

CHAPTER 8

IMPLEMENTATION PLAN

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8.1 Implementation Process

The various programmes proposed in this Study presuppose their implementation with the participation of local people, making the involvement of administrators in the Project highly desirable to frequently visit villages to communicate with local people. However, as existing administrative bodies which are involved in wide-ranging activities may find it difficult to implement the Project in addition to their existing activities, the Project Office (the details of which will be described later) will be established as an administrative body principally responsible for the implementation of the Project. This Project Office will introduce field extension teams (provisional name) which will visit villages and which will conduct various programmes together with local people.

Meanwhile, there appears to be a general tendency for farmers to cling to their traditional pattern of life in the face of these new programmes and difficulties in programme extension work are anticipated. To alleviate such difficulties, a group of farmers showing understanding of and interest in the programmes will be formed in each village to play a leading role in programme implementation.

The Project Office will provide intensive technical guidance and support for these groups and sub-groups in order to disseminate new techniques from farmers' groups to villages and finally throughout the entire Model Area. The technical guidance provided by the Project Office will mainly focus on farmers' groups even though there will be occasions on which similar guidance will be provided for other farmers in the subject villages in the process of extension activities.

In regard to such land use-related plans as the slope land agriculture, agroforestry development, bamboo plantation and lowland productivity improvement, demonstration farms will be introduced in each village in addition to the formation of farmers' groups to provide extension models.

The imagined expansion of the extension effects and the relationship between the Project Office and villages are shown in Fig. 8-1-1 and Fig. 8-1-2 respectively.

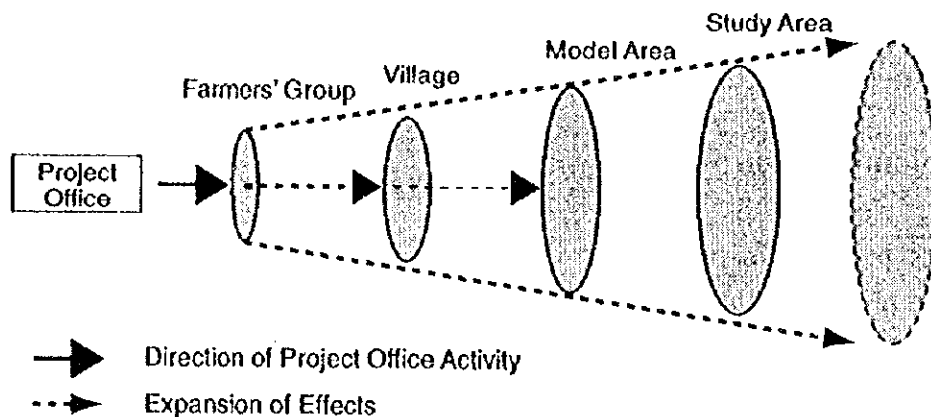


Fig. 8-1-1 Expansion Image of Extension Effects

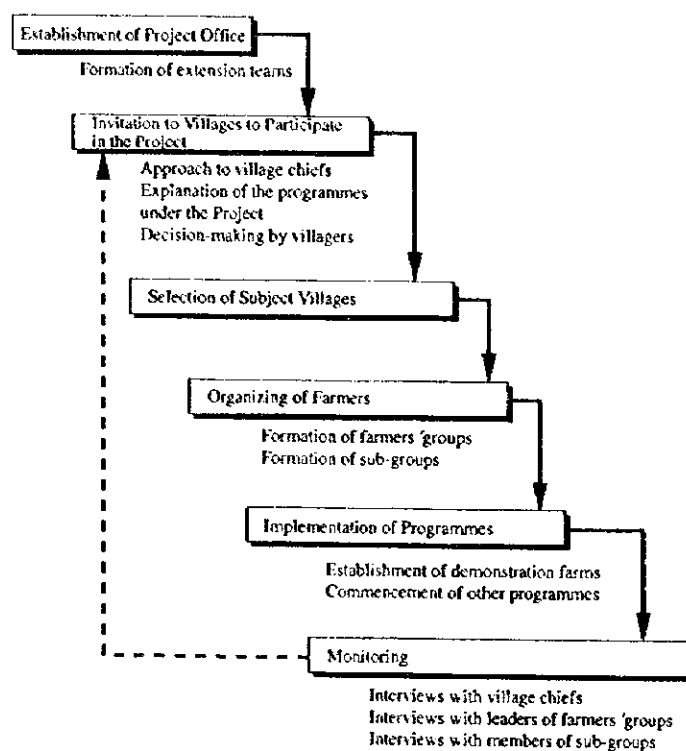


Fig. 8-1-2 Work Flow of Project Office

8.1.1 Selection of Subject Villages

The priority of each village for programme implementation has been determined based on the selection criteria for each programme. The Project Office extension teams will commence the subject programmes with reference to the priorities set out below, and a comprehensive assessment of the aspirations of each village with regard to the programmes, village geographical distribution, available budget and manpower, etc.

(1) Priority of Villages for Agroforestry Development and Slope Land Agriculture

The priority of villages for agroforestry development has been decided based on (i) the ratio of households dependent on slash and burn cultivation, established by the socioeconomic baseline survey and (ii) subject areas for slope land agriculture and agroforestry, such as slash and burn cultivation sites, bushland and secondary forests with a low crown density, identified on the land use and vegetation map (see Table 8-1-1).

(2) Subject Villages of Non Wood Forest Products Production Project

1) Charcoal production programme

The surplus wood resulting from the development of dry farmland following the implementation of the agroforestry development programme will be used as charcoal wood for a while. As part of the agroforestry development programme, firewood forests will be created to supply charcoal wood. Bamboo Forests (2) will be converted to high quality bamboo forests and the high quality bamboo forests will also be used as charcoal wood. Accordingly, the subject villages of the bamboo production programme have been selected from the subject villages of the agroforestry development programme.

2) Bamboo plantations programme

As the easy transportation of bamboo during the rainy season is an important consideration in the selection of bamboo plantation sites, the selection priority is given to those villages where Bamboo Forests (2) are widely distributed along a national road or vehicle road. The initial candidate villages include Nanon-Nua, Nampath-Nua, Houaymo-Nua, Somsanouk, Nampat, Vangkhi, Houayxi and Namphao. Such villages as Phonkeo, Nalao, Nangeun-Nua and Nangeun-Tai for which the construction of a local road is planned under the social infrastructure development project (see 7.4.2) will also be considered as candidate villages for this programme in the future. In the case of these 4 villages, the improvement of bamboo forests will be made in accordance with the progress of village road construction.

3) Cardamon production programme

Although cardamon is a very promising product, it is an export-oriented crop and its price is liable to price fluctuations in the international market. It is recommended that the production scale of cardamon should be only gradually increased, taking the actual market conditions into consideration. Cardamon has constituted one of the few cash income sources for minority ethnic groups, and the priority should be given to their villages to avoid any disruption of the market. This priority given to the villages of

minority ethnic groups is also practical as these villagers have the advantage of established knowledge of how to grow cardamon. In the selection of villages, priority is also given to the minority ethnic villages with a strong dependency on slash and burn cultivation in Lao Sung and Lao Theung in the Model Area.

Based on Table 8-1-1, the candidate villages are Nangeun-Nua, Namon-Nua, Phonekeo and Nampath-Nua in the Namon Area and Taothan, Nampath-Tai, Nampat and Houaymo-Nua in the Somboun Area. In order to identify the effects of the programme, villages with knowledge of handling cardamon are given priority.

(3) Subject Villages of Lowland Productivity Improvement

Under the lowland productivity improvement project, the evaluation criteria for the lowland paddy seeds multiplication and supply system establishment programme, second cropping promotion in lowland paddy land programme and fish culture extension in lowland paddy land programme have been established based on the findings of the lowland paddy holding size, lowland paddy yield and annual income from the data of socioeconomic baseline survey and PRA. The priority ranking of villages has been decided from the evaluation (see Table 8-1-2).

(4) Subject Villages of Infrastructure Development Project

In the case of the infrastructure development project, priority villages for the improvement and new construction of local roads programme construction of rural domestic water supply facilities programme and existing primary school upgrading programme have been selected based on the absence or insufficiency of such infrastructure. The subject villages of each programme are shown in Table 8-1-3-(1) through (3).

(5) Subject Villages of Rural Community Supporting Project

The rural community supporting project consists of the forest land allocation programme, village revolving fund system establishment programme, weaving entrepreneurship development programme, skill-based informal education programme, improved cooking stove dissemination programme, school forest programme and bamboo crafts promotion programme. Among these programmes, the evaluation criteria for the weaving entrepreneurship development programme have been established based on the possession of paddy fields, possession and yield of slash and burn cultivation sites, importance of the handicraft industry and annual income level, all of which were clarified by the socioeconomic baseline survey, and the priority ranking of villages has been decided (see Table 8-1-4).

In regard to the school forest establishment programme, in view of the need for pupils to participate in outdoor work under the programme, primary schools with only lower grade pupils have been omitted to limit primary schools with classes of higher grades. The bamboo crafts promotion programme is only applicable to the subject villages of the bamboo plantation programme and the actual work will commence when the production of high quality bamboo starts. The other programmes will be implemented in line with the progress of the slope land agriculture programme and agroforestry development programme.

