

## ***CHAPTER 4 MASTER PLAN***

## **CHAPTER 4 MASTER PLAN**

### **4.1 Basic Development Concepts**

#### **4.1.1 Potentials and Constraints on Agricultural Development**

The final targets of agricultural development of the Study Area were set as “improvement of rural living standard” and “increase in farmers’ income”. To achieve these targets, the project objectives were set as “inundation mitigation”, “improvement of marketing system” and “improvement of irrigation and drainage”. The long-term development plans of Dong Thap and Tien Giang Provinces (1995-2010) were also taken into consideration in these targets and objectives.

Both long-term development plans place emphasis on agricultural sector though adopting industrialization policy. Land scarcity and rapid growth in population and labor force lie behind this policy orientation. As these plans were formulated in 1994-1995 when the country as well as the region enjoyed the high economic growth rates, development targets were set at a higher level. Asian currency crisis in 1997 also gave impact to the Viet Nam’s economy.

##### **(1) Development Potentials**

The study area, located at the upper part of the Mekong Delta and bordering Cambodia, is endowed with rich natural resources. With rather short history of development in the country and even in the Mekong Delta, the area achieved remarkable development performance in agriculture, particularly in rice production. This, as mentioned already, is attributed to the continuous development effort by government and people investing in flood control, irrigation and drainage, followed by intensive cultivation of paddy introducing high yielding varieties.

The Mekong Delta, the rice bowl of the country, produces more than 55% of the total agriculture product. As one of the major agricultural commodity and staple food of the population, rice is the most important crop in the country.

Rice in the study area in Mekong Delta has comparative advantages in a number of aspects, compared to other regions in the country. In addition to the climatic condition of tropical monsoon, farming in the area has a number of conspicuous characteristics compared to other parts of the country, particularly to the Red River Delta. These include bigger farm size per household, the higher level of paddy yield/ha, and also higher ratio of planted area to actual paddy land compared to other part of the country including Red River Delta. Therefore, the gross output of food (paddy equivalent) per capita is very high in the Study Area. This means that rice in the study area is the highly commercialized commodity compared to any other part of the country.

Though paddy production is dominant due to natural condition, crop diversification is going on,

particularly in the southern part and along the Tien river where inundation is not so serious. In these parts of the study area, fruits, livestock and aquaculture are expanding gradually. For the creation of non-farm job opportunities, agro-industry, particularly food industry based on the material produced in the region, is considered a most promising area, though there exist constraints as referred later.

## **(2) Development Constraints**

In the study area, expansion of agricultural land is not expected anymore. Almost all the available land have been developed already. Under the situation of growing population and labor force, equitable income of the people in the study area in future depends on the intensive/diversified agriculture and the creation of non-farm job opportunities. In agriculture, though the study area has the potentials due to its comparative advantages, there exist constraints for increasing income and improving the living condition of the rural people. Infrastructure for flood protection, inundation mitigation, transportation network improvement and others need to be focused not only for agricultural production but also for the improvement of living conditions. In addition to inundation, a certain part of the area is covered by acid sulfate soils which limit agricultural production.

In production, unstable yield and lower quality of product are the matters of concern. These are partly due to inundation with yearly fluctuation. The quality of paddy produced and marketed is affected by the mixture of different varieties and insufficient drying and processing. These lead to lower quality and hence to lower price of rice. Marketing systems are not well established to maximize the benefit of producers and those involved in marketing and processing. Further, in market economy, individual farmers will not be able to benefit fairly by their effort in production, processing and marketing if they do individually due to small size and limited bargaining power. The farmers groups and cooperatives are emerging in the study area, but many of them are at an infant stage in their activities and capacities.

Promotion of agro-industry, particularly food industry based on the material locally produced leads to creation of job opportunities for the increasing labor force. As the local resources are rather limited at the moment for these enterprises such as fund, technology and human resources, new investments naturally need to rely on outside including foreign direct investment. To realize these investments, in addition to the improvement of infrastructure, other incentives need to be provided to encourage the investors.

## **(3) Potential and Constraints for Agricultural Development by Sector**

Potential and constraints for the objective agricultural development by sector are summarized below.

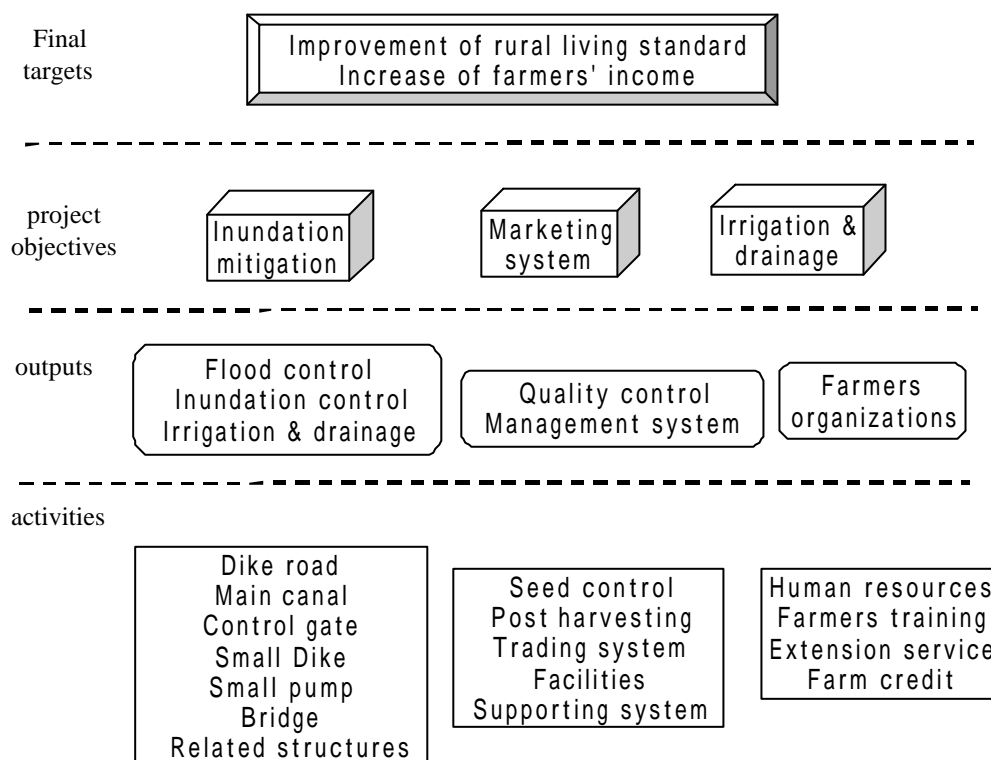
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**Potentials and Constraints of Each Sector for the Agricultural Development**

Sector	Potential	Constraints
Land use	<ul style="list-style-type: none"> <li>• High ratio of agricultural land.</li> <li>• Existence of natural reserve forest.</li> </ul>	<ul style="list-style-type: none"> <li>• No expansion of agricultural land is expected.</li> <li>• Limited forest cover.</li> </ul>
Agricultural Production	<ul style="list-style-type: none"> <li>• Paddy is most suitable crop.</li> <li>• Major portion of agricultural land devoted to paddy.</li> <li>• Exist potential to expand 3 crops a year.</li> <li>• Exist possibility to expand fruits and other crops though limited.</li> <li>• Diversification of farming including livestock and fisheries exist.</li> </ul>	<ul style="list-style-type: none"> <li>• Flood / inundation cause unsuitability of products.</li> <li>• Due to flood / inundation extent of orchard, livestock and fish breeding expansion are limited.</li> </ul>
Agricultural Infrastructure	<ul style="list-style-type: none"> <li>• Canal network for irrigation / drainage exist.</li> <li>• Transportation by boat is available in the canal system.</li> <li>• Enough irrigation water is available in main canal even in dry season.</li> <li>• Small dike system enables 2-3 crops a year.</li> </ul>	<ul style="list-style-type: none"> <li>• Situation of infrastructure is not at satisfactory level.</li> <li>• Living conditions against inundation are poor.</li> <li>• Canals obstruct road transportation.</li> <li>• Irrigation / drainage system within the dike is not well established.</li> <li>• Dike system lacks such structures as control gate, culverts, and spillways.</li> </ul>
Extension & Support System	<ul style="list-style-type: none"> <li>• Such organizations exist.</li> <li>- Extension Center</li> <li>- Plant Protection Division</li> <li>- Animal Health Division</li> <li>- Agriculture Development Service Company</li> </ul>	<ul style="list-style-type: none"> <li>• Budget constraints.</li> <li>• Limited number of extension workers and facilities.</li> <li>• Weak production and supply system for seed and seedlings.</li> <li>• Inadequate seed registration and control system.</li> </ul>
Rural Credit	<ul style="list-style-type: none"> <li>• VBARD branches exist at provincial and district level.</li> <li>• VBP extend loan to the poor.</li> <li>• The credit to farmers are increasing.</li> <li>• Other formal institution PCF also exists.</li> <li>• Cooperatives are eligible to borrow from VBARD.</li> </ul>	<ul style="list-style-type: none"> <li>• VBARD's credit does not fully meet the requirement of farmers in; <ul style="list-style-type: none"> <li>- Complicated procedure</li> <li>- Amount is small</li> <li>- Terms is so short</li> <li>- Interest rate is high</li> </ul> </li> <li>• The number of other institutions is limited.</li> <li>• Credit to cooperatives is limited at the moment.</li> </ul>
Post Harvest Processing facilities	<ul style="list-style-type: none"> <li>• Abundant supply of paddy to support paddy processing industry.</li> <li>• Enough capacity to process paddy.</li> <li>• Reliable supply of locally made machinery and spare parts.</li> <li>• Existence of many small scale food processing industry.</li> </ul>	<ul style="list-style-type: none"> <li>• Insufficient rice processing facilities for high quality rice.</li> <li>• Limited number of engineers for technology improvement.</li> <li>• Insufficient business management.</li> <li>• Limited supply of materials other than rice</li> <li>• Most of the small scale food industries are family based ones lacking funds and technologies for improvement.</li> </ul>
Marketing System	<ul style="list-style-type: none"> <li>• Better access to major market, HCMC.</li> <li>• Transportation network improving.</li> <li>• Major commodities are focused on market outside of the area.</li> </ul>	<ul style="list-style-type: none"> <li>• Marketing channels are diversified and complicated.</li> <li>• Paddy / rice price do not duly reflect the quality.</li> <li>• Insufficient market information for producers and consumers.</li> </ul>
Farmer's Organization	<ul style="list-style-type: none"> <li>• Existence of legal facility for cooperatives.</li> <li>• Existence of informal groups and cooperatives.</li> <li>• Strong needs and willingness of farmers on cooperatives.</li> <li>• Emergence of the direct cooperation between companies and cooperatives.</li> </ul>	<ul style="list-style-type: none"> <li>• Experience of failure in the past cooperatives and lack of understanding on new cooperative law on the part of farmers.</li> <li>• Lack of capable leaders.</li> <li>• Limited capital of cooperatives.</li> <li>• Limited opportunities for women's involvement in cooperative activities.</li> </ul>
Forest Management	<ul style="list-style-type: none"> <li>• Existence of concentrated forest and scattered forest.</li> <li>• Existence of natural reserve forest.</li> <li>• Substantial demands for fuel wood.</li> </ul>	<ul style="list-style-type: none"> <li>• Decreased forest cover.</li> <li>• Limited unused land for afforestation.</li> <li>• Extension and supporting system is not improved</li> </ul>
Environmental Conservation	<ul style="list-style-type: none"> <li>• There is National Park in the study area.</li> </ul>	<ul style="list-style-type: none"> <li>• Acid sulfate soil high water level to inundation.</li> </ul>

#### 4.1.2 Basic Development Concepts

Basic Development Concepts formulated for the Master Plan is illustrated below, showing the process from respective activities to the achievement of final targets. The final targets are set as the improvement of farmers' living conditions and the increase in farmers' income, and, for achievement of targets, project objectives are set as "inundation mitigation", "improvement of marketing system" and "improvement of irrigation and drainage". For the achievement of these objectives, the outputs such as "improvement of flood control, inundation control and irrigation and drainage", "improvement of quality control and management system" and "strengthening farmers organizations" will be required and the activities for these outputs should be executed effectively. The activities should be "improvement of dike road, main canal, control gate, small dike, small pump, bridge and related structures", "improvement of seed control, post harvesting, trading system, facilities and supporting system" and "training of farmers and strengthen of extension service". It is necessary to execute the activities in cooperation with each other. External conditions need to be satisfied for achievement of these objectives and outputs.



Basic Development Concepts

### **4.1.3 Target and Strategies for Agricultural Development**

#### **(1) Target Year**

The target year of the Master Plan is set as the year 2010, following the existing plans at the national, regional and provincial levels. In setting target year, two points should be mentioned. One is the term seems rather short of 10 years, which could cover the limited portion of development projects to realize the final target. Another is the serious change of economic situation surrounding the country and the region after the economic crisis occurred in 1997. The existing plans at regional and provincial levels were prepared mostly in 1994-5, when the country as well as the region enjoyed the high economic growth rates. The targets of these plans, therefore, are required to be modified to some extent. In this context, the figures of the target year in the existing plans were practically referred seeing the current situation instead of direct linkage to the Master Plan exercise.

#### **(2) Proposed targets, Strategies and External Conditions of Each Sector**

Based on the identification of the potentials and constraints, and also taking into consideration the existing development plans, both at regional and provincial levels, the proposed targets and strategies are prepared for various sectors of agricultural development. The targets and strategies of each sector involve physical and institutional aspects and often closely relate with each other. In setting targets and strategies, consideration on external conditions is essential.

#### **(3) External Conditions**

Any development target and strategy in the specified area/issue will be subject to external conditions, including natural, institutional and physical ones. For the realization of target and strategy, the related external conditions need to be satisfied. Otherwise, the target and strategies would not be the feasible ones. Typical cases would be seen in the marketing system which needs appropriate linkages with outside, the major regional market and also international market.

#### **(4) Targets, Strategies, External Conditions for Each Sector**

The targets, strategies, and external conditions of each sector are summarized below.

**Targets and Strategies of Each Sector for Agricultural Development**

Sector	Targets	Strategies	External Conditions
Land Use	<ul style="list-style-type: none"> <li>• Appropriate land use aimed at;               <ul style="list-style-type: none"> <li>-Diversified agriculture.</li> <li>-Environmental protection.</li> <li>-Support industrialization.</li> <li>-Stabilization of cropping pattern</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Increase in crop intensity.</li> <li>• Crop diversification.</li> <li>• Forestation.</li> </ul>	<ul style="list-style-type: none"> <li>• The agreement of the inhabitants.</li> </ul>
Agricultural Production	<ul style="list-style-type: none"> <li>• Paddy production increase in yield and expansion of 2-3 crops a year.</li> <li>• High quality paddy production.</li> <li>• Diversification including;               <ul style="list-style-type: none"> <li>-Fruits</li> <li>-Livestock</li> <li>-Fishery</li> </ul> </li> <li>• Increased income of farm household.</li> </ul>	<ul style="list-style-type: none"> <li>• Establishment of production system for high quality rice.</li> <li>• Establishment of diversified agricultural production system.</li> <li>• Promotion of agricultural mechanization.</li> <li>• Farming technology improvement.</li> </ul>	<ul style="list-style-type: none"> <li>• Effective support system.</li> <li>• Strengthened farmer organization.</li> </ul>
Agricultural Infrastructure	<ul style="list-style-type: none"> <li>• Protection from flood at Zone A.</li> <li>• Improvement of Drainage conditions at Zone C.</li> <li>• Mitigation of inundation conditions at Zone B and C.</li> </ul>	<ul style="list-style-type: none"> <li>• To control flood from Cambodian border</li> <li>• To improve flow capacity of canals.</li> <li>• To improve small dike system.</li> </ul>	<ul style="list-style-type: none"> <li>• Agreement with Cambodia on the construction of major work.</li> <li>• Farmers consensus on improvement plan.</li> </ul>
Extension & Support System	<ul style="list-style-type: none"> <li>• Strengthen extension system.</li> <li>• Production and supply of high quality rice seed and fruit seedling.</li> <li>• Provide enough materials with good quality by support services.</li> </ul>	<ul style="list-style-type: none"> <li>• Increase of the staff and extension materials, equipment.</li> <li>• Improvement of other support services.</li> <li>• Improvement of production and supply system of rice seeds and seedlings.</li> </ul>	<ul style="list-style-type: none"> <li>• Technical supports from the higher level organization.</li> </ul>
Rural Credit	<ul style="list-style-type: none"> <li>• To increase the coverage of farm household of credit by VBARD.</li> <li>• To encourage the investment credit for farmers, both by individuals and collectives.</li> <li>• To support the implementation of the programs/projects by special fund.</li> </ul>	<ul style="list-style-type: none"> <li>• VBARD to improve the conditions for rural credit in favor of farmers.</li> <li>• Special development fund to be established to finance the cost of programs/ project under the plan.</li> <li>• To increase the credit to farmers group/cooperatives for their investment needs.</li> </ul>	<ul style="list-style-type: none"> <li>• Rules and regulation on VBARD loans needs to be amended.</li> </ul>
Post Harvest Processing facilities	<ul style="list-style-type: none"> <li>• Reduction of post-harvest losses.</li> <li>• Increase in value added of the products.</li> <li>• Increase in job opportunities.</li> </ul>	<ul style="list-style-type: none"> <li>• Improvement of post-harvest practice, facility and equipment of producers.</li> <li>• Improvement of management system including operation, and renovation of facility.</li> <li>• Support to the introduction of new processing businesses and expansion of activities in a small industry.</li> </ul>	<ul style="list-style-type: none"> <li>• Improvement of quality inspection and control method.</li> </ul>
Marketing System	<ul style="list-style-type: none"> <li>• Collective marketing of produce by farmers organization.</li> <li>• Improve the quality of product.</li> <li>• Enlarge the scale of marketing commodity.</li> <li>• Promote the farmers' participation in marketing activity.</li> </ul>	<ul style="list-style-type: none"> <li>• Establishment of appropriate marketing channels for farmers.</li> <li>• Enlarge the scale of commodity by formulating farmers' group.</li> <li>• Promote the farmers' participation in marketing activity by initiating the model farmers' group(s).</li> </ul>	<ul style="list-style-type: none"> <li>• Improvement of the commodity market in core center.</li> <li>• Efficient collection /distribution of fruit in Food Supply System of HCMC.</li> <li>• Efficient loading work at Saigon port, Can Tho port and Sa Dec port.</li> <li>• Improvement Thuan bridge and Can Tho bridge.</li> </ul>
Farmer's Organization	<ul style="list-style-type: none"> <li>• Development of leadership of key persons among farmers and local officials.</li> <li>• Detailed contents depend on activities to be raised by other sectors.</li> </ul>	<ul style="list-style-type: none"> <li>• Training for farmers and government staff to be capable leaders.</li> <li>• Training on understanding farmers' organization and its operation.</li> <li>• Improvement/development of cooperation between governments and farmers for development.</li> </ul>	<ul style="list-style-type: none"> <li>• Existence of appropriate leaders and key persons.</li> <li>• Farmers' active and voluntary participation in the organization with strong motivation.</li> </ul>
Forest Management	<ul style="list-style-type: none"> <li>• Supply of sufficient firewood to inhabitants.</li> <li>• Establishment of appropriate forest management system.</li> </ul>	<ul style="list-style-type: none"> <li>• Strengthen of extension activities.</li> <li>• Increase of forest area as much as possible.</li> </ul>	<ul style="list-style-type: none"> <li>• Farmers agreement on forestation plan.</li> </ul>
Environmental conservation	<ul style="list-style-type: none"> <li>• Establishment of concrete countermeasure against acid sulfate problem.</li> </ul>	<ul style="list-style-type: none"> <li>• Environmental monitoring works on long-term basis.</li> <li>• Further detailed investigation</li> </ul>	<ul style="list-style-type: none"> <li>• The monitoring covers broad impacted area in the</li> </ul>

Sector	Targets	Strategies	External Conditions
		required.	Mekong Delta.

#### 4.1.4 Zoning

The zoning was conducted for establishment of sub-regional development strategies of the Master Plan. In zoning, 4 main factors, soil types, flood conditions, land use and water quality were taken into consideration. Evaluation results of respective factors are summarized in the maps. The zoning map was finalized with consideration of other factors such as the processing of the agricultural production, marketing and the distribution systems in addition to the above 4 factors. When zoning, **FLOOD CONTROL PLANNING for the INUNDATION AREAS of the MEKONG DELTA** was considered as one of basic requirements.

