Small	2	None	1	Small	2	Small	2	None	1
	Organizational	Maturity of Exist. Organiza'n	Middle	2	Middle	2	High	1	High	1	-	-
		Acceptance Ability of Cross-sectoral Approach	Middle	2	Low	3	High	1	High	1	-	-
	Social	Poverty Alleviation	Middle	2	Middle	2	Middle	2	Middle	2	Middle	2
		Understanding Participatory Approach	High	1	High	1	High	1	High	1	High	1
	Institutional	Acceptance of Dev't Principle	High	1	High	1	High	1	High	1	High	1
		Expandability to other area	Middle	2	Middle	2	Middle	2	Middle	2	Middle	2
	Overall Evaluation (Average)		1.63		1.56		1.50		1.64		1.57	

Figure 1-2 Present Condition and Priority Development Target for Model Area



Present Condition of Each Model Area

Model Area	Rice Self-sufficiency	Technical Level	Infrastructure	Agricultural Extension	Farmers Organization	Finance and Marketing
Thongharb/Nakhua	not achieved	low	not functioned	weak	only Thongharb	only Thongharb
Vangkhong	extremely low	extremely low	under installation	weak	non	non
Phonthan	surplus	ordinary	deteriorated	fair understanding TFT	existing	existing



Priority Development of Each Model Area

Model Area	Rice Self-sufficiency	Technical Level	Infrastructure	Agricultural Extension	Farmers Organization	Finance and Marketing
Thongharb/Nakhua	surplus	general level-up	rehabilitation and improvement	strengthening of SMS	establish of water users organization	fund for rehabilitation improvement
Vangkhong	achieving seif-sufficiency	general level-up	installation, participatory construction	strengthening of DAFSO	participatory construction, organization	financing for construction
Phonthan	surplus	rank-up	operation and maintenance by WUG	strengthening of TFT activity	strengthening of farmers organization	improving seasonal loan

High Priority Project

Priority Project

Table 1-5 Outline of Proposed Project and Priority

Three Piers for Development				Farmers Organization	Agricultural Finance		Stabilization of Farming/Production Increase	
Project Component (Priority)				Strengthening of Farmers Group/Organization (3)	Improvement of Financial System (3)	Improvement of Agricultural Finance (2)	Strengthening of Supporting System (1)	Improvement of Irrigation Schemes (2)
Wider Area Activity				a. Preparation of legal framework for farmers group b. Training of farmers & support staff c. Establish and mobilization of CDO	d. Improvement of Bank Accounting System e. Establishment of Financial Market for short-term basis f. Liberalization of Interest Rate and Business Branch g. Renovation of BOL Training Center	a. Improvement of Accounting system b. Restructuring c. Staff Training d. Strengthening of MIS and mobility of field staff	a. Cross-sectoral unification of extension system b. Preparation of staff database c. Guidance and training of SMS and TFT members	a. Preparation of inventory of irrigation schemes
		Present Condition	Develop. Direction					
Strategic/Intensive Area (Model Area)	Thongharb-Nakhua	Due to series of failure in irrigation development, farmers tend to not trust public agencies and APB finance.	By improvement of public and financing services as well as improvement of water management, bottom-up approach shall be examined and verified.	Strengthening of WUG & upgrade to WUA for proper water management among tributaries Establishment of APG for crop diversification & integrated farming [1]	-	a. Preparation of system to provide reliable loan for improvement/rehabili. of irrigation facility. b. New staff recruitment for Paksan SU [2]	a. Capacity building of SMS for irrigation planning and TFT members with participatory approach b. Capacity building thrugh OJT [2]	a. Promptly rehabili. destroyed facilities b. Construction of weir in Thongharb [2]
	VAngkhong	Due to consecutive flood damages, farmers motivation for attaining stabilization of paddy farming and its self sufficiency	Under efficient support system, irrigated agriculture will be introduced.	Establishment of WUG Establishment of APG for paddy cultivation [3]	-	a. Preparation of system to provide reliable loan for improvement/rehabili. of irrigation facility. b. New staff recruitment for Hinboun SSU [3]	a. Capacity building of SMS & DAFSO staff for irrigated agriculture b. Capacity building through OJT [3]	a. Verify present irrigation planning b. Transfer of existing pump, canal construction and reclamation [1]
	Phonthan	Paddy self-sufficiency attained. Due to no risk of flood, it is expected to promote advanced farming through crop diversification & integrated farming	Through efficient supply of materials and farmer organization (WUA/APG), effective farm production and marketing will be aimed	Development of advanced farming by organizing WUG/APG/BSG Arrangement of system to receive public support and financial services [2]	-	a. Preparation of system to provide reliable loan for advanced farming b. New staff recruitment for Savanakhet Branch [1]	a. Capacity building of TFT members including APB & FSC staff b. Capacity building through OJT [1]	a. Proper dam operation for advanced farming b. Heightening dyke and canal extension [3]

Note : Figures in ( ) are showing priority among project component

Figures in [ ] are showing priority within the project component ("0" means only finding and no relation to priority)

Part 2: Recommendation

CHAPTER 2 RECOMMENDATION

Chapter 2 Recommendations

2.1 Understanding the Issues and Constraints

From macro viewpoints, Laos is still moving towards a market-oriented economic system while its economic and monetary system is not yet matured. Under such situation, foreign exchange generated through border trade including smuggling is not flowing back to Laos. The policy on interest rate does not match with the current economic situation, and further there exist, no positive factor to recover from the present government financial position.

