Appendix 17
Study on Priority Schemes in Boloven Plateau Agriculture and Rural Development Project

MATER PLAN STUDY
ON
INTEGRATED AGRICULTURAL DEVELOPMENT
IN
LAO PEOPLE'S DEMOCRATIC REPUBLIC

VOLUME III

APPENDIX-17

STUDY ON PRIORITY SCHEMES
IN
BOLOVEN PLATEAU AGRICULTURE AND RURAL DEVELOPMENT PROJECT

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CHAPTER 1 INTRODUCTION

1.1 Objectives of the Review Study

This appendix report describes the result of the Review Study on the priority model schemes in Boloven Plateau Agricultural and Rural Development Project. The objectives of the study were to review the development and implementation plan of the priority model schemes. The Review Study was carried out during May to July 2001 within the framework of the "Master Plan Study on Integrated Agricultural Development in Lao PDR" that was conducted by Japan International Cooperation Agency (JICA) from November 2000.

1.2 History of the Project

(1) Master Plan and Feasibility Study in the Year of 1996

From March 1995 to September 1996, the JICA conducted a master plan and feasibility study on the Integrated Agricultural and Rural Development in Boloven Plateau (herein after called "the 1996 Study"). The 1996 Study aimed at the agricultural and rural development of about 136,000 ha of suitable net area excluding forest conservation and concession areas in the 7,000 km^2 of Boloven Plateau that is spanned over the three provinces in the southern Laos, say Saravane, Sekong and Champasak. The 1996 Study identified 16 model development schemes that will be implemented for 15-year period. A feasibility study was also made on the five priority model schemes, selected from 16 model schemes, taken as the first phase development.

(2) Request of Grant Assistance Implementation of the Project

In 1997, the Government of Lao PDR (GOL) requested the Government of Japan (GOJ) to implement three schemes out of the five priority model schemes on a grant aid assistance basis. However, the implementation of the three priority schemes has been left unrealized.

(3) The Review Study

Meanwhile, the socio-economic situation surrounding the Boloven Plateau area has changed drastically since the period of the 1996 Study, i.e. remarkable expansion of coffee cultivation for export and recent decline of coffee price, improvement of transportation including Pakse Bridge across the Mekong River, development of market oriented agriculture, etc.

The Master Plan Study on Integrated Agricultural Development in Lao PDR conducted by the JICA in 2000/01 reviewed the 1996 Study and its project formulation in Boloven Plateau in the context of Rural Development Framework. This Review Study aimed to assess the relevance of the development concept and strategy set in the 1996 Study, and to formulate an appropriate development plan, taking the above background and change of the socio-economic conditions for the last five years into account. The Review Study included the collection of the existing data and information, supplementary topographic surveys for the proposed farm to market roads and research and demonstration farms, and geo-hydrological survey for rural water supply in the priority scheme areas. In addition, a rapid rural appraisal was carried out to grasp the present socio-economic conditions and farmers' intention for development in the priority scheme areas.

As a result, the basic concept established in the 1996 Study is confirmed to be still applicable, and all the 16 schemes identified are proposed for the implementation within the frame of rural development. However, the project should be implemented on a step-by-step basis, starting from the priority schemes for which the present implementation capacity is available.

1.3 Review on Relevance of Basic Development Concepts of the 1996 Study

1.3.1 The Development Concept of the 1996 Study

(1) Development Objectives and Concept of the 1996 Study

The basic development objective of the project followed the priority development policy stated in the Third Five year Plan (1991-1995) of the GOL, and the overall

goal of the project was set as the substantial and sustainable upgrading of the living standard of the people in the area.

The project aimed the increased and stabilized agricultural production and the increase of the farmers' income. For the successful achievement of overall goal of the project, the development program on the improvement of agriculture and rural infrastructures, the strengthening of institutional and agricultural support services, and the improvement of marketing systems of agricultural commodities, etc were proposed. The detailed development programs were proposed as shown below by reflecting the specific characteristics such as altitude in the Plateau are.

(a) In the lower altitude area,
The improvement of agricultural infrastructure and the crop husbandry techniques for the increase food crop production,

(b) In the medium to high altitude areas,
The effective land use, the establishment of agricultural infrastructure, the increase and stabilize the cash crop production for income generation of farmers, and

(c) In the whole area,
The improvement of rural infrastructure, the improvement of living environment and techniques of the people for improvement of the living standards of rural people.

(2) Model Area Development Approach

The model area development approach was proposed in the master plan of the 1996, taking into consideration the implementation capacity of the GOL as well as the beneficiaries. The model area development approach was aimed at stepwise improvement of the capacity as well as the community development of the beneficiaries. The stepwise development was respectively set the first 5 years for the short term, the next 10 years for the medium term and further years for long term. The 16 model development schemes (21,400 ha) were proposed to implement for the 15 years in the master plan. Furthermore, out of the 16 model development schemes, the 5 priority model development schemes (4,420 ha) were selected for the feasibility studies. As the results of the feasibility study, the following promoting and supporting programs for the implementation of the 5 priority development schemes were proposed:

(a) Highland Crop Trial and Demonstration Station establishment project,
(b) Farm Product Whole Sale Market Establishment project,
(c) Rice Bank Establishment project

1.3.2 Development Policy and Strategy of Agricultural Sector of the GOL

(1) Objectives and Strategies of Agriculture Sector Development

The overall goals of agriculture sector development are the reduction of poverty and the raising up living standard of the people, and the GOL has issued the following objectives and strategies of agriculture sector development since 1991. The objectives and strategies of the each agriculture sector development plan are summarized below.

(i) The Third Five Year Plan

Since the establishment of the New Economic Mechanism in 1985, the GOL has promoted market-oriented economy, and the priority development objectives given in the agricultural sector of the Third Five-Year Plan (1991 to 1995) are to:

(a) ensure food self-sufficiency and food security,
(b) reduce the area subject to the slash and burn shifting cultivation,
(c) expand the agro-forestry-based industrial processing sector,
(d) improve the balance of payments,
(e) improve the transportation and telecommunication, and
(f) strengthen the administrative and managerial capability.

(ii) The Fourth Five Year Plan

The main development objectives of the agricultural sector given in the Fourth Five-Year Plan (1996 to 2000) are to:

(a) produce food for food security,
(b) stabilize the slash and burn shifting cultivation,
(c) promote cash crop production,
(d) develop agricultural infrastructure,
(e) strengthen economic situation,
(f) develop rural area,
(g) develop human resources, and
(h) strengthen the agricultural support services.

(iii) The Government's Strategic Vision on the Agricultural Sector

In 1998, the MAF prepared the Vision on Agricultural-Forestry Development 2020 based on the Fourth Five-Year Plan. And in 1999, the MAF formulated the Government's Strategic Vision for the Agricultural Sector.

The development strategies for flatland and sloping land are comparatively shown based on farming systems. The strategies on the category of sloping land to that the Boloven Plateau belongs, describe that the sloping land present a different set of problems due to remoteness, inaccessibility, endemic rural poverty, poor credit and capital accessibility and other factors. These include all the problems of

transforming shifting cultivation farming systems away from "low-input/low-output" systems in order to stabilize communities, enhance resources productivity, improve the socio-economic environment and minimize the degradation of the natural resource base. With increasing population densities in the sloping land areas, the present farming systems inevitably condemn sloping land rural people to continue poverty.

1.3.3 Review on the Development Objective and Strategies in the 1996 Study

The overall goals of the 1996 Study were the reduction of poverty and the raising up living standard of the people. And the objectives of the Study were the attaining food security, the diversifying agricultural activities, the promoting cash crops, the reducing shifting cultivation and the promoting settled farming system.

To achieve the above objectives, the programs to strengthen the management capacity of implementing agencies as well as the beneficiaries was proposed by means of the improving infrastructure and the developing human resources.

At present, in the Strategic Vision on agriculture sector, the basic policy of the sector development has been the market-oriented one in line with the national economic development policy. The overall goals of the agriculture sector development have been the reduction of poverty and raising up of the peoples' living standard, and the main objectives have been focused on to contribute effectively to attainment of the overall goal

Therefore, the objectives and strategies of the project in the 1996 Study are assessed as still keeping with the priority objectives of the sector.

CHAPTER 2 GENERAL CONDITIONS IN BOLOVEN PLATEAU AREA

2.1 Socio-Economic Conditions

The Boloven Plateau is located over the three southern provinces, say Champasak, Saravane and Sekong. The plateau is volcanic formulation of highland in altitude of 200m to over 1,200m, and blessed with ample rainfall, rather cool climate in the tropics. The plateau has a large potential for production of tea, coffee, and other tropical crops, fruits, as well as the temperate crops such as vegetables, flowers. It is rich in the picturesque scenery also.

2.1.1 Villages and population

The Boloven Plateau is composed administratively of Pakxong District (60%), and Bachiang District (10%) of Champasak Province, Saravane District (7.4%) and Laongam District (16.4%) of Saravane Province, and Thateng District of Sekong Province. The number of concerned villages was 399, with 26,430 household and 140,200 population in 1995.

Province	District	1995		2000		2000/1995 (%)	
		HH	Population	HH	Population	HH	Population
Champasak	Pakxong	7,746	41,758	9,047	49,860	114	115
	Bachiang	4,695	22,275	6,867	36,590	146	164
Saravane	Saravane	3,377	20,623	9,997	53,000	296	257
	Laongam	7,914	41,122	8,366	51,000	106	124
Sekong	Thateng	2,702	14,403	4,007	23,008	148	160
Total	5	26,434	140,181	38,274	213,458	145	152

Source: Data in 1995 were of M/P、in 2000 were obtained from the concerned district offices.

The population growth after 1996 M/P is as given in the table above. The average growth rate for the all districts is estimated at 8.8 %/year. The growth rate is the highest in Saravane district followed by Bachiang and Thateng districts, but these growths must be due to immigration besides the natural growth. The lowest is that in Pakxong district of 3.6 %/year. According to the data, it is clear that the population growth has been maintained at quite high level.

2.1.2 Land Resources and Land Use

The 1996 Study area is 654,100 ha. The suitable land for agricultural development by altitude were as given in table below.

（Unit：ha）

Altitude	Study area (%)	Suitable for agricultural develop't	Gross suitable area (%)	Concessio n area	Gross develop't area	Net develop't area
1,000m over	149,300 (23)	102,900	49,500 (24)	19,000	30,500	22,900
600～1,000m	271,700 (42)	142,900	79,700 (38)		79,700	59,800
400～600m	77,300 (12)	48,500	26,200 (12)		26,200	19,700
200～400m	155,800 (24)	96,100	55,200 (26)	11,000	44,200	33,200
Total	654,100 (100)	390,400	210,600 (100)	30,000	180,600	135,600

Notes：The gross suitable area is estimated by excluding the forest conservation area and etc. from the study area. See M/P for detail.

The gross area of 180,600 ha (135,600 ha in net) was estimated for the agricultural development in the plateau.

2.1.3 Area of Main Crops

(1) Crop Area in Year 1994 and 2000

The areas of the main crops in the Boloven Plateau in 1994 and in 2000 are given in tables below.

Year 1994 （Unit: ha）

Crops	Pakxong	Bachiang	Laongam	Saravane	Thateng	Total＊
Coffee	16,100	560	6,700	50	970	24,380
Tea	380					380
Lowland rice	240	540	460	2,390	270	3,940
Upland rice	710	2,260	4,700	160	1,110	8,900
Cardamom	760	650	1,400	30	280	3,120
Vegetables	400					400
Fruits		640	580			1,220
Total＊	18,590	4,650	13,840	2,630	2,630	42,340

Source：Based on 1996 M/P. ＊：The some figures are slightly different from those in M/P due to round up.

Year 2000 （Unit: ha）

Crops	Pakxong	Bachiang	Laongam	Saravane	Thateng	Total	Year 2000/year 1994%
Coffee	24,480	2,460	15,460	390	3,080	45,870	188
Tea	195					195	51
Lowland rice	230	1,250	1,300	16,220	1,480	20,480	525
Rainfed	230	1,070	1,200	14,350	800	17,650	
Irrigated		180	100	1,870	680	2,830	
Upland rice＊			5,320	10		5,730	64
Cardamom	404	1,130	2,390	90	620	4,634	149
Vegetables	760	NA			150	990	248
Fruits	NA	2,300	5,360	110		7,770	637
Total	26,069	7,140	29,830	17,300	5,330	85,669	202

Source: concerned DAFOs.

＊: The area of upland rice showed distinct decrease as seen in the table. But this figure shows decrease in shifting cultivation, the actual upland rice cultivation area must not be so decreased.

(2) Crop Area in Year 2000 and Target of M/P

The development target areas of main crops in 1996 M/P and the actual crop area

in year 2000 are as given in the table below.

（Unit：ha）

Crops	Year 1994	1996 M/P	Year 2000	Increase	Against target (%)
Coffee	24,380	59,380	45,900	21,520	77
Tea	380	1,380	200	-180	
Lowland rice	3,940	40,280	20,500	16,560	51
Upland rice	8,900	700	5,700	-3,200	39
Cardamom	3,120	800	4,600	1,480	
Vegetables	400	5,710	1,000	600	18
Upland crops＊	*	22,360	NA		
Fruits	1,220	5,000	7,800	6,580	156
Total	42,340	135,700	85,700	-	63

＊：The data in the concerned districts are not well arranged for the upland crops.

The 1996 Study proposed to increase total agricultural land in four times, decrease upland rice area to 700 ha for 15 years. Develop 40,000 ha of irrigated lowland rice including the existing rice field of 3,900 ha. Expand the existing coffee area of 24,400 ha to 59,400 with 10,000 ha of irrigation development.

