

supplied will include an automatic rain gauge, a recording anemometer, and an A-class evaporation pan.

- (b) Construction of additional meteorological yard in Beng district.
- (c) Installation of additional rainfall recorders, one in a 250 km<sup>2</sup> catchment area, nine (9) sites in total.
- (d) Installation of additional water level gauge in the five (5) main rivers.

(5) **Improvement and Establishment of Water Users' Associations**

It is essential to establish efficient water users' associations by organizing the existing farmers' groups in connection with the proposed irrigation development in the model areas (for activity programs, refer to Sub-chapter 5.2 of this report). Two (2) new water users' associations in the Xai and Beng model areas will be organized, and re-organization of an existing association in the Hun model area will be required to cover the whole lowland rice field in the area.

#### **8.4 Development of Social Infrastructures**

Development of social infrastructures to be implemented under the Scheme includes (i) rehabilitation and upgrading of the district roads; (ii) additional construction of rural water supply systems; and (iii) rehabilitation and upgrading of primary schools, as mentioned below.

- (1) There are two (2) district roads related to the model areas. One is in Xai model area, which connects Nasao and Nale villages to the National Road No.2 with a total length of about 1.9 km, and the other runs from Hun town to Somphon village with a total length of 7.5 km in Hun model area. The former extends further to Kavang, Tangkok and Chomong, connecting five sub-districts to the Road No.2. The latter also connects three sub-districts to Hun town through Kang and Phouthong villages in the remote area. In spite of the fact that these roads play an important role in connecting the remote areas with the district centers for the people's economic activities, the road conditions are very poor, passable only in the dry season by 4-WD vehicles or truck because of the lack of drainage facilities. These two district roads will be rehabilitated as a model in developing the district road network in the study area. The road width will be expanded to 6.0 m with a gravel pavement of 3.5 m in carriage way. The related structures will be three (3) Irish type of bridges, eight (8) box culverts and 32 pipe culverts.



- (2) Out of 22 villages relevant to the model areas, the people in eight (8) villages can use domestic water from the urban water supply system in Xai city and rural water supply systems in Beng and Hun district centers. Usually, the people in the remaining villages are doing washing and bathing in the streams nearby the villages. As for the drinking water, almost all the villages depend on only one or two shallow wells or dug holes beside the streams. Then, construction of three (3) rural water supply systems, one in each district, will be included in the Scheme, taking into account available water sources, population of beneficiary and urgency of supplying clean water to 12 villages in and around the model areas. These villages are located three (3) in Xai model area, four (4) around Beng area and five (5) in Hun area. The proposed construction plan of the water supply systems is shown in Table 12 and Fig. 8.
  
- (3) Most of the primary schools in the villages have Class I and II, and Thaohom schools (primary schools belonging to town or sub-district) have generally Class III to V, covering several villages nearby. There exist 17 primary schools in the villages and four Thaohom schools in and around the model areas. Because of the limited education budget of the Province, most of the primary schools in the villages are established and maintained by the villagers' responsibility, except for some schools such as Thaohom ones which are managed by the Province. The conditions of school houses are very poor. Most of them consist of thatched roof, bamboo mat wall and earth floor with humble lumber of desks, chairs and blackboards. They are in a great need of rehabilitation. Out of 17 villages, nine (9) villages have no school house and utilize the village community house, village office or sub-district clinic.

In the proposed rehabilitation plan of the primary schools, a priority will be given to Thaohom school so that the village primary schools nearby can be integrated into the rehabilitated Thaohom school. In addition, primary schools in the villages will be integrated into one through construction of a new school between the villages. As a result, four (4) Thaohom schools and eight (8) village primary schools will be rehabilitated together with the required number of desks, chairs and blackboards in each school. They are five (5) in Xai, three (3) in Beng and four (4) in Hun. The proposed rehabilitation plan is summarized in Table 13 and Fig. 8.



Detailed study on the development of social infrastructures is given in ANNEX-FE of Feasibility Study on the Model Areas Scheme, Volume III.

#### **8.5 Measures to Environmental Problems**

The measures to alleviation of environmental problems proposed in Sub-chapter 5.4 will be carried out as one of the components of the Scheme mainly by the integrated agricultural station in collaboration with the offices concerned.

#### **8.6 Implementation and O&M of the Scheme**

Implementation and O&M of the proposed Model Areas Scheme will be managed by the Project Office to be newly established under the control of the Ministry of Agriculture and Forestry. As mentioned so far in this report, various action plans and programs are proposed to be implemented under the Scheme. Close cooperation between the Ministries, agencies, and offices concerned in the Province as well as in Vientiane is essential for successful implementation of the Scheme. It is, therefore, proposed that a Coordination Committee be organized under the leadership of the Ministry of Agriculture and Forestry. The proposed organization of the Project office is illustrated in Fig. 9. The office will have a full responsibility for construction supervision of civil works in the model areas development, and will be re-organized after civil works construction to establish the integrated agricultural station for execution of various development programs (refer to Sub-chapter 5.1, Section (2) and Sub-chapter 8.2, Section (4)). The proposed implementation schedule of the Scheme is shown in Fig. 10.

For construction of the Project Office, the authorities in the Province have proposed a bareland area covering 32 ha which is located in the eastern suburbs of Xai city. Xai meteorological station also exists in this land. Most of the land is currently covered with grass, except for 2 ha of rice field. The distribution pipe of Xai urban water supply system is available at the meteorological station and can be extended to the new Project office. Irrigation water can be lifted by small-scale pump from the Nam Ko river. With these favorable conditions, this land is proposed to construct the Project office. In addition to the Project office in Xai, construction of a site office with a staff quarter in Hun district will also be required to facilitate the implementation of various plans and programs as well as for construction supervision, because Hun model area is located about 100 km far from Xai city. This site office will be used as new extension office after the civil work construction in Hun model area is completed (refer to Sub-chapter 8.2, Section (2)).



## 8.7 Cost Estimates of the Scheme

The costs for implementation of the three model areas consist of direct construction cost, procurement of O&M equipment and agricultural machines, administration and engineering service costs, and contingencies. The costs are estimated on the basis of feasibility-level design of the facilities shown in Volume IV "Drawings", and on the following basis :

- (a) All the costs are estimated at December 1992 price level. The exchange rates applied are Kip 715 = Yen 125 = US\$ 1.
- (b) The construction works will be carried out by contractor(s) selected through competitive bidding.
- (c) Taxes on construction materials, machinery and plants to be imported from abroad shall be exempted from the cost estimates.
- (d) The costs are divided into foreign and local currencies.
- (e) Physical contingency related to construction quantity is assumed to be 5%.
- (f) Price contingency is assumed to be 2% for foreign currency and 5% for local currency, provided that the implementation period is four (4) years.

Total project cost is estimated at US\$15.54 million, consisting of US\$10.27 million in foreign currency and US\$5.27 million in local currency, and summarized as follows : The breakdown of the cost estimates is given in Table 14.





Unit : US\$ 1,000

Major Item	F/C	L/C	Total
1. Preparatory works	578	334	912
2. Irrigation system	3,766	2,161	5,927
- Xai area	1,498	858	2,356
- Beng area	1,298	730	2,028
- Hun area	970	573	1,543
3. Social infrastructures	951	490	1,441
- District road	416	169	585
- Rural water supply	371	78	449
- Primary school	164	243	407
4. Agricultural station	754	479	1,233
5. Extension office	139	90	229
6. Rice bank	168	120	288
7. Equipment	1,559	0	1,559
Sub-total (items 1 - 7)	<u>7,915</u>	<u>3,674</u>	<u>11,589</u>
8. Administration cost	0	232	232
9. Engineering service	927	0	927
Sub-total (items 1 - 9)	<u>8,842</u>	<u>3,906</u>	<u>12,748</u>
10. Physical contingency	442	195	637
11. Price contingency	984	1,167	2,151
Total	<u>10,268</u>	<u>5,268</u>	<u>15,536</u>

Note : F/C means foreign currency. L/C means local currency.

## 8.8 Evaluation of the Scheme

Evaluation of project should be made usually in terms of economic and financial aspects, and project effects. The Scheme includes some development programs such as establishment of agricultural station, rice banks, strengthening of extension office, construction of rural water supply system and schools, etc. which could not be evaluated through quantitative analysis by estimating the tangible benefits of these programs. In addition, the Scheme will be the model in integrated rural agricultural development, and also has a function to establish the base for further expansion of such a development that will be carried out under the medium and long term programs. For these reasons, the evaluation of the Scheme made in this chapter is limited to financial evaluation and the effects to be expected from the implementation of the Scheme.

### (1) Financial Evaluation

Financial evaluation is made through analysis of the impact on the increase in farm income of farm households with an average size by ethnic groups in each model area. In this



analysis, the economy of the farm households is examined under both without-project and with-project conditions. The average size of farm households in each model area is summarized as follows :

Farming Size	Xai		Beng	Hun	
	LL	Mix	LL	LL	LT
Lowland rice area (ha/family)	0.57	0.42	0.55	0.71	0.2
Upland rice area (ha/family)	0.0	0.31	0.19	0.28	0.9
Number of livestock:					
Buffalo (nos./family)	2.8	1.9	4.1	2.8	2.9
Cattle (nos./family)	2.0	1.8	3.5	0.7	0.1
Pig (nos./family)	1.6	0.4	3.4	1.8	1.2
Poultry (nos./family)	14.7	14.3	24.5	12.8	7.9

Note: LL=Lao Loum      LT= lao Theung

The income and expenditures of the average farm households under without- and with-project conditions are summarized as follows (for details, refer to Tables 15 and 16) :

Unit: Kip 1,000

Income/Expenditures Without Project Condition	Xai		Beng	Hun	
	LL	Mix	LL	LL	LT
Lowland rice	106.4	78.4	102.7	164.1	89.8
Upland rice	0.0	30.7	19.0	27.9	0.9
Upland crops	0.0	6.7	10.9	6.0	19.4
Livestock	55.5	25.4	102.2	48.9	43.4
Income total	161.9	141.2	234.6	215.2	189.4
Expenditures	305.0	290.0	254.0	171.0	113.5
Balance	-143.1	-148.8	-19.4	44.2	75.9

Unit: Kip 1,000

Income/Expenditures With Project Condition	Xai		Beng	Hun	
	LL	Mix	LL	LL	LT
Lowland rice	186.3	137.2	127.1	164.1	46.2
Upland rice	0.0	30.9	19.0	27.9	89.8
Upland crops	0.0	6.7	10.9	6.0	19.4
Livestock	55.5	25.4	102.2	48.9	43.4
Income total	241.8	200.3	259.2	247.0	198.9
Expenditures	305.0	290.0	254.0	171.0	113.5
Balance	-63.2	-89.7	5.2	76.0	85.4

As seen in the above tables, the economy of the farm households in the model areas will be improved by the increase in agricultural production to be expected after the implementation of the Scheme, though the households in Xai model area will have unbalanced economy in their income and expenditures.

The major risks foreseen in achieving the production target may be insufficient performance of training and services by extension workers, and insufficient and not timely supply of the required farm inputs. It is, therefore, recommended to establish the proposed agricultural station in early stage of the Scheme in order to carry out various trials and training



of extension workers as well as farmers. In addition, rice banks should also be established not only for more credit services but for sufficient and timely supply of farm inputs.

(2) Effects of the Scheme

The major effects on improvement of rural economy and living standard of farmers are evaluated in view of (i) improvement and stabilization of agricultural economy; (ii) food production increase; (iii) income generation; (iv) support for women in development; (v) increase in employment opportunity; (vi) control of slash and burn cultivation; and (vii) living condition and health, as shown below.

Effects on improvement and stabilization of agricultural production: almost all development programs of the Scheme will have both direct and indirect positive effects on the improvement and stabilization of agricultural production, except the program for construction of additional rural water supply. The direct effects will be expected from such programs as strengthening of extension services, agricultural and irrigation development in Xai, Beng and Hun model areas.

Food production increase: the direct effects on increase in food production will be brought by the implementation of such programs as strengthening of extension services, agricultural and irrigation development in the model areas. The expected increment of food production will be 1,800 tons of paddy.

Income generation: the income generation effects will directly be born by the above mentioned programs for agricultural production. Besides these programs, direct effects will be expected from establishment of rice bank, and support services for women's group such as promotion of participation in rice bank and extension of sericulture technique.

Support for women in development: the programs to support for women in development in the Scheme are mostly services for women's groups in such practical programs as women's school by extension offices, promotion of participation in rice bank, extension of sericulture technique. Besides these support services for women, construction of additional water supply system will improve the situations of hygiene and health in their living conditions.

Increase in employment opportunity: the effects on increase in employment opportunity will be expected from the economic activity programs such as establishment of rice bank, agricultural and irrigation development, and supporting programs for women such



as extension of sericulture technique and promotion of participation in rice bank. The program for rehabilitation and construction of primary school is not the economic activity program, but it will bring high effects on increase in employment opportunity by promoting enrollment in the primary education, which may uplift the enrollment to higher education.

Control of slash-and-burn cultivation: the expected 1,800 tons of incremental paddy would be equivalent to the production from about 1,300 ha of slash-and-burn cultivation area. Among other programs proposed in the Scheme, the agricultural station will contribute indirectly to control slash-and-burn cultivation through the study and planning programs for alleviation of environmental problems which will be carried out in the station under the Scheme for formulating necessary programs to be implemented in the medium and long term development phases.

Improvement of living and health conditions : the direct effects on improvement of living and health conditions in the model areas will directly be expected by the programs of construction of additional rural water supply system for supplying clean and safe water for villagers. Rehabilitation and upgrading of district road network will also bring the good effects on rural life through convenient transportation of materials and information to the villagers. Other programs which will contribute to improve rural economy will indirectly affects to uplift the living standard of villagers.





