

### IV-3 REGIONAL AGRICULTURE DEVELOPMENT PLAN

#### IV-3.1 Development Potential

##### 1) Land and Water Resources

##### (1) Land Resources

The environmental, forestry and land use study has been carried out by making use of the GIS database in SKR. Based on the soil, elevation and slope maps, the land suitability maps have been prepared. The soil and suitability maps are presented in Figures IV3-2 and IV3-3. Further, according to the land suitability as well as environmental consideration, the potential land use in SKR in 2020 has been prepared as summarized below.

**Table IV3-1 Potential Land Use in SKR in 2020**

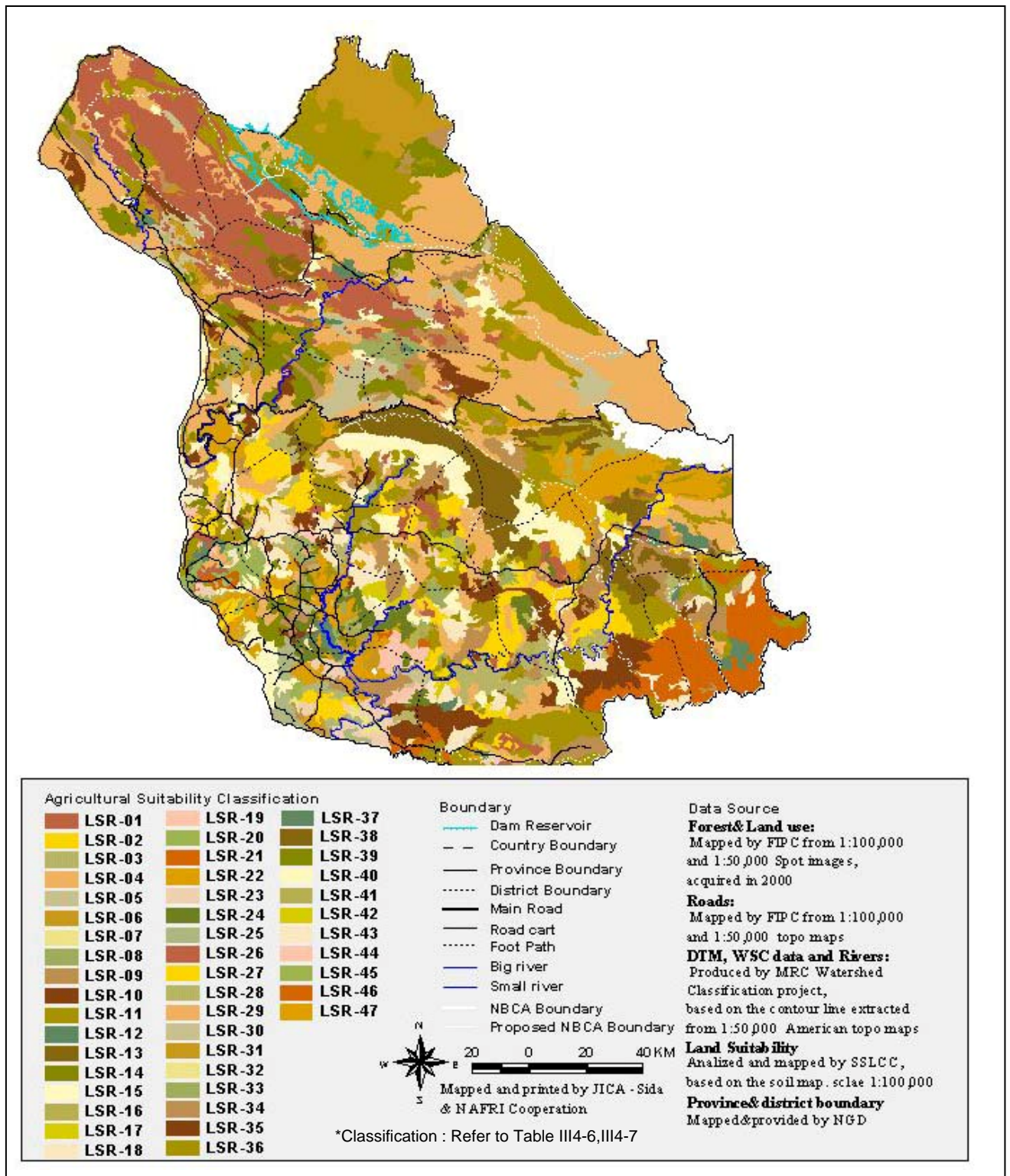
(Unit: '000 ha)