According to the crop area data obtained through the concerned DAFOs for year 2000, the total agricultural land increased in two times or achieved 63% of the target of M/P. The coffee area in year 2000 is 45,900 ha and which already achieved 77 % of the target M/P. The crop area of tea was decreased to about a half of that in 1994. The area of lowland rice increased in four times or achieved 50% of the target, but the majority of the area is rainfed rice field, and the irrigated rice field is 2,830 ha or 7.4 % of the M/P. The achievement of decrease the upland rice area is less than 40 % of the target. The area for vegetables increased in two times, mostly due to extension of vegetable cultivation in other district besides Pakxong District, but only 20 % of the target. The area for fruit trees has been expanded very rapidly; this is mainly due to expansion of banana plantation in the low altitude areas in Bachiang and Laongam districts.

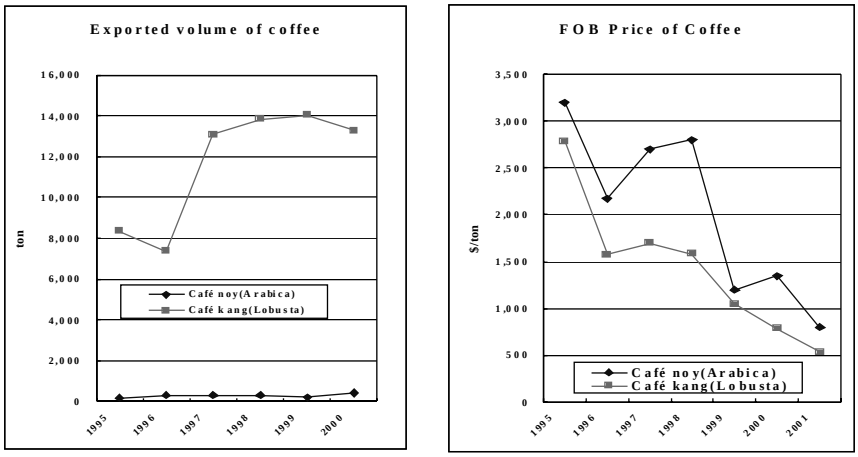
(3) Sustainable Farming Techniques

As a whole, the agricultural land has been increased in very high rate comparing to the development target of The 1996 Study. On the other hand, the area of upland rice and Cardamom based on the slash and burn shifting cultivation is totaled in 10,000 ha. The area for upland crops and vegetables has not been increased well, and irrigation development for rice and coffee has not been achieved the target. These facts show that the establishment and extension of the settled farming system techniques have never been achieved.

2.1.4 Price of Coffee

(1) International Price and Exported Volume of Coffee

The coffee has become the largest farm produce in the Boloven Plateau that has achieved about 80% of the target set in 1996 M/P. On the contrary the price of coffee has been stagnated for these years and the coffee farmers have been affected in their household economy especially in the monocultural area of coffee. The exported volume of coffee from Laos and the international prices of coffee (FOB Thailand) in these years are as shown in the figures below.

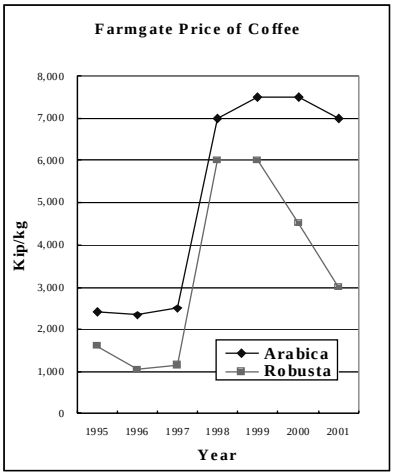


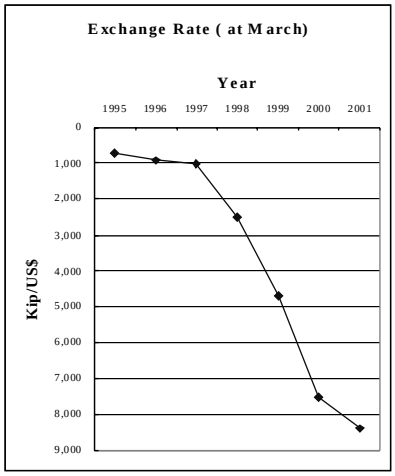
Source：Lao Coffee Exporters Association, Pakse, May 2001.

The exported volume of Robusta coffee was increased from 8,300 ton in 1995 to 14,000 ton in 1999. The exported volume of Arabica coffee was increased from 150 ton in 1995 to 420 ton in 2000. While the international price of coffee has been stagnated at low level of US$1,050/ton in 1999 and US$790/ton in 2000 and US$ 540/ton in May 2001 for Robusta coffee that shares 97% of the produce of the Boloven Plateau. The price of Arabica coffee is also has become as low as US$800/ton in 2001.

(2) Farmgate Price of Coffee

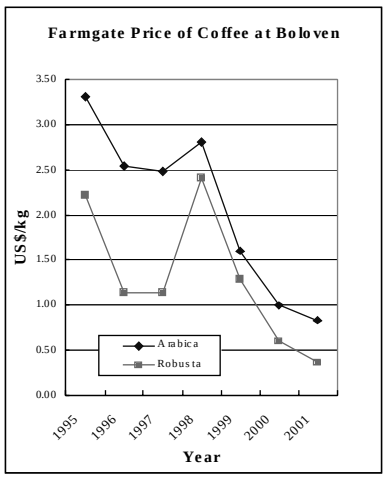
The farmgate price of coffee in the Boloven Plateau has been affected by the stagnation of the international price as shown in the figure below.





Source：Lao Coffee Exporters Association, Pakse, May 2001.

In the above figure it shows rapid increase in the farmgate price, but it is due to the devaluation of the exchange rate of Kip to US$. The actual price fluctuation of the farmgate price of coffee is as shown in the figure left. The farmgate price of Arabica coffee in May 2001 is about one fourth of that in 1995, and one sixth of Robusta as well.



2.1.5 Crop Diversification

The 1996 Study proposed crop diversification to avoid adverse affect of the price fluctuation of coffee to the household economy of farmers. The many farmers in the coffee monocultural area have affected by the price stagnation of coffee. They have arranged credit from APB for expansion of the coffee area, and now

they need more loans to purchase their food (rice), and most of the loans have not repaid. It is urgent matter to promote crop diversification to solve the monoculture of coffee by introducing of other cash crops or food crops, and to establish the settled sustainable farming systems.

2.2 Agricultural Support Services

2.2.1 Government Organizations Concerned

(1) Roles of PAFS

The PAFS, which is organized under the provincial Governor, has responsibility to extend agricultural support services and provides technical assistance to DAFO following the national policy. Main roles of the PAFS are administration on agricultural and forestry activities, development of agricultural infrastructure, development and extension of technology on agriculture, forestry and livestock and issuance of land title to individual person and juridical person.

(2) Staff of the 3 PAFS concerned with the project implementation

The project has been proposed in the 3 provincial areas of the Champasak, Saravan and Xekong. Staff of the each PAFS is summarized in Table 2.2.1, and comparatively analyzed the number of staff by the grade of staff as shown below.

（Unit：person）

Province	Champasak		Saravane		Sekong	
Total staff	530	3	300	2	155	1
Staff/district	53.0	3	37.5	1	38.8	2
Staff/10,000 rural population	10.6	3	1.4	1	6.4	2
Bachelor/district	2.8	3	1.8	2	1.0	1
Diploma/district	7.5	2	4.4	1	7.8	3
TC/district	34.6	3	21.0	1	25.8	2
TAFE/district	7.7	2	10.4	3	4.3	1
Staff for research station	18	3	0	2	0	2
Staff for RDP in Boloven Plateau	4	3	4	3	2	2
Total score	-	25	-	16	-	16

The Champasak PAFS has more advanced management capacity for the project implementation among the 3 PAFS, based on the temporary score evaluation.

2.2.2 Activities of Agricultural Research and Extension

(1) Activities of Research

Agricultural research institutes closely concerned to the agricultural development in Boloven Plateau are:

(a) Fishery Research and Extension Station,
(b) Fruit Tree Research Station,

(c) Nonghine Livestock Research Farm,
(d) Upland Multiplication Station in Palay,
(e) Coffee Research Center, and
(f) Phone Ngham Rice Seed Production Station.

The Coffee Research Center belongs to the NAFRI, and the Phone Ngham Rice Seed Production Station is under the LAO-IRRI Rice Project. The others are under the management of PAFS of the Champasak Province.

The Ban Itou Coffee Research Station has a plan to strengthen its activity particularly on the soil fertility management including application of manure not only for coffee but also for other food crops in the Boloven Plateau.

The Center has strong intention to expand its farm area in the high altitude more than 1,200 m where is marginally suitable area for coffee plantation mainly due to frost damage.

(2) Activities of Research and Extension

Activities of the agriculture research stations, which belong to the PAFS of Champasak Province, have been stagnated with less improvement since the time of the 1996 Study.

The diversified farming system has not been satisfactorily extended in the mono-cultural area of coffee, and further more, the settled farming systems is not extended for the reduction of shifting cultivation. The shortage of the human resources and stagnation of the extension work cause the delay of development progress of both the farming systems. The activation of the research work and development of the human resources are the indispensable problems to be solve for promoting development in the Boloven Plateau as proposed in the 1996 Study.

2.2.3 Agriculture Credit

Agriculture Promotion Bank (APB) has been organized to provide the formal agricultural credit since 1994. The individual farmer, farmers' group and agricultural trading company are the possible borrowers of the credit. The branch office of APB is located at Pakse town of the Champasak Province and at Saravane town of the Saravan Province. In the Boloven Plateau area, a sub-branch office of APB Pakse branch office is located in Pakxong

The majority of loans have been for expansion of coffee plantation in the Boloven Plateau area. However, farmers are now facing problems of price stagnation of coffee and they borrow loans to buy rice.

2.2.4 Technical Supporting Services on Water Management

Extension of irrigation facilities and technique is significant steps to increase agriculture production and quality. Most of farmers as well as extension workers are not well familiar with the irrigated lowland rice cultivation and technology of water management in the Boloven Plateau area due to insufficient experience and less knowledge on irrigation. In case of irrigation project, water user association has not been satisfactorily functioned well.

For instance, in case of Palay irrigation development project, which was completed construction work in 1996 for 150 ha of lowland rice cultivation (50 ha in the dry season) under management of the PAFS of Champasak Province, the water users' association (WUA) was newly established in February 2001.

The 4 village governments concerned have held the meetings of the farmer groups before the establishment of the WUA. The farmer groups have met problems on water management. One of the reasons that hinder the establishment of the water user association is to be due to incomplete development of the on-farm irrigation facilities, which were rendered onto the beneficiaries' shoulder. In addition, less knowledge of farmer was one of the reasons. Agricultural support service needs to develop the on-farm irrigation facilities as well as the establishment and operation of the water users' association.

2.2.5 Agriculture Supporting Services of other project in Boloven Plateau

The Rural Development Project in Boloven Plateau, which has been undertaken by the GOL with technical assistance of the French Government, has taken agriculture support services in the Boloven Plateau area since the year of 1997. The project has been composed of five programs of (i) promotion of coffee production, (ii) promotion of food crop production, (iii) promotion of farmers' organization, (iv) promotion of livestock production, and (v) development of rural infrastructure. The programs have been implemented in the selected farmers in one (1) village. At present, the 126 villages are the focal points. The promotion of food crops is, taking into consideration the disadvantage of monoculture of coffee, lowland rice, peanuts and vegetables.

2.3 Marketing System and Organization

The agricultural produce in the area is basically marketed under the free marketing system.

(1) Marketing of Coffee

Coffee, the main produce of Boloven Plateau, is marketed through the rather systematically organized marketing system formed by traders and exporters. The collecting agencies at village level are mostly farmer. The Lao Coffee Exporters Association has been established at Pakse in 1994 to promote the fair trading of coffee, 27 member companies are registered and the floor price of coffee at the farmgate etc. are discussed by the association.

(2) Marketing of Vegetables

Cabbage, Chinese cabbage and cucumbers are the most common vegetables in the area. The main marketing route of these vegetables is from individual farmer to the middleman. The middleman sales vegetables to the traders in Pakse. There are no cooperative activities of farmers for marketing the vegetables in the area. The farmers have less bargaining power to formulate the farmgate price of the vegetables. It was observed that some vegetable farmers send vegetables by them using tillers to Pakse or Xong Mek market directly. Some times vegetables are sent mostly to Thailand by several large lorries at once.

(3) Marketing of Farm Inputs

There are parallel route of marketing of fertilizers, namely the government route that deals with the foreign assisted materials, and the private route that deals with the most of farm inputs, chemicals and machinery etc. The fertilizers by the government route are mostly tied up with credit of APB. Most of farmers buy seed of cabbage at the Thailand border.

(4) Farm Produce Exported through Quarantine

The farm produce exported through the plant quarantine system of PAFS Champasak Province is as given in the table below.

（Unit：ton）

Produce	1996	1997	1998	1999	2000
Coffee	6,809	14,664	16,186	16,464	19,743
Cardamom	162	197	576	143	79
Peanuts	152	108	28	15	6
Banana	1,308	3,221	3,080	292	70
Cabbage	372	219	1,099	775	716

Source：Crop Section of PAFS, Champasak Province, May 2001.