## **IX. RECOMMENDATIONS**

### **9.1 Early Implementation of the Model Areas Scheme**

The proposed Master Plan for integrated rural agricultural development in the study areas includes various project components such as increase in agricultural productivity, development of physical infrastructures, institutional improvement, including the training of staff and farmers. The implementation of the Master Plan should, therefore, be made under well-designed stage-wise program.

Thus, the Model Areas Scheme is proposed as the short term development program of the Plan for the purpose of establishing the core to demonstrate and evaluate the effects of the proposed agricultural development as well as the base for further expansion of the development that will be carried out under the medium and long term programs in the Plan. The implementation of the Scheme and the subsequent medium and long term programs will contribute to the control of slash-and-burn cultivation as well as to acceleration of socio-economic activities by rural people in the study area and the Province. In addition, the government staff as well as farmers could improve their technical and managerial capability and accumulate the experience in this type of rural agricultural development that can be applied for the future economic development not only in the study area but also in other potential areas of the Province.

Therefore, early implementation of the Scheme is strongly recommended.

### **9.2 Establishment of the Project Office and Close Cooperation**

As proposed in this report, a new Project Office and a Coordination Committee should be established for implementation and subsequent O&M of the Project including the Scheme. When the commencement of the Scheme implementation is confirmed by the Government of Lao PDR, it is recommended that actions necessary for establishment of these new organizations be started by the Ministry in collaboration with the Province. During the Project implementation as well as the Scheme, close cooperation between the ministries, agencies, and offices concerned is essential at all times, especially with NAEC, NARC, and the Sericulture Pilot Station in Vientiane, under the control of the Coordination Committee with guidance from the Ministry of Agriculture and Forestry.



### **9.3 Measures to Environmental Problems**

Some measures which will contribute to alleviation of environmental problems due to slash-and-burn cultivation activities are proposed. The measures include various programs such as data collection, investigations, data analysis and training of the staff and farmers. Although these programs will be implemented mainly by the integrated agricultural station, it is recommended to keep close contact with the national agencies as well as the international economic cooperation organizations concerned in order to obtain data and information useful for successful implementation of the programs.

### **9.4 Integrated Support for Women's Groups**

Some support programs for women's groups related to the model areas are proposed, which will be implemented by periodical opening of women's schools in the strengthened extension offices of the districts. In addition, establishment of rice banks is also proposed, organizing the existing women's unions at village level as a basis. Although necessary support services for implementation of these programs should be given directly by the Project, it is recommended to provide an integrated support service by the Project, the Province, the districts and the villages for the program implementation, especially for successful operations and management of the rice banks.



## *Tables*



View of shifting cultivation land  
in Beng District



Table 1 Population, Number of Village and Family in Each District

Item	Xai	Beng	Hun	Total
Population	37,446	24,053	39,768	101,267
- Lao Loum	35.5 %	37.9 %	19.6 %	30.0 %
- Lao Theung	51.5 %	54.1 %	67.2 %	58.1 %
- Lao Sung	12.9 %	8.0 %	13.2 %	11.9 %
No. of Villages	172	106	157	435
- Lao Loum	23	21	19	63
- Lao Theung	108	70	110	288
- Lao Sung	25	15	22	62
- Ethnic Mix	16	-	6	22
No. of Families	6,169	3,830	6,556	16,558
Member per Family (person)	6.1	6.3	6.1	6.1

Note : Population, number of villages and families are based on the data collected from each district office.

Table 2 Present Land Use in Study Area

Category	Xai	Beng	Hun	Total	Unit : ha	
					% of total	
Agricultural Land :		91,744	40,755	68,906	201,405	36.1
- Lowland Rice Field		1,183	1,010	907	3,100	0.6
Irrigated		998	839	825	2,662	0.5
Rainfed		185	171	82	438	0.1
- Shifting Cultivation Area		89,900	39,000	65,900	194,800	34.9
Upland Rice Field (Ray)		22,100	13,600	19,100	54,800	9.8
Planted		3,409	3,790	5,551	12,750	2.3
Not Planted		18,691	9,810	13,549	42,050	7.5
Fallow Land		67,800	25,400	46,800	140,000	25.1
- Other Crops (perennial crops)		661	745	2,099	3,505	0.6
Forest Area		117,700	78,500	99,400	295,500	53.0
Others (bamboo area, village, road, river, etc.)		15,556	35,745	9,694	60,995	10.9
Total		225,000	155,000	178,000	558,000	100.0

Source : District office

Note : \* Sum of cropped upland in last 3 years

Table 3 Average Size of Land Holding by Ethnic Group

Item	Unit: ha and head/household								
	Xai			Beng			Hun		
Ethnic group	LL	LT	LS	LL	LT	LS	LL	LT	LS
Lowland	0.48	0.18	0.05	0.42	0.02	0.00	0.45	0.02	0.02
Upland	0.24	0.78	0.59	0.49	1.40	1.20	0.60	0.97	0.93
Total	0.72	0.96	0.64	0.91	1.42	1.20	1.05	0.99	0.95
Buffalo	1.2	0.8	0.3	2.3	1.2	1.5	2.0	1.1	0.5
Cattle	0.3	1.3	2.1	1.3	0.6	0.8	0.2	0.2	1.5
Horse	-	-	1.1	-	-	0.4	-	-	1.4
Pig	1.0	2.1	2.4	1.8	1.7	2.9	1.7	1.3	3.4
Goat	-	0.2	0.8	0.7	0.9	0.4	-	0.3	0.4
Poultry	3.3	17.4	9.2	12.9	8.0	11.0	10.3	6.8	11.1

LL : Lao Loum

LT : Lao Theung

LS : Lao Sung





Table 4 Inventory of Existing Irrigation System

Command Area Category	No. of Scheme	Total Irrigation Area (ha)	Average Irri. Area (ha)	Remarks
<b>Xai District :</b>				
Less than 5 ha	39	99.6	2.6	All brushwood weir
6 - 10 ha	7	57.8	8.3	All brushwood weir
11 - 20 ha	11	150.9	13.7	All brushwood weir
21 - 30 ha	4	102.8	25.7	All brushwood weir
31 - 50 ha	5	180.0	36.0	All brushwood weir
More than 51 ha	3	406.5	135.5	Con. weir 1 scheme
Sub-total	<u>69</u>	<u>997.6</u>		
<b>Beng District :</b>				
Less than 5 ha	17	63.4	3.7	Con. weir 1 scheme
6 - 10 ha	10	58.6	5.9	All brushwood weir
11 - 20 ha	3	42.0	14.0	All brushwood weir
21 - 30 ha	1	25.0		All brushwood weir
31 - 50 ha	3	117.3	39.1	Con. weir 1 scheme
More than 51 ha	6	532.9	88.8	Con. weir 2 schemes
Sub-total	<u>40</u>	<u>839.2</u>		
<b>Hun District :</b>				
Less than 5 ha	4	15.0	3.8	Con. weir 1 scheme
6 - 10 ha	3	21.7	7.2	All brushwood weir
11 - 20 ha	6	103.7	17.3	Con. weir 1 scheme
21 - 30 ha	4	110.5	27.6	Con. weir 1 scheme
31 - 50 ha	5	211.4	42.3	Con. weir 3 schemes
More than 51 ha	4	362.7	90.7	Con. weir 3 schemes
Sub-total	<u>26</u>	<u>825.0</u>		
<b>Total, Study Area :</b>				
Less than 5 ha	60	178.0	3.0	Con. weir 2 schemes
6 - 10 ha	20	138.1	6.9	All brushwood weir
11 - 20 ha	20	296.6	14.8	Con. weir 1 scheme
21 - 30 ha	9	238.3	26.5	Con. weir 1 scheme
31 - 50 ha	13	508.7	39.1	Con. weir 4 schemes
More than 51 ha	13	1,302.1	100.2	Con. weir 6 schemes
Total	<u>135</u>	<u>2,661.8</u>	<u>19.7</u>	

Source : Data obtained from both provincial and district offices.



Table 5 Land Use Condition in Northern Region and Oudomxay Province

Land Use	1981/82		1988/89		Change	
	(1,000 ha)	(%)	(1,000 ha)	(%)	(1,000 ha)	(%)
<b>Northern Region :</b>						
Current Forest	3,349	37.2	3,199	35.6	- 150	- 4.5
Bamboo Area	701	7.8	338	3.7	- 363	- 51.7
Shifting Cultivation Area						
Currently Used (Ray)	353	3.9	611	6.8	258	73.2
Fallow (Unstocked)	4,024	44.7	4,254	47.3	230	5.7
Sub-total	4,377	48.6	4,865	54.1	488	11.2
Permanent Agricultural Land						
Rice Field	59	0.6	77	0.8	18	30.7
Other Agricultural Land	5	0.1	5	0.1	0	0.0
Sub-total	64	0.7	82	0.9	18	30.7
Other Areas	509	5.7	516	5.7	7	1.2
<b>Total</b>	<b>9,000</b>	<b>100.0</b>	<b>9,000</b>	<b>100.0</b>	<b>0.0</b>	<b>0.0</b>
<b>Oudomxay Province :</b>						
Current Forest	399	29.0				
Bamboo	150	11.0				
Shifting Cultivation Area						
Currently Use (ray)	61	4.5				
Fallow (Unstocked)	713	51.9	Not available			
Sub-total	774	56.4				
Permanent Agricultural Land						
Rice Field	19	1.3				
Other Agricultural Land	1	0.1				
Sub-total	20	1.4				
Other Areas	30	2.2				
<b>Total</b>	<b>1,373</b>	<b>100.0</b>				

Source : Reconnaissance Survey, Forest Inventory and Management Office, July 1991.

Table 6 Present Land Use in Each District

Category/District	Xai District		Beng District		Hun District		Study Area	
	(1,000 ha)	(%)	(1,000 ha)	(%)	(1,000 ha)	(%)	(1,000 ha)	(%)
Forest Area	117.7	52.3	78.5	50.6	99.4	55.8	295.5	53.0
Bamboo Area	0.0	0.0	24.3	15.7	6.8	3.8	31.1	5.6
Shifting Cultivation Area								
Currently Use (Ray)	22.1	9.8	13.6	8.8	19.1	10.8	54.8	9.8
Fallow (Unstocked)	67.8	30.1	25.4	16.4	46.8	26.3	140.0	25.1
Sub-total	89.9	39.9	39.0	25.2	66.0	37.1	194.9	34.9
Permanent Agricultural Land								
Rice Field	1.2	0.6	1.0	0.6	0.9	0.5	3.1	0.6
Other Agricultural Land	0.7	0.3	0.7	0.5	2.1	1.2	3.5	0.7
Sub-total	1.9	0.9	1.7	1.1	3.0	1.7	6.6	1.3
Other Areas	15.5	6.9	11.4	7.4	2.9	1.6	29.8	5.3
<b>Total</b>	<b>225.0</b>	<b>100.0</b>	<b>155.0</b>	<b>100.0</b>	<b>178.0</b>	<b>100.0</b>	<b>558.1</b>	<b>100.0</b>

Note : Planimeter estimation from land use and forest map (1 : 50,000) prepared by the Forest Inventory Project, except for permanent agricultural land which is estimated by data from the District Offices.



Table 7 Action Plans and Programs for Integrated Agricultural Development (1/2)

