

IV. AGRICULTURE DEVELOPMENT PLAN

CHAPTER IV

AGRICULTURE DEVELOPMENT PLAN

IV-1 LAO AGRICULTURE SECTOR: OVERVIEW

IV-1.1 General

Farming systems in Lao PDR are distinguished by two major features; agriculture in the plains along the Mekong and its major tributaries, and in the mountainous regions. Within the two environments, different farming systems have been developed. In the river plains, a lowland rainfed rice mono-culture is developed, which depends entirely on seasonal monsoon rains. Additional dry season irrigation in the river plains, either by gravity or pumped systems, has been developed in the last three decades. The total dry season irrigated area was approximately 91,000 ha in 2000, or about 18% of the total lowland rice cultivation area in the country. In the valley floors of the mountainous regions, irrigation is limited to small-scale gravity fed systems.

The possibility of high rainfall intensities during the monsoon rains and the steep mountain slopes in the watersheds result in high peak flows in the wet season, accompanied by a high flood risk and increased water logging. In contrast, low flows prevail in the dry season. Dry spells, when they occur in the wet season, create an additional drought risk for rice cultivation. Reported rice deficits are usually related to unusual dry years or to flood damage. With 88% of the cultivated area relying on rainfed agriculture, these conditions are unfavorable for crop cultivation. With a few exceptions, only the Mekong and its major tributaries provide water discharge sufficient to support large scale dry season irrigation, and in these areas the higher risk of flooding prevails in the wet season.

Rainfed lowland rice accounts for 66% of the cultivated rice area and 71% of production in Lao PDR (1999). Approximately 84% of the rainfed lowland rice areas are in the central and southern agricultural regions, mostly on the low-level ancient terraces of the Mekong with an elevation of about 200 meters above mean sea level. Much of the remaining rice producing areas occupy narrow valleys in the northern regions.

Rice is the single most important food crop in Lao PDR. The area planted for rice represents more than 80% of the cropped area. According to the agricultural statistics, the area for lowland rice cultivation increased from 392,400 hectares in 1990 to 477,500 hectares in 1999. The area for dry season rice cultivation increased from 26,600 hectares in 1997 to 87,000 hectares in 1999 and now constitutes approximately 18% of the total rice producing area. In order to maintain and expand this dry season production, the cultivation systems must be operated and maintained in an appropriate way and rehabilitated to their best operation level.

Total rice production increased from 1.49 million tons in 1990 to 2.09 million tons in 1998. Lowland wet season rice production increased from 1.09 million tons in 1990 to 1.50 million tons in 1999. During the same period, irrigated dry season production increased from 39,000 tons to 354,000 tons. Due to difficult terrains and poorly developed internal and external transport systems, most areas away from the Mekong are relatively isolated from the lowland areas of the country. One implication is that local production is limited to meeting immediate local needs, with some more ambitious individuals producing a small surplus for sale in local markets. With a small population and low demand for diversified products, the opportunity for internal market expansion is minimal.

The present system of agricultural research and its application through effective extension services is not developed adequately throughout the country or even in the lowland areas. Only in recent years, National Research Program, supported by Lao-IRRI, has demonstrated the importance of an inter-linked research-extension concept. Other programs (e.g., SIRAP and FIAT) have demonstrated that a strong participatory approach in research and extension can achieve remarkable results in regard to production and income improvements. The recent integration of former research institutions into the new National Agriculture and Forestry Research Institute (NAFRI) and the establishment of the Agricultural Extension Agency (AEA) are important steps in the right directions. Implementation of the effective research and efficient extension systems requires an infrastructure in terms of facilities, communication and international co-operation, as well as adequate human resources.

IV-1.2 Recent Trends and Issues

1) Food Security

Food self sufficiency is based on production of rice to meet domestic needs and stocks. Based on the FAO Food Balance Sheet in 1997, rice balance in 1997 and 2000 is estimated as follows:

Table IV1-1 Rice Balance in Lao PDR

	1997	2000
Requirement (kg/milled rice/person), 1/	172	170
Population	4,806,450	5,210,000
Total milled rice required (tons)	826,709	885,700
Adjustments for stocks (% of requirement), 2/	0	10
Total milled rice requirement with stock adjustment (tons)	826,709	974,270
Production (tons), 3/	1,660,000	1,994,000
Less: seed and post-harvest losses, 16%	265,660	319,040
Net paddy milled (tons)	1,394,400	1,674,960
Milled rice production at 62% recovery	864,528	1,038,475
Less: rice for other uses, 2%	17,291	20,770
Net milled rice available (tons)	847,237	1,017,706
Surplus/deficit	20,528	43,436
% self-sufficiency	2%	5%

Note: 1/ Consumption of 172 kg rice/capita/year in 1997 (FAO Food Balance Sheet)
Consumption of 170 kg rice/capita in 2000 and 150 kg in 2020 (Estimate).
2/ 10% of stock adjustment was added in 2000 (Estimate).
3/ Estimated based on 1975-2000 Basic Statistic.

Source: Estimated by the Study Team based on the data of "FAO/UNDP Crop and Food Supply Assessment Mission, 1996"..

The above table shows that Lao PDR is fairly close to rice sufficiency with 10% of stock adjustment in 2000.

2) From Subsistence Farming to Market Oriented Farming

The transformation from subsistence agriculture to market oriented agriculture forces the farmers living in the rural areas to change their traditional way of living and spirits, as well as their farming systems. Lao farmers, same as those in other countries, are likely to avoid taking risks for their farming activities. They need guarantee for stable markets and profitable prices for their products. At present, farmers and public institutions are more concentrated on "production" than "marketing". In order to promote "market oriented agriculture", "marketing and profitability" should be more important issues to be addressed than "production".

Until now, many agricultural projects have insisted on the importance of market for crop diversification. However, actual marketing has been left to be developed by farmers themselves. Projects normally recommend some promising crops to farmers, but they cannot find stable markets and often lose from growing recommended new crops and never try it any more. In other words, the government has paid less attention to " what should be done by the public to transform subsistence agriculture to market oriented agriculture ".

The government clearly recognizes the need to redress the zonal imbalances between the highland and flatland areas, and is embarking on a strategy to shift

resources and priorities towards accelerating the integration of the sloping land areas into the national economy while maintaining the pace of market driven growth along the Mekong.

3) Stabilization of Shifting Cultivation

According to the National Reconnaissance Survey of Land Use and Forest Cover (ADB, 1997), about 280,000 families practice shifting cultivation, and more than 300,000 hectares were cleared and planted under shifting cultivation annually from 1982-1989. With increased efforts targeted to the sloping land, the area under shifting cultivation decreased to 192,258 hectares (198,868 households) in 1995 and 148,000 hectares (156,720 households) in 1998. The decrease in shifting cultivation revolved mainly around the sloping areas of the central and the southern provinces endowed with large plains and having greater agricultural development potentials. The gradual development in the seven major plains (in terms of improved access and market network, increased investments in irrigation, and improved public service delivery) has provided shifting cultivators in the concerned areas with a range of more sustainable and viable farming alternatives.

However, there still remains much to be done in the remote sloping lands in the north and eastern part of the country, where the majority of shifting cultivators are found. Current rural development programs of the government are targeted to these regions. The agriculture and forestry sector is considered to be a pillar of these rural development programs.

Shifting cultivation is seen as an unsustainable land use practice by the government who declared its intention to stabilize it in favor of more stable and productive agricultural methods, including a sustainable rotational land use system.

IV-1.3 Government's Agriculture Policy

1) Vision 2020 on Agriculture Development

Following the 7~8% national economic growth rate targeted by the government, the Ministry of Agriculture and Forestry (MAF) prepared the "Vision 2020 on Agricultural Development", which would play a leading role in improvement of the agriculture sector.

The Vision 2020 envisages that in order to increase production of agriculture and forestry, all efforts must be concentrated on the following two (2) major issues:

- i) Utilization of rich natural resources and existing potential along with the natural environment conservation; and
- ii) Effective use of lands based on the existing topographical and geographical conditions, specific and traditional agricultural production system, and appropriate advanced technology.

The specific targets for production in the year 2020 are set as follows:

(a) Rice Production

Rice production should definitely be assured for 200 kg of paddy/capita/year as a minimum vital requirement in 2020 (average 350 kg of paddy/capita/year in 2000 will be reduced due to meat consumption instead of rice). In addition, around 30% of total production of paddy per year should be regularly reserved for an optimum vital requirement or for higher export value.

(b) Meat Production

Meat production should be assured at 60 kg/capita/year in 2020, an increase from 25.6 kg/capita/year in 2000. In order to achieve this target, production should be intensified to reach 33,000 tons of buffalo meat and beef, 82,000 tons of pork, 197,000 tons of fish, 98,000 tons of poultry, 66,000 tons of egg and 16.5 tons of fresh milk in 2020. In addition to this target to meet the annual consumption, the Vision 2020 envisages export of meat product with a total value of around US\$ 50 million.

