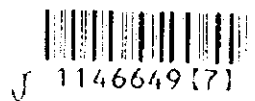


JAPAN INTERNATIONAL COOPERATION AGENCY
MINISTRY OF AGRICULTURE AND FORESTRY, LAO P.D.R.

**THE STUDY ON WATERSHED MANAGEMENT PLAN
FOR
FOREST CONSERVATION IN VANGVIENG DISTRICT
IN
LAO PEOPLE'S DEMOCRATIC REPUBLIC**

FINAL REPORT

SEPTEMBER, 1998



**JAPAN FOREST TECHNICAL ASSOCIATION (JAFTA)
KOKUSAI KOGYO CO., LTD.**

AFF
JR
98-59

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PREFACE

In response to the request from the Government of LAO PDR, the Government of Japan decided to conduct the Study on Watershed Management Plan for Forest Conservation in Vangvieng District in LAO PDR and entrusted the study to Japan International Cooperation Agency (JICA).

JICA sent to LAO PDR the study team headed by Dr. Etsuzo Uchimura, Japan Forest Technical Association, five times between October 1996 to July 1998.

The team held discussions with the officials concerned of the Government of LAO PDR, and conducted field studies in the study area. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of LAO PDR for their close cooperation extended to the team.

September, 1998



Kimio Fujita
President

Japan International Cooperation Agency

September, 1998

Mr. Kimio FUJITA
President
Japan International Cooperation Agency
Tokyo, Japan

Dear Mr. FUJITA,

Letter of Transmittal

It is my pleasure to submit to you the Final Report following the completion of the Study on Watershed Management Plan for Forest Conservation in Vangvieng District in Lao PDR.

The Report compiles the findings of field surveys conducted in the period from September, 1996 to September, 1998 in accordance with the agreement made between the Japan International Cooperation Agency (JICA) and the joint venture [Japan Forest Technical Association (JAFTA) and Kokusai Kogyo Co., Ltd.], the results of the subsequent analysis and the plan formulated.

In the course of the Study, the Forest Conservation and Watershed Management Plan designed to achieve the conservation of forest resources as well as soil and water conservation while seeking enhancement of the living standard of local people was formulated through consultations with officials of the Government of Lao PDR.

I sincerely hope that the Forest Conservation and Watershed Management Plan will be implemented as planned with the concerted efforts of the Government of Lao PDR and all other organizations concerted to enhance the forest resources and to contribute to the development of Lao PDR.

I would like to express my utmost gratitude to JICA, the Ministry of Foreign Affairs and the Ministry of Agriculture, Forestry and Fisheries for their kind understanding and cooperation in the Study. As to Lao internal agencies, my gratitude is equally due to the JICA Office, Embassy of Japan, Ministry of Agriculture and Forestry, Provincial Agriculture and Forestry Service Office of Vientiane Province and all other related organizations for their invaluable advice and assistance given to the Study Team.

I believe that JICA will find the Report useful for the future promotion of the Forest Conservation and Watershed Management Plan in Lao PDR.

Very truly yours,

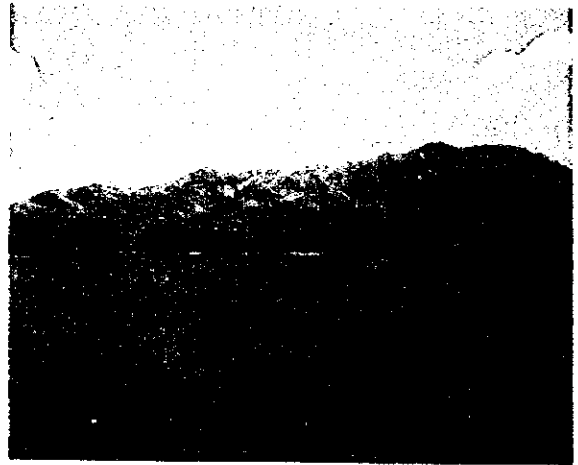


Etsuzo UCHIMURA
Team Leader

The Study on the Watershed Management Plan for
Forest Conservation in Vangvieng District in Lao
People's Democratic Republic.



A scene of soil survey



Nam Ngum Reservoir and mountain slopes
(View from Mouayxi Village)



Sprout trees regenerated from slash and burn



View of a Village



Slash and burn area
(Namon-Nua Village)



Slash and burn area
(Somsanouk Village)



Village Meeting during a PRA at a school
(Nampath-Tai Village)



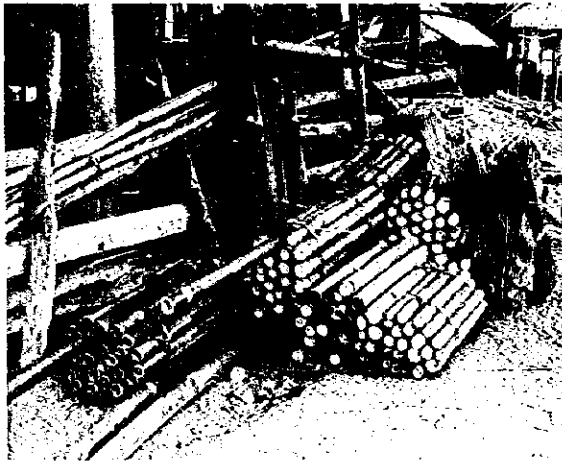
Discussion on land use during a PRA at a temple
(Vangkhi Village)



A scene of water source during dry season
(Nampat Village)



Carrying rice sacks from slash and burn area



Bamboo for roofing



A scene of weaving
(Houaypamon Village)

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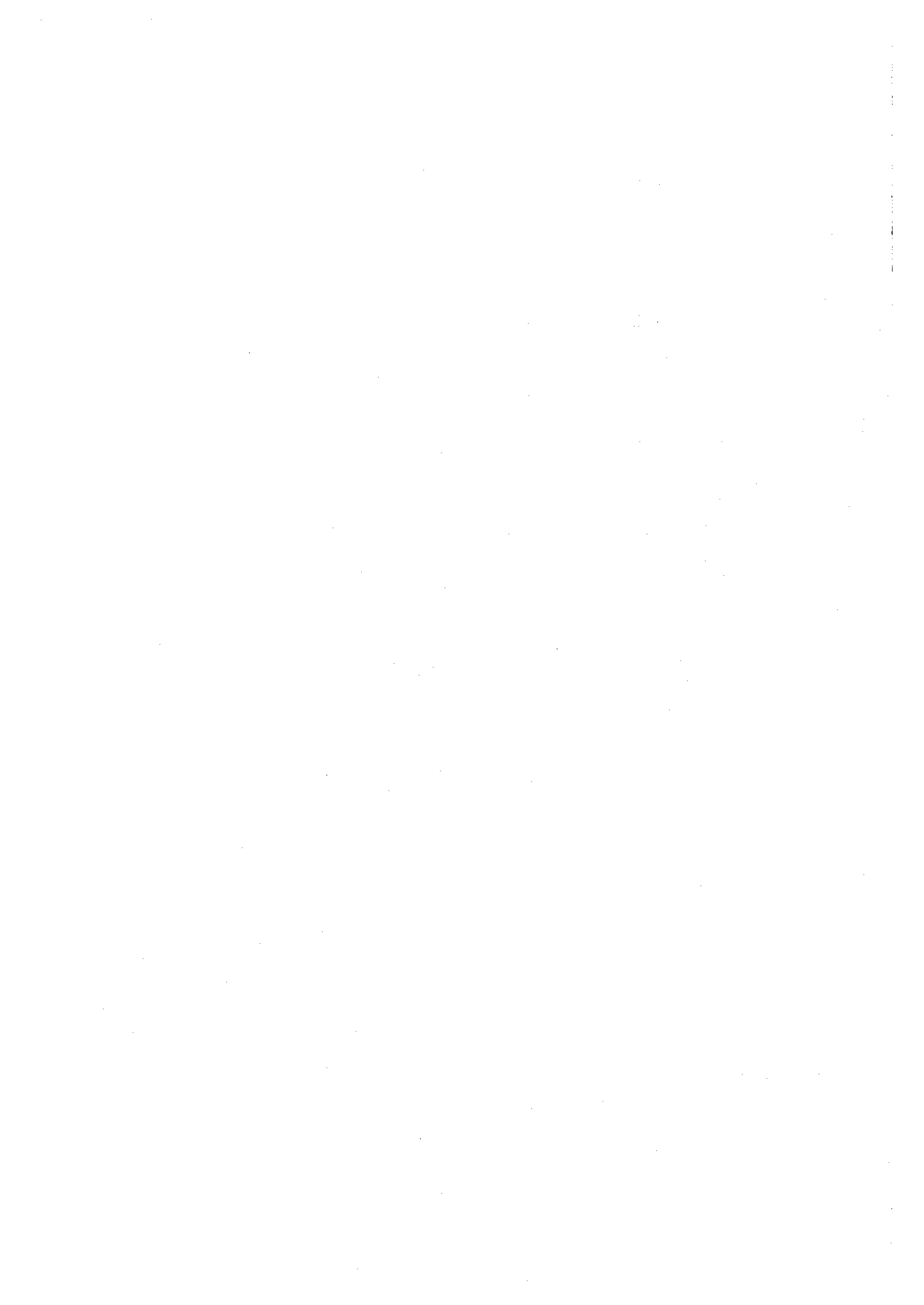
ANNEX

- 1. NATURAL ENVIRONMENT IN THE MODEL AREA**
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- 7. MEMBERS FOR THE STUDY**
- 8. S/W**

SEPARATE VOLUME

- 1. GUIDELINE FOR FORMULATION OF WATERSHED MANAGEMENT PLAN FOR FOREST CONSERVATION**
- 2. SOCIO-ECONOMIC BASELINE SURVEY REPORT**

SUMMARY



SUMMARY

1. Background of the Study

Lao PDR is a typical mountainous country with hills and mountains occupying some 80% of the total national land area of approximately 237,000 km². Forests, which cover 47% of the national land, play an important role as sources of forest products, headwater forests for dams constructed for hydropower generation and firewood sources for the public. However, they have been significantly depleted by the recent expansion of farmland and slash and burn cultivation and this situation is also evident in the watershed of the Nam Ngum Reservoir which generates most of the electricity for domestic consumption and which is an important source of electricity for export.

Changing the course of Nam Xang was planned to feed more water to the Nam Ngum Reservoir to increase the electricity supply. In order to achieve this objective, it is urgently necessary to ensure the sustainable use of forest resources and forest conservation in the said watershed to improve the water retaining performance of forest land and to prevent the filling of river channels by sand.

Under these circumstances, the Government of Lao PDR made a request to the Government of Japan in August, 1995 to conduct a feasibility study in relation to the preparation of an integrated watershed management plan for the Nam Ngum Reservoir watershed. In response to this request, the Government of Japan dispatched the Preparatory Study Team to Lao PDR in January, 1996, followed by another Preparatory Study Team (for discussion of the S/W) in March, 1996. The S/W was signed in April, 1996 after confirmation of the contents of the full study and the scope of cooperation.

2. Objective of the Study

The objective of the Study is the formulation of a master plan for integrated watershed management focusing on the following three points. One of the major characteristics of the Study is its basic application of the participatory method to both the formulation and implementation processes of the watershed management plan.

- (1) Sustainable use of forest resources in the Vangvieng District which forms part of the watershed of the Nam Ngum Reservoir
- (2) Improvement of the standard of living of local people

- (3) Continuous supply of a sufficient volume of water to the Nam Ngum Reservoir in the years to come

In addition, basic reference materials, including guidelines, will be provided to enable the Government of Lao PDR to formulate further watershed management plans for the said watershed. Moreover, technology transfer to the Department of Forestry of the Government of Lao PDR will be made in the course of the Study.

3. Subject Area of the Study

The subject area of the Study is categorised into the following three areas.

The aerial photography area is approximately 700,000 ha, consisting of some parts of Vientiane Province and some parts of the Sai Somboun Special Zone, both of which are located in the watershed of the Nam Ngum Reservoir.

Within the area subject to aerial photography, an area of approximately 170,000 ha, consisting of the Nam Xong watershed and surrounding areas located in the Vangvieng District, is designated as the Study Area.

The Model Area consists of the Somboun Area and the Namon area, both of which are located near the Nam Ngum Reservoir in the southern part of the Study Area, totalling approximately 59,400 ha.

4. Outline of the Study

The Study commenced in September, 1996 for approximately two years until September, 1998 with Phase I constituting the period up to July, 1997 and Phase II constituting the remainder of the period. Firstly, a general survey was conducted in the Study Area, followed by natural environment, socioeconomic environment and socioeconomic baseline surveys in the Model Area. In addition to these surveys, aerial colour photographs were taken and a topographical map (scale: 1/20,000) was prepared. These surveys in the Model Area were then followed by a PRA (participatory rural appraisal). Next, the Forest Conservation and Watershed Management Plan (the Plan) was formulated based on the survey findings, aerial photographs and topographical map, etc. Moreover, the Guidelines for the Formulation of a Watershed Management Plan for Forest Conservation were also prepared.

5. Related Administrative Bodies

The National Assembly, the members of which are elected in a general election, acts as the supreme organization which appoints the president. The government is formed under the president and is headed by the prime minister to whom ministers are accountable. Under the prime minister, the administrative hierarchy is composed of provincial governors, district chiefs and village chiefs. The provincial governors and district chiefs have their own offices.

Each ministry has a provincial service and district office. These form a technical line called the vertical line. The relationship between the office of the provincial governor and the technical service and also between the office of the district chief and the district technical office is one of coordination and is called the horizontal line.

The organization of the Ministry of Agriculture and Forestry includes two vice-ministers under the Minister as well as the Minister's Office, Department of Organization, Training and Personnel, Department of Forestry, Department of Meteorology and Hydrology, Department of Irrigation and Small-Size Hydropower, Department of Veterinary and Livestock and Department of Agriculture and Extension. The Minister's Office controls the provincial agriculture and forestry services which in turn control the district agriculture and forestry offices. The Department of Forestry has four divisions, i.e. Personnel and Administration, Forest Management and Wood Supply, Planning, Finance and Cooperation and Plantation Promotion and Conservation. Each division has 3 - 4 sections.

6. Relevant Legal System

The Decree of the Prime Minister stipulating issues relating to forest conservation, etc. was replaced by the Forestry Law (1996). The Forestry Law sets forth various rights regarding forests and forest land as described below.

Article 13 stipulates that the allocation of forests and forest land to individual persons should be made based on the basic principle of planting trees at degraded forest and barren land.

(1) Forest Land (Article 4)

Forest land is land, with or without forests on it, which the state has determined to be forest land.

(2) Ownership of Forests and Forest Land (Article 5)

Natural forests and forest land are the property of the national community.

Trees and forests which have been planted or regenerated by individuals or organizations using their own labour or capital and with the recognition of the state become the property of the planter or regenerator. The planter or regenerator then assumes rights of possession, use, transfer and inheritance in accordance with the regulations and laws.

(3) Allocation of Forests and Forest Land to Individuals and Organizations for Management and Use (Article 13)

The state grants the right to use degraded forests and barren land to individuals and organizations for the purpose of planting trees or regenerating forests depending on their capacity in terms of labour and capital. An individual family will be allocated an area of no more than three hectares for each unit of labour in the family.

(4) Forest Categories (Article 16)

Forests in the Lao People's Democratic Republic are classified in five categories.

1. Protection forests
2. Conservation forests
3. Production forests
4. Regeneration forests
5. Degraded forest land or barren land

(5) Customary Use of Forests and Forest Land (Article 30)

The customary use of forests and forest land is the use of forests, forest land and forest resources which has been practiced over a long period of time and is recognised by society and/or law.

The customary use of forests, forest land and forest resources must be in accordance with village regulations on forests and forest land which the village authority has determined.

7. Relevant Development Plans

The Tropical Forest Action Plan announced in 1990 lists the following three basic principles for forests and forestry.