	Short Term Development Stage (1995 to 2000)	Short Term Development Stage (2001 to 2005)	Long Term Development Stage (2006 to 2010)
<p>Scheme Component, Action Plan and Program</p> <p>A. Increase and Stabilization of Agricultural Productivity</p> <p>A.1 Improvement and Strengthening of Agricultural Support Services</p> <p>A.1.1 Strengthening of Agricultural Extension Services</p>	<ul style="list-style-type: none"> <li>○ Construction of office buildings with storage and garage in each model area</li> <li>○ Construction of staffquarter, if necessary</li> <li>○ Supply of necessary equipment for each office</li> <li>○ Assignment of extension workers</li> <li>○ Training of extension workers</li> <li>○ Demonstration of improved lowland rice farming system for model areas</li> <li>○ Distribution of improved seeds and seedlings to model areas</li> <li>○ Periodical opening of women's school for model areas</li> <li>○ Extension of improved sericulture to model areas</li> </ul>	<ul style="list-style-type: none"> <li>● Increase in staffing of extension workers</li> <li>● Training of extension workers</li> <li>● Demonstration of improved lowland rice farming system for the study area</li> <li>● Demonstration of improved gentle sloping upland field farming system for the study area</li> <li>● Distribution of improved seeds and seedlings to the study area</li> <li>● Periodical opening of women's school to the study area</li> <li>● Extension of improved sericulture to the study area</li> <li>● Promotion of vaccine injection effects to farmers</li> <li>● Support services for vaccine injection</li> </ul>	<ul style="list-style-type: none"> <li>● Increase in staffing of extension workers</li> <li>● Training of extension workers</li> <li>● Demonstration of improved lowland rice farming system for the study area</li> <li>● Demonstration of improved gentle sloping upland field farming system for the study area</li> <li>● Distribution of improved seeds and seedlings to the study area</li> <li>● Periodical opening of women's school to the study area</li> <li>● Extension of improved sericulture to the study area</li> <li>● Promotion of vaccine injection effects to farmers</li> <li>● Support services for vaccine injection</li> </ul>
<p>A.1.2 Strengthening of Veterinary Services</p>	<ul style="list-style-type: none"> <li>○ Establishment of rice bank in each model area</li> <li>○ Construction of office buildings with storage and drying yard for rice bank in each model area</li> <li>○ Supply of rice mill, sesame cleaner and office equipment for each office</li> <li>○ Training of rice bank staff</li> </ul>	<ul style="list-style-type: none"> <li>● Establishment of additional rice bank</li> <li>● Supply of equipment and instruments</li> </ul>	<ul style="list-style-type: none"> <li>● Re-organization of rice bank to the farmers' organization</li> <li>● Construction of offices for farmer's organization</li> <li>● Construction of storage</li> <li>● Supply of equipment and instruments</li> </ul>
<p>(a) Establishment of Efficient Marketing System</p> <p>(b) Strengthening of Government Institution</p>	<ul style="list-style-type: none"> <li>○ Construction of integrated agricultural station</li> <li>○ Construction of training facilities</li> <li>○ Development of trial farm plots</li> <li>○ Supply of necessary equipment for station</li> <li>○ Supply of O&amp;M machinery for model areas</li> <li>○ Multiplication of seeds and seedlings</li> <li>○ Training of extension workers and rice bank staff</li> <li>○ O&amp;M of irrigation system and roads in model areas</li> <li>★ Development of technologies for irrigated lowland rice field farming</li> <li>★ Development of technologies for gentle sloping upland field farming</li> <li>★ Introduction of improved sericulture</li> <li>★ Preparation of concrete program for strengthening of veterinary services</li> <li>★ Preparation of concrete program for establishment of farmers' organization, and strengthening of government institution</li> <li>★ Preparation of stage-wise implementation programs for rehabilitation and upgrading of existing irrigation system</li> <li>★ Preparation of concrete programs for new irrigation development</li> <li>★ Preparation of stage-wise implementation programs for rehabilitation and upgrading of district road, development of rural water supply system, and rehabilitation and construction of primary schools and village communities</li> <li>★ Basic study and analysis on environmental issues</li> </ul>	<ul style="list-style-type: none"> <li>● Training of staff concerned of province and districts</li> <li>● Improvement of facilities and equipment related to this component.</li> <li>● Multiplication of seeds and seedlings</li> <li>★ Training of extension workers and rice bank staff</li> <li>★ Development of farming technologies in steep sloping areas</li> <li>★ Improvement of livestock raising techniques</li> <li>★ Preparation of stage-wise implementation programs for rehabilitation and upgrading of existing irrigation system</li> <li>★ Preparation of stage-wise implementation programs for new irrigation development</li> <li>★ Preparation of concrete program for small-scale storages development for irrigation purpose</li> </ul>	<ul style="list-style-type: none"> <li>● Multiplication of seeds and seedlings</li> <li>● Training of extension workers and rice bank staff</li> <li>★ Development of farming technologies in steep sloping areas</li> <li>★ Improvement of livestock raising techniques</li> <li>★ Preparation of stage-wise implementation programs for rehabilitation and upgrading of existing irrigation system</li> <li>★ Preparation of stage-wise implementation programs for new irrigation development</li> <li>★ Preparation of stage-wise implementation programs for small-scale storages development</li> </ul>
<p>A.2 Establishment of Integrated Agricultural Station</p>	<ul style="list-style-type: none"> <li>○ Preparation of concrete Action Plans &amp; Programs</li> <li>★ Development of Appropriate Technologies</li> </ul>	<ul style="list-style-type: none"> <li>○ Execution of Pilot Model Areas Scheme</li> <li>● Execution of Development Scheme</li> </ul>	<ul style="list-style-type: none"> <li>○ Preparation of concrete Action Plans &amp; Programs</li> <li>★ Development of Appropriate Technologies</li> </ul>



Table 7 Action Plans and Programs for Integrated Agricultural Development (2/2)

Scheme Component, Action Plan and Program	Short-Term Development Stage (1995 to 2000)	Short-Term Development Stage (2001 to 2005)	Long-Term Development Stage (2006 to 2010)
<b>B. Development of Agricultural Production Infrastructure</b>			
B.1 Rehabilitation and Grade-up of Existing Irrigation System	<ul style="list-style-type: none"> <li>○ Rehabilitation and upgrading of existing irrigation system in model areas</li> <li>○ Training of staff concerned of province and district users association</li> <li>○ Development of laws and regulations related to water</li> <li>○ Improvement of existing water users association in model areas</li> <li>○ Training of farmers in on-farm water management and O&amp;M of irrigation facilities for model areas</li> </ul>	<ul style="list-style-type: none"> <li>● Rehabilitation and grade-up of existing irrigation systems in the study area</li> <li>● Strengthening of existing associations</li> <li>● Training of farmers staff in proper management of association</li> <li>● Training of farmers in on-farm water management and O&amp;M of irrigation facilities</li> </ul>	<ul style="list-style-type: none"> <li>● Rehabilitation and grade-up of existing irrigation systems in the study area</li> <li>● Strengthening of existing associations</li> <li>● Training of farmers staff in proper management of association</li> <li>● Training of farmers in on-farm water management and O&amp;M of irrigation facilities</li> </ul>
B.2 Establishment of Water Users Association	<ul style="list-style-type: none"> <li>○ Training of farmers in on-farm water management and O&amp;M of irrigation facilities for model areas</li> <li>○ Strengthening of existing meteorological station in Xai</li> <li>○ Construction of additional meteorological yards in Beng</li> <li>○ Installation of rainfall recorders at 9 sites</li> <li>○ Installation of water level gauge staff in main rivers</li> </ul>	<ul style="list-style-type: none"> <li>● Strengthening of existing associations</li> <li>● Training of farmers staff in proper management of association</li> <li>● Training of farmers in on-farm water management and O&amp;M of irrigation facilities</li> </ul>	<ul style="list-style-type: none"> <li>● Strengthening of existing associations</li> <li>● Training of farmers staff in proper management of association</li> <li>● Training of farmers in on-farm water management and O&amp;M of irrigation facilities</li> </ul>
B.3 Improvement of Metro-Hydrological Network	<ul style="list-style-type: none"> <li>○ Strengthening of existing meteorological station in Xai</li> <li>○ Construction of additional meteorological yards in Beng</li> <li>○ Installation of rainfall recorders at 9 sites</li> <li>○ Installation of water level gauge staff in main rivers</li> </ul>		
B.4 Construction of New Irrigation System	<ul style="list-style-type: none"> <li>○ Rehabilitation and gravel pavement of existing roads in model areas</li> <li>○ Construction of bridge related to model areas</li> <li>○ Training of staff concerned of province and district</li> <li>○ Construction of rural water supply system in villages related to model areas</li> <li>○ Training of staff concerned of province and district</li> <li>○ Rehabilitation of primary schools in model areas</li> </ul>	<ul style="list-style-type: none"> <li>● Construction of new irrigation system in lowland area</li> <li>○ Construction of new irrigation system in gentle sloping area for upland crops</li> <li>○ Rehabilitation and gravel pavement of other existing road network</li> <li>● Supply of construction and O&amp;M equipment</li> <li>● Construction of additional water supply system in other areas</li> <li>● Supply of construction and O&amp;M equipment</li> <li>● Rehabilitation and construction of primary schools and village communities in other areas</li> <li>● Supply of necessary equipment</li> </ul>	<ul style="list-style-type: none"> <li>● Construction of new irrigation system in lowland area</li> <li>● Construction of new irrigation system in gentle sloping area for upland crops</li> <li>○ Construction of small-scale storage for irrigation</li> <li>● Rehabilitation and gravel pavement of other existing road network</li> <li>● Supply of construction and O&amp;M equipment</li> <li>● Construction of additional water supply system in other areas</li> <li>● Supply of construction and O&amp;M equipment</li> <li>● Rehabilitation and construction of primary schools and village communities in other areas</li> <li>● Supply of necessary equipment</li> </ul>
<b>C. Development of Social Infrastructures</b>			
C.1 Rehabilitation and Upgrading of District Road Network	<ul style="list-style-type: none"> <li>○ Rehabilitation and gravel pavement of existing roads in model areas</li> <li>○ Construction of bridge related to model areas</li> <li>○ Training of staff concerned of province and district</li> <li>○ Construction of rural water supply system in villages related to model areas</li> <li>○ Training of staff concerned of province and district</li> <li>○ Rehabilitation of primary schools in model areas</li> </ul>	<ul style="list-style-type: none"> <li>● Rehabilitation and gravel pavement of other existing road network</li> <li>● Supply of construction and O&amp;M equipment</li> <li>● Construction of additional water supply system in other areas</li> <li>● Supply of construction and O&amp;M equipment</li> <li>● Rehabilitation and construction of primary schools and village communities in other areas</li> <li>● Supply of necessary equipment</li> </ul>	<ul style="list-style-type: none"> <li>● Rehabilitation and gravel pavement of other existing road network</li> <li>● Supply of construction and O&amp;M equipment</li> <li>● Construction of additional water supply system in other areas</li> <li>● Supply of construction and O&amp;M equipment</li> <li>● Rehabilitation and construction of primary schools and village communities in other areas</li> <li>● Supply of necessary equipment</li> </ul>
C.2 Construction of Rural Water Supply Facility	<ul style="list-style-type: none"> <li>○ Construction of rural water supply system in villages related to model areas</li> <li>○ Training of staff concerned of province and district</li> <li>○ Rehabilitation of primary schools in model areas</li> </ul>	<ul style="list-style-type: none"> <li>● Construction of additional water supply system in other areas</li> <li>● Supply of construction and O&amp;M equipment</li> <li>● Rehabilitation and construction of primary schools and village communities in other areas</li> <li>● Supply of necessary equipment</li> </ul>	<ul style="list-style-type: none"> <li>● Construction of additional water supply system in other areas</li> <li>● Supply of construction and O&amp;M equipment</li> <li>● Rehabilitation and construction of primary schools and village communities in other areas</li> <li>● Supply of necessary equipment</li> </ul>
C.3 Rehabilitation and Construction of Primary School and Community Facility	<ul style="list-style-type: none"> <li>○ Rehabilitation of primary schools in model areas</li> </ul>	<ul style="list-style-type: none"> <li>● Rehabilitation and construction of primary schools and village communities in other areas</li> <li>● Supply of necessary equipment</li> </ul>	<ul style="list-style-type: none"> <li>● Rehabilitation and construction of primary schools and village communities in other areas</li> <li>● Supply of necessary equipment</li> </ul>
<b>D. Measures to Environmental Problems</b>			
D.1 Integrated Agricultural Development (Indirect Measures to Environment Problems)	<ul style="list-style-type: none"> <li>○ Increase and stabilization of agricultural productivity (item A mentioned above)</li> <li>○ Development of agricultural production infrastructure (item B)</li> <li>○ Development of social infrastructure (item C)</li> </ul>	<ul style="list-style-type: none"> <li>● Increase and stabilization of agricultural productivity (item A mentioned above)</li> <li>● Development of agricultural production infrastructure (item B)</li> <li>● Development of social infrastructure (item C)</li> </ul>	<ul style="list-style-type: none"> <li>● Increase and stabilization of agricultural productivity (item A mentioned above)</li> <li>● Development of agricultural production infrastructure (item B)</li> <li>● Development of social infrastructure (item C)</li> </ul>
D.2 Control and Management Program for Slash-and-burn Cultivation (Direct Measures to Environment Problems)	<ul style="list-style-type: none"> <li>○ Program for evaluation of slash-and-burn cultivation</li> <li>○ Reserved forest establishment program</li> <li>○ Management program for uncontrolled fire</li> <li>○ Program for minimization of rotation cycle</li> </ul>	<ul style="list-style-type: none"> <li>● Reserved forest establishment program</li> <li>● Management program for uncontrolled fire</li> <li>● Program for minimization of rotation cycle</li> </ul>	<ul style="list-style-type: none"> <li>● Reserved forest establishment program</li> <li>● Management program for uncontrolled fire</li> <li>● Program for minimization of rotation cycle</li> </ul>
<b>E. Support Services for Women's Group</b>	<ul style="list-style-type: none"> <li>○ Training of key staff of existing Women Union at district and village level in model areas</li> <li>○ Support for improvement of people's living standard in model areas</li> <li>○ Support for promotion of health education in model areas</li> <li>○ Support for promotion of women's education in model areas</li> <li>○ Demonstration of sericulture in model areas</li> <li>○ Extension of garden farming in model areas</li> <li>○ Promotion of participation in rice bank for model areas</li> </ul>	<ul style="list-style-type: none"> <li>● Training of key staff of existing Women Union at district and village level</li> <li>● Support for improvement of people's living standard</li> <li>● Support for promotion of health education</li> <li>● Support for promotion of women's education</li> <li>● Extension of sericulture</li> <li>● Extension of garden farming</li> <li>● Promotion of participation in rice bank</li> </ul>	<ul style="list-style-type: none"> <li>● Training of key staff of existing Women Union at district and village level</li> <li>● Support for improvement of people's living standard</li> <li>● Support for promotion of health education</li> <li>● Support for promotion of women's education</li> <li>● Extension of sericulture</li> <li>● Extension of garden farming</li> <li>● Promotion of participation in rice bank</li> </ul>
☆ Preparation of Concrete Action Plans & Programs	<ul style="list-style-type: none"> <li>○ Execution of Pilot Model Areas Scheme</li> </ul>	<ul style="list-style-type: none"> <li>● Execution of Development Scheme</li> </ul>	<ul style="list-style-type: none"> <li>● Execution of Development Scheme</li> </ul>
★ Development of Appropriate Technologies			