Table 8-1-1 Priority of Villages for Slope Land Agriculture and Agroforestry Development Programmes

Village (No.)	Village (Name)	Multipled points	Area of Agroforestry (Point)	% of Upland Paddy Household at Present (Point)	Note
5-05	Houaypamem	25	5	5	
5-06	Somsanouk	25	5	5	
3-07	Nalao	20	5	4	
5-08	Vangkhi	20	5	4	
5-13	Namphao	20	5	4	
5-07	Nampat	20	4	5	Lao Theung
5-12	Houayxi	20	4	5	
5-10	Taathan	15	3	5	Lao Theung
5-11	Namphat-Tai	15	3	5	Lao Theung
5-14	Phakoub	15	3	5	
3-05	Phonkeo	12	4	3	Lao Sung
3-13	Houaysan	12	3	4	Lao Theung
3-10	Nangcun-Nua	10	2	5	Lao Sung
3-14	Namphat-Nua	10	2	5	Lao Theung
3-03	Namon-Nua	9	3	3	Lao Sung
5-01	Houaymo-Nua	9	3	3	Lao Theung
3-01	Vangmiang	8	4	2	
3-09	Phongnang	6	3	2	
5-02	Houaymo-Tai	6	2	3	
5-09	Phonbong	6	2	3	
5-15	Sivilai	4	1	4	Lao Sung
3-11	Nangcun-Tai	3	1	3	Lao Sung
3-06	Ngou	2	2	1	
3-12	Vanghua	2	2	1	
5-03	Thahua-Nua	2	1	2	
5-04	Thahua-Tai	2	1	2	
3-02	Namon-Tai	1	1	1	
3-04	Phonsavang	1	1	1	
3-08	Nakhom	1	1	1	
Data Source			Land Use Map	SE Base Line Survey	

% of upland paddy HH (%):

Point 1 (<20%), Point 2 (21-40%), Point 3 (41-60%)

Point 4 (61-80%), Point 5 (81-100%)

Area of Agroforestry

Point 1 (<50ha), Point 2 (51-200ha), Point 3 (201-400ha)

Point 4 (401-700ha), Point 5 (701ha<)

Agroforestry area : Secondary Natural Forest(Nsd1,Nsd2), Shrub Land, Hay, Bush, Grass Land, Bare Land

3: Namon Area, 5: Sonboun Area

Table 8-1-2 Priority of Villages for Lowland Productivity Improvement Project

(No.)	Village (Name)	Village Selection Priority (Order)	Total Points (Point)	% of L.Paddy HH at Present (Point)	Per Capita Lowland Paddy at Present (Point)	Ave. Yield of L.Paddy (Point)	Cash Income per HH at Present (Point)
Weight of Criteria				4	3	1	2
3-08	Nakhom	1	43	5	5	2	3
3-03	Namon-Nua	2	36	5	2	2	4
3-01	Vanguiang	2	36	5	3	1	3
3-06	Ngioi	4	33	5	2	1	3
3-07	Nalao	5	32	4	2	2	4
3-05	Phoncoo	6	29	4	1	2	4
3-11	Nangcun-Tai	6	29	4	1	2	4
3-13	Houaysan	8	28	3	2	2	4
3-12	Vanhua	8	28	5	1	1	2
5-09	Phonthong	10	27	3	1	4	4
3-09	Phongnang	10	27	4	1	2	3
5-01	Houaymo-Nua	10	27	4	1	2	3
3-02	Namon-Tai	10	27	4	2	1	2
3-10	Nangcun-Nua	14	25	2	1	4	5
5-13	Namphao	15	24	3	1	3	3
5-10	Taotian	16	23	2	1	4	4
5-08	Vangkhi	16	23	3	1	2	3
3-04	Phonsavang	16	23	4	1	2	1
3-14	Nampath-Nua	19	21	1	1	4	5
5-02	Houaymo-Tai	20	16	2	1	3	1
5-03	Thahua-Nua	21	13	2	0	3	1
5-04	Thahua-Tai	22	11	1	0	5	1
5-11	Nampath-Tai	22	11	0	1	0	4
5-06	Somsanouk		10	0	0	0	5
5-12	Houayxi	24	9	0	1	0	3
5-07	Nampat		8	0	0	0	4
5-15	Sivilai		8	0	0	0	4
5-05	Houaypamon	25	6	0	0	0	3
5-14	Phakoub		6	0	0	0	3
Data Source				SEBS	PRA	SEBS	SEBS

% of lowland paddy HH (%):

Point 1 (<18%), Point 2 (19-37%), Point 3 (38-55%)

Point 4 (56-74%), Point 5 (75-100%)

Per capita lowland paddy (ha):

Point 1 (<0.15ha), Point 2 (0.16-0.30ha), Point 3 (0.31-0.45ha),

Point 4 (0.46-0.60ha), Point 5 (>0.61ha)

Ave. yield of lowland paddy (ton/ha):

Point 1 (>2.1ton), Point 2 (1.6-2.0ton), Point 3 (1.1-1.5ton),

Point 4 (0.6-1.0ton), Point 5 (<0.5ton)

Cash income per HH (Mil.Kip/HH)

Point 1 (>1.21MKip), Point 2 (0.91-1.20MKip), Point 3 (0.61-0.90MKip),

Point 4 (0.31-0.60MKip), Point 5 (<0.3MKip)

Table 8-1-3-(1) Subject Villages of Improvement and New Construction of Local Roads Programme

Starting Point	End Point	Local road improvement			Related structure
		Graveling	Upgrading	Construction	
1 R-13 (Namon-Tai)	Namon-Nua	o	-	-	-
2 R-13 (Phonsavang)	Phonkeo	-	-	-	o
3 Phonkeo	Ngiou	-	-	-	o
4 Ngiou	Nalao	-	-	o	o
5 Ngiou - Nalao	Phongnang	-	-	o	o
6 Phongnang	Nanguen-Nua	o	o	-	o
7 Phonkeo	Nakhom	-	-	-	o
8 R-13 (Vanghua)	Nanguen-Tai	-	-	o	o
9 R-13	Houaysan	-	o	-	o
10 Houaysan	Nanguen-Tai	-	-	o	o
11 Nanguen-Tai	Nanguen-Nua	-	-	o	o

Remark: The works given the mark of "o" will be applied on the point.

Table 8-1-3-(2) Subject Villages of Construction of Rural Domestic Water Supply Facilities Programme

Target Village	Namon Area		Target Village	Somboun Area	
	Households (97)	Population (96)		Households (97)	Population (96)
Namon-Tai	140	835	Houaymo-Tai	84	550
Namon-Nua	113	757	Thahua-Nua	165	1,058
Ngiou	44	302	Thahua-Tai	142	829
Nalao	78	475	Houaypamom	195	1,156
Nanguen-Nua	29	193	Somsanuk	177	946
Nanguen-Tai	62	453	Nampat	49	314
Vanghua	151	853	Vangkhi	158	891
Houaysan	31	198	Phonthong	28	156
			Taothan	71	445
			Namphath-Tai	36	230
			Houayxi	65	343
			Namphao	202	1,423
			Phakoup	76	500

Table 8-1-3-(3) Subject Villages of Existing Primary School Upgrading Programme

Target Village	Namon Area			Target Village	Somboun Area		
	Households (97)	Population (96)			Households (97)	Population (96)	
		Total	6-15 yrs			Total	6-15 yrs
1. Vangmiang	100	598	173	2. Houaymo-Tai	84	550	170
2. Namon-Tai	140	835	388	3. Thahua-Nua	165	1,058	301
3. Namon-Nua	113	757	174	4. Thahua-Tai	142	829	282
4. Phonsavang	110	640	167	5. Houaypamom	195	1,156	342
5. Phonkeo	130	996	259	7. Nampat	49	314	111
6. Ngiou	44	302	113	9. Phonthong	28	156	42
7. Nalao	78	475	133	10. Taothan	71	445	143
8. Nakhom	22	107	65	11. Namphath-Tai	36	230	81
9. Phongnang	26	186	46	12. Houayxi	65	343	96
11. Nanguen-Tai	62	453	142	13. Namphao	202	1,423	387
12. Vanghua	151	853	235	14. Phakoup	76	500	106
13. Houaysan	31	198	40				
14. Namphath-Nua	33	186	30				

Table 8-1-4 Priority of Villages for Weaving Entrepreneurship Development Programme

Village (No.)	Village (Name)	Village Selection Priority (Order)	Total Points (Point)	% of Upland Paddy HH at Present (Point)	Operated S&B Land per HH at Present (Point)	Importance of Income from Handicraft (Point)	Unit Yield of S&B Paddy at Present (Point)	Cash Income per HH at Present (Point)
Weight of Criteria				5	3	4	2	1
5-05	Houaypamon	1	61	5	3	5	2	3
5-06	Somsanouk	2	57	5	5	2	2	5
5-10	Taothan	3	51	5	4	1	3	4
3-13	Houaysan	4	48	4	2	2	5	4
5-14	Phakoub	5	47	5	3	1	3	3
5-15	Sivilai	6	44	4	4	0	4	4
5-07	Nampot	6	44	5	3	1	1	4
5-12	Houayxi	6	44	5	2	1	3	3
5-11	Nampath-Tai	9	43	5	2	1	2	4
5-09	Phonthong	10	42	3	5	0	4	4
3-12	Vanghua	11	40	1	1	5	5	2
5-13	Namphao	12	39	4	2	1	3	3
3-10	Nangoun-Nua	13	38	5	2	0	1	5
3-14	Nampath-Nua	14	37	5	1	0	2	5
5-08	Vangkhi	14	37	4	2	1	2	3
3-07	Nalao	16	35	4	1	1	2	4
3-06	Ngjou	16	35	1	1	4	4	3
5-01	Houaymo-Nua	18	34	3	2	1	3	3
5-04	Thahua-Tai	19	32	2	3	2	2	1
3-11	Nangoun-Tai	20	31	3	2	0	3	4
5-02	Houaymo-Tai	21	29	3	1	1	3	1
3-03	Namon-Nua	22	28	3	1	0	3	4
3-05	Phonkeo	22	28	3	1	0	3	4
3-01	Vangmiang	22	28	2	1	1	4	3
5-03	Thahua-Nua	25	27	2	2	1	3	1
3-08	Nakhom	26	25	1	1	1	5	3
3-09	Phongnang	27	24	2	1	0	4	3
3-02	Namon-Tai	27	24	1	1	1	5	2
3-04	Phonsavang	29	23	1	1	1	5	1
Data Source				SEBS	SEBS	SEBS	SEBS	SEBS

% of upland paddy HH (%):

Point 1 (<20%), Point 2 (21-40%), Point 3 (41-60%)

Point 4 (61-80%), Point 5 (81-100%)

Operated S&B per HH at present(ha/HH):

Point 1 (<0.77ha), Point 2 (0.78-1.05ha), Point 3 (1.06-1.33ha)

Point 4 (1.34-1.61ha), Point 5 (>1.62ha)

Importance of income from Handicraft(score)

Point 1 (<14), Point 2 (15-29), Point 3 (30-44),

Point 4 (45-59), Point 5 (>60)

Unit yield of slash and burn paddy(t/ha):

Point 1 (>1049kg), Point 2 (787-1048kg), Point 3 (525-786kg),

Point 4 (263-524kg), Point 5 (<262kg)

Cash income per HH at present(000Kip/HH)

Point 1 (>1201Kip), Point 2 (901-1200Kip), Point 3 (601-900Kip),

Point 4 (301-600Kip), Point 5 (<300Kip)

8.1.2 Formation of Farmers' Groups

Villages in the Model Area generally have an elected village chief who is supported by two deputy chiefs responsible for economic and cultural issues respectively. The village chief supervises the elders' group, youth group, women's group and parents' group. Some villages have a water use group and security group in addition to the above four groups.

Each village will form a farmers' group (provisional name) under the deputy chief in charge of economy with a view to implementing the planned programmes. This farmers' group will be divided into programme-based sub-groups consisting of farmers who are interested in participating in specific programmes. The size of a sub-group should be restricted to nine members per extension worker to ensure group unity and close communication with the extension worker while the optimal size is 3 - 5 members.

