

VOLUME 2 – CHAPTER 14

FORESTRY DEVELOPMENT FOR NAKAI RESETTLERS

Table of Contents

| | | |
|--------------|--|-----------|
| 14 | FORESTRY DEVELOPMENT FOR NAKAI RESETTLERS | 1 |
| 14.1 | INTRODUCTION | 1 |
| 14.1.1 | Current Forestry Situation | 1 |
| 14.1.2 | The Resettlement Area and Forest Resources | 1 |
| 14.1.3 | Forestry Development for Improved Livelihoods and Incomes | 3 |
| 14.1.4 | Strategy for Resettler Forestry Development | 3 |
| 14.2 | VILLAGE FORESTRY EXPERIENCE IN LAO PDR..... | 4 |
| 14.3 | LEGAL BASIS FOR VILLAGE FORESTRY AT NAKAI PLATEAU | 4 |
| 14.4 | PLANNING PRINCIPLES AND FOREST MANAGEMENT PLAN | 6 |
| 14.4.1 | Forestry Development and Management by Villagers, for Villagers | 6 |
| 14.4.2 | Sustainable Management of Natural Forests for Timber Production | 7 |
| 14.4.3 | Log Marketing and Wood Processing..... | 8 |
| 14.4.4 | Forest Improvement with Local Species..... | 9 |
| 14.4.5 | Conservation of Resource Bases of NTFP | 9 |
| 14.4.6 | Conservation of Soils, Water Resources, Biodiversity and Scenery..... | 10 |
| 14.5 | MAIN COMPONENTS OF THE NAKAI PLATEAU VILLAGE FORESTRY PROGRAM..... | 10 |
| 14.6 | COMPONENT 1: INSTITUTIONAL DEVELOPMENT..... | 10 |
| 14.6.1 | Technical Assistance..... | 10 |
| 14.6.2 | Nakai Plateau Village Forestry Association..... | 11 |
| 14.6.3 | Village Forestry Committees:..... | 11 |
| 14.6.4 | Forestry Work Teams..... | 12 |
| 14.6.5 | Managerial and Technical Staff..... | 12 |
| 14.6.6 | Compensation and Audit..... | 12 |
| 14.6.7 | Capacity Development and Forestry Training System | 14 |
| 14.7 | COMPONENT 2: NATURAL FOREST MANAGEMENT | 16 |
| 14.7.1 | FM Activities to Be Conducted in All Zones: | 16 |
| 14.7.2 | FM Activities in Conservation and Protection Zones | 17 |
| 14.7.3 | FM Activities for Regenerating Forest Zones | 17 |
| 14.7.4 | FM Activities for Production Forest Zones..... | 18 |
| 14.8 | COMPONENT 3: FORESTRY BUSINESS ENTERPRISE | 19 |
| 14.8.1 | Forestry Business Licence's..... | 19 |
| 14.8.2 | Transition or Construction Phase Forestry Business..... | 19 |
| 14.8.3 | Long Term Sustainable Forestry Business | 20 |
| 14.8.4 | Design Considerations for Transition and Long Term Harvesting and Wood Processing..... | 20 |
| 14.8.5 | The Enterprise Operations Design | 22 |
| 14.9 | COMPONENT 4: FOREST REGENERATION AND IMPROVEMENT..... | 23 |
| 14.10 | INDICATIVE IMPLEMENTATION PLAN | 23 |
| 14.11 | FINANCING PLAN..... | 24 |
| 14.11.1 | Costs | 24 |
| 14.11.2 | Sales Revenues | 24 |
| 14.11.3 | Project Financial Returns..... | 25 |
| 14.11.4 | Financing..... | 25 |
| 14.12 | BENEFITS | 27 |
| 14.12.1 | General Benefits..... | 27 |
| 14.12.2 | Employment..... | 27 |
| 14.13 | RISKS | 28 |
| 14.14 | SCHEDULE OF COMMUNITY FORESTRY DEVELOPMENT PROGRAM..... | 29 |

List of Tables

| | | |
|--------------|---|----|
| Table 14-1: | Most Common Tree Species Occurring within the Dry Dipterocarp Ecotype (DD)..... | 1 |
| Table 14-2: | Most Common Tree Species Occurring within the Dry Evergreen Ecotype (DE)..... | 2 |
| Table 14-3: | Most Common Tree Species Occurring within the Mixed Deciduous Ecotype (MD)..... | 2 |
| Table 14-4: | Common Tree Species Occurring within the Mixed Broadleaf and Coniferous Ecotype (MS) | 2 |
| Table 14-5: | Forested Land in the Resettlement Area by Forest Ecotype..... | 3 |
| Table 14-6: | Legislation Relevant to Village Rights in the Forestry Sector..... | 5 |
| Table 14-7: | Sustainable Annual Yield and Harvest from Forest Ecotypes | 8 |
| Table 14-8: | Technical Assistance Requirements (number of persons months)..... | 11 |
| Table 14-9: | Log Market Value & Cost of Production Summary | 21 |
| Table 14-10: | Sawn Wood Average Sale Prices (per cu. m. ex Mill Yard)..... | 24 |
| Table 14-11: | Forest Utilization Investment Alternatives Summary (in US\$ 000's)..... | 26 |
| Table 14-12: | Potential employment opportunities to be offered by the NPVFA | 28 |
| Table 14-13: | Timetable of the Main Activities of the Community Forestry Development Program. | 30 |

List of Figures

| | | |
|--------------|---|----|
| Figure 14-1: | Organization Chart of Nakai Plateau Village Forestry Association (NPVFA)..... | 13 |
|--------------|---|----|

14 FORESTRY DEVELOPMENT FOR NAKAI RESETTLERS

14.1 INTRODUCTION

14.1.1 Current Forestry Situation

Timber and other forest products are significant sources of revenue at the Nakai Plateau. However, the current administrative and management arrangements are such that local communities receive little direct benefit, especially from commercial forestry operations. Villagers have legal rights to 5 m³/family of timber to build houses for newly established families, but they are not authorised to engage in timber harvesting for commercial purposes. Individuals are sometimes involved in commercial logging and sawmilling operations as workers or tree spotters. Forest resources are, however, important for households, providing for rural energy needs (fuelwood for cooking and resin for lighting), fodder for livestock, fencing, non-timber forest products (NTFP), wildlife, and timber for housing and tools estimated at around 1 m³ per year per household. While PM Decree 59 (2002) and implementing MAF Regulation 0204 (2003) have reformed the role of villagers and their benefits from commercial timber harvesting in production forest areas, the NT2 resettlement program is considered a special case, and the GOL has allocated, via PM Decree 193, the whole forest area on the southern side of the Nakai reservoir as a Resettlement Area to be used by Nakai resettlers as a community forest for sustainable commercial harvesting and timber utilization.

14.1.2 The Resettlement Area and Forest Resources

The defined resettlement area is 20,692 hectares, of which 18,106 hectares (or 88 %) is classified as forest land that is highly variable in terms of composition and volume. The other 2,600 hectares is to be reserved for resettlement and agriculture.

The Resettlement Area forests have been identified as belonging to four main forest ecotypes:

- Dry Dipterocarp,
- Dry Evergreen,
- Mixed Deciduous, and
- Mixed Broadleaf and Pine (including some areas of pure pine)

Mixed broadleaf and pine is the most common. *Pinus merkusii* (mai pek) is the local pine species. The most common hardwood species include: *Dipterocarpus alatus* (mai nyang), *Hopea feerea* (mai khen), *Vatica cinerea* (mai si), and *Anisoptera robusta* (mai bak). A forest inventory was carried out in 2001¹. A full list of the main tree/timber species found is presented in Table 14-1 to Table 14-4 below.

Table 14-1: Most Common Tree Species Occurring within the Dry Dipterocarp Ecotype (DD)

| Species code | Species name | Tree/ha | Volume/ha (m ³) | Commercial | Volume/tree (m ³) |
|--------------|-----------------------------------|---------|-----------------------------|------------|-------------------------------|
| 174 | <i>Dipterocarpus obtusifolius</i> | 12.2 | 6.6 | Commercial | 0.5 |
| 040 | <i>Pomitia pinnata</i> | 7.4 | 2.3 | Commercial | 0.3 |
| 315 | <i>Schima wallichii</i> | 7.0 | 4.0 | Commercial | 0.6 |
| 175 | <i>Vatica cinerea</i> | 3.0 | 1.7 | Commercial | 0.6 |
| 182 | <i>Dipterocarpus alatus</i> | 3.0 | 5.3 | Commercial | 1.8 |
| 110 | <i>Pinus merkusii</i> | 2.6 | 3.8 | Commercial | 1.5 |
| 234 | <i>Irvingia harmandiana</i> | 2.2 | 1.1 | Commercial | 0.5 |

¹ *Forest Inventory and Preliminary Harvesting and Management Considerations*, National Inventory and Planning Centre, National Agriculture and Forestry Research Institute. Laos P.D.R.