From micro viewpoints, most of the existing irrigation schemes are facing difficulty in attaining the planned irrigable area due to the mismatch between the potential irrigable area and capacity of installed pumps as well as poor quality of canal constructed by the farmers themselves. In addition, over-pumping of water is daily practiced by farmers due to lack of proper O & M know-how, and this has resulted in excessive operation of pump, thus shortening the durable life of equipment. On the other hand, supply channel of input materials (fertilizers and pesticides) for dry season paddy cropping, is rather complicated considering that two sources of fund such as APB and FSC which adopt different procedures. Consequently, farmers are not able to receive the recommended input on time. Considering the vulnerability of the present farming situation, it is evident the area might plunge again into poverty without proper countermeasures.

In order to attain the main objectives of rural development in Laos, namely "improvement of rural environment and upgrading living standard of villagers", it must be able to increase food production through the improvement of agricultural productivity. Laotian government has put emphasis on the maximum utilization of the limited resources, especially water resources by accelerating the provision of facility measures. However, the pace of the said development exceeded the capacity of the concerned staff at provincial level, and implementation of facility construction has been promoted without an appropriate examination and analysis of the projects. Consequently, these projects are implemented without paying proper attention to farmer-beneficiaries as well as sufficient justification, thus several problems mentioned above have happened. On the other hand, the interest of the staff concerned with farmer support system is not towards the farmers but rather in compliance with the direction of the higher authority where they belong and this resulted in extending the services which the farmers do not exactly require. Since these problems originated from the weakness of human resource and their organizations either from the farmers side or supporter (public agency), it is expected that by strengthening these human resources and improvement of training system, positive effects can be obtained.

2.2 Recommendation

(1) Justification of the Projects

In most public agencies, especially at the higher level, the planned target of development as well as the projects are characterized as a slogan, often lacking in concrete process on how to realize benefits to farmers. The policy makers also failed to consider the causal relationships in the process of "input", "management" and "output". In this connection, it can be pointed out that the project planner is not fully

acquainted with the real conditions of the targeted areas. At the central level of public agencies, a project is being planned only to realize the target set by the higher authority without considering the interests of beneficiaries and other stakeholders, and there exist no space to accommodate the participatory development approach.

Given the actual situation mentioned above and, for the purpose of alleviating the poverty situation prevailing in the area, the proposed projects and schemes shall adopt a participatory development approach with the basic target to "harmonize the support system among sectors" and "sustainability through the farmers' own effort". In other words, the Study formulated the proposed projects and schemes by applying the participatory approach, where the role and responsibility of the farmers and the supporters are clarified and requires both the supporter and also the farmers to self-training and upgrading of themselves in order to achieve coordination and cooperation. During the Phase 2 field survey, the TFT was operationalized on a trial basis as the key factor required for the implementation of the formulated projects and schemes and with the success, it was identified. In addition, the effectiveness of the participatory approach was verified and reflected in the project formulation, by the process of feeding-back the PDM to the villagers through a puppet show played by the Vientiane Story Caravan.

Through the Study, the priority projects in the model areas are found to be economically, technically, financially and socially feasible. On the basis of the three pillars of "stabilization of farming and increase of agricultural production", "agricultural finance" and "farmers organization", the proposed projects duly recognized the farmers' intention, sustainability and environmental impact, and then contain the same technical level with villagers in the model areas. Although it is rather difficult to expect drastic change or improvement of the living environment in rural areas, through the implementation of the priority projects, it is evident that such interventions have higher potentials to contribute in the improvement of living condition and poverty alleviation, gradual but steady impact could be expected. Under such situation, it is prerequisite to work with the concerned agencies for prompt realization of the proposed projects by considering the following:

(a) it could be ascertained that there is a positive interest for farmer beneficiary participation in the projects in which the results of the participatory planning was fed-back to them for further confirmation;

(b) it is expected that the TFT will function as a catalyst in implementing the formulated projects/schemes; and

(c) it is also possible to extend or spread the best practice as experienced in the model areas to other areas in the Study area.

(2) Necessary Measures for Priority Project

Taking into consideration the limited resources and fund available in Laos, in prioritizing the projects and schemes which will be implemented, due attention should be paid on the following:

(i) Highest Priority on the Implementation of Human Resource Development

The Study found out that the capability of farmers and technical staff at district/provincial levels is insufficient if they plan to become the real executors of rural development. In terms of program scope, it has to be manageable by farmers through the establishment of farmers' organization and the provision of agricultural finance.