Category	Khammouan Prov.	Savannakhet Prov.
(1) Paddy field	133	281
(2) Field crops (other agricultural land)	123	173
(3) Fruit tree/ Tree crops plantation	85	164
(4) Pasture (grazing land)	142	287
(5) Forest		
- Protection Forest	361	127
- Reforestation for protecting WS	138	111
- Production forest	457	962
(6) Barren land & rocks	198	3
(7) Swamp	19	13
(8) Urban	1	3
(9) Water	11	16
Total	1,668	2,140

Source: Prepared by SKR Study Team based on GIS database.

Categories (1) ~ (4) above are used for agricultural purposes as well as for animal raising. The total available areas in each category appear to be sufficient for the proposed agricultural development plan of small holder basis.

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**Figure IV3-1 Agricultural Suitability in SKR**

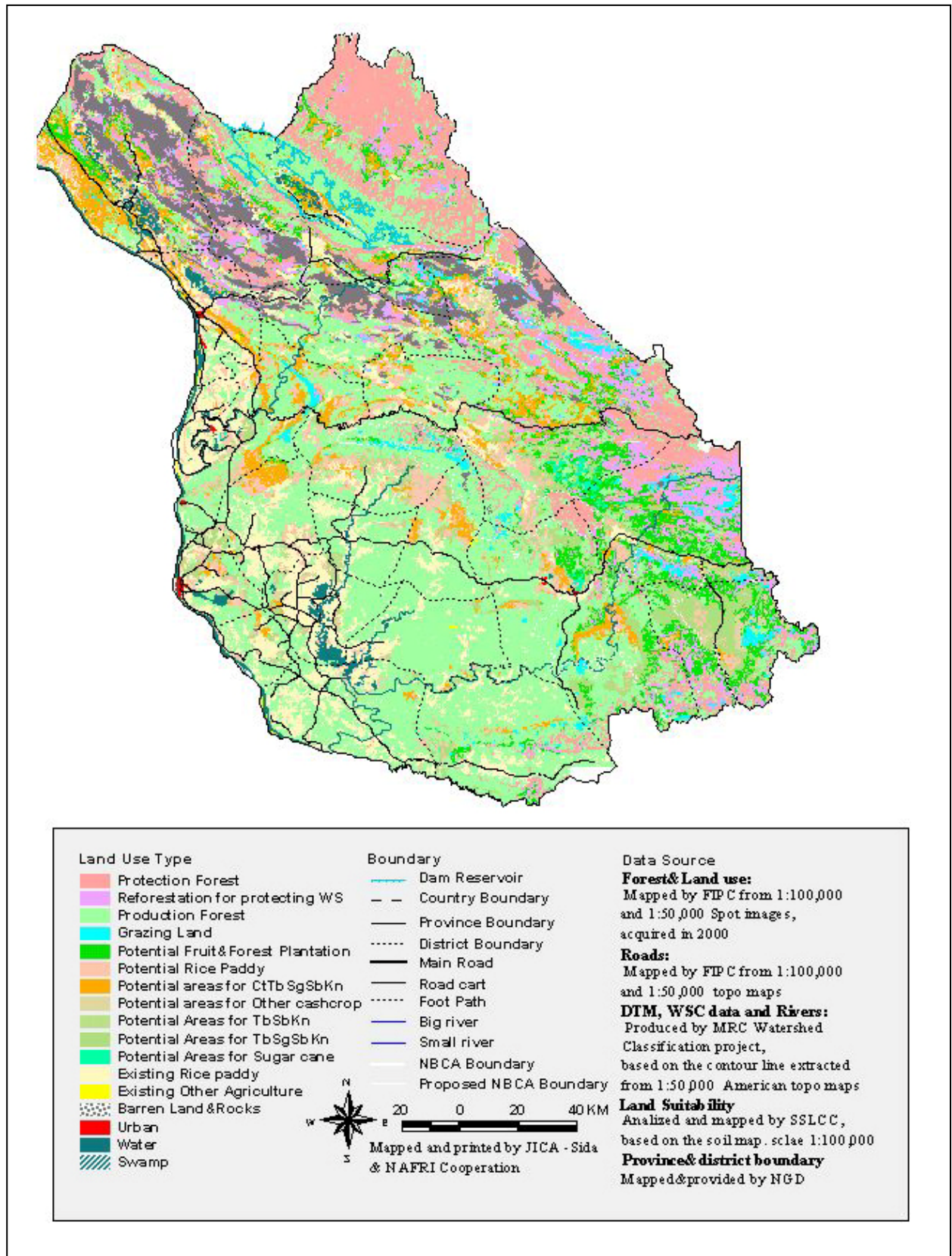


Figure IV3-2 Land Suitability Map in SKR

## (2) Water Resources

Based on the data available at the provincial irrigation sections (PIS) of PAFOs, DOI in collaboration with a JICA expert in DOI prepared a list of potential irrigation schemes in March 1996. The potential list has been updated by the SKR Study Team as summarized below.

**Table IV3-2 Potential Irrigation Schemes in SKR**

Province / Region	Nos. of districts (no.)	Nos. of schemes (no.)	Potential Irrigable Area		Existing irrigated ('000 ha)	Additionally irrigable ('000 ha)