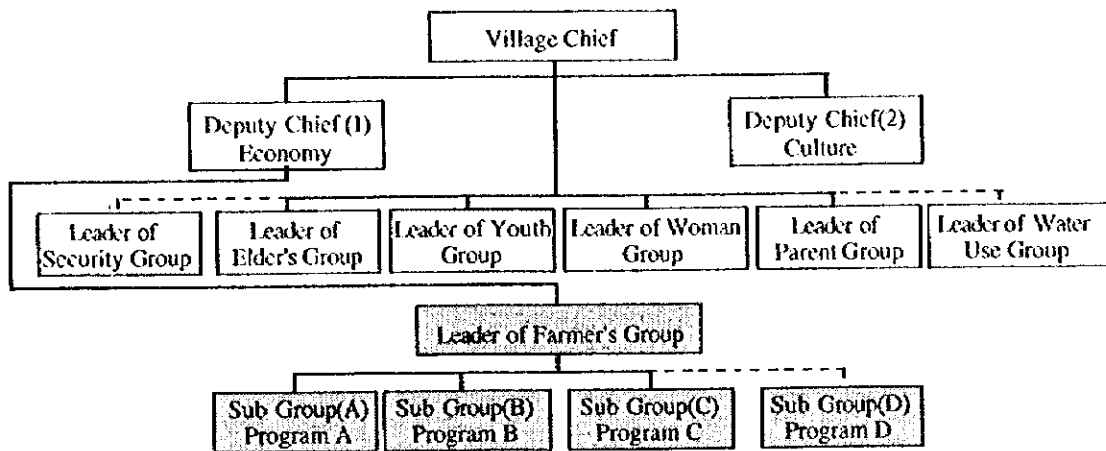


Fig. 8-1-3 Project Implementation System at Village Level

8.1.3 Demonstration Farms

In the case of the agroforestry development programme, the slope land agriculture programme and lowland productivity improvement, the demonstration farms will be established to facilitate the extension of these programmes.

The agroforestry demonstration farm will be selected by the relevant farmers' group and will be established on communal land belonging to the village. The Project Office will provide the necessary equipment and materials and will also provide technical guidance. The agroforestry proposed here is not the type depending on machinery but that which can be achieved by the manual labour of the participating farmers. Nevertheless, seedlings of trees and fruit trees for planting and grazing grass will be required and local people hope that these will be provided by the government. In response to this hope, the Project Office will provide the seeds free of charge. The size of the demonstration farms will be decided by the number of households participating in the sub-groups. In the case of silvi-agriculture, the farm size per household will be 1.2 ha, i.e. 120% of the slash and burn cultivation area per household. In the case of silvo-pasture, the farm size per household will be 2 ha, assuming that each member household has four head of cattle (average figure for the Model Area found by the socioeconomic baseline

survey) and each head requires 0.5 ha of land. Assuming that each sub-group comprises five members, a silvi-agriculture demonstration farm of 6 ha and a silvo-pasture demonstration farm of 10 ha will be established in each village.

The number of trees to be planted in lines in the case of the silvi-agriculture demonstration farm will be 6,600 based on 1,100 trees per ha. Therefore, some 10,000 seedlings will be required, including fruit tree seedlings and the silvo-pasture demonstration farm. These seedlings will be produced by farmers' groups receiving the necessary equipment and technical guidance from the Project Office.

The principles used to determine the demonstration farm size for the slope land agriculture programme are similar to those for the agroforestry development programme. The farm size per participating household will be 1.2 ha, i.e. 120% of the slash and burn cultivation area per household, which translates to 6 ha in each village based on five participating sub-group members.

The improvement of bamboo forests, i.e. the bamboo plantation programme, is not technically difficult and can be achieved by means of the provision of advice at the implementation stage. Consequently, demonstration farms will not be established under the bamboo plantation programme and bamboo seedlings will be produced by farmers.

In regard to the paddy seeds multiplication and supply system establishment programme, second cropping promotion at lowland paddy programme and fish culture expansion at lowland paddy programme under the lowland productivity improvement project, 0.15 ha, 0.5 ha and 0.5 ha of paddy fields will be converted as the respective demonstration farms in each village.

8.1.4 Extension Method

Details of each programme implementation are set out in the Annex (See Annex 5, Project Profiles). Accordingly, discussion will be limited here to the extension methodology with regard to the following three items. Extension activities are targeted at the area farmers, and are to be carried out by PAFSO and DAFOs staff.

- 1) Effective agroforestry (including slope land agriculture) as a system to replace slash and burn cultivation ;
- 2) Lowland paddy improvement and bamboo forest improvement considered effective in increasing cash income;
- 3) Instruction of rural water supply facilities strongly desired by villagers.

(1) Agroforestry (including slope land agriculture)

The major reason for viewing slash and burn cultivation with concern in recent years is the fact that increasingly faster rotation of land use in this manner results in recultivation on soil which has not yet had a chance to recover its nutrient content thereby causing rapid soil degradation.

Slash and burn cultivation carried out to date has been almost completely limited to upland rice cultivation on slopes, and this monoculture production pattern is in itself a problem. To address this, agroforestry systems (including slope land agriculture) are to be introduced under the Project as the cultivation pattern on hill slopes, and combined cultivation methods are to be pursued. It is thus necessary that all parties understand that this will make possible sustainable farm management, crop diversification, and effective land use. Given the fact that a great deal of courage is necessary on the part of farmers to pioneeringly move into what for them is an unknown area of farming activity, it is firstly necessary that personnel of government agencies who are in a position to carry out the relevant extension work be imbued with the required self-confidence to effectively accomplish their mission.

Below, seedling production for tree species to be used in silvi-agriculture and silvo-pastoral farming is discussed.

1) Silvi-Agriculture

a. Extension to the government side

Firstly is the selection of instructors for training extension workers. Normally, this instruction would be provided by professional staff of the specific agency. In the case of the Lao PDR, this training would be done in cooperation with the Faculty of Agriculture of Laos University, Nam Seuang Forest Research Center, the Department of Forestry and the like. From outside the country, it would be conceivable to dispatch experts specializing in agroforestry from ICRAF, and learning institutions world-wide, as well as professionals from related universities, government agencies and research facilities in neighboring countries. Specifically in terms of nearby countries, experts are available at the Royal Department of Forestry of Thailand, Vietnam's Forest Science Research Institute, the University of the Philippines, etc.

Instructors prepare their own textbooks. In this regard, the Department of Forestry of the Lao PDR has on hand a "Practical Guide to Dryland Farming

(Integrated Farm Management, Planting Tree Crops, Contour Farming with Living Barriers)". This extension material is rich in illustrations explained in both Lao and English and it would be particularly effective. Increased numbers of this guidebook could be printed as is, or it could be used as a basis for preparation of a new textbook.

Although basic knowledge of agroforestry can be taught in the classroom, this is not sufficient training for extension workers to be effective in dealing with farmers in the field. Practical training in the field under the tutelage of an instructor is thus necessary. It would be possible to carry out this type of field training of extension workers at the Forest Training Center of the Department of Forestry.

b. Extension to farmers

Parallel to instilling knowledge of agroforestry in extension workers, extension activities would also be carried out directed at the farmer. In technology extension to the agroforestry groups, basic knowledge would be imparted to the farmer in the form of classroom lectures under a workshop format. A convenient venue for this would be the Afforestation Center scheduled for completion in 2000. Also, since practical training is ultimately more important for the farmer than basic classroom instruction, training programmes and inspection field trips would be carried out at locations actually under cultivation. Providing opportunities for at least the agroforestry group leader of each village to participate in inspection tours of similar projects in neighboring districts or provinces will be important in opening up attitudes to the possibilities of the farming technology to be introduced under this Project.

Due to the potential lack of reading skills on the part of farmers, it would be useful for texts used in the workshop sessions to be well illustrated. Ample space should be left in the margins of texts as well to allow for notations by the trainees.

It is important that extension activities include not only workshop sessions, but that the extension officers regularly visit individual farm households as well to elicit questions and provide on-the-spot instruction. Furthermore, such field extension activities will serve to brush-up the technical level of the extension officers themselves.

It is necessary that the content of extension activity include methods for seedling production, land preparation, tree planting, etc. Other required aspects encompass extension in effective field crop, fruit trees and arboreal crop cultivation, as well as research on farm product marketability.

Since compost input is important to sustain soil fertility, it is necessary to extend knowledge to the farmers on compost preparation utilizing livestock manure, local grasses (particularly Gramineae species) and rice stalk, and the most effective timing for compost application. In this regard, the cooperation of the Soil Center of Lao PDR would be expected. A cooperative link-up with the Agricultural and Rural Development Project in Vientiane Province (ARDP) is also necessary as the similar experience under this project will serve as a valuable reference.

2) Silvo-Pastoral

It is generally considered difficult to achieve effective farm management in areas of low soil productivity without a farming approach which combines crop cultivation with animal husbandry. With the exception of poultry, cattle raising is the most common type of animal husbandry in the Model Area. However, this type of livestock care comprises open grazing with virtually no other feed provision, resulting in insufficient animal nutrition. This open grazing also leads to livestock damage of planted crops. Accordingly, important issues in future cattle husbandry are enclosed ranch system corralling and improvement in animal fodder.

To address this, animal husbandry under a silvo-pastoral format is to be extended under the Project whereby hedges (mainly of leguminous species which provide fodder as well) are to be planted to create an enclosure for livestock. Within this enclosure small tree stands would be established to provide livestock with appropriate shade, and concentrated orchard planting carried out. The above mentioned Practical Guide to Dryland Farming (Contour Farming with Living Barriers) will serve as a valuable reference in establishing the subject hedges.

It is recommended that pasture land comprise mixed growth of gramineous and leguminous grasses. The present grassland, however, is dominated by Gramineae species and therefore needs improvement to provide sufficient nutrition for grazing livestock. There are presently livestock research stations at three locations in the Lao PDR. At the Nam Souang Livestock Research Center, the closest such facility to the Model Area, research and seed harvesting for fodder crops for large livestock is being

carried out. With the cooperation of this center, extension officers would receive training in basic knowledge and cultivation techniques for fodder crops, disease prevention in livestock, etc.

Also, as in the case of agroforestry, classroom lectures would be provided to local residents via a workshop format. Likewise, a cooperative tie-up in this regard with the ARDP would also be recommended.

3) Seedling production

It is planned that local residents themselves will establish nurseries and produce seedlings for trees to be planted under agroforestry. This will begin with an annual production of 10,000 seedlings to be used for the demonstration farms in each village.