Table 14-2: Most Common Tree Species Occurring within the Dry Evergreen Ecotype (DE)

| Species code | Species name | Tree/ha | Volume/ha (m ³) | Commercial | Volume/tree (m ³) |
|--------------|--------------------------|---------|-----------------------------|----------------|-------------------------------|
| 175 | Vatica cinerea | 19.1 | 22.0 | Commercial | 1.2 |
| 040 | Pomitia pinnata | 12.7 | 6.3 | Commercial | 0.5 |
| 075 | Ormosia cambodiana | 7.4 | 3.9 | Commercial | 0.5 |
| 315 | Schima wallichii | 5.1 | 5.5 | Commercial | 1.16 |
| 104 | Hopea feerea | 4.8 | 8.3 | Commercial | 1.7 |
| 182 | Dipterocarpus alatus | 4.5 | 12.7 | Commercial | 2.8 |
| 012 | Mesua ferrea | 3.3 | 2.1 | Not commercial | 0.6 |
| 247 | Lagerstroemia | 3.0 | 1.7 | Commercial | 0.5 |
| 317 | Aporosa villosa | 2.9 | 1.2 | Commercial | 0.4 |
| ? | Sindora sp, Dalbergia sp | ? | ? | Commercial | ? |
| 231 | Anisoptera | 2.5 | 7.0 | Commercial | 2.8 |
| 005 | Arytera littoralis | 2.1 | 1.1 | Commercial | 0.5 |

Table 14-3: Most Common Tree Species Occurring within the Mixed Deciduous Ecotype (MD)

| Species code | Species name | Tree/ha | Volume/ha (m ³) | Commercial or not | Volume/tree (m ³) |
|--------------|----------------------------|---------|-----------------------------|-------------------|-------------------------------|
| 040 | Pomitia pinnata | 16.7 | 6.5 | Commercial | 0.4 |
| 315 | Schima wallichii | 7.0 | 5.9 | Commercial | 0.9 |
| 110 | Pinus merkusii | 6.4 | 7.3 | Commercial | 1.1 |
| 175 | Vatica cinerea | 5.3 | 6.7 | Commercial | 1.3 |
| 182 | Dipterocarpus alatus | 4.2 | 6.3 | Commercial | 1.5 |
| 174 | Dipterocarpus obtusifolius | 4.0 | 2.0 | Commercial | 0.5 |
| 323 | Keteleeria | 2.6 | 3.3 | Commercial | 1.3 |
| 075 | Ormosia cambodiana | 2.2 | 1.1 | Commercial | 0.5 |
| ? | Sindora sp, Dalbergia sp | ? | ? | Commercial | ? |
| 317 | Aporosa villosa | 2.1 | 1.1 | Not commercial | 0.5 |

Table 14-4: Common Tree Species Occurring within the Mixed Broadleaf and Coniferous Ecotype (MS)

| Species code | Species name | Tree/ha | Volume/ha (m ³) | Commercial or not | Volume/tree (m ³) |
|--------------|----------------------------|---------|-----------------------------|-------------------|-------------------------------|
| 110 | Pinus merkusii | 16.7 | 4.0 | Commercial | 2.4 |
| 315 | Schima wallichii | 11.5 | 9.0 | Commercial | 0.8 |
| 040 | Pomitia pinnata | 9.0 | 4.2 | Commercial | 0.5 |
| 175 | Vatica cinerea | 7.0 | 7.3 | Commercial | 1.0 |
| 075 | Ormosia cambodiana | 4.4 | 2.3 | Commercial | 0.5 |
| 182 | Dipterocarpus alatus | 4.3 | 6.6 | Commercial | 1.5 |
| 174 | Dipterocarpus obtusifolius | 4.3 | 1.8 | Commercial | 0.4 |
| 167 | Eygenia compongensis | 2.8 | 1.4 | Not commercial | 0.5 |
| 234 | Irvingia harmandiana | 2.6 | 1.5 | Commercial | 0.6 |
| 247 | Lagerstroemia | 2.2 | 1.5 | Commercial | 0.7 |

Over this forested land the average stand volume is about 100 m³/ha (see Table 14-5), although there is a lot of variability in this volume from heavily degraded forest, medium degraded forest to moderately well stocked forests.

Logging and shifting cultivation have in the past heavily degraded much of the forested land. After excluding: (a) contiguous areas with low stand volume (i.e. <80 m³/ha) in about 7,793 ha - degraded production forest, (b) inaccessible and steep forests of about 4,723 ha, and (c) present and future areas for

resettlement and agriculture of about 2,586 ha, only about 5,590 ha of the 18,106 ha forested land can be considered for commercial production in the short to medium term.

The results of the 2001 inventory area and available volume analyses are:

Table 14-5: Forested Land in the Resettlement Area by Forest Ecotype

| Forest ecotype | Stocked, production forests | | Degraded production forest | Forests on steep slopes | All land in Resettlement Area | |
|---|-----------------------------|-----------------------------|---|-------------------------|-------------------------------|-----------------------------|
| | Area (ha) | Volume (m ³ /ha) | Area (ha) (no disaggregated area or volume data for these forest zones) | | Area (ha) | Volume (m ³ /ha) |
| Dry Dipterocarp | - | - | | 310 | 310 | 35 |
| Dry Evergreen | 1,108 | 157 | | 2,576 | 3,684 | 126 |
| Mixed Deciduous | 263 | 107 | | 3,145 | 3,408 | 74 |
| Mixed Broadleaf and Pine | 4,219 | 153 | | 6,485 | 10,704 | 103 |
| Subtotal - forest land | 5,590 | | 7,793 | 4,723 | 18,106 | |
| Unstocked/agriculture | | | | | 2,014 | |
| Other land uses | | | | | 572 | |
| Total- whole "Resettlement Area" | 5,590 | 151 | 7,793 | 4,723 | 38,798 | 100 |

Subsequently it has been determined there are some 17,000 cubic meters of commercial wood on degraded production forest lands and 5,100 cubic meters on project construction lands.

14.1.3 Forestry Development for Improved Livelihoods and Incomes

The development of organized community forestry on the Nakai Plateau has good potential to provide diversified income and employment opportunities. For example, by practicing sustainable forest management, the communities can harvest up to 6,000 m³ annually of timber on a sustainable basis from the 5,590 ha of production forests, obtain additional incomes from controlled, well managed forest grazing and farming domesticated non-timber forest products.

14.1.4 Strategy for Resettler Forestry Development

The NT2 Project is required to ensure that PAP's participate in the planning and implementation, and then obtaining financial benefits from commercial forest operations conducted in a sustainable manner. This will require the establishment and training a Board of Management to approve all investments and operating budgets and organize village support and participation in planning and implementation of the various forest activities.

To achieve this, the practice of village forestry will be institutionalised by establishing the Nakai Plateau Village Forestry Association (NPVFA) as the Board of Management, and developing its capacity to administer the NPVFA, manage forest resources, and run forestry business enterprises on behalf of the PAP's.

This approach to forest land and resources development and management by a well trained local forest organization (NPVFA) working with village based forestry groups under individual village community control, is expected to achieve the following outcomes:

1. Increased off-farm employment and incomes in the Resettlement Area through sustainable forest management, harvesting, and processing of forest products;
2. Regular incomes to resettled households in the form of annual dividends, with any reserves to be set aside to support other community or forest based enterprises;
3. Organization and support provided for participatory planning and zoning of stocked and degraded forest lands at village level, to enable multi purpose management and activities such as controlled forest grazing and fodder tree and grass crop establishment;
4. Participatory planning and technical and financial assistance to domestic NTFP development;
5. Self-sufficiency provided in timber, fuelwood, and wild NTFPs; and

6. Watersheds protected, especially in steep areas, and conserving biodiversity, both *in situ* and in specially zoned areas, as well as sites of scenic, historical, and cultural significance.

14.2 VILLAGE FORESTRY EXPERIENCE IN LAO PDR

A customary form of community forest and land-use management already exists amongst all the villages on the Plateau, as in most of the Lao PDR, resulting from a mix of traditional village practices based on ethnic and spiritual beliefs, village regulations, and formal and informal cultural norms on the one hand, and GOL policy and regulations on the other. At the village level, these rules usually differentiate between locals and non-locals, and define the roles and responsibilities of individuals in relation to sharing of community resources for various purposes. Village management rules are generally consistent with government policies and regulations. This village management of community resources may be more appropriately termed as “village forestry” since entire villages are involved in and benefit from forestry within their village boundaries, rather than any single interest group.

In the last ten years, experience in organizing villages for forestry development has been developed in Lao PDR. In Khammouane Province itself, village forestry has been introduced in a number of villages by a GoL - World Bank funded project and the Japanese Overseas Volunteer Corporation. These projects provided guidelines for organizing a village forestry association (VFA), training villagers to run the association, providing village work teams with skills to conduct sustainable forest management operations, formulating and implementing a forest management plan, and utilizing the benefits from forestry for the welfare of members and for village development.

Villagers on the Nakai plateau already have considerable practical experience in forest harvesting and processing. However, they lack experience in management and community enterprises. There is no reason why they cannot develop a model similar to the many successful large-scale agro-forestry business enterprises of Maori Incorporations and Trusts in New Zealand managing their community-family clan land resources in communal ownership structures.

14.3 LEGAL BASIS FOR VILLAGE FORESTRY AT NAKAI PLATEAU

Government policy promotes village participation in forestry management and activities. PM Decree 102 (1993) recognizes village administration as a formal level of the government with rights and duties to implement policies at the village level. The Forestry Law (1996) recognizes the village as the grass-roots level of a four-tiered forestry administration that includes the national, provincial, district, and village levels. The law states that village authorities have the right and duty to develop specific regulations that are “appropriate to the actual conditions of the village”.