			Wet S. ('000 ha)	Dry S. ('000 ha)		
Khammouan						
- Lowland (Mekong)	3	28	60	56	19	41
- Central	3	67	101	68	19	82
- Eastern	3	74	34	21	4	30
(sub-total)	(9)	(169)	(195)	(145)	(42)	(153)
Savannakhet						
- Lowland (Mekong)	5	74	90	63	45	45
- Central	6	159	87	28	21	66
- Eastern	4	145	71	31	6	65
(sub-total)	(15)	(378)	(248)	(122)	(72)	(176)

Source: Updated by the SKR Study Team based on the List of Potential Irrigation Schemes, March 1996 by DOI, MAF.

The potential irrigable areas in SKR seem to be high compared with the existing irrigated paddy areas as well as the total existing farm lands. It may be attributable to the fact that the potential study is preliminary in nature, based on 1:100,000 scaled topographical maps and the fact that no specific hydrological surveys were conducted. Thus, the potential irrigable areas might have been estimated optimistically. However, it can be said that the potential of water resources for irrigation development in SKR is generally encouraged from the view points of water availability. The points to be considered are the investment cost and its cost recovery. The government should consider how to maximize the efficiency of the existing irrigation facilities, as well. For that purpose, the strengthening of WUA in O&M for the existing irrigation facilities, and some minor rehabilitation of the facilities will be recommended.