- (1) Improvement of forest management in order to protect existing forests and to increase their productivity
- (2) Rationalisation of the use of forest resources in order to enhance their economic value
- (3) Facilitation of the permanent settlement of 60% of the 1.5 million people currently engaged in slash and burn cultivation by the year 2000

The 1996 - 2000 Socioeconomic Development Plan announced in 1996 adopts the following basic targets for the cultivation and forestry sector.

- (1) Increased production of rice and other food
- (2) Promotion of market-oriented production
- (3) Promotion of export-oriented production
- (4) Stabilisation of slash and burn cultivation sites
- (5) Consolidation of irrigation facilities
- (6) Promotion of research and testing on agroforestry

8. Existing Watershed Management-Related Projects

- (1) Nam Ngum Watershed Management and Conservation Project (GTZ)
- (2) Forest Conservation and Afforestation Project (JICA)
- (3) Agriculture and Rural Development Project in Vientiane Province (JICA)
- (4) Afforestation Centre Construction Project (JICA)
- (5) Upland Agriculture Development Project (World Bank)

9. Natural Environment of the Study Area

The rainfall level is particularly high from June to August with a strong monsoon presence, resulting in monthly rainfall of around 700 mm. Ninety percent of the annual rainfall is concentrated in the six-month period from June to November. The dry season with an extremely low rainfall level is from December to April although mean monthly rainfall of 10 - 30 mm is still recorded in the dry season.

The mean annual temperature at Vangvieng is approximately 25°C. April is the hottest month near the end of the dry season with a mean monthly temperature of around 28°C. The mean monthly temperature drops to some 21°C in December and January.

The elevation is high in the northern and eastern parts of the Study Area which form mountainous areas with a number of 2,000 m class mountains, including Ph. Pakhao (El. 2,256 m). The mountains in the western and southern parts of the Study Area are relatively low with an elevation of generally lower than 1,000 m. The northwestern side of the Nam Ngum Reservoir is a hilly area with an elevation of 300 - 500 m.

Nam Xong runs from north to south in almost the centre of the Study Area. The right bank is marked by limestone mountains with a series of steep cliffs, the difference in relative height of which is as large as 1,000 m, showing a unique landscape.

The northern area consists of such sedimentary rocks as conglomerate, sandstone, slate and limestone which belong to the Carboniferous Permian System of the Paleozoic Group. As all rocks other than limestone are strongly weathered deep under the ground surface, fresh rocks are seldom observed except for outcrops of sandstone along mountain valleys or at eroded steep slopes.

The southern area also consists of such sedimentary rocks as conglomerate, sandstone, slate and limestone of the Triassic System of the Mesozoic Group. As in the case of the sedimentary rocks in the northern area, all of these are strongly weathered and stones are seldom observed near the ground surface. Outcrops and boulders of mainly sandstone are observed in eroded areas at summits and steep slopes and near valley bottoms.

The parent materials of the local soils are weathered sedimentary rocks. Because of the extremely advanced weathering of these rocks, except limestone, the properties of the parent materials do not strong reflect on the soils.

The most widely distributed soil groups are Acrisols and Alisols. Because of strong leaching, these soils have lost their bases with a resulting low cation exchange capacity, low degree of base saturation and low pH value.

Vangvieng and its surrounding area where the Study Area is located has high annual rainfall and temperature levels and belongs to the tropical monsoon zone which is characterised by the growth of Dipterocarpaceae and other trees. However, the area covered by such potential vegetation is being increasingly reduced due to the adverse impacts of commercial cutting and slash and burn cultivation. Irrigated paddy fields have been developed on basin-like flat land in the sub-watersheds of Nam Xong.

10. Socioeconomic Environment of the Study Area

The Study Area is under the jurisdiction of Vientiane Province and there are five sub-districts and 76 villages under the jurisdiction of the Vangvieng District.

The Vangvieng District has a population of 41,860 with 6,822 households (as of 1996). The average household size is 6.14 persons which is similar to that of the Lao PDR (6.09 persons/household) and Vientiane Province (6.07 persons/household).

Agriculture is the main economic sector in the Study Area with approximately 88% of the working population engaged in agriculture which is broadly defined as including livestock, fisheries and forestry. In general, however, the productivity is low and vulnerable to the vagaries of the weather. Livestock is probably the second-most important sub-sector in terms of economic returns for villagers.

There are 35 factories in the Vangvieng District, of which one factory is categorised as large-scale with more than 100 employees, eight factories are medium-scale with 10 - 99 employees and 26 factories are small-scale with 1 - 9 employees. The large-scale factory is the Lao Vangvieng Cement Plant which is located in the Vangvieng Area and which was established in 1994.

The town of Vangvieng is the district's largest market in terms of the number of retailers, followed by the market in Thahua-Nua/Thahua-Tai. In general, the sphere of influence of the Vangvieng market covers three sub-districts (Pha Tang, Vangvieng and Na Nuang) in the northern part of the district while the sphere of influence of the Thahua-Nua/Thahua-Tai market covers the Somboun Area.

There are 65 primary schools, 10 secondary schools and one high school as of 1996. Of the 65 primary schools, 28 schools provide education for only 2 - 3 years. The pupils of these schools accordingly have to attend other primary schools for higher primary education grades up to Grade 5.

Institutional health services are provided by the Vientiane Provincial Hospital which has 30 beds and four health centres, one in each sub-district except Vangvieng. Each health centre has 3 - 5 medical assistants and provides various health services for the villages for which it is responsible.

There are two national roads in the Study Area, i.e. Route 13 (R-13) and Route 13B (R-13B). R-13 is paved with asphalt and has a width of 8 m, originating from Vientiane. This road is in good condition and plays an important role in the country's economy as a trunk road. R-13B is a gravel road with a width of 5 m and branches from Route 13 at Houaymo-Tai, running some 18 km southeast to the Sai Somboun Special Zone.

As land which is appropriate for irrigated agriculture in the Study Area appears to have already been developed as paddy fields, there are few areas which can be developed as new paddy fields.

11. Natural Environment of the Model Area

The annual rainfall at Vangvieng for the seven-year period from 1989 to 1995 ranged from some 2,800 mm/year to some 3,800 mm/year with average rainfall of 3,200 mm/year. The average maximum, mean and minimum temperatures at Vangvieng for the 12-year period from 1972 to 1983 were 30.1°C, 25.4°C and 20.7°C respectively. The average annual temperature at Vangvieng is approximately 25°C.

The Model Area is situated at an elevation of between some 200 m (lower reaches of Nam Xong) and 1,864 m (Ph. Kho). The lowland/hill zone consists of the right bank area of Nam Xong, through which such smaller rivers as Nam Houm and Nam Ken flow, the lower reaches of Nam Ngat and the area surrounding the Nam Ngum Reservoir. The rivers flowing in this zone are marked by a very gentle gradient and, therefore, these rivers meander through the lowland. Settlement areas and surrounding paddy fields are found in this zone.

The zone above an elevation of 500 m consists of the areas where Ph. Kho, Ph. Kaykon, Ph. Thai Khan and Ph. Houat are located. In each area, the hillside slopes suddenly steepen just above an elevation of 500 m, forming a highland area with difficult access. The area between

El. 300 m and El. 500 m belongs to the intermediate zone between the lowland/hill zone and the highland zone where the hillside gradient gradually increases.

Based on the results of the aerial photograph interpretation, the category with the largest land coverage in the Model Area is current and former slash and burn sites, accounting for almost half (48%) of the total area. This category includes land used for slash and burn cultivation at the time of the aerial photographs (November to December, 1996), bush and bamboo forests growing at former slash and burn sites and grassland created by repetitive slash and burn cultivation. Bamboo forests (10,000 ha) at former slash and burn sites cover a particularly large area. The most prominent species is May Shoth (*Oxytenanthera parvifolia*) which quickly grows at former slash and burn sites but which is disliked by local people because of its low use value.

Bush and grassland emerging at former slash and burn sites share second place in terms of land coverage with approximately 8,000 ha each. Grassland has resulted from repetitive slash and burn cultivation which has deteriorated the soil conditions to the point where the regeneration of trees is impossible. The grass species observed are predominantly Gramineae, such as Kok Lao (*Pennisetum* spp.), Kok Khem (*Thysanolaena maxinia*) and Nya Ka (*Imperata cylindrica*).

The total area of landslide sites is 5.64 ha with an average area per site of 0.25 ha. The number of devastation sites is extremely small in view of the actual size of the Model Area and the scale of devastation is equally small. The slope gradient at devastation sites is an average of 29°. The vegetation at devastation sites is primarily natural forest in some cases but is predominantly grassland at former slash and burn sites.

12. Socioeconomic Environment of the Model Area

This section presents the results of the Socioeconomic Baseline Survey which was conducted during Nov. 1996 - Feb. 1997. The Model Area has a total population of 16,157, of which 6,779 live in the Namon Area and 9,378 in the Somboun Area. The total number of households is 1,069 in the Namon Area, 1,530 in the Somboun Area and 2,599 in the Model Area with an average household size of 6.3 persons, 6.1 persons and 6.2 persons respectively.

Based on the criterion that a village is affiliated to a particular ethnic group if the number of households of an ethnic group accounts for at least 70% of the total households, there are seven Lao Lum villages, four Lao Sung villages and two Lao Theung villages in the Namon Area while there are seven Lao Lum villages, four Lao Theung villages and one Lao Sung village in the Somboun Area.

The most important source of cash income is livestock/poultry, followed by waged labour, fish, vegetables, non wood forest products, handicrafts, private business and salary in order of importance. However, the order of importance considerably varies from one village to another.

There are great differences between villages in terms of water sources and significant differences are also found between the two areas. Many households in the Namon Area depend on wells (68% in the wet season and 67% in the dry season) while many households in the Somboun Area depend on piped water (35% in the wet season and 41% in the dry season), rivers (24% in the wet season and 29% in the dry season) and wells (18% in the wet season and 14% in the dry season). While 7% of households in the Somboun Area use rainwater in the wet season, there are no such households in the Namon Area.

Firewood is the most important source of fuel and the importance of other fuel sources is negligible. The importance of firewood is almost the same for all villages and for all ethnic groups.

Many households in the Model Area state that they lack enough cereals and meat while the number of households stating that they lack enough roots, tubers, vegetables and fish is comparatively small. The proportion of households suffering from a lack of food is high in the Somboun Area (72% of households lacking cereals and 94% of households lacking meat).

The main crop cultivated in the Model Area is paddy rice in both slash and burn areas and lowland paddy areas. Such other crops as cassava and maize in slash and burn areas and groundnuts and vegetables in lowland paddy areas are also cultivated on a limited scale.

There is a large difference between the Namon and Somboun Area in terms of the use of farmland. The proportion of households with lowland paddy areas is high in the Namon Area while the proportion of slash and burn areas is high in the Somboun Area.

Few villages have a production surplus of paddy rice and all villages in the Somboun Area have a paddy rice supply deficit. The average annual production volume per household is 1,811 kg in the Namon Area and 1,181 kg in the Somboun Area, showing a difference of 630 kg. Meanwhile, the average annual consumption per household is 1,785 kg in the Namon Area and 1,680 kg in the Somboun Area with a difference of only 105 kg between the two areas.

The average annual production in the Model Area is 1,447 kg per household and the average annual per capita consumption is 273 kg (177 kg in terms of rice). The balance of paddy rice in the Model Area (population of 16,157 with 2,599 households) can be roughly calculated based on these figures, showing total paddy production of 3,210 tons, consumption of 4,420 tons and a deficit of 1,210 tons which must be supplied from outside the Model Area.

13. PRA

13.1 Village Boundaries

Areas utilised by neighbouring villages due to unclear village boundaries were found at 24 locations by the PRA, totalling some 6,400 ha which account for 14% of the total area of the villages involved (45,500 ha). These overlapping locations are found more frequently in the Somboun Area than the Namon Area. In view of a likely increase of the demand for land following the expected population increase in the future, the establishment of clear village boundaries is required to clarify the scope of responsibility of each village in terms of land management.

13.2 Current Land Use

- (1) The largest land use category is natural forests (including secondary forests and degraded forests), occupying approximately 75% of the total land area of the 29 villages. The proportion of natural forests in the Namon Area is larger than that in the Somboun Area.
- (2) The second largest land use category is water bodies which account for approximately 14% of the total land area of the 29 villages. This proportion is particularly high in the Somboun Area at 22% due to the existence of the Nam Ngum Reservoir compared to 1.2% in the Namon Area.
- (3) Land use for slash and burn agriculture (1997 crop) is the third largest category, occupying approximately 1,600 ha and 4% of the total land area of the 29 villages. The proportion of this land use category is higher in the Somboun Area than the Namon Area.
- (4) The total land area of lowland paddy is approximately 3% (1,300 ha) of the total land area of the 29 villages, 6% (1,030 ha) of the Namon Area and 1% (260 ha) of the Somboun Area. The lowland paddy area in the Namon Area is five times larger than that in the Somboun Area.

13.3 Problems of Current Land Use and Their Causes

The problems of the current land use can be summarised as two main problems, i.e. (i) a lack of agricultural land and (ii) the low productivity of agricultural land. Both are mainly related to paddy rice production and one or both of these problems are pointed out in all villages, indicating that the largest concern of villagers in regard to the current land use is an increase of

paddy rice production. Forest degradation is also pointed out in many villages (23 of the 29 villages), illustrating the strong interest in forests among villagers.

13.4 Future Land Use Formulated by Villagers

There is a tendency in all of the 29 villages for villagers to intend to expand the land use category of orchards by 11 times the present level, followed by man-made forests (nine times), grassland (four times), lowland paddy (1.5 times) and fish ponds (1.4 times). They also intend to expand the land for slash and burn cultivation by some 4.4 times the present level. However, they plan to use this land for the next five years with 4 - 5 year rotation. Due to this increase of agricultural land, the area of natural forests will decrease to some 70% of the present level.

13.5 Land Use Priority Ranking

The first priority for future land use in many villages is the development or improvement of land (particularly lowland paddy) for the cultivation of such annual crops as paddy rice and vegetables. There is also strong interest in the development of irrigation facilities together with the development of stock raising on grassland, fish culture and orchards as cash income sources. In order to implement such development/improvement work, many villagers express a willingness to provide not only labour and available construction materials, such as stones and timber, but also a certain proportion of the construction cost.