It is recommended that the cooperation of the Nam Souang Forest Research Center be obtained regarding seedling production technology and nursery management. This center is engaged in the marketing of various types of seedling, and has ample experience in seedling production. Extension officers would accordingly learn nursery management with the help of the center, with training content to include techniques for proper selection of nursery sites, seed bed preparation, soil mixing, seed harvesting, transplanting, shade protection, watering, and planting.

Seed quality is affected by genetic factors, seed soundness, traits, etc. Of these, genetic factors directly relate to the parent tree, and in this regard it is necessary when seed harvesting from natural forest to fully examine the form of the parent tree (conditions of growth, etc.). In the case of purchased seed, it is important to buy from a clearly traceable and reputable source.

Instruction to farmers is to be done through training sessions for the gathered agroforestry group of each village. A convenient venue for such training would be the Afforestation Center. Nevertheless, detailed instruction in the field will be necessary at each village regarding actual nursery preparation and management.

(2) Improved Paddy Production

Three programmes are planned for improved paddy production, i.e. "paddy seed multiplication and supply", "secondary cropping in lowland paddy", and "fish culture expansion in lowland paddy".

With regard to technical aspects (selection of variety, selection of crop type, cultivation methods, etc.) for paddy seed multiplication and supply and secondary cropping in lowland paddy, it will be necessary to obtain the cooperation of the Naphok Research and Seed Multiplication Center (NRSMC). Furthermore, it will be important to establish a cooperative link-up with the ARDP in order to access the similar experience and useful information available under that project.

Having received necessary information and data from the NRSMC and ARDP, extension officers would convene workshops targeted at the farmer groups for extension of crop cultivation technology. Also, since consideration should be accorded the use of compost as well as chemical fertilizers, the cooperation of the previously mentioned Soil Center will be necessary in this regard. Regular extension activities in the field will be important, including instruction and consultation to farmers on the spots. Furthermore, market surveys by extension officers will be essential in providing information on market trends and types of crop with promising marketability.

The subject programmes fall more within the domain of agricultural engineers as opposed to forestry engineers, and the active cooperation of the former will be an important key to the smooth implementation of the said programmes.

Extension activities with regard to the fish culture expansion in lowland paddy is described as follows. At present, fish culture in lowland paddy is being carried out by Namon Nua and several other villages in the Model Area. As a certain level of fish culture has thus been achieved, on-site training sessions directed at farmers from neighboring villages would be held at these villages which have made relative advances in fish farming in the area. It is also recommended that the cooperation of the Nam Souang Seed Center (NSSC) be obtained in upgrading fish culture technology.

Aside from lowland paddy, there are some farmers in the area engaged in fish culture in man-made ponds on small streams, and this type of farming can be coordinated with tree planting, vegetable cultivation and livestock raising. In such cases, silvi-agriculture would be introduced whereby the slope around the pond is planted with trees, and the lower part of the slope with more gentle gradient is used for vegetable cultivation. The vegetables so produced could be either marketed or a portion used by the farmer himself. In many cases hogs are left to roam under the dwelling floor, feeding off food scraps and other refuse from the home. By engineering drainage from the dwelling such that the excrement from these hogs is carried to the man-made pond, a source of food can be

provided to the fish being raised therein. In other words, a "zero emission" approach can eliminate resource waste and foster an effective fish culture method.

(3) Bamboo Forest Improvement

Bamboo has traditionally been used in the area as an effective raw material for a range of purposes including household implements, building construction, etc. The Mai Shoth which grows in the area as secondary forest is slender and lacking in durability, and as such has essentially been left undisturbed. Bamboo forest would accordingly be improved with more useful species in order to upgrade the quality of this resource. This improvement would be in the form of introduction of a larger diameter of Mai Shoth or shift to other large diameter species of bamboo. Key points with regard to technology and extension for improved bamboo forest are as follows.

Firstly, it is important that extension officers recognize that in the case of any stump-sprouting type of bamboo species in the tropics, "cutting" produces superior rooting and facilitates propagation.

Species of bamboo are to be selected in line with intended utilization. Where bamboo is to be used as a general construction material, a species with thick diameter and lignum is desirable such as Mai phai ban (*Bambusa blumeana*). In the case of roofing or flooring, the Mai hok (*Dendrocalamus brandisii*) is good. Mai hia (*Cephalostachyum virgatum*) can be used for wall and floor construction. Large-diameter bamboo can also be used to produce charcoal.

Cutting entails severing a segment of the bamboo stalk in the rainy season at a point somewhere from the lower to mid point of the culm which includes 1~2 joints. This cut section is then embedded horizontally in the ground at a depth of 20~30 cm. Normally, rooting will occur in several weeks under rainfed conditions; however, irrigation is performed where necessary. In approximately one month, seedlings with rhizome emerge, and these are planted at the bamboo afforestation site. Planting in the rainy season results in the most favorable seedling growth.

When considering bamboo afforestation in denuded or former slash and burn sites, unnecessary bamboo stumps should either be dug up or clear-cut to prevent unwanted bamboo growth. As repeated (several times) clear cutting of bamboo results in natural death, rooted cuttings are then planted in the area devoid of stumps. Target planting is 350~400 cuttings per ha.

Since bamboo is essentially impervious to pests, the above technology is sufficient for easy extension of bamboo raising technology to farmers.

In the case of bamboo comprising natural and primary forest, on the other hand, sustained production can be achieved by avoiding clear cutting, and instead by thinning old bamboo plants.

In any case, most species of bamboo require large amounts of moisture and sunshine, and it is thus necessary to instruct farmers to avoid afforestation which is too dark.

The Nam Souang Forest Research Center is conducting experiments on bamboo planting, and it is recommended that the cooperation of the center be obtained based on the results of its research.

(4) Domestic Water Supply Facilities

According to the socio-economic baseline survey, females indicate that they would like to see a reduction in labor requirement for water-fetching chores in the course of day-to-day living. Also, local residents cite the desire for sufficient potable water supply second in importance only to adequate food supply. As a result, domestic water supply facilities are proposed under the Project for 8 villages in the Namon Area and 13 villages in the Somboun Area. The urgent implementation of these is recommended, and this can be expected to alleviate the water-fetching burden of females and children as well as improve general sanitation. It is necessary that this programme be carried out with the cooperation of the Provincial Housing and Urban Cadastral Planning Section of the Communication, Transport, Post and Construction Service Office of Vientiane province.

8.2 Implementation Schedule

8.2.1 Implementation Order of Programmes

The ownership of land use rights and village boundaries are often unclear in regard to forest land. Consequently, there are cases of land use disputes between neighbouring villages. Such programmes related to land use as the Agroforestry Development Programme, Slope Land Agriculture Programme and Bamboo Plantation Programme must only be implemented after disputes between local people have been settled. This requirement makes it necessary to firstly implement the Land Forest Allocation Programme prior to the implementation of land use-related programmes, in turn followed by the Charcoal Production Programme and Bamboo Crafts Promotion Programme. In the case of lowland paddy, as the ownership of land use

rights has been clearly established, programmes under the Lowland Productivity Improvement Plan will be implemented without the Land Forest Allocation Programme. Those programmes which are not related to land use can be equally simultaneously implemented with the Land Forest Allocation Programme. The implementation order of the programmes related to the Land Forest Allocation Programme is shown in Fig. 8-2-1.

In reality, the land use rights at some of the current or former slash and burn sites are not always clear. At some villages, there is land which is commonly accessible by villagers. At this land, it will be possible to implement various programmes without implementation of the Forest Land Allocation Programme.

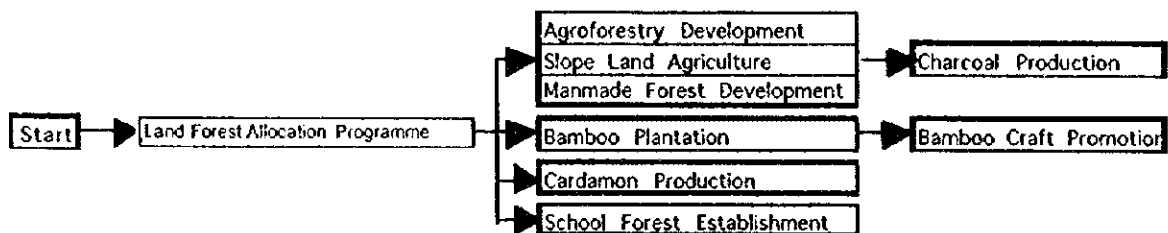


Fig. 8-2-1 Implementation Order of Programmes

8.2.2 Implementation Schedule

An outline of the implementation schedule is given in Fig. 8-2-2. Project implementation period is the 10-year period from 1999 to 2008.

The first two years comprise a preparatory period, with the Project Office being set up in the first year. The administrative role and organizational set-up of the Project Office is discussed in the following section. In the second year, subject villages for programme implementation will be selected, and farmer groups formed.

It is essential that the land forest allocation programme be given priority over other land use related programmes (agroforestry, etc.). Also, since land use conversion must be completed by 2008, the land forest allocation programme is to be commenced in the 2nd year and finished in the 5th year of the Project.

Activities	1999 y	2000 y	2001 y	2002 y	2003 y	2004 y	2005 y	2006 y	2007 y	2008 y
Establishment of Project Office										
Selection of Subject Village										
Formation of Farmers' Groups										
Land Forest Allocation Programme										
Establishment of Demonstration Farm										
Agroforestry Development										
Slope Land Agriculture										
Manmade Forest Development										
Cardamon Production										
Bamboo Plantation										
Charcoal Production										
Paddy Seeds Multiplication & Supply System Establishment										
Second Cropping Promotion in Lowland Paddy										
Fish Culture Expansion in Lowland Paddy										
Improvement and New Construction of Local Roads										
Construction of Rural Domestic Water Supply Facility										
Existing Primary School Upgrading										
Village Revolving Fund System Establishment										
Weaving Entrepreneurship Development										
Skill-Based Non-Formal Education										
Improved Cookstove Dissemination										
School Forest Establishment										
Bamboo and Wood Craft Promotion										

Fig. 8-2-2 Implementation Schedule

From the 3rd year, establishment of demonstration farms is to begin with the cooperative effort of the previously determined farmers' groups. Demonstration farms are to be in operation for a 3-year period, with achievements to be extended to surrounding villages from the 2nd to 3rd year in conjunction with the start of the agroforestry and slope land farming programme. From the 4th year, agroforestry and slope land agriculture programmes are to begin to extend for villagers with the result of demonstration farms. At the same time, the reforestation and cardamon production programmes would also begin. A five-year procedure is envisioned for conversion from slash and burn cultivation to permanent cultivation (see Fig. 7-2-5); however, a six-year period (to be on the safe side) is allocated under the Project for development of agroforestry and slope land agriculture, and the like.