2) Strategic Vision for Agricultural Sector (2001-2010)

The objective of this strategic vision is to explain and capture the government's policies, strategies and program linkages in the agricultural sector over the next 10 years.

- (a) The strategic vision begins with an overview of the dual agricultural economies of Lao PDR: the flat lowlands along the Mekong and the uplands. The lowlands are entering into a period of agricultural transformation where market forces are starting to deliver agricultural inputs through commercial channels and farm households are consuming part of their farm production and marketing the remaining part. The uplands present a different picture. Here, agriculture is basically subsistence, and farm households are locked in a poverty trap created by lack of regional market access, absence of productivity increasing technology flows and lack of capital needed to fuel the transformation process.
- (b) The divergence of the Mekong corridor and upland agricultural economies suggests the need for separate development strategies - the Mekong corridor

and the upland approaches. For the Mekong corridor, the strategy is to maintain and accelerate the pace of agricultural diversification and intensification with increased productivity per unit of land, improved value added processing, and expanded marketing and sales. The uplands present a different set of problems, due to remoteness, inaccessibility, endemic rural poverty, poor credit and capital accessibility and shifting cultivation farming system. In order to stabilize communities, enhance resource productivity, improve the socio-economic environment and minimize the degradation of the natural resource base, an integrated agricultural rural development approach is indispensable.

- (c) The government has already taken a number of concrete measures by eliminating inter-provincial commodity transport licensing and removing a number of restrictions on commodity exports. The government has also streamlined licensing procedures for domestic businesses, including agri-businesses and plans to make additional reforms over the decade.
- (d) In parallel with the government's emphasis on extending practical problem-solving technologies directly to farmers, there will be a complementary emphasis in other areas; e.g., feeder roads and rural finance development to link farmers directly to regional markets, and to extend the facilities for mobilizing savings and financing micro level investments.
- (e) Following an intensive period of stimulating market driven growth, many sloping land areas will come to enjoy a kind of market lead growth presently underway in the Mekong corridor areas. As markets expand and producers begin to diversify their production choices in response to the market signals in a given area, market forces will play the major role in moving the agricultural development process forward. At this stage, the government will concentrate more of its limited resources to other highland areas where market forces have yet to penetrate.

IV-2 REGIONAL AGRICULTURE

IV-2.1 Agriculture

1) Major Crops Production

(1) Cropped Area

Rice is a dominant crop in Savannakhet and Khammouan region (SKR). Cropped area in SKR is 178,600 hectares, or 24.9% of the total rice cropped area of 718,100 hectares in the country.

The second dominant crop is tobacco, which accounts for 31.7% (1,360 hectares) of the total cropped area of 4,295 hectares in the country. Tobacco is mainly grown on the islands or the Mekong river banks of Hinboon and Nongbok districts in Khammouan province and Xaybouly and Songkhone districts in Savannakhet province, under the contract production system with tobacco companies in Vientiane or Thailand.

Cropped areas in SKR in 1999 are summarized below.

Table IV2-1 Cropped Areas of Major Crops in 1999

(Unit: ha)

	Khammouan		Savannakhet		Lao PDR	
(1) Rice	50,800	(7.1%)	127,800	(17.8%)	718,100	(100%)
- Season rice	42,800	(9.0%)	103,400	(21.7%)	477,500	(100%)
- Irrigated rice	6,700	(7.7%)	20,200	(23.2%)	87,000	(100%)
- Upland rice	1,300	(0.8%)	4,200	(2.7%)	153,600	(100%)
(2) Maize	690	(1.7%)	2,985	(7.3%)	40,730	(100%)
(3) Starchy roots	300	(2.3%)	1,500	(11.5%)	13,050	(100%)
(4) Peanuts	30	(0.2%)	920	(7.0%)	13,110	(100%)
(5) Tobacco	790	(18.4%)	570	(13.3%)	4,295	(100%)
(6) Sugar cane	150	(3.2%)	60	(1.3%)	4,730	(100%)

Note: Figures in the parentheses are the percentages in Lao PDR

Source: Basic Statistics of Lao PDR 1975-2000

(2) Yield

The yields of major crops are rather low due to limited inputs, extensive or poor farming management, the use of local seed varieties, limited irrigation facilities, etc. There is no significant difference yields between Khammouan and Savannakhet provinces, and the averages of the whole country, as tabulated in the following:

Table IV2-2 Yields of Major Crops in 1999

(Unit: tons/ha)

	Khammouan	Savannakhet	Lao PDR
(1) Rice			
- Season rice	3.11	3.20	3.15
- Irrigated rice	4.10	4.10	4.07
- Upland rice	1.57	1.58	1.59
(2) Maize	2.49	2.05	2.36
(3) Starchy roots	6.00	5.87	6.18
(4) Peanuts	0.93	0.98	1.00
(5) Tobacco	5.66	4.94	5.44
(6) Sugar cane	25.0	25.0	36.7

Source: Basic Statistics of Lao PDR 1975-2000

(3) Production

Crop production in SKR is generally in proportion to their cropped areas. Rice production is 582,800 tons, or 27.8% of the total production of 2,094,000 tons in the country. Tobacco production is 7,285 tons, or 31.2% of the total production of 23,350 tons in the country. Major crops production in SKR in 1999 is summarized below.

Table IV2-3 Major Crops Production in 1999

(Unit: tons)

	Khammouan		Savannakhet		Lao PDR	
(1) Rice, */	162,600	(7.8%)	420,200	(20.1%)	2,094,000	(100%)
(2) Maize	1,720	(1.8%)	6,120	(6.4%)	96,110	(100%)
(3) Starchy roots	1,800	(2.2%)	8,800	(10.9%)	80,600	(100%)
(4) Peanuts	28	(0.2%)	900	(6.9%)	13,130	(100%)
(5) Tobacco	4,470	(19.1%)	2,815	(12.1%)	23,350	(100%)
(6) Sugar cane	3,750	(2.2%)	1,500	(0.9%)	173,600	(100%)

Note: Figures in the parentheses are the percentages in the Lao PDR

*/ Includes season rice, irrigated rice and upland rice.

Source: Basic Statistics of Lao PDR 1975-2000

2) Farming System**(1) Characteristics of Farming**

The present farming system in SKR is an extensive and integrated way with rainfed lowland rice and livestock raising in the forest. It can be defined as a practical "natural farming system" from the view that it follows the law of nature and avoids unreasonable trials or too much hard work. Farmers use rice straw after rice harvest, grass around paddy field, grass under trees in communal forests for feeding cattle and buffalos. Some animal manure with rice straw are also used as compost in the fields. However, since most animals are grazed in an extensive way, collective animal manure is quite limited. Large animals such as cattle and buffalos are also important as a living stock (stable property) to avoid risk from an unusual dry year or flood damage under rainfed rice farming.

The lowland rice production in the wet season still depends on climate and remains under an unstable situation, as the percentage of dry season irrigation is limited to 8 to 23% of the wet season paddy area. Under such a situation, farmers always contrive to increase production and to avoid risks. In order to increase production, such measures as introduction of improved seeds, appropriate fertilizer application, pest and disease control, and post-harvest treatment, etc. are indispensable. According to interviews with the provincial agricultural officers, the percentage of the improved rice seeds use in SKR is estimated to be about 40% in the wet season and 95% in the dry season. Fertilizer application is reported to be 30~50% of the standard (250 kg/ha) in the wet season and 80% of the standard (300 kg/ha) in the dry season. This is partly because farmers prefer to use local varieties of rice in the wet season to avoid risks. Local varieties are rather resistant to diseases, drought and/or flood in spite of a longer growing period of 140 to 150 days. Lower inputs of fertilizer in the wet season are closely related to be extended improved variety.

Due to poor water management, poor condition of on-farm facilities and other situations described above, the effectiveness of irrigation seems to be limited, resulting in low yields of 3.1 ton/ha in the wet season and 4.1 ton/ha in the dry season (Basic Statistic 1975-2000).

(2) Lowland Farming

Savannakhet and Khammouan provinces have formed the largest rice production plain based on rainfed paddy production. It is located in the alluvial lowland along the Mekong or its tributaries, with the elevation of EL130~200 m except for some highland areas with EL 600~1,000 m.

The average annual rainfall is 1,400 to 1,500 mm, which seems to be a marginal condition for rainfed paddy farming. Actually, however, due to irregular rainfall patterns, damages by drought and flood have often affected the rice production in this region.