The main factors of zoning and zoning map are shown below.

Main Factors on Zoning

	Main characteristic			
	Soil Resources with emphasis on ASS*	Flood Condition		Water Quality (pH)
		With dike	Without dike	
Zone A	ASS does not distribute. Low cation exchange capacity and low base saturation with strongly acidic subsoil. Generally thin surface horizon with a low amount of organic matter.	Dike for S-A 70% Depth: 0 to 3m Period: 2 months	Non Dike area 30% Depth: 2 to 3m Period: 4 months	pH of canal water does not likely decline below 4.
Zone B	Saturated with water for long period during the year. Rather fertile with a finer soil texture and a slower organic matter decomposition, and an influx of ions from adjacent higher lands. But the zone is sparsely covered by potential and actual ASS.	Dike for S-A 60% Depth: 2 to 3 m Period: 2 months	Non Dike area 30% Depth: 2 to 3m Period: 4 months	pH of canal water likely decline below 4 in the area adjacent to ASS, particularly at the beginning of rainy season. (June)
Zone C	Saturated with water for long periods during the year. Rather fertile with a finer soil texture and a slower organic matter decomposition, and an influx of ions from adjacent higher lands. The zone is partly covered by Potential ASS.	Dike for S-A 70% Depth: 1 to 2 m Period: 1.5 months	Non Dike area 30% Depth: 1 to 2m Period: 3.5 months	In the past 13 years in the northern part of the zone, pH of canal water declined below 4 once every two years in June.
Zone D	ASS does not distribute. Generally fertile and used for a wide range of crops due to chemically rich properties with a near neutral soil reaction. High hydraulic conductivity because of silty or loamy nature.	Garden dike area 95% Depth: 0 to 0.5 m Influenced by Tide	Non Dike area 5% Depth: 0.5 to 1m Period: 3 months	pH of canal water does not likely decline below 4.
Zone E	No ASS in the zone. Endowed with a relatively fertile alluvial soils.			pH of canal water does not likely decline below 4.



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Zone F	Severe Actual ASS covers most part of the zone together with potential acid sulphate soils.	Dike for S-A 30% Depth: 2 to 3 m Period: 2 months	Non Dike area 70% Depth: 2 to 3m Period: 4 months	The zone is very susceptible to acidification of canal water.
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\*ASS: Acid Sulphate Soils

## 4.2 Sector Projects

### 4.2.1 Land Use and Agricultural Production

#### (1) Land Use

##### 1) Basic Approaches

The basic approaches for agricultural land use planning have been considered taking into account 1) Socio-economic Master Plans of both provinces, 2) land suitability for farming, 3) present land use, 4) results of irrigation and flood control study, 5) requirement for reserved land and 6) Master Plans of Flood Control Planning for the Inundation Area of the Mekong Delta as follows:

##### 2) Land Use Plan

The proposed area-wise land use plan in the Study Area was formulated based on the basic approaches for agricultural land use planning. The plan aims at increasing the area of triple paddy cropping by mean of the mitigation control. The overall land use plan for Study Area in comparison with the present land use is summarized in the following.

The map of land use plan is also shown in Figure below.

Proposed Land Use

Land Use	Present Land Use	Proposed Land Use	Change
Agricultural land	206,200	207,000	+ 800
Single rice cropping land	11,100	8,000	- 3,100
Double rice cropping land	112,100	87,000	- 25,100
Triple rice cropping land	50,700	75,000	+ 24,300
Rice + Upland crop land	2,000	2,800	+ 600
Upland cropping land	4,200	4,200	0
Perennial crop land	26,100	30,000	+ 3,900
Forest land	8,994	10,000	+ 1,006
Presidential land	32,400	35,000	+ 2,600
Unused land	5,333	800	- 4,533
Other land	13,434	13,500	+ 66

(Unit : ha)

As mentioned above, the agricultural land will increase very little but the triple rice cropping area and the perennial cropland will increase by 20,800ha and 3,900ha respectively.

##### 3) Land Use Plan for Each Zone

The proposed land use plan for each zone is shown in the following table. When comparing with the present land use, the triple rice cropping area and the perennial crop land will increase mainly in Zone B and C.

**Land Use Plan for Each Zone**

	1 Rice Cropping	2 Rice Cropping	1Rice+Upland crop or 2 Rice Cropping	3 Rice Cropping	2 Rice+Upland crop or 3 Rice Cropping	Perenial crop or 2 Rice+Upland crop	Perenial crop or 3 Rice Cropping	Total
<b>Zone A</b>	0	13,000	3,000	0		0	0	<b>16,000</b>
<b>Zone B</b>	0	49,500	13,000	21,000	5,500	0	0	<b>89,000</b>
<b>Zone C</b>	0	0	0	7,000		9,000	51,000	<b>67,000</b>
<b>Zone D</b>	0	0	0	0		16,000	4,000	<b>20,000</b>
<b>Zone F</b>	7,000	7,500		500				<b>15,000</b>
<b>Total</b>	<b>7,000</b>	<b>70,000</b>	<b>16,000</b>	<b>28,500</b>	<b>5,500</b>	<b>25,000</b>	<b>55,000</b>	<b>207,000</b>

**Present Land Use for Each Zone**

	1 Rice Cropping	2 Rice Cropping	1Rice+Upland crop	3 Rice Cropping	Upland crop	Perennial crop	Total
<b>Zone A</b>	0	15,800	200	0	0	0	<b>16,000</b>
<b>Zone B</b>	3,900	66,800	0	16,000	2,000	0	<b>88,700</b>
<b>Zone C</b>	200	22,000	300	32,000	0	12,000	<b>66,500</b>
<b>Zone D</b>	0	0	1,500	2,200	2,200	14,100	<b>20,000</b>
<b>Zone F</b>	7,000	7,500	0	500	0	0	<b>15,000</b>
<b>Total</b>	<b>11,100</b>	<b>112,100</b>	<b>16,000</b>	<b>50,700</b>	<b>5,500</b>	<b>25,000</b>	<b>206,200</b>

(Unit : ha)

## (2) Agricultural Production

### 1) Target of Agricultural Production

Target crops of agricultural production will be paddy and fruit.

The Study Area is expected to be the major rice crop zone even in the future. Paddy is the most suitable crop, and it occupies more than 90% of total cultivation area. Paddy cropping will remain as dominant farming system in the Study Area.

Although the area devoted to growing fruits in the Study Area is limited due to floods, the area is suitable for fruits in other aspects. Farmers are able to obtain high income from fruits though the market price will fluctuate year by year.

Meanwhile, livestock and aquaculture remain rather limited in production and marketing capacity.

#### **Paddy**

As for the paddy cropping in Vietnam, the major goals were placed on the increased yield and cropping ratio in the past. As the result of these efforts, rice has been sufficiently supplied. The target of rice production is sifting from the quantity to quality now.

In spite of the major rice production area in Mekong, the Study Area produces low quality of rice. It is an urgent issue to improve rice quality together with higher productivity.

The major causes of lower quality rice in the area are;

- So many varieties are used and no uniformity of varieties.
- Most of the farmers use seed produced by themselves and seed replacement ratio is low.
- The mixture of different rice varieties in cultivation period.
- As inappropriate, farming practice such selection of seeds and pest/decease control.

### **Fruit**

As for the fruit garden, the monoculture fruit garden of mango, longan and citrus are increasing as the market has expanded in recent years. However, the Study Area has lagged behind in introduction of the proper varieties and high quality seedlings. Therefore, farmers lack access to proper seedling sources.

DARD started inspection of fruits seedling business and introduction of the proper seedlings, which requires support from outside.

## **2) Agricultural Production Plan**

Target of agricultural production is set based on the estimation of the anticipated crop yields and cropping ratio through the investigations and discussions with concerned officials. Targets of agricultural production in the Master Plans of both provinces are also taken into consideration.

The target of cropping ratio of paddy will increase to 2.33 from 2.22, the yield to 5.00 ton/ha from 4.80 ton/ha with increased rice production of 182,360ton compared with the present data,. Targets are summarized in the upper table of the following page.

In increasing income of farm household, in addition to higher yield, improved quality is also important. This issue of quality will be more emphasized in marketing in the future. The targets of quality improvement for rice and fruit are given in the second table of the following page.

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**Main Target of Agricultural Production Plan to Year 2010**

		Present 1998	Target 2010	Remark (Land increase and decrease)
<b>Rice</b>				
<b>Exportable quality</b>				
Productivity	Ton	1,880,640	2,063,000	1/ + 182,360ton
Yield	Ton/ha	4.80	5.00	
Cropping intensity		2.22	2.33	
Cultivated area	Ha	391,800	412,600	+ 20,800ha
Paddy land	Ha	176,100	177,000	+ 900ha
<b>Perennial crop</b>				
Cultivated area	Ha	26,100	30,000	+ 3,900ha
<b>Fruit</b>				
<b>Exportable quality</b> 2/				
Mango	Ton	24,973	40,000	
Longan	Ton	81,576	120,000	
Citrus	Ton	21,077	35,000	
Banana	Ton	17,087	17,000	
<b>Upland crop</b>				
Cultivated area	Ha	6,400	7,000	+ 600ha
Maize	Ton	5,295	6,000	
Soybean	Ton	7,740	8,000	
Vegetables	Ton	12,923	15,000	
<b>Livestock product</b> 3/				
Pig		318,300	440,000	
Hen		3,800,600	5,000,000	
Duck		2,705,100	4,500,000	
<b>Aquatic product</b> 4/				
Natural catching yield	Ton	17,464	17,000	
Breeding cage yield	Ton	13,000	58,000	
Breeding pond yield	Ton	12,920	25,000	

1/ Estimate of productivity of rice in 2010 is based on Master Plan of both provinces

2/ Estimate of productivity of fruit in 2010 is based on Master Plan of both provinces and annual increase rate of late years.

3/ Estimate of productivity of livestock in 2010 is based on annual increase rate of late years.

4/ Estimate of productivity of fruit in 2010 is based on Master Plan of both provinces and annual increase rate of late years.

**Target of Improving Rice Quality**

Item	Target	Remark ( Existing data )
Whole Grain Recovery : Without broken grain, damaged grain, dead grain, immature grain, foreign grain, foreign matter	More than 60%	None data for the paddy and the brown rice Polished rice are 40 ~ 48%.
Appearance : Evaluation contents are thickness, maturity, hardness, uniformity, shape, luster, chaffed rice, white core rice, white belly rice.	Perfect appearance	
Moisture Content Ratio	Below 14.5% for paddy	Around 16% for the paddy and the brown rice

**Main Target of Improving Fruit Quality**

Mango	Renewal to the high quality varieties
Longan	Renewal to the high quality varieties
Citrus	Introduction of tolerant varieties to Greening disease

**3) Land Use Plan for Each Zone**

The basic farming system and proposed land use plan for each zone is shown in following table.

Zone	Present Farming	Proposed Main Farming	Proposed Main Agricultural Land Use
A	Double Rice Cropping	Double Rice Cropping	Same as the present
B	Double Rice Cropping	Double Rice Cropping Triple Rice Cropping	Double Rice Cropping land : 70% Triple Rice Cropping land : 30%
C	Double Rice Cropping Triple Rice Cropping	Triple Rice Cropping Specializing Fruit Garden Livestock & Aquaculture with VAC system	Triple Rice Cropping land : 80% Fruit garden : 15% Others : 5%
D	Triple Rice Cropping Mixed planting Fruit Garden	Triple Rice Cropping Specializing Fruit Garden	Triple Rice Cropping land : 50% Fruit garden : 50%
E	Aquaculture	Specialized Aquaculture	
F	Single Rice Cropping Reserve Area	Reserve Area Same as the present	Forest reserve program

\* Based on the adoption of rotational inundation control system

To achieve the above targets, the plans of each sector were established as referred in the followings.

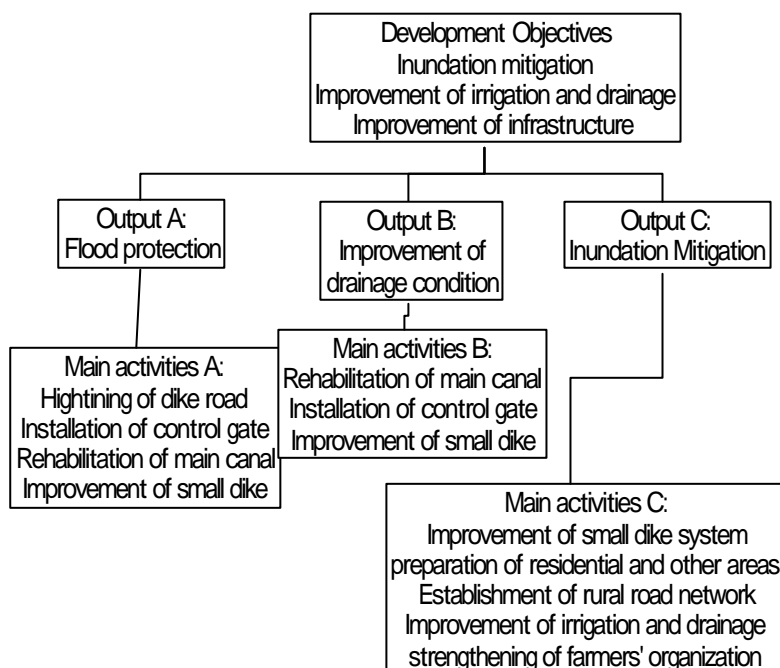
#### 4.2.2 Agricultural and Rural Infrastructure

##### (1) Development Objectives and Approach

Based on the development concepts, the development objectives for agricultural and rural infrastructure sector are set as inundation mitigation, improvement of irrigation and drainage and improvement of rural infrastructure. For the achievement of the final goal of the Master Plan with the development activities of other sectors, following development objectives for each zone are set, taking into consideration of “the Flood Control Master Plan of Mekong Delta” which was approved in June, 1999.

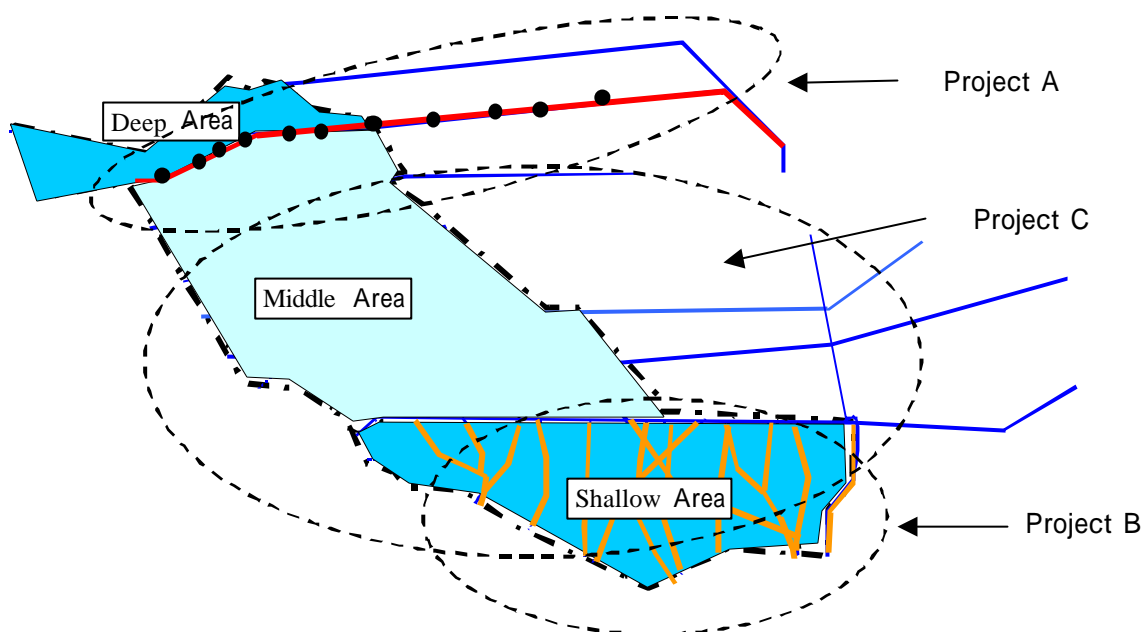
Development Objectives for Each Zone	
Zone A: Deep Inundation Area ( Single Paddy )	Based on the development plan of other zones, the countermeasure will be considered in the future. At the moment, improvement plan is not considered.
Zone B: Medium Inundation Area ( Double Paddy )	Inundation mitigation and other infrastructures will be considered but perfect prevention will not be considered.
Zone C: Shallow Inundation Area ( Double, Triple Paddy )	A perfect prevention from inundation will be considered in the future. Inundation mitigation and other infrastructures will be considered urgently.
Zone D: Shallow Inundation Area ( Paddy and Fruits )	A perfect prevention from inundation will be considered in the future. Inundation mitigation and other infrastructures will be considered urgently.
Zone E: Deep Inundation Area ( Inland fish )	Based on the development plan of other zones, the countermeasure will be considered in the future. At the moment, improvement plan is not considered.
Zone F: Medium Inundation Area ( Preserved, Forest )	Based on the development plan of other zones, the countermeasure will be considered in the future. At the moment, improvement plan is not considered.

In order to achieve development objectives, the expected outputs are set as “flood protection”, “improvement of inundation conditions”, “mitigation of inundation conditions” and following projects are proposed and studied.



Output A: Protection from Flood	Output B: Improvement of Drainage Condition	Output C: Mitigation of Inundation Condition
Project A: Flood Control on Boundary Area	Project B: Flood Control on Southern Nguyen Van Tiep	Project C: Small Dike System Improvement
Objective: To control the flood from June to Aug. Targeted Zone: Zone A	Objective: To prevent inundation through out the year Targeted Zone: Zone C, Zone D	Objective: To control inundation, to prepare residential area Targeted Zone: Zone B, Zone C

**Proposed Project of Infrastructure Sector**



The Project A and Project B were proposed in the Flood Control Master Plan of Mekong Delta and the development objectives were approved by the Government of Viet Nam in June 1999.

**(2) Development plan**

**Project A: Flood Control on Boundary Area**

With heightening of dike road from Hong Ngu to Hung Ha (around 42 km) and installation of 10 main control gates (w=7 to 25m, h=9 to 10 m), the flood from Cambodian border will be controlled in July and August. The protection of big flood and stabilization of S-A rice crop are expected.

Main components
Tu Thuong water control works: dredging two canals, constructing 3 spillways to Tien River
Tan Thanh – Lo Gach water control project: To construct the flood control channel beside the National Road No.1
Improvement of Dike road: hightening of dike road 42 km, 10 control gate and spill ways
Improvement of Tien and Vam Co rivers: dredging canals (28 canals: So Ha, Tan Thanh – Lo Gach, Hong Ngu, Dong Tien, 2/9, Khang Chien Binh Thanh and Thong Nhat and others)

**Project B: Flood Control on Southern Nguyen Van Tiep**

With rehabilitation of 20 main canals (widening and dredging) at the southern part of Nguyen



Van Tiep Canal and improvement of dike system, the flood condition of upper part will be improved and the area at lower part will be prevented from inundation throughout the year. Improvement of drainage conditions and stabilization of 3 rice crops are expected.