The exported volume of banana and cabbage was drastically decreased since 1999 in the above statistics, but it seemed to be exported without passing the quarantine

service of Champasak Province.

2.4 Price and Quality of Farm Produce

(1) Quality of Coffee

The Robusta coffee that shares 97 % of coffee in the Boloven Plateau is mostly processed with dry method. The farmers are recommended to dry using concrete floor or bamboo mat, but majority of them dry coffee on the ground directly and deteriorate the quality. The French assisted project recommends the wet method for Arabica coffee.

(2) Quality of Vegetables

Cabbage is transported in bulk and careless handling and resulted in high loss on the way of farm to market. Generally farmers and traders pay less attention to reduce loss of produce both in quality and quantity. It is strongly recommended that the producers and traders should be trained about quality and loss of the produce.

(3) Seasonal Price Fluctuation of Cabbage

According to information by farmers the price of cabbage fluctuates seasonally in the wide range, 3,000 Kip/kg to 150 Kip/kg, and some times no price is formed. Generally the high price is observed around the end of dry season to the beginning of the wet season (April to June), and the end of the wet season (September to October). But in 1999 the price in that season was quite low might be due to over production.

2.5 Rural Infrastructures

2.5.1 Rural and Market Roads

After the 1996 Study, rehabilitation of rural roads such as the National Road No. 13 in Champasak Province, the road sections Pakse-Pakxong-Sekong of the National Road No. 23 and the road sections, Tateng-Xekong of the National Road No. 16 has much been of progress. The rehabilitation work of roads has given significant impacts to regional economy and communication of the Boloven Plateau area.

At present, it can access to Sekong within 3 hours from Pakse by car because of completion of rehabilitation works of road sections, Pakxong-Sekong of the National Road No. 23. Furthermore, other road sections Savannakhet-Pakse of

the National Road No.13 is under rehabilitation and is scheduled to complete rehabilitation works of these road sections in 2003. Therefore, it is possible to connect within about 9 hours between Pakxong and Vientiane by car after the year of 2003.

On the other hand, accomplishment of the Pakse Bridge across the Mekong River has given better access conditions to Thailand for marketing of agricultural products in the Boloven Plateau. It takes only half-hour to Xong Mek City located in Thailand from Pakse City. It is expected very easy access to the Boloven Plateau area from Thailand, Vietnam and Cambodia after the year of 2003 and very aggressive marketing activities in the Boloven Plateau area.

As for rural road development which were secondary roads of road networks in the Boloven Plateau, some feeder roads have been constructed in the Boloven Plateau area before 1996 under the upland agriculture development project for the marketing and extension activities of coffee. Furthermore, the 3 rural roads have been constructed as of the year of 2000 under the rural development project undertaken by the GOL with the technical assistance of the French Government. Total length of the rural roads is approximately 43 km, which are expanded in Pakxong District of 29 km, Laogaum District of 12 km and Tateng District of 2 km.

2.5.2 Existing Irrigation Schemes

(1) Irrigation Scheme around Boloven Plateau

Slash and burn shifting cultivation farms dominantly expand in the Boloven Plateau area and only two typical irrigation schemes, namely Palay Irrigation Project and Tong Vay Village Irrigation Project have been constructed. The Champasak PAFS directly has managed the 2 schemes.

According to the Irrigation Division of the Champasak PAFS, the irrigation conditions of the 2 schemes are summarized below.

(i) Palay Irrigation Project

The Palay irrigation project aims to implement double rice cultivation with crop intensity of about 130 % in irrigation area of 150 ha. The project has been managed under the Irrigation Division of the PAFS. Irrigation facilities consists of concrete weir, main and secondary canals of approximately 8 km and tertiary canals. Irrigation facilities excluding tertiary irrigation canals were constructed by the PAFS, and construction of tertiary canals was entrusted to farmer groups under technical guidance of the PAFS. Construction of the project was completed

in 1996, but the WUA was established in February 2001 through participatory approaches.

At present, main and secondary canals are deteriorated due to poor maintenance works, and the leakage of irrigation water is identified in many places of the irrigation canals. Tertiary canals have been unsystematically and ineffectively constructed. Irrigation water supply was carried out paddy field by paddy field.

In the dry season, the project has met severe problems to carry out proper water supply to all farmer groups. These conditions are caused due to the following problems:

(a) Construction of tertiary canals was entrusted to farmer groups, who have not any knowledge and experience on irrigation,
(b) The PAFS and DAFO have not carried out sufficient technical guidance on construction of tertiary canals to farmer groups.

(ii) Tong Vay Village Irrigation Project

Irrigation facilities, especially intake structure and main canal have been severely damaged by flood. The corruption was mainly caused due technical reasons on design and poor management of construction supervision. The PAFS has recognized the reasons of the corruption of irrigation facilities and understood the request on urgent rehabilitation of the irrigation facilities. But, the PAFS could not prepared sufficient budget for the rehabilitation works for these 4 years. Farmer groups have tentatively rehabilitated the irrigation facilities once under instructions of the village chief, but it resulted that irrigation water supply can not fully delivered in all irrigation area. At present, the WUA is not established.

(2) Water User Association in Champasak Province

The Champasak PAFS has irrigation 297 schemes, and total irrigation area attains approximately 19,230 ha. WUA has been established in the 288 schemes (17,400 ha) as of the year of 2000 to follow Technical and Management Guidelines on Water User Association prepared by the MAF. The Irrigation Division of Champasak PAFS has considered the following matters on water management and establishment of WUA.

(a) Necessity of planning on irrigation development with farmer's participatory approach
(b) Upgrading of engineering aspects on planning, design and construction supervision
(c) Upgrading of plan and skill on water management
(d) Upgrading of staff qualification, especially extension workers and irrigation engineers

The Irrigation Division of the PAFS has already prepared and submitted training program on the matters mentioned above for local Government officers concerned, extension workers, and key farmers for the 5-year from 2001 to 2005 and is requesting approval on the budget of the program.

2.5.3 Rural Water Supply

The JICA Study on Groundwater Development for Champasak and Saravan Province has constructed rural water supply systems at the 200 villages located in the Laogum District and low land of the Se Done River and the Mekong River until the year of 2000. The rural water supply facilities consisted of tube well and hand. The rural water supply has given significant impact to improvement of living standard of rural people.

In accordance with the Study Report "Hydrogeology of Champasak and Saravan Provinces in Lao PDR, 1995", the potential of ground water has much different yield due to complicate structures of geology in the project area. Water quality of ground water is generally no objections for drinking use. It has identified that contents of a few chemical factors such as Iron and Manganese are over than allowable contents authorized by the Water Quality Standards of WHO, but the contents do not affect the health of human being.

On the other hand, the Rural Development Project in the Boloven Plateau, which has been undertaken by the GOL with technical assistance of the French Government has also developed rural water supply at the 21 villages. Water resources of the rural water supply are deep ground water of 40 sites and spring water of 7 sites. The project has tried to organize farmer association through the construction of rural water supply system and the establishment of water user groups.

2.5.4 Village Electrification

Houay Hou dam was constructed in the upper stream of the Houay Hou River in 1998 under BOT management.

. The Dam is located in the southern-west area of the Boloven Plateau. Generation of hydropower of 115 MW has been carried out and sold to Thailand.

In line with the hydropower development, village electrification has also developed on the private and government bases in the Plateau area. The Lao Electricity Company (EDL) of Champasak Province has a village electrification program for the 4 years from 2001 to 2004, namely Southern Province Rural Electrification Program (SPREP), and the village electrification is scheduled to

expand in 127 villages of 10 districts until the year of 2004. The program started in 2001 and is being implemented in some areas of the Pakxong District.

2.5.5 Marketing Facilities

Agricultural products in the Boloven Plateau such as coffee, vegetables, other cash crops has aggressively flowed out to the local markets of the Plateau, the main towns of the southern area of Lao PDR and Thailand for the recent years. Because rural roads and National Road have been drastically rehabilitated in and around the Plateau area, and farmers' business mind have been gratefully stimulated by coffee marketing around 1995 to 1998.

Local market facilities have been being renovated in Pakxong. Other market facilities have been constructed at Tateng and Village km 20. Furthermore, the existing 2 local market facilities of Pakse have been being reconstructed, and new market facilities were constructed near the Pakse Bridge. In addition, other new market facilities have been constructed at branching point of the National Road No. 13 to the National Road No. 23.

CHAPTER 3 PRIORITIZATION FOR IMPLEMENTATION OF THE PRIORITY MODEL SCHEME

The three priority model schemes, for which GOL requested GOJ the financial assistance for the implementation in 1997, are: namely Upper Champi Scheme in Champasak Province, Upper Kapheu Scheme in Saravane Province, and Upper Tayun Scheme in Xekong Province. In the Master Plan Study in 2000/01, the basic development concept and development strategy proposed in the 1996 Study were reviewed, and the relevancy of project formulation was proved appropriate especially from the viewpoints of the development policy, socio-economic and agricultural constraints, rural requirements, implementation capacity, etc.

The Review Study in the said Master Plan re-assessed the prioritization for implementation of five priority model schemes from viewpoints of management capacity of the executing agency and field conditions for application of development technology such as the crop diversification and the settled farming.

The executing agency for the implementation of the model scheme will become the each PFAS. According to the comparison of the number and educational background of the staff and engineers of the each PAFS, it can be evaluated that the Champasak PAFS has more advanced management capacity for the implementation among the 3 Provinces. And, then the Review Study resulted to give the highest priority of the implementation to the model schemes located in the Champasak Province area. The implementation of the five model schemes divided into the two stages, i.e. the 1st slice implementation and the 2nd slice for the priority model schemes. Of the five model schemes, two schemes are selected as the 1st slice implementation, and the rest three schemes for the 2nd slice. The two priority model schemes are the Upper Champi Scheme and the Upper Tapoung Scheme as shown below.

Priority Projects	Province	Requested by GOL in 1997	Selected in Review Study
Upper Champi Scheme	Champasak	○	○
Upper Tapoung Scheme	Champasak	—	○
Upper Kapheu Scheme	Saravane	○	—
Lower Xe Set Scheme	Saravane	—	—
Upper Tayun Scheme	Sekong	○	—

The Upper Tapoung Scheme area is located at the high land with an altitude of 1,200 m to 1,260 m and has cool climate conditions. Coffee plantation is

sometimes suffered from heavy frost in the dry season due to the altitude and climate. Additionally, low price and yield of coffee also severely affected farmers' income. The highest demand on agriculture in the Scheme area is extension of technology on crop diversification to earn enough income for daily life as well as the settled farming in the slash and burn shifting cultivation area for sustainable agriculture production.

The Upper Champi Scheme area has been covered by the monoculture area of coffee and has advantageous location for marketing of coffee and other crops. However, the farmers have severe problems on the marketing of coffee due to low price of coffee and low quality of agriculture products, which were suffered from the damaged market roads. The highest demand is also the same as the demand of the Upper Tapoung Scheme.

Therefore, it can be evaluated that the effects derived from the two priority model schemes are expected to be high for the coffee mono-culture areas prevailing in the Boloven Plateau in both the needs of quality improvement of coffee products and crop diversification

CHAPTER 4 PRESENT CONDITIONS IN AND AROUND THE TWO PRIORITY MODEL SCHEME AREAS

4.1 General

The location of the selected scheme areas are as shown in the Location Map. The socio-economic condition and the farmers' intention for the development in the concerned villages was surveyed by applying the Rapid Rural Appraisal method for two sample villages in each area. The survey result is as summarized in Table 4.1.1. The general conditions in the project areas in 1995 and at present (2001) are summarized in the table below.

Project area	**Upper Champi Area**		**Upper Tapoung Area**	
Altitude（m）	900-1,200		1,200-1,260	
Gross development area（ha）	870		100	
Year	1995	2001	1995	2001
Number of village	8	8	3	3
Number of HH	770	1,046	260	354
Population (person)	4,730	7,260	1,480	1,830
Agricultural condition（HH）	Coffee only:49% Coffee/Tea:50% Total coffee area in 8 villages :1,627ha、Area of tea:254ha	Coffee only:95% Coffee/Tea:5% Total coffee area in 8 villages :2,462ha、Tea area:117ha	Coffee only:28% Coffee/Tea:62% Total coffee area in 3 villages: 430ha 、Vegetable area:134ha	Coffee only:0% Coffee/vegetables:100% Total coffee area in 3 villages:746ha 、Vegetable area:136ha Upland rice is continued
Condition of the land for development（ha）	Coffee:460ha Tea:130ha	Coffee:700ha＊ Tea:60ha＊	Most of area is fallow wild grass owned by villages	Most of area is fallow wild grass owned by villages. Some parts were allocated to villagers.
Constraints for development, problems	Water deficit for coffee、 Low quality of coffee,、 Frost damages for coffee, Short in agricultural techniques.	Low price of coffee, Low yield of coffee, Water deficit for coffee, Low quality of coffee	Water deficit for vegetables, Short in agricultural techniques	Low price of coffee, Low yield of coffee, Water deficit for vegetables, Low price of vegetables, Low yield of crops by short fallow period
Rural water supply	Gravity-pipe x 2, Shallow well x 1	Total 69 deep wells in KM36、38	No wells, all using river water	Total 44 deep wells in 2 sample villages

Source：Table 4.1.1 Village Profile, and Village Condition in 1995 in M/P.
Notes: HH stands for household.

4.2 Population and Number of Household

The annual growth rate of population and number of household in Upper Champi area from 1995 is estimated at 8.8 % and 6.9 % respectively. And that in Upper Tapoung area is 4.3 % and 6.2 % respectively.