Because of the gentle slope and meanders of the river, the plain areas of the watershed of Xebangfai, Xechamphon and Xebanghiang and their tributaries have habitual floods with normal rainfall. These habitual floods do not bring big damages to farmers but fertile soil to the area, which enable them to grow many kinds of crops with traditional or appropriate farming system. "Decreasing water planting system" is one of the applicable farming systems under this condition. At the end of the flooding period, farmers prepare nurseries and when flooding water starts to go down, they begin to replant seedlings in accordance with the decrease in water level. Farmers also try to store water in the small rivers or streams using

concerning operation and maintenance of the facilities and cost recovering of the capital.

The following table shows the percentages of dry season irrigation compared with the wet season paddy areas. In 1997, the percentages of dry season irrigation in Khammouan and Savannakhet provinces were about 5~6%, nearly the same level as that of the national level. While, in 1999, the percentages of the dry season irrigation area drastically increased to 18.2% at the national level, 7.7% in Khammouan and 23.3% in Savannakhet.

Table IV2-4 Increase in Lowland Paddy Areas

(Unit: ha)

Year	Season	Khammouan		Savannakhet		Lao PDR	
1997	Wet	33,600	(8.0 %)	93,110	(22.1%)	421,050	(100%)
	Dry (irrigated)	1,880	(5.6 %)	4,363	(4.7 %)	26,645	(100%)
1998	Wet	35,268	(8.2 %)	81,959	(19.1 %)	430,207	(100%)
	Dry (irrigated)	3,916	(11.1 %)	11,444	(14.0 %)	53,136	(100%)
1999	Wet	43,000	(9.0 %)	102,436	(21.5 %)	477,180	(100%)
	Dry (irrigated)	6,700	(7.7 %)	20,253	(23.3 %)	87,030	(100%)

Note: Figures in the parentheses are the percentages in the Lao PDR

Source: Agricultural Statistic of Lao PDR. 1999

(3) Sloping Land Farming

Even highland areas, farmers grow wet land rice in small flat valleys where possible. However, due to limited flat areas, particularly in Sepone , Nong and Vialbulu districts of Savannakhet province and Hinboon, Nhommalad, Boualapa, Nakay districts of Khammouan province, farmers generally grow crops on sloping land. On sloping land, farmers intercrop upland rice and any other food crops through the slash and burn farming system in order to avoid risks of mono-cropping failure.

The typical slash and burn farming system on sloping land is: (i) slash and burn in the dry season, (ii) planting of maize, cucumber, cotton, pumpkin and cassava at the beginning of the rainy season in June, (iii) after 1~2 weeks of the above food crop's planting, upland rice seeds are sown in early July, and then (iv) chili and eggplant are planted in mid July. Most of these food crops and industrial crop (cotton) are for self-consumption or self-use. Harvest is done according to the growing and maturity condition. Rice is harvested from October to November and consequently cotton is harvest. Root crops such as cassava are preservable and important as emergency food. Reduction of the slash and burn farming system on sloping land is one of the priority issues of the government. However, the slash and burn areas in Khammouan and Savannakhet provinces are less serious compared with the northern mountainous region. The statistics in 1999 indicate

that the total slash and burn area in the country was 153,600 hectares, and it was 1,300 hectares (0.8%) in Khammouan and 4,200 hectares (2.7%) in Savannakhet.

3) Farm Economy

To assess the farm income situation in SKR, two farm economy surveys in the region are referred to.

(1) Socio-economic Household Survey by SKR Study Team

The socio-economic household survey was conducted by the Study Team in May 2000, dividing the Study area into 4 regions; i.e., (i) Mekong coastal, (ii) Near Mekong, (iii) Central, and (iv) Eastern Remote. The results of the survey on the annual household income are summarized below.

Table IV2-5 Average Annual Household Income

(Unit: '000 Kip)

Region	Mekong		Near Mekong		Central		Eastern Remo.	
Khammouan								
(1) Agriculture Products	642	(30%)	1,367	(63%)	828	(30%)	329	(52%)
(2) Other than (1)	1,525	(70%)	819	(37%)	1,906	(70%)	309	(48%)
Total	2,167	(100%)	2,186	(100%)	2,734	(100%)	638	(100%)
(Total in \$)		(2287)		(\$290)		(\$362)		(\$84)
Savannakhet								
(1) Agriculture Products	564	(56%)	520	(28%)	66	(11%)	286	(70%)
(2) Other than (1)	444	(44%)	1,369	(72%)	528	(89%)	125	(30%)
Total	1,008	(100%)	1,889	(100%)	594	(100%)	411	(100%)
(Total in \$)		(\$136)		(\$250)		(\$78)		(\$54)

Note: */ US\$ 1.0 = 7,550 Kip as of May 2000.

Source: Survey by JICA Study Team, May 2000

When above figures are compared with the per capita GDP estimated in the macroeconomic frame work (see Sector Plan II), it is found that the farmer's income level is quite low, even though some allowance is considered.

The rate of agricultural products in total income ranges from 11% to 70% with an average of 43%. The biggest non-agricultural income is labor, ranging from 11% to 38% for both seasonal and regular labor employment. The situation of the eastern region in Savannakhet province is an exceptional case, because it has little opportunity for labor employment. Anyhow, this situation clearly indicate how difficult it is to earn attractive incomes from the present farming activities. Further, it may become more serious in the future when a lot of the younger generation don't want to succeed their parent's job of agriculture due to the unattractive cost performance of the present farming.

(2) Study on “Small Scale Agricultural and Rural Development Program along the Mekong River”

The survey was conducted for the JICA Study in Vangkhong area of Hinboun district in Khammouan province and Phonthan area of Xaiphouthong district in Savannakhet province in 1999. The results of the survey indicate that:

- (i) average income of Vangkhong area is 6,245,170 Kip/HH (892 \$/HH, 144 \$/person); and
- (ii) average income of Phonthan area is 9,282,616 Kip/HH (1,326 \$/HH, 177 \$/person).

In the Vangkhong area, total farm income is estimated to be 6,245,170 Kip/HH. Since the average paddy field is 1.1 ha/HH in this area, 917,880 Kip/HH can be earned from rice cultivation, which accounts for only 15% of the total farm income. The sources of farm income other than rice are: (i) livestock 2,648,100 Kip/HH (42%), (ii) labor employment 1,194,310 Kip/HH (19%), and (iii) non-agriculture 1,346,880 Kip/HH (22%). In the Phonthan area, the average paddy field is 3.0 ha (including wet and dry seasons). However, the importance from other resources of income is the same as in the Vangkhong area. The income from rice cultivation is 3,605,376 Kip/HH, or 39% of the gross farm income of 9,282,616 Kip/HH. Other sources of income are (i) livestock 3,718,180 (40%), (ii) labor employment 949,080 Kip/HH (10%), and (iii) non-agriculture 815,260 Kip/HH (8%).

Farm expenditure depends on farming system and farm size. Farm expenditure is estimated to be 3,120,786 Kip/HH (446 \$/HH, 72 \$/person) in the Vangkhong area and 4,075,587 Kip/HH (582 \$/HH, 78 \$/person) in Phonthan. The results of the interview survey, as summarized on the following page, reflect the farm economy along the Mekong coastal area.

Table IV-2-6 Household Income Survey by JICA Mekong Study

1. Province	Khammouan		Savannakhet	
2. District	Hinboun		Xaiphounthong	
3. Area	Vangkhong		Phonthan	
4. Nos.of sample farmer (HH)	10		50	
5. Nos.of family living (persons/HH)	6.2		7.5	
6. Paddy field (ha/HH)	1.1 (*)		3.0 (**)	
7. Farm income (Kip/HH)	6,245,170		9,282,616	
a) Rice and other (Kip/HH)	917,880	(15%)	3,605,376	(39%)
b) Livestock (Kip/HH)	2,648,100	(42%)	3,718,180	(40%)
c) Home industry (Kip/HH)	138,000	(2%)	194,720	(3%)
d) Labor employment (Kip/HH)	1,194,310	(19%)	949,080	(10%)
e) Non-agriculture (Kip/HH)	1,346,880	(22%)	815,260	(8%)
8. Farm income (\$/HH)	892		1,326	
9. Average income (\$/person)	144		177	
10. Farm expenditure (Kip/HH)	3,120,786		4,075,587	
a) Dry season rice (Kip/HH)	0	(0%)	606,317	(15%)
b) Wet season rice (Kip/HH)	989,800	(32%)	956,855	(23%)
c) Other crops (Kip/HH)	7,200	(0%)	109,205	(3%)
d) Livestock (Kip/HH)	759,000	(2%)	376,604	(9%)
e) Machinery (Kip/HH)	173,765	(6%)	405,900	(10%)
f) Home industry (Kip/HH)	36,050	(1%)	196,621	(5%)
g) Food, materials (Kip/HH)	1,640,111	(53%)	1,357,725	(33%)
h) Others (Kip/HH)	197,960	(7%)	66,361	(2%)
11. Farm expenditure (\$/HH)	446		582	
12. Average expenditure (\$/person)	72		78	

Note: US\$ 1.0 = 7,000 Kip (1999)

(*) : Wet season only, (**) : Wet and Dry season

Source: Study on Agriculture and Rural Development along the Mekong, JICA, 1999

4) Farmer's Organization

(1) Water Users Association (WUA)

In both provinces, there are four Water Users Associations (WUAs) officially registered at the district authority and the Department of Administration of the Office of the Prime Minister. They are:

- Mouang Kao scheme: Thakhek district in Khammouan province;
- Ban Veun Tonhen scheme: Xaybouly district in Savannakhet province;
- Thasano scheme: Khanthabouly district in Savannakhet province; and
- Nakae scheme: Khanthabouly district in Savannakhet province.