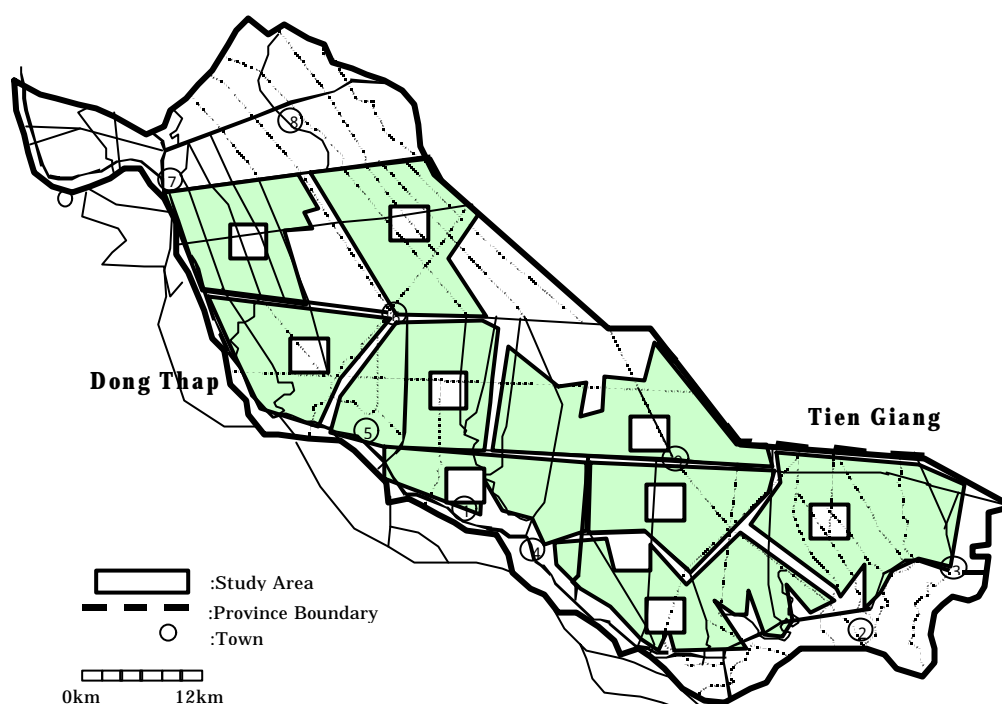
Main components
Dredging and widening of main canal: 20 main canals total length 180km, width 15 to 25 m
Related structures: small control gate (height 5 to 7 m 123 units), bridge 72 units
Heightening of small dike: heightening 30 to 40 cm, total length 1,300 km, culverts (height 5m, width 5m, 324 units)

### **Project C: Small Dike System Improvement**

With improvement of small dike system, installation of bridges, strengthening of farmer's organization and applying of rotational inundation control, the residential, forest, and other areas will be prepared, rural road net work will be improved, irrigation and drainage system will be established and inundation will be controlled without any big impacts on the outside area. The improvement of rural living conditions and increase in rice production will be expected.

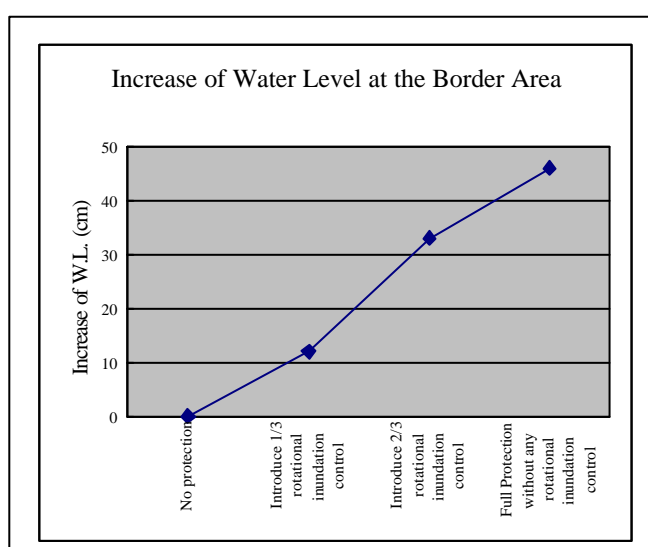
Main components
Improvement of small dike: heightening 0.2 to 1.2 m, width 0.6 to 4.2 m total length 2,900 m related structures (spill way, culverts, control gates), gravel pavement
Irrigation and drainage system (104systems): irrigation system (pump, canal, diversion work), drainage system (pump, canal)
Installation of bridge: bridge for car access 26 bridges, bridge for bike passing 329 bridges
Strengthen of farmers' organization: 9 combined organization will be established based on 202 dike units

The area for Zone B and C can be divided into 9 project areas based on the present conditions of inundation, existing infrastructures, acid sulfate soils, cropping pattern, etc. as shown below.

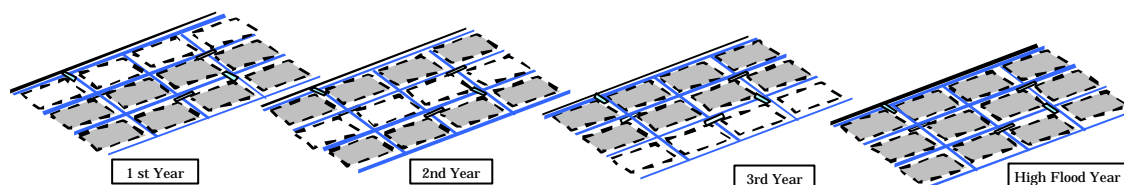


Block									
Number of dike systems	19	18	20	33	31	20	23	34	29
Total area (ha)	16,221	14,517	16,271	21,153	20,220	10,450	13,680	19,794	14,448
Benefited area (ha)	12,977	11,614	13,017	18,228	17,482	8,360	10,944	17,843	11,559
Dike length ( km )	267	206	387	345	343	251	321	340	347
Mean Heightening(m)	1.2	1.4	1.1	1.1	1.0	0.5	0.5	0.5	0.3

The hydrological analysis using mathematical model was done for studying the influence of increasing of water level with this project. As the results, the maximum high water level is expected at northern part of Tan Hong (boundary area with Cambodia), 46 cm of increasing of water level is calculated with non-inundation control for all area. With non-inundation control for 30 % of total area, the increasing of water level will be around 10 cm and this increase of water level will not cause any serious influence to existing structures.

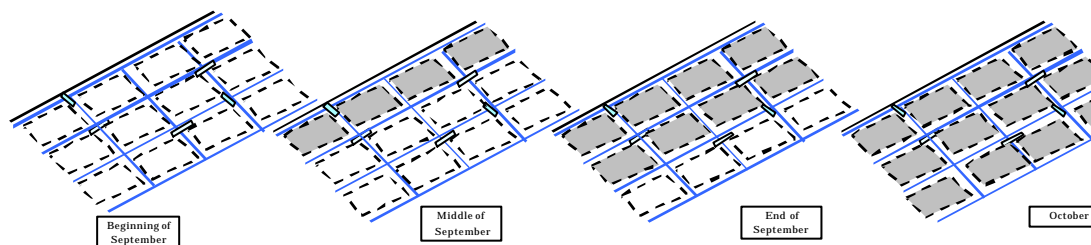


Therefore, based on 30 % non-inundation control, the rotational inundation control system is proposed. For the high flood such as one time for 10 years, all area must be inundated. Based on this idea, the project was explained in the meetings such as public hearing and the idea was agreed by beneficiaries in the medium inundation area.



**Rotational Control in Middle Inundation Area**

However, in shallow inundation area, an alternative idea in which the inundation is controlled rotationally in September and the inundation is made in all area in October was suggested by the beneficiaries. After confirming the hydrological analysis, it was decided to apply this idea.



**Rotational Control in Shallow Inundation Area**

The comparison of characteristics among each blocks are summarized below;

Area	Medium inundation area ( zone B )					Shallow inundation area (zone C)			
Influence for rural living conditions large=3,middle=2,small=1	3	3	2	2	2	1	1	1	1
Constrains for cropping large=3,middle=2,small=1	3	3	3	3	2	1	1	2	1
Damage from inundation large=3,middle=2,small=1	2	2	2	2	1	3	3	3	1
Influence from acid sulfate soil small=3,middle=2,large=1	2	1	2	2	1	3	3	3	3
Relation with main canal simple=3,middle=2,mplicate=1	3	1	1	3	3	1	3	3	1
Influence for environment small=3,middle=2,large=1	1	1	3	3	3	3	3	3	3
<b>Total</b>	<b>14</b>	<b>11</b>	<b>13</b>	<b>15</b>	<b>12</b>	<b>12</b>	<b>14</b>	<b>15</b>	<b>10</b>

Based on this comparison, those blocs can be classified into following 4 categories. As the constructions of Block and will make increasing of water level at boundary area, these constructions are better to be done after discussion with the Government of Cambodia.

Blocks for implementation at first stage:

Blocks for second stage :

Blocks for third stage :

Blocks for after discussion with Cambodia :

**(3) Implementation plan**

The problems of implementation of projects are summarized below;

Project A	The increase in water level at border line with Cambodia is estimated at 25 cm and the decrease in water level at south part of dike road is expected as 17 cm in August. As the gates will be opened in September and October, a large change of water level on peak inundation time is not expected. However, as impacted area is quite large, impacts on water level, discharge amount, water quality, etc. should be studied. The KOICA study team is carrying out the study on flood control master plan for Mekong River basin including the area in Cambodia now and it is necessary to make F/S based on the results of that study.
Project B	The decrease in water level at medium inundation area in October is expected as about 10 cm but approx. 15 cm of water level increase is estimated in shallow inundation area. Since the area of impact of this project is quite large, it is necessary to make F/S based on the study results of KOICA team.
Project C	With rotation inundation control with 30% non-inundation, in October the increase in water level is expected as 11 cm at boundary area and also less than 10 cm in other areas. According to the discussion with KOICA study team, any big problem is not expected considering 20 cm of difference of water level between 50% and 20% of probability. Therefore, it is not necessary to wait for the KOICA study results. Furthermore, the project components will be able to adjust through the F/S. However, the farmers' agreement and strengthening of farmers' organization are required for introduction of rotational inundation control system and it is necessary to study more about socio-economic environment.

Based on these conditions, the implementation plan is studied and the results are summarized below;

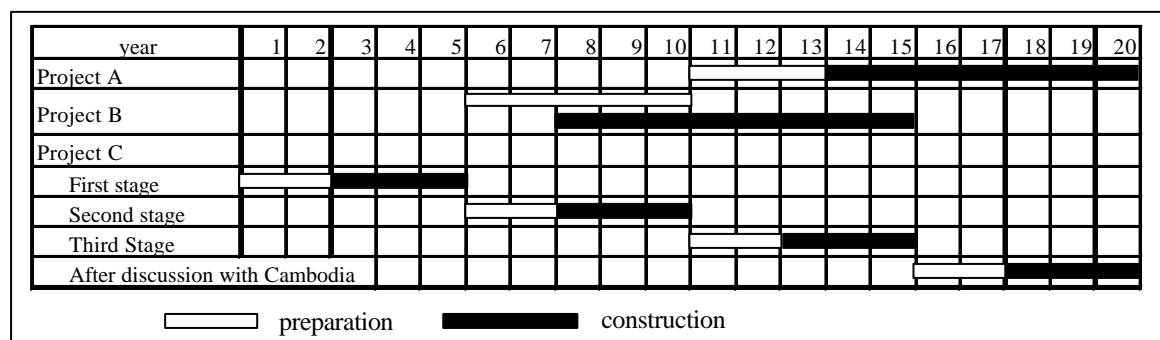
Project A: After confirming the results of KOICA study team, F/S should be carried for 1 year. The discussion will be required with Cambodian government based on the study results. After that, detailed design and tendering for 2 years and construction for 7 years will be required.

Project B: After confirming the results of KOICA study team, F/S should be carried for 1 year. After that, for each main canal, detailed design and tendering for 1 year and construction for 1 year will be required. Then 2 years will be required for 1 canal. Total period is estimated as 10 years.

Project C: For each block, 3 months for F/S, 1 year for detailed design and farmers' agreement will be required. 3 years for construction period is expected considering stabilization of embankment and transportation of materials. The total period is 5 years. 9 blocks is divided into 4 groups as shown below;

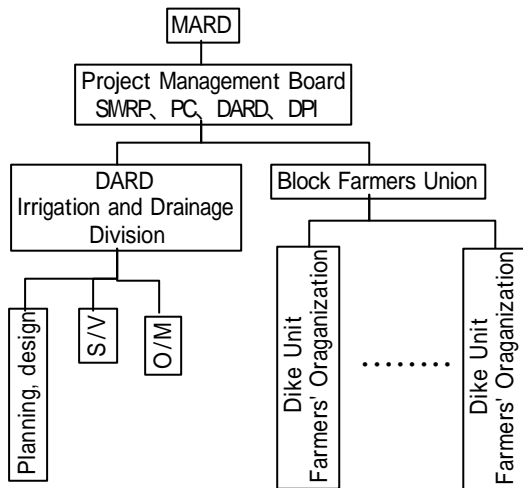
First stage :     、 Second stage :     、 Third stage :     ,

After discussion with Cambodia :

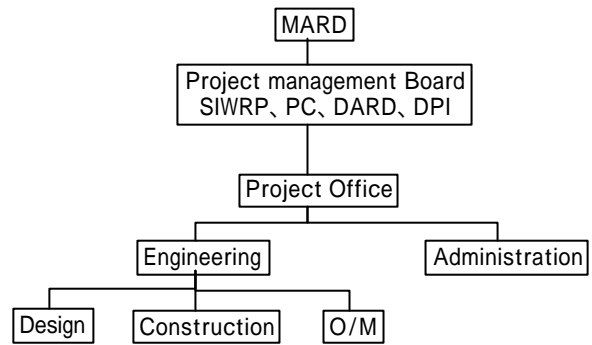


**(4) Implementation and O/M Organization**

Implementation and O/M organizations for project A and B should be established as shown in the figure. The new project office will be required under the management board which consists of SIWRP and other related agencies. The human resources for staffing will be expected from SIWRP and other related agencies. The project management board is also required for Project C. Under the project management board, the sections of planning/design, construction S/V, O/M of irrigation and drainage division of DARD will work for preparation, construction and O/M respectively. The private consultants will be available for assisting the work. The rotation inundation control plan and distribution of payment for farmers will be decided by each block farmers union which consists of farmers organizations of each dike unit. The operation of gate control, collection of management fee, etc. will be operated by staff of related commune PC under management of DARD O/M section. The farmer's organization of dike unit will consist of existing farmers collectives which are managing the O/M of irrigation and drainage system as water users association now. DARD will support for strengthening and unifying of farmers organization.



Organization for Project C



Organization structure for Project A and B

**(5) Project costs**

The costs of projects are estimated as shown below.

Project	Project Cost		O/M Cost	
	Billion VND	( million US\$)	Million VND/year	( thousand US\$/year)
Project A: Flood Control on Boundary Area	1,654.5	(118.2)	2,545.5	(181.8)
Project B: Flood Control on Southern Nguyen Van Tiep	2,163.6	(154.5)	3,818.2	(272.7)
Project C: Small Dike System Improvement	1,793.0	(128.1)	66,268.3	(4,733.4)
	210.4	(15.0)	7,186.8	(513.3)
	185.9	(13.3)	6,350.5	(453.6)
	217.1	(15.5)	7,415.3	(529.7)
	288.5	(20.6)	9,856.0	(704.0)
	270.5	(19.3)	9,239.0	(659.9)
	115.2	(8.2)	4,868.2	(347.7)
	154.1	(11.0)	6,509.7	(465.0)
	217.5	(15.5)	9,190.0	(656.4)
	133.8	(9.6)	5,652.7	(403.8)

**(6) Recommendations**

- Since the expected area of impact is large for Project A and B, it is necessary to make F/S based on the results of KOICA Study Team.
- The environmental impacts on water level, discharge amount, water quality should be studied for Project A and B. In addition, the discussion with Cambodian Government will be required for Project A
- The impacted area for project C will be small. However, it is necessary to study environmental impact to mitigate the impact in the F/S.
- The rotational inundation control system should be required for Project C. Therefore, it is necessary to study for obtaining farmers' agreement, strengthening of farmer's organizations and O/M system.

### 4.2.3 Forest Management

#### (1) Objectives

The objectives of the Study on forest management is to contribute to improving the rural environment, stabilizing and increasing the income of farm households and improving the living conditions of farmers through forest conservation and stable supply of fuel wood.

#### (2) Planning Items

In regard to national forests, the present forests will be further fostered together with concentrated planting at appropriate sites. Border protection forests will be created along border zones. Environmental conservation forests will be created mainly in private forest areas where there is concern in regard to the decrease in forest area and also in areas which are unsuitable for agriculture. Scattered planting will be conducted along roads, canals and embankments for the purpose of supplying fuelwood for local people. Concentrated planting will also be conducted at unused land which is located outside government forestry areas. Extension activities will be conducted for plantation management by local people.

##### 1) Concentrated Planting at Government Forestry Areas

Unused land where planting appears feasible in government-owned production forest areas, is totalling 103 ha in total. Concentrated planting will be planned for this area. *Melaleuca cajuputi* will be planted and management will be conducted by each body in accordance with its own management principles.

The Tram Chim National Park has 4,307 ha of unused land. Of the 4,307 ha of unused land, 370 ha has been secured for planting and concentrated planting will be planned for this area. *Melaleuca cajuputi* will be planted and the administrative body of the National Park will manage the plantations in accordance with its development principles.

##### 2) Concentrated Planting Outside Government Forestry Areas

The GIS land use survey conducted by Sub-NIAPP in 1999 in the Study Area indicates 574 ha and 148 ha of unused land in Thanh Hong District and Thanh Binh District respectively, totalling 722 ha. Concentrated planting in these areas will be planned for the purposes of supplying fuelwood for local people and preventing soil erosion, floods and wind damage.

*Melaleuca cajuputi* will be planted at a density of 20,000 trees/ha. Thinning will be conducted annually for trees of four years of age through nine years of age, followed by selective cutting with a cutting cycle of 10 - 13 years. Cutting sites will be regenerated. Plantations will be managed by the People's Committee of the relevant communes.

##### 3) Environmental Conservation Forest Zone

Environmental conservation forest zone will be created in the area of approximately 17,000 ha lying in

the northern part of Thap Muoi District, for the purposes of preventing floods, conserving water, ensuring biological diversity and regulating the climate. This area will include an existing 2,063 ha of private forests and 140 ha of national forests. Concentrated planting will be planned for 900 ha of unused land. *Melaleuca cajuputi* will be planted. Scattered planting along roads, canals and ridges between paddy fields will be planned for a paddy field area of approximately 14,000 ha which excludes the planned area for concentrated planting and existing private and national forests. 660,000 *Melaleuca cajuputi* trees will be planted for this purpose.

New canals with a total length of 80 km will be created at existing forests without canals and at the newly planned concentrated planting sites for forest fire control. A watch-tower and monitoring station will be constructed at five sites. The DARD of the Dong Thap Province will be responsible for the supervision of planting and the management of new plantations.

#### **4) Border Protection Forest**

A border protection forest will be planned for the border zone with Cambodia in Hong Ngu District and Thanh Hong District for border security and flood prevention. This forest will be 46 km in length and 100 m in width and will cover a total of 460 ha. *Bambusa* spp. will be planted. The DARD of the Dong Thap Province will be responsible for the supervision of planting and management of this border protection forest.

#### **5) Scattered Planting**

Scattered planting along roads, embankments and canals will be planned in areas other than Cai Be and Cai Lay Districts for the purposes of supplying fuelwood for local people and preventing soil erosion, floods and wind damage. No scattered planting will be planned for Cai Be and Cai Lay Districts under the Study because of the facts that (i) the fuelwood consumption in these two districts is lower than in other areas, (ii) the limbs and tops of abundant fruit trees can be used as fuelwood and (iii) there are already many scattered plantations.

A total of 14,549,000 trees will be planned for scattered planting. The planting species will be *Melaleuca cajuputi* (60%), *Eucalyptus camaldulensis* (20%) and other species (20%), such as *Acacia auriculiformis*, *Acacia hybrid*, *Hopea odorata* (Sao den), *Dipterocarpus alatus* (Dau), *Mangifera* sp. (Xoai), *Bambusa* spp., *Sarcocephalus* sp. (Gao), *Samanea samana* (Cong), *Combretum quadrangulare* (Tram bau) and *Pithecellobium dulce* (Me nuoc).

The planting density will be 20,000 trees/ha for *Melaleuca cajuputi* and 10,000 trees/ha for *Eucalyptus camaldulensis*. Supplementary planting will be conducted if the dead tree ratio is high. Weeding will be conducted in the first three years if necessary.

In the case of *Melaleuca cajuputi*, thinning will commence at four years of age and will continue annually upto nine years of age. The thinning rate will be around 20% for the first thinning and around 10% thereafter. The cutting period will be approximately 10 years. The annual cutting rate will be 10% or less and cutting sites will be regenerated.



In the case of *Eucalyptus camaldulensis*, thinning will be conducted twice at 3-4 years of age and 6-7 years of age. The thinning rate will be around 30% each. The cutting period will be approximately 10 years. The annual cutting rate will be 10% or less and cutting sites will be regenerated. Scattered plantations will be managed by the People's Committee of the relevant communes.

#### **6) Extension Program**

Extension training will be planned to facilitate scattered planting and concentrated planting outside government forestry areas. The People's Committee of the relevant communes will be approached to select approximately two members for training. Training will be conducted at the extension training center to be strengthened under the Agricultural Assistance Plan.

#### **7) Annual Work Plan and Project Cost Estimate**

The Project term will be 6 years and Project cost is estimated to be 25,769 million VND.