Since improvement of bamboo forest is not technically difficult, extension of this technology is to begin directly from the 3rd year, foregoing the establishment of a demonstration farm in this regard. In the 5th year following commencement of bamboo forest improvement, the charcoal production programme using bamboo as raw material will start.

Programmes for paddy seed multiplication and supply system establishment, second cropping promotion in lowland paddy, and fish culture expansion at lowland paddy require the utilization of lowland paddy. As land use rights in the case of lowland paddy are clear, these programmes would start promptly in the 3rd year of the project (following the preparatory period), without waiting for implementation of the land forest allocation programme as would

be the case for agroforestry development, etc. A five-year period has been allocated for implementation of the paddy seed multiplication programme and supply, and fish culture expansion at lowland paddy programme; however, an eight-year period is designed for the second cropping promotion at lowland paddy programme. Within this eight-year period, cropping would be targeted at the local area market for the first four years, during which time information on crop marketability would be gathered as a basis for subsequent cultivation aimed at the Vientiane market in the latter four years.

Since local road construction will improve crop marketability, this would be carried out from the 3rd year, prior to the agroforestry and second cropping promotion at lowland paddy programmes. In light of the high villager desire for stable domestic water supply, the programme for construction of rural domestic water supply facilities would begin from the second year of the preparatory period with targeted completion within five years. The programme to upgrade existing primary schools would be carried out in the latter five years of the project implementation period following road construction necessary for delivery of equipment and materials.

The programme to establish a village revolving fund system would be carried out in conjunction with the start of agroforestry development. Extension programmes such as weaving entrepreneurial development and skill-based informal education are aimed at strengthening the village support structure, and as such would commence promptly from the third year following elapse of the preparatory period. Since school forest establishment is related to the land forest allocation programme, this would begin from the 5th year of the project at the same time as other programmes related to forested sites such as the agroforestry programme, etc.

The bamboo crafts promotion programme would commence five years after the start of bamboo forest improvement in order to make use of improved bamboo as raw material. At the same time, the wood-working promotion programme would also start.

8.3 Implementation System

The Project Office will be established to play a central role in the implementation of the proposed projects under the Plan. As the Model Area falls in two administrative areas, i.e. the Vangvieng District and Hineheup District, the Project Office should be established at the Vientiane provincial level rather than the establishment of two separate offices in the two districts in view of better efficiency. The Project Office will be established under PAFSO. While maintaining liaison with PAFSO, the Project Office will also need to collaborate closely with DAFOs. Also, technical tie-up with the Department of Forestry and the Afforestation

Center will be required. As the planned programmes will affect areas under the jurisdiction of not only the Ministry of Agriculture and Forestry but also those ministries involved in construction and education, the Department of Forestry will play an important role in liaising with such ministries of the central government. Liaising with private sector engineers will be necessary for the weaving entrepreneurship development programme and charcoal production programme.

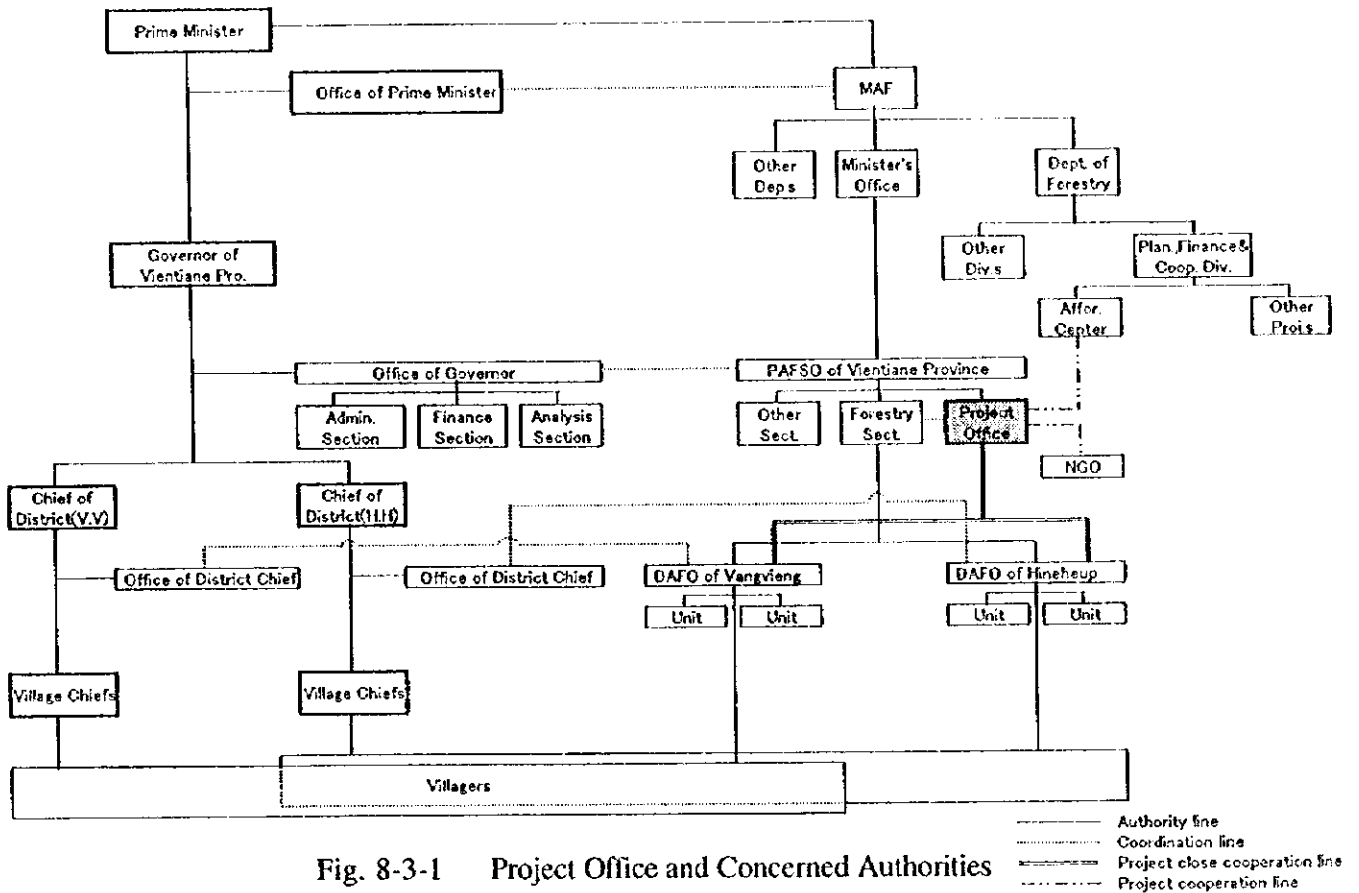


Fig. 8-3-1 Project Office and Concerned Authorities

As shown in Fig. 8-3-2, the Project Office will have an Administration Section, Planning/Evaluation Section and Extension/Training Section under the Director. The Administration Section will comprise the General Affairs Unit and Accounting Unit while the Planning/Evaluation Section will comprise the Planning Unit and Monitoring/Evaluation Unit. The Extension/Training Section will comprise the Extension Technical Unit, Extension Unit and Training Unit. The Extension Technical Unit houses experts to teach extension techniques and methods which are appropriate vis-a-vis the local conditions to staff members of the Extension/Training Section. The status of these experts is equivalent to that of project specialists (extension specialists). The Project Office will have a total of 30 staff members, i.e. four staff members for the Administration Section (including the Director), two staff members for the Planning/Evaluation Section and 24 staff members, including extension technic experts, for the

Extension/Training Section. The Extension Unit will have 20 staff members which will be divided into four teams. Both the Somboun Area and the Namon Area will be divided into two blocks and a team of five members will be responsible for each block. Distinction between senior and junior staff members will be introduced in the case of some units. Senior staff members will act as unit leaders to coordinate the work of the junior staff members. The area(s) of responsibility of each unit is shown in Table 8-3-1.

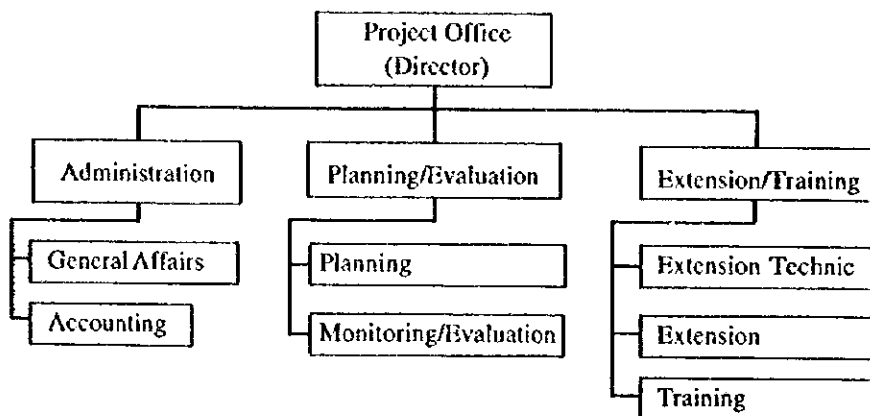


Fig. 8-3-2 Organizational Structure of Project Office

Table 8-3-1 Staff Allocation of Project Office

Section/Unit		Senior	Junior	Work Assignment
Director		1		Administration and external negotiations
Administration	General Affairs	1		General affairs
	Accounting	1	1	Accounting
Planning/Evaluation	Planning	1		Rural economy
	Monitoring/Evaluation	1		Social analysis
Extension/Training	Extension Technic	1		Extension specialist
	Extension	2	18	Agroforestry, afforestation, nurseries, agriculture, fruit trees and fish culture
	Training	1	2	Development of rural community
Total		9	21	

8.4 Rough Project Cost Estimation

The total implementation cost of the proposed projects is roughly estimated to be US\$ 2,385,500 (3,752 million kip) over the 10-year period and the breakdown of this cost is shown in Table 8-4-1 (see Annex 6 for details). The exchange rate between the kip and the US dollar used for this estimate is 1,560 kip = 1 US\$ (as of October, 1997).