Table 8 Anticipated Rice Production

	Short Term Stage			Medium Term Stage			Long Term Stage		
	Without Project	With Project	Increment	Without Project	With Project	Increment	Without Project	With Project	Increment
<b>1. Harvested Area (ha)</b>									
Lowland Rice Field									
Irrigated									
Traditional	2,660	1,930	-730	2,660	1,000	-1,660	2,660	0	-2,660
Technical (wet)	0	830	830	0	2,280	2,280	0	3,700	3,700
Technical (dry)	0	125	125	0	250	250	0	300	300
Rainfed	440	440	0	440	220	-220	440	0	-440
Total	3,100	3,325	225	3,100	3,750	650	3,100	4,000	900
Upland Rice Field									
Rainfed	12,750	12,750	0	12,750	12,750	0	12,750	12,750	0
Irrigated	0	0	0	0	1,500	1,500	0	3,500	3,500
Total	12,750	12,750	0	12,750	14,250	1,500	12,750	16,250	3,500
<b>2. Yield (ton/ha)</b>									
Lowland Rice Field									
Irrigated									
Traditional	2.6	2.9	0.3	2.6	3.2	0.6	2.6	3.5	0.9
Technical		4.0	4.0		4.5	4.5		5.0	5.0
Rainfed	2.0	2.3	0.3	2.0	2.5	0.5	2.0	2.8	0.8
Upland Rice Field									
Rainfed	1.4	1.4	0.0	1.4	1.6	0.2	1.4	1.8	0.4
Irrigated			0.0		3.0	3.0		3.5	3.5
<b>3. Production (ton)</b>									
Lowland Rice Field									
Irrigated									
Traditional	6,916	5,597	-1,319	6,916	3,200	-3,716	6,916	0	-6,916
Technical (wet)	0	3,320	3,320	0	10,260	10,260	0	18,500	18,500
Technical (dry)	0	500	500	0	1,125	1,125	0	1,500	1,500
Rainfed	880	1,012	132	880	550	-330	880	0	-880
Sub-total	7,796	10,429	2,633	7,796	15,135	7,339	7,796	20,000	12,204
Upland Rice Field									
Rainfed	17,850	17,850	0	17,850	20,400	2,550	17,850	22,950	5,100
Irrigated	0	0	0	0	4,500	4,500	0	12,250	12,250
Sub-total	17,850	17,850	0	17,850	24,900	7,050	17,850	35,200	17,350
Total	25,646	28,279	2,633	25,646	40,035	14,389	25,646	55,200	29,554



Table 9 Calculation of Foreign Exchange Saving and Magnitude of Forest Degradation

(1) Foreign Exchange Saving

	1990	Short Term	Medium Term	Long Term
Incremental Paddy Production (ton)	-	2,630	14,390	29,550
Convert into rice (ton)	-	1,710	9,350	19,210
Volume of Imported Rice (ton)*	40,000	-	-	-
Value of Imported Rice (million US\$)*	9.6	-	-	-
Expectative Foreign Exchange Saving (million US\$)	-	0.4	2.2	4.6

Note: \*; FAO Trade Year Book.

(2) Magnitude of Forest Degradation

	Short Term		Medium Term		Long Term	
	Without	With	Without	With	Without	With
Rice Production (ton)	25,650	28,280	25,650	40,040	25,650	55,200
Rice Demand (ton)*	40,110	40,110	46,870	46,870	64,300	64,300
Deficit in Rice (ton)	-14,460	-11,830	-21,220	-6,830	-38,650	-9,100
Converted into Upland Rice Area (ha)**	10,330	8,450	15,160	4,880	27,610	6,500

Note: \*; estimated from the population projection and per capita consumption (details are given in ANNEX-MA AGRO-ECONOMY AND MARKETING of Volume II Master Plan Study).

\*\*; deficit in rice divides unit yield of rainfed upland rice (1.4 ton/ha).



Table 10 Existing Irrigation System Related to Each Model Area

Scheme	Water Source	Net Irrigation Area (ha)	Type of Weir	Remarks
1. Xai Model Area :				
B. Nale	Nam Mao )	197*	Brushwood	Excess water from small streams
B. Cheng	Nam Mao )		Brushwood	
Other small schemes		113	No weirs	
Total		<u>310</u>		
2. Beng Model Area :				
B. Beng Kham	Nam Hao	103	Brushwood	
B. B. Thakat	Nam Hao	85	Brushwood	
B. Beng Kham	Nam Hao	10	Brushwood	
B. Nahouay	Nam Hao	8	Brushwood	
B. Nahouay	Nam Hao	15	Brushwood	
Total		<u>221</u>		
3. Hun Model Area :				
B. Somxai	Nam Ngat	50	Concrete	By province
B. Phonsavat	Nam Ngat	59	Concrete	By Quaker
B. Somxai	Nam Ngat	30	Concrete	By district & village
B. Nakham-tai	Nam Kham	40	Brushwood	
B. Nakham-nua	Nam Kham	20	Brushwood	
Total		<u>199</u>		

Source : District offices in Xai, Beng and Hun

Note : \* means total net irrigation area of two schemes.



Table 11 Main Features of Irrigation Development in Each Model Area

1. Xai Model Area :

- (1) Net Irrigation Area : 302 ha, including 108 ha on the right bank and 194 ha on the left bank.
- (2) Diversion Weir : One concrete fixed type of weir with a crest length of 60 m and a height of 4.2 m.
- (3) Irrigation Canal
  - Main canal : Two main canals with a total length of 6.9 km, wet stone masonry lining.
  - Secondary canal : 12.9 km in total, earthen type.
- (4) Drain : 7.0 km in total.

2. Beng Model Area :

- (1) Net Irrigation Area : 270 ha, including 167 ha on the right bank area and 103 ha on the left bank area.
- (2) Diversion Weir : One concrete fixed type of weir with a crest length of 40 m and a height of 1.6 m.
- (3) Irrigation Canal
  - Main canal : Two main canals with a total length of 9.3 km, wet stone masonry lining.
  - Secondary canal : 13.9 km in total, earthen type.
- (4) Drain : 6.3 km in total.
- (5) River Improvement : 0.9 km on the Nam Hao river.

3. Hun Model Area :

- (1) Net Irrigation Area : 201 ha in Nam Ngat area, including 70 ha on the right bank area and 131 ha on the left bank area.  
57 ha on the left bank area of the Nam Kham river.
- (2) Diversion Weir : One concrete fixed type of weir on the Nam Ngat (crest length : 22 m and height : 1.8 m)  
  
One concrete fixed type of weir on the Nam Kham (crest length : 40 m and height : 2.1 m)
- (3) Irrigation Canal
  - Main canal : 5.7 km in total, wet stone masonry lining.
  - Secondary canal : 13.6 km, earthen type.
- (4) Drain : 9.2 km in total.





Table 12 Development Plan of Rural Water Supply System

Item	Xai Area	Beng Area	Hun Area
1. Related Village (population/no. of family)	(1) B. Nasao (337/57) (2) B. Nale (356/58) (3) B. Houaykhom (480/97)	(1) B. Phokeo (477/74) (2) B. Pangdua (365/62) (2) B. Nalai (363/52) (4) B. Gnjo (538/91)	(1) B. Somphon (641/126) (2) B. Nakham-nua (261/50) (3) B. Nakham-tai (351/60) (4) B. Na (657/118) (5) B. Mai (262/54)
2. Total Population	1,173	1,743	2,172
3. Design Population*	1,600	2,300	2,900
4. Water Source	Hoay Khoum	Houay Lai	Houay Phon
5. Available Amount of Water**	6.7 lit/sec	2.9 lit/sec	5.7 lit/sec
6. No. of Tap required***	B. Nasao (7) B. Nale (7) B. Houaykhom(12)	B. Phokeo (9) B. Pangdua (8) B. Nalai (7) B. Gnjo (11)	B. Somphon (13) B. Nakham-nua (6) B. Nakham-tai (8) B. Na (13) B. Mai (6)
(Total of Required Taps)	(26)	(35)	(46)
7. Length of Main Pipe (Water Source to Village)	3.1 km	2.4 km	4.4 km
8. Length of Distribution Line	4.5 km	4.2 km	3.7 km

Note : \* Predicted population in Year 2000 with 2.9 % of growth rate.  
 \*\* Discharges measured in November, 1992.  
 \*\*\* Estimated at a rate of ten (10) families per tap.



Table 13 Rehabilitation Plan of Primary School

District Village	No. of Pupil by Class					No. of Room	Remarks
	I	II	III	IV	V		
<b>Xai :</b>							
1. B. Nalao*	116	38	-	-	-	3	
2. B. Nasao	28	12	-	-	-	2	
3. B. Houaykhoun	49	22	-	-	-	2	
4. B. Thaohom Khet 1	-	-	64	58	33	4	B. Bancheg village
5. B. Thaohom Khet 4	40	22	19	17	16	4	B. Nale village
<b>Beng :</b>							
1. B. Phokeo	33	31	-	-	-	2	
2. B. Thakat	47	-	-	-	-	2	
3. Thaohom Khet 1**	180	110	101	78	40	10	B. Benglouang
<b>Hun :</b>							
1. B. Somphon	26	11	-	-	-	2	
2. B. Nakham-nua*** B. Nakham-tai	42	23	-	-	-	2	
3. B. Na & B. Mai****	39	21	-	-	-	2	
4. B. Thaohom Khet 2*****	25	17	48	15	17	4	B. Somxai village
<b>Total</b>	<b>12 schools with 39 rooms</b>						

- Note :
- \* Pupil of Class I and II in B. Nami is included and supposed to join B. Nalao.
  - \*\* Class I in B. Bengkham, B. Nahouay, B. Benglouang and B. Houayla is supposed to join Thaohom Khet 1 in B. Benglouang.
  - \*\*\* Total number of pupil in B. Nakham-nua and B. Nakham-tai, and a school house is proposed to be constructed between the two villages.
  - \*\*\*\* Total number of pupil in B. Na and B. Mai, and a school house is proposed to be constructed between the two villages.
  - \*\*\*\*\* Class I and II in B. Somxai is proposed to join Thaohom Khet 2 in Somxai.



Table 14 Construction Cost of Model Areas Scheme

Items	Total Cost			Equivalent ( Yen 1,000 )
	FC ( US\$ 1,000 )	LC ( US\$ 1,000 )	Total ( US\$ 1,000 )	
1. Preparatory Works	578	334	912	114,000
2. Irrigation and Drainage				
(1) Xai area	1,498	858	2,356	294,500
(2) Beng area	1,298	730	2,028	253,500
(3) Hun area	970	573	1,543	192,875
3. Social Infrastructures				
(1) District road				
- B.Nasao to B.Nale (Xai)	102	49	151	18,875
- Hun center to B.Somphon (Hun)	314	120	434	54,250
(2) Rural water supply				
- Houay Khoum system (Xai)	102	21	123	15,375
- Houay Lai system (Beng)	124	25	149	18,625
- Houay Phon system (Hun)	145	32	177	22,125
(3) Primary school				
- Xai area	63	94	157	19,625
- Beng area	59	87	146	18,250
- Hun area	42	62	104	13,000
4. Agricultural Station	754	479	1,233	154,125
5. Extension Office				
(1) Beng extension office	43	28	71	8,875
(2) Hun extension office	96	62	158	19,750
6. Rice Bank				
(1) Xai rice bank	56	40	96	12,000
(2) Beng rice bank	56	40	96	12,000
(3) Hun rice bank	56	40	96	12,000
Sub-total (1 - 6)	6,356	3,674	10,030	1,253,750
7. Equipment	1,559	0	1,559	194,875
8. Administration cost	0	232	232	29,000
9. Engineering Services	927	0	927	115,875
Sub-total (1 - 9)	8,842	3,906	12,748	1,593,500
10. Physical Contingency	442	195	637	79,625
Sub-total (1 - 10)	9,284	4,101	13,385	1,673,125
11. Price Contingency	984	1,167	2,151	268,875
Total (1 - 11)	10,268	5,268	15,536	1,942,000

Note:

US\$ 1.0 = Kips 715 = Yen 125

FC : Foreign currency portion, LC : Local currency portion



Table 15 Farm Household under Without-Project Condition

		Unit of value: Kip in 1000				
Ethnic group	(Unit)	Xai		Beng	Hun	
		LL	Mix	LL	LL	LT
A. Income:	(Kip)	161.9	141.2	234.6	215.2	189.4
1) Field crop		106.4	115.8	132.4	166.3	146.0
Lowland rice:						
Production	(ton/paddy)	1.5	1.1	1.4	1.8	0.5
Net reserve*	(Kip/ha)	186.7	186.7	186.7	186.7	186.7
Cultivated area	(ha)	0.57	0.42	0.55	0.71	0.20
Income	(Kip)	106.4	78.4	102.7	132.6	37.3
Upland rice :						
Production	(ton/paddy)	0.0	0.4	0.3	0.4	1.3
Net reserve*	(Kip/ha)	99.1	99.1	99.1	99.1	99.1
Cultivated area	(ha)	0.00	0.31	0.19	0.28	0.90
Income	(Kip)	0.0	30.7	18.8	27.7	89.2
Upland crop:		0.0	6.7	10.9	6.0	19.4
Sesame**						
Net reserve	(Kip/ha)	215.8	215.8	215.8	215.8	215.8
Cultivated area	(ha)	0.00	0.03	0.02	0.03	0.09
Income	(Kip)	0.0	6.7	4.1	6.0	19.4
Tobacco***						
Net reserve	(Kip/ha)	89.4	89.4	89.4	89.4	89.4
Cultivated area	(ha)	0.0	0.0	0.08	0.0	0.0
Income	(Kip)	0.0	0.0	6.8	0.0	0.0
2) Livestock****		55.5	25.4	102.2	48.9	43.4
B. Expenditure:		305.0	290.0	254.0	171.0	113.5
1) Cloth		59.0	54.0	49.0	43.0	29.0
2) Foods*****		118.0	110.0	82.0	53.0	33.0
3) Health		38.0	33.0	36.0	26.0	24.0
4) Education		12.0	9.0	19.0	9.0	6.0
5) Transportation		26.0	14.0	22.0	14.0	6.5
6) Others		52.0	70.0	46.0	26.0	15.0
C. Balance(A-B)	(Kip)	-143.1	-148.8	-19.4	44.2	75.9

\* The amount of net reserve for lowland and upland crops is based on typical crop budget study.