#### **(3) Effect of Plan Implementation of Fuelwood Supply**

The likely supply volume of fuelwood for the year 2010 following the implementation of the Plan is estimated for the Dong Thap Province area within the Study Area.

The total volume, including the thinned volume and the branch volume, which can be supplied as fuelwood is an average of 23,000 m<sup>3</sup> a year.

At present, the Dong Thap Province area within the Study Area has 3,725 ha of production forests, 2,287 ha of protection forests and 2,821 ha of special use forests in addition to an estimated 31,752,000 trees for wood production (bamboo is excluded) in scattered plantations. 3,725 ha of production forests is expected to supply 60,000 m<sup>3</sup> of industrial roundwood and 51,000 m<sup>3</sup> of fuelwood annually on average.

31,752,000 trees in scattered plantations can presumably produce an average of 67,000 m<sup>3</sup> of industrial roundwood and 125,000 m<sup>3</sup> of fuelwood annually. Accordingly, it is estimated that existing production forests and scattered plantations in the Dong Thap Province area within the Study Area have combined potential to produce 176,000 m<sup>3</sup> of fuelwood annually on average.

Given the above estimates, the Dong Thap Province area within the Study Area will be able to supply 199,000 m<sup>3</sup> of fuelwood a year on average up to 10th project year, and 234,000 m<sup>3</sup> of fuelwood a year on average with the implementation of the Plan. As the estimated fuelwood demand in the area in 2010 is 201,000 m<sup>3</sup>, there should be sufficient supply capacity to meet the fuelwood demand in future. This prospect is further boosted by the availability of additional fuelwood supply from existing bamboo stands and protection forests.

Economic benefit by fuelwood production with the implementation of the Plan was estimated. Of fuelwood production, final cutting volume was estimated by stumpage price, and thinning volume and branch volume were estimated by fuelwood price. Annual average benefit is calculated to be

4,590,000,000VND up to 10th project year, and 14,460,000,000VND after 10th project year up to 20th project year.

#### **(4) Recommendations**

- 1) Suitable planting sites for *Melaleuca cajuputi* extend widely in Dong Thap Province, Tien Giang Province and Long An Province and, therefore, the formulation of an integral forest management plan for these three provinces should prove effective in terms of forest conservation and forest management.
- 2) In many parts of eastern Tam Nong District and northern Thap Muoi District, the single cropping of rice is currently conducted despite the poor local soil conditions which are unsuitable for farming. Attempts should be made to obtain the consent of local people for comprehensive operation involving agriculture, forestry and fishery.
- 3) While the introduction of various facilities for visitors in the Tram Chim National Park is desirable, proper attention should be paid to the construction work of such facilities not causing any adverse impacts on the ecosystem of the National Park.
- 4) While *Melaleuca* spp. are very important planting species for acid sulfate soil areas, their present use is mainly restricted to producing piles for building materials and fuelwood. It is, therefore, essential to expand the scope of *Melaleuca* spp utilization. What appear to be crucial here is the early implementation of an experimental project for (i) the breeding of *Melaleuca* spp. as well as the introduction of a *Melaleuca* hybrid for increased increment and qualitative improvement, (ii) tests to develop new wood uses, such as charcoal, pulpwood and floor wood, etc. (iii) establishment of a production system to cater for new uses, and (iv) examination of the profitability of operation.

#### **4.2.4 Post-harvest Processing**

##### **(1) Objectives and Strategy**

Based on the target of the Study, “To increase the income and improve their living standard” as the precondition, the Objectives and Strategy for formulating the Master Plan in this sector are set as follows:

##### **1) Objectives**

- Reduction of post-harvest losses  
To reduce post-harvest losses in terms of quantity and quality, and to increase producer’s profit.
- Increase value added of the products.  
To increase value added of products, and increase producer’s income.

- To increase job opportunity  
To increase job opportunity and absorb surplus labor, and increase inhabitant's income.

## **2) Strategy**

### **a. Producer's Level**

- Improve the post-harvest practice  
To train producers for the post-harvest technology including the quality control measure and improve the post-harvest practice, in order to reduce losses and to improve quality.
- Introduction of appropriate post-harvest facilities and equipment  
To spread post-harvest facilities and equipment such as warehouse and dryer in order to reduce losses and to improve quality.
- Support introduction of processing for the increased value added of the products  
To support introduction of processing and to establish new processing businesses to increase efficiency, especially in terms of technology.

The above strategies are recommended to be implemented by producer's group so as to maximize the economic efficiency.

### **b. Processing Industry Level**

The strategy expects the improved procurement condition where producers will be given better offer to their products by the processing industry and increase of job opportunity.

#### **Existing rice processing industry**

- Improvement of factory management including machinery operation technology  
To train management staff and operators of processing plant or machinery on modern factory management and plant operation in a more profit oriented manner. The expected technical subjects are as follows:  
Factory management / Profit management / Processing plant and machinery operation / Inspection and quality control / Process control in view of a recovery rate and losses
- Renovation of facilities, machinery and equipment  
To renovate facilities, machinery and equipment especially aged and old fashioned ones and introduce necessary devices for inspection and quality control to improve the factory's efficiency and profitability.

#### **Other processing industry**

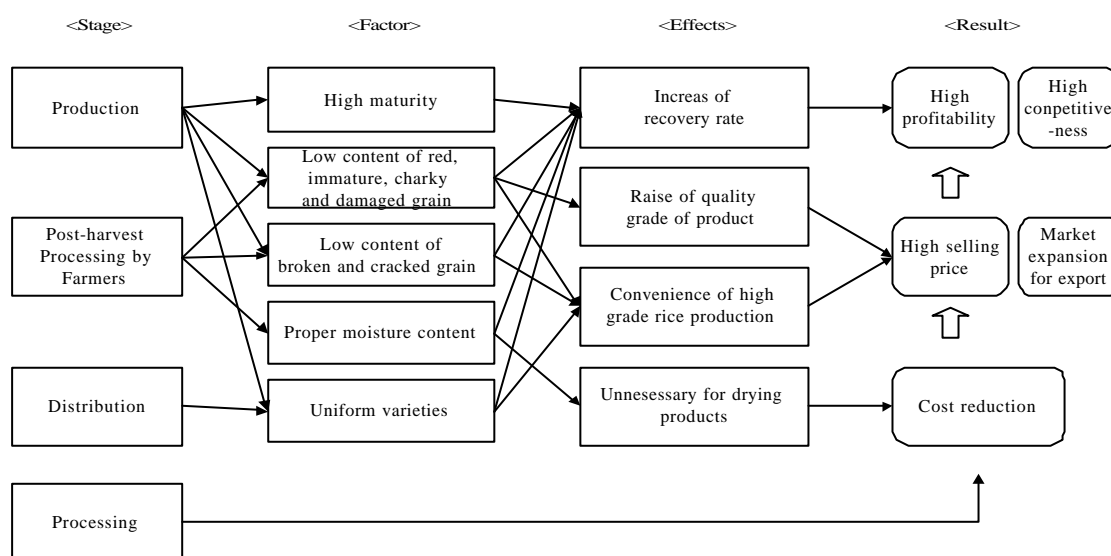
- Support to the introduction of new processing businesses and expansion of activities in small industry  
To support the introduction of new processing technologies upon request of entrepreneurs and enterprises for the purposes of establishment of a new processing business, to develop

new product lines and to expand production capacity.

**c. Necessity of cooperation and linkage among strategies**

Improvement of post-harvest processing of farmer’s level provides the reduction of losses on quantity and quality. The reduction of quantitative losses can bring profits directly to farmers by increasing in their selling amount. On the other hand, the reduction of qualitative losses or the improvement of quality can bring economic effects only through the following process as shown in the chart below. To improve the quality at farmer’s level, there is a need that farmers should be motivated by higher price for their high quality product. It is indispensable that the processors must have the capability for precisely evaluating the differences of various raw materials and reflecting it to the procurement price. Further, the trader must offer proper buying price to farmers in conformity with the above condition between price and quality. Therefore, it is necessary to recognize that the improvement of post-harvest processing will be promoted by the implementation of the strategies through effective cooperation and linkage among concerned parties.

**Improvement of rice quality and effects given in processing**



The correlation of each strategy including the development plan is shown in Annex.F.4.1.

**(2) Development plan**

The outline of the development plan are classified and arranged as follows:

**1) General**

**A-1 Training and extension of P/H technology including quality control**

The project will introduce post-harvest technology training and extension facility in Dong Thap Prov.

and Tien Giang Prov. The former covers the field of rice and the latter covers fruits and vegetables.

Objectives		Activities	
1) To improve P/H practice of producers 2) To improve processing factory management 3) To improve quality control technology 4) To support to introduction of new processing technology 5) To foster experts needed for development of P/H industry.		1) To train producers 2) To train management staff and operators of processing machinery 3) To train producers, traders and processors 4) To train and support farmer's group, entrepreneurs & enterprises 5) To train graduates of a high school, college and a university	
Input	Implementing Agency	Requirement	
Necessary facility for training. Assistance to preparation of a training course design and curriculums	Dong Thap PC Tien Giang PC Assist. Agency: PHTI will recruit and dispatch trainers.	Cooperation and support by PHTI	

#### **a. Dong Thap Province**

<The part of this project carried out in Dong Thap Province is included in the “Integrated Project for Rice Quality Improvement”>

- i) Site : This project will be executed at the Agricultural Extension Center in Cao Lanh Town planned to be introduced by the Integrated Project.
- ii) Trainees : Farmers, farmer's groups, traders, processors and graduates.
- iii) Monitoring of post-harvest losses  
Trainig on the P/H loss assessment technology is to be included in programs. The assessment data is to be collected timely with the cooperation of trainees and to learn the actual loss generating condition in the Area. (Refer to **B-1**)
- iv) Staff: Four permanent staffs and temporally staffs will be recruited.
- v) Facility and equipment : Theoretical training is carried out in the lecture room for multi-purpose use and the facility and equipment such as rice mill and inspection equipment are to be introduced.
- vi) Cost :

	1,000VND
Equipment	1,000,000
Building	1,060,000
Total	2,060,000

- vii) Operational cost: Operational cost is to be shared by trainees and clients for development activity.

#### **b. Tien Giang Province**

- i) Site : This project will be attached to the existing Vocational Guidance School in Cai Be District.
- ii) Trainees : Farmers, farmer's groups and traders
- iii) Technical support : The support on the application technology development will be

provided to farmer, farmer's group and traders by their requests.

- iv) Staff : One permanent staff and temporally staffs will be recruited.
- v) Facility and equipment: Theoretical training is carried out in the existing lecture rooms and the facility and equipment such as various type of storage and quality control equipment for practical training will be installed newly.
- vi) Cost :

	1,000VD
Facility & equipment	1,000,000
Building	530,000
Total	1,530,000

- vii) Operational cost : Operational cost is shared and owed by trainees and clients for development activity.

## 2) Rice P/H Processing

### B-1 Assessment Study of Post-harvest Losses

Objectives		Activities
1) To obtain reliable technical and numerical data to be used for consideration of improvement plans and measures		To carry out assessment study from paddy field to rice processing factory at enough numbers of places during a year.
Input	Implementing Agency	Requirement
Fund and/or technical cooperation.	Agricultural extension Center Assist agency : PHTI	Assessment method will be given careful consideration for obtaining useful reliable data.

<This project is included in A-1, as a component in the " Integrated Project">

### B-2 Improvement of P/H Facility and Equipment of Producers

Objectives		Activities
1) To reduce P/H losses 2) To improve quality		To provide a credit for producer's procurement of P/H facility and equipment such as a drying yard, a dryer, a warehouse and inspection devices.
Input	Implementing Agency	Requirement
Credit line with economical condition for producers	Dong Thap PC Tien Giang PC Agricultural Development Bank	To provide training

<This project is included as a component in the " Integrated Project">

- i) Implementation organization : To formulate the implementation organization within DARD in Dong Thap Province P. C.
- ii) Fund : To introduce 1.5 M US\$ for the Project as revolving fund.
- iii) Facility and equipment : Facility and equipment supported by the fund are drying yards, storage facilities by bamboo nets and flat bed dryers.
- iv) Credit condition : 3 years period with 0.7%/month of interest.
- v) Mean of application : After inspection and judgement of the collateral condition and repayment ability the credit is applied to qualified applicants. This program is carried out by revolving fund.
- vi) Facility and equipment spreading plan : Total number of places are 2,000 by the end of 2010 starting from the year 2002.

### **B-3 Improvement of Processing Facility and Equipment**

<b>Objectives</b>		<b>Activities</b>
1) To reduce losses and increase profitability 2) To improve quality		To provide a credit for processor's procurement of facility and equipment for renovation.
<b>Input</b>	<b>Implementing Agency</b>	<b>Requirement</b>
Credit line with economical condition for processors	Dong Thap PC Tien Giang PC	To provide training To expand a short term loan for planned procurement.

<This project is included as a component in the "Integrated Project">

- i) Implementation organization : To formulate the implementation organization within an appropriate bank.
- ii) Fund : To introduce 2 M US\$ to an account for the Project in a bank as a revolving fund.
- iii) Facility and equipment : The fund is used for the renovation and expansion of existing facility and equipment.
- iv) Credit condition : 3 years period with 0.9 – 1.0%/month of interest. Max.
- v) Mean of application : After inspection and judgement of the propriety of request, collateral condition and repayment ability the credit is applied to qualified applicants. This program is carried out continuously through refunding by revolving use of repayment money.
- vi) Facility and equipment renovated and expanded : Total number of factories applied to this program is as follows, starting from 2002.

Annual: Average 140 factories

Total by 2010: 1,200 factories

### **3) Model project**

#### **C-1 Model Activities for Producer's Group**

<b>Objectives</b>		<b>Activities</b>
1) Option 1 To reduce losses and improve quality		To introduce facility and equipment such as warehouse, dryers and inspection devices To inspect quality of their products. To sell their products by variety basis and inspection results
2) Option 2 To produce high quality rice, reduce losses and improve quality		<The following activities are added to the above.> To produce high quality rice by introduction of qualified seed and improvement of cultivation practice
3) Option 3 To produce high quality rice, reduce losses, improve quality and add a value by milling		<The following activities are added to the above.> To introduce a rice mill.
<b>Input</b>	<b>Implementing Agency</b>	<b>Requirement</b>
Necessary facility and equipment or credit line for introduction of them	A farmer's group under a supervision of Provincial and District PC.	To be applied to existing or newly organized producer's group To provide training To provide a cooperation by rice mills (SOEs).

<This project is included as a component of the "Integrated Project" and compiled with plans in the other sector concerned.>

- i) Facility and equipment : A Rice mill, dryers, quality control equipment etc.
- ii) Building : A processing factory, warehouses etc.

iii) Staffing : Five permanent staffs will operate.

iv) Cost :

	1,000VD
Facility & equipment	2,000,000
Building	2,320,000
Total	4,320,000

### **(3) Recommendation**

#### **1) Importance of National Promotion Policy**

As mentioned above, the proper incentive must be given to persons and the enterprises concerned to improve the condition of the post-harvest processing. This means that the establishment of proper and effective market mechanism is called for in the area. To ensure to make such situation, the appropriate promotion measures are to be considered by the Government in parallel with the efforts made through the development plan in the region. There exist many issues to be tackled, such as quality standard of agricultural products, inspection system. Market intervention and others which can not be dealt within the specific project area.

#### **2) Necessity of Technical Cooperation**

There are many components for introducing machinery and equipment among the development plans. The application technology for the effective use of those machinery and equipment are necessary because the machinery and equipment cannot generate any profits by themselves. To transfer technology to the peoples concerned, various training programs are proposed in the development plan. However, for some subjects, to recruit capable trainers seems to be difficult. In these cases, the technical cooperation from abroad might better be considered.

### **4.2.5 Improvement Plan of Marketing System**

#### **(1) Target and Strategy**

##### **1) Target**

Specific problems which can be handled within the Study Area are taken for consideration in this plan because agricultural marketing systems in the Study Area considerably depend on the external factors of the Study Area such as national level policy, transport infrastructures and food distribution system.

Rice and fruits are regarded, in this plan, as target commodities from viewpoints of the necessity of improvement and expected effects, though each one has a different marketing system.

Major agricultural products of the Study Area depend on markets outside of the Study Area. To realize a better price in the competitive markets, superior quality is the key factor. Quality of agricultural products fundamentally depends on the production stage. To enhance the farmers' activities for quality



improvement, it is necessary to introduce a system which directly returns the profit of quality improvement to farmers.

Development targets for the improvement plan of marketing system are set as :

- a) Improve the quality of products, b) Enlarge the scale of marketing, c) Increase the bargaining power and
- d) Farmers' participation to marketing/ processing activities.

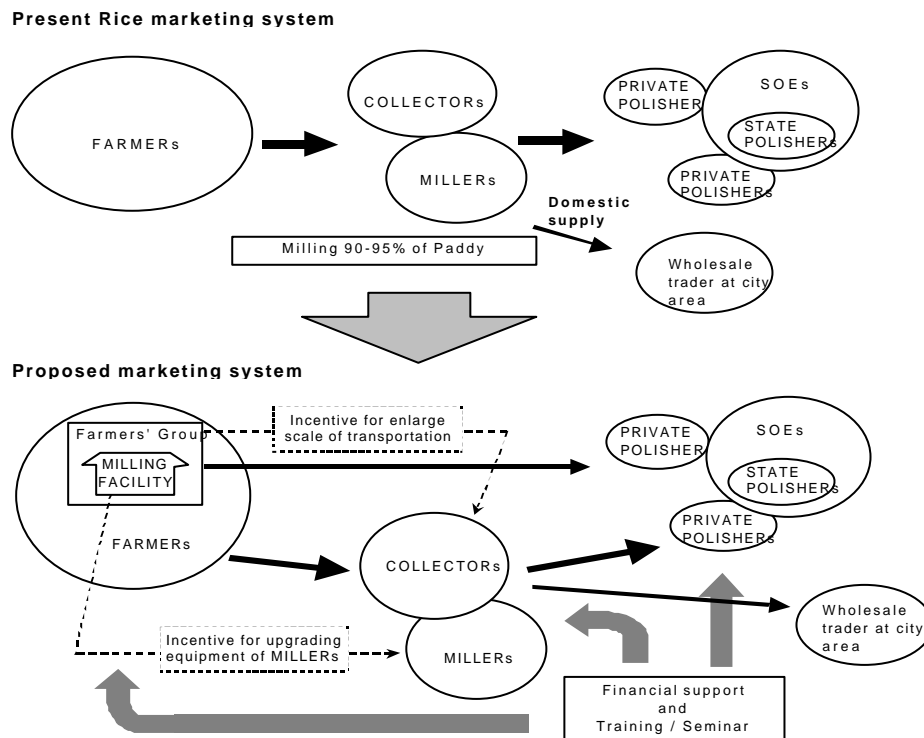
**2) Strategies**

**Improvement of rice marketing system**

In addition to the mixed cultivation and uneven quality of paddy at farmers' level, at collectors and processing stages, the mixture of different varieties/qualities will arise. This mixture makes it difficult to reflect duly the quality of paddy to its price. Therefore this lead to the lack of incentives of farmers to improve their paddy quality.

To improve this situation, planting of unified varieties and improvement of paddy quality should be encouraged at farmers' level. In addition, group sales of the products to large processors should be considered to secure the return of profits from improved quality. Group sales will strengthen the bargaining power of farmers through large scale of rice marketing.

Though group sales activities are already introduced outside the Study Area, farmers' group activities are very weak in the Study Area and it may take many years to become popular. Therefore, together with the improvement of farmers' side, financial and technical supports to collectors and rice processors are necessary. To introduce the farmers' group activities of unifying varieties, quality improvement and group sales in the Study Area, it is most effective to show an example of success model(s) to farmers.



Based on the above strategy, following 5 projects are prepared for the improvement plan of rice marketing.

- Establishment of model of farmer's group sales activity.
- Seminar for promotion of farmers' group sales activity.
- Financial support to upgrade the equipment for physical distribution.
- Training of quality control & evaluation.
- Financial support to improve the processing facility and equipment.