WUA is a formal farmer's organization, which acts as a juristic body. Despite its legal independence, WUA is also a communal organization. Therefore, it is governed by a steering committee represented by the village administrative authority of all the villages located in the irrigation schemes. The WUA management committee, which is elected by the WUA's general assembly, operates the irrigation scheme. WUA is not only responsible for operation and

maintenance of the scheme, but also for procurement of input supplies and credit for members and for marketing of farm products. With their legal entity, WUAs have the right to undertake business ventures with the APB and trading companies.

Irrigation public assets have been fully transferred to the associations. The irrigation system is presently under the full responsibility of the farmer organization. Irrigation Service Fee (ISF) system has been introduced, and in order to recover the cost for future investment, WUAs are in the process to increase their ISFs to cover all O&M costs, and to include Village Development Fund (VDF). At present, the actual ISF and VDF collected do not cover the full recovery costs of those schemes. Despite the establishment of WUA through the stepwise process by SIRAP, the associations are still young and need to be further strengthened. APB is also hesitating to provide medium and long term loans to the associations.

(2) Water Users Group (WUG)

In all irrigation schemes formulated by DOI and PAFO, there are Water User Groups (WUGs) established by the village authority. WUGs are established under the directive of DOI for operation and maintenance of the irrigation schemes. The organization is a village driven organization headed by the chief or deputy chief of the village. In the case of WUGs, which are non-formal water user organizations, the public irrigation assets still belong to the government. However, WUGs are responsible for operating and collecting water charges. The water charge in most of the schemes is structured to cover electricity or fuel expenses (in case of pump scheme), cost for mechanical operation and maintenance, and a fee for the pump operators.

Some WUGs took initiative to borrow funds from the banks to construct the main canal and secondary canals. This proves the fact that there is a developing sense of ownership among farmers and a tendency of strong WUGs to upgrade their status to WUA.

(3) APB Credits

The credit policy of the Agricultural Promotion Bank (APB) is to provide credit to groups of farmers (5 to 10 families). APB credit groups are formed for seasonal loans (short term). Since the groups are heterogeneous, they will not be composed of the same persons when the groups are reformed for the next season. APB credit groups have no production function. They rule as a credit group with the sole aim to return money back to APB at the end of each production season. After repayment is made, the groups dissolve.

(4) Production Groups

In WUG, water block groups are formed into production groups. However, their function is mainly water management. The function of “production grouping” is limited. Farmers are not sharing resources to buy fertilizer and other inputs for production and are still selling farm products individually.

One farmer’s production group has been recently established in Savannakhet province. The farmers group is called the “Association of Agriculture and Livestock Production in Savannakhet” established in March 1999. The association is composed of about 110 members, 25 fish farmers, 27 pig farmers, 3 cattle farmers, 8 poultry farmers, and 6 crops farmers. About 80% of members live in and around Savannakhet city and the others in various districts of Savannakhet province. The prime objective of the association is to cooperate and promote agricultural activities, particularly to get credit from APB. With the efforts of members and support by the provincial government, the application for APB loan of 600,000,000 Kip (= \$79,000) was approved in January 2000 with a special annual interest rate of 7% and 5 years in return period.

(5) Contract Farming Group

The only crop cultivated under contract farming in the provinces is tobacco. In the Xebangfai plain of Khammouan province particularly, Lao Tobacco Company entered into a contract with a group of farmers to produce tobacco. The contract farming group also got credit from APB.

5) Farmer’s Supporting System

(1) Agricultural Extension

MAF has established an Agricultural Extension Agency (AEA) under the Department of Agriculture (DOA). The role of AEA is to build an integrated farming extension system, FSEW-SMS (Farming System Extension Worker – Subject Matter Specialist) system to be set up in the District Agriculture and Forestry Offices (DAFO) and the Provincial Agriculture and Forestry Office (PAFO).

Under the new farming systems extension mechanism, the departments will continue to provide normal services such as improved seed development and livestock vaccinations, etc. AEA will take the lead in farming systems extension and will draw upon technical staff of the line departments for technology transfer and support to the FSEW at district levels and the SMS at province levels.

DAFOs are presently organized on sub-sectoral lines (crops, livestock, irrigation, forestry, meteorology and administration). DAFO staff (FSEWs), who are the frontline extension workers, theoretically provide advisory services to farmers in

their particular sub-sectors. They are supported by the respective sub-sector SMS at PAFO.

(2) Agricultural Research

Agricultural research on rice production is conducted through the Lao National Rice Research Program assisted by the Lao-IRRI Research and Training Project. The National Agricultural Research Center (NARC) has general responsibility for crop research under MAF. In the past years, agricultural research was restructured with the formation in May-June 1999 of the National Agriculture and Forestry Research Institute (NAFRI) by combining 9 research centers. The centers continue to work on their programs in crops (including rice), livestock, fisheries, forestry (including agro-forestry), watershed management, and wetlands. The linkage between NAFRI and MAF is through the Council of Science and Technology (CST). Department Directors will sit on the CST chaired by the Minister of Agriculture and Forestry.

(3) Agricultural Credit

Agricultural Promotion Bank (APB) is the sole state-owned specialized bank created in August 1993. APB has 3 branches and 19 service units which are further supported by sub-service units or mobile service in main districts of the country. The APB's main function is to serve for credit requirements of the government priority programs in the agricultural sector with subsidized loans. However, APB service reaches only 20% of total farm households in the country.

The main APB loans are farm-operation loans to farmers. The interest rates for farm-operation loans are as low as 7%~10%. Interest rates for other non-seasonal agriculture-related loans (e.g., farm machinery and livestock fund) are 30% ceiling based on the mortgage of individual assets (e.g., land and farm machinery). APB loans to individual farmers are extended through the farmer groups. Short-term loans in kind (fertilizer) for rice cultivation is predominant among the lending activities, while medium-term loans have been given for two-wheel tractors and pumps, also in kind.

(4) Supply of Agricultural Inputs

Fertilizer

A preliminary estimate based on DOA's recommendation (6 bags/ha dry season irrigation and 4 bags/ha for wet season irrigation on 101,000 ha and 239,000 ha respectively) gives a total annual requirement of fertilizer at 78,000 tons in 1999. Total imports of fertilizers into the country was about 37,000 tons (28,000 tons by the private sector and 9,000 tons by APB), or about 48% of total fertilizer requirements. All chemical fertilizers are imported, and their import and

distribution are handled by both the public and private sectors. However, in some donor-financed projects, particularly KR-II program funded by the Japanese government, the central and provincial governments undertake import and distribution at subsidized process. The single largest supplier of fertilizer to farmers is APB. Imported fertilizers are distributed to three locations (Vientiane, Savannakhet and Champasak). Farmers pick up their requirement from these stores on loans in kind from APB. Transport cost from the stores to farm-gate is born by farmers.

Prices are fixed/approved by the government, generally lower than those set by the private sector. The private sector is active in Vientiane, Savannakhet, Khammouan and Champasak provinces. APB met less than 10% of estimated fertilizer requirements in 1999, reflecting its inability to meet farmers' demand. Field inquiries indicate that farmers giving priority to food security, continue to plant paddy in both wet and dry seasons and use little or no fertilizer in the wet season partly due to risk of floods or droughts.

Seeds

Over 90% of rice seed used by farmers in Lao PDR consists of grain saved from the previous season's harvest. There is no private company supplying improved seed to farmers. Less than 10% of farmers' requirements of improved seed are supplied by recognized sources of seed production. Seed of improved rice varieties is produced and distributed to farmers at three centers, one located in Vientiane Municipality by EA and the other two in the provinces of Champasak and Savannakhet. Existing seed production facilities include: Naphok Seed Production Factory run by the Department of Extension; Tasano Seed Production Station in Savannakhet (mainly for rice seed); Hatdokeo Vegetable Seed Production Station; and Phonegnam Seed Production Station for rice in Champasak. Seed of other crops are generally difficult to obtain and doubtful in quality, except for some high quality vegetable seed imported from Thailand.