\*\* The cultivated area of sesame is estimated at about 10% of upland rice field.

\*\*\* The cultivated area of tobacco is estimated at about 40% of the upland rice field only Beng area.

\*\*\*\* The income by livestock are based on the socio-economic survey result.

\*\*\*\*\* The paddy consumption per family is estimated about 1.8t/year(6 person/family x 300kg/person). Most of families in Xai model area need to buy paddy for food usually by income from other than farm income.





Table 16 Farm Household under With-Project Condition

		Unit of value: Kip in 1000				
Ethnic group	(Unit)	Xai		Beng	Hun	
		LL	Mix	LL	LL	LT
A. Income:	(Kip)	241.8	200.3	259.2	247.0	198.9
1) Field crop		186.3	174.9	157.0	198.1	155.5
Lowland rice:						
Production	(ton/paddy)	2.7	2.0	1.9	2.5	0.7
Net reserve*	(Kip/ha)	326.8	326.8	231.1	231.1	231.1
Cultivated area	(ha)	0.57	0.42	0.55	0.71	0.20
Income	(Kip)	186.3	137.2	127.1	164.1	46.2
Upland rice :						
Production	(ton/paddy)	0.0	0.4	0.3	0.4	1.3
Net reserve*	(Kip/ha)	99.8	99.8	99.8	99.8	99.8
Cultivated area	(ha)	0.00	0.31	0.19	0.28	0.90
Income	(Kip)	0.0	30.9	19.0	27.9	89.8
Upland crop:		0.0	6.7	10.9	6.0	19.4
Sesame**						
Net reserve	(Kip/ha)	215.8	215.8	215.8	215.8	215.8
Cultivated area	(ha)	0.00	0.03	0.02	0.03	0.09
Income	(Kip)	0.0	6.7	4.1	6.0	19.4
Tobacco***						
Net reserve	(Kip/ha)	89.4	89.4	89.4	89.4	89.4
Cultivated area	(ha)	0.0	0.0	0.08	0.0	0.0
Income	(Kip)	0.0	0.0	6.8	0.0	0.0
2) Livestock****		55.5	25.4	102.2	48.9	43.4
B. Expenditure:		305.0	290.0	254.0	171.0	113.5
1) Cloth		59.0	54.0	49.0	43.0	29.0
2) Foods*****		118.0	110.0	82.0	53.0	33.0
3) Health		38.0	33.0	36.0	26.0	24.0
4) Education		12.0	9.0	19.0	9.0	6.0
5) Transportation		26.0	14.0	22.0	14.0	6.5
6) Others		52.0	70.0	46.0	26.0	15.0
C. Balance(A-B)	(Kip)	-63.2	-89.7	5.2	76.0	85.4

\* The amount of net reserve for lowland and upland rice is based on typical crop budget.

For Xai area about 41.4% of second crop of rice is introduced, then the net reserve is estimated at this increase rate( $231.1 \times 1.414 = 326.8$ )

\*\* The cultivated area of sesame is estimated at about 10% of upland rice field.

\*\*\* The cultivated area of tobacco is estimated at about 40% of the upland rice field only Beng area.

\*\*\*\* The income by livestock are based on socio-economic survey result.

\*\*\*\*\* Most of families in Xai model area spend more expenses than farm income. It may be earned by other than farming activities.



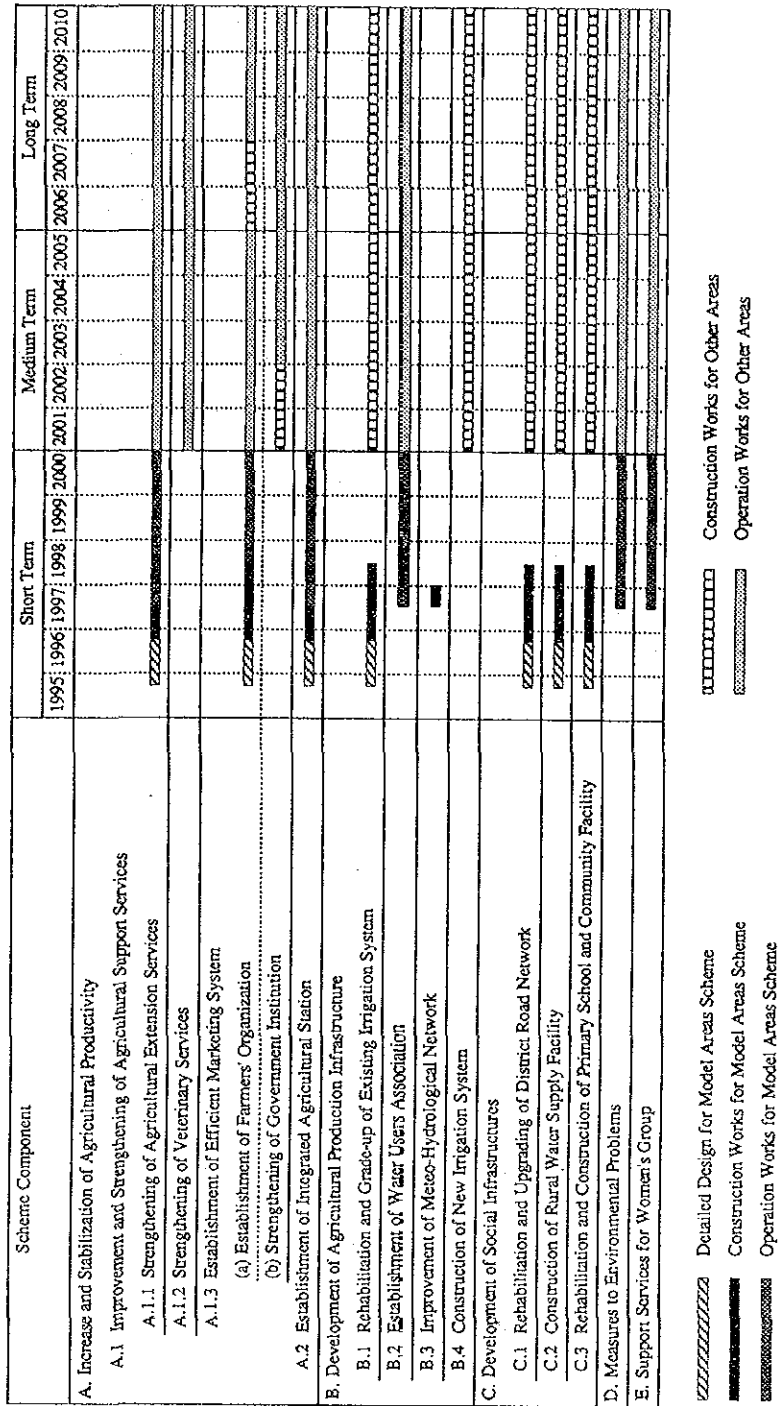
## *Figures*



Seeding glutinous rice on the slope of a hill  
by Lao Theung



Fig. 1 Implementation Schedule of Integrated Agricultural Development



THE LAO PEOPLE'S DEMOCRATIC REPUBLIC  
 MINISTRY OF AGRICULTURE AND FORESTRY

AGRICULTURAL DEVELOPMENT PROJECT  
 TO CONTROL SLASH AND BURN CULTIVATION  
 IN OUDOMXAY PROVINCE

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(Unit: ha in net)

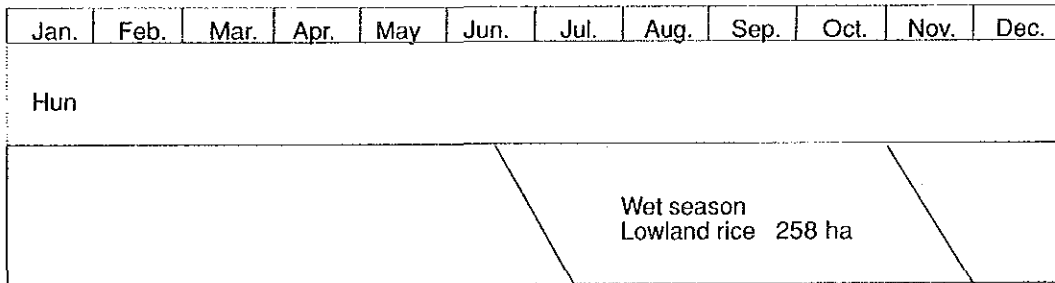
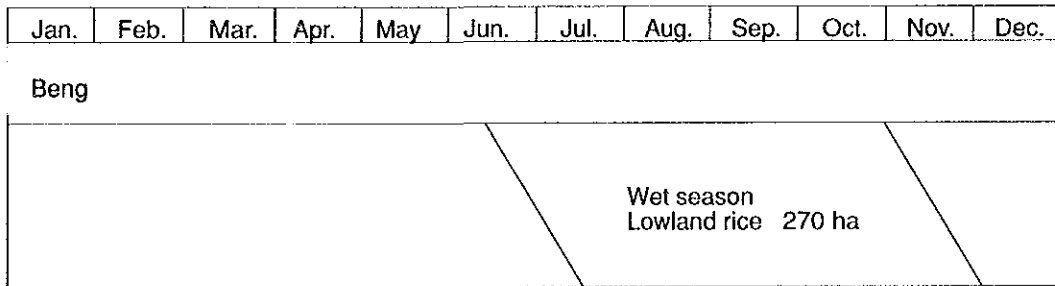
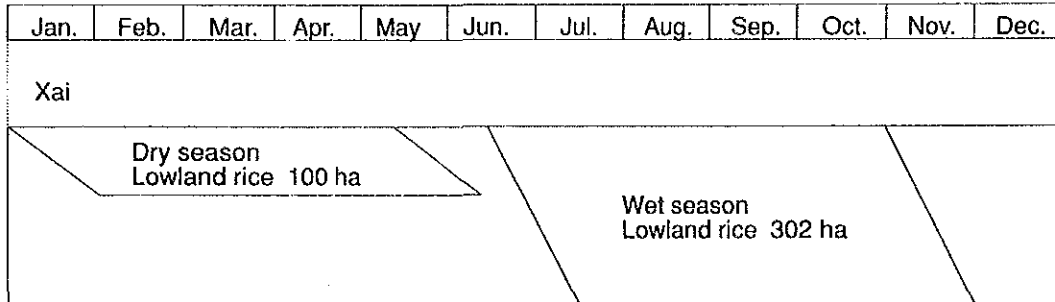


Fig. F-2 Proposed Cropping Pattern in the Model Scheme Area

THE LAO PEOPLE'S DEMOCRATIC REPUBLIC MINISTRY OF AGRICULTURE AND FORESTRY
AGRICULTURAL DEVELOPMENT PROJECT TO CONTROL SLASH AND BURN CULTIVATION IN OUDOMXAY PROVINCE
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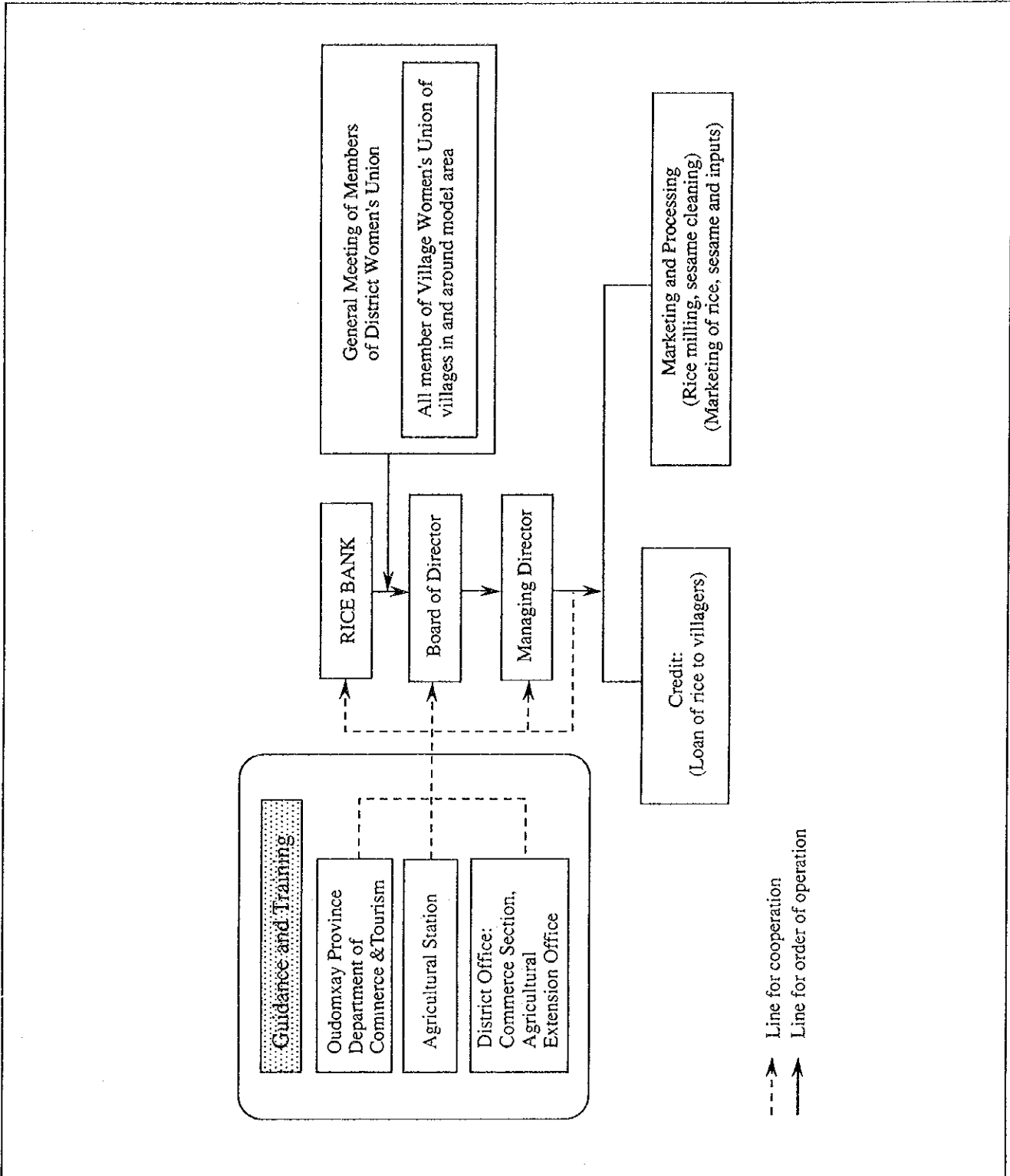