Table 8-4-1 Project Cost Estimation

Project/Programme	US\$	Conversion
		kip (million)
Symbiosis Zone Conservation Project	135,000	210.70
- Agroforestry Development	49,184	78.68
- Slope Land Agriculture	23,490	32.02
- Man-Made Forest Development	62,500	100.00
Lowland Productivity Improvement Project	9,800	15.27
- Paddy Seeds Multiplication and Supply System Establishment	2,500	3.87
- Second Cropping Promotion at Lowland Paddy	3,800	6.00
- Fish Culture Expansion at Lowland Paddy	3,500	5.40
Infrastructure Development Project	1,409,300	2,198.40
- Improvement and New Construction of Local Roads	838,900	1,308.70
- Construction of Rural Domestic Water Supply Facilities	93,400	145.70
- Existing Primary School Upgrading	477,000	744.00
Rural Community Support Project	54,600	85.24
- Land Forest Allocation Programme	11,600	18.10
- Village Revolving Fund System Establishment	14,500	22.62
- Weaving Entrepreneurship Development	14,500	22.62
- Skill-Based Informal Education	1,700	2.70
- Improved Cooking Stock Dissemination	1,700	2.70
- School Forest Establishment	9,800	15.30
- Bamboo Crafts Promotion	800	1.20
Office Expenditure	776,800	1,242.86
- Vehicles (five pick-up trucks and 20 motorcycles)	216,500	346.40
- Miscellaneous Equipment	64,900	103.82
- Personnel Cost	205,200	328.32
- Staff Training	85,000	136.00
- Other Office Expenditure	205,200	328.32
Total	2,385,500	3,752.47

8.5 Monitoring Plan

Monitoring of the projects will be conducted to clarify the degree of impact of project implementation on the natural environment as well as social environment and also to clarify the project progress and effects.

The final evaluation will be conducted at the end of the project and will be referred to for the implementation of similar projects in other areas.

Monitoring of the environmental factors listed in Table 9-4-1 in Chapter 9 will be conducted, except for the factor which "no serious negative impacts will occur". The resulting monitoring items and their evaluation indicators are listed in Table 8-5-1 and Table 8-5-2.

Table 8-5-1 Monitoring of Environmental Factors

Environmental Factor	Indicators
Change of Lifestyle	Change of farming method, improvement/new extension of local roads and number of domestic water supply facilities
Conflict Among Local People	Number of complaints registered with village chiefs concerning village boundaries and areas of overlapping village boundaries
Readjustment of Forest Use Rights	Number of problems registered with village chiefs concerning the use of protection forests established by villagers
Existing System and Customs	Number of slash and burn cultivation sites or number of households engaged in slash and burn cultivation
Impact on Rare Species and Habitat	Change of grassland to forests
Impact on Soil and Land	Degree of soil fertility improvement and change of yield
Impact on Hydrology and Water Quality	River flow rate (particularly that of small rivers) in the dry season
Sustainability of Forest Resources and Functions	Number of slash and burn cultivation sites, number of households engaged in slash and burn cultivation and afforestation area

Table 8-5-2 Monitoring of Plan Components

Plan Component	Indicators
Slope Land Agriculture Programme	Number of slope land agriculture groups and area of slope land agriculture
Agroforestry Development Programme	Number of agroforestry groups and agroforestry area
Man-Made Forest Development Programme	Planting area and bamboo forest improvement area
Non Wood Forest Products Production	Number of charcoal kilns, shipment value of charcoal, shipment value of bamboo and shipment value of cardamon
Lowland Productivity Improvement	Area of paddy fields subject to paddy seeds multiplication and supply system establishment, yield of improved rice cultivation, area and yield of second cropping and fish culture production volume
Infrastructure Development Project	Total length of extended local roads, number of new domestic water supply facilities and number of upgraded primary schools
Rural Community Support Project	Number of villages where forest land allocation has been completed, number of villages where a revolving fund system has been established, amount of fund and number of revolving fund users, number of weaving training completed and degree of product quality improvement, number of literacy education courses held and number of participants, number of improved cooking stoves introduced and state of use, number of villages in which a school forest has been introduced and planting area and number of bamboo craft workers and state of sales

CHAPTER 9

INITIAL ENVIRONMENT EXAMINATION

CHAPTER 9 INITIAL ENVIRONMENT EXAMINATION

9.1 Environmental Care Principles

For the watershed management plan, the land use suitability classification is conducted in consideration of the expected land use by local people, established through the PRA, and legal restrictions, etc. following the site classification based on the natural environmental conditions. The suitable land use categories used are "forest zone", "symbiosis zone" and "agricultural zone". A forest zone is an area in which forests are actively preserved for the conservation of a headwater area. In symbiosis forest zone, agroforestry is actively introduced to encourage a shift from slash and burn cultivation. Priority in an agricultural zone is given to agriculture, particularly paddy field cultivation. In addition, it is planned to develop such social infrastructure as the road network and water supply system in order to improve the living environment of local people and also to increase the production level of fish culture, textiles, charcoal and bamboo materials to provide additional sources of income other than agriculture. If it is believed that the implementation of these plans will possibly have serious adverse impacts on the social and natural environments, care must be taken at the planning stage to prevent the occurrence of such adverse impacts.

In regard to environmental care under the Study, the environmental factors which would be affected by the watershed management plan were examined to clearly identify the items to be addressed in advance, followed by field screening and scoping in view of the envisaged contents of the plan. Finally, an overall evaluation was conducted based on the field survey findings as well as the screening and scoping results. In the course of conducting the initial environmental examination, the Environmental Care Guidelines for Development Studies (Forestry), suggested by JICA, were used for reference purposes in view of the fact that environmental assessment guidelines have not yet been established in Lao PDR.

9.2 Site Environment

The social environmental factors, natural environmental factors and site environmental factors requiring special attention in the Model Area are compiled in Table 9-2-1 - 3.

Table 9-2-1 Social Environmental Factors

Land Ownership	Land is owned by the state.
Land Use	Forests, grassland, slash and burn sites and paddy fields
Local Economic Activities	Agriculture is the main activity. Fishing at the dam reservoir, paddy field cultivation and fish culture are also observed. Some villages prosper due to commerce along national routes.
Local Customs (Forest Use and Other Aspects)	While land is owned by the state, people can acquire forest ownership which allows them to use, transfer and/or inherit. At present, people tend to use forests based on customary rights.
Local People	The majority of local people are engaged in agriculture.
Public Health	Malaria is the main concern of local people.
Population	The population of the Model Area is approximately 16,000 with some 2,600 households.
Miscellaneous	Newly established villages by refugees returning from Thailand are observed.

Table 9-2-2 Natural Environmental Factors

Climate	<p>Mean annual rainfall: approximately 3,200 mm</p> <p>Mean annual temperature: 25.4°C</p> <p>Mean annual maximum temperature: 30.1°C</p> <p>Mean annual minimum temperature: 20.7°C</p>
Vegetation	The potential vegetation is tropical monsoon forests consisting of Dipterocarpaceae and others. The present vegetation mainly consists of broad-leaved secondary forests and grassland.
Topography	The elevation ranges from 200 m to approximately 2,000 m. The northern, central and southern parts are mainly mountains, flat land and hills respectively. Limestone mountains form steep cliffs, showing a unique landscape.
Geology/Soil	<p>North: conglomerate, sandstone, slate and limestone formed in the Paleozoic Permian - Carboniferous period.</p> <p>South: conglomerate, sandstone, slate and limestone formed in the Mesozoic Triassic period</p>
Hydrology	Nam Xong, a tributary of Nam Lik, runs through the central part of the Study Area. Since the completion of diversion work at the end of 1995, most of the water of Nam Xong is channeled to the Nam Ngum Reservoir.
Ecosystem	The Study Area is not included in the National Biodiversity Conservation Area.
Rare Species	Tigers and other rare wild species are said to inhabit remote parts of the Study Area. The details are, however, unknown.

Table 9-2-3 Site Environmental Factors Requiring Special Attention

Site Environmental Factors Requiring Special Attention	In Model Area		
	Yes	No	Unknown
< Specially Designated Area >			
1. Habitat of fauna and flora subject to Washington Convention			○
2. Habitat of birds subject to Migratory Bird Protection Convention		○	
3. Wetland subject to Ramsar Convention		○	
4. Designated area of World Cultural and Natural Heritage Convention		○	
5. Protection Forest	○		
6. Natural Park		○	
7. Protected Forest/Wildlife Reserve		○	
< Social Environment >			
8. Reservation for natives and minority tribes, etc.		○	
9. Area of historical remains, cultural heritage or beauty spots		○	
10. Area of economic activity causing serious negative impacts		○	
< Natural Environment >			
11. Arid or semi-arid area			
12. Monsoon forest zone	○		
13. Tropical rain forest area		○	
14. Tropical highland forest area	○		
15. Wetland		○	
16. Peat area		○	
17. Mangrove forest area		○	
18. Coral reef		○	
19. Rocky land, steep land, eroded land or devastated land	○		
20. Closed water body (lake or man-made reservoir)	○		

Special notes on cases where development in the area, surrounding area and/or areas of similar conditions has caused serious impacts on the environment.

- (a) It is planned to block Nam Lick to divert the river water to the Nam Ngum Reservoir through a tunnel. It is hoped to use the head between the tunnel and the Nam Ngum Reservoir for hydroelectric power generation.

- (b) It is planned to construct the second and third Nam Ngum Dams on Nam Ngum upstream of the Nam Ngum Reservoir for hydroelectric power generation.

9.3 Field Screening and Scoping

Field screening and scoping were conducted to determine the likely impacts of the planning items of the plan (see Table 9-3-1) on the environmental factors. The results are given in Tables 9-3-2 - 4.

Table 9-3-1 Planning Items of Watershed Management Plan and Planned Activities

Planning Item	Planned Activities
Agroforestry	Introduction of various combination patterns, such as trees and crops, trees and livestock and fruit trees and livestock, etc., to improve the land productivity while protecting forest degradation due to slash and burn agriculture
Forestation	Widespread grassland at former slash and burn sites will be converted to forests through active planting to increase the water yielding function in the watershed and also to expand forest resources. Local species will be given planting priority.
Natural Regeneration	Secondary bush land at former slash and burn sites will be left to natural regeneration if feasible. Useful species will be planted at sites requiring enrichment to facilitate the transformation to forests.
Nurseries	Seedlings will be produced for forestation and enrichment. A nursery will be created in each village if possible for management and the production of seedlings by local people.
Erosion Control	Efforts will be made to rehabilitate devastated land and rivers.
Development of Social Infrastructure	The construction and improvement of local roads for daily life and the development of a water supply system will be conducted.
Change of Land Use	Slash and burn sites will be converted to alternative types of land use and paddy fields will be created.