Tasano Seed Production Station in Savannakhet is producing F1 seeds of Tasano-1 (TSN-1: glutinous improved rice with 125 days growing period), which is becoming popular in the Mekong coastal areas, and is noted for its good eating quality. However, the system of improved rice variety seeds has not been properly established yet in both provinces and the exact figures of diffusion of the improved variety are not obtained by PAFOs.

(5) Marketing System

The agricultural commodities produced by farmers are usually sold to middlemen (small traders) who are visiting individual farmers. Since there is no farmer's marketing organization in both provinces, farmers have less power to negotiate

with middlemen on the price of their products. In case of paddy, however, the farmers can sell their products at rather attractive prices due mainly to the recent high demands.

Some other products such as fresh vegetables and forest products are sold to retailers or directly to consumers at the nearest market. An unstable market is the major constraint for promotion of many cash crops such as cucumber and tomato. Soybean, groundnut and maize production was once promoted but this attempt was unsuccessful due mainly to unattractive prices, unstable market, and limited technical support by PAFOs.

There are two flows of rice purchasing systems. One is through private systems operated mainly by middlemen, and the other is through the Food Supply Company (FSC). FSC was recently established in each province aiming at (i) promotion of agricultural production, (ii) stabilization of rice price, and (iii) distribution of surplus rice to the area of deficiency. The major constraints for purchasing paddy by FSC are (i) shortage of budget, (ii) inconvenient transportation, and (iii) insufficient rice mill and storage capacity.

6) Irrigation

(1) Existing Irrigation Schemes

Lots of irrigation schemes have been implemented since 1975 in both provinces. These schemes can be classified into pump lifting, gate/weir and small reservoir, depending on topography and accessibility to water resources. Most of them are small to medium scale with the service area of 50 to 500 hectares (130 hectares on an average).

Pump irrigation schemes have been developed along rivers where irrigation water can be directly drafted. However, their service area is generally limited to the areas just along the river. Gate/weir is generally small in scale, used mainly for supplementary wet season irrigation due to limited dry season flow in the streams. In some sites along the rivers or streams, small reservoirs are located with the dike height of 2 to 4 m. Most of them are also used for wet season supplementary irrigation since runoff from the basin is insufficient for dry season cropping.

Since the 1995/96 flood, "National Pump Installation and Management Program (NPIMP)" has been initiated nation-wide to compensate for rice production loss and encourage dry season second rice cropping. NPIMP was fully funded by the Lao government, and almost all the programs has been completed in 1999. The program has considerable impact on expansion of the dry season rice production. The irrigated area for the dry season rice in the whole country was increased from

26,000 ha in 1997 to 91,000 ha in 2000. Under the program, the total units of pump purchased were about 7,000 of both diesel (5 to 125 HP) and electric (1 to 90 KW) types.

The inventory survey of the irrigation schemes as of March 1999 is summarized below. According to the table, there exist 211 schemes covering about 33,000 ha of the wet season supplemental irrigation and 18,000 ha of the dry season irrigation in Savannakhet province, and 177 schemes covering 14,000 ha of the wet season and 4,000 ha of the dry season irrigation in Khammouan province.

Table IV2-7 Inventory of Existing Irrigation Schemes

	(unit)	Savannakhet	Khammouan
(I) Construction Year: 1975-1995			
a) Number of schemes			
- Pump scheme	No.	13	14
- Weir, Gate weir, Reservoir	No.	78	19
<u>(Sub-total)</u>	No.	<u>91</u>	<u>33</u>
b) Actual irrigated area, 1/			
- Wet season	Ha	10,782	5,026
- Dry season	Ha	4,346	1,814
(II) Construction Year: 1996-1998			
a) Number of schemes			
- Pump scheme, 2/	No.	112	139
- Weir, Gate weir, Reservoir	No.	8	5
<u>(Sub-total)</u>	No.	<u>120</u>	<u>144</u>
b) Actual irrigated area, 1/			
- Wet season	Ha	22,670	9,419
- Dry season	Ha	13,311	2,306
(III) Total (1975-1998)			
a) Number of schemes			
- Pump scheme	No.	125	153
- Weir, Gate weir, Reservoir	No.	86	24
<u>(Sub-total)</u>	No.	<u>211</u>	<u>177</u>
b) Actual irrigated area, 1/			
- Wet season	Ha	33,452 (81,959), 3/	14,445 (35,268), 3/
- Dry season	Ha	17,657	4,120

Note: 1/ Based on the above inventory data as of March 1999.

2/ Mostly under National Pump Installation and Management Program.

3/ () Total harvested area of wet season rice in 1998.

Source: Inventory of Existing Irrigation Scheme as of March 1999, DOI, MAF.

The table also indicates that among a total of 388 schemes, 278 schemes (70%) are pump lifting type of irrigation and 110 schemes (30%) are other types such as weir, weir gate and reservoir. Almost all the schemes of weir, gate weir and reservoir were constructed in 1975-1995. Among 278 pump schemes, 251 schemes (90%) were constructed from 1996 to 1998 under NPIMP. The installation of main pumping facilities was completed by 1999. However some

additional works such as canal construction are to be continued to ensure the planned expanded irrigation areas.

More than 50% (205 schemes) are located in the lowland region along the Mekong (about 70% of the total irrigated area). On the other hand, in the eastern mountainous region, there exist only 64 irrigation schemes (16%) covering about 10% of the total irrigation area as summarized below.

Table IV2-8 Existing Irrigation Schemes by Region

Province/ Region	Nos. of districts	Nos. of schemes	Irrigated Area (ha)	
			Wet season	Dry season
Khammouan Province				
- Lowland (Mekong)	3	78	7,830	2,835
- Central	3	70	4,600	960
- East mountainous	3	29	2,015	325
(sub-total)	(9)	(177)	(14,445)	(4,120)
Savannakhet Province				
- Lowland (Mekong)	5	127	25,132	14,283
- Central	6	49	5,065	2,257
- East mountainous	4	35	3,255	1,117
(sub-total)	(15)	(211)	(33,452)	(17,657)

Source: Inventory of Existing Irrigation Schemes in Lao PDR, March 1999 by DOI, MAF

(2) O&M and Water Management

Since most of the pumping facilities were constructed after the 1995/96 flood, no substantial maintenance or repair work has been required so far. However, it is observed that some pumps are compelled to withdraw muddy water (high in silt and sand content) as water level recedes in the dry season. This will shorten the life span of the pump facilities. Adequate maintenance work for regular check and provision of spare parts will be required in the near future.

Most of irrigation canals in SKR are unlined earth canals. Canal maintenance such as weeding and bank repair is the collective efforts of farmers. On-farm facilities such as feeder canals and diversion works have not been fully provided yet in the fields, especially at some medium to large scale irrigation project sites. According to the irrigation development policy, irrigation canal and on-farm water management is to be provided by the Water User Groups (WUGs). However, it has not been fully provided yet due to financial and technical limitation of WUG. The fact is that the newly constructed pump scheme suffers from incomplete canal systems, and the irrigation area is limited to around pump stations due to lack of feeder canals.

Lack of maintenance work is observed in farm roads, reservoir, dikes and weirs. Eroded canal slope and sedimentation lead to delivery loss of pumped water.

Deterioration of reservoir dikes reduces the storage capacity. Except for some areas supported by SIRAP, FIAT and other international supporting agencies, WUGs are not active. In the pump irrigation projects, collection of irrigation service fee is a major job of WUG at present. Since WUGs in reservoir or weir irrigation scheme have not properly organized, no maintenance work has been conducted so far, and the dike and gate structures are left to deteriorate. Free access to such facilities also indicate weak ownership and cooperative senses among villagers.

(3) Irrigation Management Transfer (IMT)

Establishment of the Water Users Association (WUA) is a key issue for the smooth implementation of the government irrigation development policy aiming at handing over the duties for operation and management to farmer groups. A "Decree on Article of Irrigation Water Users Association" was enacted in March 1997, granting WUA the authority to prepare operation and management funds and to mobilize their own resources for irrigation development.

Irrigation Management Transfer (IMT) is a basic policy of the government, in which all irrigation systems including existing, ongoing and future systems either granted or loaned, shall be entirely turned over to the related communities. In the basic frame of IMT program, the following process is envisaged:

- Before transferring irrigation systems, responsible organization for operation and maintenance of IMT shall be established in the form of association groups or collectives to properly operate and manage irrigation facilities;
- Village Development Fund (VDF) shall be set up to perform the duty of collecting invested capital and to manage development budgets allocated for village development;
- After setting up the responsible organization and VDF, the irrigation system shall be transferred to the communities of water users; and
- The communities of water users are responsible organizations for operation and maintenance of the irrigation system transferred.

The communities shall be responsible for collecting irrigation service fees (ISF) from beneficiary farmers. The collected ISFs shall be split into the following three categories as compensation for:

- Cost recovery to VDF (for reinvestment and to cover expenses for village development);
- Cost recovery to the government (for compensation to the government); and
- Project management (for operation and maintenance of irrigation facilities).