13.6 Needs of Villagers for Implementation of Land Use Plan

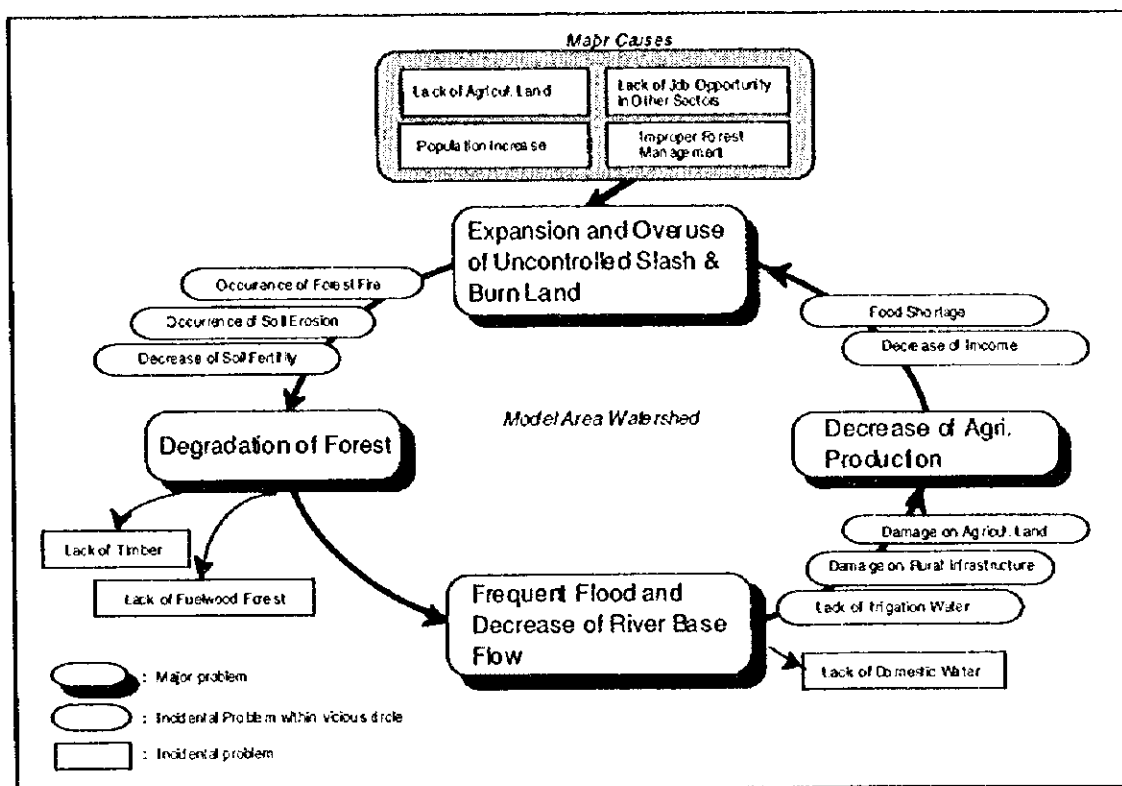
In general, villagers require more funds, seeds/stock and techniques and less fertilisers and agrochemicals. The needs of villagers considerably differ between the Namon Area and Somboun Area in regard to the development of agricultural land for annual crops, i.e. the need for irrigation is higher in the former and that for markets is higher in the latter. This is probably because of the stronger intention of villagers in the Namon Area to develop/improve lowland paddy while villagers in the Somboun Area intend to cultivate upland crops, the marketing of which is usually difficult, in addition to lowland paddy. For the development of man-made forests, villagers require more funds and seeds/stock (seedlings) than techniques.

13.7 Needs of Villagers for Social Infrastructure Development

Villagers have a strong need for the development of such social infrastructure as roads, domestic water supply facilities, schools and electricity supply facilities which is both directly and indirectly related to land use planning.

13.8 Watershed Problems and Their Causes

The predominant problems of watershed degradation and their causes are simply illustrated below.



14. Impeding Factors for Watershed Management

- (1) Shortage of farmland
- (2) Population increase
- (3) Low labour absorption capacity of other industries
- (4) Inadequate forest management

The following problems are either directly or indirectly related to the vicious circle of a worsening watershed environment.

- (1) Cultivation of a limited number of species
- (2) Insufficiency of social infrastructure

(3) Insufficiency of agricultural and forestry extension system

(4) Insufficient educational facilities

15. Expectations of Local People

The findings of the socioeconomic baseline survey and PRA highly rank the following issues among the expectations of local people in regard to their work, daily life and development of social infrastructure, etc. These expectations will be taken into consideration in the formulation of the Plan.

- i) Easing of the work burden : slash and burn cultivation-related work and water fetching
- ii) Issues of strong interest : sufficient food, sufficient drinking water and cash income
- iii) Increase of cash income (land use) : rice, livestock, vegetables and fruit trees
- iv) Social infrastructure : roads, domestic water supply facilities and primary schools

16. Basic Principles of Watershed Management Plan

What is necessary in the future is reform of the conventional land use with a view to developing complex farming practices involving useful trees, grains, vegetables, livestock and fruit trees.

Given the present natural as well as socioeconomic conditions described so far and the development principles adopted by the Government of Lao PDR for the agriculture and forestry field, i.e. (1) increased crop production, (2) stabilization of slash and burn cultivation and (3) promotion of experiments and research on agroforestry, it is decided that the objective of watershed management in the Model Area will be "conservation of the watershed environment in the Model Area stabilizing slash and burn cultivation". This objective cannot be achieved only by forest improvement, it also demands conscious efforts to strengthen the agricultural production system and village support system and to develop rural infrastructure. The following principles are, therefore, adopted to achieve the objective.

- Introduction of a sustainable production system to replace slash and burn cultivation
- Improvement of the standard of living of local people and their living environment
- Rehabilitation of forests degraded by slash and burn cultivation
- Strengthening of the village support system

The necessary approaches to achieve these principles are described below.

(1) Introduction of a sustainable production system to replace slash and burn cultivation:

Improvement of the land productivity and labour productivity will be aimed at through the formulation of a land use plan based on the intentions of local people and diversification of production based on the land productivity evaluation results and other measures.

(2) Improvement of the standard of living of local people and their living environment:

Improvement of the local standard of living will be aimed at through improved income based on the measures described in (1) above and the development of social infrastructure, including roads, water supply system and schools.

(3) Rehabilitation of forests degraded by slash and burn cultivation:

The conservation of forests will be aimed at by means of planting trees in devastated forests.

(4) Strengthening of the village support system:

A plan to provide support which is at least required to achieve the above targets will be formulated.

Under the present Study, a PRA was conducted using each village as the basic unit to clarify the local land use problems with the participation of local people and their expectations and needs in regard to land use were then identified. A watershed management plan was formulated using the results of this bottom-up approach with the participation of local people. The participation of local people is also an essential feature of the implementation of the plan. In short, people play a main role in the plan, from planning to implementation.

The basic concept of the plan formulation process is illustrated below.

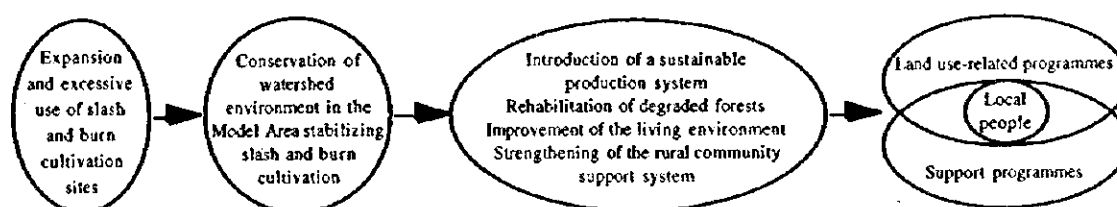
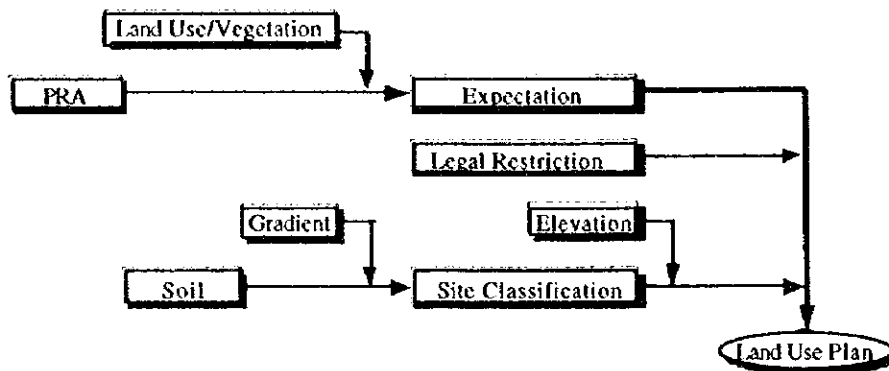


Image of Basic Principles

17. Land Use Plan

Under the Study, the expectations of land use on the part of local people have been identified by the PRA and land use which takes such expectations as well as the natural conditions, legal regulations and other relevant issues into consideration is planned.



Flow of Land Use Suitability Judgement

As a result of the site suitability classification efforts, land in the Model Area was roughly classified in three categories, i.e. "suitable site for agriculture", "suitable site for forestry" and "moderately suitable site for both agriculture and forestry (forest)". These three categories were then renamed the "agriculture zone", "forest zone" and "symbiosis zone" respectively.

Current land use in the Model Area comprises 38% forest, 48% present and former slash and burn sites, and only 2% permanent farmland. The remaining 12% of the area is almost entirely water bodies.

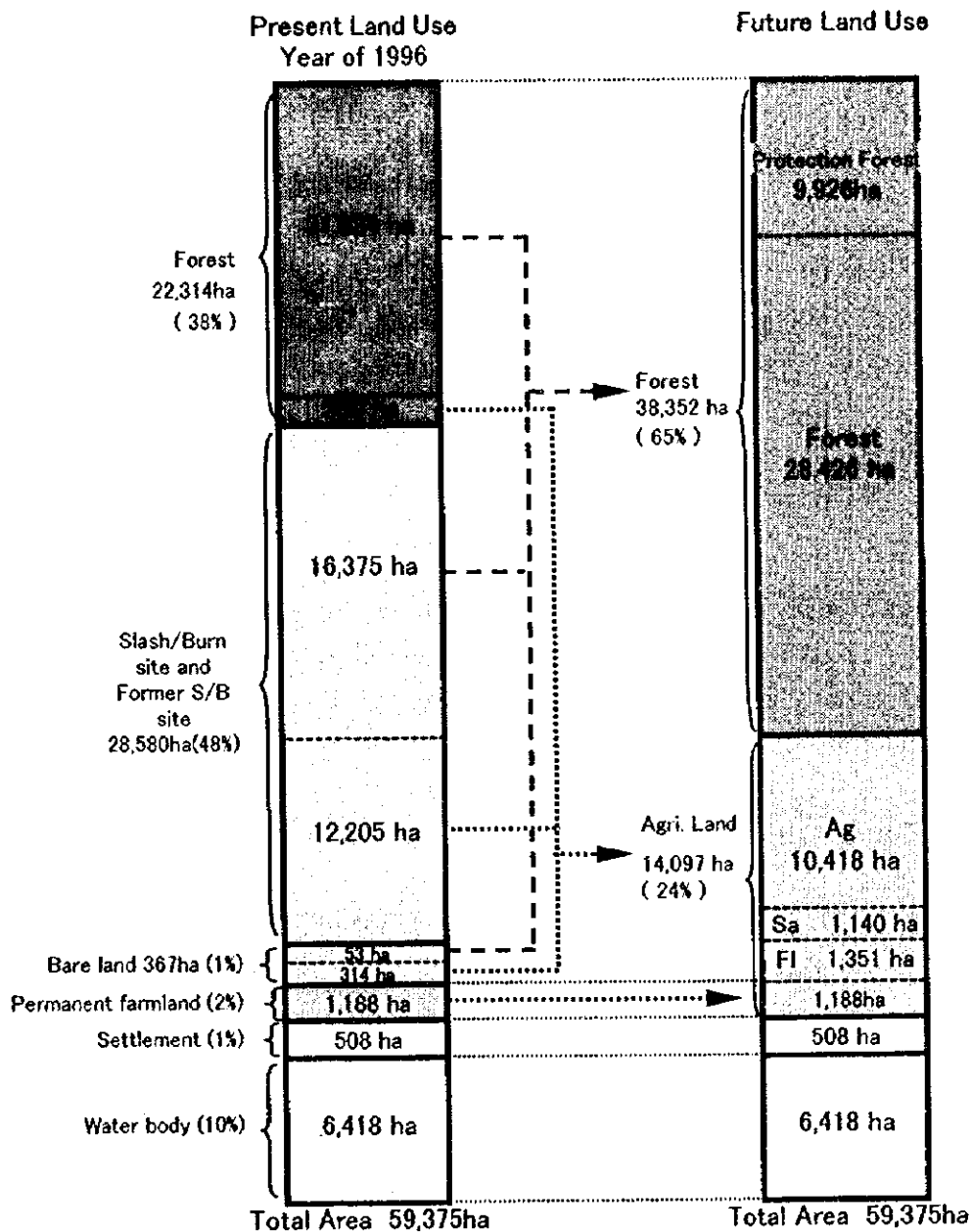
Instead of slash and burn cultivation, future land use would entail permanent cultivation in the form of agroforestry and slope land agriculture on present and former slash and burn sites. Permanent cultivation would spare fallow slash and burn sites from the process of repeated burning, making possible forest regeneration.

In the following Figure, changes in future land use are indicated by arrows for that portion of the area which will undergo transition to forest land (broken line) and that portion which will convert to agricultural land (dotted line).

The area which will be forest in the future comprises the majority of present forest land (21,924 ha), some (16,375 ha) of present and former slash and burn sites, and a portion of bare land

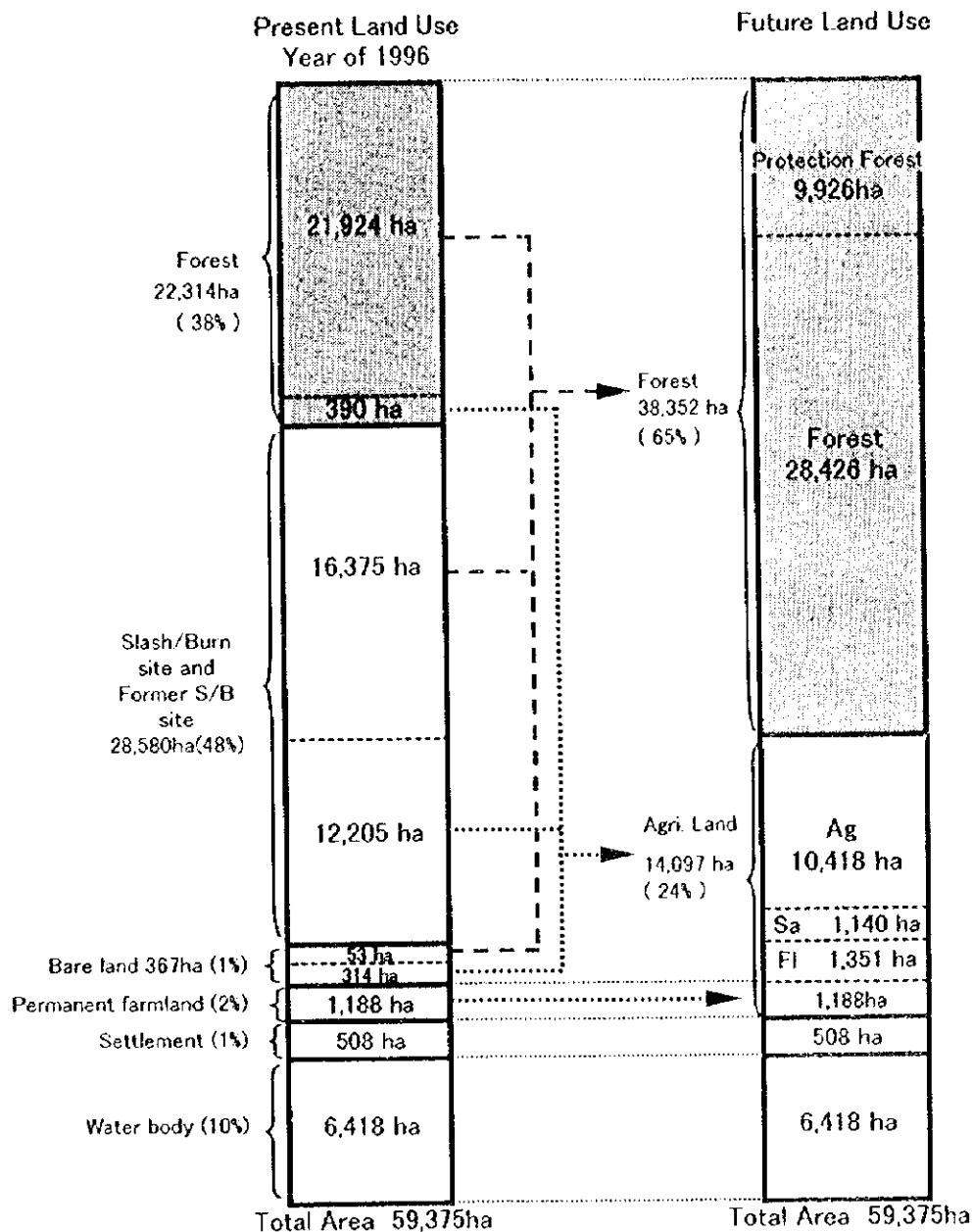
(53 ha). Total future forest area is 38,352 ha. Of this, 9,962 ha represents area which local residents want to preserve as protection forest.