4.3 Change in Agricultural Condition

The agricultural condition has been changed in these five years. The coffee area expanded 51% and 73% in Upper Champi and Upper Tapoung areas respectively. In Upper Champi area, the rate of coffee monoculture farmers increased from 49 % to 95 %. In Upper Tapoung area, the rate of coffee monoculture farmer decreased from 30 % to 0 %, and all of farmers cultivate coffee and vegetables. This phenomenon is seemed to be that the farmers in the area have been affected by the coffee price stagnation and been required to earn cash to buy food (rice). The coffee area in Upper Tapoung is still under expansion, but this may not be for produce of coffee but for to keep right of land title.

4.4 Land in the Scheme Area

The land in Upper Champi area has been mostly covered with coffee plantation. The land, which the trial and research farm of upland crops was proposed in the 1996 Study, has been distributed to individual farmer and covered by coffee plantation. On the other hand the land proposed for development in the Upper Tapoung area has been partly distributed to villagers, but the majority is still remained as it was.

4.5 Farmers' Intention for Development

According to the rapid rural appraisal, the agricultural problems and the needs mentioned by the farmers are slightly different by scheme area. The results of the survey are summarized below. The detailed is shown in Table 4.1.1.

(1) Upper Champi area：

(i) The water deficit problem for flowering of coffee is still remained as mentioned in The 1996 Study. Irrigation development is requested by the farmers to improve and stabilize yield and quality of coffee.

(ii) The farmers have recognized that the reason of low price of coffee is due to low international price, but on the other hand they think that may be due to low quality because of shortage of techniques, and they request practical

training to improve quality of coffee.

(iii) The farmers requested coffee-farming techniques such as pruning, soil management and so on.

(iv) The farmers requested market information for promoting crop diversification from monoculture of coffee.

(v) The villagers requested improvement of school building to promote schooling for the children.

(vi) The villagers requested improvement of village community hall to facilitate the participation of the people to the village activities.

(2) Upper Tapoung area：

(i) Considerable number of farmers cultivate upland rice (50 ha) due to shortage of cash to buy food (rice). The upland rice cultivation is mostly carried out field under few years fallow period. Then the yield has become very low especially due to weed. They have become to apply plowing by tractor.

(ii) Unstable price of vegetables: The farmers sell vegetables on the roadside to the middleman visiting their farm. The farmers have less information on the price of produce and have less bargaining power. The farmers have no means to participate to formulate fair price of produce.

(iii) It is essential to train the farmers to use appropriate application of pesticide to avoid disastrous damage and to attain safe produce.

(iv) The maize cultivation is expanded in this area for the purpose to supplement the food (rice) shortage. Green corn is marketed so frequently in and around the area.

(v) The villagers requested upgrading of school building with electricity and water supply and toilet.

(vi) The villagers requested improvement of village community hall to facilitate the participation of the people to the village activities.

4.6 Constraints and Demand of Agricultural Development

As the results of the Review Study, the constraints and demand of agriculture development are summarized below.

(i) Slash and burn shifting cultivation

The slash and burn shifting cultivation is still being practiced with the same scale as in 1994. The Government has declared to stop the slash and burn shifting cultivation by 2005 as the national strategy. Therefore, farmers, who have earned livelihood by slash and burn shifting cultivation, have to carry out rotational farming management in the already deforested areas where a short-term cycle rotational farming is only possible. Therefore, they are facing serious problems

how to obtain sufficient foods and agriculture products for their living under these conditions.

The local Governments have also been providing various extension activities on the alleviation of slash and burn shifting cultivation to farmers in the Boloven Plateau showing new trials to sustain sufficient and stable agriculture product for the farmers. But, the extension of technology on alleviation of slash and burn shifting cultivation is still poor. Extension of the technical support services such as the establishment of technology on the settled farming system, is high demand and needs for the local Governments and rural people.

(ii) Sharp drop of farm gate price of coffee and necessity of crop diversification

Farm gate price of coffee has decreased by 75% in arabica coffee and 85% in robusta coffee in Boloven Plateau area during the period of 1995 - 2001 due to sharp drop of international price. The decrease of the farm gate price has severely affected to the income of farmers. The farmers are trying to change in their farming management and they strongly request the Government to extend the technology on crop diversification. It is recommended to strengthen current movement of crop diversification, for which tropical crops and food crops has been introduced into coffee farmers as inter crops.

(iii) Poor agriculture supporting services

Agricultural supporting services do not function satisfactorily due to shortage of qualified staff, shortage of operation fund, and lack of equipment. Farmers have not well known activities of agriculture support services undertaken by the local Governments. Agriculture supporting services should be strengthened from viewpoints of institutional development and human resources development.

(iv) Low quality of crops

This is one of bottlenecks to sustain higher market price. Improper management of post harvest has caused poor quality of crops. In addition, farmers themselves, middlemen and sellers are not much interested in quality of crops. It is necessary to improve technology of post harvest and increase awareness of farmers and middlemen regarding quality control.

(v) Over-supply and low market price of vegetables

Over-supply and low market prices of vegetables, especially cabbage, were take place in the dry season because many farmers cultivate the same vegetable mainly in their home gardens. It is necessary to introduce new techniques, especially adjustment of cropping pattern and more crop diversification to stabilize supply of vegetables all year-round.

4.7 Land Holding Conditions in Upper Tapoung Area

(1) Demonstration Area

(i) Land Allocation

Land allocation has been carried out in the proposed demonstration area since 1997, and but the allocation of land does not complete at present. In accordance with land holding survey carried out, and the following matters were identified.

(a) Land holding is broadly divided into 2 villages, namely Phoulankeo and Xetapoung, and lands of approximately 8 ha have been allocated to farmers of both villages with land title. Both villages keep the non-allocated land of about 84 ha. However, most of farmers have kept their territory areas around their registered area without land title.

(b) As the result of land holding survey, it is identified that 10 households occupy lands of 11 parcels. Total area issued land title is approximately 8 ha only. Land of about 50 ha is being used without land title.

(c) Location and detailed information of land holding conditions are respectively described in Figure 4.7.1 and Table 4.7.1.

(ii) Land Use

Some households have cultivated cabbage, upland rice, maize and coffee in their farm partially, but others have not planted any crops due to shortage of labor power.

(2) Areas along Main Canal Route

(i) Land Allocation

According to interview survey, all lands located along the proposed main canal have been already allocated to villagers. In the land holding survey, it was confirmed that lands of 38 parcels have some agricultural activities, and total area attains approximately 20 ha. But bush lands also extend in middle section of the same canal route. Conditions of land holding on bush area could not be clarified

well. In addition, one cemetery area was identified near middle section of the proposed main canal.

(ii) Land Use

Farms of upland rice, vegetables, others cash crops, aquaculture and coffee plantations are expanded in over 50 % of village area. 24 households of Xetapoung village are belonging to these agricultural activities.

4.8 District Road from Pakxong Town to Xetapoung Village

(1) Traffic Quantity and Loads

There is no data on traffic quantity of the District road from Pakxong to Xetapoung village. As the results of the interview survey to village people, traffic quantity is very small along the road from Pakxong to Xetapoung Village. But, heavy construction equipment and truck, which weight of car will be over 20 ton have run on the roads.

(2) Roles of Pakxong DCTPC

The Pakxong District Communication, Transportation, Post and Construction (DCTPC) consisting of one chief and 3 staffs has carried out monitoring activities of rural roads in Pakxong District area. Main roles of DCTPC are to monitor rural roads in the Pakxong District area and to make proposal on rehabilitation works of the damaged sections of roads to the Champasak PCTPC.

(3) Present Maintenance Plan of the District Road, Pakxong - Xetapoung

The Pakxong DCTPC has not prepared short-term action plan on maintenance works of overall rural roads in the Pakxong District area. It seems that the DCTPC has trusted all preparation works of maintenance plan to the Champasak PCTPC.

The Champasak PCTPC has not prepared the maintenance plan of the district road sections from Pakxong town to Xetapoung village yet.

(4) Present Conditions of Other Section of the District Road

Rural development in the Boloven Plateau project has improved in other sections of the same district road from Nonghing village located along the provincial road No. 23 to Xetapoung village in 1999. Other sections of the road have been rehabilitated through additional embankment and laterite pavement with drain ditches.

(5) Pakxong Bridge

(i) Historical Background of Bridge

The Pakxong Bridge was constructed approximately 30 years ago. The bridge had timber super structure of 3-span, and abutment and pier were stones. Total length is 26 m, and height of bridge is approximately 3.2 m from bottom of pond.

Replacement of super structure of bridge was carried out in 1985, and superstructure has improved berry bridge type with 2-span including construction of steel pier.

(ii) Present Conditions of Bridge

As the result of interview survey to the Champasak PCTPC and the Pakxong DCTPC, traffic load of bridge has been limited up to 15 ton previously, but heavy construction equipment and tracks, which the load would be over 20 ton, have several times passed on the bridge. Both abutments are still fine, but steel pier has been partially corroded.

4.9 Rural Water Supply in Village Areas

(1) Construction Mechanism of Tube Well and Operation of Water Supply

Water resource for water supply in the 3 village areas namely, Xetapoung, Houayxan and Poulangkeo is ground water and river water, and dominant water resource is ground water in the village areas. Villagers have constructed water supply system consisting of tube well with hand pump together with a few household groups. In this case, some rich households provided cash for construction, and other households participated to construction of water supply to supply manpower. Harmonious operation of tube well has been sustained within the each household group. But there is no technical assistance of local Governments such as Provincial and District Governments.

(2) Situation of Tube Well

At present, 88 tube wells have been constructed in the 3 village areas as shown below. In accordance with interview survey, most of these tube wells are shallow tube well with well depth less than 25 m. Water level of tube wells generally range within 10 m to 6 m.

Village	No. of Tube Well
Xetapoung	32
Houayxan	44
Poulangkeo	12
Total	88

(3) Water Quality of Domestic Use Water

Water sampling has been carried out at the 3 exiting tube wells located in the village areas, and quality analysis has been carried at water laboratory of Vientiane. Based on results of quality analysis, heavy toxins of chemical components have not been identified, but content of iron is more than 3 times of

the standard content defined by guidelines and standards of drinking water issued by Government of Lao PDR. The high contents of iron affect tap water conditions and not directly affects human health. Furthermore, many coliforms of more than 5 times of the standard are confirmed.

Therefore, water quality is accepted from viewpoint of chemical aspect, while it can be pointed out that water should be treated by some systems for drinking. The water laboratory recommends making boiling of water for drinking. The detailed results of water quality analysis are shown in Table 4.9.1.

(4) Ground Water Potential

Ground water survey had carried out drilling tube well of 51-m depth at the 3 tube wells namely No.1 (Phourangkeo), No.2 (Xetapoung) and No.3 (Kaphu) of the Tapoung Scheme during the Review Study. Furthermore, water quality analysis on sample water of the 3 tube wells had been carried out at laboratory of Water Supply Authority, Ministry of CTOC, Lao PDR. The following matters were clarified through the survey and laboratory analysis.

(i) Geological structures are of mixture with basalt boulder, basalt lava, black basalt and weathered basalt.
(ii) Stable aquifer is anticipated in the weathered basalt layers such as basalt boulder and black basalt, which are in depth of more than 30 m from ground surface.
(iii) Static water level ranges 12.75 m at No.1 tube well, 3.5 m at No.2 tube well and 13.3 m at No.3 tube well.
(iv) Transmissibility of the aquifer is very high of more than 1.5×10^{2} m^2/min at the 3 tube well as the results of pumping tests in case of both the tests such as constant discharge test and recovery test.
(v) Well yield can be estimated at more than 60 lit/min, because the pumping test has been carried out in rainy season and lack of capacity of the used pump.
(vi) As results of water quality analysis, all items for analysis do not exceed over the allowable content and it is evaluated that water is safety for drinking.

Based on these results, it was clarified that deep ground water can be used for rural water supply development in the Scheme.

4.10 Village Electrification around Upper Tapoung Scheme

(1) Demarcation of Village Electrification around Upper Tapoung Scheme Area

According to the information of Provincial Office of Lao Electricity Company (Electrificate Du Lao, EDL), village electrification in and around Upper Tapoung

Scheme area has been developed under the private sector base or being developed under Government base. The EDL has constructed and established main networks for village electrification along provincial road from Pakse town to Pakxong town under the Government base. The EDL has also implemented further village electrification along district road from Pakxong town to villages of Upper Tapoung Scheme areas under the short-term action program. The program has already covered electrification in the villages of Houay Xe, Xetapoung, Poulangkeo and others.

On the other hand, village electrification networks constructed by village peoples as private sector, extends in the 12 villages areas located approximately 2 - 11 km north from Village Km 36. Electric power has been delivered from Village Km 36 located along the provincial road from Pakse town to Pakxong town. The electricity network extends villages located approximately 5 km west from Poulangkeo village as shown in Figure 4.10.1.

(2) Southern Province Rural Electrification Program

According to the Southern Province Rural Electrification Program (SPRE) mentioned in the Section 2.4.1, village electrification in and around Upper Tapoung Scheme area has been covered under the SPRE. In accordance with implementation program of the SPRE, electric power supply is scheduled to start around the Upper Tapoung Scheme area in the middle of 2002. At present, some preparation works of village electrification such as transportation and stocks of concrete poles to string electric cables are carried out, and in some places of villages, concrete poles have been installed along district road from Pakxong to Upper Tapoung Scheme area as shown below.