Through the VDF process, mandated by the Prime Minister's Order 26/PM, and elaborated in a number of related documents, beneficiary farmers are required to repay a part of the costs of irrigation construction, improvements or rehabilitation when these costs are from the Lao government or external sources. A village committee specifically established for this purpose shall be responsible for management of VDF. Cost recovery to VDF is made over a period of 20 years (or less if full costs are recovered earlier). Payments to VDF are measured in kilograms of paddy per hectare per year. The calculation method and their allocations are as follows:

- 200 kg/ha/year for a gravity irrigation system, among which 20% goes to the government and 80% to VDF;
- 150 kg/ha/year for an electric power pumped irrigation system, among which 15% goes to the government and 85% to VDF;
- 100 kg/ha/year for a diesel powered pumped irrigation system in lowland area, among which 10% goes to the government and 90% to VDF;
- 100 kg/ha/year for a diesel powered pumped irrigation system in mountainous area, among which 5% goes to the government and 95% to VDF.

In addition to cost recovery to VDF, an ISF for full funding of routine operation and maintenance costs is required. The amount payable to ISF will vary from site to site depending on respective needs. WUA would set the rate of ISF on an annual basis, with the assistance of the District Agriculture and Forestry Office (DAFO). In the ADB funded Decentralized Irrigation Development and Management Project (DIDMP), which will be commenced from early 2001, ISF requirements are expected to range from \$25 to \$65 per ha per year, depending on the type of irrigation system and its requirements. At the present costs and exchange rate, this would amount to a paddy contribution of between 270 kg and 700 kg/ha per year. ISF takes into account the incremental costs of electricity but recognizes savings in consumption as a result of improved water management.

(4) Cost Recovery to VDF and O&M Cost

Cost recovery to VDF and O&M cost for an irrigation scheme has been estimated on the basis of previous, ongoing and future schemes with an average command area of 100 ha. The following table indicates the feature of estimation:

Table IV2-9 Cost Recovery and O&M Cost

Cost Recovery and O&M Cost	Electric Pump Scheme	Weir Scheme
1. Average construction cost	\$1,500/ha	\$ 2,000/ha
2. Max. capital cost recovery to VDF for 20 years	\$276/ha (3,000kg paddy)	\$368/ha (4,000kg paddy)
3. Subsidy on capital cost recovery	\$1,224/ha	\$1,368/ha
4. Estimated annual O&M Cost (ISF)	\$51/ha (550 kg paddy/ha)	\$30/ha (326 kg paddy/ha)
5. Total percentage of annual payment for VDF and O&M costs (ISF) among the production	23% (690 kg paddy/ha)	18% (540 kg paddy/ha)
6. Actual collected ISF (Irrigation Service Fee)	1/	50 kg/ha/season, 2/

Note: 1/ Except for some schemes supported by SIRAP, FIAT and other international supporting agencies, WUGs, which is responsible for ISF collection, are not active and ISF are not properly collected.

2/ Five subprojects in CMISP have collected ISF for 1999 wet season with an average ISF of 50 kg of paddy/ha/season.

Source: - Draft Final Report of the Study on Small Scale Agricultural and Rural Development Program along the Mekong River, by JICA, March 2000.

- Draft Final Report of PPTA No.3189-LAO on Decentralized Irrigation Development Project by ADB, February 2000.

- Midterm Review Report of Community Managed Irrigation Sector Project by ADB Loan No. 1488-LAO, October 2000.

- Project Report of Agricultural Development Project, by World Bank, April 2000.

According to the operation and management division of DOI, as of August 2000, 437 schemes with 43,000 ha of irrigation area have been fully transferred to the community in the whole country, which is about 20% of the total wet season irrigation area. However, there is insufficient information to ensure that the relevant communities, to which the irrigation facilities have been transferred, are properly managing the facilities and collecting ISFs, as well as capital recovery cost to VDF. Since it is estimated that the total percentage of annual payment for VDF and ISF to be 23% (690 kg of paddy) for electric pump schemes and 18% (540 kg of paddy) for weir schemes, the repayment is a burden for beneficiary farmers. Actually, in five subprojects of the CMI Project, beneficiary farmers have collected ISFs with an average of 50 kg of paddy/ha for the wet season in 1999.

Affordability is based on increases in farmer profits to accrue from increased production of rice and higher-profit alternative crops. These assumptions rest firmly on other assumptions of increased support to farmers in the areas (e.g., extension and training). The costs to the government in providing these services might, to some extent, be offset by reduction in the existing subsidies to O&M, system repairs and rehabilitation. However, the cost of developing these services would be significant, and would need to be incurred before current subsidies can be fully withdrawn. It must be clearly understood that the immediate government commitment to IMT is quite significant and should be seen as an ongoing commitment in terms of finance and personnel, as well as supporting policies and regulations.

7) Changes of Recent Agricultural Environment

(1) Savan Advance Agriculture Co.

This agricultural processing factory in Savannakhet was established by a private Thai company in 1997. The factory is equipped with an oil-extracting facilities (15 tons/day), drying facilities (50 tons/day), rice mills and storage facilities. Extracted oil is for export to Thailand. The manager of the factory explained that:

- (i) Demand of soybeans and peanuts is high in Thailand;
- (ii) Presently, Thailand is importing 500~1,000 tons of soybean and peanut from Vietnam;
- (iii) Import taxes for peanuts and soybeans from Lao PDR are treated as a special case, non- tax for soybean and 5% tax for peanuts;
- (iv) Import tax for peanuts from Vietnam is 7~8%;
- (v) In spite of such advantage, the owner is facing difficulty with collecting materials for processing; and
- (vi) Major issues addressed in collecting materials in the past 4 years are:
 - a) Contract production system is not properly undertaken by the farmers;
 - Factory provided peanut seeds to the farmers.
 - Farmers do not care for the peanuts cultivation or sometimes feed them to cattle.
 - Production is much smaller than expected.
 - Farmers always try to sell products to other buyers at a better price.
 - b) Rice is a dominant crop and only a limited quantity of peanuts are grown in Savannakhet province. This factory is now collecting products mainly from Saravane province, where peanuts are grown in slash and burn areas or between coffee trees in the wet season. The provincial government is promoting peanuts production by supporting seed supply to farmers.
 - c) Contract production system is not applied in this case and the factory buys the peanuts from traders at a market price.
 - d) Since the quantity of soybean and peanut is insufficient for oil production, the factory buy kapok seeds as substitute, which contain 12% of oil but normally have been discarded until now. The buying price of Kapok seeds is 300 kip/kg (same as in Thailand).

The chief of PAFO suggests that:

- (i) It will take time for farmers to understand the contract production system properly; and
- (ii) The provincial government plans to play a coordinating role between producer and buyer to follow up the contract production system in the future.

Lessons learned from the Case of Savan Advance Agriculture are:

- (i) Market mechanism of competition should be basically applied to sustain market economy;
- (ii) Producers (farmers) should make their best efforts to reduce the production cost;
- (iii) Until farmers become competent, some support by the government is required such as supply of free seeds and loans at low interests; and
- (iv) After confidence has been established between the producers and buyers, the production areas have been extended by farmers themselves.

(2) Association of Agriculture and Livestock Production in Savannakhet

The background of the establishment of the association is:

- (i) Rice production for self-sufficiency has been achieved in the province;
- (ii) Other agricultural production is insufficient and prices are higher than those in Vientiane;
- (iii) Demand for those production is high but supplying capacity is low;
- (iv) Producers are facing the difficulties of lack of capital fund and complicated regulations; and
- (v) Livestock is one of the promising farming activities, but it cannot be managed individually. Animal feed must be imported, which is expensive and unstable due to some regulations in the related countries.

Under such circumstances, the association was voluntarily established in March 1999 to solve the issues, to cooperate with other organizations, and to strengthen the power of producers. As of June 2000, the total membership of the association is about 110 to 120 persons, divided into 6 groups such as fishery group, pig, cattle, poultry, crop production, feed and piglet/ chick. After long efforts, the association has successfully been approved for the APB loans at the special interest rate of 7% (loan amount was 600,000,000 Kip). The fund is being used basically for initial investment in livestock/farming activities. The activities of this farmer's association should be encouraged as a pilot case to facilitate market oriented farming in the region.

(3) Plan for Establishment of Provincial Feed Mill Factory

MAF instructed to establish a provincial feed mill factory in Khammouan, Savannakhet, Champasak, and Vientiane province, aiming at promotion of livestock farming and securing feed for animals. Although a detailed plan is not clear yet, the following issues are to be addressed for sustainable operation of the factory:

- (i) Demand for feed production will increase in accordance with increase in local demand for poultry, pig and fish;
- (ii) Establishment of a feed mill factory can give farmers an incentive to grow feed crop; and
- (iii) Issues to be addressed for sustainable operation of the factory will examine if the semi-governmental organization can maintain effective management of the factory or not, and if the factory can provide a reasonable and acceptable buying price to farmers or not.