On the other hand, the area which will be agricultural land in the future comprises a portion of existing forest (390 ha), some (12,205 ha) of present and former slash and burn sites, a portion of bare land (314 ha) and currently utilized permanent farmland (1,188 ha). Total future agricultural area is 14,097 ha.



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18. Land Use by Zone

(1) Forest Zone

This zone is located in the upper reaches of the watershed and consists of steep slopes and areas which are remote from a village centre. As a result, few people enter this zone and most areas have been left as natural forests. Slash and burn agriculture has been taking place, however, at gently sloping areas in the zone. As the zone is distributed in a headwater area, the preservation of forests is intended to maintain the water yielding function. No man-made forest, permanent cultivation site or settlement currently exists in this zone.

(2) Symbiosis Zone

The symbiosis zone is located between the forest zone and agriculture zone. Slash and burn agriculture is the main form of agriculture in this zone, causing a general decline of the land productivity. There are current slash and burn cultivation sites, fallow land and abandoned land due to the depletion of soil nutrients. The creation of symbiosis between forest and agriculture is planned for this zone by mixing such land use categories as natural forests, slope land agriculture (including pasture and orchards), man-made forests and bamboo forests in a mosaic manner.

(3) Agriculture Zone

This zone represents areas in which lowland paddy fields have been developed in the Model Area. As the productivity and yield of lowland paddy are decisive factors in the livelihood of local farmers, the existing lowland paddy fields will almost certainly remain permanent farmland.

19. Forest Zone Conservation Plan

No designation of protection forests will be conducted in the forest zone so as to enable the removal of naturally damaged trees, hunting and the gathering of wild plants and mushrooms by local people if this is the case.

The planting of trees at bare land and land which has become grassland due to poor soil may be desirable in the forest zone to facilitate the quick restoration of forests. Given the facts that 1) the Model Area has suffered few landslides and, 2) enjoys the relatively quick recovery of vegetation due to a high level of rainfall provided and, 3) the forest zone is located in a remote area, however, natural regeneration will be selected for forest restoration purposes.

20. Symbiosis Zone Conservation Project

20.1 Conservation of Natural Forests

All primary natural forests and secondary natural forests with a crown density of 40% or more will be made usable by local people for the collection of firewood and other purposes. When trees are cut to serve local people, the sites in question will be restored through natural regeneration by sprouting. Rules on the diameter of trees subject to cutting to produce firewood and also on the handling of protection forests to be established by villagers will be introduced to meet the intentions of villagers so that these forests can be protected by the villagers themselves.

20.2 Afforestation

(1) Planting of Timber Trees

The planting area is some 1,300 ha which is the total figure of area suggested by villagers. Assuming that suitable sites for planting account for 70% of the subject sites, the total planting area will be approximately 900 ha.

The common planting density is 1,100 trees/ha, taking the planting density recommended by the Forest Regulation into consideration. The total number of trees to be planted will be approximately one million.

As the FORCAP intends the production of 200,000 seedlings/year from nurseries belonging to the afforestation centre and district office, these seedlings will be supplied to meet the demand under the Man-Made Forest Development Programme. Local people will be responsible for planting work and for the erection of fencing to protect the planted areas from domestic animals.

As part of the efforts to extend the necessary techniques and tending methods, etc. of afforestation to local people, demonstration forests will be created at sites with favourable tree growth in planted areas with a view to converting them to seed orchards in the future. These seed orchards will provide another source of income for local people through the sale of seeds.

Planting Area for Timber Production

Namon	Area (ha)	Somboun	Area (ha)
Vangmiang	54	Houaymo-Tai	55
Namon-Tai	39	Thahua-Nua	5
Namon-Nua	64	Thahua-Tai	1
Phonsavang	14	Houaypamom	50
Phonkeo	28	Nampat	18
Ngiou	7	Vangkhi	310
Nalao	60	Taathan	84
Nakhom	33	Namphat-Tai	80
Nangcun-Nua	160	Houayxi	34
Namphat-Nua	14	Namphao	2
		Phakoub	54
		Sivilai	210
Total		Total	903
Seedlings No.=(473+903)×0.7×1,100≐ 1,000,000			

(2) Improvement of Bamboo Forests

1) Enlargement of Mai Shoth

Bamboo shoots appear approximately three times a year in the Model Area and the diameter class and length of the bamboo shoots increase each time they regenerate. To encourage this process, the number of clumps will be reduced to 350 - 400 in the fourth or fifth year in accordance with the state of growth. By cutting older, small diameter bamboo previously regenerated, usable culms can be produced in the fourth or fifth year. When the culms reach a usable diameter, they will be cut for use at a rate of approximately 25%.

2) Conversion to other large diameter species

Suitable species for the conversion of low quality bamboo forests to large diameter, high quality forests are Mai Hock and Mai Phaibaan, both of which are observed in the Model Area.

The propagation of bamboo can be conducted using seeds obtained after flowering or using cuttings. For the present purpose, the use of cuttings is selected in view of the easier process.

20.3 Agroforestry Development

(1) Silvi-Agriculture

There are two recommendable sub-patterns, i.e. the combination of trees and agricultural products and the combination of trees and fruit trees. In the case of the former, the primary crop will be upland rice which is the most important crop for farmers. Such other crops as pulses, peppers, tomatoes, cabbages, melons, cassava and sweet potatoes can also be cultivated. The cultivation of diverse agricultural products in the shade of trees while growing upland rice on the slope is possible. In the case of the sub-pattern combining trees and fruit trees, the likely fruit trees for planting are banana, pineapple, papaya, mango and breadfruit.

As the subject areas of agroforestry have a slope gradient of 10° - 25°, measures to prevent soil loss will be required. The planned solution is the contour planting of grass to create simplified terraces. The contour planting of pasture grass will be conducted at 3 m intervals on the slope. The trees to be planted will be those of the Leguminosae family as these are both short and compact and have a small shaded area. They are also effective for soil improvement purposes. Once mature, they can be used as firewood and their branches and leaves can be used as animal fodder. Three lines of these trees will be planted in a zigzag manner for every five lines of pasture grass. When the subject site is a sparse secondary natural forest, useful trees will be kept.

The maintenance of farmland as permanent cultivation sites requires the supply of nutrients to the soil. The planting of leguminous trees is one measure to meet this requirement. Although the primary requirement is to make compost, the transportation of compost on a slope is hard work. Therefore, gramineous grass growing around farmland will instead be cut and buried on farmland to act as simple compost. This will not only reduce the adverse impacts of rain to prevent soil loss but will also supply necessary nutrients to the soil.

(2) Silvo-Pastoral

The introduction of silvo-pastoral is proposed from the viewpoint of introducing stock raising which reflects the local characteristics and which will contribute to forest conservation and watershed management.

1) Enclosure fencing

The creation of hedges is proposed here as permanent fencing using such leguminous species as *Gliricidia sepium*.

2) Creation of shaded area for livestock

Small stands will be created on pasture land to allow livestock to avoid scorching sunshine. If small forests already exist in an enclosed area, they will be used for this purpose. One small stand of some 30 trees randomly planted at intervals of approximately 3 m will be created for each 2 - 3 ha.

3) Grassland improvement

The cultivation of grass on pasture land is important to increase the productivity of livestock raising and, therefore, the introduction of high quality grass is desirable. A simpler method which can be employed by local farmers will be used to improve the grass under the Plan in view of the principle of participation by local people.

20.4 Slope Land Agriculture (Gradient of Less than 10°)

Relatively gentle slopes with a gradient of less than 10° will be used as permanent farmland and these gentle slopes will still require soil loss prevention measures. To be more precise, the contour planting of grass at 3 m intervals on the slope will be conducted to create simplified terraces. The agricultural products to be grown on these terraces will be dry field paddy, pulses, peppers, tomatoes, cabbages, melons, cassava and sweet potatoes, etc.

20.5 Non Wood Forest Products Production

(1) Charcoal Production

The pit method has many advantages, such as a short time required to produce charcoal, simplicity, low cost and compactness and will be introduced in the Model Area.

(2) Bamboo Production

Bamboo is a very promising local resource because of its (i) suitability vis-a-vis the natural environment of the Model Area, (ii) ease of cultivation which does not require advanced technologies and (iii) ease of transportation to and marketability in Vientiane which is not far from the Model Area. The improved bamboo forests will not only produce bamboo for use as bamboo but will also provide raw materials for bamboo charcoal.

(3) Cardamon Production

Although the price of cardamon is significantly affected by market trends, earnings of 765,000 - 1,800,000 kip/ha can be anticipated based on an average unit price of 4,500 kip/kg in 1996, making it an attractive cash crop for farmers.

21. Agriculture Zone Plan

21.1 Lowland Productivity Improvement Project

- (1) The Paddy Seeds Multiplication and Supply System Establishment Programme will result in a unit yield increase of lowland paddy through the utilisation of improved seeds recommended by the MAF instead of deteriorated self-produced seeds. According to the results of trials, the unit yield of improved seeds is some 10% higher than that of the seeds produced by farmers under the same cultivation conditions, showing excellent prospects.
- (2) The Second Cropping Promotion at Lowland Paddy Programme will diversify the crops at existing lowland by the introduction of short-growing crops which will be cultivated with limited irrigation water in the dry season. In the short-term, the subject crops will be mainly for home consumption and/or the local markets. With such crops, farmers are expected to learn cultivation and marketing techniques. In the medium-term, the subject crops will be gradually expanded to those aimed at Vientiane and other larger markets.
- (3) The Fish Culture Expansion at Lowland Paddy Programme will increase the scale of fish culture using lowland paddy fields and will bring additional income to farmers and improve their nutrition. As market prices of fish have been recently increasing due to the decreasing trend of the catch in the Nam Ngum Reservoir, this programme is expected to generate higher cash income for local farmers.

These three programmes will be implemented in all of the 25 target villages with lowland paddy fields. A demonstration farm for each programme will be jointly created and operated by the Project office and relevant farmers' group to demonstrate the intended development activities and results of each programme.

22. Infrastructure Development Project

(1) Improvement and New Construction of Local Roads Programme

The objective of this programme is the expansion of economic activities in the Model Area through the upgrading of existing local roads and the construction of new roads to connect remote villages with Route 13. The programme consists of three main components, i.e. (i) gravelling of existing earth roads (total length of 4.96 km), (ii) upgrading of existing cart roads by means of gravelling (total length of 1.6 km) and (iii) construction of new local roads (total length of 13.4 km), together with bridges and crossing structures related to these roads.

The villages involved in this programme are 11 villages in the Namon Area, of which three villages are rather remote from Route 13 with no local roads connecting these villages.

(2) Construction of Rural Domestic Water Supply Facilities Programme

The objective of this programme is to ensure the supply of domestic water for villages in the Model Area by means of either a gravity piped water supply system (piped system) or dug wells/shallow tube wells. Where possible, the piped system will firstly be examined in accordance with the guidelines of the Water Supply and Environmental Sanitation Programme prepared by the Ministry of Health with the assistance of UNICEF and the construction of wells will then be considered for those villages where the piped system is not feasible or inapplicable.

The programme is proposed for eight villages in the Namon Area and 13 villages in the Somboun Area, taking the present water supply system conditions and preferences of villagers in the Model Area into consideration. The programme is expected to reduce the heavy burden on women and children in terms of the daily work of fetching domestic water and is also expected to improve the sanitary environment.

(3) Existing Primary School Upgrading Programme

Under this programme, existing primary schools in the Model Area will be upgraded to the national standard applied by the Ministry of Education. A total of 25 school buildings, consisting of 14 buildings in the Namon Area and 11 buildings in the Somboun Area, will be improved except for those school buildings conforming to the said standard in the villages of Sivilai and Somsanouk. Two schools in the villages of Houaypamon and Nampat will be completely rebuilt because of the extremely poor conditions of the existing buildings.

23. Rural Community Supporting Project

Under the Rural Community Support Project, the following seven programmes are planned.

(1) Land-Forest Allocation Programme

This programme will be implemented in all 29 villages to support forest conservation and to clarify ambiguous village boundaries and land use rights of individual farmers, both of which have been impeding the promotion of agriculture at permanent sites as a replacement for slash and burn agriculture.

The implementation priority of the subject villages of the programme will be given to those villages where the establishment/extension of fixed type agriculture will be emphasised.

(2) Village Revolving Fund System Establishment Programme

This programme will basically support the expansion of agroforestry development at permanent farmland through the provision of investment and production loans for farmers. Under the programme, a village organization responsible for the management of the revolving fund system will firstly be established in each village. The Project Office will train management staff for system management. The Project Office will then provide initial funds which may be provided in kind, particularly at the initial stage, based on the requirements of member farmers. It will be necessary for the management staff to examine the propriety of the loan requirements of members prior to giving loans. Member farmers will have to repay the loans under certain conditions to be established. The repaid amounts will then be loaned to other member farmers. The Project Office will periodically provide guidance on proper fund/loan management for the management staff and on effective production activities for member farmers. Two auditors consisting of the village chief and DAFO official will audit the fund/loan management of the organization. The programme will cover all 29 villages while giving priority to those villages where emphasis is placed on agroforestry development.

(3) Weaving Entrepreneurship Development Programme

This programme will strengthen the village weaving system by means of providing training for selected village weavers. Under the programme, one capable weaver will be selected from each village for extensive training. This training will cover various fields, including quality control, book-keeping and marketing, etc. The trained weaver will then take responsibility for the training of other weavers in the village. Under this programme, village women are expected to increase their cash income and improve their vocational skills in a wide range of activities related to weaving. The programme will be implemented in all 29 villages.

(4) Skill-Based Informal Education Programme

This programme will be implemented to improve the adult literacy rate, particularly that of women, and to improve the technical skills of women in regard to the management of village level small projects. Under the programme, those villagers interested in attending literacy classes will be organized into a group and will be taught reading and writing by selected villagers or school teachers on a voluntary basis using materials to be provided by the Project Office. As an incentive, the Project Office will provide several training courses

for group members in addition to literacy classes. "Improved cooking stove making" and "bamboo crafts" are proposed as likely effective training courses for this purpose. As an alternative, training on domestic garden management is proposed in order to improve the nutritional level of villagers, to improve their technical level for crop diversification and to increase their cash income. The programme will cover all 29 villages, giving priority to those villages where emphasis is placed on agroforestry development.

(5) Improved Cooking Stove Dissemination Programme

Under the programme, training on how to make improved cooking stoves using locally available materials will be provided by the Project Office. The group will make cooking stoves and will sell them to other villagers. Profits from the sale of the cooking stoves will be used for the purchase of materials required for the literacy classes. This programme will have the effects of reducing firewood consumption, reducing the firewood collection work of villagers and increasing the forest conservation potential at a village level.

(6) School Forest Establishment Programme

This programme will be implemented as part of environmental education for primary school children and their parents. They will be enlightened in regard to the importance of forests through the establishment and operation of a school forest in cooperation with the Project Office. Tree planting and forest management techniques will be provided by the Project Office. The timber to be produced in the school forest will possibly be utilised for school renovation and the fruit will possibly be consumed by the pupils or sold for cash income to assist school renovation. This programme will be implemented in 12 villages in which complete primary schools (for five-year schooling) are located.