(3) Mini-hydropower Facility in Pakxong

Mini-hydropower station has been constructed in Pakxong town and operated as of 1998. However, after accomplishment of village electrification in Pakxong town in1998, operation of mini-hydropower station was stopped. In accordance

with Provincial EDL office, the facility has been already handed over to District Governor Office, and they do not have any plan for operation of the mini-hydropower station.

4.11 Summary of Present Conditions of Infrastructures

There is a little difference physical conditions of rural infrastructure comparing to the field conditions in the 1996 Study.

A little development of water supply system and district road is identified as shown below.

(1) Upper Champi Scheme area

(i) District road increases about 1.3 km.

(ii) According to the rapid rural appraisal at village km 36 and km38 of the Upper Champi scheme, water supply using tube well have been slightly developed comparing to filed conditions in the previous survey. The tube well development has been dominantly carried out on private base of village people. But, village people need other tube well development for community use.

(iii) There is no development progress of the school buildings and community halls. Village people hopes to rehabilitate these facilities through donors' assistance.

(2) Upper Tapoung Scheme area

There is no development progress of rural infrastructures excluding water supply.

Water supply has been slightly developed on private base of village people. But, village people still need more development of water supply for improvement of their living standards.

4.12 Demand and Constraints of Rural Infrastructure Development

Considering present conditions and development progress of the each rural infrastructure mentioned above, the constraints and problems of development, development need and future counter measure after the construction of the each infrastructure are summarized below.

(1) Rural and Market Roads

The District Government has recognized the important roles of the rural roads as regional marketing roads. The Villages of Upper Tapoung and Upper Champi Schemes have a comparatively favorable location for local marketing in the Boloven Plateau and are connected with rural roads. Specially, road sections from

Pakxong town to Xetapoung Village (Upper Tapoung Scheme) and other road section from Village km 36 to Khot Noy Village (Upper Champi Scheme) are important for marketing activities for both the Schemes. But, some sections of these roads have been seriously damaged. The village people have met severe problems of transportation and marketing, especially quality control of agricultural products in the rainy season. Beneficiaries of the roads have complained and strongly requested urgent rehabilitation.

But, the Government could not reply to these requests due to the following constraints and problems.

(a) Lack of the qualified engineers and staff for maintenance works in the DCTPC
(b) Lack of management plan of the District Government for maintenance works
(c) Insufficient budget of annual maintenance works for rural roads

Taking into consideration mentioned above, it is recommended to implement the following counter measure since construction stage of the rural and market roads.

(a) Preparation of maintenance plan and strengthening District Government staff concerned to maintenance works
(b) Preparation of sufficient budget to carry out annual maintenance including establishment of self-management system after construction.

(2) Market Facilities

They also need small market facilities to strengthen bargaining of their agriculture product. At present, most of farmers have met marketing problems of vegetables in some seasons, and, some farmers have brought their vegetables to markets located at national border of Thailand. But, they could not participate in price formulation at the markets and not to earn good profit through their activities. They have not constructed the own market facilities due to the following constraints and problems.

(a) Lack of budget of construction of market facilities and supporting organization
(b) Lack of knowledge on marketing and market management

To prevent similar problems on marketing in and around Upper Tapoung Scheme area after construction of the proposed market facilities, it is recommended to carry out training of market user groups and village Government staff for management and operation works including maintenance works.

(3) Rural Water Supply

Rural water supply is not in satisfactory conditions to sustain hygiene conditions of the village people, and village people have met a lot of disease problems in the dry season. Some village people have improved their water supply system through construction of shallow tube wells and pipeline system of surface water supply from rivers. But, the development progress of the rural water supply is not satisfactory for the village people, especially in public utilities such as schools and village community places. Rural water supply is one of higher priority needs for village people. The village people have strongly requested the construction of the rural water supply system to the District and Provincial Governments. However, both the Governments have not replied to these requests due to the following constraints and problems.

(a) Lack of budget of construction of the facilities for the District Government
(b) Low knowledge on establishment of water user association and management

In line with construction of rural water supply facilities, it is recommended to implement training of water user association and village Government staff for management and operation works including maintenance works.

(4) Irrigation Facilities

Village government and farmer groups have been keen irrigation. But most of farmers do not have experience of irrigation. Poor extension of irrigation facilities is mainly caused due to the following constraints and problems.

(a) Lack of budget of construction of irrigation facilities for the Provincial Government
(b) Low knowledge on irrigation water management of farmer groups and extension worker
(c) Lack of qualified irrigation engineers and technician at the local Government offices.

Considering these constraints and problems, it is necessary to carry out training of water user association and village Government staff for management and operation works including maintenance works before commencement of construction of the irrigation facilities in the Scheme area.

(5) School Buildings

District and Village Government have been keen to rehabilitate school buildings to increase the literacy and educational standards and to strengthen the participation

of environmental issues such as alleviation of slash and burn shifting cultivation. The Champasak PAFS also takes aggressive approaches to construct school buildings to extend knowledge on agriculture to students. However, Both the local Governments have met the following constraints and problems.

(a) Lack of budget of construction and maintenance of school buildings for the Provincial and District Governments
(b) Lack of budget for supporting system for teachers and management

It is recommended to prepare sufficient budget for annual maintenance works including establishment of self-management system under the District and Village Governments. And furthermore, it is necessary to carry out training of teachers and village Government staff for management and maintenance works after construction of school buildings.

(6) Village Community Hall

The regional economy has been slightly developed through rural road development for these years. Social activities of the village people such as activities of village community, extension activities on agricultural technology, etc. have become aggressively. In addition, with the decentralization policy declared in March 2000, the village organization is defined as an implementing unit of the development projects. This policy has resulted in increase of village administrative activities, however their organizational activities are limited due to lack of village community facilities. The need of the village community hall is one of the highest. However, they have met a financial problem for the construction such as lack of budget for construction supported by the District and Village Governments.

Before and after the construction of communication hall, it is recommended to examine the following matters.

(a) Preparation of sufficient budget to carry out annual maintenance including establishment of self-management system under the Village Governments
(a) Training of village Government staff for management and maintenance works

CHAPTER 5 DEVELOPMENT PLAN FOR THE TWO PRIORITY MODEL SCHEMES

5.1 Basic Development Concept

The development objectives of the Schemes are to secure food for people through extension of the settled farming system, to improve the farmers' income in the area through extension of crop diversification and to increase in agricultural production through strengthening agriculture support services and to improve social activities such as community development, marketing of produce, and cultural activities.

Overall goals of the Schemes are to improve the living standard and to alleviate poverty in the Scheme areas.

5.2 Development Strategies and Approaches towards Implementation

(1) Improvement of Marketing System in Farm Area

The proposed improvement is composed of the two main items: (i) establishment of market facility in Xe Tapoung village, and (ii) Improvement of Farm to Market Road. The construction work and operation and maintenance of the proposed road will be carried out by the existing organizations without establishment of new organization for that purpose. The proposed system aims to establish the marketing system in which the farmers will be able to participate in price formulation by establishing a market facility in the farm area. The market facility operation and management organization is necessary to be established under the village administration mechanism with assistance by district office of commerce. This organization will be formed during the stage of the construction work and will be able to undertake the operation and management work immediately after construction. The envisaged benefit of the improvement of transportation infrastructure and the market facility will be attained immediately after completion of the construction.

(2) Preparatory Activities prior to Settled Farming Systems Development

It is ideal to implement the proposed research farm and the demonstration farm based on further study to clarify the technical and managerial problems in the proposed plan. The problems to be clarified prior to the implementation are especially for; (i) the farm land development method, (ii) necessity and effect of irrigation under the specific climate condition in the area, and (iii) to promote and

confirm the establishment of organization and budget allocation for the operation of the research and demonstration farms, as well as (iv) to promote farmers' participation to the implementation. The preparatory activities will be conducted for about three years. The contents and scale of the Settled Farming Systems Development will be set only after evaluating the outputs of preparatory activities.

(3) Rural Infrastructure Improvement

With the decentralization policy declared in March 2000, the village organization is defined as an implementing unit of the development projects. This policy has resulted in increase of village administrative activities, however their organizational activities are limited due to lack of village community facilities. In fact in the Upper Tapoung, administrative works and village conference are held in the village chief's house. In connection with the provision of market facilities that will be operated and maintained by the related village organizations, the village community halls have to be facilitated along with the improvement of marketing system in farm area.

Villager houses in the Upper Tapoung are individually or collectively facilitated with hand-pumped shallow tube well. The water supply facilities are also required for the village community halls, since such various social activities requiring better quality of water as public health care services will be frequently held here. The village community halls associated with water supply facilities will be managed by the existing village organization without technical guidance.

(4) Needs of Technical Assistance to Settled Farming System Development

The settled farming system development conducted in the NAFRI out-reach research farm have a wide range of objectives, including research and trials of selection of adequate crop varieties, soil management, improved farming, etc., training and guidance for extension workers and farmers, seed and seedling multiplication, and other integrated farming techniques. These objectives conform to the national strategy of reduction of slash and burn shifting cultivation, and therefore NAFRI is placing a strong emphasis on these issues through locally established national agricultural research stations. The main constraint to undertaking research and extension works is lack of experience in the government staff who will be directly engaged in. For this reason, it is proposed to provide the NAFRI out-reach research farm and demonstration farm in the Upper Tapoung area with a technical assistance to mobilize the research and extension activities and train the government's staff to be deployed. The period of technical assistance is three years after the construction of facilities.

(5) Time-frame of Implementation

From the above discussions, the priority model schemes is divided into the following two sub-schemes:

(a) Priority Model Sub-scheme - 1, including Improvement of Marketing System and Rural Infrastructure Improvement in farm areas, and Preparatory Activities for Settled Farming Systems Development.

(b) Priority Model Sub-scheme - 2, including Settled Farming Systems Development and Technical Assistance for Settled Farming Systems Development

The time-frame for the Priority Model Sub-scheme - 1 consists of the marketing system improvement and rural infrastructure in farm areas for one year period, and preparatory activities for settled farming system development for three year period. The implementation timing of the Priority Model Sub-scheme - 2 will be examined after the evaluation of outputs from the preparatory activities for it. The time-frame for the Priority Model Sub-scheme - 2 is expected to be four year period including the technical assistance to the settled farming system development.

The time frames for both the priority model sub-schemes are expressed below.

Implementation Time Frame of Priority Model Sub-scheme - 1

Development Plans	Year		
	1st	2nd	3rd
I-1 Marketing System Improvement in Farm Area			
(1) Improvement of farm to market road	○		
(2) Establishment of marketing facility	○		
I-2 Improvement of village community halls with water supply facilities	○		
II Preparatory activities for Settled Farming System Development	○	○	○

Implementation Time Frame of Priority Model Sub-scheme - 2

Development Plans	Year			
	1st	2nd	3rd	4th
I Construction of Facilities for Settled Farming System Development				
(1) NAFRI out-reach research farm	○			
(2) Construction of demonstration farm	○			
II Technical Assistance to for Settled Farming System Development		○	○	○

5.3 Development Plan of Upper Tapoung Scheme

The GOL has been strongly promoting strategy to reduce slush-and-burn shifting cultivation. But, the techniques of the settled farming system (techniques for sustainable agriculture) has not been developed and not extended to the farmers.

Under the circumstances, the farmers have carried out crop diversification activities in the Scheme area to avoid defect of monoculture of coffee that is susceptible to frost damages and price fluctuation. But, basically the farmers are carrying on the diversified crop farming by applying shifting cultivation techniques under a few years short fallow period. Then the productivity is low and not well stabilized.

The marketing system in the area is primitive and the farmers have less bargaining power, and by the multi effect with the poor social environment the most of the people are in the poor condition.

Taking into account the needs of development, farmers' intention for development, and the condition of the available resources, the following integrated development plan is proposed to improve the living standard of people in the area.

Proposed Components for the Upper Tapoung Area

(a) Marketing System Improvement in Farm Area	
a-1 Establishment of marketing facility	Market facility, water supply, management organization, institutional organization for market information service
a-2 Improvement of farm to market road	Road from Pakxong to Houayxan village
(b) Settled Farming Systems Development	
b-1 Establishment of NAFRI Out-reach Research Farm	Research farm including buildings and facilities,
b-2 Demonstration farm for settled farming system	Farm plot for farmers including irrigation/drainage facilities, farm road, etc.
(c) Rural infrastructure improvement	
c-1 Improvement of community hall	Multipurpose hall, office for village administration, water supply, etc.

5.3.1 Marketing System Improvement Plan

For improvement and strengthening marketing activities in and around the Scheme area, the improvement of farm to market roads, construction of market facility, establishment of market management committee and improvement of market information supply service are proposed as shown below.

(1) Establishment of Market Facility

The market facility with a space of 1 ha is established at Xe Tapoung Village as shown in Figure 5.3.1. The facility will be a gathering point of farmers and traders in the farm area, and will promote the fair price setting with farmers and traders. The facility will be the supplying place of the market information collected from Pakse or Xong Mek, and so on

(2) Improvement of Farm to Market Road

The improvement of the farm to market road is proposed at an existing road section of 8.3 km from the Scheme area to Pakxong town in order to strengthen marketing activities as shown in Figure 5.3.2. The road paved with asphalt is proposed.