(4) Plan for Establishment of Provincial Bio-fertilizer Factory

MAF instructed some provincial governments to establish bio-fertilizer factories, aiming at sustainable agricultural development and reducing importing chemical fertilizer. In Savannakhet, a feasibility study on the establishment of a bio-fertilizer factory has been completed (assisted by Vietnam) and the provincial government is planning to start its construction shortly. Another bio-fertilizer factory is under study in Khammouan province.

In March 2000, the first bio-fertilizer factory was established in Champasak province (Champa Biofer Enterprise) with the following features:

- (i) The factory is managed by the PAFO staff and the provincial department of industry and handicraft.
- (ii) The bio-fertilizer comprises: peat soil (60%), bat droppings (30%), chicken droppings (7%), rice bran (3%)
- (iii) Except for peat soil, the factory buys raw materials brought to the factory by farmers or traders at the prices of 100 Kip/kg for bat droppings, 200 Kip/kg for chicken droppings, and 500 Kip/kg for rice bran.
- (iv) Peat soil is collected from the bottom of ponds or lakes and is air dried before mixing.
- (v) The price of bio-fertilizer is 22,500 Kip/ 50kg, and 1 ton/ha is required for rice growing.

IV-2.2 Livestock

1) Present Situation of Livestock Sub-sector

(1) General

The livestock sub-sector, which accounted for 20.6% of GDP in 1998, plays an important role in the economy of Lao PDR. In addition, from a farmer's point of view, livestock is regarded as an indispensable component of the present farming system, as more than 50% of farm income is derived from livestock. Most animals are presently reared by small holders by an extensive and traditional system in a resource saving manner. Thus, it is expected that livestock development will be

one of the important alternatives for farmers to take off the present subsistence agriculture.

In SKR, most of farmers maintain a variety of livestock for domestic use, food, draught power, transport or savings. Buffaloes are used for land preparation. Cattle are not used for land preparation, but mainly for pulling carts or meat. Pigs, chickens, ducks are important sources of protein for home consumption. Further, buffaloes, cattle and pigs are sold to domestic markets, as well as exported to other provinces and sometimes to Thailand. In SKR, there is a small slaughterhouse, managed by the Savannakhet provincial office. This slaughterhouse processes 10 to 20 heads of buffaloes and cattle per day, where meat inspection is done by RDC meat inspector.

(2) Animal Health Services

There is no formal export of livestock because of the inability to meet the international health standards. Diseases likely to have a large impact at the farm level include hemorrhagic septicaemia (HS) in cattle and buffalo, a complex of acute killing diseases of pigs (e.g., swine fever), Newcastle disease in poultry, and a variety of endoparasitic diseases in all species of farm animals.

The Department of Livestock and Fishery (DLF) is responsible for all administrative, political and technical activities at the central level. At the provincial level, the Provincial Livestock and Fisheries Office (PLFO) is responsible for public services concerning animal health and its production. At the village level, staff of the District Livestock and Fisheries Office (DLFO) are responsible for providing those services for villagers in cooperation with the Village Veterinary Workers (VVs). VVs are voluntarily selected and trained on animal health and disease control technique by DLFO and PLFO staff in order to provide those services for villagers.

Presently the animal health services are limited due to lack of trained staff and medicines, as well as inadequate farmer knowledge on animal diseases and their control. However, where farmer's awareness is raised and inputs and services are readily available, there is evidence of the relatively high levels of adoption of health care packages.

Vaccination coverage is well below the levels required for disease containment. Vaccination cover ratio has fallen since introduction of the cost recovery charges. However, the cost recovery charges are only one of the constraints impeding the effectiveness of vaccination program. Other constraints include: (i) poor rural infrastructure; (ii) incomplete cold chain networks; (iii) insufficient funds for vaccine procurement; (iv) poor coordination of vaccine distribution particularly at provincial

level, (v) inadequately trained and equipped vaccinators; and vi) poor farmer education.

2) Livestock Production in SKR

The livestock population and annual growth rate of major livestock species in SKR are summarized in the following.

Table IV2-10 Livestock Population in SKR

(Unit: '000 heads)

	1995	1996	1997	1998	1999, */		A.G.R., **/
Khammouan							
(1) Buffalo	91	92	94	91	85	(8%)	-2%
(2) Cattle	47	52	54	49	52	(5%)	3%
(3) Pig	123	86	88	67	48	(4%)	-21%
(4) Poultry	405	409	455	456	419	(3%)	1%
(5) Goat	0.7	1.5	2.0	3.3	3.0	(3%)	44%
Savannakhet							
(1) Buffalo	233	241	243	256	186	(18%)	-5%
(2) Cattle	301	305	317	337	217	(20%)	-8%
(3) Pig	139	159	162	187	118	(9%)	-4%
(4) Poultry	805	824	942	1,444	1,389	(11%)	15%
(5) Goat	21	21	25	30	23	(21%)	2%
Lao PDR							
(1) Buffalo	1,191	1,211	1,223	1,093	1,008	(100%)	-4%
(2) Cattle	1,146	1,186	1,228	1,127	1,080	(100%)	-1%
(3) Pig	1,723	1,722	1,813	1,464	1,320	(100%)	-6%
(4) Poultry	11,338	11,656	11,946	12,111	12,353	(100%)	2%
(5) Goat	153	159	165	122	112	(100%)	-8%

Note: */ Figures in the parentheses are the percentages in the whole country.

**/ A.G.R. Average annual growth rate during the period from 1995 to 1999.

Source: Yearly Statistic Report 1999, Planning Department, MAF

The animal population in Khammouan province accounts for 3% to 8% of the country, and in Savannakhet for 9% to 21%.

As for annual increase in the animal population, the above table suggests that the livestock population in SKR has not been increased in recent years in spite of big demands for consumption. One of the reasons may be low purchasing capacity. Another reason may be limitation of carrying capacity of animals under the traditional extensive raising systems.

IV-2.3 Fisheries

1) Role of Fishery Sub-sector in SKR

(1) Present Status of Regional Fisheries

Fish Consumption and Nutrition

Fish is one of the most important protein diets of Lao people. Among animal product consumption, Funge-Smith (1997) indicated that Lao people obtained about 37% of protein from fish, higher than other sources (24% from chicken and other birds, 23% from pork and other domestic animals, and 15% from forest animals).

In Savannakhet province, fish capture in 1996 was about 4,882 tons or about 12.9 % of the national production. Assuming that all the fish catch is locally consumed, the per capita consumption from fish catch is about 6.7 kg/capita/year. In Khammouan province, the situation is not much different from Savannakhet province. Fish production in 1996 amounted to about 2,004 tons. The per capita production was about 6.8 kg/capita/year. With the same assumption as in the case of Savannakhet province, the per capita consumption may reach 15 kg/year.

Compared with the national average of 7.7 kg/capita/year, it is slightly lower but it is considerably high from the viewpoint of resource richness. As data of inland fish capture in the Southeast Asia Region are always about 30 % lower than actual catch because of direct catch and consumption, the per capita consumption of Savannakhet people may be as high as 10 kg/capita/year.

From the discussion with the Director of Living Aquatic Resources Research Center, it has been revealed that the per capita consumption of fish caught from the natural waters is about 15 kg/year. This figure is endorsable from the data of MRC and FAO. However, it is unknown whether the current exploitation of fishery resources has reached its maximum sustainable yield or not, as the assessment of fish stock and its productivity has not been conducted to the level that fair judgment can be made.

Table IV2-11 Fish Capture in SKR

Parameters	Savannakhet	Khammouan
Population 1998	726,880	294,830
Pop. Growth	2.5%	2.6%
Fish Capture, 1996	4,882 tons	2,004 tons
Fish Culture, 1996	n.a.	n.a.
Seed Production	1,175,000	175,000

Source: Fishery Resources and Development Policy Framework in Lao PDR., Department of Livestock and Fisheries.

Aquaculture

In Lao PDR, fish production from aquaculture is low, only about 8,300 tons from 30,000 farmers in 1996 (DLF personal interview). This may indicate that the fishery resource is still abundant. Aquaculture cannot be effectively developed unless it has a comparative advantage over the natural fish capture or scarcity of water in the dry season.

It is reported that the total aquaculture area is 464 hectares in Savannakhet and 86 hectares in Khammouan. It comprises rice-cum fish culture, fish pond culture, and culture in other types of waters. In SKR, each province has one hatchery from which about one million fingerlings are produced a year. From interviews with provincial fishery officers, it has been revealed that the fingerling production is sufficient for extension work of this year but it may not be sufficient for the next year. The shortage is illegally imported from neighboring countries, Thailand and Vietnam.