(7) Bamboo Crafts Promotion Programme

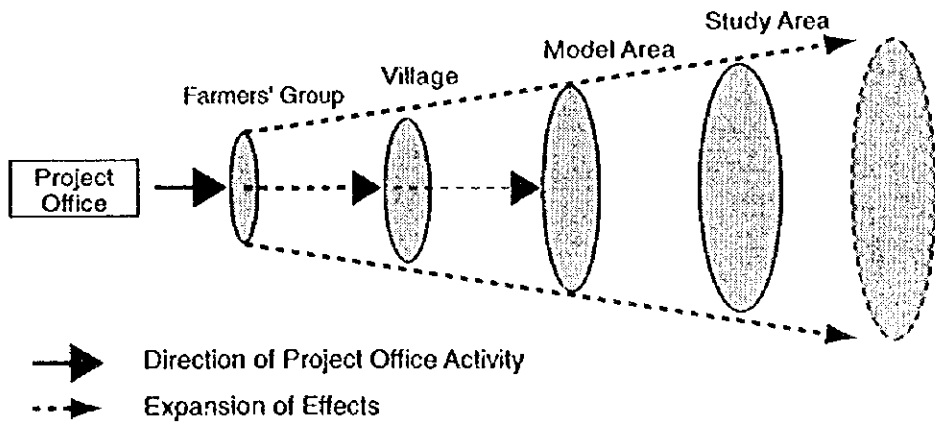
This programme will be implemented when the production of high quality bamboo commences following the conversion of the Mai Shoth bamboo forests observed at former slash and burn cultivation sites to high quality bamboo forests. The main purpose will be to increase cash income by selling bamboo crafts using readily available bamboo.

24. Implementation Process

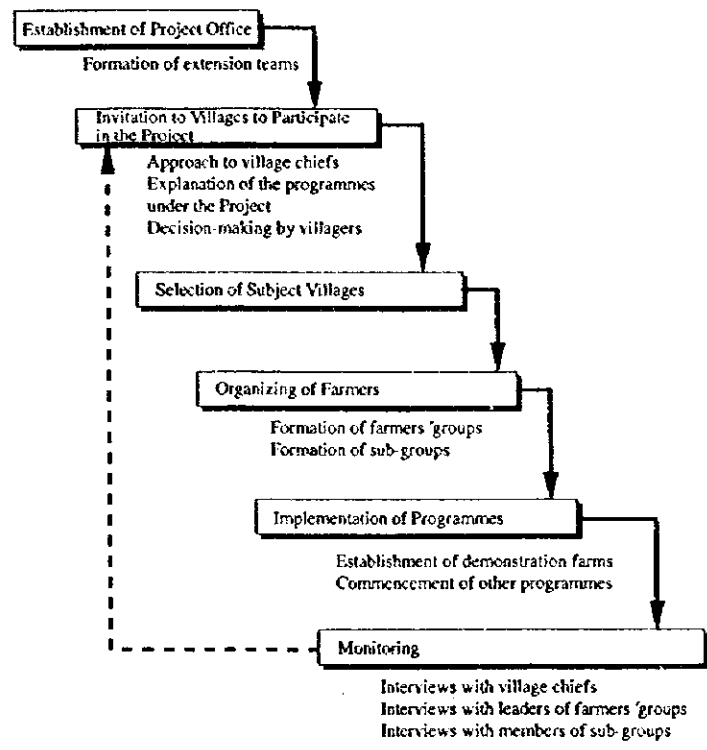
A group of farmers showing understanding of and interest in the programmes will be formed in each village to play a leading role in programme implementation. In regard to such land use-related programmes as the Slope Land Agriculture Programme, Agroforestry Development Programme, Bamboo Plantation Programme and Second Cropping Promotion at Lowland

Paddy Programme, demonstration farms will be introduced in each village in addition to the formation of farmers' groups to provide extension models.

The imagined expansion of the extension effects and the relationship between the Project Office and villages are shown below.



Expansion Image of Extension Effects



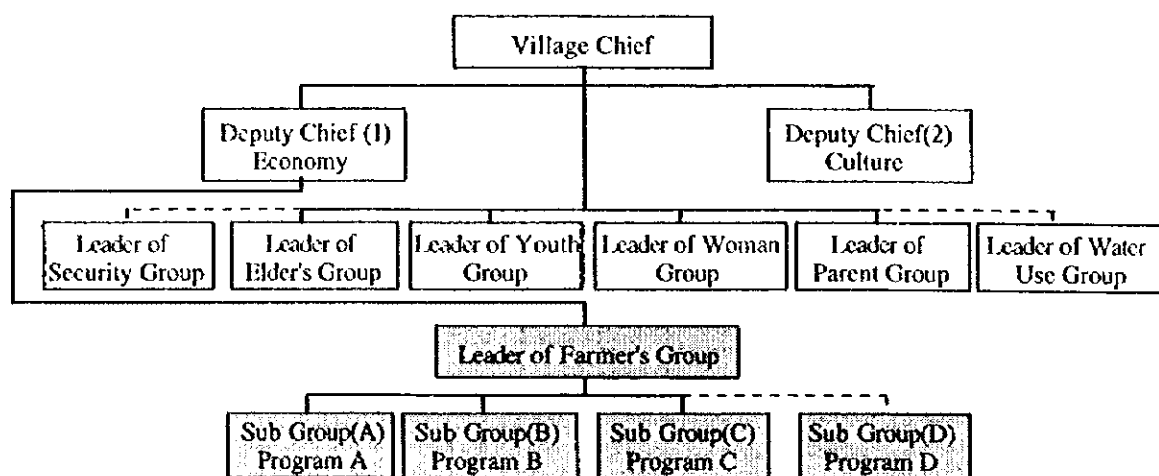
Work Flow of Project Office

25. Selection of Subject Villages

The priority of each village for programme implementation has been determined based on the selection criteria for each programme. The programmes will be implemented by the field extension teams of the Project Office, commencing with high priority villages, while respecting the intentions of each village in regard to programme implementation.

26. Formation of Farmers' Groups

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



Project Implementation System at Village Level

27. Demonstration Farms

The size of the demonstration farms will be decided by the number of households participating in the sub-groups. In the case of silvi-agriculture, the farm size per household will be 1.2 ha, i.e. 120% of the slash and burn cultivation area per household. In the case of silvo-pastoral, the farm size per household will be 2 ha, assuming that each member household has four head of

cattle (average figure for the Model Area found by the socioeconomic baseline survey) and each head requires 0.5 ha of land. Assuming that each sub-group comprises five members, a silvi-agriculture demonstration farm of 6 ha and a silvo-pastoral demonstration farm of 10 ha will be established in each village.

The principles to determine the demonstration farm size for the Slope Land Agriculture Programme are similar to those for the Agroforestry Development Programme.

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

In regard to the Paddy Seeds Multiplication and Supply System Establishment Programme, Second Cropping Promotion at Lowland Paddy Programme and Fish Culture Expansion at Lowland Paddy Programme, 0.15 ha, 0.5 ha and 0.5 ha of paddy fields will be converted as the respective demonstration farms in each village.

28. Implementation Schedule

The implementation period of the proposed forest conservation and watershed management plan is 10 years from 1999 to 2008. The Project Office will be established in the first year. In the second year, Subject Villages will be selected and Farmers' Group also will be formed. From the third year, other programmes will be started. The land forest allocation programme and Improvement and New Construction of Local Roads programme will be started from the second year prior to the other programmes. The implementation schedule is shown below.

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

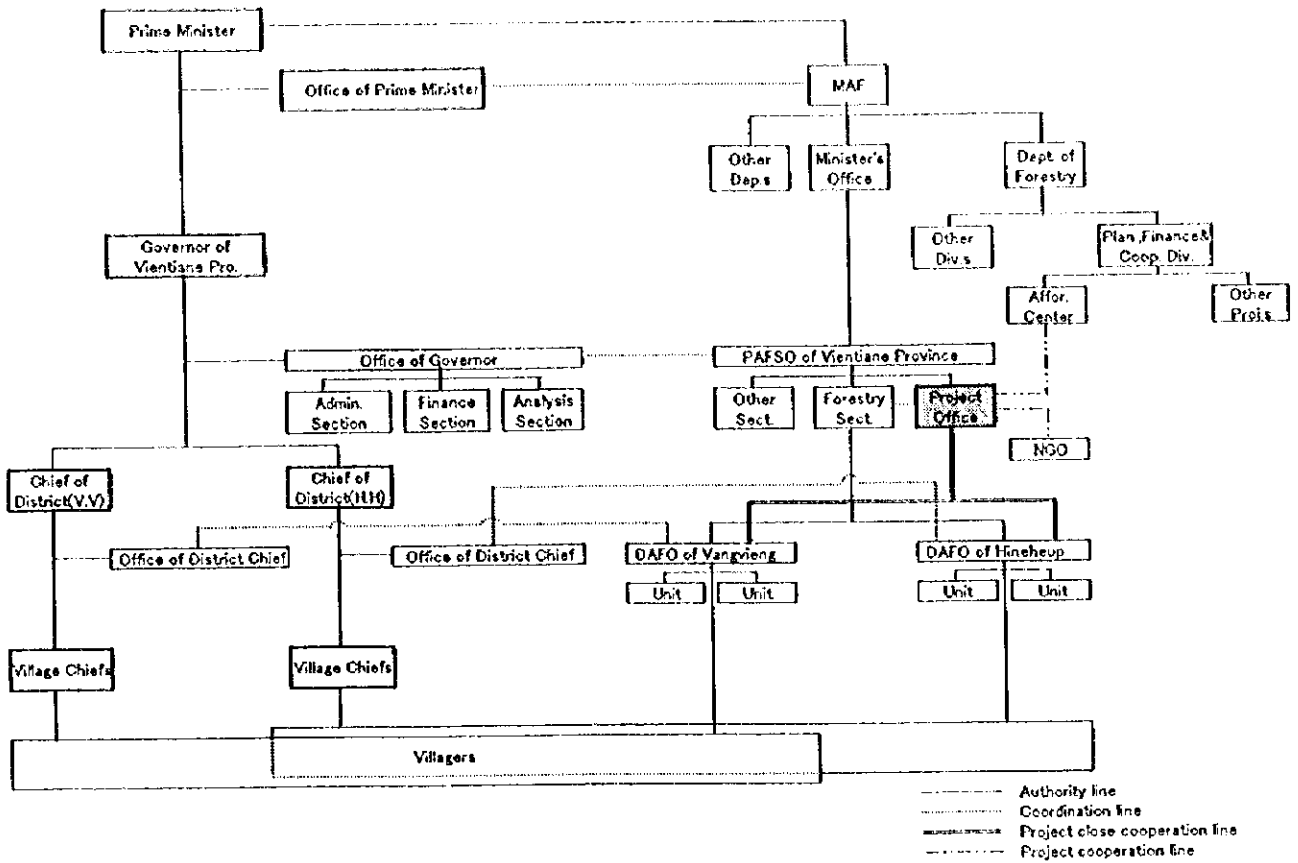
Implementation Schedule

29. Implementation System

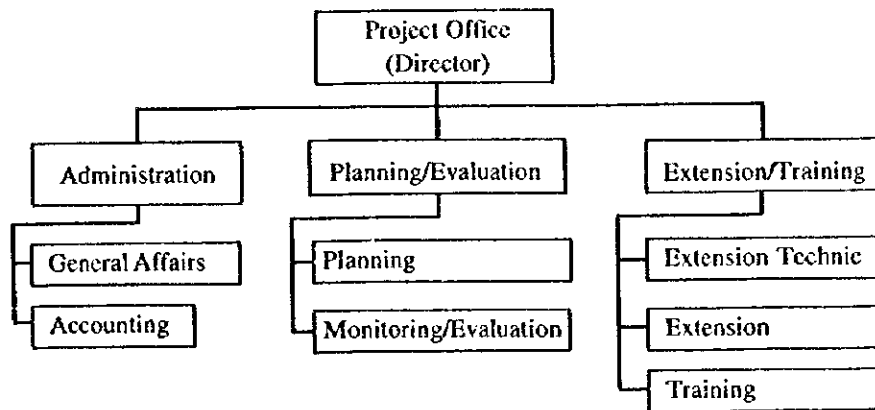
The Project Office will be established under PAFSO.

The Project Office will have an Administration Section, Planning/Evaluation Section and Extension/Training Section under the Director. The Administration Section will comprise the General Affairs Unit and Accounting Unit while the Planning/Evaluation Section will comprise the Planning Unit and Monitoring/Evaluation Unit. The Extension/Training Section will comprise the Extension Technic Unit, Extension Unit and Training Unit.

The Project Office will have a total of 30 staff members, i.e. four staff members for the Administration Section (including the Director), two staff members for the Planning/Evaluation Section and 24 staff members, including technical extension experts, for the Extension/Training Section.



Project Office and Concerned Authorities



Organizational Structure of Project Office

Staff Allocation of Project Office

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

30. Project Roughly Cost Estimation

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

Project Cost Estimation

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

31. Monitoring Plan

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

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

Monitoring of the environmental factors listed in Table 9-4-1 in Chapter 9 and other components of the Plan will be conducted, except for those for which "no serious negative impacts will occur".

32. Environmental Care

(1) Conflict Among Local People

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

(2) Readjustment of Forest Use Rights

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

(3) Impact on Rare Species and Habitat

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

(4) Impact on Soil and Land

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

33. Evaluation

(1) Transition from Slash and Burn to Permanent Cultivation

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

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

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

Agricultural Land Area

Category		Namon and Somboun Area	Sharing and out of Village Area	Total
Present	Permanent Farmland	1,039	149	1,188
Plan	Agroforestry (Ag)	6,396	4,022	10,418
	Fruit Orchard	1,116	65	1,181
	Pasture land	2,525	393	2,918
	Upland Rice A	2,755	3,564	6,319
	Slope Land Agriculture (Sa) B	777	363	1,140
	Dry Farm Land (F1) C	993	358	1,351
A+B+C		4,525	4,285	8,810

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

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

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

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

However, the fact that it will take some time for leguminous tree species to grow and for terracing to establish the appropriate slope gradient, maximum impact from introduction of the above measures cannot be anticipated in the first year of the Project. Also, it is difficult to precisely predict the degree of improvement in productivity which can be expected under the Project. Assuming that unit yield with the new farming methods is the same 1 ton/ha as for the present slash and burn cultivation, then an area for agroforestry and slope land farming equivalent to that for slash and burn becomes necessary.

As determined from Table 5-6-1, the required area for slash and burn cultivation in 2008 without the Project is 3,085 ha. An equivalent area for the agroforestry and slope land farming to replace this slash and burn under the Project thus becomes necessary. However, if an additional 20% of farm land is developed to offset the reduction in

effective cultivated area due to slope vegetation cover and terracing for the purpose of soil conservation, then 3,700 ha of farmland becomes necessary under the Project (3,085 ha x 1.2). In other words, if 3,700 ha of farmland for agroforestry, etc. is available in 2008, the supply and demand balance for rice would be maintained. Also, since the permanent farming does not need rotational cultivation, fallow land can revert back to forest, and the expansion in wasteland occurring under slash and burn will be stopped.

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

(3) Increase in Water Flow in Dry Season

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

(4) Infrastructure Development

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

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

(5) Securing Pasture Land

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

(6) Establishment of Bamboo Forests

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

34. Recommendations

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

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

CHAPTER 1

OUTLINE OF THE STUDY

CHAPTER 1 OUTLINE OF THE STUDY

1.1 Background of the Study

Lao PDR is a typical mountainous country with hills and mountains occupying some 80% of the total national land area of approximately 237,000 km². Forests, which cover 47% of the national land, play an important role as sources of forest products, headwater forests for dams constructed for hydropower generation and firewood sources for the public. However, they have been significantly depleted by the recent expansion of farmland and slash and burn cultivation and this situation is also evident in the watershed of the Nam Ngum Reservoir which generates most of the electricity for domestic consumption and which is an important source of electricity for export.

The Nam Xang Dam was built to increase the electricity supply by changing the course of Nam Xang to feed more water to the Nam Ngum Reservoir. In order to achieve this objective, it is urgently necessary to ensure the sustainable use of forest resources and forest conservation in the said watershed to improve the water retaining performance of the forest land and to prevent the filling of the river channels by sand.

Under these circumstances, the Government of Lao PDR made a request to the Government of Japan in August, 1995 to conduct a feasibility study in relation to the preparation of an integrated watershed management plan for the Nam Ngum Reservoir watershed. In response to this request, the Government of Japan dispatched the Preparatory Study Team to Lao PDR in January, 1996, followed by another Preparatory Study Team (for discussion of the S/W) in March, 1996. The S/W was signed in April, 1996 after confirmation of the contents of the full study and the scope of cooperation.