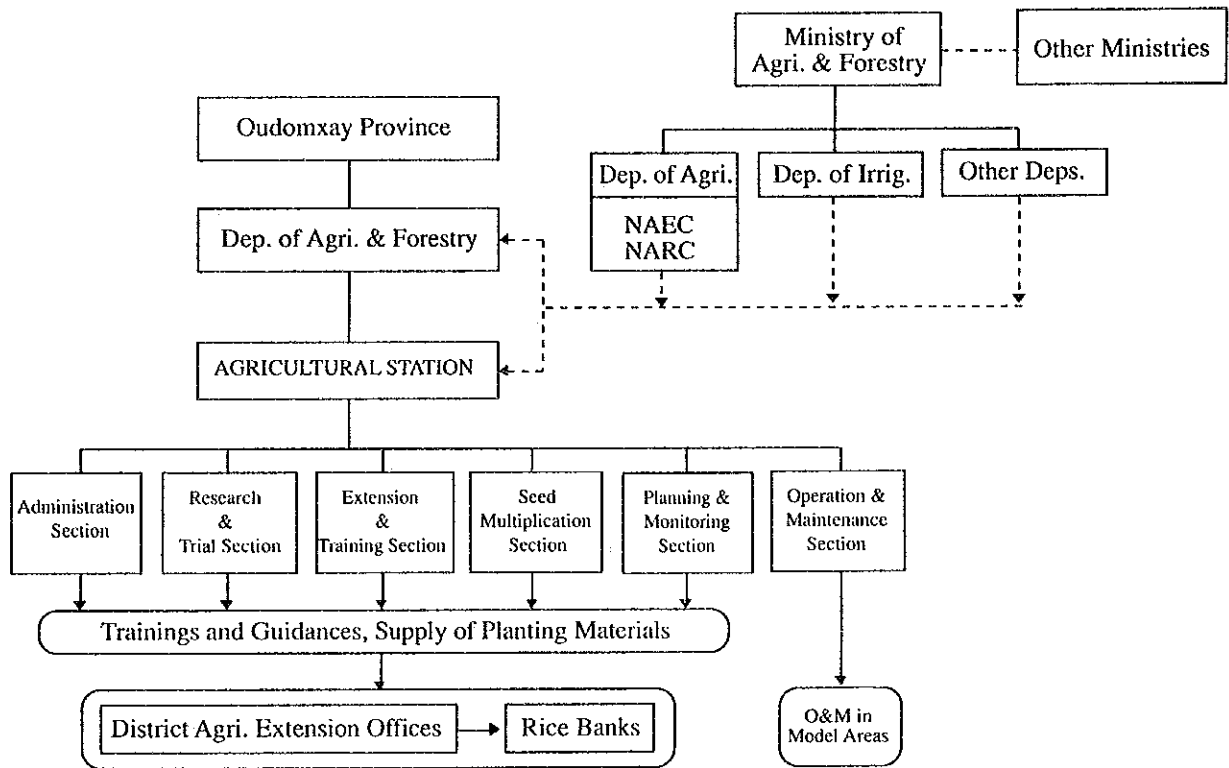
Fig. F-3 Organization and Cooperation Line of Proposed Rice Bank

THE LAO PEOPLE'S DEMOCRATIC REPUBLIC  
 MINISTRY OF AGRICULTURE AND FORESTRY

AGRICULTURAL DEVELOPMENT PROJECT  
 TO CONTROL SLASH AND BURN CULTIVATION  
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Note \* : National Agricultural Extension Centre  
 \*\* : National Agricultural Research Centre

Fig. F-4 Proposed Organization of Agricultural Station and Concerned Authorities

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 MINISTRY OF AGRICULTURE AND FORESTRY

AGRICULTURAL DEVELOPMENT PROJECT  
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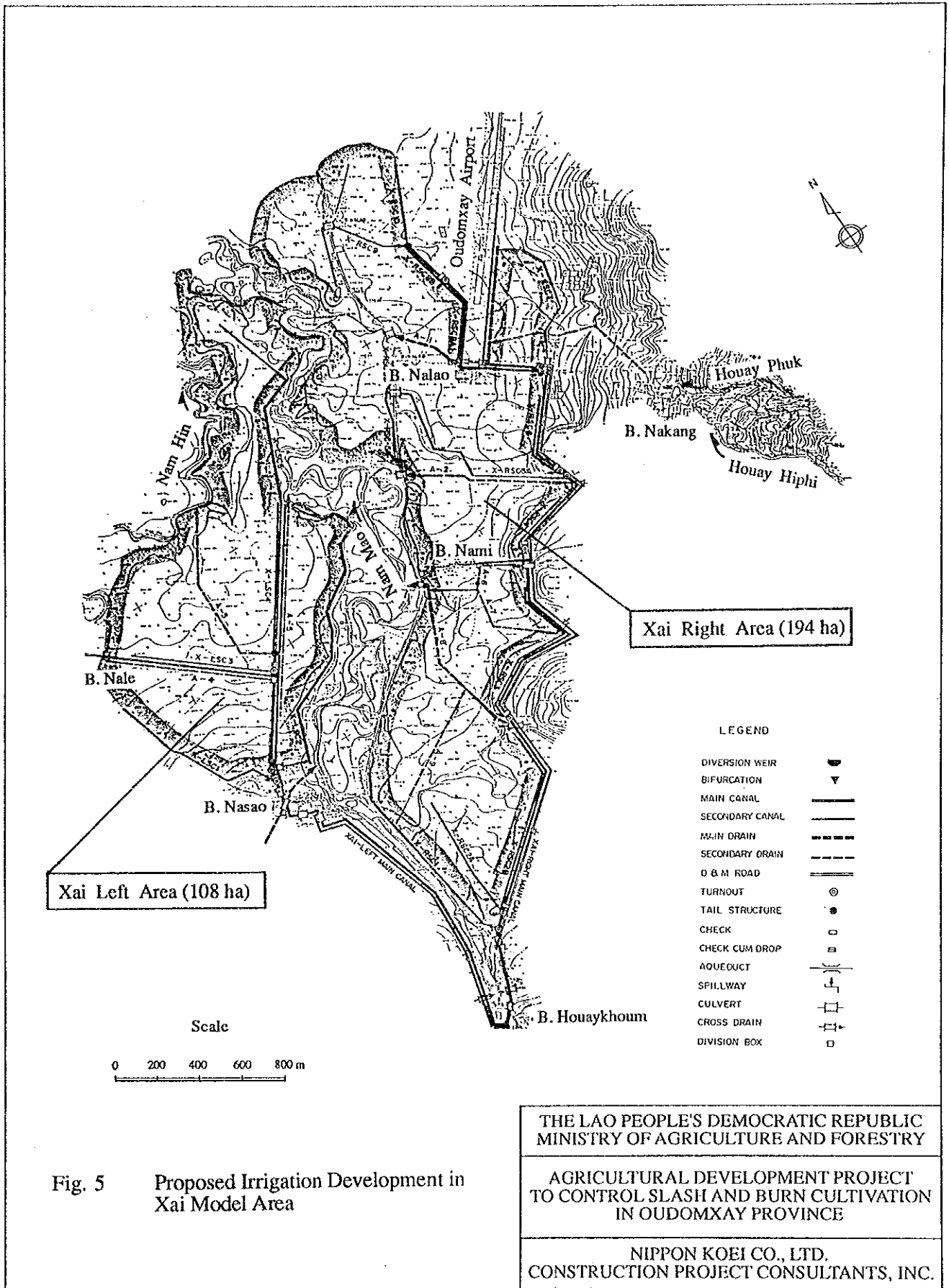


Fig. 5 Proposed Irrigation Development in Xai Model Area

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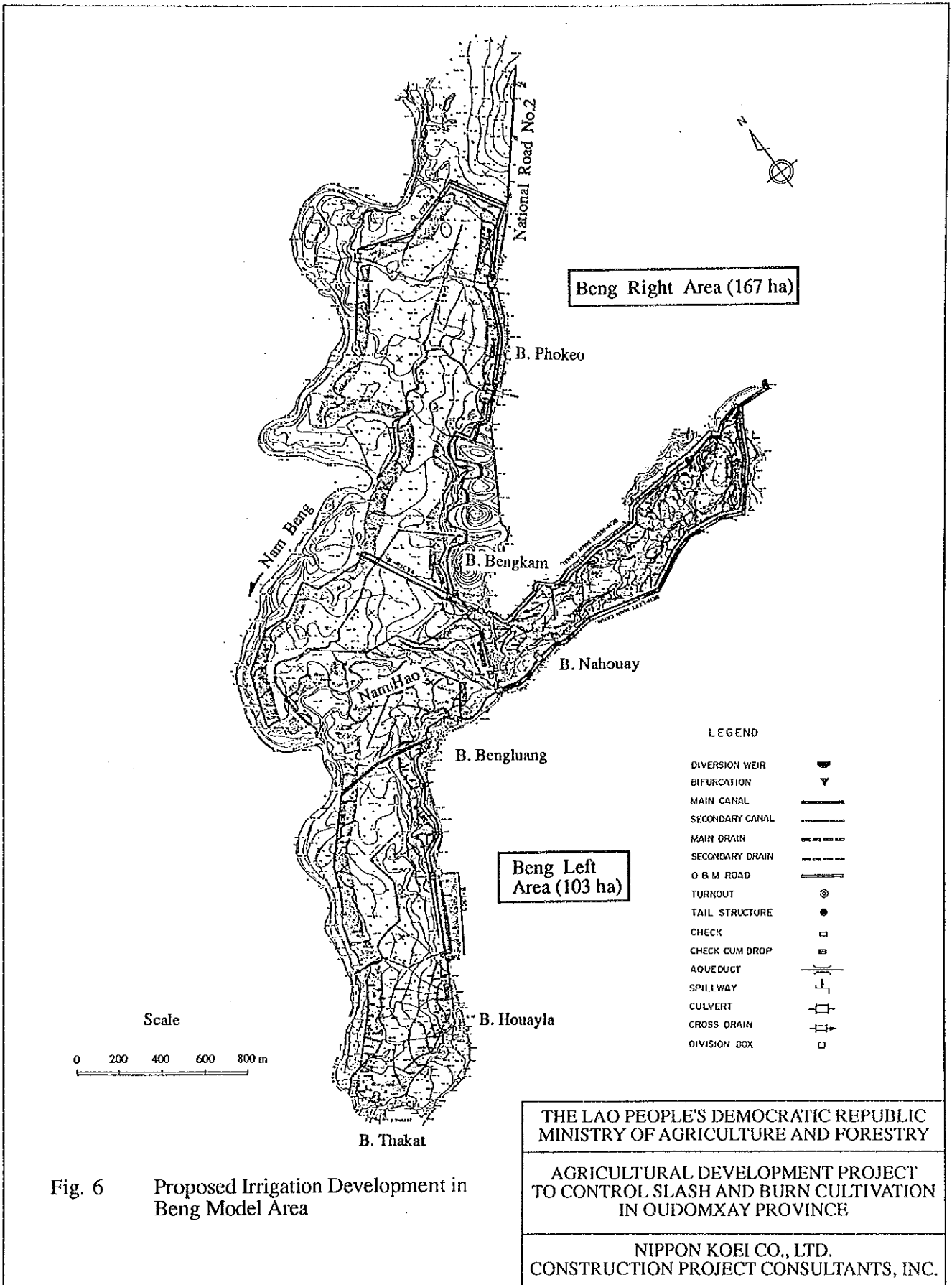