Decree No. 59/2002/PM, providing for implementing the Sustainable Management in Production Forest Areas (PFA), states that “Village Forestry Organizations shall organize the villagers’ participation to implement all sustainable production forest management activities within the scope of their capacity with FMUs under outlined instructions and regulations”. Such activities include demarcation, land-use planning, pre-harvest inventories and tree marking, management planning, monitoring and control, harvesting activities, log sales and receipt of revenues and other development activities consistent with forest management agreements and plans” (Article 8.4). However, due to the need to provide resettling villagers impacted by the NT2 project with a guaranteed source of income, the GOL has decided to enact specific legislation and regulations to enable the Resettlement Area forests to be commercially managed by the resettling villages, as a special case.

The following legal instruments specifically provide a legal framework for the management of the forests in the Resettlement Area by the Nakai Plateau Village Forestry Association:

- ❖ **Decree No. 193/PM of 29 December 2000** (see Volume 1 Appendix D-1) establishing the Nakai-Nam Theun NBCA Corridor Areas, the reservoir area, and the Resettlement and Forest Area for the affected people.
- ❖ **Decree No. 37/PM of 12 April 2002** (see Volume 1 Appendix D-2) approving the allocation of the Resettlement and Forest Area to the affected people.

- ❖ **Authorization No. 0063/MAF of 29 April 2002** (see Volume 1 Appendix D-3) authorizing the Khammouane Governor to issue regulations on the establishment and conduct of operations of a NPVFA which will manage the forest resources allocated to the resettlers.
- ❖ **Regulation No. 484/KM.GOV of 13 June 2002** (see Volume 1 Appendix D-4) establishing the NPVFA and providing a set of guidelines for its management and operations.
- ❖ **Decision 171/PG(RCC).KM**, dated 7 March 2005, to "amend the regulation 484/PG.KM on the establishment and operation of Nakai plateau villager forestry Association of the NT2 Project, dated 13/6/2002". This amendment makes a few small changes to the original Decisions 484, and adds two clauses granting the NPVFA (a) exemption from local taxes and levies and (b) granting the NPVFA sawmill and logging licences.
- ❖ **Decision 85/PG(RCC).KM**, dated 9 Feb 2005, on "the Management and Use of the Resettlement Area-and the NT2 Reservoir on the Nakai Plateau for that is impacted by the NT 2 Project". This decision grants the Nakai plateau Resettlers exclusive rights to all the forest resources in the Resettlement Area for a period of 70 years, after which a further granting of exclusive rights may be granted.

Table 14-6: Legislation Relevant to Village Rights in the Forestry Sector

| Document | Date | Issuing Body |
|--|----------------|------------------------|
| Constitution | 15/8/1991 | Constitution Committee |
| Laws | | |
| Forestry Law | 11/11/1996 | National Assembly |
| Water and Water Resources Law | 2/11/1996 | National Assembly |
| Land Law | 4/12/1997 | National Assembly |
| Environmental Protection Law | 26 April 1999 | National Assembly |
| Decrees | | |
| PM Decree 102: Organization and Administration of Villages | 5 July 1993 | Prime Minister |
| PM Decree 59: Sustainable Forest Management of Production Forest Areas | 22 May 2002 | Prime Minister |
| PM Instruction 3: Expansion of Land Management, Land and Forest Allocation | 25 June 1996 | Prime Minister |
| Regulations | | |
| MAF Regulation 196 on development/promotion of sustainable tree planting | 15 August 2000 | Minister of MAF |
| MAF Regulation 535: Management of Village Forests | 18 June 2001 | Minister of MAF |
| MAF Order 54: Customary Rights and Use of Forest Resources | 7 March 1996 | Minister of MAF |
| MAF Instruction 377: Customary Use of Forest Resources | 17 April 1996 | Minister of MAF |
| MAF Instruction 822: on Land-Forest Allocation for Management and Use | 2 August 1996 | Minister of MAF |

One of the first steps in organizing the NPVFA has been the drafting and approval of its **Article of Associations** (direct translation from Lao version being '**Rules and Regulations**') which were formulated in a participatory manner in 2003. An English translation of this document is attached as Appendix E-1.

A 70-year **Forest Management Contract** will be drafted and signed jointly by the NPVFA, Nakai DAFO, PAFO, and the Khammouane Provincial Administration. This contract will provide for the rights and obligations of all parties. Contract duration of 70 years is considered both (a) consistent with the Land Law (2003) and (b) be sufficient to provide incentive to villages to regenerate and manage the forest for the long term production of hardwood and (quality) softwood timbers, which may take at least 50 to 70 years to reach harvestable maturity.

The NPVFA **Articles of Association** and proposed Forest Management Contract will be to include the duties and rights of villages required under PM Decree 59 and MAF implementing regulation to cover all aspects of forest management, rather than the village role merely being a labour force as outlined in MAF Regulation 535 and PM Orders 10 and 15. Specifically, the NPVFA will have the sole rights to harvest and sell timber and NTFP from the allocated forest, provided this is done in a sustainable manner. Sustainable forest management is the main obligation of NPVFA, which will be undertaken by carrying out planning,

forest management (including forest regeneration and stand improvement), protection, and conservation activities.

14.4 PLANNING PRINCIPLES AND FOREST MANAGEMENT PLAN

A **Forest Management Plan** will be developed by the NPVFA, assisted by DAFO, PAFO and NTPC TA, and updated every five years. This plan will provide for the long-term management of the Resettlement Area forests and their timber and non-timber resources. A more detailed annual operational plan for forest management and utilization (and allocation of a quota) will be formulated as the implementing plan, based on more detailed annual pre-harvest inventories.

A set of planning principles which have guided the drafting of the NPVFA Articles of Association and will continue to be used in the Resettlement Area forest management planning and utilization are proposed to provide a basis for assessing the suitability and feasibility of actions planned to meet the forestry development objectives, as follows:

- Forest development and management by villagers, for villagers;
- Zonation and sustainable management of natural forests for timber production and other forest uses;
- Wood processing into timber, semi-finished and finished products;
- Support to individual village committee organizations;
- Planning and development of domesticated NTFP where appropriate and financially feasible.
- Promotion of strategies and methodologies for controlled forest grazing.
- Forest plantation development with local species, if and where appropriate and financially feasible;
- Conservation of the resource base of wild NTFPs; and
- Conservation of soils, water resources, biodiversity and scenery.

The Management and Operations Plans will be implemented through a NPVFA Logical Framework for its Business Plan that also includes other activities described later in this report.

14.4.1 Forestry Development and Management by Villagers, for Villagers

The Resettlement Area and its forest resources have been legally allocated to villagers who will be affected by the NT2 Project on the Nakai plateau². The object of management of this forest area is geared mainly towards providing sustainable employment, income, and other benefits to the affected villagers. Village forestry, together with land and forest use planning and allocation, will be the main vehicle for securing tenure for villagers and the leading role of villagers in forestry development and management.

Village forestry at Nakai Plateau will see the (affected) villagers as managers of the forest resources that have been allocated to them. As forest managers, they will:

- Collect the needed information (e.g. through forest inventories);
- Formulate specific policies for sustainable forest management;
- Prepare plans to carry out those policies; and
- Implement plans and make operational decisions.

At first the villagers may have limited capacity to undertake all these activities, and outside help will be provided to develop sustainable forest management systems and procedures, train the villagers to apply them, and guide the villagers until they are able to do the work themselves. Thus the Nakai DAFO, aided by NTPC TA, will provide technical assistance to NPVFA in all phases of forestry development from

² Decree on the Approval of the Allocation of the Resettlement and Forest Area to People and Village Organizations Affected by the Nam Theun 2 Project for Carrying out Forestry Business Activities. No. :37/PM April 12, 2002

organizing the NPVFA, formulating a forest management plan, training villagers, and overseeing village forestry work.

14.4.2 Sustainable Management of Natural Forests for Timber Production

Sustained yield is an important foundation of sustainable forest management. It means simply that the annual harvest volume from a forest must not exceed the annual growth rate (or yield) of commercial species, where annual yield is expressed as the mean annual increment (MAI) in stand volume after accounting for mortality and other drain from the timber resources. Sustained yield forest management will be applied specifically in production forests, which together with forest plantations will be the only forest zone where commercial timber production will be allowed to take place.

The adoption of such a sustained yield forest management principle is the only way to ensure that timber production related employment would be sustained and that timber revenue (and thus dividends) would also be sustained or even increase over time, assuming increasing real timber prices.

Sustainable management will require that the 18,106 ha of forested land in the Resettlement Area is zoned for into five **main forest management zones/types**, following the generally accepted categorization in the Lao PDR, as follows:

(Well stocked) production forests. These will be composed of stands with volume of at least 80 m³/ha and whose structure contains a naturally occurring proportion of small, medium, and large trees. Logged-over forests containing more than 80 m³/ha but mainly in small and medium trees, as well as inaccessible and steep forests, will not be zoned as production forests.

Regenerating production forests. These will generally be a low-volume forest containing less than 80 m³/ha usually as a result of logging, but still containing good tree numbers of required species. Stands in this zone will be protected so that in time they will increase in stand volume and tree sizes and can be re-zoned as production forests.

Protection forests. Regardless of stand volume, forests in steep slopes (generally exceeding 25°) and on the edge of water course's will be zoned for protection of soil and water resources, as well as of wildlife that has sought refuge in these less accessible slopes.

Conservation forests. While it may not be necessary to zone conservation forests within the production forests - as Lao PDR already has a considerable network of National Protected Areas (NPA) and the Resettlement Area itself is surrounded by two NPAs - conservation corridors connecting them the NPAs or other sections of particular value may be identified and zoned as conservation forests. In addition, inaccessible areas will also serve the function of a conservation forest as they provide refuge to wildlife that has retreated from disturbed areas.