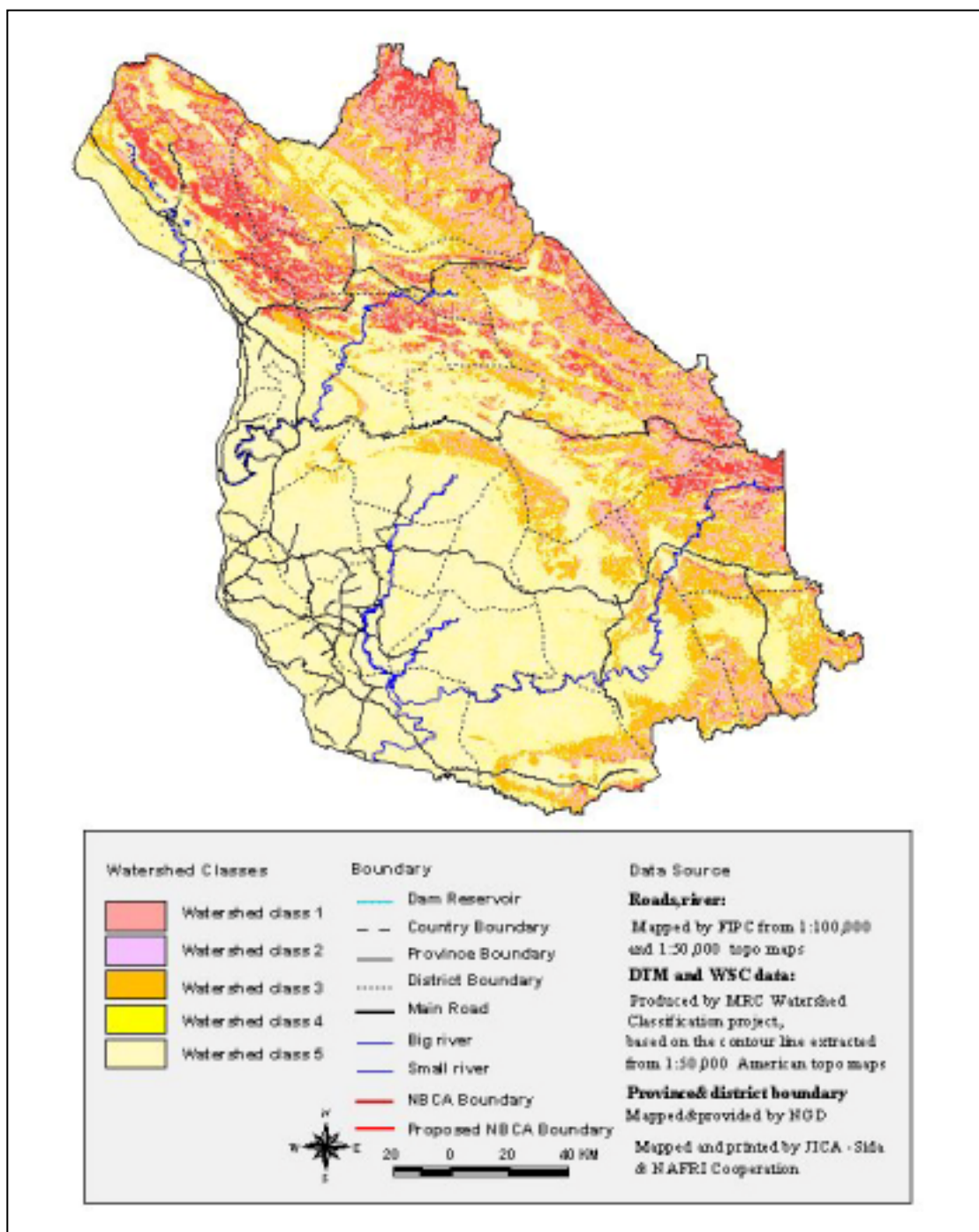


Figure IV3-3 Watershed Classification in SKR

2) Demand for Food Consumption

(1) Rice Balance Projection

In order to project the future demand for rice in Lao PDR, the FAO Food Balance data and the government target in 2020 have been compared as summarized on the following page.

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**Table IV3-3 Annual Rice Consumption per Capita**

Food	Laos			Thailand
	1997, */	2020, */	1997, **/	1997, **/
1. Rice (paddy) (kg)	350	260, ***/	-	-
Rice (milled) (kg)	210	156	172.2	108.3
2. Meat (kg)	25.6	60	26.1	84.3

Note: \*/ Vision 2020 on Agricultural Development in Laos, by MAF.  
\*\*/ Food Balance Sheet by FAO, 1997  
\*\*\*/ 200 kg paddy plus 30% of stock.

With the above in view, the following assumptions have been set at the whole country level in order to project the rice balance in SKR:

- Annual rice consumption: 170 kg/capita in 2000 and 150 kg/capita in 2020
- Annual meat consumption: 30 kg/capita in 2000 and 50 kg/capita in 2020

Based on these assumptions, the demand for rice in SKR is projected as shown below.

**Table IV3-4 Rice Demand Projection in SKR**

Province	Savannakhet			Khammouan		
	2000	2010	2020	200	2010	2020
Requirement (kg/milled rice/person)	170	160	150	170	160	150
Population ('000 persons)	760	973	1,245	308	395	505
Total milled rice required ('000 tons)	129	156	189	52	63	76
Adjustment for stock (%)	30	30	30	30	30	30
Total milled rice required ('000)	168	202	243	68	82	99
Total paddy required ('000)	271	326	392	110	132	160

**(2) Food Balance Projection**

In order to project the future demand for food commodities in Lao PDR, the FAO Food Balance data have also been examined, comparing with those in the neighboring countries, as summarized below.