Fig. 6 Proposed Irrigation Development in Beng Model Area





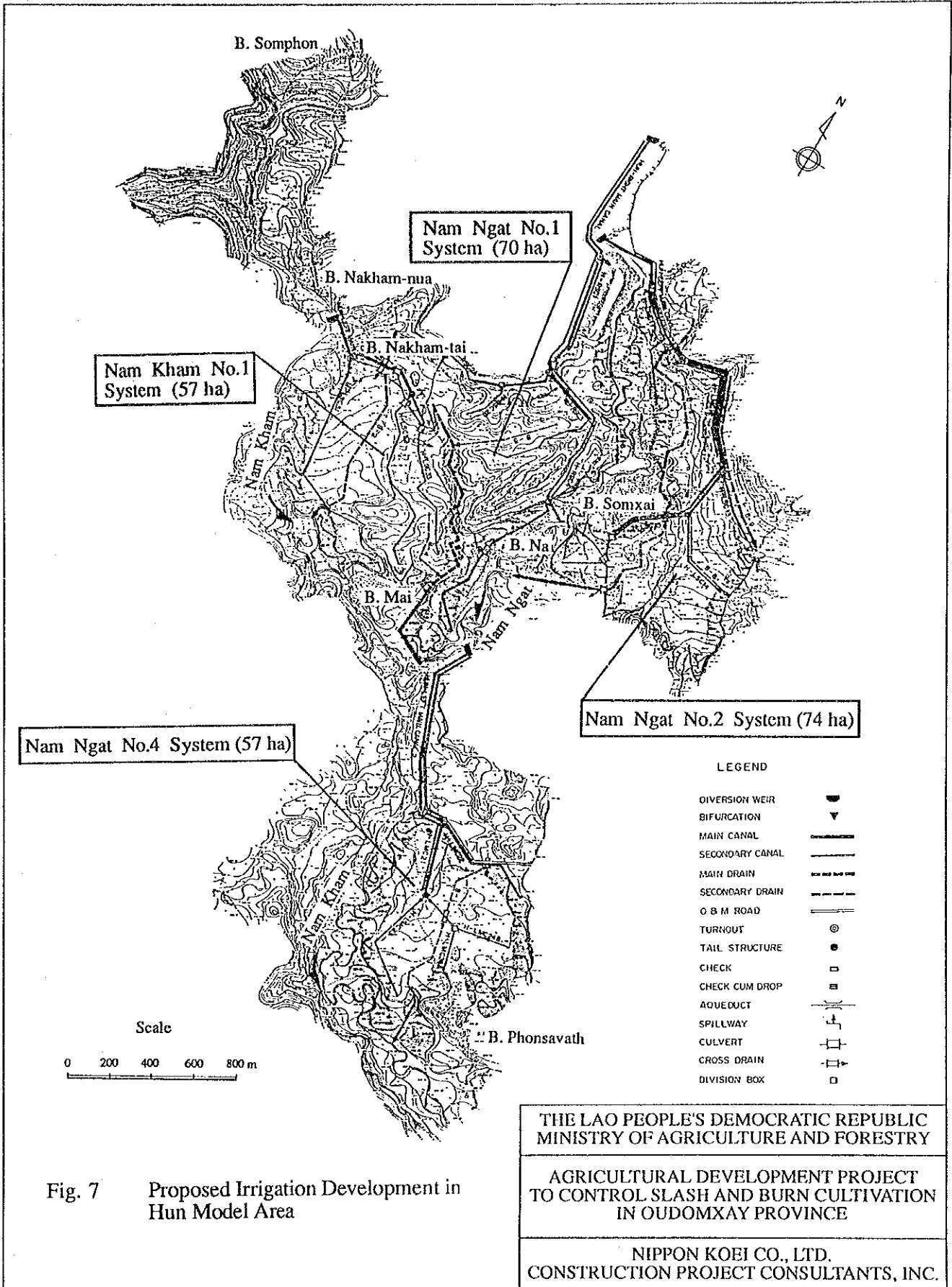


Fig. 7 Proposed Irrigation Development in Hun Model Area



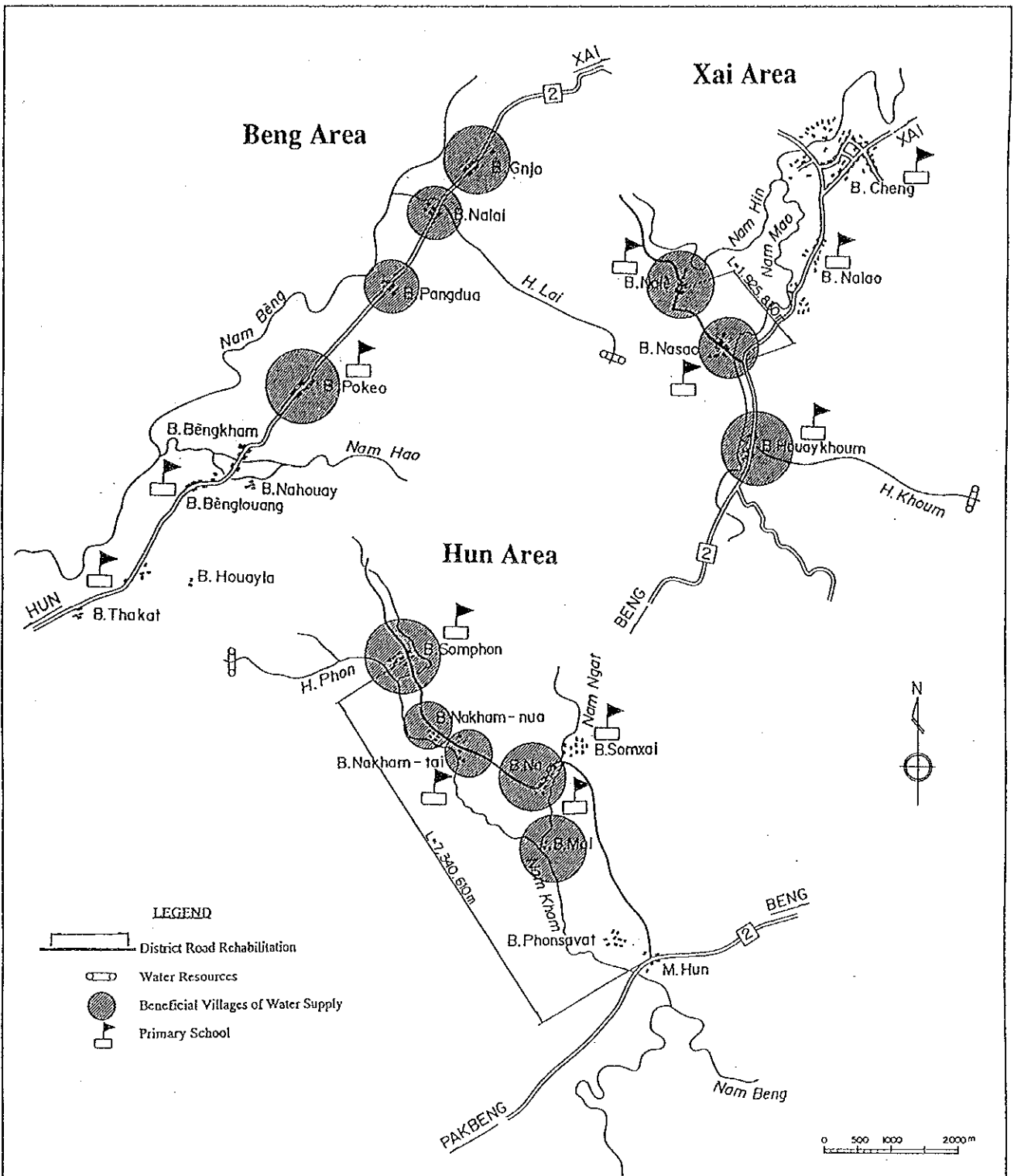


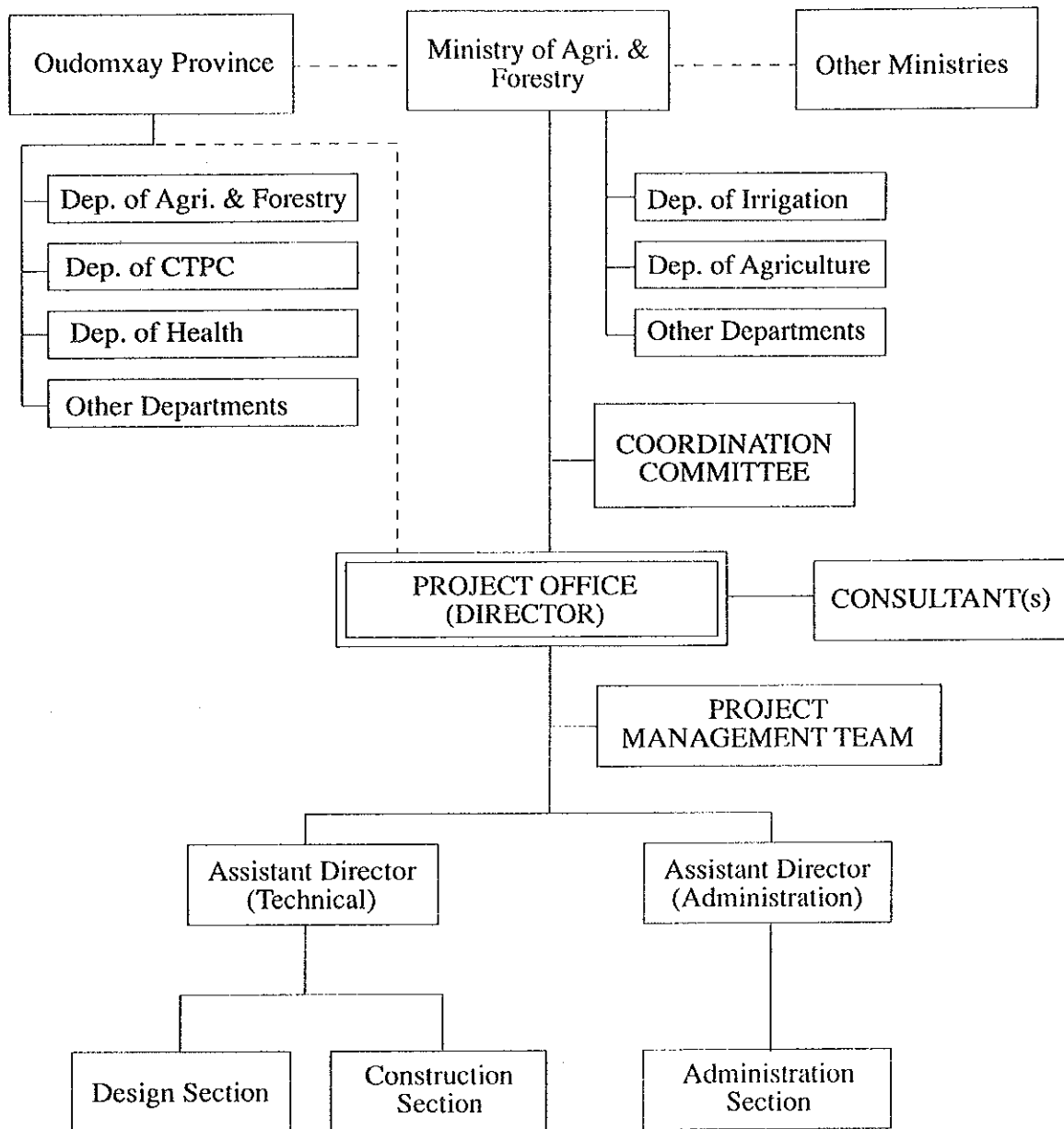
Fig. 8 Development Plan of Social Infrastructures in and around Model Areas

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 MINISTRY OF AGRICULTURE AND FORESTRY

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Note: - - - means coordination line

Fig. 9 Proposed Organization of Project Office

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AGRICULTURAL DEVELOPMENT PROJECT TO CONTROL SLASH AND BURN CULTIVATION IN OUDOMXAY PROVINCE
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Proposed Construction Schedule of Model Areas Scheme