Degraded forests, which may be converted to other land use purposes. Extremely low-volume forests with poor potential for natural regeneration into a production forest will be zoned as degraded forests. In the Resettlement Area, these forests usually result from shifting cultivation, excessive logging, and wind throw in logged-over stands. Permitted uses of degraded forests could include, subject to technical and financial viability studies, plantation of native tree species and domesticated native NTFP species (or non native species confirmed as non-invasive), controlled grazing, and development of sustainable rainfed agriculture.

Zoning of the forest area for the different proposed uses involving a high level of local village involvement will be an integral part of forest management planning. For the purposes of this SDP, however, the area of current production forests has already been estimated (from the 2001 forest inventory at 1% sampling intensity) to determine the level of employment and income that could be expected from forestry in the Resettlement Area. The results show that production forests would likely cover only about 5,590 ha after excluding logged-over, steep, and inaccessible forests and proposed settlement areas.

Table 14-7 shows the estimated **sustainable annual harvest** per ha from the production forests after deducting an allowance for logging damage and stand development from the Mean Annual Increment (MAI) of commercial trees. For optimum stand growth, heavier harvests than shown should be made in dense dry evergreen forests bringing the average stand density down from 157 m³/ha to say 130 m³/ha. Stands with volumes of 120-140 m³/ha have been shown in other project areas to grow faster than stands with volumes of 140-160 m³/ha. Based on a sustainable harvest rate of 1.2 m³/ha for hardwoods and 1.5 m³/ha for pines over the 5,590 ha of production forests, annual harvests of about 8,000 m³ could possibly be sustained. However, for budgeting and income forecast purposes, a second conservative annual harvest estimate of 6,000 m³ could also be used to calculate cost and returns, which will also provide a sensitivity analysis in terms of resource availability.

Table 14-7: Sustainable Annual Yield and Harvest from Forest Ecotypes

| Forest eco-type | Average stand density (1) | Growth information (2) | | MAI for commercial trees (3) | Allowance for damage and stand dev. (4) | Sustainable annual harvest |
|------------------------------|---------------------------|------------------------|------------------------|------------------------------|---|----------------------------|
| | | For. stand density | Mean annual increment | | | |
| Dry Evergreen | 157 | 160 | 1.8 m ³ /ha | 1.4 m ³ /ha | 0.2 m ³ /ha | 1.2 m ³ /ha |
| Mixed Deciduous | 107 | 100 | 3.6 m ³ /ha | 2.5 m ³ /ha | 1.3 m ³ /ha | 1.2 m ³ /ha |
| Mixed Broadleaf and Softwood | 153 | 150 | 2.2 m ³ /ha | 2.0 m ³ /ha | 0.5 m ³ /ha | 1.5 m ³ /ha |

(1) Average stand density for production forests at Nakai Plateau estimated from FIPC 2001 inventory.

(2) Growth information (mean annual increment-MAI) for DE and MD from FOMACOP, 2000 and for MS (pine) from Margules Groome Pöry, 1997.

(3) Commercial trees in DE and MD is about 70-75% of total volume, MS about 90%.

(4) Allowance for logging damage is 20-33% of logged volume. The rest of the allowance is a reserve (left uncut) to improve the stand density (0.0 m³/ha for DE and MS, 1.1 m³/ha for MD).

Silvicultural decisions, including the timing, intensity and method of harvesting, regeneration, and timber stand improvement, will be different for hardwoods and pines. Hardwoods generally occur in mixed, uneven-aged stands; pines often occur in pure, even-aged stands that co-exist with hardwood stands in the mixed forests in the Resettlement Area. While a tree selection system is suitable for hardwood stands, mature pine stands are generally harvested by the seed-tree method or by clear cutting in patches, which are then regenerated naturally by seed bearing cones on the ground or from trees in surrounding stands, or by tree planting if natural regeneration fails.

14.4.3 Log Marketing and Wood Processing

The generation of sufficient annual incomes and dividends from the utilization of forests of the Resettlement Area (to meet the target of the NT2 Project) requires that the NPVFA will not only sell logs, but whenever possible and economic, will also transform the logs into timber, or semi-finished and/or finished timber products. Thus, the NPVFA may either:

- Option 1: Sell raw logs;
- Option 2: Primary conversion of raw logs and selling sawn wood - locally, possibly regionally; or
- Option 3: Secondary and tertiary wood processing, and selling locally or exporting finished products.

Under current Lao practice, Option 1 involves:

- A pre-harvest inventory to determine the species and volume of timber available for harvesting;
- Securing a harvesting quota;
- Pre-selling standing timber;
- Harvesting the pre-sold volume of the agreed species; and
- Completing the sales of logs at a second landing.

This practice aims to avoid the risk of harvesting timber that ultimately could not be sold, and would just decay and perish. [Note that this does not seem to have been the practice followed previously on the

Nakai plateau, where there is a lot of timber cut but not collected, and thus lies decaying in-situ]. Sub-options include:

- (a) Selling standing timber by letting the buyer do the logging and payment of royalties, taxes, and fees; and
- (b) Conducting logging and final sales at a second landing; receiving full payment for the logs; paying royalties, taxes, and fees; and releasing custody of the logs to the buyer.

14.4.4 Forest Improvement with Local Species

Planting of local species will be employed mainly as a means to assist natural regeneration in harvested hardwood stands and to fully regenerate harvested pine stands in cases where natural regeneration fails. Conversion of natural forests to plantations will generally not be done. There are certain cases, however, where forest plantations may be established. An example is where an under-stocked pine stand is in grave danger of wind throw. The remaining trees might be cut down and the area might then be converted to forest plantations of fast-growing species, should this option be assessed to be technically and economically viable. Alternatively, the area may be replanted with pine seedlings. This may be seen as a pine plantation development; it may also be seen as simply artificially regenerating a naturally occurring pine stand.

In any case, plantation development would be done, if at all, in scattered, small patches that would blend well with natural forest stands, rather than as large contiguous units. This is not only good forestry practice in a generally natural forest area; it is also being encouraged in one of the criteria for forest certification by the Forest Stewardship Council. Subject to NPVFA consideration of the costs and benefits of FSC certification, this may form part of the strategy for forestry development in the Resettlement Area.

In forest improvement work more detailed financial evaluations of different species suited to the available sites at different management regimes are required to justify NPVFA investments from its forest enterprise earnings. Substantial data is already available in the region to assist such evaluations.

14.4.5 Conservation of Resource Bases of NTFP

The following NTFPs are collected for local use and consumption on Nakai Plateau:

- Rattan and bamboo shoots, which are cooked or sold;
- Bamboo and rattan for house construction and handicraft;
- Vegetables from 40 or more types of leaves from trees, shrubs, and herbs;
- Fish and other water animals like frog, shrimp, soft-shelled turtle, crab and mollusk; and
- Wildlife, including mammal species, bird species and reptile species, regularly eaten as a more importance source of protein than livestock.

NTFPs for commercial use fall into four categories:

- Plant exudates (kisi, po heuang/my gaedtsana);
- Medicinal plants (kheua hem, hak tin hounng, cardamom);
- Spices and condiments (mak phep, mak khene, no kha); and
- Tree barks (bong, chouang, pos a).

In the late 1990's, NTFPs were the most important source of cash income (41%) compared to livestock (32%), and off-farm employment (28%). In 1997, villagers from five surveyed villages ranked kisi resin (14%) and fish and frogs (14%) as the most important NTFP followed by rattan shoots (12%), cardamom (10%), wildlife (10%), bong bark (6%), bamboo shoots (6%), vegetables (5%), rattan canes (5%), and mushrooms (4%). Food products are more numerous and considered more important (56%) than non-food products (44%).

The resource bases of NTFP include all forest ecotypes and zones, although the amount and type of NTFP vary by forest ecotype and zone. Current NTFP collection sites include those that would be

flooded, and once resettled, villages would need to relocate their NTFP collection sites. Aside from flooding, over-collection and logging pose a threat to the resource bases of NTFP. Monitoring, assessment, and control are necessary to prevent over-collection. The threat posed by logging is especially true when high-intensity logging is practiced, but not when low-intensity, low-impact logging is practiced.

14.4.6 Conservation of Soils, Water Resources, Biodiversity and Scenery

A significant portion of the Resettlement Area lies in the southern watershed (as opposed to the NT2 Watershed as defined in PM Decree 25) of the future Nakai Reservoir. The rest is in the watershed of the Nam Katang. Forestry operations, if improperly done, could contribute to silting of the proposed reservoir. Thus, it is important to ensure that the soils and water resources in the Resettlement Area are conserved by means of a number of measures that will be described in the forest management plan, the most important of which will be restricting logging operations to the dry season.

The Resettlement Area is also bounded by the Nakai Nam Theun NPA to the north and the Khammouane Limestone NPA to the south west. These NPAs are connected by corridors that abut the northern and southern ends of the Resettlement Area. Thus, wildlife may wander from the two NPAs to the forests in the Resettlement Area. It will be important to ensure that forestry operations in the Resettlement Area are done in a manner that minimizes disturbance to wildlife and their habitats. Low-intensity, low-impact logging can be designed to mimic nature in terms of intensity in the natural death and regeneration of trees, and has been found to cause minimal changes in forest structure and species composition, and need not have serious impacts on wildlife. Thus, the harvesting regimes in the production forests of the Resettlement Area will be adapted to ensure minimal disturbance of wildlife habitats.