(3) The Beneficiary Groups of Market Facility

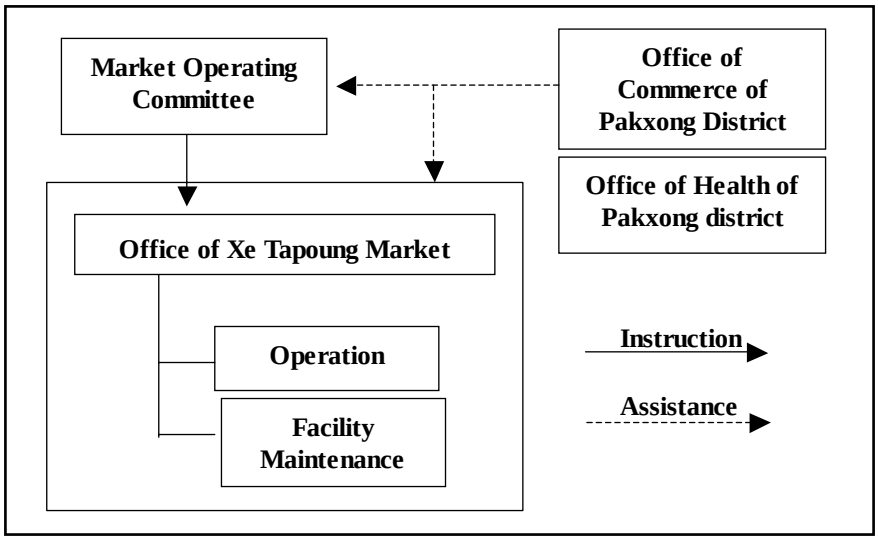
The villages shown below are envisaged to be the direct beneficiaries of the market facility and the farm to market road.

Village	To Pakxong	To Market	HH	Population	Total village area	Area of coffee	Area of cabbage	Area of other vegetables
	(Km)	(Km)			(Ha)	(Ha)	(Ha)	(Ha)
Nongsavan	4	5	27	148	326	36	4	12
Nongkali	6	3	35	214	750	82	10	18
Houaisan	8	1	152	791	2,337	288	60	6
Phou Din Den	8	7	65	410	1,207	281		
Xetapoung	10	1	147	667	612	298	20	30
Phoulangkheo	10	3	55	367	1,500	160	10	10
Kotnoy	17	9	97	581	1,515	398		
Nongyatheun	14	6	92	439	1,325	118	20	93
Nongyaloum	15	7	66	364	412	117	15	40
Phou Damkouan	16	8	151	851	1,146	433	15	68
Kapheu	13	5	140	893	2,185	764		12
Total	-	-	1,115	6,276	15,268	3,114	158	317

Data source: DAFO Pakxong, June 2001.

(4) Operation of the Market

The market at the initial stage will be operated under the new market management committee established by three villages of Xe Tapoung, Houayxan and Phoulangkheo. The office of commerce of the Pakxong District will be requested to assist the initial operation of the market. The Market Operating Committee also promotes and organizes farmers' cooperative after the maturing of market operation and management, and the market operation will be transferred to the organization. The organization is proposed as shown below.



(5) Market Information Supply Service

The market information supply is the component to promote the participation of farmers to the marketing system, and it is a part of institutional support services for marketing.

The market information supply service will be carried out in corporation with present government agencies concerned such as the district and provincial offices of commerce.

The Pakxong District office of commerce is responsible agency to collect market information in corporation with the offices of commerce at Pakse City and Vangtao, etc. and supply the latest information of marketing to the Xe Tapoung Market for farmers and traders. The market information supply services contribute to promotion of organizing farmers during the establishment of the farmers' cooperative.

(6) The Expected Impact

The farmers will be able to participate to formulation of prices of produce, and they may have frequent opportunity to observe other produce gathered in the market. This may contribute to the upgrading of quality of produce and to save loss.

5.3.2 Rural Infrastructure Development Plan

The following rural infrastructures are proposed, taking into account the improvement program of the living standards of the village people and the closed relation with the village people's activities on marketing development such as

hygiene conditions of the market facilities and training on market management for village people.

(1) Rural Water Supply and Village Community Hall

Description	unit	Quantity	Remarks
Rural Infrastructures			
1) Rural water supply	km	2.2	Consisting of 2 new tube wells and one existing tube well, and water supply pipe to market facility, village multipurpose communication hall.
2) Village community hall	m2	432.0	for 3 villages

5.4 Development Plan of Upper Champi Scheme

The Upper Champi Scheme area has the most advanced location of marketing in the Boloven Plateau area. Coffee plantation is dominantly expanded in the Scheme area, and the marketing system of coffee has already been established. However, the farmers have met problems on quality management of coffee as well as other crops and transportation of these crops suffered from the traffic conditions of the deteriorated roads.

The living standard of village people in the Upper Champi Scheme area is comparatively higher than that in the Upper Tapoung Scheme area. The farmers have capacity to rehabilitate minor damages of rural structures by the manner of the self-reliance, excluding large rehabilitation works such as rehabilitation of rural roads.

Taking these matters into consideration, the development plan of the Scheme is to improve the part of farm to market road.

The improvement of the farm to market road is proposed at an existing road section of 5.3 km in and around the Scheme area as shown in Figure 5.3.2. The asphalt-pavement road is proposed.

5.5 General Features of the Development Plan

The general features of both the 2 Priority Model Schemes are summarized below. In addition, locations of the rural infrastructure proposed in the Upper Tapoung Scheme are shown in Figure 5.5.1.

Description		unit	Quantity	Remarks
I	Marketing System and other Rural Infrastructure			
I-1	Farm to Market Roads and Market Facilities			
	1) Rehabilitation of farm to market road	km	8.3	Pakxong town - Houay Xan village for Upper Tapoung Scheme
		km	5.3	Km 36 village in Upper Champi Scheme
	Subtotal	km	13.6	
	2) Market facilities	ha	1.0	in Xetapoung village
I-2	Rural Infrastructures			
	1) Rural water supply	km	2.2	Consisting of 2 new tube wells and one existing tube well, and water supply pipe to market facility, village community hall.
	2) Village community hall	m2	432.0	for 3 villages

CHAPTER 6 DESIGN OF RURAL INFRASTRUCTURE

6.1 Upper Tapoung Scheme

(1) Farm to Market Roads

(i) Design Standard

Design of road was made based on "Standard Design Manual of Rural Roads October 1998" authorized by CTPC.

(ii) Design Conditions

(a) Road surface is, in principal approximately 0.2 m above from original ground surface.

(b) Design traffic load is 15 ton

(c) Side ditch and/or lined side ditch should be facilitated along the road.

(iii) Dimension of the proposed road

(a) Total width of road	7 m
(b) Width of shoulder	each 2 m
(c) Effective with of road	5 m
(d) Road pavement	double bitumen surface treatment (DBST)
(e) Width of pavement	5 m

(iv) Preliminary design

(a) Rehabilitation of roads	Xetapoung - Pakxong 8.3 km
(b) Rehabilitation of super structure of the bridges	Pakxong Bridge
(c) Crossing structures (concrete pipe and	box culvert)

(v) Sample design drawings

(a) Plan and Longitudinal Profile	Figure 6.1.1
(b) Plan and Section of Box Culvert	Figure 6.1.2
(c) Plan and Section of Pipe Culvert	Figure 6.1.3

(2) Market Facilities

(i) Design Conditions

(a) Trading capacity	24. ton/day

(a) Reinforcement Concrete foundation and pole

(b) Timber beam for roofing

(c) Tile roofing

(ii) Design of facilities

(a) Building of sale place	750 m^2 (25 m x 30 m)
(b) Office	300 m^2 (25 m x 30 m)

(c) Water tank and pipe line

(d) Toilet — 40 m^2 (4 m x 10 m)

(e) Waste water and materials treatment facilities

(f) Parking area with asphalt pavement

(iii) Sample design drawings

(a) Layout — Figure 5.3.1

(b) Market facilities — Figure 6.1.4

(3) Rural Water Supply

(i) Design

(a) Pipeline

Village Phoulangkheo	PVC pipe (Dia. 50 mm), 430m
Village Houayxan	PVC pipe (Dia. 100 mm), 750m
Village Xetapoung	PVC pipe (Dia. 50 mm), 1,520m

(b) Water tanks — 3 nos.

(c) Submergible pump — 3 units (1.5 kw)

(4) Village Community Hall

(i) Design

(a) Village Community Halls including water supply system and toilet in the 3 village, Villages of Phoulangkheo, Houayxan and Xetapoung

(ii) Sample design drawings

(a) Village Hall — Figure 6.1.5

6.2 Upper Champi Scheme

(1) Farm to Market Roads

Design Standard, design conditions and dimension of the proposed road are the same as the Upper Champi Scheme

(i) Design

(a) Road sections — District road of 5.3 km from Village km 36

(b) Rehabilitation of super structure of the bridges — 3 nos.

(c) Crossing structures

(ii) Sample design drawings

(a) Plan and Longitudinal Profile — Figure 6.2.1

6.3 Quantity of Construction Works

Construction works of the infrastructure are broadly divided into 2 groups

consisting of (i) rehabilitation of farm to market roads including market facilities, and (ii) rural infrastructures such as rural water supply system and village community hall.

Quantities of main works of infrastructures were estimated as summarized below based on the preliminary design drawings shown in the Sections 6.1.2 and 6.2.2.

(1) Farm to Market Roads and Market Facilities

Farm to market roads is paved with double bitumen surface treatment (DBST), and total length of the roads in both the Schemes is 13.6 km. Embankment of the rural roads including sub-base course and base course is estimated at approximately 60,000 m^3, and pavement of DBST s estimated at 75,000 m^2.

Area of market facilities is 1 (one) ha, and main works of market facilities are building of 1,090 m^2 for sale place, office and toilet, water tank, waste materials treatment facilities and asphalt pavement of parking area.

(2) Rural Infrastructures

(i) Rural water supply

Main works of rural water supply are PVC pipelines and concrete water tanks. Total quantities of the main works are estimated at 2,200 m^3 as excavation, 3,000 m as PVC pipelines and 200 m^3 as concrete.

CHAPTER 7 IMPLEMENTATION PLAN

7.1 Implementation Time Schedule of the First Slice of the First Phase

Implementation period of construction works is 3years on the assumption of the international competitive tenders for procurement of contractors and consultants, weather conditions, phasing of construction stage and preparatory activities on the crop diversification in the settled farming system area. The Schedule is shown below. Construction period of the each infrastructure is assumed as follow:

(a) Farm to market road including market facilities 8 months
(b) Rural infrastructure (village community hall with rural water supply) 6 months

Description / Year			1	2	3
I	Market System and other Rural Infrastructure				
	a	Farm to market roads and market facilities			
	b	Rural water supply			
	c	Village community hall			
II	Preparatory Activities for Settled Farming System				
		Technical Assistance for preparatory activities			

7.2 Project Organization for the Implementation

Execution body of the implementation is formulated under the existing organizational framework of the Central and Local Governments. The Project office for the Integrated Agriculture and Rural Development of the Upper Champi and Upper Tapoung Schemes is established in the office of the Champasak PAFS. The Director of the Champasak appoints one (1) Project Manager and organizes the Project office. All the proposed construction works are directly implemented under management of the Project Manager in collaboration with the other provincial agencies concerned, the Pakxong DAFO and the NAFRI Coffee Research Center as shown in Figure 7.2.1. After accomplishment of all construction works, the responsibility of O & M works of the facilities is handed over to the each agency as shown below.

(a) Champasak Provincial Government Office: Farm to market road,
(b) Pakxong District Office and Village Government Office: Village community hall, and
(c) Market Operating Committee/ Farmers' cooperative: Market facilities

The Project Office consists of three divisions for the scheme implementation such as the Divisions of Extension, Technical and Administration and Treasury. Main tasks and roles of the each division and minimum required staff are as follows:

(a) Extension Division (2 Sr. staff and 2 Jr. staff)
to strengthen participatory approaches on scheme implementation and management of beneficiaries farmers,

(b) Technical Division (2 Sr. engineers and 3 staff)
to supervise the construction works and to monitor environmental issues and

(c) Administration and Treasury Division (one Sr. Staff and 2 Jr. staff)
to carry out administration on scheme implementation and payment matters

CHAPTER 8 COST ESTIMATION OF THE TWO PRIORITY MODEL SCHEMES

8.1 Basic Conditions for Cost Estimation

(1) Basic Assumption

Construction cost are estimated at the price level of May 2001, taking into consideration cost of labor, construction material and equipment, tender method, management capacity of contractors, etc. Construction cost is estimated with international competitive bidding (ICB), and on the following conditions and assumptions.

(i) Construction materials are assumed to transport from Pakse to the each scheme site.

(ii) Working ratio and work capabilities of equipment are estimated based on prevailing conditions of cost estimation of the other projects in the Boloven Plateau area and/or Lao PDR.

(iii) Land acquisition costs is not considered because almost land areas are still kept by the local Governments.

(iv) Physical contingency is assumed as 10 % of the direct construction costs

(v) Overhead and profit of contractor are assumed as 20 % of direct construction cost.

(vi) Exchange rate is applied as follows.

US $ 1.0 = ¥ 124

(2) Basic Cost of Construction Works

Basic cost for construction works such as labor cost, construction materials and construction equipment were collected and studied during the Review Study. The basic cost shown in Table 8.1.1 are used for the estimation.

8.2 Construction Cost of the Two Priority Model Schemes

Construction cost of the 2 Schemes facilities such as costs of rehabilitation of the farm to market roads, market facilities and rural infrastructure such as village community halls with rural water supply system, is estimated at US $ 4.76 millions including the cost of the engineering services.

The local Government has covered Land of both schemes, and land acquisition cost is not included in this cost estimation.

Physical contingency is assumed as 10 % of the sum of construction cost and

engineering service cost.