1.2 Objective of the Study

The objective of the Study is the formulation of a master plan for integrated watershed management focusing on the following three points. One of the major characteristics of the Study is its basic application of the participatory method to both the formulation and implementation processes of the watershed management plan.

- (1) Sustainable use of forest resources in the Vangvieng District which forms part of the watershed of the Nam Ngum Reservoir
- (2) Improvement of the standard of living of local people

- (3) Continuous supply of a sufficient volume of water to the Nam Ngum Reservoir in the years to come

In addition, basic reference materials, including guidelines, will be provided to enable the Government of Lao PDR to formulate further watershed management plans for the said watershed. Moreover, technology transfer to the Department of Forestry of the Government of Lao PDR will be made in the course of the Study.

1.3 Subject Areas of the Study

The subject area of the Study is categorised into the following three areas depending on specific purposes. The scope of each area is shown in Fig. 1-3-1.

The aerial photography area is approximately 700,000 ha, consisting of some parts of Vientiane Province and some parts of the Sai Somboun Special Zone, both of which are located in the watershed of the Nam Ngum Reservoir.

Within the area subject to aerial photography, an area of approximately 170,000 ha, consisting of Nam Xong and related areas located in the Vangvieng District, is designated as the Study Area.

The Model Areas are the Somboun Area and the Namon Area, both of which are located near the Nam Ngum Reservoir in the southern part of the Study Area, totalling approximately 59,400 ha.

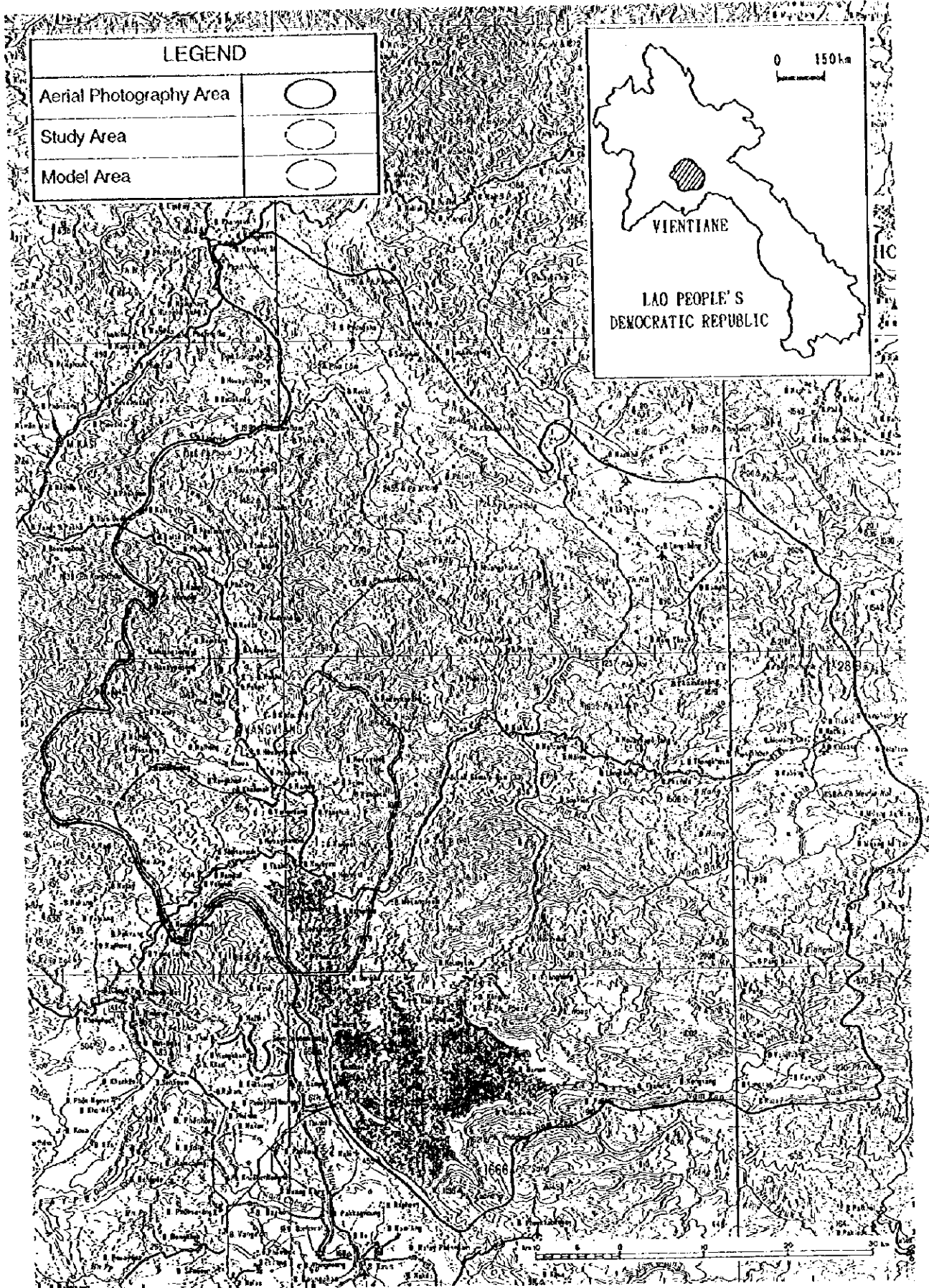


Fig. 1-3-1 Subject Areas of the Study

1.4 Outline of the Study

The Study commenced in September, 1996 for approximately two years until September, 1998 with Phase I constituting the period up to July, 1997 and Phase II constituting the remainder of the period. Firstly, a general survey was conducted in the Study Area, followed by natural environment, socioeconomic environment and socioeconomic baseline surveys in the Model Area. In addition to these surveys, aerial colour photographs were taken and a topographical maps (scale: 1/20,000) were prepared. These surveys in the Model Area were then followed by a PRA (participatory rural appraisal). Next, the Forest Conservation and Watershed Management Plan (the Plan) was formulated based on the survey findings, aerial photographs and topographical map, etc. Moreover, the Guidelines for Formulation of Watershed Management for Forest Conservation were also prepared. The above study processes are shown in Fig. 1-4-1.

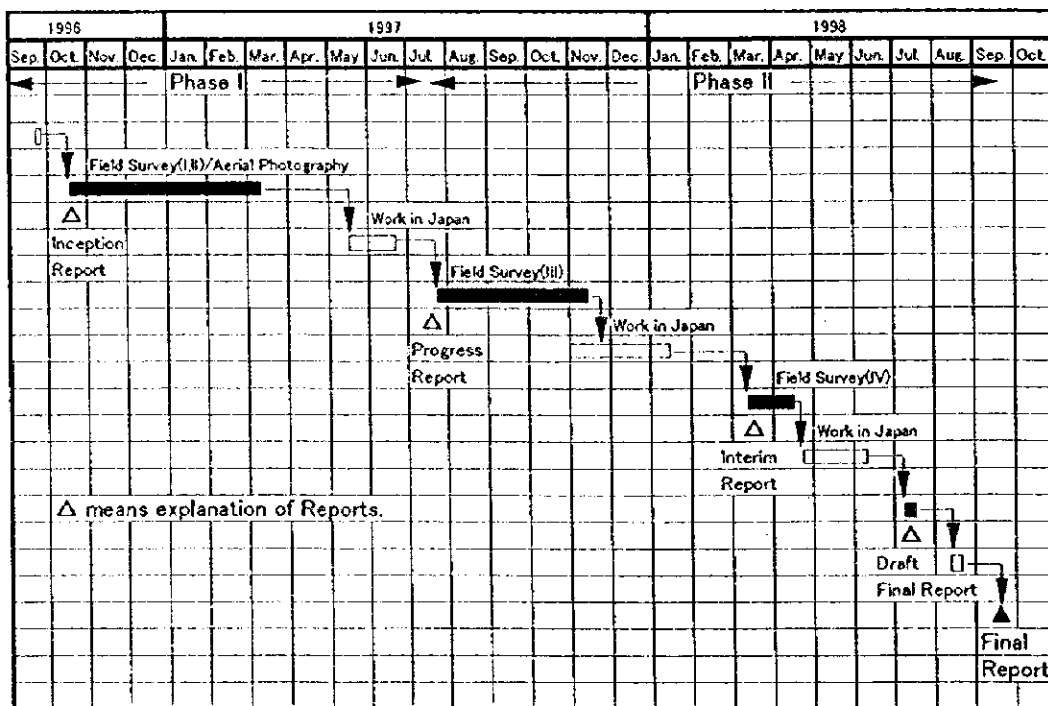


Fig. 1-4-1 Outline of Study Processes

CHAPTER 2

BACKGROUND OF FOREST CONSERVATION AND WATERSHED MANAGEMENT

CHAPTER 2 BACKGROUND OF FOREST CONSERVATION AND WATERSHED MANAGEMENT

2.1 Natural and Socioeconomic Environment

2.1.1 Natural Environment

Lao PDR is a landlocked country on the Indo-China Peninsula. Its national land stretches some 1,000 km in the south-north direction between 14°N and 22°N, and some 400 km at the widest point and 150 km at the narrowest point near Thakhek in the east-west direction. Approximately 4.73 million (1996) people live in a national land area of 236,800 km². This means an extremely low population density of 19 persons/km². The western border is shared with Myanmar and Thailand. Lao PDR also faces Viet Nam to the east, southern China to the north and Cambodia to the south.

Topographically, the national land is characterised by mountain ranges, highlands, valleys and flatlands. The Laos Plateau with a sub-tropical climate lies to the north. The southern part consists of the lowland and flatlands with a tropical climate. The highlands are dotted with mountain ranges consisting of crystalline schist, gneiss and limestone with an average elevation of 1,200 m. The Mekong, which flows eastwards up to Luang Prabang, turns south and runs through the highlands while absorbing water from its tributaries. While virgin teak forests once thrived in the Mekong watershed, they have now been depleted and replaced by small teak afforestation sites observed here and there.

The lowland is gently descending tableland, starting from the Annam Mountains near the Vietnamese border in the east towards the Mekong in the west. It consists of old limestone and sandstone and is believed to have risen during the Mesozoic age. Its surface is covered by laterite. The elevation range is approximately 200 - 400 m except for some dotted mountains with an elevation of some 2,000 m. Streams originating in the northern mountain ranges and the plateaus in the Annam Mountains eventually flow into the Mekong. There is high rainfall from May to October caused by the tropical monsoon, and there is low rainfall during the dry season from November to April. Although the annual rainfall level varies from one region to another, the average rainfall is 1,000 - 1,500 mm. The distinction between the rainy season (May to October) and dry season (November to April) is very clear in most regions. Some rivers which nearly dry up at the end of the dry season can have a water depth of 1 - 2 m in the rainy season. On such occasions the rivers become impassable and frequently isolate villages.

There is an area inland which is characterised by a tropical savannah climate. A sub-tropical belt, which is arid in winter, lies near the Chinese border to the north. The annual rainfall level in these areas is low. The temperature is high during the rainy season and low during the dry season as it coincides with winter in the northern hemisphere.

From a geological point of view, the highlands in the north are composed of the Indo-China Complex, incorporating the Arakan Mountains, the Thai Orogenic Belt and the Indo-China Block. The Tongking Block lies to the east. The Korat-Vientiane Block and Annam Block are also said to exist.

The most widespread soil group in the Indo-China Peninsula is Acrisols which are widely observed in Lao PDR. Acrisols are found in areas with a minimum annual rainfall of 1,500 mm and with distinctive rainy and dry seasons. The soil is acidic, poor in nutrients and liable to erosion. Bamboo grows as secondary vegetation at former slash and burn sites. When the land is subjected to repeated slashing and burning, it eventually becomes grassland where only graminaceous grasses can grow, making the regeneration of any forest difficult.

Nitisols is the next most widespread soil group in Lao PDR, and they are found in the southern region where the bedrock consists of basalt, andesite or diorite and with a tropical climate where the annual rainfall level is 1,000 - 3,000 mm. Nitisols are typical dark reddish brown tropical soils with a deep clayey layer. As there is no sudden change of the clay content based on the soil depth, changes of the soil properties are gentle. As a result Nitisols have high water retainability which explains the excellent root system development in this soil. Leptosols are also frequently found in limestone areas in Lao PDR. They form a shallow, immature soil layer above the bedrock. Such other soil groups as Fluvisols, Cambisols and Ferralsols are also distributed in small patches in the entire country including the Study Area. In general, different soil types are found depending on the topographical as well as geological features, such as landslide sites and sedimentation sites, etc.

2.1.2 Socioeconomy Conditions

Lao PDR has a total national land area of 236,800 km². According to the Forest Cover and Land Use in Lao PDR, a report published by the Department of Forestry in 1992, the land use is classified as forests (47.2%), consisting of useful Dipterocarpaceae, coniferous species and evergreen species, cultivated land (3.6%) and other (49.2%). More than 70% of the land classified in the category of other consists of unstocked forests or bamboo forests, both of which are commonly observed at former slash and burn cultivation sites. The forest area is vast even today when these forests at former slash and burn cultivation sites are included but there is

a trend of the expansion of secondary unstocked forests at the expense of large diameter trees. It cannot be denied that forests in Lao PDR are deteriorating in terms of both quality and quantity.

Since 1975 when the socialist regime was established, the Government of Lao PDR has adopted centralisation rather than decentralisation as the basic administrative policy and the promotion of the collectivisation of agriculture has indeed improved rural life. The First Five Year Socioeconomic Development Plan commenced in 1981 and a few years later it was publicly announced that self-sufficiency in rice supply had been achieved. Despite this announcement, there are still many farmers who have no option but to conduct slash and burn cultivation which does not produce a sufficient quantity of rice for their own consumption.

In 1986, a policy of opening up the national economy and the Second Five Year Socioeconomic Development Plan were decided to mark the new policy of introducing market principles as the pillars for national economic management. In 1988, the scope of authority of state enterprises to make their own policy decisions was expanded while the establishment of private businesses was encouraged. These new policies were further accompanied by enforcement of the Foreign Investment Law in July, 1988 to promote inward investment by foreign enterprises.

The departure from the traditional socialist economic regime was also marked by the introduction of the New Constitution of the Lao PDR in August, 1991. In Chapter 2, the Constitution clearly sets forth the transformation from a natural economy to a commodity economy, guarantee of private ownership and phased introduction of the market mechanism permitting free competition.

In regard to Lao PDR's GDP, the shares of the industrial and service sectors have been increasing in recent years while the share of agriculture and forestry has been declining. However, the agriculture and forestry sector is still the main industry in Lao PDR as it employs some 85% of the working population and accounts for more than 50% of the GDP. In recent years, The GDP of Lao PDR has recorded an annual growth rate of 6 - 8% with a GDP per capita of US\$ 211 in 1990 and US\$ 350 in 1995. The Government of Lao PDR hopes to increase the GDP per capita to US\$ 500 by the year 2000.

Although Lao PDR has historically exported timber, electricity and coffee, the export shares of clothing/textiles and motorcycles (based on the knock-down system) have been rapidly increasing in recent years. In contrast, the main import items are machinery and raw materials, rice and other foodstuffs and crude oil. The total import value of US\$ 320 million in 1993 far

exceeded the total export value of US\$ 158.6 million, indicating the weak economic base of agriculture where the trade balance shows a chronic deficit.

Lao PDR is said to be a multi-ethnic country, closely related to the movement of various ethnic groups in the 10th Century or even earlier. The main tribe moved from today's Indonesia and settled in inland Lao prior to the 10th Century and those ethnic groups which moved southwards along the Mekong from southern China in the 10th Century to settle wherever there was suitable land for rice cultivation. Lao's inland location certainly made it easier for ethnic groups in neighbouring China, Thailand, Myanmar and Vietnam to resettle. In addition, the overwhelming presence of mountainous and highland areas, covering 80% of the national land, contributed to the scattered dwelling of many ethnic groups in local areas, presumably creating the national character of decentralised political power.