The Resettlement Area is located along the southern rim of the future reservoir. Once completed, the reservoir and its surroundings would provide scenic sites for outdoor recreation and would be an attractive destination for tourists. Forestry operations should therefore be done in a manner that would conserve the value of these scenic sites. Measures will be included in the forest management plan for this purpose, foremost of which is the application of low-intensity, low-impact logging and encouragement of natural regeneration of harvested stands.

14.5 MAIN COMPONENTS OF THE NAKAI PLATEAU VILLAGE FORESTRY PROGRAM

To attain the forestry development objectives given in Section 23.4.1 on the basis of the planning principles given in Section 23.4, a number of activities will be implemented via the four programs or components of the Nakai resettlement forestry program:

- (1) Institutional Development;**
- (2) Natural Forest Management;**
- (3) Forestry Business and Enterprise Development;**
- (4) Forest Improvement with Local Species.**

14.6 COMPONENT 1: INSTITUTIONAL DEVELOPMENT

Institutional development will include:

- Organizing the NPVFA, in which all resettler villagers have the right to be members, and a village forestry committee (VFC) and forestry work teams in each village;
- The provision of Technical Assistance (TA) - mainly national, but also some regional and international TA, by NTPC, thru the start-up and training phases of the program; and
- The gradual development of the capacity of villagers and staff to administer the NPVFA and its forest management, utilization and marketing operations.

14.6.1 Technical Assistance

Technical Assistance (TA) will be provided by in two parts:

- Short term TA support in the first 6 months to establish management and administration systems, and design, plan, procure and install income generating capital plant and equipments to secure early cash flows; and
- Long term support to training programmes over a 3 year period for the gradual development of the capacity of villagers and staff to administer NPVFA and its forest management, utilization, and marketing operations. These training programmes are outlined in Section 14.6.7 covering the capacity development and forest and forest industry training systems to be implemented.

Table 14-8: Technical Assistance Requirements (number of persons months)

| | 1 st 6 Months | 2 nd 6 Months | Year 2 | Year 3 | Total person months |
|--------------------------------------|--------------------------|--------------------------|--------|--------|---------------------|
| TA - Specialist | Start Up | Training Phase | | | |
| International | | | | | |
| ▪ Forest Management & Harvesting | 4 | 2 | 1 | 1 | 8 |
| ▪ Institutional Development | 1 | 1 | 1 | 1 | 4 |
| ▪ Forest Industry Design & Marketing | 4 | 2 | 1 | | 7 |
| Domestic / Regional | | | | | |
| ▪ Management & Administration | 2 | 2 | 2 | 2 | 8 |
| ▪ Forest Management & Harvesting | 6 | 6 | 6 | 3 | 21 |
| ▪ Sawmill Management & Marketing | 6 | 6 | 6 | 3 | 21 |
| ▪ Civil Design & Construct Engineer | 4 | 2 | | | 6 |
| ▪ Mechanical Plant Install Engineer | 4 | 2 | | | 6 |
| ▪ Electrical Installation Engineer | 3 | 2 | | | 5 |
| ▪ Sawmill /Saw shop Maintenance | | 2 | 1 | 1 | 4 |
| ▪ Forest Management Trainers (2) | | 4 | 4 | 4 | 12 |
| ▪ Harvest Equipment Maintenance | 1 | 1 | 1 | 1 | 4 |
| ▪ Industrial Safety/Hygiene Training | 1 | 0.5 | 1 | 0.5 | 3 |

14.6.2 Nakai Plateau Village Forestry Association

The NPVFA, consisting of resettler households as members, has been approved to be established under Regulation No. 484/KM.GOV of 13 June 2002. Eligible affected families, which are those that have been registered before the cut-off date on 1 October 1998 or have subsequently grown from registered families, have been given opportunity to apply for and be enlisted as members of NPVFA. An Articles of Association and By-Laws has also been formulated via a participatory process, and will be ratified by the enlisted members followed by an election of officers and the formal approval of the NPVFA organization by the Governor of Khammouane. The By-Laws will be further developed as NPVFA incorporates to it the policies and regulations pertaining to its administration and the sustainable management and utilization of the forest.

Figure 14-1 illustrates the organizational structure of NPVFA. The *General Assembly* of all villages is on top of the structure of NPVFA. The General Assembly will have two categories of members: (a) families and (b) individual family members (husband, wife, and unmarried children and close relatives living together as a family). A member family will be entitled to a single vote on matters brought to the general assembly for decision, as well as to a single share in the profits of the association. Individuals from a member family are entitled to seek employment in NPVFA operations, as well as to form their own member family after they get married.

14.6.3 Village Forestry Committees:

To ensure better participation of member families in decision making and individual members in various activities, they will be organized into their respective *Village Assembly* and involved in NPVFA activities through their respective *Village Forestry Committee* (VFC). Thus NPVFA will essentially be an aggregation of village assemblies and their VFCs.

A VFC will be composed of 5-8 villagers depending on the size and preference of the village. It will be headed on concurrent basis by the *village chief*, who had already been elected by the village and who will also represent the village in the *Board of Management*. The other members will be appointed by the village chief after their confirmation by the village assembly. These members will include at the minimum a *secretary*, an *accounts officer*, and a *village forester*. The secretary will keep minutes of meetings of the VFC and take charge of records keeping. The accounts officer's primary responsibility will be bookkeeping and safeguarding the cash and other assets of the village entrusted to the VFC. The village forester will manage the different forestry work teams of the village. Deputies or assistants may be appointed for each of the above-mentioned officers.

14.6.4 Forestry Work Teams

Each village will organize forestry work teams to do the different forest management and utilization activities assigned by NPVFA to the village. Work teams will be organized for conducting forest inventory, tree marking, access track clearing, controlling logging and second landing operations, post-harvest assessment, regeneration and timber stand improvement, forest plantation development, forest protection, etc. Work team membership will not be mutually exclusive; in practice a team may be formed from another team, e.g. a tree marking team from the forest inventory team, to facilitate transfer of work related information from an activity to the next activity.

NPVFA will also organize teams or crews whose members will come from or represent each village. For example, an annual forest operations planning team will be formed consisting of village foresters. Sawmilling crews will have villagers from different villages as members, but a village will not have its own sawmilling crew.

14.6.5 Managerial and Technical Staff

A professional *manager* will be hired by the Board of Management to plan and run the regular activities of NPVFA, provide management assistance to the VFCs, supervise the village foresters, and look after the different business enterprises of NPVFA. The manager will organize his/her own management staff including a secretary, treasurer/cashier, accountant/bookkeeper, property officer/buyer, and office assistants.

Managers and technicians will also be put in charge of running wood processing and other enterprises, e.g. sawmilling, timber treatment and tertiary processing operations, as well as in timber chain-of-custody certification requirements. Villagers will be hired after training as technicians and even as managers if they are capable. The different managers will report directly to the NPVFA manager.

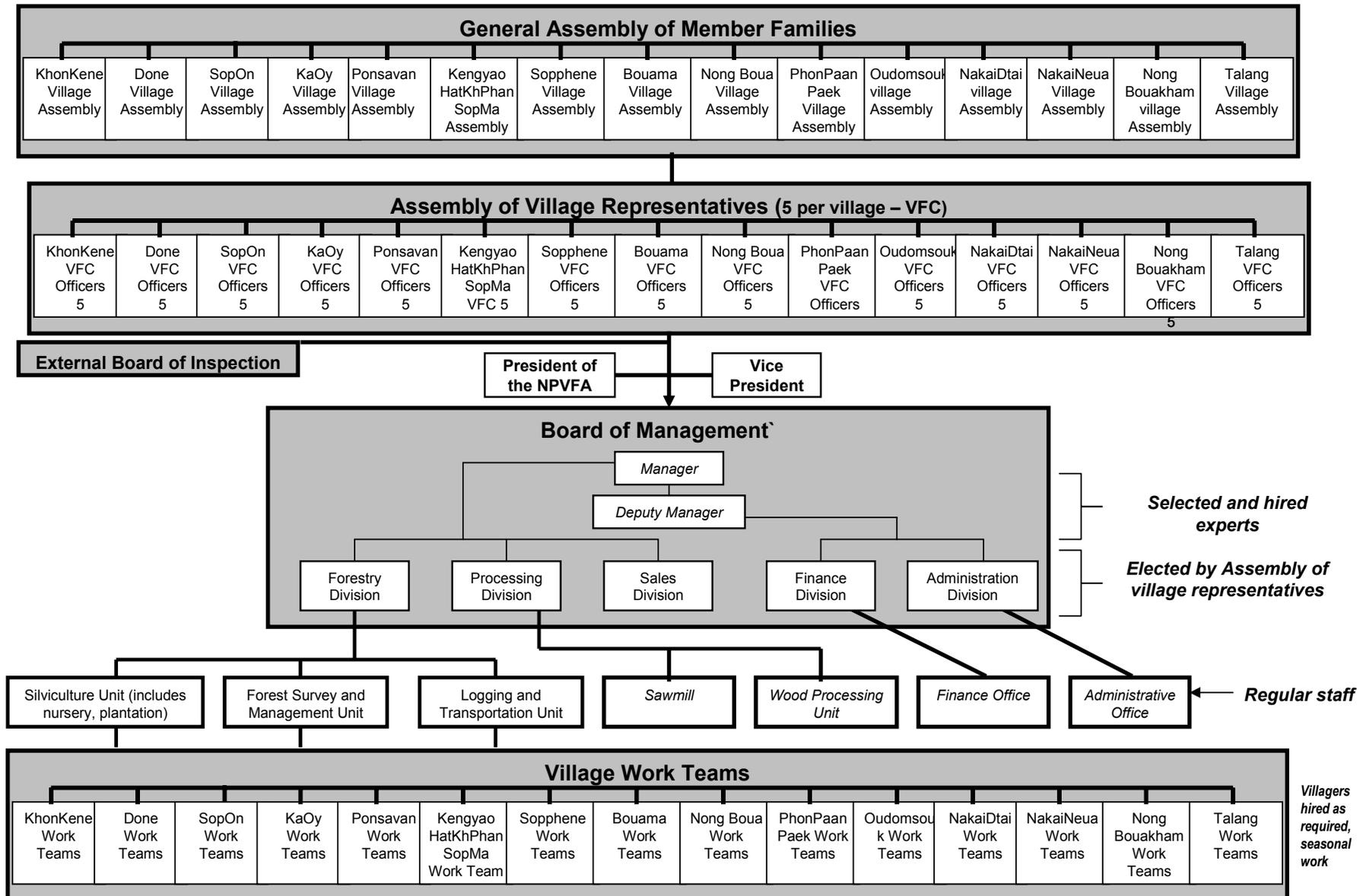
As well, a marketing staff will be organized to take charge of all market related concerns, both buying inputs and selling processed products. The staff will, however, focus on export marketing of processed wood products.