In addition, costs of technical assistance works on the preparatory activities for the settled farming system and the water management and agriculture supporting service are estimated at US $ 0.9 millions.

Total project cost is estimated at US $ 5.66 millions as summarized below.

Description	Project Cost (US $ millions)
I Marketing System and other Rural Infrastructure	
I-1 Farm to Market Road and Market Facilities	
a Farm to Market Road	3.62
b Market facilities	0.26
Subtotal (I-1)	3.88
I-2 Rural infrastructure	
a Rural water supply	0.21
b Village community hall	0.23
Subtotal (I-2)	0.44
Subtotal (I-1 & 2)	4.33
I-3 Physical Contingencies (10 % of Subtotal (I-1 & 2))	0.43
Total (I)	4.76
II Preparatory Activities for Settled Farming System Development	
II-1 Technical Assistance	0.90
Total (II)	0.90
Total (I+II)	5.66

8.3 Cost of Technical Assistance

The cost of technical assistance on preparatory activities for the settled farming system development is estimated on the following assumptions.

(1) Preparatory Activities for the settled farming system development

Remuneration of Experts and incidental cost for 3 years	US $ 0.6 millions
Construction cost for the related facilities and equipment	US $ 0.2 millions
Operation cost and miscellaneous	US $ 0.1 millions
Total	US $ 0.9 millions

CHAPTER 9 PROJECT IMPACT

The impacts to be brought by the project are expected as follows:

(1) Socio-economic impact

(i) Increase in farm income will be expected through the attainment of the appropriate farm gate price of the produce by improvement of the marketing system in the farm area and by informing the market price in the main markets relevant to the area,

(ii) The local transportation will be considerably improved by the rehabilitation of the existing road. This will not only enhance the marketing activities of the area but also contribute to the improvement of accessibility and communication between village areas and town areas and resulted in the cultural development,

(iii) The income of the farmers will be improved and stabilized by applying the diversified crop cultivation under the settled farming systems,

(iv) Improvement in living standard of the people will be expected through the increase in farm income, and improvement of rural facilities such as water supply,

(v) Participation of the people to the village meeting, agricultural extension seminars, living improvement activities, etc. in the area will be promoted by supplying the community hall, and this will contribute to the continuous and sustainable development activities of the communities.

(2) Environmental impact:

Reduction of the slash and burn cultivation will be promoted by expansion of the established settled farming systems,

(3) Impact of model effect:

All of the above mentioned impacts will become as the model of the agricultural and rural development in the areas of similar condition in the Boloven Plateau.

Table

Table 2.2.1 Staff in PAFS of Champasak, Saravane and Sekong Province

(1) Champasak Province

No.	PAFS & DAFO	No. of staff		Level of Education						Field of of Speciality					
		Total	Female	Phd.	Master	Bachelor	Diploma	TC	TAFE	Admin.	Agronomy	Livestock	Forestry	Irrigation	Hydrology
1	PAFS	225	35	0	1	17	48	135	24	55	24	35	80	22	9
2	DAFO, Pakse	23	4	0	0	0	3	17	3	5	3	4	9	2	0
3	DAFO, Sanaspmboon	28	5	0	0	0	1	26	1	5	5	5	10	0	3
4	DAFO, Bachiangchaluernsouk	24	3	0	0	1	3	16	4	5	5	4	10	0	0
5	DAFO, Paksong	30	2	0	0	1	5	15	9	5	6	2	10	0	7
6	DAFO, Pathoumphone	29	7	0	0	2	2	22	3	6	5	5	10	3	0
7	DAFO, Phothong	33	5	0	0	1	3	23	6	5	7	8	10	3	0
8	DAFO, Champasack	28	4	0	0	3	3	18	4	5	5	5	8	5	0
9	DAFO, Soukhoumma	26	3	0	0	1	3	15	7	6	4	3	8	1	4
10	DAFO, Moonlapamok	20	2	0	0	1	1	17	1	4	3	5	7	1	0
11	DAFO, Khong	36	5	0	0	0	3	25	8	6	5	6	14	3	2
12	Extention Station PhonNgam	9	2	0	0	0	0	7	2	9	0	0	0	0	0
13	Research Station, Ban Itou	17	3	0	0	1	0	9	4	0	17	0	0	0	0
14	Station KM20	2	0	0	0	0	0	1	1	2	0	0	0	0	0
15	Palay														
16	Nonghin														
17	RDP in Boloven														
	Total:	530	80	0	1	28	75	346	77	118	89	82	176	40	25
	Average/District*	53.0	8.0	0.0	0.1	2.8	7.5	34.6	7.7	11.8	8.9	8.2	17.6	4.0	2.5
	Average/Population**	10.6	1.6	0.0	0.0	0.6	1.5	6.9	1.5	2.4	1.8	1.6	3.5	0.8	0.5

* The average is for 10 districts. ** Per 10,000 rural population. 57.2x87% = 49.8

(2) Saravan Province

No.	PAFS & DAFO	No. of staff		Level of Education						Field of of Speciality					
		Total	Female	Phd.	Master	Bachelor	Diploma	TC	TAFE	Admin.	Agronomy	Livestock	Forestry	Irrigation	Hydrology
1	PAFS	103	22	0	0	10	20	55	18	19	22	17	18	18	9
2	DAFO, Saravanh	28	6	0	0	0	1	17	10	5	5	6	11	1	0
3	DAFO, Taoi	16	0	0	0	0	2	7	7	5	2	2	7	0	0
4	DAFO, Toumlan	15	0	0	0	0	0	8	7	3	3	3	6	0	0
5	DAFO, Lakhonpheng	26	1	0	0	0	4	15	7	9	3	6	7	1	0
6	DAFO, Vapi	26	3	0	0	0	3	14	9	5	2	7	12	0	0
7	DAFO, Khongsedone	32	5	0	0	1	2	22	7	7	5	6	10	1	3
8	DAFO, Lao Ngam	43	5	0	0	2	1	24	16	18	2	7	14	0	2
9	DAFO, Samoui	11	0	0	0	1	2	6	2	5	0	1	5	0	0
	Total:	300	42	0	0	14	35	168	83	76	44	55	90	21	14
	Average/District	37.5	5.3	0.0	0.0	1.8	4.4	21.0	10.4	9.5	5.5	6.9	11.3	2.6	1.8
	Average/Population**	1.4	0.2	0.0	0.0	0.1	0.2	0.8	0.4	0.3	0.2	0.3	0.4	0.1	0.1

** Per 10,000 rural population. 29.2x94% = 27.4

(3) Sekong Province

No.	PAFS & DAFO	Actual No. of staff		Level of Education						Field of of Speciality					
		Total	Female	Phd.	Master	Bachelor	Diploma	TC	TAFE	Admin.	Agronomy	Livestock	Forestry	Irrigation	Hydrology
1	PAFS	80	12	0	0	4	25	46	5	15	13	11	22	16	3
2	DAFO, Laanan	23	3	0	0	0	4	19	0	4	3	3	8	5	0
3	DAFO, Kalum	13	0	0	0	0	0	5	8	5	2	2	3	1	0
4	DAFO, Datchung	12	1	0	0	0	0	10	2	2	4	2	3	1	0
5	DAFO, Thatheng	23	3	0	0	0	2	19	2	4	5	2	10	2	0
6	Upland Project	4	0	0	0	0	0	4	0	4	0	0	0	0	0
	Total:	155	19	0	0	4	31	103	17	34	27	20	46	25	3
	Average/District	38.8	4.8	0.0	0.0	1.0	7.8	25.8	4.3	8.5	6.8	5.0	11.5	6.3	0.8
	Average/Population**	6.4	0.8	0.0	0.0	0.2	1.3	4.2	0.7	1.4	1.1	0.8	1.9	1.0	0.1

** Per 10,000 rural population. 7.3x84%=6.1 Notes: TC stands for Technical Certificate, TAFE stands for Technical Advance Further Education.

Data source: MAF, 2000. The population in the rural area in each province was based on the Agricultural Statistics 1975-2000, MAF.

Table 4.1.1 Village Profile of Upper Tapoung and Upper Champi Scheme Areas (1/2)

		Uppertapoung Scheme Area		Upper Champi Scheme Area	
	Village name	Xetapoung	Phoulangkheo	KM 36	KM 38
1.	Altitude (m)	1,200	1,200	940	940-1000
	Population (person)	667	367	529	652
	Number of household	144	55	92	109
	Farm household	144	55	92	106
	Coffee only	0	0	87	102
	Coffee and tea			5	4
	Coffee and vegetable	144	55		
	Business	2	2	4	9
	Government /private employee	1		3	6
	Ethnic group	LL:13, LT:131	LL:3, LT:52	LL:57, LT:35	LL:93, LT:16
2.1	Agricultural Condition				
	Village land area (ha)	approx. 1,500	612	553	985
	Forest/Bush	210	340	226	464
	Crop area	363			
	Coffee	298	160	270	349
	Yield of coffee	0.3-0.4 ton/ha	0.4 ton/ha	0.3 ton/ha	0.5 ton/ha
	Upland rice	50	mixed in young coffee land	0	0
	Cabbage	15	10		
	Tea	0	0	4	10
2.2	Number of animals				
	Buffalo	0	0	0	0
	Cattle	25	180	273	250
	Horse	5	2	1	3
	Pig	3	20	51	21
	Poultry	5,000	300	472	258
2.3	Number of hand tractor	47	very few	9	9
3.	Education				
	Illiterate	166: 25% (M:40%, F:60%)	54:15% (M:20%, F:80%)	43:8% (M:23%, F:77%)	38:6% (M:39%, F:61%)
	Primary school	2 building, frequently closed	1 building, frequently closed	1 building, operating regularly, no toilet, no electricity	2 building, operating regularly, no toilet, no electricity
4.	Health				
	Village health worker (person)	2	0	3	3
	Midwives (person)	2	3	1	2
	Pharmacies (no.)	1	0	0	0
	Main diseases	Malaria, cholera, diarrhea, cough, TB	Malaria, cholera, diarrhea, cough, TB	Malaria, cholera, diarrhea, cough, TB	Malaria, cholera, diarrhea, cough, TB
5	Living and housing condition				
	Water supply				
	Deep well (no.)	32	12	49	20
	Use deep well (HH)	104	55	79	44
	Use rivers (HH)	40	0	13	30
	Piped water (HH)	0	0	0	35
	Use latrine (HH)	0	0	6	4
	Housing	80 % are of grass roofing, with bamboo-mat walls	60% are of grass roofing, with bamboo-mat walls	10 % are of grass roofing and bamboo-mat walls	16 % are of grass roofing with bamboo-mat walls
	Electrification	No electricity supply	No electricity supply	19 HH	???
6.	Major problems				

Table 4.1.1 Village Profile of Upper Tapoung and Upper Champi Scheme Areas (2/2)

		Uppertapoung Scheme Area		Upper Champi Scheme Area	
	Village name	Xetapoung	Phoulangkheo	KM 36	KM 38
6.	Constraints in Agriculture	- Upland rice production is not enough due to low yield because of 2-3 years of fallow period, too much weed, insects and other pests.	- Upland rice production is not enough due to low yield because of 2-4 years of fallow period, too much weed, insects and other pests. Lack of fund for land preparation by tractor.		
		- Coffee production of low yield due to shortage of water at flowering time, Low quality due to lack of appropriate techniques.	- Coffee production of low yield due to shortage of water at flowering time, Low quality due to the farmers have never been talked about the quality.	- Quality of coffee not always satisfy the market standard due to lack of knowledge.	- Coffee yield is low. Price are low. Traders never inform about quality improvement. The roads to plantation is bad. Low price of tea.
		- Cabbage production of low yield and high production cost.	- Merchants sometimes complain quality to buy at low prices. Women have never given technical advises.		- No experience to grow vegetables for sale. And no water for irrigation.
		- Price of farm products are low, due to low demands, and low quality.	- No other potential alternatives are in clear information on marketability.	- No other potentials due to lack of irrigation water.	
	APB Rural credit	45M kip for 9 groups, 0.8 - 3M/HH, mostly for buying rice, a few for fertilizers for cabbage, 15 HH repaid	3.3M kip for 3 groups, 0.2 - 1M/HH, mostly for buying rice, one for fertilizers for cabage, 10 HH repaid	200Mkip for 45 HH, 0.3 - 20M/HH, no one repaid, but interest repaid	360M kip for 68 HH, 30 HH 0.8 - 1M, 3 HH 2M - 4M, 35 HH 5M - 10M no one repaid execept interest
7.	Health	Malaria, diarrhea and cold	Malaria, diarrhea and cold	Malaria, diarrhea and cold. Not enough safe water supply	Malaria, diarrhea and cold. Not enough safe water supply
8.	Education	Primary school is not properly operated mostly due to absence of teacher. Children also for farm work while busy time.	Primary school is not properly operated mostly due to absence of teacher. Children also for farm work while busy time.	Primary school has no electricity, water supply and toilets.	Primary school has no electricity, water supply and toilets.
9.	Requested projects by farmremrs	Technical extension and training	Technical extension and training	Technical extension and training	Technical extension and training
		Credit with low interest	Credit (for man, women don't like credit)	Credits	Credits
		Irrigation system for vegetables and coffee	Irrigation water,	Water for coffee garden	Water for coffee garden
		Road improvement to Pakxong	Road improvement to Pakxong		Improvement access road to and one bridge for coffee area
		Marketing research and information at district level	Market facilities, and price information	Marketing facility	
		3 tube wells	3 tube wells		5 tube wells for drinking water
		One primary school with furniture, tube well and toilets	One primary school with furniture, tube well and toilets	Electricity, toilet and tube well for school	Dispensary and health revolving fund
		Feeder road to potential irrigated land	Land allocation in irrigated area		
		One village meeting hall	One village meeting hall	One village meeting hall	One village meeting hall
				Malaria control programs	

Data source : Village Intention Survey, by JICA Study Team, June 2001.