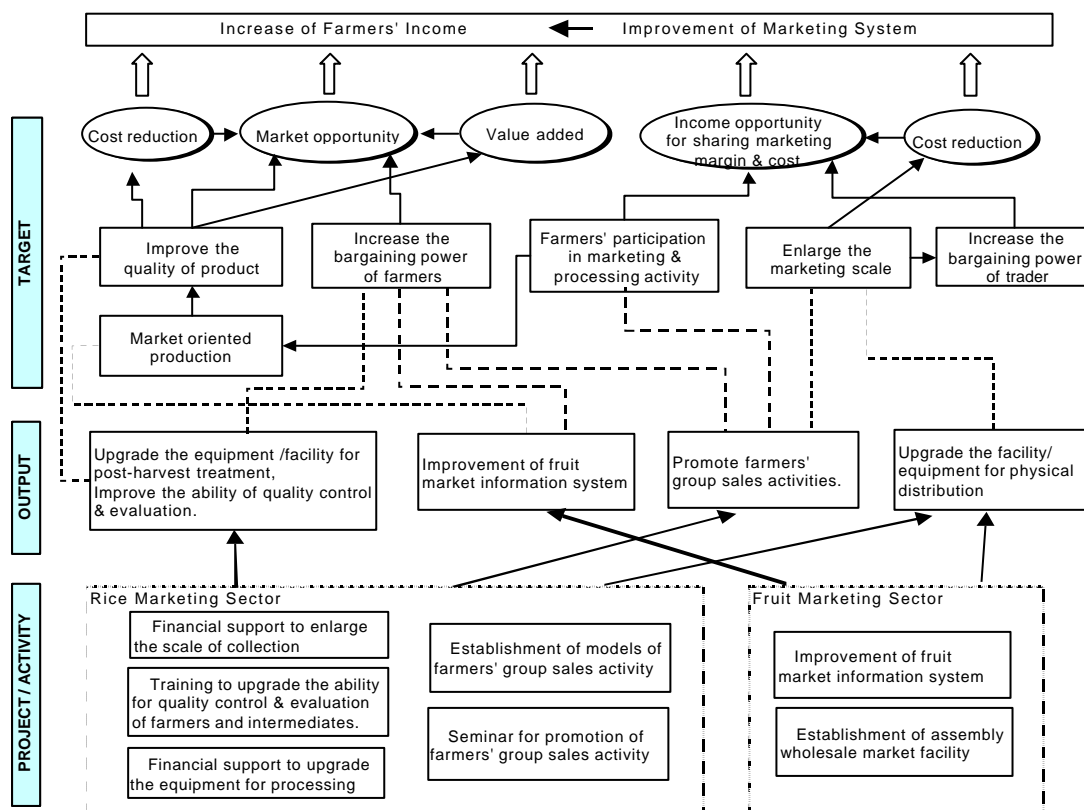
Above and are already described in the section of 4.2.4 Post-Harvest Processing.

**Improvement of fruit marketing system**

Under the present marketing system of major fruits, collection and distribution to markets, HCMC and other provinces are conducted efficiently by private traders. There exist clear differences of price among the varieties and qualities. Assemblies wholesale markets in the Study Area already play important roles in collection and distribution of fruits produced in/around the Study Area. Due to continuing increase of fruits production in/around the Study Area, the improvement plan is formulated with targets of improving marketing efficiency and increasing the bargaining power. Based on the above strategy, following 2 projects are prepared for the improvement plan of fruit marketing system.

- Improvement of fruit market information system.
- Establishment of assembly wholesale market facility.

Flow of activity/project - output - target is illustrated as below.



**(2) Project for Rice Marketing System**

**1) Establishment of models of farmers' group sales activity**

To promote the farmers' group sales activity establishment of the model group in the Study Area is proposed.

**a. Outline of the project**

The scale of each model will be determined by actual scale of selected farmers' group. Based on the scales of existing farmers' cooperatives and taking into consideration of the scale merits of rice mill, size of farmers' groups is set as 400 ha – 500ha (400 - 500 farm households). Taking into account of the ripple effect to the wide areas, 4groups (cooperatives) will be selected as model.

**b. Facility / Equipment for activity model**

Facility and equipment for a model of 500ha is as follows;

Facility

Warehouse (paddy and rice)	: 1800m <sup>2</sup>	Office	: 80m <sup>2</sup>
Dry yard * 1	: 1000m <sup>2</sup>		

Equipment

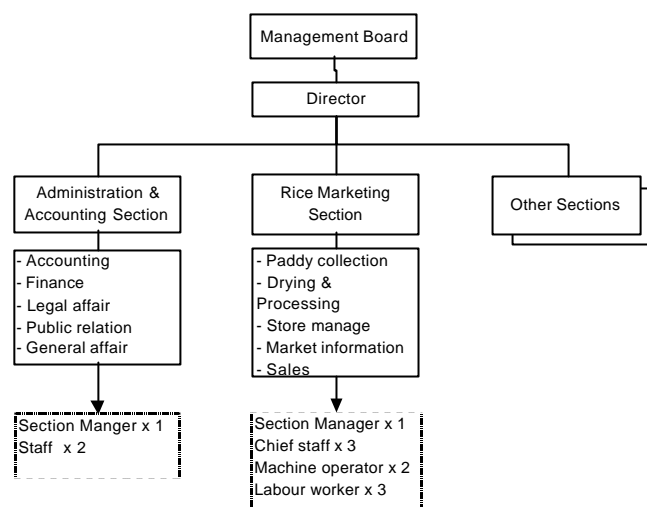
Milling machine	: 1 set	Paddy dryer	: 1 set
For quality control and inspection	: 1 lot	For data collection	: 1 set
For commodity handling	: 1 lot	For office management	: 1 set
Boat	: 1 unit	Spare part	: 1 lot

\* 1 : Dry yard scale will be varied depend on the locations.

**c. Management plan for activity models**

Practical activities such as collection, storage, transportation of products, operation of processing facility, sales management, quality control, accounting/financing shall be carried out by business unit being established in each farmers' cooperative. Section managers and technical personnel must have enough experiences in each field and it is desirable to recruit personnel from private sector.

Under direct supervision of Director of cooperative, business unit shall conduct practical activities in accordance with the working plans approved by Management Board. Simple works such as loading/unloading can be conducted by casual employment.



Business unit for operation of group sales activity

After recruiting the key staffs and formulating the business unit, following training programs shall be conducted for initiation of business activity.

Trainee	Contents	Purpose
All staff of business unit	Practical training of collection, storage, transportation, operation of processing facility, sales management, quality control, accounting and financing.	To secure the smooth operation of business activity, comprehend the contents of job each other.
All cooperative members (farmers)	Practical methods of quality control and evaluation	To improve the paddy quality of cooperative member.
Staff of business unit	Preparation of working manuals	To secure the smooth operation of business activity
Machine operators and Chief staff	Operation and maintenance of procured equipment	To master the operation and maintenance of procured equipment

#### **d. Implementation plan for the model project**

Implementation body of the model project is DARD of province. Project team has to be established with two full-time staff in DARD to conduct activities as mentioned below. After completing the models establishment, these two staff continue to work for introduction of group sales activity to other farmers' groups based on the experience of the model project.

#### **Activities of project team**

Implementation of the model project:

- Management of the project, - Coordination works between relevant organizations such as other sections of DARD, SOEs and Bank., - Workshop/ Training program for formulation of farmers' group.

Support activity to model farmers' groups:

- Recruitment of key staffs, - Formulation of business unit, - Preparation of working manuals, -

Training program for starting business activity.

**e. Project cost and O/M cost**

Facility / Equipment cost		O/M cost ( per year) (1,000NVD)	
Facility	27,000,000	Operation cost	380,000
Equipment	12,800,000	Depreciation	4,050,000
<b>Total</b>	<b>39,800,000</b>	<b>Total</b>	<b>4,430,000</b>

**2) Seminar program for promotion of farmers' group sales activity**

After completing the establishment of models, conduct a seminar program to disseminate the advantages of group sales activity, knowledge of how to formulate farmers' group and supporting system of the provincial government by way of study tour to the model activity and others.

Trainee	Seminar title	Number of trainee	Period	Number of seminar per year	Total number of trainee per year
Farmers	Seminar program for promotion of group sales activity	25-30 per seminar	3days	6 times	150

Seminar will be conducted at the Extension Center of DARD by the model project staff.

**3) Support program for marketing intermediaries**

( Financial support to upgrade the equipment for physical distribution)

To improve efficiency of marketing, provide financial support (credit) to collectors for enlarging their scale of physical distribution.

Purpose of use	Amount of credit	Required capital	Note
Renew or adding new boat ( minim boat size 20 ton )	Max. VND60 million per person	US\$1,600,000	No credit shall provide to a purpose of start collecting business.

Required condition of credit : Term 4 year, Interest 0.7% per month

Number of beneficiary : 120 business unit per year, Toatl 1100 business units (2010)

Implementation plan is described in the section 4.2.8 Rural Credit.

Support programs to processors for improving the quality of product ( Training of quality control & evaluation. Financial support to improve the processing facility and equipment ) are described in the section 4.2.4.

**(3) Project for Fruit Marketing System**

**1) Improvement of fruit market information system**

**a. Background and Object**

Though SOFRI in My Tho has started collection and regular dissemination of fruit market

information since 1998, area and frequency of collection and dissemination are limited. Pricing Departments of P.C are collecting price information of many commodities including major agricultural products such as paddy and rice. But no price information of fruit is collected.

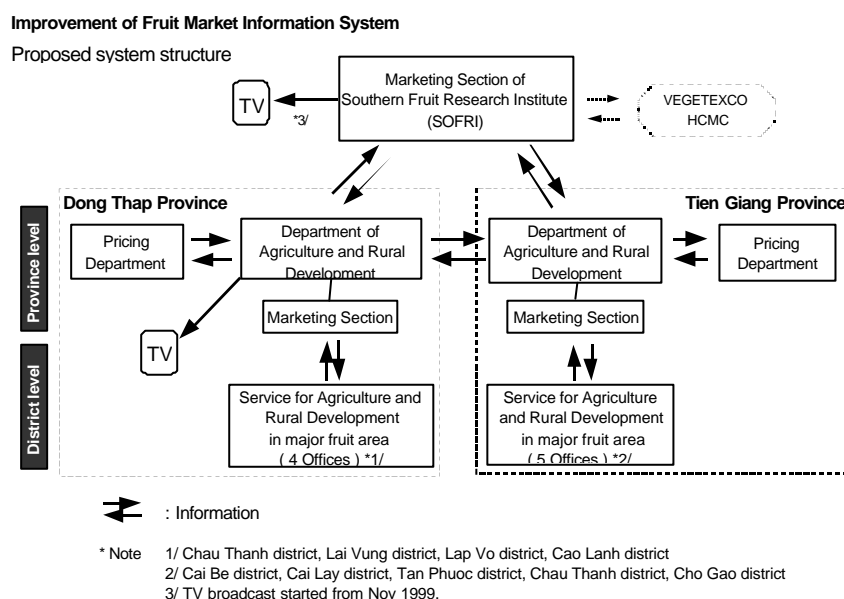
In order to promote efficiency of fruit marketing and to strengthen bargaining power of farmers, establishment of systematic information system is to be considered.

**b. Outline of the project**

Utilizing existing functions of information collection, information network will be established by combining the DARD and Pricing Department of both Dong Thap Province and Tien Giang Province, SOFRI and some district level agricultural offices.

In order to formulate a new network, a new section for marketing information services shall be set up in the DARD in Dong Thap and Tien Giang Provinces respectively as coordinators. After establishment of the network, marketing sections of both provinces conduct following activities.

- Analysis of data collected and dissemination through public media (TV / Radio).
- Develop the network to collect information of HCMC market, China border market and other foreign markets.



District level agricultural offices conduct periodical surveys to grasp the situation of production/harvest and market prices at each district

As the result of activity of the information network, the DARD will be able to accumulate market information and to grasp real situations of markets more clearly. It enables the DARD to provide better guidance to the farmers.

**c. Equipment**

Personal computer and related items                      11 sets

Equipment for telecommunication 11 sets

**d. Management plan**

To allocate a permanent staff ( 1 person ) at each marketing section of provinces for formulation of the network.

**e. Project cost and O/M cost** ( mil. VND )

	2 Provinces	9 Districts	Total
Project cost	263	282	545
Operation cost	100	*	259
		159	

( \* ) Estimated from necessary M/M .

**2) Establishment of assembly wholesale market facility**

**a. Object of improvement market facility**

Many of assembly wholesalers are located at Cai Be Market and An Huu Market in Cai Be district. Fruits from the Study Area and other production areas in Mekong River Delta are collected and distributed to HCMC, China boarder and other provinces through these markets. Though the continuous increase of fruits production are expected in/around the Study Area, market facilities such as shop, parking place, piers for unloading and storage facilities are in poor condition.

To maintain the efficiency of fruit marketing in the Study Area, an adequate market facility for wholesale activity will be established in respect to increase in fruit production.

**b. Outline of the Project**

To establish a wholesale market facility is planned by rezoning the existing shops. Formulation of management board is proposed including all traders as members of the board. Management of new market facility will be under supervision and assistance of the province/district PC.

- Facility / Equipment

Facility

Shop ( 20 shops )	: 1500 m <sup>2</sup>	Storage	: 100 m <sup>2</sup>
Packing warehouse	: 200m <sup>2</sup>	Office	: 80m <sup>2</sup>
Parking/loading space	: 800m <sup>2</sup>	Unloading/working space	: 1250 m <sup>2</sup>

Equipment

For market data management	: 1 set	For office management	: 1 set
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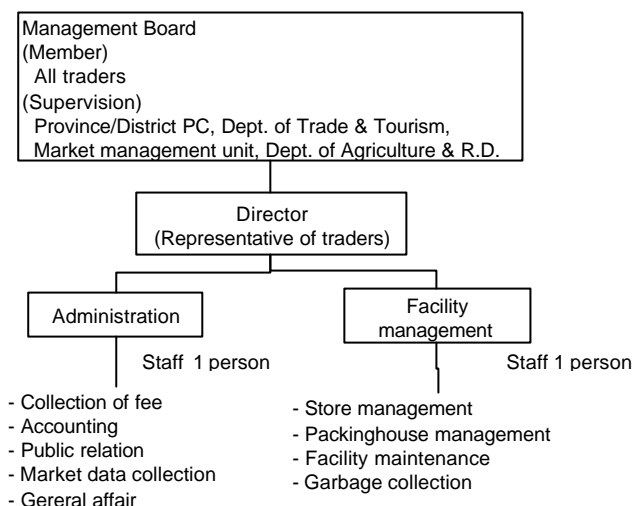
- Market management plan

Management board including all traders as member of the board shall manage the new market facility under the supervision and assistance of the province/district PC. Management board

shall stipulate the following regulations for smooth operation of the facilities.

- Regulations for utilization of the market facilities
- Formation of market office units
- Operation plan for the storage and packing warehouse

Through the joint activity of market management of traders, formulation of fruit traders association, establishment of their own fruit brand and development of a new market may be realized.



**c. Project cost (1,000VND)**

Facility	11,517,000
Equipment	65,000
<b>Total</b>	<b>11,582,000</b>

**d. O/M cost** : O/M costs will be collected as a market space fee from traders.

**(5) Implementation Plan**

From the view points of benefit to farmers, project effects and possibility of realization, the implementation plan is prepared as below.

year	1	2	3	4	5	6	7	8	9	10
Establishment of model of farmer's group sales activity.		■	■							
Seminar for promotion of farmers' group sales activity			■	■	■	■	■	■	■	■
Financial support to upgrade the equipment for physical distribution			■	■	■	■	■	■	■	■
Improvement of fruit market information system			■	■	■	■	■	■	■	■
Establishment of assembly wholesale market facility						■	■	■	■	■

Preparation
  Implementation



#### 4.2.6 Environment Protection Plan

##### (1) Background and problems to be addressed

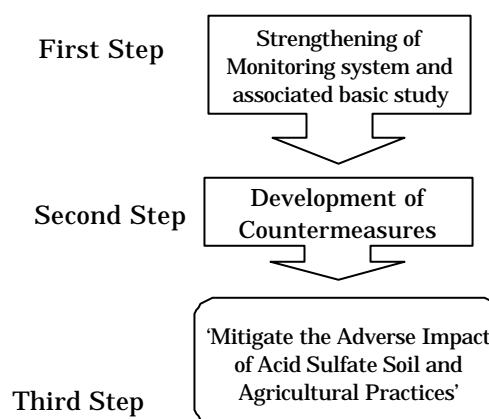
Acid sulfate soil covers the middle and the northern part of the Study Area, which poses severe problems in agricultural production and living standard of the rural farmers. Agricultural land in the Study Area will be developed, as has been conducted in the past, through excavation of canal in the area influenced by acid sulfate soil together with intensive flushing of generated sulfate. This development effort will result in acidification of soil and contamination by sulfate of surface water which is being used as drinking water of the region's residents. In addition, problems associated with pesticides use which lead to contamination of surface water is also being raised in the Study Area.

To this end, SIWRP has been conducting Water Quality Monitoring since 1986 in the Mekong delta with particular emphasis on surface water quality. It started pesticides monitoring, though intermittently, from 1994. However, behavior of sulfate in soil and influence of the substance on quality of underground water, another important source of drinking water, have not been fully surveyed. Although it is well known fact that the pesticides effluent from paddy field has a specific pattern being characterized by 1) herbicides sprayed before sowing, 2) insecticides sprayed at the middle of rice growth stage and 3) peak appearance three days after application, the sampling design in the monitoring has not taken into account the pattern and region's farming practice.

##### (2) Target and Approach

Under the framework of the Master Plan the final target of which is set forth as 'Improvement of Rural Living Standard' and 'Increase of Farmer's Income', the final goal of the environmental protection plan is to 'Mitigate the Adverse Impact of Acid Sulfate Soil and Agricultural Practices'.

The goal is materialized through, first of all, strengthening of water quality monitoring that has been conducted by the local institute, and basic study to develop countermeasures against the problems.



##### (3) Strengthening plan of Water Quality Monitoring

The monitoring system is to be strengthened through identifying additional analytical items, sampling sites and appropriate timing so as to develop appropriate mitigation measures against the problems associated with acid sulfate soil and agricultural practices. The study should focus region's application pattern of pesticides and other related issues.

Program	Contents
Strengthening Water Quality Monitoring Plan	The current monitoring system is to be strengthened through identifying necessary analytical item, additional sampling sites and appropriate sampling design based on such studies as application pattern of pesticides. The outcome the monitoring should be regularly reviewed and fed-back.

The said programs can be conducted with the current human resources and facilities. However, instruments for multiple analysis such as GC-MS is to be supplied to facilitate the task.

Program	Quantity	Price	Remarks
Strengthening Water Quality Monitoring Plan	1 set	US\$150,000	Vessels for sample storage Water purifier GC-MS Auto-sampler Rotary evaporator etc.

#### (4) Implementation Plan

The executing agency is 'Center of Water Quality and Environment' which has experience in water monitoring. First of the tasks is to continue the currently operating water monitoring activities. Basic study that is to be conducted as a part of the activity will strengthen the monitoring.

#### Schedule

	2000	2005	2010
<b>Monitoring</b>			
<b>Evaluation</b>			

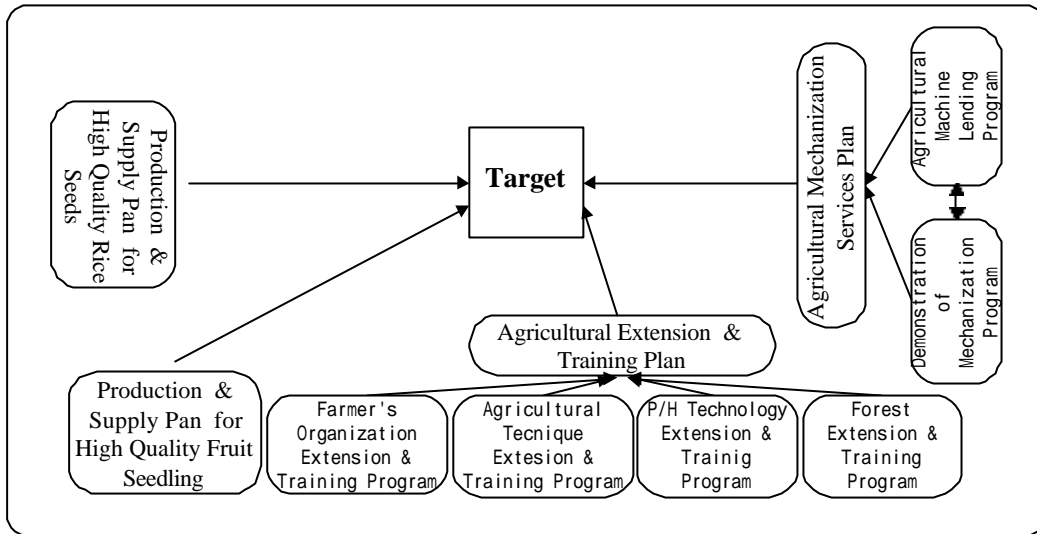
#### 4.2.7 Extension and Support System

Agricultural support services under the Study Area have been implemented by the lower branches of the DARDs, such as Agricultural Extension Center, Plant Protection Office, Division of Veterinary, Agriculture Development Service Company and so on.