Table 9-3-2 Screening Results

Screening Item	Assessment	Remarks (Reasoning)
Primary Category (Viewpoint)	Results	
< I. Social Environment >		
1. Social Life (possible negative impacts on existing social life in terms of daily life, economic activities, community and customs, etc.)	Yes	An alternative agricultural method to slash and burn and a change of land use could create conflict. Meanwhile, sustainable land use and improved productivity will improve the lives of local people.
2. Health and Hygiene (possible negative impacts on the health conditions of local people and effects on diseases)	No	The establishment of headwater forests and the development of water supply facilities will improve local health and hygiene.
3. Historical Remains, Cultural Heritage and Beautiful Landscape, etc. (existence of special value in terms of history, archaeology, landscape or science or of special social value)	No	There are no important historical remains or cultural heritage. The restoration of forests will improve the local landscape in general.
< II. Natural Environment >		
4. Rare Wildlife and Ecosystem (existence of rare wildlife and/or ecosystem)	No	The decrease of slash and burn sites and improvement of grassland to natural forests will have positive impacts
5. Soil and Land (possible development of land devastation, soil erosion and/or soil contamination)	No	The restoration of forests will contain soil and land devastation.
6. Hydrology and Atmosphere, etc. (possible negative impacts on surface water of rivers and lakes, groundwater and/or atmosphere)	No	The improved water yielding function will have positive impacts.
7. Sustainability of Forest Resources and Functions (possible destruction of sustainability of forest resources and forest functions to benefit the public)	No	The decrease of slash and burn sites, forestation and natural regeneration will assist the sustainability of forest resources and functions.
Overall Evaluation	Scoping Required	

Table 9-3-3 Scoping Check List

Environmental Factor	Development Activity Affecting the Environment								Remarks	
	Agro-forestry	Forest-ation	Natural Regeneration	Nursery	Erosion Control	Infrastructure Development	Change of Land Use			
1. Social Life										
(1) Daily Life										
① Systematic Resettlement										
② Non-Voluntary Resettlement										
③ Change of Lifestyle	P	C	C	C	C	P	P	P		Easier access to farming sites
④ Conflict Among People								A		Obscure village boundaries
⑤ Natives/Minority Tribes/Nomads										
(2) Demographic Problems										
① Population Increase										
② Rapid Change of Demographic Structure										
(3) Economic Activities of Local Inhabitants										
① Transfer of Economic Activity Base	C	C	C	C	C	C	C	C	C	Keeping agriculture activity
② Conversion of Economic Activity - Unemployment	C	C	C	C	C	C	C	C	C	As above
③ Widening Income Gap	P	P	C	C	C	P	P	P	P	Sustainable land use

(4) Systems/Customs

① Readjustment of Common Rights to Forest Use	C	C	C	C	C	C	C	C	A	Restriction of land use
② Change of Social Structure through Grouping, etc.	C	P	C	C	C	P	C	C	C	Strengthening of cooperation system by local persons
③ Reform of Existing Systems and Customs	P	C	P	C	C	C	C	C	P	Decline of slash and burn agriculture

2. Health and Hygiene

① Increased Use of Agrochemicals	C	C	C	C	C	C	C	C	C	
② Outbreak of Local Diseases										
③ Spread of Infectious Diseases	C	P	P	C	C	C	P	C	C	Improved living environment and improved drinking water quality
④ Accumulation of Residual Toxicity (Agrochemicals)	C	C	C	C	C	C	C	C	C	
⑤ Increased Household and Body Waste										

3. Historical Remains, Cultural Heritage and Beautiful Landscape, etc.

① Damage/Destruction of Historical Remains, etc.										
② Loss of Rare Landscape										
③ Impact on Underground Resources										

< II. Natural Environment >

Environmental Factor	Development Activity Affecting the Environment							Remarks
	Agro-forestry	Forest-ation	Natural Regeneration	Nursery	Erosion Control	Infrastructure Development	Change of Land Use	
4. Rare Wildlife Habitat								
① Vegetational Change	P	P	P	C	C	C	C	Improvement of grassland to forests
② Impact on Rare Species and Indigenous Wildlife	C	C	P	C	C	C	C	Enlargement of natural forests
③ Decline of Biological Diversity	P	P	P	C	C	C	P	Decline of slash and burn agriculture
④ Invasion by and Propagation of Harmful Species	C	C	C	C	C	C	C	
⑤ Disappearance of Wetland and Peat Moor								
⑥ Natural Forests	P	C	P	C	C	C	P	Due to decrease of slash and burn sites
5. Soil and Land								
(1) Soil								
① Soil Erosion	P	P	P	C	P	C	C	Control of soil loss
② Salinization of Soil								
③ Decline of Soil Fertility	P	C	P	C	C	C	P	Control of soil loss
④ Soil Contamination	C	C	C	C	C	C	C	

(2) Land

① Land Devastation	P	P	P	P	C	P	C	P	Due to decrease of slash and burn sites
② Emergence of Land Slide	P	P	P	P	C	P	C	C	Control of devastated land by forests
③ Decline of Wind Breaking and Fire Prevention Functions	P		P					P	Decrease of both slash and burn sites and grassland
④ Subsidence									

6. Hydrology and Water Quality, etc.

(1) Hydrology

① Change of Flow Regime of Surface Water	P	P	P	P	C	C	C	C	Effects of forest restoration
② Change of Flow Regime and Table of Groundwater	P	P	P	P	C	C	C	C	"
③ Occurrence of Drought or Flood	P	P	P	P	C	C	C	C	"
④ Sedimentation	P	P	P	P	C	C	P	A	"
⑤ Lowering of Riverbed	P		P		C				"
⑥ Adverse Impact on Shipping									

(2) Water Quality/Water Temperature

① Water Pollution/Decline of Water Quality	P		P			P		P	Effects of forest restoration
② Eutrophication									
③ Change of Water Temperature									

(3) Atmosphere

① Air Pollution												
② Discharge of CO ₂												
③ Microclimatic Change		P		P								
④ Noise												

7. Sustainability of Forest Resources and Functions

① Discontinued Sustainability of Raw Forest Resources	P	P	P	P	P	P	C	C	P	Sustainable use of forest resources
② Discontinued Sustainability of Environment Conservation Functions	P	P	P	P	P	P	C	C	P	Preservation of forests

Symbols

- A : Negative impacts are likely to occur
- C : No special negative impacts are envisaged
- P : Positive impacts are likely to occur

Table 9-3-4 Scoping Check List

< I. Social Environment >

Environmental Factor	Degree of Environmental Impact					Remarks
	A	B	C	D	P	

1. Social Life

(1) Daily Life

① Systematic Resettlement			○			Not applicable to Model Area
② Non-Voluntary Resettlement			○			"
③ Change of Lifestyle					○	Improvement of living standard
④ Conflict Among People		○				Conflict due to land use restrictions
⑤ Natives/Minority Tribes/Nomads			○			Not applicable to Model Area

(2) Demographic Problems

① Population Increase			○			Not applicable to Model Area
② Rapid Change of Demographic Structure			○			"

(3) Economic Activities of Local Inhabitants

① Transfer of Economic Activity Base			○			Consent through people's participation
② Conversion of Economic Activity - Unemployment			○			Not applicable to Model Area
③ Widening Income Gap			○			"

(4) Systems/Customs

① Readjustment of Common Rights to Forest Use		○				Conflict due to land use restrictions
② Change of Social Structure through Grouping, etc.			○			Grouping of local people
③ Reform of Existing Systems and Customs					○	Decline of slash and burn agriculture

2. Health and Hygiene

① Increased Use of Agrochemicals			○			Use of chemicals at nurseries
② Outbreak of Local Diseases			○			Not applicable to Model Area
③ Spread of Infectious Diseases			○			"
④ Accumulation of Residual Toxicity (Agrochemicals)			○			"
⑤ Increased Household and Body Waste			○			"

3. Historical Remains, Cultural Heritage and Beautiful Landscape, etc.

① Damage/Destruction of Historical Remains, etc.			○			Not applicable to Model Area
② Loss of Rare Landscape			○			"
③ Impact on Underground Resources			○			"

< II. Natural Environment >

Environmental Factor	Degree of Environmental Impact					Remarks
	A	B	C	D	P	

4. Rare Wildlife • Habitat

① Vegetational Change					○	Positive impact due to forest restoration
② Impact on Rare Species and Indigenous Wildlife			○			"
③ Decline of Biological Diversity					○	"
④ Invasion by and Propagation of Harmful Species			○			"
⑤ Disappearance of Wetland and Peat Moor			○			Not applicable to Model Area
⑥ Deterioration					○	Acceleration of natural regeneration and decline of slash and burn agriculture

5. Soil and Land

(1) Soil

① Soil Erosion					○	Decline of slash and burn agriculture
② Salinization of Soil			○			Not applicable to Model Area
③ Decline of Soil Fertility					○	Decline of slash and burn agriculture
④ Soil Contamination			○			Not applicable to Model Area

(2) Land

① Land Devastation					○	Positive impact due to forest restoration
② Emergence of Land Slide					○	"
③ Decline of Wind Breaking and Fire Prevention Functions			○			"
④ Subsidence			○			Not applicable to Model Area

6. Hydrology and Water Quality, etc.

(1) Hydrology

① Change of Flow Regime of Surface Water					○	Positive impact due to forest restoration
② Change of Flow Regime and Table of Groundwater			○			"
③ Occurrence of Drought or Flood					○	"
④ Sedimentation					○	"
⑤ Lowering of Riverbed			○			Not applicable to Model Area
⑥ Adverse Impact on Shipping			○			"

(2) Water Quality/Water Temperature

① Water Pollution/Decline of Water Quality			○			Not applicable to Model Area
② Eutrophication			○			"
③ Change of Water Temperature			○			"

(3) Atmosphere

① Air Pollution			○			Not applicable to Model Area
② Discharge of CO ₂			○			"
③ Microclimatic Change					○	Positive impact due to forest restoration
④ Noise			○			Not applicable to Model Area

7. Sustainability of Forest Resources and Functions

① Discontinued Sustainability of Raw Forest Resources					○	Positive impact due to forest restoration
② Discontinued Sustainability of Environment Conservation Functions					○	"

Symbols

- A : Serious negative impacts will occur
- B : Serious negative impacts may occur
- C : No serious negative impacts will occur
- D : Unknown
- P : Positive impacts will occur

9.4 Overall Evaluation

Based on the field scoping results, overall evaluation was conducted and the evaluation results are shown in Table 9-4-1.