Table 4.7.1 Land Holding Conditions in the Upper Tapoung Scheme

(1) Land Holding Conditions along the Proposed Main Canal

No. of Parcel	Owner	Address(Village)	Land Title Area (ha)	Occupied Area (ha)	Land Use
1	June	Xetapoung		3.100	Cultivation of coffee and rice, and house
2	Sith	Xetapoung		0.300	Cultivation of rice and house
				0.325	Cultivation of coffee
3	Phet	Xetapoung		0.450	Cultivation of rice and house
4	Pong oy	Xetapoung	0.500	0.875	Cultivation of coffee and house
				0.550	Cultivation of rice
5	Keekhith	Xetapoung		0.475	Bush
6	Louan	Xetapoung	0.290	0.975	Cultivation of coffee and house
				0.180	Cultivation of vegetables (cucumber)
				0.200	Cultivation of coffee
				0.700	Bush
7	Vong	Xetapoung		0.250	Cultivation of coffee
				0.125	Cultivation of vegetables (cucumber)
8	Tone	Xetapoung		0.225	Cultivation of vegetables (cabbage)
9	Song	Xetapoung		0.250	Cultivation of coffee and house
10	Peng	Xetapoung		0.425	Cultivation of coffee and house
11	TongKham	Xetapoung		0.050	Cultivation of upland crop
12	Chiang	Xetapoung	0.120	0.125	Fishery cultivation and cultivation of upland crop
			0.560	0.850	Cultivation of coffee and house
13	Noukoon	Xetapoung	0.090	0.425	Cultivation of coffee
14	Khen	Xetapoung		0.525	Cultivation of coffee
15	Khamsouan	Paksong	0.975	0.975	Cultivation of coffee
16	Bounma	Xetapoung		0.125	Cultivation of coffee
18	Keyong	Xetapoung		0.400	Bush
				0.325	Cultivation of rice
				0.250	Cultivation of coffee
19	Pan	Xetapoung		0.375	Cultivation of coffee
				0.400	Cultivation of rice
20	Khamphang	Xetapoung	0.420	0.425	Cultivation of coffee
	(Pheng hap)			0.700	Cultivation of coffee
				0.400	Cultivation of upland crops (maize)
21	Khamphengyok	Xetapoung	0.060	0.125	Fishery cultivation and house
22	Khampou	Xetapoung	0.280	0.550	Cultivation of coffee
23	Lo	Xetapoung	1.300	2.375	Cultivation of coffee
				1.000	Cultivation of coffee
24	Khamvong	Xetapoung	0.310	0.625	Cultivation of coffee
25	Kee	Xetapoung	0.040	0.175	Cultivation of coffee
	Total		4.945	20.605	

(2) Land Holding Conditions in Demonstration Area

No. of Parcel	Owner	Address(village)	Land Title Area (ha)	Occupaied Area (ha)	Land use
①	Phan	Paksong		23.925	Coffee (1ha)
②	Khoon	Xetapoung		12.475	Upland rice (1ha) and coffee(8ha)
③	Seeboon	Xetapoung		0.425	Cabbage
④	Seethong	Xetapoung		4.400	Upland rice (1.5ha)
⑤	Liep	Xetapoung		1.150	Coffee (abandoned)
⑥	Chong	Phpulangkeo		6.675	Bush
⑦	Houi	Phpulangkeo		2.175	Bush
⑧	Yong	Phpulangkeo	1.225	1.225	Fishery
⑨	Tai	Xetapoung	2.000	2.000	Upland rice (0.5ha)
⑩	Thithyang	Xetapoung	4.500	4.500	Bush
	Total		7.725	58.950	

Table 4.9.1 Water Quality of Tube Well in Villages Of Xe Tapoung and Phoulangkeo

Sampling place: Nam Xetapoung & Phourankeo
Sampling Date: 16/5/2001 ~ 28/5/2001

	Description of Analysis	Units	No. 1	No. 2	No. 3	Standard
	Village Name		Xetapoung	Xetapoung	Phourankeo	
	Temp. Atmosphere ºC		22	22	22	
1	pH		6.9	5.4	5.3	5.8 ~ 8.6
2	Turbidity	NTU	3.5	40.0	8.0	5
3	Odor and Taste		Normal	Normal	Normal	Normal
4	M. Alkalinity ($CACO_3$)		80	4.0	2.0	
5	P. Acidity ($CaCO_3$)	mg/l	35	24	56	
6	Ammonia Nitrogen (NH_4-N)	mg/l	-	-	-	0.5
7	Nitrite-Nitrogen (NO_2-N)	mg/l	-	-	-	1.0
8	Nitrate-Nitrogen (NO_3-N)	mg/l	N.D < 0.01	N.D < 0.01	0.04	10
9	Chloride Ion (CI)	mg/l	14.5	5.1	13.2	250
10	Sulfate Ion (SO_4^{2-})	mg/l	N.D < 2	2.0	N.D < 2	250
11	Electric Conductivity	µm/cm	138	10	11	
12	Iron (Fe)	mg/l	0.1	1.1	1.0	0.3
13	Manganese (Mn)	mg/l	0.003	0.081	0.023	0.1
14	Total Hardness ($CaCO_3$)	mg/l	60	2	8	500
15	Suspended Solid	mg/l	N.D < 2	22	N.D < 2	
16	Calcium (Ca)	mg/l	9.26	0.40	0.75	
17	Magnesium (Mg)	mg/l	1.04	0.41	0.60	
18	Coliform Group/100 ml	MPN	1,000	1,000	1,000	N.D < 1.0 MPN
19	Total Colony 1/ml	mg/l	26	532	53	100
20	Fluoride (F)	mg/l	N.D < 0.1	0.4	N.D < 0.1	1.0

Table 8.1.1 Cost of Labour, Construction Materials and Construction Equipment

Labor Cost

(unit: US $)

Item	Unit	Unit Price
Foreman	day	10.0
Assistant Foreman	day	8.0
Skilled Labor	day	6.0
Common Labor	day	2.5
Heavy Equipment Operator	day	10.0
Assistant Operator	day	5.3
Dump Driver	day	6.0
Driver	day	3.0
Skilled Mechanic	day	7.0
Mechanic	day	5.3
Electrician	day	5.3
Form Worker	day	3.5
Chief of Reinforcement Work	day	4.1
Reinforcement Worker	day	2.3
Chief of Carpenter	day	3.5
Carpenter	day	2.3
Chief of Mason	day	4.1
Mason	day	2.9
Senior Field Superintendent	day	7.0
Junior Field Superintendent	day	5.6
Topo Surveyor	day	9.4

Construction Material Cost

(unit: US $)

Item	Unit	Unit Price
Sand	m3	6.3
Stone (300mm)	m3	11.0
Gravel (50-30mm)	m3	7.0
Gravel (30-20mm)	m3	7.0
Gravel (13-5mm)	m3	7.0
Road Aggregate	m3	23.0
Portland Cement	ton	74.0
Reinforcing Bar	ton	352.0
Coarse Aggregate	m3	9.8
Fine Aggregate	m3	9.4
Steel	ton	311.2
Poly Vinyl Chloride pipe Dia.20	m	0.3
Poly Vinyl Chloride pipe Dia.30	m	0.4
Poly Vinyl Chloride pipe Dia.50	m	5.0
Poly Vinyl Chloride pipe Dia.100	m	17.5
Wood (2nd Class)	m3	250.0
Plywood (4mm)	m2	2.3
Galvanized Iron Mesh	no.	10.8
Slate (0.5 x 1.2m) color	no.	5.2
Gasoline	lit.	0.4
Light Oil	lit.	0.4
Engine Oil	lit.	1.5
Grease	kg	2.8
Cut-back Asphalt	lit.	320.0
Asphalt Emulsion (Prime Coat)	lit.	320.0
Brick	m3	58.8
Concrete Pipe Dia. 300	m	7.9
Concrete Pipe Dia. 400	m	11.9
Concrete Pipe Dia. 600	m	25.0
Concrete Pipe Dia. 800	m	27.7
Concrete Pipe Dia. 1000	m	30.0
Steel Pipe Dia.50	m	3.4
Steel Pipe Dia.100	m	8.1

Rental Cost of Constriction Equipment

(unit: US $)

Item	Unit	Unit Price
Concrete Mixer, 0.3m3	day	90
Bulldozer, 3t	day	100
Bulldozer, 6t	day	150
Bulldozer, 9t	day	180
Bulldozer, 11t	day	200
Bulldozer, 15t	day	220
Bulldozer, 21t	day	250
Backhoe, 0.2m3	day	120
Backhoe, 0.4m3	day	120
Backhoe, 0.6m3	day	130
Rake Dozer, 11t	day	150
Rake Dozer, 15t	day	150
Rake Dozer, 21t	day	170
Motor Scraper	day	100
Dump Truck, 4t	day	70
Dump Truck, 6t	day	80
Dump Truck, 8t	day	100
Dump Truck, 10t	day	120
Motor Grader, 3.1m	day	200
Tire Roller, 6-8t	day	170
Tire Roller, 8-20t	day	170
Water Tanker, 6,000l	day	70
Asphalt Distributor	day	180
Mowing Machine	day	80
Track Crane, 10t	day	200
Track Crane, 15t	day	300
Truck Mixer, 3.0m3	day	120

Figure

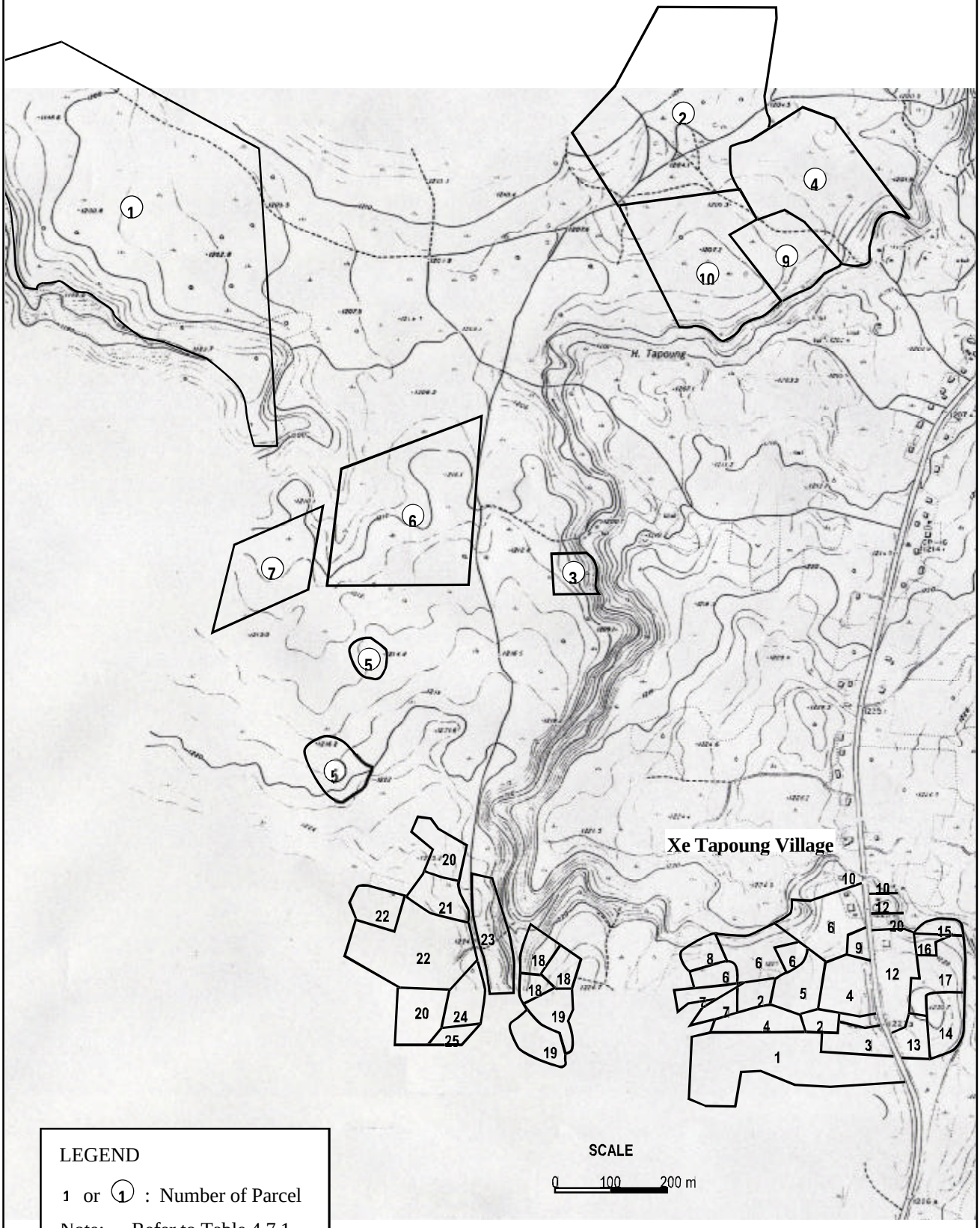


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Figure 4.7.1

Land Holding in the Upper Tapoung (Scheme