The proposed agricultural support programs are formulated in accordance with the basic recognition of the needs for strengthening agricultural support services and referring to the experience of the services rendered in the past, and suggestions given by the DARDs.

In case of increasing income of farm household, it is important not only to get high yield of products but also to improve quality. This importance of quality will be more emphasized in future. The Master plan for agricultural support services will be planned to focus on this point.

The structure of the strategies and ideas of action for the Master Plan are described below.



**(1) Plan for Production & Supply of High Quality Rice Seeds**

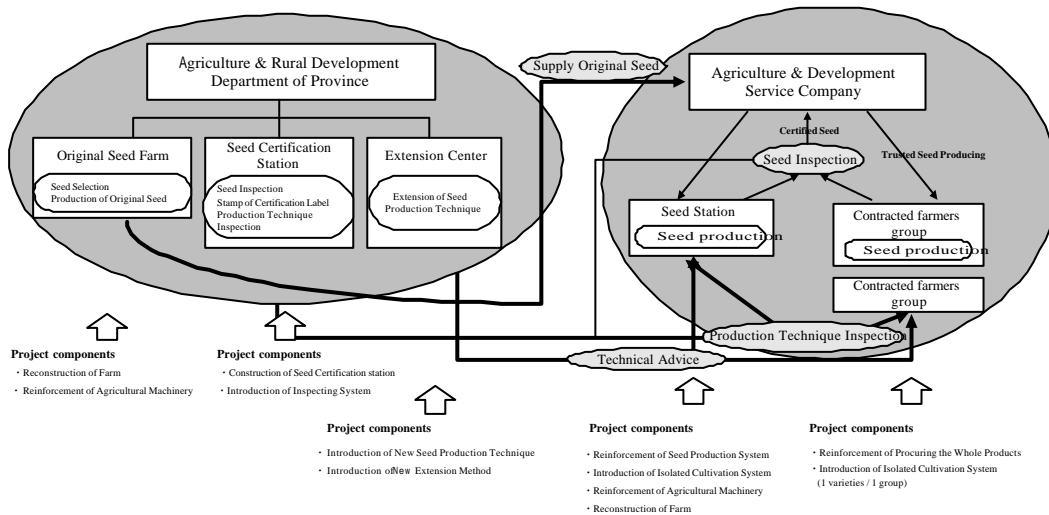
**1) Objectives**

Paddy is the most suitable and important crop in the Study Area. However, Vietnamese rice produced is generally considered to be of low quality and rice from Dong Thap area is of lower quality even in Vietnamese standard. To improve the rice quality is the major objective for agricultural and economic development of the Study Area.

**2) Details of Plan and Implementation Organization**

The production and the supply of appropriate seed and introduction of uniform varieties are important. For this purpose, new system of seed production should be established. The idea of new system is given below.

**Idea on System of Rice Seed Production**



Major reformation includes 1) Shifting the Original Seed Station to DARD from AGRISED0, 2) Organizing Seed Certification Section under the Extension Center. Therefore new system consists of 1) Original Seed Station selects original seeds and produces foundation seeds, 2) Enforce the seed inspection and the seed production supervision.

### 3) Rice Seed Multiplication Schedule

As the final target, seed renewal percentage will be raised to 20%. However, rice seed multiplication is carried out continuously in order to meet the seed demand. In practice the seed renewal percentage will be gradually raised from 1% to 5% by 2010. Improving existing seed farm, the renewal seeds are planned to increase to 1,000ton from 58ton, the foundation seeds increase to 1,000ton from 58ton. The implementation schedule is shown as follows

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	長期計画
Estimated Cultivated Area	388,710	388,710	388,710	392,000	396,000	399,000	402,000	406,000	409,000	413,000	416,000	420,000	423,000	423,000
Seed Requirement for Planting 0.2t/ha	77,742	77,742	77,742	78,400	79,200	79,800	80,400	81,200	81,800	82,600	83,200	84,000	84,600	84,600
Expected Rate of Renewal Seeds	1.30%	1.30%	1.30%	2%	3%	4%	5%	5%	5%	5%	5%	5%	5%	20%
Requirement of Certified Seeds	1,011	1,011	1,011	1,568	2,376	3,192	4,020	4,060	4,090	4,130	4,160	4,200	4,230	16,920
Requirement of Seed Farm Duble cropping x Finishing rate 70%	144	144	144	224	339	456	574	580	584	590	594	600	604	2,417
Requirement of Foundation Seeds	58	58	58	90	136	182	230	232	234	236	238	240	242	967
Requirement of Foundation Seed Far Duble cropping x Finishing rate 70%	8	8	8	13	19	26	33	33	33	34	34	34	35	138

### 4) Outline of Facility and Machinery Improvement

#### a . Original Seed Farm

32ha

	Unit
Dyke system	5km
Irrigation Canal	2km
Land leveling	30ha
Irrigation Pumping Station	1
Culvert	4
Drying yard	200m <sup>2</sup>

Electric pump	1set
Electric Control Unit	1set
Transformer	1set
Tractor	2
Combine	1
Rice Planter	2
Attachment	2set

#### b . Seed Production Farm

418ha

	Unit
Dyke system	50km
Irrigation Canal	16km
Land leveling	400ha
Irrigation Pumping Station	3
Culvert	36
Drying yard	800m <sup>2</sup>

Electric pump	5set
Electric Control Unit	3set
Transformer	3set
Tractor	10
Combine	2
Rice Planter	2
Attachment	2

#### c . Seed Inspection Center

	Unit
Inspection Center	200m <sup>2</sup>
Equipment	1set

**(2) Production and Supply Plan for High Quality Fruit Seedling**

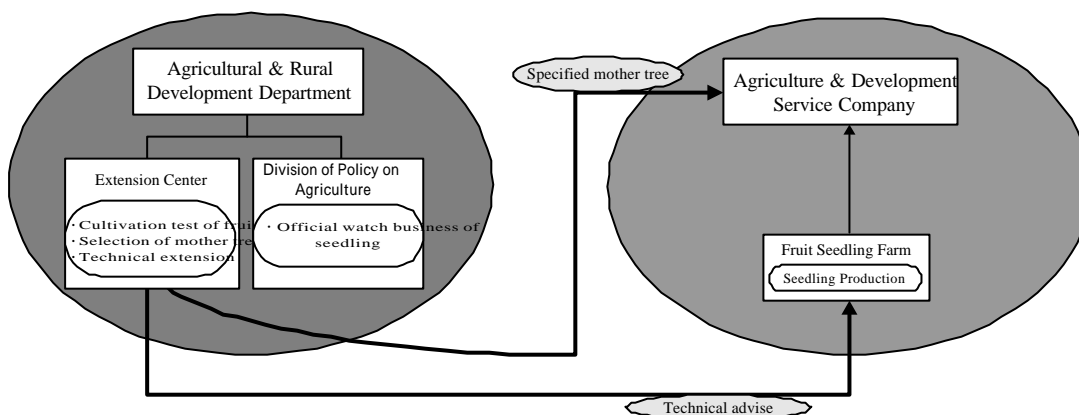
**1) Objectives**

The fruit is the second most important crop in this area. It can be fairly profitable, though the market price fluctuates. The problem is how to respond to the market requirement, namely good quality of fruits. To respond to the requirement, high quality seedling production and supply system should be established together with enhanced fruit growing technology.

**2) Details of the Plan & Implementation Organization**

The idea is to produce suitable fruit seedlings and introduce good varieties. For this purpose, organizing and reinforcing the system of seedling production and distribution should be considered.

**Plan on System of Fruit Seedling Production**



**3) Outline of Facility and Machinery**

Fruit farm

	Unit
Net house	200m2
Equipment	1set

Fruit inspection section

	Unit
Inspecting room	50m2
Instrument	1set

**(3) Agricultural Extension and Training Plan**

Agricultural extension and training is one of the most important supporting services covering such as the farmer organization, agricultural production, processing marketing and forestry. This consists of four programs.

**1) Program**

**A. Farmer's organization extension and training program**

The program includes activities to strengthen the existing and new farmer's organizations, to introduce a suitable organization management system to farmer's organizations.

**Activities**

Item	Program	Target
Formation/strengthening of farmers' groups ( Business training for the leaders and leader groups )	<ul style="list-style-type: none"> <li>• Operation and management</li> <li>• Accounting, financial management</li> <li>• Quality control</li> <li>• Fund raising</li> <li>• Planning, management, evaluation</li> <li>• Understanding of Cooperative Law</li> </ul>	Members in charge of each sector in leader groups
Preparation of joint activities/extension of post-harvest processing technique	<ul style="list-style-type: none"> <li>• Collecting/Storage and transportation</li> <li>• Purchasing, Selling, trading</li> <li>• Operation of drying and processing facilities</li> <li>• Quality control, Accounting/finance</li> </ul>	Each member in charge of the sector

**B. Agricultural technique extension and training program**

The demonstration, the training and the visiting are carried out for the purpose of the technique extension and training on rice farming, fruit farming and the diversified farming techniques. The main points are described in the following table.

**Activities**

Course	Method	Scale	Target
Rice farming technique Fruit farming technique Diversified farming technique	Demonstration	1 Size : 0.3ha No : 20places/year	Farmer Farmer's group
	Training	1 course : 25farmer 5days No : 12course/year	Farmer's Representative
	Visiting	No : 30places/month /1extension officer	Farmer Farmer's group

**C. Post-Harvest Extension and Training Program**

This program includes the following activities.

**Activities**

Course	Contents	Target
Post harvest processing technique	Technique of drying/storage	Farmer Farmer's group
Quality inspection and management technique	Technique of quality check/management for rough rice, brown rice and polished rice	DARD's staff Farmer's group
Factory management technology	Technique of facility management	Farmer's group
Rice processing technology	Technique of processing / loss control / Maintenance of facilities	Farmer's group

**D. Forest Extension Training Program**

This program includes following activities for melaleuca forest and the afforestation of the fuel woods.

**Activities**

Course	Method	Scale	Target
Protection of Melaleuca forest Afforestation of fuel woods	Training	1 course : 25farmer 5days No : 12course/year	Farmer's Representative

**2) Implementation Organization**

The agricultural extension center executes these programs. An appropriate lecturer will be invited from the extension center, DARD or proper organization for the training course.

**3) Outline of Facility and Machinery**

	Unit
Training Center	300m <sup>2</sup>
Milling shed	100m <sup>2</sup>
Drying yard	100m <sup>2</sup>
Storage	50m <sup>2</sup>

Dryer	1
Tools	1set
Equipment	1set

**(4) Agricultural mechanization plan**

**1) Objective**

Agricultural mechanization is seen mostly in cultivation and threshing operations in the Study Area. Promotion of mechanization should be made taking into account the balance of the supply and demand of labor force in the Study Area.

However, labor shortage will occur in near future as industrialization will advance. Mechanization, especially introduction of combine for harvesting and drying, will improve the rice quality efficiently. However, mechanization of rice cultivation should be considered in longer perspective.

**2) Program**

**A. Demonstration of total mechanization system of rice cultivation**

In addition to agricultural machines used for the rice cultivation, there are pumps for irrigation/drainage and threshers for paddy. They are partly mechanized, but has not been systematized. Uniform fertilization and seeding give high yield, and it is also important for the effective utilization of fertilizer and seed. The quality seems to be greatly improved, if the integrated system of paddy cultivation is established. Therefore it is necessary to demonstrate a total mechanized system of rice cultivation.

Activities

Item	Method	Scale	Target
Broadcaster Sprayer Combine	Demonstration	1 kind of machine : 40place / 1 year	Farmer's Group
Broadcaster Sprayer Combine	Training	1 course : 25farmer 5days No : 12course/year	Farmer's Representative

**B. Agricultural Machinery Supply Service**

This service provides farmers on rental basis the agricultural machines such as combines, sprayers and

broadcasters which are not popular as yet in the Study Area.

### 3) Implementation organization

In this plan, AGRISEDO will be an implementation organization and provides demonstration and the rental services of the agricultural machine.

### 4) Outline of Facility and Machinery

( Demonstration program )

	Unit
Training field	1000m <sup>2</sup>
Tractor	2
Combine	2
Attachment	2sets
Equipment	1set

( Agricultural Machinery Supply Service )

	Unit
Repair Shop	150m <sup>2</sup>
Machine House	300m <sup>2</sup>
Trailer	2
Tractor	20
Combine	10
Attachment	20sets
Tools	1set

### (5) Project Cost

The project costs of each plan are roughly estimated as follows.

Project	Total cost		Maintenance & Management cost	
	Million VND	Thousand US \$	Million VND	Thousand US \$
1.Production & Supply Plan for High Quality Rice Seed	14,536	1,038.0	420	30.0
2.Production & Supply Plan for High Quality Fruit Seedling	725	52.0	25	1.8
3.Agricultural Extension and Training Plan	4,032	288.0	130	9.3
4.Agricultural mechanization services plan	12,903	921.0	300	21.0

### (6) Project Benefit

#### **Production & Supply Plan for High Quality Rice Seeds** :( Condition:Term=10year, FIRR10% )

Selected seeds can be expected to supply farmers.

(A farmer needs additional cost of 80,000VND per ha to buy seeds. In case of 5% seed renewal, the cost per one cropping will be 4,000VND per ha.)

#### **Production & Supply Plan for High Quality Fruit Seedlings** :( Condition:Term=10year, FIRR12% )

Selected seedlings are to be supplied to farmers.

(A farmer needs additional cost of 20,000VND to buy seedling.)

#### **Agricultural Extension and Training Plan :**

The improvement of farming technique and the improvement of quality and quantity of the



production will be expected.

**Agricultural Mechanization Plan :**

The improvement of quality and quantity of the products will be expected. It is possible to recover the project cost in 5year from the income of the rental service.

**4.2.8 Rural Credit**

**(1) Constraints and Potentials**

In rural credit, formal financial institution, particularly VBARD and VBP play a key role. Other institutions such as PCF and NGO, though their shares in credit services are relatively small, cover more broad areas including health, welfare education and others, and are also contributing in responding the actual needs of rural inhabitants.

As formal institution, VBARD is the outstanding provider of rural credit.

However, only those farmers with land use certificate are eligible for VBARD credit, landless farmers being left behind from the Banks credit. They have to rely on VBP, if they are recognized as the poor.

Coverage of VBARD in credit services in the area is expanding in recent years, covering around 70-80 % of total farmers in the area. In the past, the clients of VBARD were SOE's, but in recent years, the shares of individual farmers and private enterprises are increasing rapidly.

However, VBAR credit doesn't meet fully the needs of farmers. Among them are, complicated procedure, limited access to the bank branch, terms and conditions including interest rate.

Most of the credit provided are short-term one at present, but the trend of disbursement shows the gradual increase in medium and long-term loans. As a matter of fact, interest rate is declining due to the stabilization of the price and financial system compared to the part few years. Interest rate applied to farm credit is closely related to the original cost and management cost. In most cases, each credit amount is small, hence management cost is generally high.

For future development, farmers may need additional investment, namely for machinery/ equipment and facilities for expanding and intensifying their farming activities. In these cases, the current interest rate also needs to be reviewed whether the rate is applicable from the viewpoint of farm management and profitability to farmers.

Credit to farmers' organization, particularly to agricultural cooperatives will increase the importance though it is very limited at present. As farmers have rather limited capacity to introduce big machinery or equipment by individuals, cooperatives may introduce on behalf of member farmers using credit from VBARD.

**(2) Target on Strategy on Rural Credit**

To achieve the objectives of integrated rural development, rural credit plays an important role. In addition to the investment in infrastructure, additional investment and input are required for farmers, either individually or collectively. Fund resources for rural credit need to be increased.

For the programs and projects included in the Master Plan, Special Development Fund will better be created so as to accommodate the investment needs under the Plan. Fund resources are to be mobilized from domestic resources and ODA loans.

For recurrent credit needs of farmers, existing VBARD credit is to be expanded and credit condition be improved in favor of farmers. To this end, current rules and regulations need to be modified in favor of farmers and farmers organization.

**(3) Establishment of Special Fund.**

To respond the financial requirement for the implementation of projects under the Master Plan, Special Fund are proposed to be created at provincial level with the contents as shown below.

Sector	Project	Target	Purpose of Credit	Terms/ Conditions
Agricultural Production	Seeds supply	farmers	Purchase of seeds	4m. 0.8%/m
	Seedling supply	farmers	Purchase of seedlings	12m. 0.8%/m
Post Harvest Processing	Postharvest improvement	farmers	Drying and storage facilities	3y. 0.7%/m
	Material procurement Processing improvement	processors	Improvement of facilities & equipment	3y. 0.9-1.0%/m
Marketing	Scale expansion	traders	Transportation	2y. 0.9-1.0%/m

\* m: month, y: year

**4.2.9 Farmers' Organization**

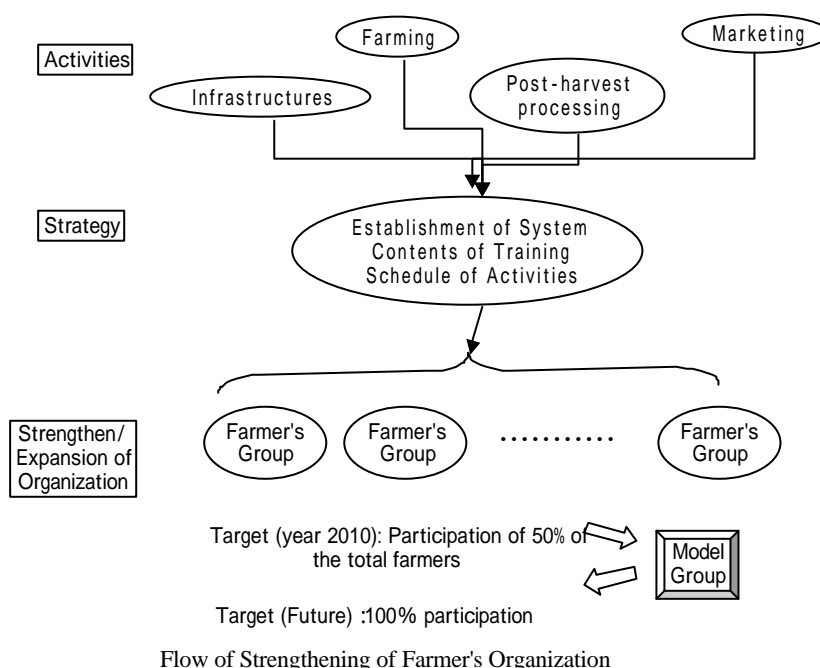
In order to achieve the project target, the establishment and strengthening of farmers' groups are important for the development of rural infrastructure, selling of the agricultural products, purchasing of production materials, use of large facilities and machinery, etc. The existing farmers' groups are collectives which continue some activities of old cooperatives and other small farmers' groups operated with simple purpose or multiple objectives. Besides modern cooperatives based on the new Cooperative Law (issued in 1996) have been established. The number of the new type cooperatives is still very limited and their activities are in the beginning stage. In order to develop dyke system and expand the business of the small-scale farm households, it is necessary to establish and strengthen the farmers' groups actively. Major activities to be implemented by the groups by sector are listed as follows.