The people of Lao PDR are sometimes classified based on their place of dwelling (in terms of elevation). In general, those who have settled in lowland areas with high floor houses are called "Lao lum" (lowland Lao). These people linked to Thai people form the mainstay of Lao's population, accounting for almost 50%. Their traditional homes have a high floor and, in local areas, houses with wooden pillars, woven bamboo walls and a cut bamboo or galvanised iron sheet roof are frequently seen. New houses, however, tend to adopt a modern structure of concrete pillars and brick walls instead of the traditional structure. The Lao lum living in rural areas traditionally cultivate paddy rice during the rainy season at flat land and in valley bottoms. Many of the women weave the traditional ethnic cloth called "sinh" on the ground below the high floor of their homes as a side business to supplement the household income.

The "Lao theung" (mid-mountain Lao) who live in areas of medium elevation between 800 m and 1,200 m originally moved northwards from today's Indonesia and are said to have been the first arrivals in Lao to settle inland. The relevant ethnic groups are the Muon, Lu, Ka and some twenty groups of Indonesian origin and the Sedang of Khmer origin who are said to have arrived in the 12th Century. The dwelling areas of these groups spread all over Lao PDR today and they are said to account for some 30% of the total population.

Minority ethnic groups called the "Lao sung" (highland Lao) are said to live in mountain areas with an elevation of 1,200 m or higher and account for some 15% of the total population. These groups are Chinese and Vietnamese in origin. They traditionally live in flat floor houses in remote mountain areas, cultivating maize and cassava, etc. for their own consumption and also poppies and producing cloth to earn a living.

Slash and burn cultivation has been taken for granted in Lao PDR for a long time to create farming sites for crop cultivation. Even the Lao lum rely on this method to produce foodstuffs. In forest areas, the need to remove trees to create farming sites is more acute, leading to the entry of local people into forests to create farming sites by means of the slashing and burning of trees.

The recent population increase in rural areas and the repeated use of farmland with a short rotation cycle have reduced the land productivity due to a decline of the soil fertility and loss of the top soil, creating such environmental and social problems as a decline of the food production volume, expansion of slash and burn sites, impoverishment of the vegetation quality, decline of the river flow rate during the dry season and flooding during the rainy season.

Slash and burn sites and former slash and burn sites occupy 48% of the Model Area (53% of the land area excluding such water bodies as the Nam Ngum Reservoir), indicating extremely high dependence on this particular method of agriculture. Local people in the Model Area are composed of Lao lum at 62.7%, Lao theung at 20% and Lao sung at 17.6%, showing a higher percentage of Lao lum than the national average. The high dependence on slash and burn cultivation despite the higher proportion of Lao lum, who are traditionally engaged in paddy rice cultivation, can presumably be attributed to the shortage of suitable land for paddy rice cultivation and the shortage of such necessary agricultural infrastructure such as irrigation facilities. It is believed that dependence on slash and burn cultivation can be observed throughout Lao PDR.

2.2 Necessity of Forest Conservation and Watershed Management

The GDP of Lao PDR has shown a gradual increase of the share of textile and other industrial products but the agricultural share of more than 50% indicates that Lao can still be described as an agricultural country. Agriculture is centred on rice production and rice fields are said to account for 90% of the total cultivation area. 77% and 19% of rice fields are rainwater-fed lowland fields and slash and burn cultivation fields respectively, leaving only 4% for irrigated lowland fields.

The natural conditions of Lao PDR show a predominance of mountainous land with steep slopes and flat land is rare. Lao PDR is located in the tropical monsoon zone and there is a clear difference in terms of rainfall between the rainy season and the dry season. Although the rainfall level varies from one region to another, there are areas where the annual rainfall exceeds 3,000 mm in the northern, central and southern regions. Some 90% of the annual rainfall is

concentrated in the rainy season from June to November. The steep topography and uneven rainfall pattern are likely to be the main reason for Lao PDR's repetitive flooding in the rainy season and drought in the dry season, causing significant impacts on the agriculture which is heavily dependent on rainwater.

Forests are not only a source for timber production but are also effective in preventing floods through levelling of the river flow rate by means of their water yielding function and also in maintaining the river flow rate in periods of low rainfall. However, Lao PDR's forests have been decreasing due to commercial cutting and slash and burn cultivation. The analysis results of the satellite images of the Forestry Department show a loss of 470,000 ha of forests in the seven year period from 1982 to 1989. This figure corresponds to 2% of the total national land area and 4% of the total forest area. The decrease of forests on such a scale is believed to be closely related to the occurrence of floods in the rainy season and to drought in the dry season.

The electricity generated by the hydropower station at the Nam Ngum Dam is highly ranked in terms of its export value and is one of the country's most important export commodities. As it is believed that hydroelectric power generation will continue to constitute the most important export commodity in the future, there are many plans to build hydropower stations in various parts of the country, including second and third dams upstream of the Nam Ngum Dam.

Under these circumstances, the continued generation of electricity at a stable level is at least required not only to preserve the export volume of electricity but also to realise a more advantageous export price of electricity, making it essential to secure a sufficient volume of water which is the basis for hydroelectric power generation. However, the traditional slash and burn cultivation and recent expansion of farmland have accelerated the devastation of forests, causing concern in regard to the decline of the water yielding function of forests as well as productivity in all parts of the country today. The conservation of forests to improve their water yielding function to ensure a stable supply of water is one of the most important issues for Lao PDR to achieve stable electricity generation in the future. Consequently, adoption of the practice of watershed management based on forest conservation is highly desirable.

2.3 Related Administrative Bodies

The administrative system in Lao PDR is outlined in Fig. 2-3-1. The National Assembly, the members of which are elected in a general election, acts as the supreme organization which appoints the president. The government is formed under the president and is headed by the prime minister to whom ministries are accountable (See Fig. 2-3-2). Under the prime minister,

the administrative hierarchy is composed of provincial governors, district chiefs and village chiefs. Each provincial governor and district chief have their own offices.

The Committee for Planning and the Committee for Investment and Cooperation have been recently established with the dividing up of the Committee for Planning and Cooperation. The former is responsible for the coordination of various ministries and agencies in implementing national plans, while the latter is responsible for the management of international aid and private foreign investment. Each ministry has a provincial service and district office. These form a technical line called the vertical line. The relationship between the office of the provincial governor and technical service also between the office of the district chief and the district technical office is one of coordination and is called the horizontal line.

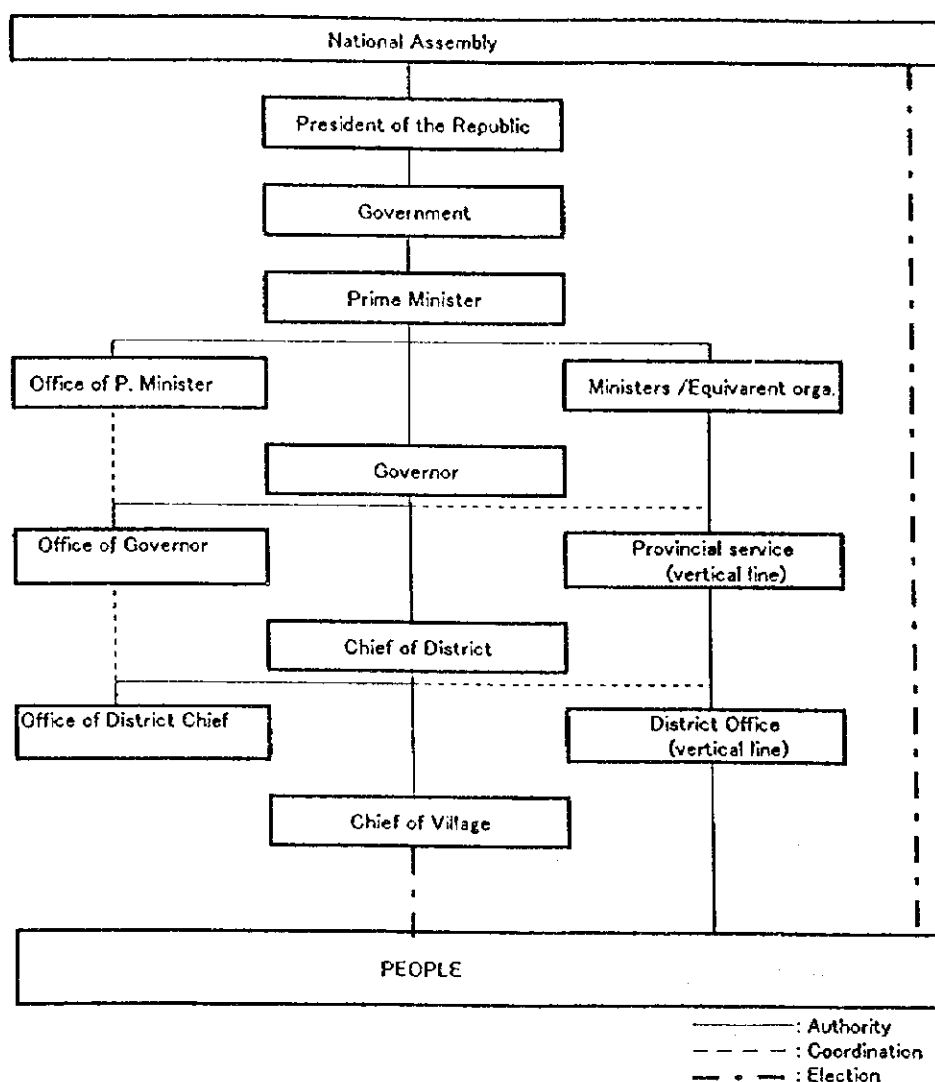
The organization of the Ministry of Agriculture and Forestry is shown in Fig. 2-3-3. There are two vice-ministers under the minister as well as the Minister's Office, Department of Organization, Training and Personnel, Department of Forestry, Department of Meteorology and Hydrology, Department of Irrigation and Small-Size Hydropower, Department of Veterinary and Livestock and Department of Agriculture and Extension. The Minister's Office controls the provincial agriculture and forestry services which in turn control the district agriculture and forestry offices. In Vientiane Province, for example, the Provincial service of Agriculture and Forestry is located in Phonhong and the District Offices of Agriculture and Forestry in Vangvieng, under which the Forestry section and Agriculture section control sectors of forestry and agriculture, etc.

Fig. 2-3-4 shows the organization of the Department of Forestry of the Ministry of Agriculture and Forestry. The Department of Forestry has four divisions, i.e. Personnel and Administration, Forest Management and Wood Industry, Planning, Finance and Cooperation and Plantation Promotion and Conservation. Two deputy directors under the director general control two divisions each. Each division has four sections. The Lao-Japan Forestry Cooperation Unit of the Planning, Finance and Cooperation Division is responsible for the Forest Conservation and Afforestation Project (FORCAP) and the present Study. Meanwhile, the Centre for Protected Areas and Watershed Management of the Plantation Promotion and Conservation Division is responsible for the Nam Ngum Watershed Management and Conservation Project (NAWACOP) of the GTZ.

There is a total of some 1,900 forestry-related officials nationwide, consisting of some 400 at the central department and 1,500 at local offices. The annual budget of the Department of Forestry stands at 1.5 billion Kip (exchange rate of 1,560 Kip = one US dollar as of October, 1997). The high personnel cost makes it difficult for the Department of Forestry to launch projects using its own budget, forcing the Department of Forestry to rely on overseas aid and loans for project implementation. The total amount of foreign aid and loans in fiscal 1997 is estimated to be 15 billion Kip which is ten times the size of its own budget.

While the difficult access to many villages due to the poor conditions or even absence of roads often disrupts forestry-related activities in local areas, manpower and budget shortages are the main bottlenecks of forest management. However, close liaising between the agricultural section and forestry section of both the provincial and district offices appears to provide a sound base for the effective functioning of future forest management work. Furthermore, the recent establishment of the National Lao University has paved the way for the training of senior engineers at home to replace the dependence on overseas and will certainly contribute to the consolidation of manpower at both the national and local levels.

The division of one village into two villages is often conducted. Despite frequent changes of the administrative boundaries, the geographical village and district boundaries are far from clear. Clear geographical indication of the administrative boundaries is a pending issue to be addressed by the Government of Lao PDR in the future.



Note: Prepared based on the Organization of the Government of the Lao PDR (UNDP, 1996)