14.6.6 Compensation and Audit

The villagers constituting the VFCs are entitled to compensation and other benefits at a rate to be determined by the Board of Management, including a salary for those who will be working full time, e.g. village forester. As well, the Board of Management will determine the rate of compensation and other benefits for the managerial and technical staff and wage rates for work teams.

Each VFC will be transparently operated and subject to annual operations assessment and accounts audit by NPVFA, which in turn will be transparently operated and subject to annual operations assessment and accounts audit internally by its *Board of Inspection* as provided for in Regulation No. 484/KM.GOV of 13 June 2002. In addition, NPVFA will be subject to an external audit by a provincial or other selected auditing organization.

Figure 14-1: Organization Chart of Nakai Plateau Village Forestry Association (NPVFA)



14.6.7 Capacity Development and Forestry Training System

The challenge for the implementation of the Nakai Plateau Village Forestry Program is to gradually develop the NPVFA into a competent business organization. Activities to achieve this will be strategically guided by a Business Development Plan and Logframe that includes a training program and a long but sustained learning-by-doing process. Business planning and management training will be largely dealt with by NTPC and its contract specialists.

The process of building up the capacity of NPVFA will be made possible by means of support provided and nurturing by NTPC, the RMU, Nakai DAFO, and Khammouane PAFO. The following discussion illustrates how capacity building will be done through training and immediate application of knowledge and skills obtained from training.

Training approach

In general each development activity will be preceded by systems development and training. A multi-stage, modular, learning-by-doing training system will provide training of provincial and district staff and villagers at the Nakai Plateau. Training will be multi-stage involving training of staff followed by training of villagers. Training will be modular, and knowledge and skills learned for a given module will be immediately applied in actual practice by villagers under staff supervision (learning-by-doing) before another module is learned.

The integration of systems development, training and application in actual operations is described in the following steps of a development-training-application cycle:

Stage 1 – Systems Development:

Systems and procedures for the given activities will be developed by experts in the field. This will generally take about a week (longer for some topics, e.g. forest management planning). At the same time, the experts will work with NTPC and DAFO trainers to prepare for the training activities.

Stage 2 – Training of District forestry staff:

In stage 2, relevant experts or NTPC or PAFO trainers will conduct training of district staff on the activities and their systems and procedures. In general training will include two activities, one from one component and another from a different component. For example, training on enlisting NPVFA membership (Component 1: Institutional development) may be combined with training on pre-harvest inventory (Component 2: Forest management). A district staff training course will generally last a week or more including a practicum in one village. District staff members will be grouped into teams and each team will be assigned a number of villages.

In general, these training sessions will be conducted, at least initially, at the Nakai District Forestry Headquarters. A participatory forestry expert will usually conduct the training, assisted by NTPC staff during organizing and conducting.

The entire set of topics for capacity building will be introduced subset-by-subset in successive training sessions. Field application of a subset will be done before training moves to the next subset. This way learning is reinforced by immediate practice. Modules will be selected for a particular training session such that they can be covered in 4-5 training-days (for example: a module on forest inventory, plus a module on VFC organizing).

Stage 3 – Training of village teams:

Under the supervision of NTPC/PAFO trainers, the teams of Nakai District forestry staff will conduct training of village work teams assigned to them. Training will be conducted either in the villages, or villagers may be asked to go to Nakai District Forestry Headquarters for training. If conducted in the villages, training will be organized first at a lead village as a practicum for the training of district forestry staff.

A participatory forestry expert may supervise the training at the lead villages, for example.

The trainees may be the VFC or a forestry work team (e.g. forest inventory team), depending on the topic. The same topics as in Stage 1 are covered but simplified (e.g. more techniques/procedures, less concepts), so that villagers could absorb the lessons well, and addressed to the appropriate team (e.g. VFC for administrative topics, forestry work team for forestry work topics).

Stage 4 - Application in actual operations by the village teams:

Under the supervision of district staff, village work teams will apply the knowledge and skills obtained from the training to conduct the given activities. In case of difficulties, the district staff will provide technical assistance. A given activity may take several weeks to complete by village teams.

In this way, lessons learned in Stage 3 will be immediately applied by the village teams under forestry staff supervision, for at least the first day or two. After the forestry staff trainers leave the village, the village teams will continue the work by themselves. For example, the VFC conducts further meetings; the forest inventory teams complete the forest inventory. At the end of the forestry operation, the village work team together with the supervising staff will prepare a report for monitoring purposes.

Stages 1 to 3 will generally take a month or less to do. Stage 4 should commence immediately from Step 3. When required a certain time lag should be allowed between the start of two consecutive development-training-application cycles to ensure that training and application resources are not overwhelmed by too much demand for work and/or time. The same steps will be undertaken when the activity is repeated the following year. However, the focus will no longer be on learning how to do the activity, but to consolidate the experience of the previous year and to incorporate the lessons from the experience to improve performance in doing the activity.

Training topics

The following lists illustrate the topics that will be introduced during training. The list will be further developed as implementation of the training program proceeds.

Typical training topics for the VFC/VFA administration:

- Organizing the village for forestry administration and forestry operations;
- Conducting an election of officers;
- Participatory rural appraisal;
- Conducting committee meetings;
- Conducting village assembly meetings;
- Recording minutes of meetings;
- Preparing reports of meetings and forestry operations;
- Budgeting;
- Bookkeeping;
- Internal audit of financial transactions by VFC and work teams;
- Simplified personnel management system;
- Procurement;
- Simplified inventory management;
- Internal monitoring and control.

Typical training topics for forest management, harvesting, and utilization operations:

- Land-use mapping;
- Land-use planning;
- Forest inventory for management planning;
- Division of the forest management area into annual coupes;
- High conservation value forest assessment;
- Forest management system for different forest types and resources;
- Long-term forest management planning;
- Pre-harvest inventory;
- Annual forest operational planning;
- Timber scaling and grading;

- Preparing for forest harvesting;
- Control of forest harvesting;
- Post-harvest assessment;
- Forest regeneration by natural means and by tree planting;
- Nursery and plantation operations;
- Forest stand improvement;
- Conservation of high forest values;
- Forest protection from fire, man, and other agents;
- Forest products utilization;
- Primary, secondary, and tertiary processing of forest products.

Training schedule

A training schedule taking into account the seasons in the year, operational requirements, and synchronization with NT2 project development will be developed. The above topics will be combined into modules, the modules combined into subsets for introduction in a sequence of training sessions, and the training sessions scheduled in stages as indicated above so that all topics are eventually covered. This will take about three years after which training will be mainly refresher courses.

Training resources

Since training is immediately followed by application in actual practice, preparation and procurement of resources will ensure the requirements of both the training sessions and actual operations.

Training venues

The Nakai District Forestry Headquarters provide a suitable venue for the training of forestry staff, as well as for occasional training of villagers (e.g. VFC members). At the village, the village temple, a large house (usually belonging to the village chief or a VFC member), or village meeting hall (to be built by the project) could all serve as training venue.

Equipment and tools

Adequate equipment and tools will be provided to the staff and village teams during training. These tools will then be handed over to the village teams, who will use them in actual operations. Mobile white boards combined as a poster stands will be provided to each team of trainers, and visual aids for training sessions will be produced beforehand, but also during the actual conduct of the training.

14.7 COMPONENT 2: NATURAL FOREST MANAGEMENT

Sustainable forest management will be implemented following the participatory formulation of a long-term Forest Management Plan and recurrent Annual Operational Plans for the Nakai Plateau Forest Management Area (NPFMA). The Forest Management Plan will be reviewed and updated every five years. The NPFMA will likely be divided into two sub-FMAs:

- (i) North-western Resettlement Area Sub-FMA; and
- (ii) South-eastern Resettlement Area Sub-FMA.

This will facilitate the participation of village teams in participatory sustainable forest management, considering that the new location of villages will be spread over the length of the Resettlement Area. Each of these two sub-FMAs will be further divided into annual coupes for harvesting and stand improvement operations in a way that will also facilitate village participation.