Judging from the situation, the most important issue is securing sustainability of dry season irrigation and there remains a certain question whether to put a time-consuming human capacity building on top priority. On the other hand, it is a fact that the present "top-to-down" development method as well as the bureaucratic technology transfer method are facing their limitation.

On the other hand, it is difficult to expect that the Lao government will allocate part of its budget to the newly formulated projects/schemes, because there exist a possibility for Lao government to suddenly improve its tight financial condition partly due to internal and external flow of foreign exchange from macro economic viewpoint. In this connection, the best alternative is to introduce the strategic/intensive and the participatory development method is considered in view of effective utilization of the limited resources as well as to deploy and to expand the cross-sectoral development approach and the TFT concept.

As a realistic and concrete method to build up capacity of human resource, it is necessary for the central level, as the wider area activity (a) to unify the existing extension system, (b) to prepare a database of concerned staff, (c) to provide technical inputs and training for PAFSO technical staff as SMS and DAFSO technical staff as generalist, and (d) to prepare an inventory of existing irrigation facilities. On the other hand, it is planned at the strategic/intensive area (a) to establish and strengthen water management related farmer organization (WUG/WUA), (b) to establish and strengthen farmer groups relating to agricultural production (ACG/APG) and (c) to provide on-the-job training for planning and implementation of rehabilitation and construction irrigation facilities by using the immediate scheme as a teaching material.

It is duly recommended that the concerned stakeholders must assume the following roles and responsibilities:

Farmer Beneficiaries

- To establish the organization/group (ACG, APG, BSG, WUG/WUA) and systematize the operation of these organizations
- To provide local resources including labor and materials for the construction of infrastructure
- To bear a part of cost (equity contribution) for support activities
- To positively approach the public agencies and to voice out their messages and demands

DAFSO

- To receive SMS' s training and to independently upgrade capacity as a generalist

- To cooperate with TFT and participate in the activities

PAFSO

- To prepare a staff database relating to farmer support system
- To independently upgrade its capacity as SMS (technical staff)
- To provide technical support for TFT activities
- To prepare an inventory of existing pump irrigation schemes

Central Office/Staff

- To resolve or facilitate the resolution of political issues
- To unify the current extension system
- To prepare and manage staff database relating to farmers support system

APB

- To dispatch its own staff and to cooperate with TFT activity

(ii) Strengthening of APB to receive two-step loan

Since the Study area is enjoying a favorable location extending along Mekong River, it is highly possible to introduce development approaches mobilizing agricultural finance than in other areas in Laos. The APB will continue to play an important role for rural finance, as it can solely extend financing business in rural area and because it is rather difficult to expect BOL to continue to increasingly provide the fund source for the institutional loan due to tight financial position of the government. Therefore, it becomes urgent to restructure and strengthen the APB to be able to receive an external finance (two-step-loan). In the context of the improvement of the financial system for Laos as a whole, the following are recommended:

BOL

- To establish and promote a domestic market for short-term finance
- To promptly improve the bank accounting system
- To continue financial support to APB by extending the same level of institutional loan until the APB becomes capable to receive a two-step-loan.

APB

- To allocate long term institutional loan: In the model area, APB shall provide ordinary loan for the seasonal farming expenses after completion of the scheme

- To implement and publish auditing by external institution
- To exert effort to absorb surplus rural fund through expansion of savings business activity
- To provide training for executive and back-bone staff in third countries

Farmer-Beneficiaries

- To cooperate with APB in the simplification of the process in receiving institutional loan through establishing ACG and APG

(iii) Highest Priority on the Implementation of Phonthan Area Development

In the model areas where the strategic/intensive development activity is adopted, the TFT activity has an important role, as carried out within the framework of the Study. TFT with guidance and training from the technical staff in PAFSO as SMS, is expected to play the role of an interface between farmers and the public agencies, by transmitting the necessary technical information to the farmers and real needs and constraints of farmers to the higher authority.

The responses to and understanding of TFT activity by people in Savanakhet revealed that it is more advanced than the other two provinces. In the overall structure of TFT, Savanakhet province opted for a simple office type structure while Bolikhamsai and Khammouane provinces proposed a committee type structure. Furthermore, it is remarkable that TFT members in Phonthan area showed higher comprehension on TFT concept than the other two areas. In addition, in the Team's prioritization of the three model areas, Phonthan area ranked as top, obtaining highest priority in three out of the five sub-components.

For the effective and efficient utilization of the limited resources available in Laos, the Study followed the basic principle that the best practices and experience to be accumulated through the strategic/intensive area development approach will be extended to other areas. In this connection, it is recommended not to commence the proposed project in the three model areas all at once, but shall start from Phonthan area to strengthen the proposed scheme including the TFT concept.