**Activities by Sector**

Sector	Activities
1. Rural Infrastructure	- Maintenance and management of small dikes - Maintenance and management of water use facilities (pumps, irrigation and drainage, etc.) - Collection of water use fee
2. Farming	- Purchasing of input materials and facilities (fertilizer, chemicals, seeds, equipment, etc.) - Lending of machinery, assistance of land preparation with fee - Joint use of pesticide
3. Post-harvest Processing	- Drying of paddy - Milling - Storage
4. Marketing	- Joint collecting of paddy - Joint selling of paddy - Joint selling of milled rice

**(1) Target of Promotion of Farmer's Organization**

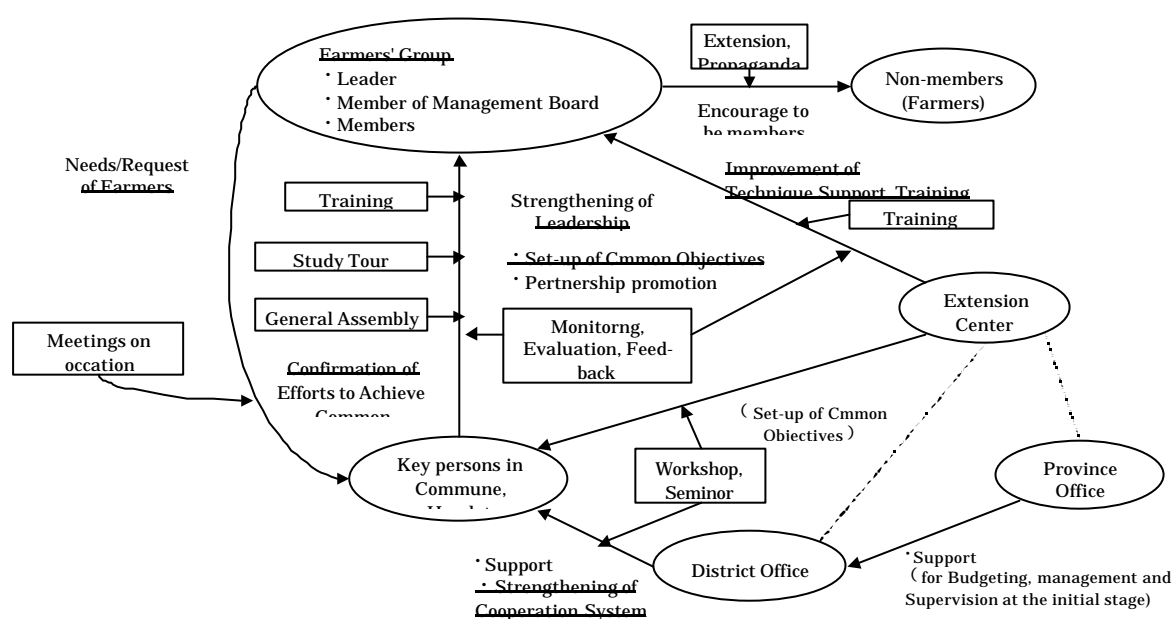
The establishment and strengthening of the farmers' groups in the Study Area depends basically on the farmer's initiative, willingness and efforts. Additionally, the supporting system by the government is necessary for the group's activities. It is desirable that the farmer's organizations and their activities will be expanded to all over the area. In the future, 100% of farmers in the region will be covered to join the organizations and be trained and strengthened.



For 10 years by the target year 2010, about 50% of the farmers will be targeted to be trained as organization's members based on the activities for strengthening of the organization decided by each sector. After that, the model farmers' groups will encourage other farmers who are not members yet to participate in the groups. Therefore, the existing small farmer's groups will be developed to the cooperatives and the existing cooperatives will be strengthened and expanded in their operation system and scale of activities step by step. The followings are the necessary strategy for this purpose.

## (2) Strategy to Set Up and Strengthen Farmer's Organizations

The figure below illustrates the relationship among all participants to be necessary for establishment and strengthening of farmer's groups, and also the needed measures. The groups should be formed with initiatives of the farmers and the government will provide technical and financial supports to them. Especially, key persons in the community and hamlet and leaders of the farmer's groups are important for the success. In the early stage of establishment, Provincial, District and Commune offices will play an important role in guidance, supervision and financial support. The detailed contents of the workshops and training will be decided based on the specific activities in each sector needed for farmer's organization.



System of Strengthening of Farmer's Organization

## (3) Action Plan of Strengthening of Farmer's Organization

### (a) Contents of Activities to Form/Strengthen Organizations

Table below shows the contents of the activities for the formation and strengthening of the groups and the implementation schedule. At first, both sides of the government and farmers should understand the benefit and advantages of organization and set up the common objectives to be achieved. Once the concept of the organization is understood well and agreed among the relevant participants, the organization can be started with finding out the appropriate farmer's leaders and key persons in the government office. The governmental staff in charge of organization and extension and leaders of the farmer's groups should be improved in their quantity and quality. Not only leaders and key persons but also members of the groups and extension workers should be trained. It is necessary that executive and operation capacity of the management board of the

cooperatives and the groups should be strengthened. Additionally, the members of the groups need to be provided with the opportunities that they can visit other successful groups to observe their experiences, to exchange information and to adopt the advantages. It will take about 1-2 years to carry out one cycle of activities to establish and strengthen groups.

**Activities for Establishment /Strengthening of Farmer's Groups**

Item	Contents
A. Stage of Preparation of Common Understanding	<ul style="list-style-type: none"> <li>• Workshop / Seminar for Governmental Staff in charge (set up of common objectives)</li> </ul>
B. Training of governmental key persons	<ul style="list-style-type: none"> <li>• Selection of candidate of key person</li> <li>• Training to make skilled key persons</li> </ul>
C. Establishment/strengthening of groups	<ol style="list-style-type: none"> <li>1. Role of key persons                             <ul style="list-style-type: none"> <li>• Preparation of draft plan of the project</li> <li>• Participation to selection of farmer's leaders</li> <li>• Provision of training to farmers' leaders</li> <li>• Preparation of the draft project of organization</li> <li>• Support for preparation of the draft plan of joint activities</li> <li>• Monitoring of activities of farmers' groups</li> <li>• Evaluation and feed-back of activities of farmer's groups</li> <li>• Consulting for the farmers' groups</li> </ul> </li> <li>2. Role of farmers                             <ul style="list-style-type: none"> <li>• Selection of leaders</li> <li>• Selection of leading groups</li> <li>• Basic education for leading groups</li> <li>• Study tour</li> <li>• Preparation of draft plan of joint activities</li> <li>• Explanation of the project to farmers</li> <li>• Registration of organization</li> <li>• Selection of members of management board at general assembly</li> <li>• Training of staff member of each section</li> <li>• Preparation of the implementation plan of joint selling</li> </ul> </li> </ol>

The following table shows the contents of the training and education to be provided the members of the farmer's organizations and key persons of the government.

**Training and Education to Form and Strengthen Farmer's Organizations**

Title	Contents	Target Persons
1. Preparation of the common understanding (a) Workshop/Seminar	<ul style="list-style-type: none"> <li>- Understand the advantages and benefits of the organization</li> <li>- Set up the common recognition and objectives</li> </ul>	<ul style="list-style-type: none"> <li>- Staff in charge of farmers' organization in province and district</li> <li>- Staff of extension center</li> </ul>
2. Training of governmental key persons (a) Basic education	<ul style="list-style-type: none"> <li>- Planning, implementation, monitoring and evaluation of the projects</li> <li>- Fund raising</li> <li>- Operation and management</li> <li>- Methods of propaganda and communication</li> <li>- Understanding of legal framework including Cooperative Law</li> </ul>	<ul style="list-style-type: none"> <li>- Staff of commune and hamlet</li> <li>- Extension workers, staff in charge of farmers' groups</li> </ul>

**(b) Implementation System and Operation and Management Plan**

Under MARD, Project Management Board will be established consisting of DARD, PC of Province and Extension Center. This Board has a responsibility for guidance and overall supervision of activities in the early stage of organization. Under the supervision of the Board, DARD, especially Extension Center will be responsible to the implementation in cooperate with in PCs of District, Commune to strengthen the farmers organizations , the model project is proposed

including activities related to other sections.

In selecting the model organizations (Cooperatives), performance/experience, understanding/consciousness of the leaders and their members on cooperative activities and their capabilities will be considered. Two cooperatives may be selected as the model organizations (Details are referred in 7.3). For dike system, the details are also referred in 6.3.

#### **(4) Recommendation**

In order to implement the above Master Plan, the emphasis should be put on the following points, taking account of the external conditions.

- The agreement among the people should be reached on introducing rotation system of management of small dykes. Therefore, the survey to confirm the intention of the inhabitants should be implemented as soon as possible.
- There exist still not a few farmers with distrust of new type cooperatives due to the experience of failure of the old cooperatives. In order to change their attitudes, the government should make efforts to diffuse the objectives of the modern cooperatives and contents of the activities under Cooperative Law.

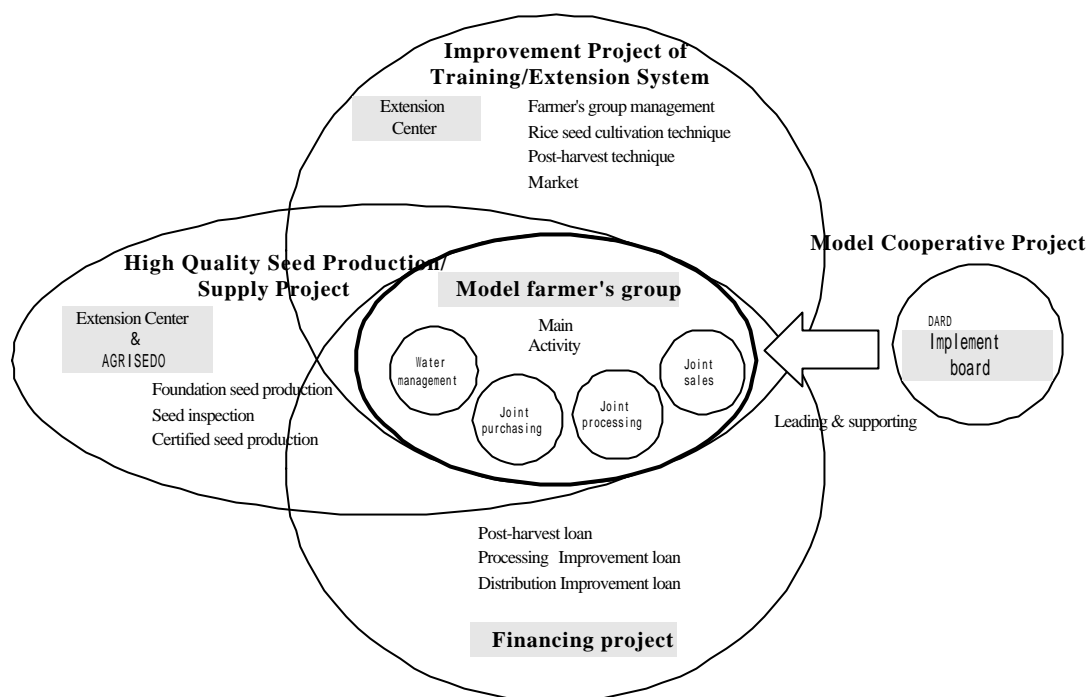
#### **4.2.10 Rice Production/Marketing Improvement Project (Integration of Sector Projects)**

Improvement of rice quality as well as increase in productivity is a major challenge for the development of rice production, the major contributor of agricultural sector, in the Study Area. To this end, an integrated approach covering all the processes from production of seed to post-harvest processing and marketing is required.

##### **(1) The basic concept of the integrated project**

Among 24 proposed projects, the projects dealing with improvement of rice production and marketing were put together as an integrated project. The project was formulated comprising four major components 1) "Extension and training project", 2) "Producing and supplying project for high quality rice seed", 3) "Model farmer's group project" and 4) Financing project. The particular emphases are given to 'High Quality Rice Seeds Production/Supply Project', 'Improvement of Training/Extension System', 'Model project of overall improvement of rice production by farmers' group project' and 'Credit program'.

The basic concept is illustrated in the figure given in the top of the following page.



This integrated project has been formulated consisting from each sector's plans such as below.

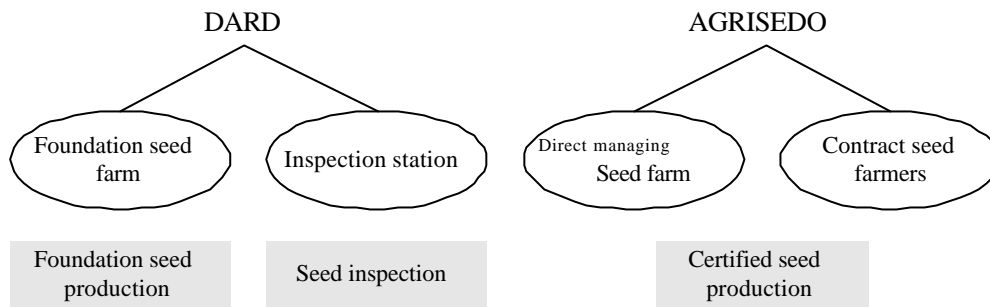
Sector	Projects
Post Harvest Processing	Training and Extension of Post Harvest Technology including Quality Control and Monitoring of Harvest Losses
Marketing	Collective Marketing by farmer's Group Introduction and Dissemination of Collective Marketing
Extension and Support Services	High Quality Rice Seeds Production/Supply Project Improvement of Training/Extension System
Rural Credit	Establishment of Special Fund for Respective Project Implementation
Farmers' Organization	Establishment/enhancement of cooperatives integrating the Projects of Various sectors

**(2) Details of Each Plan and Implement Organization**

**1) High Quality Seed Production/Supply Project**

Main objective of this project is the establishment of inspection and supply systems of the suitable rice seeds. DARD carries out the foundation seed production and the seed inspection. AGRISEDO carry out the multiplication and distribution of certified seeds.

The details are referred to 4.2.7 ( 1 ) Production and Supply Plan for High Quality Rice Seed.



**2) Improvement Project Training/Extension System**

This project will be executed by the Extension Center for the rice quality improvement. The contents of program are as shown below

- Farmer organization : 4.2.9 Training and Education to Form and Strengthen Farmer’s Organizations
- Agricultural production : 4.2.7 (3) Agricultural Extension and Training Plan
- Post-harvest processing : 4.2.4 A-1 Training and extension of P/H technology including quality control
- Marketing : 4.2.5 1) Establishment of models of farmers' group sales activity

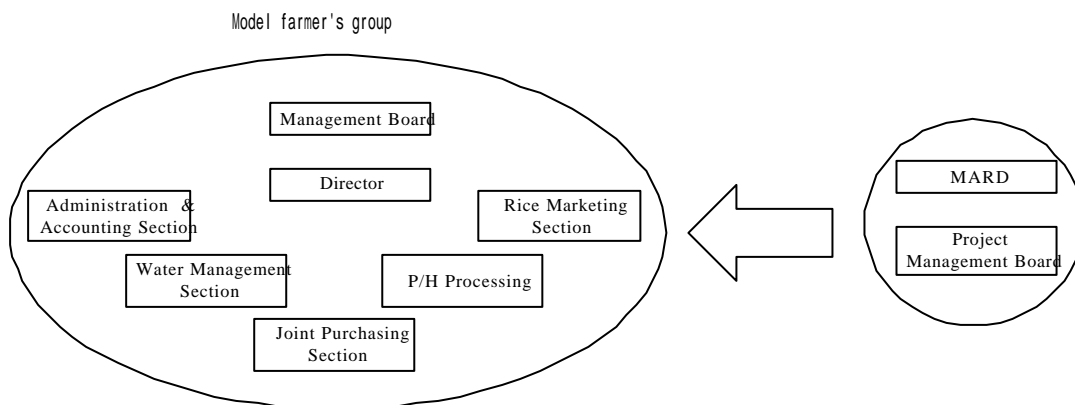
**3) Model Cooperative Project**

The model farmer group practices the production, processing and marketing of high quality rice. This activity provides ripple effect to other farmers, polishers and traders.

The implementation organization of the model project consist of DARD, the leading and supporting body and farmer’s group which is managing body of the various activates.

For details refer to below.

- Farmers’ organization : 4.2.9 Implementation System and Operation and Management Plan
- Marketing : 4.2.5 1) Establishment of models of farmers' group sales activity





**4) Credit Program**

Responding to the requirement for the implementation of each sector's project, the special fund will be established including the following contents at the provincial level.

Sector	Target	Financing Target	Financing condition
Post-harvest	Farmer	Drying facility, Storage	3year 0.7%/month
	Factory	Polishing facility, Equipment, Storage facility	3year 0.9-1.0%/ month
Market	Trader	Improvement of transport	2year 0.9-1.0%/month

**(3) Outline of Facility and Machinery**

**(Producing and supplying project for high quality rice seed )**

	Unit
Dyke system	55km
Irrigation Canal	18km
Land leveling	430ha
Irrigation Pumping Station	4
Culvert	40
Drying yard	1,000m <sup>2</sup>
Inspection Center	200m <sup>2</sup>

Electric pump	6set
Electric Control Unit	4set
Transformer	4set
Tractor	12
Combine	3
Rice Planter	4
Attachment	4set
Equipment	1set

**(Extension and training project)**

	Unit
Training Center	300m <sup>2</sup>
Milling shed	100m <sup>2</sup>
Drying yard	100m <sup>2</sup>
Storage	50m <sup>2</sup>

Dryer	1
Tools	1set
Equipment	1set

**(Farmer's group model project ) 3 group**

	Unit
Drying yard	4,500m <sup>2</sup>
Storage	5,400m <sup>2</sup>
Port	36m
Office	240m <sup>2</sup>

Mill unit	3unit
Dryer	6unit
Equipment of quality management	3set
Equipment of shipping	3set
Equipment of office	3set
Boat	3

**(4) Implementation Plan**

From the view points of benefit to farmers, project effects and possibility of realization, the

implementation plan is scheduled as below.

Year	1	2	3	4	5	6	7	8	9	10
Production & Supply Plan for High Quality Rice Seed										
Extension and training project										
Farmer's group model project										
Financing project										

Preparation
  Implementation

### (5) Project Cost

The project costs of each plan are roughly estimated as follows

Project	Total cost		Maintenance & Management cost	
	Million VND	Thousand US \$	Million VND	Thousand US \$
<b>1. Production &amp; Supply Plan for High Quality Rice Seed</b>	14,536	1,038.0	420	30.0
<b>2. Extension and training project</b>	725	52.0	25	1.8
<b>3. Farmer's group model project</b>	4,032	288.0	130	9.3
<b>4. Financing Project</b>				

### (6) Evaluation

In case of the yield increase of 0.2ton/ha and efficiency rate at 50% within 10 years

FIRR is estimated with 12.5%.

In case of rice price increase of 70VND/kg and efficiency rate 50% within 10 years

FIRR is estimated with 13.2%.

For the detailed estimation refer to Appendix Table K 2 1 ~ 2.6.

## 4.3 Project Implementation Plan

### 4.3.1 Projects Prioritization

Prioritization for respective sector projects in the Master Plan is carried out based on the evaluation criteria as mentioned below. In addition, financial and technical cooperation by ODA, relevance with existing plans for national, regional and provincial levels, farmer's motivation, interest and sharing ability for redemption and capability of executing agency for project implementation are considered. Following indexes are used to the evaluation, which are categorized into 3 ranks.

In case of the integrated project, evaluation for respective projects listed in the Master Plan are not carried out separately. These projects are evaluated as an integrated project.

A : High adaptability for the evaluation criteria

B : Middle adaptability for the evaluation criteria

C : Low adaptability for the evaluation criteria

#### **Evaluation Criteria**

1. Project sustainability and environmental impact

Proposed projects with high sustainability and/or no negative environmental impacts shall be prioritized.

2. Farmer's benefit

Proposed projects with high applicability for farmer's needs and/or high achievement ability of farmer's interests shall be prioritized.

3. Justification with upper level plans

Proposed project with possibility to adjust existing plans for national, regional and provincial levels shall be prioritized.

4. Implementation possibility

Proposed project, which can be implemented without any serious obstacle by executing agency, shall be prioritized.

5. Socio-economic impacts

Proposed project, which can be expected high socio-economic impacts, shall be prioritized.

6. Model effect

Proposed project, which can be expected to be a model development project for surrounding area of the project area, shall be prioritized.

7. Economical impacts

Proposed project with high investment return, especially which is possible to produce direct benefit for farmer, shall be prioritized.

8. Multiplier effect

Respective projects in the same or different sectors, which can be expected to produce a multiplier effect by implementing as the integrated project, shall be prioritized.