Natural forest management involves some activities which cover all of the natural forests, and some activities which are specific to specific forest management zones, whose boundaries will be delineated as part of the Forest Management Plan.

14.7.1 FM Activities to Be Conducted in All Zones:

A number of activities will be conducted regardless of the forest management zone, such as:

- **Forest protection.** Forest protection will take place throughout the year, but will be focused in the dry months when forest fires, clearings for shifting cultivation, and other illegal activities are more likely to occur. Lookout towers will be built in strategic places to spot occurrences of forest fires. Fire fighting teams will be provided training in fire fighting techniques, provided equipment, and will be on call in case of occurrences of forest fire. Regular forest protection teams will, however, be organized and assigned territories to patrol, monitor, and control any occurrences of fire, clearings, and other illegal activities.
- **Soil erosion.** Sites that are actively contributing to the silting of the reservoir will be mapped and prioritized for design and application of erosion control measures. Soil erosion control will, however, mainly be applied as part of forest management operations. For example, construction of logging roads will be minimized. If built, they will be properly sited and designed to minimize soil erosion and siltation of the reservoir.
- **Control of poaching of wildlife.** NPVFA will coordinate with protected area staff in the control of poaching of wildlife. Trapping and hunting of wildlife for trade purposes in the Resettlement Area will be banned. In addition, to minimize hunting for food, villagers (ie, NPVFA members) will be encouraged to focus on the raising of poultry and other livestock, and will be supported to maintain livestock health.
- **Management of collection of NTFP.** NPVFA will protect the Resettlement Area against collection of NTFP by outsiders. It will also monitor collection of NTFP by its members and use the monitoring information to regulate collection and protect the resource bases of NTFP.

14.7.2 FM Activities in Conservation and Protection Zones

Forest management in the NPFMA will combine commercial production with conservation activities in both planning and implementation to ensure minimum impact of production activities on high conservation values (HCV) existing in the area. The NPFMA is likely to contain the following HCVs:

- Some concentration of biodiversity owing to its location between two National Protected Areas.
- Landscape level forests, since it has over 18,000 ha of relatively contiguous forests although already disturbed by past human activities.
- Threatened ecosystem, i.e. native pine forests which are no longer as abundant in Lao PDR as before.
- Most of the Resettlement Area and its forest are actually part of the watershed of the Nakai reservoir.
- Areas fundamental to basic needs of local communities, e.g. NTFP collection sites, livelihood bases, as well as spiritual and cultural sites.

Management actions to maintain the HCVs will be preceded by identification and mapping of the different HCVs and will consist of one or a mix of the following approaches:

- Exclusion of specially designated conservation and protection zones from commercial production.
- Where commercial production activities are allowed, the use of low-impact, low intensity methods.
- Limitations imposed on the type and methods of human activities depending on the site and its inherent characteristics and importance as a home of the given HCV, e.g. hunting restrictions.
- Monitoring of HCVs and the effectiveness of management actions in maintaining HCVs using easy-to-implement methods.

14.7.3 FM Activities for Regenerating Forest Zones

Regenerating forests are those that are in the process of restoration from damage caused by past human activities, mainly logging and slash-and-burn agriculture. The natural site potential of these forests is such that if left alone long enough they would revert back to their former productive condition. Forest protection from further human activities is therefore the main management activity associated with restoring these forests. Forest protection is a minimum-effort, minimum-cost action but could reap maximum returns.

Forest restoration methods, e.g. assisted natural regeneration, are being developed in many countries including Lao PDR through research and development (R&D). The aim is to find ways to make premium species that used to grow in abundance, e.g. dipterocarp and rosewood species, get re-established and growing well. Several R&D results have been published over the years; what is generally slowing down commercial investments on forest restoration is the uncertainty of financial recovery considering the long-term growing periods involved vis-à-vis the low-cost measure of simple forest protection or the short-gestation measure of conversion to fast-growing plantation.

Thus, forest management activities for regenerating forests at the NPFMA will be limited to:

- Delineation of the regenerating forest zone on the map and demarcation on the ground as practicable.
- Forest protection especially from human activities.
- Monitoring of forest condition through permanent sample plots.
- Inviting international and national research institutions, e.g. NAFRI, to conduct R&D trials at NPFMA.

14.7.4 FM Activities for Production Forest Zones

Forest management of production forest will initially be conducted in the 5,700 ha or so of forest that have currently been identified as well stocked. In 20 years or so, the regenerating forest will progressively be included in the stocked production forest zone and management regimes.

Forest management activities specific to the production forests will include the following:

- (i) Pre-harvest inventory. A forest inventory of the immediately following year's harvesting coupe will be conducted consisting of a 100% inventory and mapping of large trees (i.e. >50 cm in diameter), a 10% sampling of small to medium trees (10-50 cm in diameter), and a 10-plot sampling of regeneration per sub-compartment of the annual coupe.
- (ii) Forest operations planning. Based on information from the pre-harvest inventory, a forest operations plan for the immediately following year will be formulated. The plan will include a list of trees to be cut, a logging plan, and a plan for regeneration, timber stand improvement, forest plantation development, protection, and other operations.
- (iii) Securing harvesting quota. A request for quota will be made based on the list of trees to be cut and submitted before mid-June of each year to PAFO for consolidation and endorsement to MAF/DOF. Approval of the quota is usually done in October of each year. The NPVFA will require formal conditions contained in its community forest concession agreement for the GoL to provide a minimum available log volume of 6,000 cu.m. per year from the concession and exclusive utilization rights to the concession area.
- (iv) Tree marking. Once the quota has been approved, trees to be cut in the next dry season will be marked. Seed trees to be left uncut will also be marked.
- (v) Forest road building or clearing access tracks. Generally no earthmoving is required to build logging access tracks in the flat to rolling terrain in the Resettlement Area. It is enough to manually cut small saplings along the access track; the logging truck then takes care of blazing its trail along the manually cleared direction. Forest road building will, however, be required for main access roads and in steeper parts of the production forest.
- (vi) Control of logging operations. Village work teams will direct loggers to the trees marked to be cut ensuring that no other trees are cut, mark the log number on the logs to be transported to the second landing, and record those logs.
- (vii) Second landing operations. Village work teams will also control operations at the second landing ensuring that the logs are properly recorded, scaled and graded by forest officers, and transported out only with proper documentation. An agreement will be required with GoL to locate the second landing at the sawmill entrance gate with logs measured by forest officers whenever practical on truck. Measurement at this point for sale and purchase of logs will substantially reduce logging and transport costs and avoid the risk of substantial volume losses that have occurred in the past.

- (viii) Post-harvest assessment. Post-harvest assessment will take place just before the rainy season to assess how logging was conducted and to collect information for planning subsequent regeneration and timber stand improvement operations.
- (ix) Assessment of stand growth and yield. In the absence of growth and yield information specific to Nakai, the long-term forest management plan and the annual forest operations plans for the early years will be formulated on the basis of stand growth and yield information collected outside Nakai. A more accurate growth and yield information for the Resettlement Area will be obtained by establishing and re-measuring annually for 5 years (then once every 5 years thereafter) an adequate number of permanent sample plots (at least 50). Once they are available the information will be used in revising the forest management plan and formulating subsequent annual forest operations plans.
- (x) Natural regeneration, tree planting and timber stand improvement. Both hardwood and pine stands will be regenerated naturally following appropriate silvicultural systems, e.g. tree selection system for hardwoods and seed tree system for pines. Planting of nursery-raised pine seedlings in areas where natural regeneration fails will be done using natural patterns and associations with other species in a way that will restore the natural forest ecotype rather than turning the site into a pine plantation. In other forest ecotypes, assisted natural regeneration using indigenous species will be done in sites where the number of regeneration is inadequate. Timber stand improvement will also be done in logged-over stands to promote the growth and development of the residual tree crop.
- (xi) Forest conservation imbedded in different forest management operations. Operations affecting the soil, water, and biological resources of the forest that are conducted before, during, and after harvesting of timber and NTFP will conform to a set of conservation rules. For example, logging will conform to low-intensity and low-impact rules in every step.

14.8 COMPONENT 3: FORESTRY BUSINESS ENTERPRISE

14.8.1 Forestry Business Licence's

Enterprise development covers all forestry business activities from harvesting to processing of forest products into sawn wood, semi-finished and finished wood products, with chemical treatment of low density timbers for prevention of insect and fungal attack. The NPVFA will apply for and be granted at least three types of business licences:

- 1. Logging and log transport business licence:** 100 % NPVFA.
- 2. Log processing or sawmilling business license:** 100% for both the permanent sawmill and wood treatment plant.
- 3. Timber processing and furniture factory business licence:** Financial analyses and other management considerations indicate it would be best to lease part of the sawmill site to an appropriately qualified and experienced company to purchase part of the sawmill output to process into other products to supply to specific external markets.

This business will be developed in two phases:

- The Transition or Construction Phase in which salvage logging in Project Lands and areas for resettlement housing and intensive agriculture will be the main, if not the only, forest harvesting undertaken in the Resettlement Area during this period.
- Post-Construction and post-COD, the long term phase, in which the production forest in the Resettlement Area will be selectively harvested for sustained yield production.

14.8.2 Transition or Construction Phase Forestry Business

The foundation for attaining the long-term, effective, economic and sustainable forest management and wood processing will be built up during the transition or development phase. This phase will be devoted mainly to (a) institutional development and training, (b) producing the timber with preservative treatment and processing sawn wood that is needed to construct houses for and access external markets for better prices, and (c) establishment of the infrastructure and equipment for short and longer term production.