**Table IV-3-5 Major Foods Consumption and Calories**

Food	(Unit: kg/capita/year)			
	Laos	Thailand	Cambodia	Vietnam
1. Rice	172.2	109.0	168.9	165.1
2. Other cereals and root crops	51.0	26.9	16.8	49.3
3. Sugar crops	24.7	69.4	2.5	14.3
4. Sweeteners	2.6	30.7	6.0	11.1
5. Vegetables	27.7	36.3	39.4	56.1
6. Oil crops and vegetable oils	3.1	24.9	6.2	7.4
7. Fruits	31.5	88.5	27.9	46.3
8. Beef	6.0	4.5	5.1	2.3
9. Pork	6.1	7.8	9.3	15.7
10. Poultry meat	2.0	15.8	2.3	2.8
11. Milk	2.6	21.6	3.2	3.1
12. Egg	1.3	9.5	1.2	1.9
13. Fish	8.5	33.1	8.5	17.1
14. Calories (per day)	2,175	2,462	2,078	2,422

Source: Food Balance Sheet, FAO, 1998

The above table indicates some interesting suggestions to predict future food consumption; e.g.,

- The trend of food consumption in Laos, Cambodia and Vietnam are quite similar each other, but some differences are found between those three countries and Thailand;
- The rice consumption in the three countries are around 160 to 170 kg/capita/year, while it is 100 to 110 kg/capita/year in Thailand, which means people in the three countries take about 70% (570 kcal/day/capita) of the necessary daily energy from rice and Thai people take about 40% (360 kcal/day/capita) from rice.
- The differences are clearly found in the consumptions of fruits, poultry meat, sweeteners, fish, milk and eggs. Those items are consumed in Thailand 3 to 10 times more than in Laos, Cambodia and Vietnam;
- Such a trend of food consumption in Thailand may probably happen in Laos, Cambodia and Vietnam to a certain extent in the future.

Based on the above examinations, the food balance projection has been prepared as shown below. The projection has been made on the basis of the following assumptions:

- Annual rice consumption: 170 kg/capita in 2000 and 150 kg/capita in 2020;
- Annual meat consumption: 30 kg/capita in 2000 and 50 kg/capita in 2020;
- Annual fruits consumption: 40 kg/capita in 2000 and 80 kg/capita in 2020; and
- Annual fish consumption: 10 kg/capita in 2000 and 24 kg/capita in 2020.

**Table IV3-6 Food Balance Projection**

Year	Food	2000		2010		2020	
		Energy, 1/ (Kcal/kg)	Annual Req., 2/ (kg)	Annual Req., 2/ (kg)	Annual Req., 2/ (kg)	Annual Req., 2/ (kg)	Annual Req., 2/ (kg)
	1. Rice	3,300	170.0	160.0	528.0	150.0	495.0
	2. Other cereals	955	51.0	48.7	51.0	51.0	48.7
	3. Sugar crops	290	40.0	11.6	55.0	70.0	20.3
	4. Sweeteners	3,483	5.0	17.4	10.0	34.8	20.0
	5. Vegetables	190	28.0	5.3	29.0	5.5	30.0
	6. Oil crops	6,900	4.5	31.1	5.6	38.6	7.5
	7. Fruits	807	40.0	32.3	70.0	56.5	80.0
	8. Beef	2,790	6.0	16.7	7.0	19.5	8.0
	9. Pork	2,113	6.2	13.1	6.4	13.5	6.6
	10. Poultry meat	1,935	2.5	4.8	3.0	5.8	4.0
	11. Milk	785	2.4	1.9	2.7	2.1	3.0
	12. Egg	1,490	2.0	3.0	3.0	4.5	4.0
	13. Fish	1,110	10.0	11.1	16.0	17.8	24.0
	14. Others			62.0		62.0	62.0
	(Total per capita)		820.0		853.3		896.6
	<b>Average per capita (Kcal/day)</b>		<b>2,247</b>		<b>2,338</b>		<b>2,457</b>

Note: 1/ USDA Nutrient Database,

2/ Annual requirement, estimated by the SKR Study Team

3/ ('000 Kcal/year)

### **3) Demand for Fish**

#### **(1) Fish Production**

In fish production development, the government has set up the program for aquaculture and floodplain management, reservoir management, and aquatic resources identification, assessment and management.

For aquaculture and floodplain management, the focus is put on (i) assessment of the traditional fish culture system and floodplain resources potentialities in regards to different agro-ecological zones, (ii) search for development of aquaculture system development together with strengthening of extension services, (iii) fish disease prevention and control, and (iv) development of fish feed from locally available resources. In the field of aquaculture, a seed production center has already been granted under the FAO/UNDP project, supplemented by pilot aquaculture extension. Some NGOs have also incorporated aquaculture into their programs.