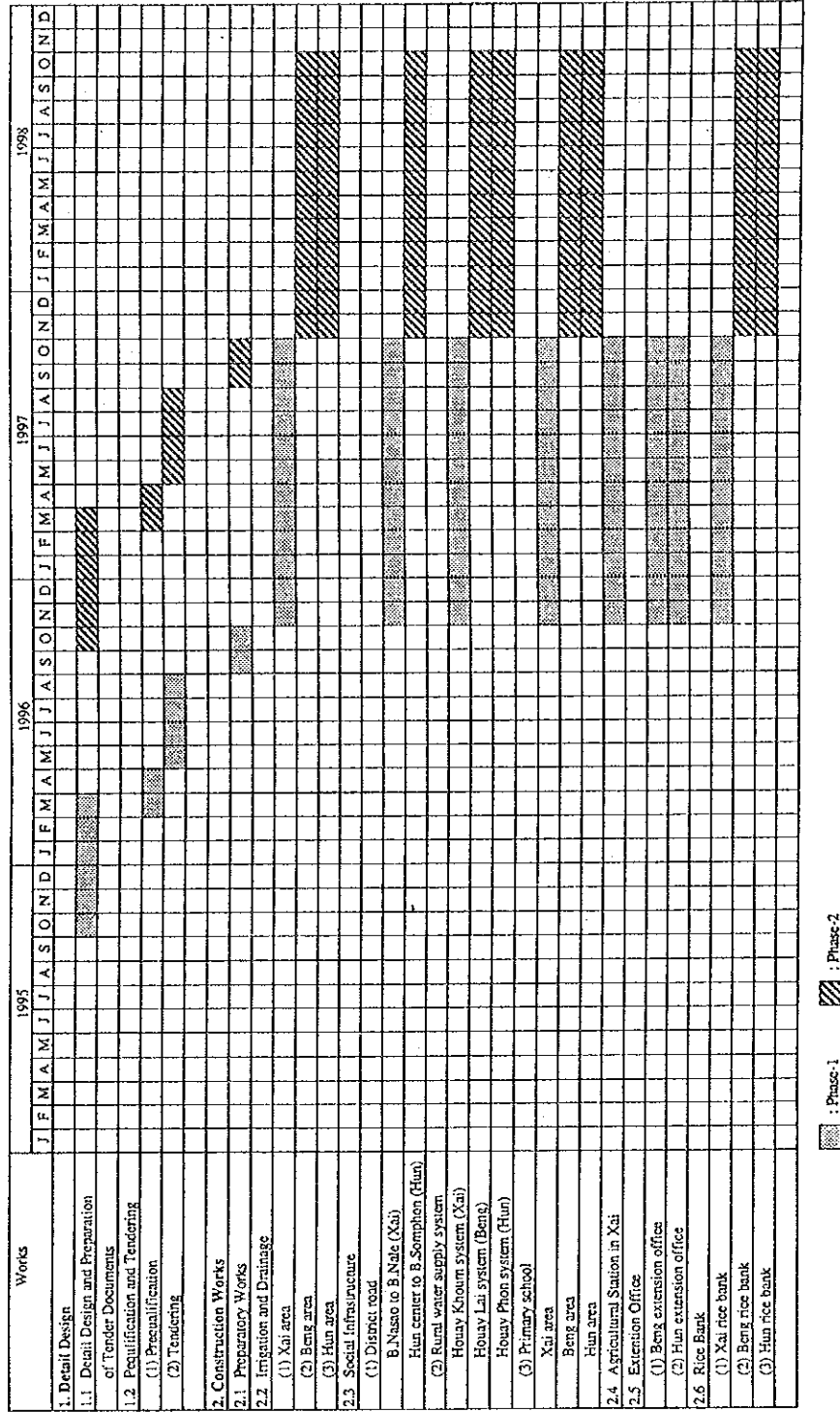


Fig. 10 Proposed Construction Schedule of Model Areas Scheme

THE LAO PEOPLE'S DEMOCRATIC REPUBLIC  
 MINISTRY OF AGRICULTURE AND FORESTRY

AGRICULTURAL DEVELOPMENT PROJECT  
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# *Annex 1*

## *Scope of Work*



View of Xai town

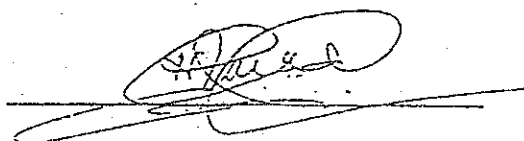


SCOPE OF WORK  
FOR  
THE MASTER PLAN STUDY  
ON  
THE AGRICULTURAL DEVELOPMENT PROJECT TO CONTROL SLASH AND BURN CULTIVATION  
IN  
THE OUDOMXAY PROVINCE  
IN  
THE LAO PEOPLE'S DEMOCRATIC REPUBLIC

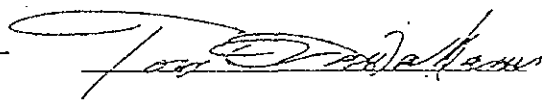
AGREED UPON BETWEEN  
MINISTRY OF AGRICULTURE AND FORESTRY OF THE LAO PEOPLE'S DEMOCRATIC REPUBLIC  
AND  
JAPAN INTERNATIONAL COOPERATION AGENCY

Vientiane,

October 10, 1991



Mr. Kou Chansina  
Director of Economic Planning,  
Finance and International  
Cooperation Department,  
Ministry of Agriculture and  
Forestry



Mr. Toru Kawakami  
Leader of Preparatory  
Study Team,  
Japan International  
Cooperation Agency



## I. Introduction

In response to the request of the Government of the Lao People's Democratic Republic (hereinafter referred to as "the Government"), the Government of Japan has decided to conduct the Master Plan Study on the Agricultural Development Project to Control Slash and Burn Cultivation in the Oudomxay Province (hereinafter referred to as "the Study"), in accordance with the relevant laws and regulations in force in Japan.

Accordingly, the Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programs of the Government of Japan, will undertake the Study, in close cooperation with the authorities concerned of the Government.

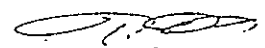
The present document sets forth the Scope of Work for the Study.

## II. Objectives of the Study

1. To formulate a master plan of the agricultural development to control slash and burn cultivation in the Oudomxay province, in which comprehensive water resources development programs are to be reviewed and developed with possible agricultural development projects to be identified and evaluated.
2. To conduct a feasibility study on the selected model area identified in the master plan.

## III. Study Area

The Study covers a part of the Oudomxay province, which consists of Xay district, Seng district and Hun district.





#### IV. Scope of the Study

The Study will be divided into two phases as follows.

##### 1. Phase I

##### 1.1. Data collection and field survey

To collect and review available data and information relevant to the Study and to carry out a field survey on the following items:

- (1) Natural conditions (topography, meteorology, hydrology, water resources, geology, soil)
- (2) Social conditions (population, social organization, socio-economy, employment, income level and distribution, education, others)
- (3) Agriculture (farming, land use/tenure (including farm size distribution, slash and burn cultivation), cropping patterns, agricultural organization (support services and extension services)
- (4) Agro-economy (farmers economy, farmers organization, farm inputs and productivity, credit, machinery, marketing system)
- (5) Agricultural infrastructure (irrigation-drainage systems and diversion schemes, flood control systems, operation and maintenance of the existing irrigation systems, others)
- (6) Social infrastructure (rural roads, electricity, water supply, others)

1.2. To analyze data/information collected through 1.1 mentioned above.

1.3. To identify projects, put them in priority order and select a model area.





1.4. To formulate a master plan of the agricultural development.

1.5. To estimate appropriate project costs and benefits.

1.6. To evaluate the project.

1.7. Recommendation.

## 2. Phase II

A feasibility study on the model area is conducted by the following measures.

2.1. To prepare topographic maps at the scale of 1/5,000 for the model project area selected for the feasibility study.

2.2. To collect supplementary data/information and conduct a detailed field survey specific to the model area.

2.3. To formulate the agricultural development plan of the model area, including:

(1) Land use, cropping pattern and farming system plan,

(2) Irrigation and drainage plan,

(3) Agricultural organizations and supporting services plan,

(4) Processing and marketing plan,

(5) Infrastructure plan,

(6) Preliminary design of irrigation and drainage facilities,

(7) Operation and maintenance plan.

10



2.4. To conduct a preliminary design of main facilities of the model area.

2.5. To prepare the implementation schedule.

2.6. To estimate the project costs and benefits.

2.7. To evaluate the project.

2.8. Recommendation.

#### V. Study Schedule

The Study will be executed in accordance with the attached tentative work schedule.

#### VI. Reports

JICA shall prepare the following reports in English, and submit them to the Government.

1. Inception Report:

Twenty (20) copies at the commencement of the first phase field work.

2. Progress Report ( I ):

Twenty (20) copies at the end of the first phase field work.

3. Interim Report:

Twenty (20) copies at the commencement of the second phase field work.

4. Progress Report ( II ):

Twenty (20) copies at the end of the second phase field work.



5. Draft Final Report:

Twenty (20) copies within one (1) month after the end of the second phase home office work.

The Government is requested to give comments on the draft final report within one (1) month after receiving them.

6. Final Report:

Fifty (50) copies within two (2) months after receiving the comments on the Draft Final Report.

VI. Undertaking of the Government of the Lao People's Democratic Republic

1. To facilitate a smooth conduct of the Study, the Government shall take following necessary measures:

- (1) To secure the safety of the Japanese study team (hereinafter referred to as "the Team"),
- (2) To permit the members of the Team to enter, leave and sojourn in the Lao People's Democratic Republic for the duration of their assignment therein, and exempt them from alien registration requirements and consular fees,
- (3) To exempt the members of the Team from taxes, duties and any other charges on equipments, machinery and other materials brought into the Lao People's Democratic Republic for the conduct of the Study,
- (4) To exempt the members of the Team from income tax and other charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Team for their services in connection with the implementation of the Study,
- (5) To provide necessary facilities to the Team for remittance as well as utilization of the funds introduced into the Lao People's Democratic Republic from Japan in connection with the implementation of the Study,



- (6) To secure permission for entry into private properties or restricted areas for the conduct of the Study,
  - (7) To secure permission for the Japanese study team to take all data and documents (including photographs and maps) related to the Study out of the Lao People's Democratic Republic to Japan,
  - (8) To provide medical services as needed. Its expenses will be chargeable on members of the Japanese study team.
2. The Government shall bear claims, if any arises against the members of the Team resulting from, occurring in the course of, or otherwise connected with the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the members of the Japanese study team.
  3. Ministry of Agriculture and Forestry (hereinafter referred to as "MAF") shall act as counterpart agency to the Japanese study team and also as coordinating body in relation with other governmental and non-governmental organizations concerned for the smooth implementation of the Study.
  4. MAF shall, at its own expense, provide the Japanese study team with the followings, in cooperation with other organization concerned:
    - (1) Available data and information (including photographs and maps) related to the Study,
    - (2) Counterpart personnel,
    - (3) Suitable office spaces with necessary equipments in the study area,
    - (4) Credentials or identification cards,
    - (5) Appropriate number of vehicles with drivers in the study area.





VII. Undertaking of JICA

For the implementation of the Study, JICA shall take the following measures;

1. To dispatch, at its own expense, the Team to the Lao People's Democratic Republic,
2. To pursue technology transfer to counterpart personnel in the course of the Study .

IX. Consultation

JICA and MAF shall consult with each other in respect of any matter that may arise from, or in connection with the Study.

1/3



TENTATIVE SCHEDULE

Month Item	MONTH IN ORDER																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
WORK IN LAOS																						
WORK IN JAPAN																						
REPORTS	△ IC/R				△ P/R(I)				△ IT/R					△ P/R(II)			△ DE/R				△ F/R	
PHASE	← Phase I →										← Phase II →											

Remarks IC/R : Inception Report P/R : Progress Report  
 IT/R : Interim Report DE/R : Draft Final Report  
 F/R : Final Report

10



MINUTES OF MEETINGS  
FOR  
THE MASTER PLAN STUDY  
ON  
THE AGRICULTURAL DEVELOPMENT PROJECT TO CONTROL SLASH AND BURN CULTIVATION  
IN  
THE OUDOMXAY PROVINCE  
IN  
THE LAO PEOPLE'S DEMOCRATIC REPUBLIC

AGREED UPON BETWEEN  
MINISTRY OF AGRICULTURE AND FORESTRY OF THE LAO PEOPLE'S DEMOCRATIC REPUBLIC  
AND  
JAPAN INTERNATIONAL COOPERATION AGENCY

Vientiane,  
October 10, 1991



Mr. Kou Chansina  
Director of Economic Planning,  
Finance and International  
Cooperation Department,  
Ministry of Agriculture and  
Forestry

Mr. Toru Kawakami  
Leader of Preparatory  
Study Team,  
Japan International  
Cooperation Agency

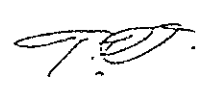


In response to the request of the Government of the Lao People's Democratic Republic, concerning the Master Plan Study on the Agricultural Development Project to Control Slash and Burn Cultivation in the Oudomxay Province (hereinafter referred to as "the Study"), the Government of Japan decided to dispatch through Japan International Cooperation Agency (hereinafter referred to as "JICA"), which is responsible for the implementation of technical cooperation programmes of the Government of Japan, the preparatory study team (hereinafter referred to as "the Team") to the Lao People's Democratic Republic from October 3 to October 11, 1991. The Team, headed by Mr. Toru Kawakami, made a field visit, and discussed and exchanged views on the Study with the Ministry of Agriculture and Forestry, represented by Mr. Kou Chansina, the Director of the Department of Economic Planning, Finance and International Cooperation (hereinafter referred to as "DEPFIC") of the Ministry of Agriculture and Forestry.

The Team and DEPFIC reached mutual agreement on the Scope of Work on October 10, 1991.

The following minutes were prepared to confirm the main issues discussed and matters agreed upon by both sides in connection with the Scope of Work.

- (1) Both sides confirmed that the model areas to be studied at the level of feasibility study shall be within 1,500ha depending on the result of phase I study.
- (2) Both sides confirmed that environmental aspects would be including in S/W, IV.2.8.
- (3) DEPFIC requested that the topographic survey of model areas (scale 1/5000) shall be conducted by JICA.
- (4) DEPFIC requested the vehicles and equipments necessary for the study would be procured by JICA and be donated to the DEPFIC after the termination of the study.

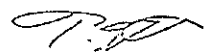






- (5) Regarding to the technical transfer. DEPFIC requested the consideration of JICA for counterpart training in Japan.
- (6) The team stressed that due attention shall be paid to secure the safety of the Japanese study team.

The team promised to convey above requests (from (3)to(5))to the Government of Japan.





LIST OF ATTENDANTS

Laos P.D.R. SIDE

Mr. Kou Chansina                      Director of Economic Planning, Finance and  
International Cooperation Dept.

Mr. Alca Thavonsouk                      Deputy Director of Economic Planning,  
Finance and International Cooperation Dept.

Mr. Oudone Sisongkham                      Assistant to the Director of Economic Planning,  
Finance and International Cooperation Dept.

Mrs. Kcobang A Keola                      Planning Officer of Irrigation Dept.

Mr. Vandy Douangala                      Agriculture Extension Officer of Agriculture  
and Extension Dept.

Mr. Noukone Symavong                      Director of National Office of the Protection  
Environment

Mr. Sounthone Ketphanh                      Engineering Forester of Forestry and Environment  
Dept.

JAPANESE SIDE

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