**List of respective projects included in the Master Plan**

Sector	Project	Evatution
Agricultural Infrastructure	1.Flood Control on Boundary Area	A
	2.Flood Control on Southern Nguyen Van Tiep Canal	A
	3.Small Scale Dike System Improvement	A
Forestry Management	4.Concentrated Plantation of National Forest	A
	5.Concentrated Plantation outside of National Forest	A
	6.Conservation Forest	A
	7.Border Protection Forest	A
Post Harvest Processing	8.Scattered Plantation	A
	9.Training and Extension of Post Harvest Technology including Quality Control and Monitoring of Harvest Losses	---
	10.Improvement of Drying Facilities/Equipment of farmers	---
	11.Improvement of Processing Facilities/Equipment of Processors	---
Marketing	12.Model Processing Activities by Farmer's Group	---
	13.Collective Marketing by farmer's Group	---
	14.Imtroduction and Dissemination of Collective Marketing	B
	15.Expansion of Marketing Scale at Producing Area	B
Environmental Conservation	16.Improvement of Fruits Marketing Information System	B
	17.Upgrading Wholesale Market for Fruits	A
	18.Monitoring of Acid Sulfate Soils/Water Quality	A
Extension and Support Services	19.High Quality Rice Seeds Production/Supply Project	---
	20.High Quality Fruits Seedling Production/Supply Project	B
	21.Improvement of Training/Extension System	---
	22.Agricultural Machinery Service Program	B
Rural Credit	23.Establishment of Special Fund for Respective Project Implementation	---
Farmers` Organization	24.Establishment/enhancement of cooperatives integrating the Projects of Various sectors	---

<b>Integrated Project</b>	<b>Rice Production/Marketing Improvement Project</b> <ul style="list-style-type: none"> <li>● Training and Extension of Post Harvest Technology including Quality Control and Monitoring of Post-Harvest Losses</li> <li>● Improvement of Drying Facilities/Equipment of farmers</li> <li>● Improvement of Processing Facilities/Equipment of Processors</li> <li>● Collective Marketing by farmer's Group</li> <li>● Introduction and Dissemination of Collective Marketing</li> <li>● High Quality Rice Seeds Production/Supply Project</li> <li>● Improvement of Training/Extension System</li> <li>● Establishment of Special Fund Respective Project Implementation</li> <li>● Establishment/enhancement of cooperatives integrating the Projects of Various sectors</li> </ul>	<b>A</b>
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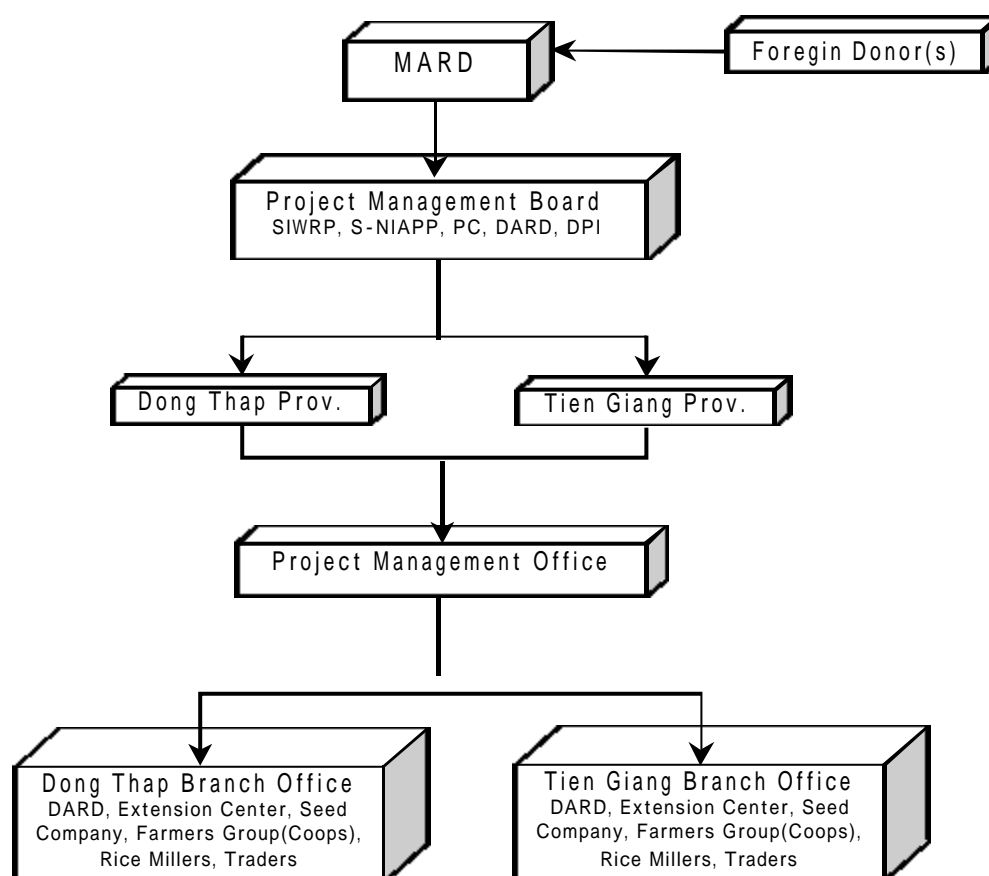
**4.3.2 Implementation Plan**

**(1) Implementation Plan**

In preparing the implementation plan, the results of the above evaluation were reflected. The implementation plan is shown in the attached table.

**(2) Implementing Organization**

Implementing organization varies among projects of each sector depending on the contents of concerned project. In general, the implementing organizations are classified broadly into public organization such as provincial governments and their related organizations, private organizations and farmer's group including cooperatives. It is also important to consider the implementing organization from the viewpoints of fund resources of the projects, namely central or regional government, and/or ODA. As an example, implementing organization system with financial support from foreign donors is shown as below.



In the integrated project, many organizations or agencies will be involved in its implementation. To strengthen the implementing organization is most important and establishment of strong project management office will be required. To enhance of coordination and cooperation among concerned agencies, the project management board for leading and supporting of the Project Management Office should be established at the provincial level.

**(3) Estimated project cost**

Project cost and operation/maintenance cost are roughly estimated for the respective projects and the

integrated project as shown in attached table.

### **4.3.3 Recommendations**

In line with the project objectives, namely “Inundation Mitigation”, “Improvement of Agriculture Products Processing and Marketing” and “Irrigation and Drainage System Improvement”, various projects in each sectors are proposed broadly. These projects range over many types and broad substances and require a lot of investment on long term basis. Therefore, it is important that these projects will be proceeded step by step with consideration of priority and interdependency among the projects. In this implementation, following matters can be considered particularly important.

- i. Adequate Fund Mobilization Plan
- ii. Establishment of Solid Implementing Organization
- iii. Approval of the Active Participation of Farmers
- iv. Adequate Operation and Management Plan
- v. Special Consideration on Environmental Impact

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#### **4.4 Initial Environmental Examination**

##### **4.4.1 Outline**

Environmental impacts were examined for the projects that were presented in '4.2 Sector Projects'. The examination was made by categorizing the projects into the following eight fields of projects. Refer to the list of respective projects included in the Master Plan in page 4-66.

[Eight Fields of Sector Projects]

- |                                |                                    |
|--------------------------------|------------------------------------|
| 1) Agricultural Infrastructure | 2) Post-Harvest Processing         |
| 3) Forest Management           | 4) Marketing                       |
| 5) Environmental Conservation  | 6) Extension and Supporting System |
| 7) Rural Credit                | 8) Farmer's Organization           |

EIA was judged necessary for the projects categorized in the field of 'Agricultural and Rural Infrastructures' as significant adverse environmental impacts, including alteration of hydrology, were forecasted. No significant negative environmental impacts were identified for the projects categorized in another fields, thereby, detailed assessment is not necessary.

The following part begins with brief description of negative environmental impacts of the projects categorized in 'Agricultural and Rural Infrastructures' with particular emphasis on the Small Dike Improvement Project'. Description of impacts concerning other projects follows.

A draft IEE report on 'the Small Dike Improvement Project' is attached in Appendix M. It will be subject to further review of concerned organization.



## Summary of IEE of the Master Plan

[Nine Fields of Sector Projects]

- |                                |                                    |
|--------------------------------|------------------------------------|
| 1) Agricultural Infrastructure | 2) Post-Harvest Processing         |
| 3) Forest Management           | 4) Marketing                       |
| 5) Environmental Conservation  | 6) Extension and Supporting System |
| 7) Rural Credit                | 8) Farmer's Organization           |

Category of Environmental Impact	Fields								Remarks	
	1	2	3	4	5	6	7	8		
<b>I. Social Environment</b>										
1. Socio-economic Issues										
(1) Social Issues										
1	Planned residential settlement	C	C	C	C	C	C	C	C	As for 'Flood Control on Boundary Area', a detailed assessment of social impacts need to be conducted because it is anticipated that water level raises 25cm in July and August.
2	Involuntary resettlement	C	C	C	C	C	C	C	C	
3	Substantial changes in way of life	C	C	C	C	C	C	C	C	
4	Conflict among communities and peoples	C	C	C	C	C	C	C	C	
5	Impact on native peoples	C	C	C	C	C	C	C	C	
6	Others	E	C	C	C	C	C	C	C	
(2) Demographic Issues										
1	Population increase	E	C	C	C	C	C	C	C	As for 'Flood Control on Boundary Area', population increase is anticipated.
2	Drastic change in population composition	C	C	C	C	C	C	C	C	
	Others	C	C	C	C	C	C	C	C	
(3) Economic Activities										
1	Changes in bases of economic activities	C	C	C	C	C	C	C	C	No clear evidence of adverse impact. Impact on fishing which farmers practice during inundation period need to be studied for the projects in 'Agricultural and Rural Infrastructure'.
2	Occupational change and loss of job opportunity	C	C	C	C	C	C	C	C	
3	Increase in income disparities	C	C	C	C	C	C	C	C	
4	Other	E	C	C	C	C	C	C	C	
(4) Institutional and Custom Related Issues										
1	Adjustment & regulation of water or fishing (reparian) rights	C	C	C	C	C	C	C	C	Farmers organizations are to be strengthened in the projects categorized in 'Marketing' and 'Farmer's organization'.
2	Changes in social and institutional structures	C	C	C	C	C	C	C	C	
3	Changes in existing institutions and customs	C	C	C	C	C	C	C	C	
4	Others	C	C	C	C	C	C	C	C	
2. Health and Sanitary Issues										
1	Increase use of agrochemicals	E	C	C	C	C	C	C	C	Safe use of pesticides should be practiced.
2	Outbreak of endemic diseases	C	C	C	C	C	C	C	C	
3	Spreading of epidemic diseases	C	C	C	C	C	C	C	C	
4	Residual toxicity of agrochemicals	C	C	C	C	C	C	C	C	
5	Increase in domestic and other human wastes	C	C	C	C	C	C	C	C	
6	Other	C	C	C	C	C	C	C	C	
3. Cultural Asset Issues										
1	Impairment of historic remains and cultural assets	C	C	C	C	C	C	C	C	Sites of cultural assets were identified. The information need to be incorporated in the project planning.
2	Damage to aesthetic sites	C	C	C	C	C	C	C	C	
3	Impairment of buried assets	C	C	C	C	C	C	C	C	
4	Others	C	C	C	C	C	C	C	C	

\*1:

**THE STUDY ON INTEGRATED AGRICULTURAL DEVELOPMENT PLAN  
IN THE DONG THAP MUOI AREA VIET NAM FINAL REPORT**

Category of Environmental Impact		Fields								Remarks
		1	2	3	4	5	6	7	8	
<b>II. Natural Environment</b>										
<b>4. Biological and Ecological Issues</b>										
1	Changes in vegetation	C	C	C	C	C	C	C	C	Projects categorized in 'Agricultural and Rural infrastructure' induces changes in hydrology resulting in adverse impacts on the ecosystem of the Tram Chim National Park.
2	Negative impacts on important or indigenous fauna and flora	B	C	C	C	C	C	C	C	
3	Degradation of ecosystems with biological diversity	B	C	C	C	C	C	C	C	
4	Proliferation of exotic and/or hazardous species	C	C	C	C	C	C	C	C	
5	Destruction of wetlands and peatlands	C	C	C	C	C	C	C	C	
6	Encroachment into tropical rain forests and wild lands	C	C	C	C	C	C	C	C	
7	Destruction or degeneration of mangrove forests	C	C	C	C	C	C	C	C	
8	Degradation of coral reefs	C	C	C	C	C	C	C	C	
9	Others	C	C	C	C	C	C	C	C	
<b>5. Soil and Land Resources</b>										
<b>(1) Soil Resources</b>										
1	Soil erosion	C	C	C	C	C	C	C	C	The information concerning acid sulfate soil should be incorporated in project planning.
2	Soil salinization	C	C	C	C	C	C	C	C	
3	Deterioration of soil fertility	B	C	C	C	C	C	C	C	
4	Soil contamination by agrochemicals and others	C	C	C	C	C	C	C	C	
5	Others	B	C	C	C	C	C	C	C	
<b>(2) Land Resources</b>										
1	Devastation or desertification of land	C	C	C	C	C	C	C	C	
2	Devastation of hinterland	C	C	C	C	C	C	C	C	
3	Ground subsidence	C	C	C	C	C	C	C	C	
4	Other	C	C	C	C	C	C	C	C	
<b>6. Hydrology and Air and Water Quality</b>										
<b>(1) Hydrology</b>										
1	Changes in surface water hydrology	B	C	C	C	C	C	C	C	The projects categorized in 'Agricultural and Rural Infrastructure' may induce changes in hydrology. Detailed assessment of the impacts needs to be conducted.
2	Changes in groundwater hydrology	C	C	C	C	C	C	C	C	
3	Inundation and flooding	B	C	C	C	C	C	C	C	
4	Sedimentation	C	C	C	C	C	C	C	C	
5	Riverbed degradation	C	C	C	C	C	C	C	C	
6	Impediment of inland navigation	C	C	C	C	C	C	C	C	
7	Others	C	C	C	C	C	C	C	C	
<b>(2) Water Quality and Temperature</b>										
1	Water contamination and deterioration of water quality	B	C	C	C	C	C	C	C	Effluent of sulfate and agrochemicals may impair water quality.
2	Water eutrophication	C	C	C	C	C	C	C	C	
3	Sea water intrusion	C	C	C	C	C	C	C	C	
4	Changes in temperature of water	C	C	C	C	C	C	C	C	
5	Other	C	C	C	C	C	C	C	C	
<b>(3) Atmosphere</b>										
1	Air pollution	C	C	C	C	C	C	C	C	
2	Other	C	C	C	C	C	C	C	C	
<b>7. Landscape and Mining Resources</b>										
1	Damage to Landscape	C	C	C	C	C	C	C	C	
2	Impediment of mining resources exploration	C	C	C	C	C	C	C	C	

A: As SEI is identified or expected, further scrutiny is required.

B: Since SEI is not fully clarified through the preliminary evaluation, further study is required.

C: As SEI is recognized to be nil, no further study is required.

#### 4.4.2 IEE concerning the Projects of Agricultural and Rural Infrastructures

##### (1) Social Environment

##### 1) Socio-economic Issues

###### Social Issues

###### *Small scale dike improvement project*

No significant environmental impact was identified, as the project does not include component that fall into this category. This project would improve living conditions of the area by means of provision of residential space on the elevated dike.

###### *Flood Control on Boundary Area*

A detailed assessment is necessary. It is anticipated that construction of dike designed to extend from Hong Ngu district to Hung Ha may raise water level to approximately 25cm above the present level in the north of the dike in July and August.

###### *Flood Control on Southern Nguyen Van Tiep*

Careful implementation plan need to be prepared to deal with land acquisition.

###### Demographic Issues

###### *Small scale dike improvement project*

Rapid population growth caused by such incidence as 'Boom Town' is not anticipated from observation of dike rehabilitation work that was being implemented during field study.

###### *Flood Control on Boundary Area*

Careful examination is required for demographic issue because boom town and induced development is anticipated.

###### Economic Activities

###### *Small scale dike improvement project*

Loss of fishing opportunity is likely induced. Contribution of fishing to household economy seemed fairly small thus anticipated impact may not be significant. However, intentions of the beneficiaries need to be confirmed and benefit foregone by the loss of fishing opportunity need to be studied.

###### Institutional and Custom Related Issues

The projects do not encompass components that would adversely influence local institution and customs. However, detailed examination of introduction of rotational inundation control system is necessary.

2) Health and Sanitary Issues

**Increase use of agrochemicals**

*Small scale dike improvement project*

The project would increase cropping intensity from 2.0 to 2.3 per year in average. It is thereby anticipated that this would result in proportional increase in pesticides and fertilizer load on acreage of land in a year. Although the impact on the environment was judged insignificant at the moment, it needs further examination because there are some uncertainties. Focus should be given to the impact on the ecosystem in the national park.

*Flood Control on Boundary Area*

This project does not include any component that may change use of agrochemicals directly or indirectly.

*Flood Control on Southern Nguyen Van Tiep*

Changes in cropping intensity likely induces increase in pesticides and fertilizer use.

**Residual Toxicity**

The projects do not include any components that alter application pattern of pesticides.

**Other health and sanitary issues**

*Small scale dike improvement project*

Endemic and epidemic diseases are not anticipated by elevation of dike height and other project components. Population increase is not anticipated thus the project does not lead to any significant environmental negative impact concerning increase in domestic and other human waste.

*Flood Control on Boundary Area*

Population increase may result in increase in domestic and other human wastes.

3) Cultural Asset Issues

Sites of the region's cultural assets have been identified, which were taken into consideration for site selection of the project.

(2) **Natural Environment**

1) **Biological and Ecological Issues**

**Biological and Ecological Issues**

*Small scale dike improvement project*

The Tram Chim National Park being surrounded by the project areas is rich in biological diversity with unique bioresources. The Eastern Sarus Crane (*Grus antigone sharpii*) is, among others, of great importance in respect to its rarity. The focus of the assessment need to be given to such impacts on the ecosystem in the Park as increase in water level and contamination of water by agrochemicals.

*Flood Control on Boundary Area*

Impacts on the ecosystem inside the park need to be examined.

*Flood Control on Southern Nguyen Van Tiep*

Impacts on the ecosystem inside the park is supposed to be negligible because of geographical settings.

2) **Soil and Land Resources**

**Degradation of Soil Fertility**

*Small scale dike improvement project*

Concerns about degradation of soil fertility was raised by the local experts. It was suggested that regular supply of natural fertility brought about by inundation be reduced by introduction of rotational inundation control system. This would lead to declined agricultural production in the long run. Therefore detail examination will be required.

**Soil Acidification**

*Small Dike Improvement Project*

Although acid sulphate soil distributes in the areas and adjacent areas, soil may not be acidified directly by the project because the project areas are determined excluding the area of acid sulphate soil and the project is not new land development. Once pyrite layer mistakenly excavated in the course of construction work, the soil is oxidized and poses severe acidity. This may induces decreased soil productivity and aggravated water quality in canal system around the area. Thus detailed examination is necessary and the construction work needs to be carefully designed.

*Flood Control on Boundary Area*

Selection of site for facilities need to be carefully determined.

*Flood Control on Southern Nguyen Van Tiep*

Selection of site for facilities need to be carefully determined.

(3) **Hydrology, water quality and air**

**Impacts on Hydrology**

*Small Dike Improvement Project*

Change in water level was roughly assessed. It indicated that change in water level is approximately 6 cm with assumption of 30 % of non-inundation of the areas. There are some other assumptions in the estimate, thus, further study is necessary.

*Flood Control on Boundary Area*

The impacts to Cambodian side also need to be studied.

*Flood Control on Southern Nguyen Van Tiep*

Changes in hydrology that may occur in the upstream and down stream need to be studied.

**Water Quality**

*Small Dike Improvement Project*

If sulfidic material that underlies the present soil surface is exposed to atmosphere by mismanagement of construction work, release of sulphate ( $\text{SO}_4^{2-}$ ) may be accelerated. Contamination of water by increased use of pesticides and fertilizer need to be studied with particular emphasis on the impacts to the National Park.

*Flood Control on Boundary Area*

Volume of flooding water in the middle inundation area in August is changed, thus, water quality in this period also need to be studied.

*Flood Control on Southern Nguyen Van Tiep*

As mentioned above, influences of acidity and agrochemicals is also a factor that affect water quality.

(4) **Impacts on Air Quality**

Air pollution caused by agricultural practice is not anticipated because rural farmers presently adopt manual sprayer for application of pesticides. In addition, large scale aerial spray of pesticides will not be adopted even in long run and it would take time to introduce shoulder type sprayer.

**4.4.3 Initial Environmental Examination of the projects in other fields**

(1) **Social Environment**

1) **Socio-economic Issues**

**Social Issues**

The projects in the field of Marketing deals with development of direct sales channel from Model Farmer's group to Polishers. This is expected to result in increased income of farm households in the long run by facilitating competition in the market. However intentions of

beneficiaries and other stakeholders need to be studied.

**2) Health and Sanitary Issues**

The project does not include any component that induces changes in Health and Sanitary Issues.

**3) Cultural Asset Issues**

The project does not include any component that induces changes in cultural assets issues.

**(2) Natural Environment**

The project does not include any component that induces changes in natural environment.