In reservoir fisheries, the emphasis is put on pre-impoundment assessment via Environmental Impact Assessment (EIA) and appropriate mitigation measures. The other aspects such as bio-environmental monitoring and improvement, as well as socio-economic resettlement and multi-purposes reservoir development will be taken as integral parts of fishery development. In this field, assistance from the Swiss Government for Nam Ngum Reservoir fishery management and cooperation by DANIDA through the Mekong River Commission Secretariat (MRC) for resources assessment have been secured.

The aquatic resource identification, assessment and management program aims at an inventory of indigenous species, habitat and migration pattern, water quality, environmental and social assessment for aquatic animal conservation, as well as emphasizes some important species. In this field, DLF has tried to participate in all of the EIA preparation. Moreover, some other international organizations such as IDRC have also participated in development.

These programs have been built for the post harvest technology, emphasizing on research extension and development for improvement of fish products, prevention of post harvest loss in handling and preservation. In the field of post harvest management, support service for ice plant has just been set up.

#### **(2) Consumption Trend**

From the survey of UNDP/FAO's provincial aquaculture development project, it has been revealed that the present fish consumption of Lao people ranks about 37% of wet weight protein intake as shown in Table IV3-7. In Savannakhet, fish



consumption falls in the national average. It is anticipated that this trend of fish consumption may continue for a long period.

**Table IV3-7 Annual Consumption of Animal Product in Some Provinces**

(Unit: %)

Protein Consumption	Oudom-xay	Saya-boury	Xieng Khoung	Savan-nakhet	Se-kong	All Country
Chicken, Duck, Turkey, Eggs, Other Birds	18	19	26	12	21	24
Fresh Fish, Dried Fish, Preserved Fish, Tinned Fish Amphibians, Aquatic Animals	25	34	40	37	55	37
Pork, Beef, Buffalo, Goat, Dried Meat	38	22	22	20	16	23
Reptile, Forest Games, Insects	12	13	4	22	3	15

Source: Lao/97/007, UNDP/FAO

### (3) Projected Demand for Fish

The future fish demand in Lao PDR has been calculated on the basis of the government policy to increase fish consumption from 10 kg/capita/year at present to 20 kg/capita/year in the year 2020, by increasing 2 kg for every 5 year period, except for the last 5 year of 4 kg increment. The projected demand in the year 2020 will be around 162,000 tons.

**Table IV3-8 Estimated Fish Demand (2000 –2020)**

Year	2000	2005	2010	2015	2020
P/C Fish Demand (kg)	10	12	14	16	20*
Population	5,000,000	5,625,000	6,328,000	7,119,000	8,010,000
Fish Demand (tons)	50,000	67,500	86,000	113,900	162,000
Capture Production (tons)	38,000	40,000	42,000	44,000	46,000
Fish Shortage	12,000	27,500	44,000	69,900	116,000
Savannakhet					
Population	726,900	817,800	900,000	1,105,000	1,231,900
Fish Demand (tons)	7,300	9,800	12,600	17,680	17,680
Khammouan					
Population	294,800	331,700	373,200	419,800	472,300
Fish Demand (tons)	2,950	4,000	5,200	6,700	9,400

The capture production may not exceed 46,000 in the year 2020. Therefore the shortage of about 116,000 tons or about 72 % of the demand, should derive from aquaculture. If the same scenario is applied for SKR, fish demand is projected to be around 17,680 tons for Savannakhet and 9,400 tons for Khammouan, from which 12,700 tons and 6,768 tons should derive from aquaculture in respective regions.

#### **(4) Potential for Fishery Development**

##### Capture Fisheries

In the capture side of Lao fisheries, it is unknown whether it has reached the maximum sustainable yield or not. However, from the field observation, fishery resource is quite scarce. Further, fishes of all sizes and all kinds are utilized, and it is likely that maximum sustainable yield of fishery resources has already been reached. Even though many water resource development projects are planned and some are underway, the catch will never meet the ever-increasing demand.

Nevertheless, there are some potential sites that can be developed for capture fisheries. The lowland can be easily developed to be a small water resource. Any site where the catchment area is sufficient to provide the water pond of 10~20 hectares in size and 3.5 m in depth has a high potential for development of new fishing ground for villagers. With proper fishery management, such as nursing and stocking, and with proper regulation of fishing activities, these ponds could turn to be productive and may provide a refuge for fish in the dry season.