Table 9-4-1 Overall Evaluation

Environmental Factor	Evaluation Result	Reason for Evaluation Result
Change of Lifestyle	P	The local lifestyle will be improved due to the change of the method of farming from slash and burn agriculture at remote sites to agroforestry at sites near dwelling places, improvement/construction of local roads and secured supply of domestic water, etc.
Conflict Among Local People	B	In areas where the village boundaries are not clearly established, people's expectations of land use at the same site may differ from one village to another, creating a possible source of conflict among local people.
Readjustment of Forest Use Rights	B	While the forest use conditions are principally based on the expressed intentions of local people, there is a possibility of conflict due to land use restrictions, including the introduction of a forest conservation zone.
Existing Systems and Customs	C or P	The introduction of agroforestry will improve the conventional cultivation methods employed by local people as slash and burn agriculture will decline.
Impact on Rare Species and Habitat	C or P	An increase of the biomass is anticipated due to (i) the introduction of a forest conservation zone, (ii) the prevention of forest degradation due to the decrease of slash and burn agriculture and (iii) the planting and encouragement of the natural regeneration of true grass dominated grassland.
Impact on Soil and Land	C or P	The introduction of agroforestry will reduce soil loss and the decline of soil fertility through the decline of slash and burn agriculture.
Impact on Hydrology and Water Quality	C or P	Positive impacts are anticipated due to forest restoration.
Sustainability of Forest Resources and Functions	P	The decline of slash and burn agriculture, creation of firewood forests, reforestation and natural regeneration will contribute to establishing the sustainability of future forest resources.

Symbols

- A: Serious negative impacts will occur
- B: Serious negative impacts may occur
- C: No serious negative impacts will occur
- D: Unknown
- P: Positive impacts will occur

9.5 Environmental Care

(1) Conflict Among Local People

The land use expectations of land use of local people at the same site may differ from one village to another in those areas where the village boundaries are not clearly established, creating a possible source of conflict. The clear establishment of village boundaries will be required in the future with administrative guidance.

(2) Readjustment of Forest Use Rights

The forest use conditions are principally based on the expressed intentions of local people. However, there is a possibility that conflicts will emerge due to land use restrictions.

(3) Impact on Rare Species and Habitat

Although no wildlife reserve to protect rare fauna and/or flora exists in the Model Area, planting will emphasise the selection of multiple species and local species as much as possible.

(4) Impact on Soil and Land

Slash and burn cultivation rapidly deteriorates the soil fertility because it accelerates nutrient loss as well as soil loss. The introduction of agroforestry is expected to result in a decline of slash and burn agriculture. In addition, such soil conservation measures as the terracing of farmland and line planting along contour lines will be introduced to prevent soil loss and the decline of soil fertility.

CHAPTER 10

EVALUATION

CHAPTER 10 EVALUATION

The Study has been conducted to formulate a watershed management plan for forest conservation in the Vangvieng District in Lao PDR. The following items are expected by implementation of this plan.

(1) Transition from Slash and Burn to Permanent Cultivation

In the case of the farmers in the model area who have been engaged over the years in hill agriculture aimed at rice production, the lack of lowland paddy development has resulted in an unavoidable dependency on upland rice cultivation by means of slash and burn. This in turn has resulted in soil degradation and decline in productivity, forcing farmers to further increase slash and burn sites and generating an ever-expanding amount of wasteland. By introducing a land use plan under the Project focused on soil conservation and sustainability, permanent cultivation will be fostered in the target area; slash and burn farming will decrease; and forest regeneration will be promoted.

(2) Obtaining the Balance of Demand and Supply of Rice

Present farmland area and the future farmland area to accommodate agroforestry, slope land agriculture, etc. planned under the Project to replace slash and burn cultivation are shown in Table 10-1. The area selected as appropriate for agroforestry (Ag) totals 10,418 ha, comprising 6,396 ha in the Namon and Somboun Areas, and 4,022 ha in areas shared between villages and outside village boundaries.

Table 10-1 Agricultural Land Area

Category		Namon and Somboun Area	Sharing and out of Village Area	Total
Present	Permanent Farmland	1,039	149	1,188
Plan	Agroforestry (Ag)	6,396	4,022	10,418
	Fruit Orchard	1,116	65	1,181
	Pasture land	2,525	393	2,918
	Upland Rice A	2,755	3,564	6,319
	Slope Land Agriculture (Sa) B	777	363	1,140
	Dry Farm Land (Fl) C	993	358	1,351
A+B+C		4,525	4,285	8,810

It was identified on the basis of PRA that villagers desire to engage in orchard cultivation (1,181 ha) and livestock grazing (2,918 ha). Since this is to be carried out within the framework of the agroforestry systems, the real agroforestry area becomes 6,319 ha after subtracting those portions of the area which in effect will be used for orchard cultivation (1,181 ha) and livestock grazing (2,918 ha). In addition, 1,140 ha of slope land agricultural sites (Sa) and 1,351 ha of new field expansion (F1) in the agriculture zone will be developed under the Project.

In other words, the total area comprising agroforestry (after subtracting those portions to be utilized for orchard cultivation and livestock grazing), plus the area for slope land agriculture and new field expansion in the agriculture zone is 8,810 ha. Upland rice would be cultivated in this 8,810 ha area by permanent farming methods replacing slash and burn.

The results of PRA indicate that the present area of slash and burn sites is 356 ha in the Namon Area and 987 ha in the Somboun Area, for a total of 1,343 ha. In the "without project" case where slash and burn cultivation would be continued in the future as well, the annual necessary slash and burn area in the year 2008 would be a combined 3,085 ha for both area considering population growth and the supply and demand balance for rice (see Table 5-6-1). Assuming that slash and burn is performed on a 3-year rotational basis, the total amount of slash and burn area under this scenario, including fallow land, would total 9,300 ha.

The slash and burn cultivation practiced in the area over the years without soil conservation measures or use of compost has unmistakably undergone a drop in productivity. Production in recent years is reported at 1 ton/ha. On the other hand, the agroforestry and slope land agriculture considered under the Project to replace slash and burn proposes the construction of terraces, the use of compost inputs and the planting of leguminous tree species as a means of soil conservation. Since these soil conservation measures will serve to maintain soil fertility, retain soil moisture and add nutrients to the soil, this will not only enable perennial use of farmland but also can be expected to upgrade productivity by about 10%.

However, the fact that it will take some time for leguminous tree species to grow and for terracing to establish the appropriate slope gradient, maximum impact from introduction of the above measures cannot be anticipated in the first year of the Project. Also, it is difficult to precisely predict the degree of improvement in productivity which can be expected under the Project. Assuming that unit yield with the new farming methods is

the same 1 ton/ha as for the present slash and burn cultivation, then an area for agroforestry and slope land farming equivalent to that for slash and burn becomes necessary.

As determined from Table 5-6-1, the required area for slash and burn cultivation in 2008 without the Project is 3,085 ha. An equivalent area for the agroforestry and slope land farming to replace this slash and burn under the Project thus becomes necessary. However, if an additional 20% of farm land is developed to offset the reduction in effective cultivated area due to slope vegetation cover and terracing for the purpose of soil conservation, then 3,700 ha of farmland becomes necessary under the Project (3,085 ha x 1.2). In other words, if 3,700 ha of farmland for agroforestry, etc. is available in 2008, the supply and demand balance for rice would be maintained. Also, since the permanent farming does not need rotational cultivation, fallow land can revert back to forest, and the expansion in wasteland occurring under slash and burn will be stopped.

As discussed earlier, the total area for agroforestry, slope land agriculture and new field expansion in the agriculture zone is 8,810 ha. Of this total area, 3,700 ha can be allocated for upland rice cultivation, and the remainder planted with vegetables and trees.

(3) Increase in Water Flow in Dry Season

Current land use in the Model Area comprises 38% forest, 48% present and former slash and burn sites, and only 2% permanent farmland in the form of lowland paddy and upland fields. Permanent cultivation through introduction of new farming techniques such as agroforestry and slope land agriculture would put an end to slash and burn cultivation and allow fallow land to revert to forest. As a result, permanent farmland comprising present lowland paddy and upland fields, as well as the agroforestry and slope land agricultural sites to be newly developed under the Project, would account for 24% of the overall project area and forest area would expand to 65% of the total. This can be expected to increase river water flow in the dry season with corresponding improved water use during the dry season.

(4) Infrastructure Development

The infrastructure development project is formulated under the Plan, together with several rural community support programmes, aims at improving or constructing local roads, domestic water supply facilities and primary schools. It is believed that the standard of living in this area will be improved.

Immediate availability of domestic water supply is of high priority for children who are assigned the task of household water-fetching, as well as females who require a stable water supply for cooking and washing duties. Implementation of the programme to construct rural domestic water supply facilities will free these persons from a heavy labor burden. Also, local road improvement and construction under the Project will facilitate the transport and marketability of farm produce, resulting in increased household income.

(5) Securing Pasture Land

Traditional cattle husbandry in the area comprises open grazing of animals on raw pasture, with livestock owners essentially putting no special effort into animal raising. Accordingly, livestock rely on wild grass for fodder with a corresponding low productivity of animal husbandry. At the same time, there are numerous instances of livestock invasion of cultivated areas and damage to crops, posing a serious problem for local farmers. In order to mitigate such damage, some farmers conduct slash and burn cultivation in hinterland areas where livestock is not present. To address this, leguminous species of shrub would be introduced to improve grassland areas, and corralling of livestock would be achieved through hedge planting (including shade stands within the enclosures) under silvo-pastoral systems to be established under the Project. This will not only improve animal husbandry productivity, but allow for effective coexistence of crop cultivation and livestock raising by preventing animal damage to crops.

(6) Establishment of Bamboo Forests

Species of bamboo comprising secondary forest in former slash and burn sites have up to this time been of the dwarf type, with small diameter and low utility value. However, improvement of bamboo forests under the Project by introducing high utility species will serve to upgrade the value of this important resource. The sale of raw cut bamboo, or use in handicraft fabrication will open new ways for cash income on the part of farmers.

CHAPTER 11

RECOMMENDATIONS

CHAPTER 11 RECOMMENDATIONS

The Study has formulated a watershed management plan for forest conservation, with the participation of the local populace, in the Vangvieng district comprising a portion of the Nam Ngum Reservoir watershed.

The following recommendations are made in pursuing the envisioned Project under this Study.

- a. Since irrigation canal construction will upgrade agricultural production infrastructure, the existing construction plan in this regard should be carried out as planned.
- b. In the case of introduction of agroforestry systems, the stipulation on the number of planted trees (exemption from land tax where planting exceeds 1,100 trees per ha) should be modified.
- c. Precise demarcation of administrative boundaries, and land allocation should be aggressively pursued.
- d. In order to effect appropriate watershed management, an integrated approach is necessary which encompasses administrative sectors beyond just agriculture and forestry. To achieve this, close collaboration with relevant government agencies outside the Ministry of Agriculture and Forestry will be highly important.





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