In the production section, farmers in SKR are quite keen to accept aquaculture practice. Official estimates show that there are already 8,000 ponds in Savannakhet and 2,000 ponds in Khammouan. However, from field observation, all public and private ponds are poorly designed, particularly in terms of engineering, water system and pond management. Most private ponds, except for a few innovative farmers, are hand constructed types and too shallow (about 50-60 cm in depth). Consequently they can hold the water only in the wet season. This leads to high demands for fingerlings in the early wet season.

Some farmers reveal that even though the fish reach a marketable size, they still keep them in the ponds for fresh consumption, instead of bringing them to markets.

Some cage culture practices are found in the Mekong (Savannakhet province), cultivating male tilapia. They share experience with their relatives in Thailand who are practicing cage culture on the other side of the Mekong. However, they still depend on large fingerlings (30 pieces/kg) and feed from elsewhere. Farmers noted that domestic fingerling was poorly selected and resulted in poor growth.

For economics calculation of cage culture, one can expect satisfactory return from one cage of 3 m-wide x 3 m-wide x 2 m-depth with stocking of 1,700 fishes. After 2.5 months, fish reaches a marketable size (2 kg/pieces). The yield is about 650 kg/cage and three crops a year. The expenditures per crop are 680,000 kips for fingerling, 2,160,000 kips for feed, and 400,000 Kips for wages, totaling 3,240,000 Kips. The total revenue is about 6,500,000 Kips.

(2) Employment

The official census shows that 471,700 households have their family member engaged in fisheries. Among them, 75,300 and 35,800 households are from Savannakhet and Khammouan, respectively. Their fishing grounds comprise rivers, lake or reservoirs, swamp or flood plain, paddy field, and others.

Table IV2-12 Fishing Households and Fishing Ground in SKR

(Unit: HH)

Province	No. of FHH, */	Fishing in				
		River	Lake, Reservoir	Swamp & Flood Plain	Paddy Field	Others
Savannakhet	75,800	31,000	54,500	21,400	33,600	75,000
Khammouan	35,800	16,700	25,300	19,700	8,200	3,800
Lao PDR	471,700	274,100	250,300	100,400	129,200	24,300

Note: */ Fishery Households

Source: Lao Agricultural Census, 1998/1999

Apart from fish capture, fishery sub-sector absorbs a total of 55,500 households in aquaculture activities. There are 5,300 and 500 households in Savannakhet and Khammouan, respectively. The aquaculture area covers 646 hectares and 86 hectares in Khammouan.

Table IV2-13 Aquacultural Households and Culture Area

(Unit: HH)

Province	No. of AHH, */	Rice-cum fish culture	Pond culture	Others	Area (ha)
Savannakhet	5,300	600	4,700	700	646
Khammouan	500	-	400	100	86
Lao PDR	55,500	6,100	51,500	4,600	6,396

Note: */ Aquaculture household.

Source: Lao Agricultural Census, 1998/1999 UNDP/FAO.

(3) Post-harvest Handling and Facilities

Since most fresh fishes are available in the wet season, except for those residing along the year round water course, villagers have to preserve them for dry season consumption. Traditional forms of fish preservation are smoked fish, salted fish and fermented fish (Pladaek). Pladaek is the most common form as it can be kept for a longer period of time. Short-period preservation (e.g., keeping in ice) is not common due to scarcely available ice.

(4) Fish trading

Domestic Trade

Fish marketing in SKR is not well established. However, it looks likely that villagers who caught and/or cultivated fish will bring their product to markets by

themselves. Fish price in the market is about 10,000~15,000 Kips/kg for common low price fishes and 20,000~25,000 Kips/kg for valuable Mekong fishes.

Cross National Trade

The cross national freshwater fish trade, importation of freshwater fish either fingerling or grown-out fishes, is forbidden but people are importing from Thailand. Cross border trade is taking place for valuable fishes, such as fishes in the family of Pangasidae and Siluridae from the Mekong and its tributaries are carried to Thailand, while common low value fishes such as carps of all types and tilapia are carried back to Lao PDR. The legal import of marine fishes is allowed and largely confined to the family of Carangidae, mostly from Mukdahan. In Khammouan province, a similar pattern of trade is observed between Tha Khek and Nakhon Phanom.

2) Present Fishery Management

(1) Central and Local Government

The Lao authorities envisage to develop the fishery sub-sector step by step. The first step aims at food security. Fish has been targeted to increase protein consumption. It is expected that by the year 2020 the per capita consumption would be 20~24 kg/year. The second step is to exploit fish product as means of poverty alleviation by strengthening production at the level of supplementary cash income. The third step is to produce fish sufficiently and in good quality so that it can be a commercial commodity for both local consumption and exports.

To achieve the above targets, the government has set up a plan for development in four major areas as follows:

- *aquaculture and flood plain management,*
- *reservoir management,*
- *aquatic resource management,*
- *Post harvest management.*

In the field of aquaculture the government has set up 22 hatcheries, in addition to a few private hatcheries (e.g., Saensawang Phanpla, a subsidiary hatchery from C.P. in Bangkok, located at 9 km from Vientiane). They are capable of producing as much as 130,000,000 fingerlings/year. However, it cannot meet the current demand of 500,000,000 fingerlings/year. Apart from fingerling station, the government planned to strengthen institutions in aquaculture by developing technical expertise and improving aquaculture methods from extensive to semi-intensive and intensive.

The fishery policy in SKR is not different from the national policy, since the provincial organizations are operational rather than policymaking.

(2) External Assistance

A number of external assistances, both governmental and non-governmental, have been extended to Lao PDR. Among these are:

- JICA has assigned a fishery expert attached to DLF for planning of general fishery development in the country,
- DANIDA has provided assistance through two partners, the Mekong River Commission Secretariat (MRC) for utilization of existing resources in the reservoirs and in the Mekong river basin, and Asian Institute of Technology (AIT) for strengthening human resource in aquaculture via scholarships, grant and faculty support.
- UNDP/FAO has cooperated in the Provincial Aquaculture Development Project (LAO/97/007) covering 5 provinces (e.g., Oudomxay, Sayaboury, Xieng Khouang, Savannakhet, and Sekong). Within these provinces, the project involves 37 farmer's groups of 440 families for improvement of fish fry production, development of extension capacity, forming farmer groups and assisting farmers/entrepreneurs in fish fry, bloodstock and access to credit facilities.
- AIT outreach (NGO) has extended assistance in community level aquaculture in SKR.

(3) Institutional Framework

The sole organization responsible for fisheries activities and development is the Department of Livestock and Fisheries (DLF) under MAF. It is found, however, that the number of staff handling fisheries and aquaculture at the provincial level is quite small, or about 7 in both Savannakhet and Khammouan. Only a few have experiences in aquaculture either in fingerling production or grow-out. Apart from the governmental organization in Savannakhet, the private sector has initiated the "Association of Animal Husbandry" for development of animal production including fish culture. The activities of the association are to activate technology transfer to local farmers and to fund the viable projects at a low interest rate.

(4) Support Services

Research and Extension

The research institute responsible for research on fishery is the Living Aquatic Resources Research Center (LARRC). The policy of LARRC is to conduct applied researches for improvement of food security, poverty alleviation, and biodiversity. To this end, the institute has set up three categories of researches, i.e., capture

fisheries, aquaculture, and wetland resources. Further, the institute set up a program for database development on fisheries.

The capture fishery researches are confined to the basic ecology of aquatic resources, fisheries, and living aquatic resources management system in Lao PDR. The aquaculture researches are to identify aquaculture system in Lao PDR, broodstock quality and the fingerling supply system, the breeding and grow-out system, fish diseases and fish nutrition. The wetland resource researches are confined to wetland ecology and economic production. However, as this institution is newly established, the impact of research results on the enhancement of capacity of extension officers is still limited. Further, there are only a few experienced extension officers in SKR.

Education and Training

The education center in fisheries is at the National University of Lao at Nubong Campus, in the Faculty of Agriculture and Forestry. A fishery course has been offered there. The enrollment of the Faculty is 50 students for Bachelor Degree and 50 students for diploma level. One third of them are assigned to attend an aquaculture course.

The Savannakhet regional DLF has established a program for training farmers in fish propagation and aquaculture during a three-month course. After completion of training, farmers are awarded a certificate of completion which can be used in accessing bank loans.

Credit

There are limited sources of funding for fisheries in Lao PDR. It is reported that the Agriculture Promotion Bank is the sole agent that provides loans for agricultural operation. However, a small portion has been extended to fish farmers. A large-scale aqua-farm near the town of Savannakhet has received a loan for pig farming first and then extended to fish production (fingerlings and grow-out fish). The loan is for the term of one year. Some NGOs have provided small amounts of loans for aquaculture.

In Savannakhet, aqua-farmers may access a limited amount of credit provided by the Association of Animal Husbandry, but it is limited to its members only.