##### Aquaculture

The aquaculture activities in Lao PDR is in the early stage of development as noted in the Project LAO/97/007, e.g.,

- *Poor accessibility of rural area, lack of road and government vehicles,*
- *Difficulty in coordinating and managing national scale initiative,*
- *Previous restrictions on inter-provincial travel,*
- *Lack of government funding for rural fisheries extension, and*
- *Insufficient staff at provincial and district level.*

The real shortcoming is a shortage of efficient well-trained aqua-farmers themselves. No single farmer has formal training in aquaculture theory and practice. Production of 27,000 tons of fishes in SKR in the year 2020 will require at least 5,400 well trained aqua-farmers who can produce annually 5 tons on an average per farm.

#### **IV-3.2 Issues to be Addressed**

##### **1) Irrigation Development**

Achievement of rice self-sufficiency is the highest priority for economic development of Lao PDR. Increase in rice production is possible mainly through (i) extension of land-frontier, and (ii) extension of dry season rice cultivation by irrigation. The impacts of irrigation, where any crops have not been grown in the dry season, are generous in terms of creation of more productive dry season

farming. However, the issues to be addressed for irrigation development are (i) financial constraints of the government; and (ii) O&M of irrigation facilities.

(i) Financial constraints:

Since the government budget has a limitation, it is unavoidable that farmer's participation and contribution to the irrigation projects are envisaged. A certain extent of financing responsibility might possibly be taken by farmers for irrigated rice farming in the dry season in view of the fact that most farmlands have not been utilized in the dry season.

(ii) O&M of irrigation facilities:

Proper operation of the irrigation facilities has direct impacts on agricultural production in the beneficiary area. Water User's Association (WUA) should properly function for management of the facilities. DAFO is the responsible authority for supervising WUA's activities. To secure sufficient number of well-trained staff of DAFO is the major issue to be addressed for sustainable and successful O&M of irrigation facilities.

As noted in the previous section, the government has implemented the National Pump Installation and Management Project (NPIMP) since 1997. Further, the Decentralized Irrigation Development and Management Project (DIDM) will start in 2001 financed by ADB. DIDM Project is focusing on the plain areas along the Mekong (9 provinces including Khammouan and Savannakhet), aiming at increasing agricultural production through rehabilitation of the existing pump irrigation schemes, as well as training and extension activities. Under the Prime Minister decree No.26/PM, 20% of the capital invested for construction is to be returned to the government and the remaining 80% to the Village Development Fund (VDF). Due to limited financial resources, the government may implement the irrigation projects in such a manner of cost sharing.

## **2) Profitability and Productivity of Rice Farming**

As noted in the analysis of the farm economy (Section IV-2 (3)), farmers cannot live only on rice production but rely on other income sources. In other words, rice production is important as (i) self-sufficiency, (ii) national policy of food security, and (iii) a cash crop, but not as a profitable crop at present. The rice production may become profitable only under proper conditions of (i) water management with well prepared irrigation facilities, (ii) introduction of improved variety, (iii) application of fertilizer, (iv) pest and disease control, and (v) post harvest activities, which may take some time to meet the requirements.

On the other hand, as rainfed rice farming is not profitable for farmers, it is important to maximize the profit with minimized input costs. It may be realized by

applying good local varieties which are resistant to diseases, drought and/or flood. The yields of those varieties are reasonable, and will be further increased by improving a seed selection method and a genetic improvement.

### **3) Possibility of Extension**

Unutilized areas are mostly forest, providing important feed of natural grass for cattle and buffalos. Rapid changes in land use may cause exhausting natural resources for feeding cattle and buffaloes in the dry season. The present farming is an extensive and integrated system with rainfed lowland rice and livestock raising in the forest. Cattle and buffaloes are important as livestock (stable property) to avoid risks from rainfed rice farming. Thus, rapid extension of paddy field by reclaiming unutilized forest will cause a shift in the balance among “forest+livestock+paddy field”. Besides, the profitability of rapidly extended rice fields will not be improved and will remain unstable.

### **4) Farming System in Remote Areas**

A typical farming system in the rural remote areas is a combination of (i) wet land rice cultivation in the valley plain, (ii) slash and burn cultivation in the slope land area with intercropping of upland rice, maize and food crops, and (iii) extensive animal raising. The slash and burn cultivation in the region differs from shifting cultivation in the northern mountainous areas of the country. The cropped areas in this region are rotated within 2 to 3 years, and some of them have become permanent fields. In order to make a permanent field on the sloping land, counter measures for soil erosion and soil improvement are necessary for sustainable use of the land. Farmers try to input animal manures in their permanent fields to keep soil fertility. However, such measures are not always sufficient to keep soil fertility. Without proper inputs of manures or other organic manures, the land becomes unfertile and farmers have to move to a new place.