Fig. 2-3-1 Administrative Organization in Lao

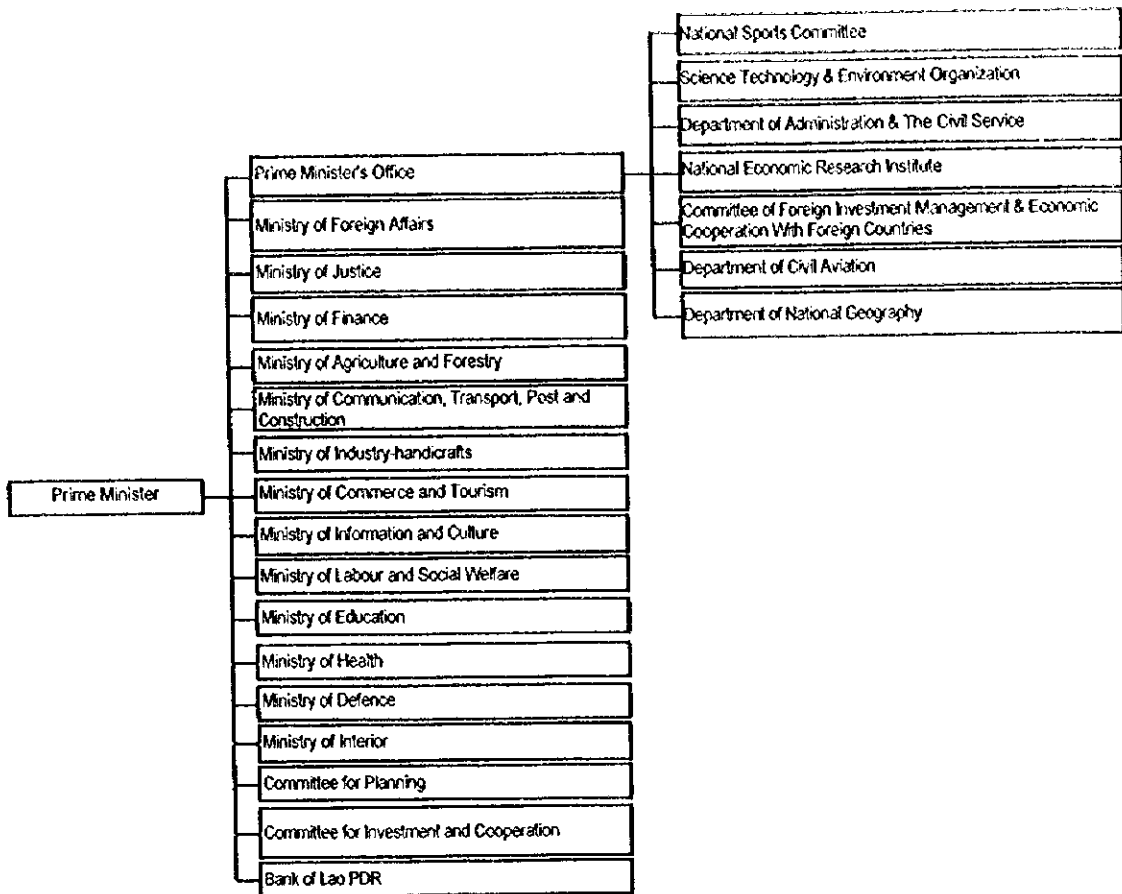
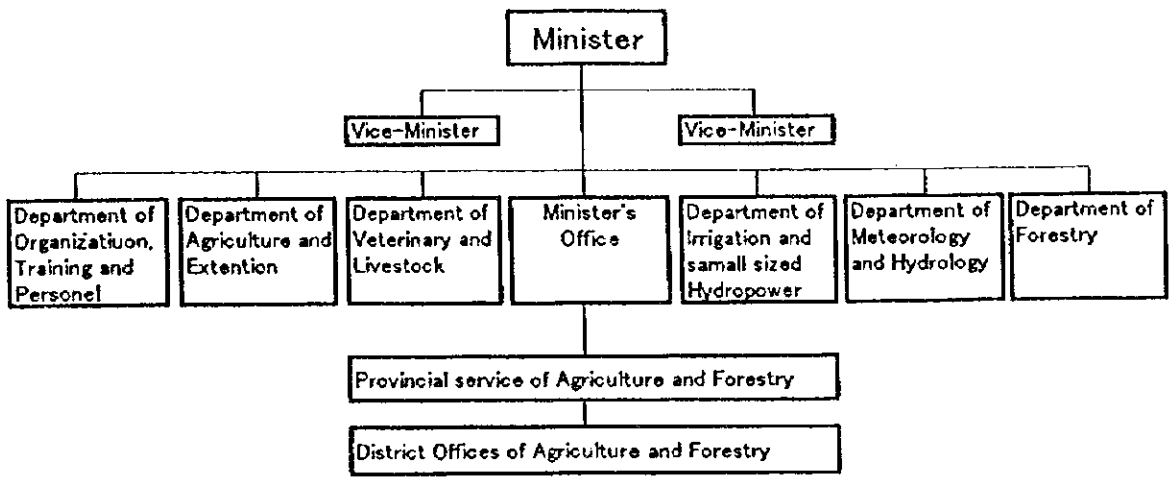
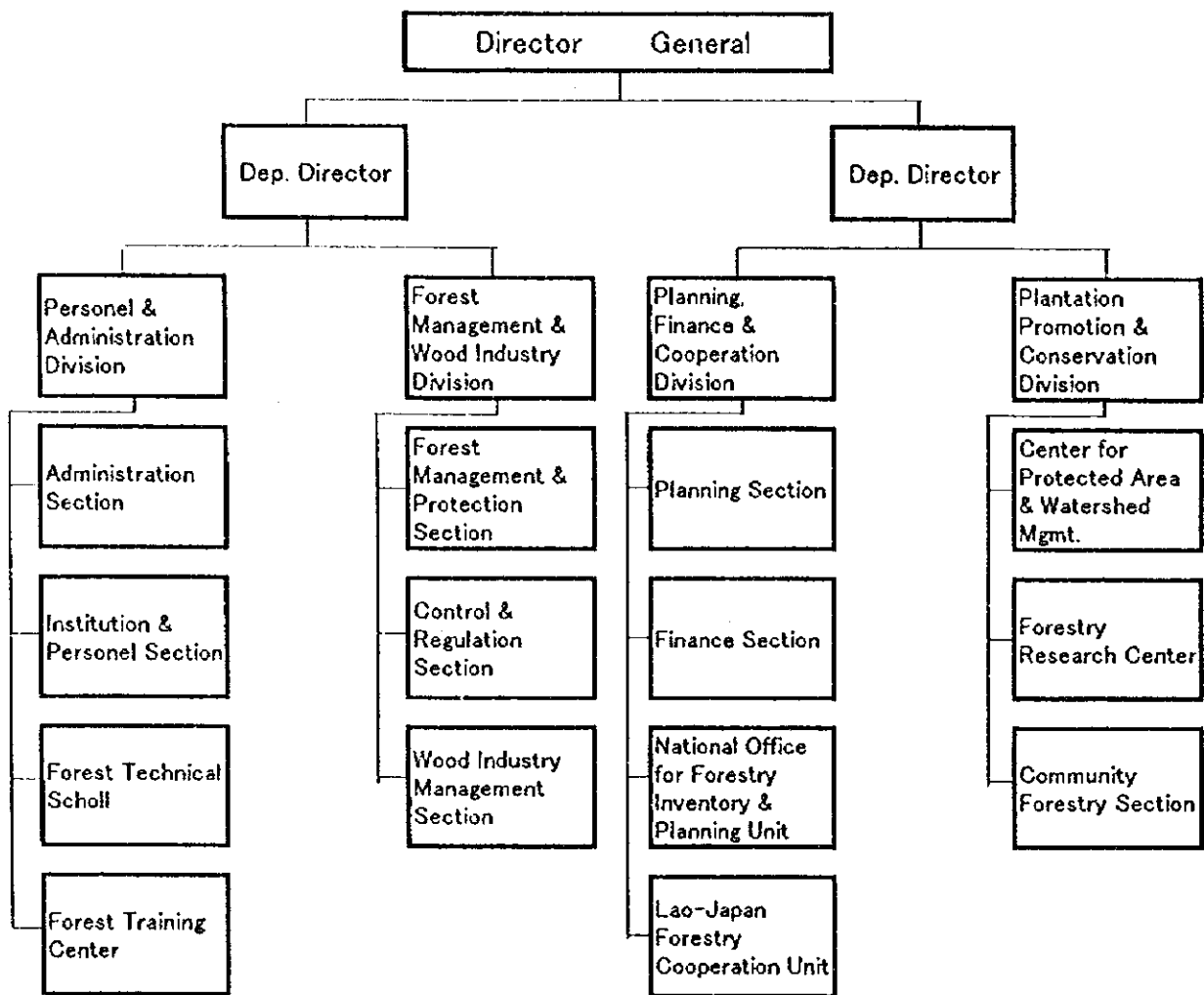


Fig. 2-3-2 Ministries of Lao PDR



Note: Prepared based on the Organization of the Government of the Lao PDR (UNDP, 1996)

Fig. 2-3-3 Organizational Structure of Ministry of Agriculture and Forestry



Note: Prepared based on Consultancy Report No. 8 (NAWACOP, 1996)

Fig. 2-3-4 Organizational Structure of Department of Forestry

2.4 Related Laws and Regulations

Until recently, Lao PDR's legal system regarding forest conservation, the environment and water resources consisted of decrees issued by the Prime Minister. The principal decrees include the Decree of the Prime Minister on the Management and Use of Forests and Forest Land: No. 169 issued in November, 1993 and the Decree on Land and Forest Allocation for Tree Planting and Protection: No. 186 issued in November, 1994.

The Forestry Law and Water and Water Resources Law were enforced in November, 1996 to gradually consolidate the legal system regarding forests and forest-related issues in Lao PDR.

The main provisions of the Decree of the Prime Minister (No. 169) are roughly described below.

- (1) Felling in forests shall be prohibited unless it is part of a forest management plan approved by the Ministry of Agriculture and Forestry or part of traditional forest use. Although urgent felling to avoid perceived danger may be conducted, post-felling notification shall be made by the organization responsible for such felling.
- (2) Under the Family Forest Management Contract, a family which meets all the contract conditions within three years after the signing of the contract shall be awarded permanent ownership and utilisation rights for the forest and forest land in question.

The main provisions of the Decree of the Prime Minister (No. 186) are roughly described below.

- (1) Land tax shall be exempted if the planting of at least 1,100 trees per ha is conducted.
- (2) Land tax shall be exempted for agroforestry land with crops provided that the land has at least 1,100 planted trees per ha.
- (3) In the case of planting land with an area of 1 – 100 ha, the district authority shall be responsible for land allocation with the cooperation of the provincial department of agriculture and forestry.
- (4) In the case of planting land with an area of 101 – 1,000 ha, the provincial authority shall be responsible for land allocation with the approval of the Ministry of Agriculture and Forestry.

- (5) In the case of planting land with an area of 1,001 ha or more, land allocation shall require the approval of the Central Government.

The Forestry Law sets forth various rights regarding forests and forest land as described below.

Article 13 stipulates that the allocation of forests and forest land to individual persons should be made based on the basic principle of planting trees at degraded forest and barren land. While this process has only recently begun, it is reported that there has been a rapid increase in northern Lao PDR of cases where allocated land has become subject to cash sale, resulting in the concentration of land ownership in the hands of a small number of people. Article 16 specifies five forest categories but the actual work of classifying individual forests under these types has not yet commenced.

- (1) Forests (Article 2)

Forest is a highly valuable national resource made up of various plant species. Forest occurs naturally or it is planted. The existence of the forest is necessary for the protection and conservation of the environment and for human life.

- (2) Forest Land (Article 4)

Forest land is land, with or without forest on it, which the state has determined as forest land.

- (3) Ownership of Forests and Forest Land (Article 5)

Natural forest and forest land is the property of the national community. The state represents the national community in the management and allocation of forest land for rational use by individuals and organisations. Individuals and organisations only acquire tenure rights to trees, natural forest and forest land when they receive the authority of responsible agencies.

Trees and forest planted or regenerated, by individuals or organisations using their own labour or capital and with the recognition of the state, become the property of the planter or regenerator. The planter or regenerator then assumes the rights of possession, use, transfer and inheritance in accordance with regulations and laws.

(4) Allocation of Forests and Forest Land to Individuals and Organizations for Management and Use (Article 13)

The state grants rights to use degraded forest and barren land to individuals and organisations, for the purpose of planting trees or regenerating forest, depending on their capacity in terms of labour and capital. An individual family will be allocated an area of no more than three hectares for each unit of labour in the family. In case a family or other organisation wants a larger area they have the right to request the lease of additional land from the state, and arrangements made will depend on production capacity.

For enterprises that want to use degraded forest or barren land for tree planting, the government has specific provisions for dealing with each case.

It is forbidden for individuals or organisations to use well developed natural forest or fallow forest, which can regenerate naturally, for tree planting.

(5) Forest Categories (article 16)

Forest in the Lao People's Democratic Republic is classified into five categories:

1. Protection Forest
2. Conservation Forest
3. Production Forest
4. Regeneration Forest
5. Degraded Forest Land or Barren Land

(6) Protection Forests (Article 17)

Protection Forest is forest and forest land classified for the protection of watershed areas and the prevention of soil erosion. It also includes areas of forest land significant for national security, areas for protection against natural disaster and the protection of the environment and other areas.

(7) Conservation Forests (Article 18)

Conservation Forest is forest and forest land classified for the purpose of protecting and conserving animal species, plant species, nature and various other things which have historical, cultural, tourism, environmental, educational and scientific research value.

(8) Production Forests (Article 19)

Production Forest is forest and forest land classified for the purpose of satisfying the requirements of national economic and social development and of people's livelihoods, for timber and other forest products on a sustainable basis and without significant negative environmental impacts.

(9) Regeneration Forests (Article 20)

Regeneration Forest is young fallow forest classified for the purpose of regeneration and maintenance so that it increases in maturity toward a state of natural equilibrium.

(10) Degraded Forests (Article 21)

Degraded Forest is forest which has been heavily damaged such as land without forest on it or barren land classified for tree planting and/or allocated to individuals and organisations for tree planting, permanent agriculture and livestock production, or for other purposes, in accordance with national economic development plans.

(11) Customary Use of Forests and Forest Land (Article 30)

The customary use of forests and forest land is the use of forest, forest land and forest produce which has been practiced for a long period and is recognized by society and/or law (an ellipsis).

The customary use of forest, forest land and forest produce must be in accordance with village regulations on forest and forest land which the village authority has determined. (The rest is omitted.)

2.5 Relevant Development Plan

The Tropical Forest Action Plan announced in 1990 lists the following three basic principles for forests and forestry.

- (1) To improve forest management in order to protect existing forests and to increase their productivity.
- (2) To rationalise the use of forest resources in order to enhance their economic value.
- (3) To facilitate permanent settlement of 60% of the 1.5 million people currently engaged in slash and burn cultivation by the year 2000.

The 1996 - 2000 Socioeconomic Development Plan announced in 1996 adopts the following basic targets for the agriculture and forestry sector.

- (1) Increased production of rice and other food: rice production of two million tons by means of intensive farming and expansion of the rice growing area to 100,000 ha (of which 25,000 ha are irrigated paddy fields).
- (2) Promotion of market-oriented production.
- (3) Promotion of the export-oriented production of coffee, fruit (bananas, etc.), cotton, pulses, livestock products and forest products (cardamon, sticklac, benzoic resin and palm, etc.)
- (4) Stabilisation of slash and burn cultivation sites.
- (5) Consolidation of irrigation facilities.
- (6) Promotion of research and testing on agroforestry.

2.6 Existing Watershed Management-Related Projects

(1) Nam Ngum Watershed Management and Conservation Project (GTZ)

One watershed management plan which is currently in progress in Lao PDR is the Nam Ngum Watershed Management and Conservation Project (NAWACOP) which commenced in 1995 with the assistance of the GTZ. The subject area of the NAWACOP consists of the uppermost reaches of the main Nam Ngum and is the main watershed of the Nam Ngum Reservoir. The area belongs to the Phukood District and Paek District of Xieng Khouang Province. Of the 108 villages in these two districts, 16 villages have been selected as pilot villages. The objective of the NAWACOP is described as "the development of a participatory method for watershed management and sustainable land use in the Nam Ngum watershed". The experience gained through the implementation of the NAWACOP is expected to assist the formulation of watershed management plans for other parts of Lao PDR.

In the pilot villages, the NAWACOP intends to change slash and burn cultivation to more intensive land use by means of land allocation, development of local handicrafts, increased cultivation of fruit trees and the wide use of a revolving fund. These activities are participatory activities using the PRA method which is implemented by trained district

officials. Aerial colour photographs, enlarged four times from the original scale of 1/20,000 to achieve a scale of 1/5,000, are used for the PRA to facilitate understanding of the present land use situation on the part of local people.

The counterpart organizations for the NAWACOP are the Centre for Protected Areas and Watershed Management (CPAWM) of the Department of Forestry at the central government level and the Provincial Agriculture and Forestry Service Office (PAFSO) at the provincial level. The actual implementation of the NAWACOP is the responsibility of the District Agriculture and Forestry Offices (DAFO) with the assistance of GTZ experts. The GTZ provides a team of six members, consisting of a team leader and experts in the fields of GIS, stock raising, forestry, agriculture and village development. Of these, the stock raising, forestry, agriculture and village development experts are members of the German Development Service (DED) which is equivalent to Japan's JOCV.

(2) Forest Conservation and Afforestation Project (JICA)

The subject area of the Forest Conservation and Afforestation Project (FORCAP) is the Somboun Area in the Vangvieng District. This project commenced in 1996 and is now in the third year. Under this project, an action programme will be formulated to promote forest management and to reduce the level of dependence on slash and burn cultivation through the participation of local public bodies and local people. In the programme formulation process, important as well as urgent issues for cooperation will be clarified through the education of local people and confirmation of their actual needs and trials are being conducted to deal with such issues. The actual components of the project include the creation of model forests, introduction of charcoal making technologies and formulation of a rural development project.

(3) Agriculture and Rural Development Project in Vientiane Province (JICA)

The Agriculture and Rural Development Project (ARDP) in Vientiane Province is being implemented in five model villages in Vientiane Province. One of these model villages is Vangkhi in the Somboun Area located in one of the Model Areas of the Study. The objective of the project is described as "the establishment of the method and technology for the participatory development of sustainable agriculture and well as participatory local development".

(4) Afforestation Centre Construction Project (JICA)

The Afforestation Centre Construction Project aims at constructing an afforestation centre with grant aid and is currently at the basic design stage. This centre is regarded as a facility

to assist activities under the FORCAP. The planned site for the centre is Houaypanon in the Somboun Area which is one of the Model Areas of the Study.

The facilities planned to be constructed include an office, a simple lodging, a training facility, an examination room and display room. The construction work will be launched in December, 1998, and is planned to be finished by March, 2000.

(5) Upland Agricultural Development Project (World Bank)

This agricultural development project has received a World Bank loan and is mainly designed to facilitate the transformation from slash and burn cultivation to fixed-type agriculture, such as paddy field cultivation. The construction of irrigation channels and local roads linking villages with nearby national roads is in progress in the Vangvieng District. In addition, an outdoor experiment facility has been established to measure the volume of soil loss depending on different types of land use.