The government is promoting “Sloping Agricultural Land Technology (SALT) for sustainable farming on the slope land. SALT includes: (i) a contour line cultivation system mixed with annual and perennial crops, (ii) mulching, (iii) compost, and (iv) fencing. Due to limited extension system and limited funds, SALT is not sufficiently employed by farmers at present. Since rice cultivation is a prior issue in the area, SALT information is not properly transmitted to the staff of PAFO.

### **5) Cash Crops**

Recommendable cash crops should have “a stable local demand or export demand”. It is also better that the recommendable crops are competitive against other competent crops that are already produced by the neighboring countries.

There seems to exist a few crops, which will be profitable even though some investments are required for processing or improving the quality. They are:

- Field crops: peanut, soybean, maize, green bean, sesame, and chili, garlic.
- Fruit tree: tamarind, longan, litchi, cashew nut, banana, and pine apple.
- Tree crops/Industrial trees: coffee, mulberry (for sericulture), kapok, bamboo, and rattan.
- Livestock: Lao PDR has an advantage in livestock raising, as there exist a lot of local varieties/species that can be improved for meat production. Local varieties of poultry, pig and cattle have a big demand in the country as well as in the neighboring countries.

## **6) Extensive Animal Raising**

The animal raising system is extensive at present. Cattle and buffaloes are grazed in the forest with little animal care and disease prevention by farmers. This is because of (i) farmers' lack of knowledge about improved animal raising system; (ii) lack of the government support to disease prevention such as training of village veterinarians and necessary equipment, vaccine and medicine; and (iii) farmer's hesitation in introducing new technology or insufficient information for them to do so.

In order to increase the number of animals under a limited land expansion in the future, the current extensive and traditional way of raising should be transferred to a certain semi-intensive and practical way. Raising in enclosure pasture lands has the following advantages:

- more effective land use and increased raising numbers;
- more effective animal care and disease prevention;
- more effective demonstration and extension purposes; and
- more effective animal manure collection for integrated and organic farming.

## **7) Animal Health Services**

Control of major epidemic diseases and of the international parasites is crucial for improvement of livestock productivity and development of export markets. It is reported that substantial economic benefits have been incurred from animal health interventions in smallholder livestock production systems and from transfer of disease control management to the private sector. The government should focus its policy formulation and limited manpower and financial resources on development of the basic animal health services to smallholder farmers. Core elements of such services may include:



- national policies and legislation which enable and encourage the private sector to deliver reliable, approved veterinary products to farmers, directly or through village veterinary workers (VVs);
- a well trained VVW force with skills and resources to earn livelihood from primary veterinary care; and
- a basic understanding of the epidemiology of, and the diagnostic capability for, the most important diseases, together with the development of cost effective control measures; and
- a national vaccine cold chain.

### **8) Livestock Feed Technology**

Gross margin analysis in the report of "Agricultural Sector Memorandum, Lao PDR, 1995" by World Bank indicates that use of improved livestock feeds would be highly profitable for farmers. Leguminous forage production integrated with traditional cropping practices offers the most cost-effective means of providing protein to ruminants and leguminous silage to supplement pig diets. Improved grasses, preferably grown in combination with legumes, also have a role in relieving both protein and digestible energy constraints to livestock production.

The most appropriate technologies for Lao PDR could be indicated by those adopted by smallholder farmers in other Southeast Asian countries, which include the following:

- shrub and tree legume establishment in blocks and live fencing in house compounds, hedgerows on crop boundaries, close planting in rows in alley-cropping systems, close planting on contour lines for erosion control, and in rehabilitation of degraded forest;
- cereal crop legume undersowing, particularly with maize;
- legume reinforcement of grazing lands which could be done even without modifying traditional grazing management; and
- conservation based forage strategies which could include forage reinforcement of soil conservation structures.

Potential alternative feed resources which Lao PDR could produce in large quantities will include sugarcane and oil seeds, (especially soybean) and high protein forages. The latter include amaranthus, cassava, sweet potato leaves, and aquatic plants. Seed supply is always a constraint to the expansion of successful forage technology. It could best be met through a buy-back program from participating demonstration farmers, especially with respect to leguminous forage seed.