An important assumption is that only timbers salvaged from Project Lands, or those purchased from the salvage logging operations in the reservoir, village resettlement and intensive farming areas would be used during this first 3 year Phase. It is assumed that the sustainable forest management and utilization in the Resettlement Area will only start in earnest in the last year of this period.

The main types of activities that will be undertaken during this first Phase include:

- Establishment of the NPVFA Logging and Transportation Unit, with equipment and staff;
- Establishment of fixed sawmilling facilities and log handling equipment;
- Installation of a wood preservative treatment plant;
- Installation of wood processing facilities that include log handling and manufacturing equipment, for the production of quality finished products to customer specifications.
- Salvage logging from Project (construction) Lands in the NT2 Resettlement Area;
- Operation of a fixed sawmill and wood treatment plant;
- Operation of a wood processing plant in a joint venture.

These activities will provide an opportunity to villagers to obtain hands-on experience in logging, sawmilling and secondary processing, and provide an income and funds accumulation, which will be reinvested in the forestry business and other community projects, independent of support from the NT2 Project, for the long term.

14.8.3 Long Term Sustainable Forestry Business

The second, long term phase, will be implemented under a management plan for sustainable forest production that requires the full development of the capability of NPVFA and its VFCs, village work teams, and staff. The forest resources of the Resettlement Area will be sustainably managed with the forest operations being FSC-certified; and the forestry business enterprises of NPVFA will be fully operational to ensure a significant contribution to the generation of income and employment for the resettlers. This phase includes the following considerations:

- The 2004 to 2007 (construction and transition period) aims to develop the required capacity and experience in management, logging (mainly salvage), sawmilling and simple treatment and processing. It is expected this will allow after 2007 a full commercial utilization of annual timber harvests, provide substantial profit margins from the sale of processed wood products, and generate further employment for the resettled families.
- Subject to further investigations, a long term contract could be negotiated with a recognized added value wood processing and export marketing enterprise with adequate funding sources to operate at the sawmill site buying and utilizing sawn NPVFA timber. Apart from financial risks, in the short to medium term the demands on NPVFA management will be considerable in setting up and running its core activities effectively. Given the developmental status of the local communities and the demands of change, the additional technical and managerial demands of value added processing are complex and direct involvement by NPVFA management could provide a major exposure to investment risk.
- Chain-of-custody certification of the processing facilities so that combined with a certification of its forest operations, NPVFA and its partner will be able to market certified wood products to EU, US, and other markets.

14.8.4 Design Considerations for Transition and Long Term Harvesting and Wood Processing

On the assumption Government of Laos will approve NPVFA's three business licence applications and access is gained on a long term basis to the indicated wood volume available, the effective development of a commercial forest based industry enterprise will be influenced by five key factors: Log wood qualities, Government log taxes, operating production levels, markets, and management control. Dealing with these separately:

Log quality: The forest resource has already been exploited for the better quality tree species of good form and dimension in the area designated for harvest management by NPVFA. This will result in general terms:

- Poorer quality logs will have lower sawmill conversion factors to sawn wood due to form, smaller log size and defects, and hence higher unit sawn output production costs.
- Over 60% of the available resource is relatively low density pinewood and some hardwood species. In local markets these have limited acceptance due to insect and fungal stain attack, and sell at low prices, usually for construction formwork. Some clear boards free of blemish are used in lower cost local furniture manufacture. This high percentage of low value local market wood (either in log or sawn form) makes achievement of a profitable wood industry enterprise virtually impossible due to the high volume of low unit value sales.

The best option currently available is to introduce the now standard international practice of chemically treating with preservatives the wood species with low density but good structural properties, to allow them to compete for the traditional end uses in building the higher value durable local hardwoods are used for. Preservative treatment of lower density timbers is now in standard use in other countries where availability of high quality naturally durable hardwoods is declining, or in some cases, stopped.

Wood Resource Taxation Costs: Log taxes payable to the Government on low and medium density timber proposed to be harvested by NPVFA are significantly higher than prices currently being received for wood of similar quality, on average, by forest owners elsewhere in Pacific Rim markets. To provide an indicative guideline of regional market values, Free on Board (FoB) values for Malaysian and Indonesian hardwoods and southern Pacific ports for pinewood adjusted for shipping rates to equate to log exports from Vietnam to South Korea or Japan are summarized in Table 14-9 below.

Table 14-9: Log Market Value & Cost of Production Summary

| Prices Costs and Returns | Medium Density Hardwoods (Ply Grade): \$/m3 | Pinewood and Low Density Hardwoods A grade: \$/m3 |
|--|---|---|
| FoB Prices | \$100 to \$140 | \$70 to \$80 |
| Selling, harvesting, transport & ship loading costs | \$60 | \$60 |
| Net Income | \$40 to \$55 | \$10 to \$20 |
| Log tax average (all log grades) | \$61 | \$51 |
| Margin for Management Costs, Profits, Dividends and Risk | -\$21 to -\$16 | -\$41 to -\$31 |

For this reason, in general local industry practice, the natural forests in Laos are selectively harvested for a small number of higher density high value species and, where they occur, pine trees of large diameter and straight form suitable for high strength plywood and furniture manufacture.

This means it will be very difficult to obtain net log revenues after taxes and operating costs, on the high percentage of low and medium density logs if they are marketed for sale as logs via Vinh or Da Nang ports in Vietnam or on the local domestic market.

Operating Production Levels: After considering the issues of lower market prices and high taxes for low density wood products, annual production targets based on a minimum harvest level of 6,000 cu.m will have to include consideration of the following demands, which in general terms are not being met by the industry in Laos:

- The high overhead costs for management to deal with substantial Government regulatory and planning consent and FSC requirements associated with implementing sustainable forest management;
- The direct costs of a substantial forest improvement and management program; and

- The dividend expectation of over US\$ 100 per household per year, indicating that disposable net earnings of over US\$ 250,000 annually are required to service dividends, capital replacements and community projects.

Markets: Achievement of the market prices indicated later in financial analyses is critical to achievement of earnings targets. In the immediate future domestic sales prospects are good if satisfactory supply contracts can be entered into with NTPC for supply of rough sawn construction grades for cement formwork and preservative treated and finished housing grades. International and local markets are also satisfactory for the small quantities of high density wood products planned for production. Development of high value export markets for pine wood also has good potential if boards are finished properly to quality specifications. Further work is required in the short term to verify market price assumptions and trends for the product out-turn. The short to medium term prospects are very poor for obtaining profits from sale of low density pinewood and hardwood logs.

Management Control: There is weak managerial capacity present at Nakai to ensure effective planning, direction and controls are in place to ensure proper operation and maintenance of the substantial capital investments to be made to achieve long term earnings targets. The approach required to capacity development and training has been described in section 23.6.7 above. Initially, external appointments will be needed to key management positions and a phased approach to training, both of the Board and the management staff, over a 3 year period. Strict commercial disciplines will be required in operations management under the guidance of a business plan and logframe that will be put in place at commencement of operations.

Currently most wood based enterprises in Laos are usually small, private family owned business with relatively low overheads. In comparison, in order to best serve its shareholder interests, the NPVFA is more corporate in nature with a small size operation servicing higher overheads on a proportionate basis. Therefore a substantial input into training in planning and risk management, and discipline in achieving productivity targets is critically important.

14.8.5 The Enterprise Operations Design

Logging: A minimum logging production target of 6,000 cu.m. per year is needed in a 100 day dry season commencing at beginning of December each year. Five crews each with nine men producing 60 cu.m. per day are needed to achieve this target. Primary extraction units will be “*Lotsalao*” winch trucks working on 500 metre radius settings to supply first landings. These units are supported by a small bulldozer for access road upgrading and extraction spur tracking formation and an excavator with dump truck for road repairs. A grapple forked loader is placed to support first landing loading of log transport trucks for an average 10 km haul to the second landing at mill yard for Government measurement for taxes.

Sawmilling: The basic mill design comprises two horizontal breakdown saws in parallel to cater for the wide variation in sawlog dimension, particularly from salvage areas. These will feed four circular resaws before wood passes through an anti-sapstain bath onto size sorting tables before stacking and filleting. Roller transfers will be installed for all wood flow lines and double shifts operated to improve capital unit productivity, and also allow most sawing and treatment of low density timbers to be completed the dry season. This approach to labour utilization will allow workers additional time to assist cropping their household farms and animal husbandry in the wet season.

The mill will be designed to allow the installation of an additional production line if the horizontal breakdown saws have insufficient throughput capacity or excessive downtime.

Wood Preservation Treatment: Wood treatment of pinewood and other non durable low density hardwoods that comprise over 60% of the volume (4,000 cu.m.) to be harvested allows substitution, in terms of both volume and price, of medium density construction hardwoods that are becoming less readily available. This also allows species previously considered non commercial to be utilized, thus leaving post harvest forest ecological conditions favourable for regeneration of commercial species.

A pressure treatment cylinder, vacuum and pressure pumps and chemical storage tanks will be installed with a capacity to treat 2500 cu. m. minimum of sawn wood a year

The sawing and treating of this lower density wood is prioritised in the dry season operation, as major losses could occur in the wet season. The timber treatment plant also allows treatment of small diameter roundwood for fence posts. These can have a 50 year service life for use in controlled livestock grazing areas.

Added Value Processing: Only a small log volume (about 500 cu.m.) of high density durable species are expected to be available for sawing, drying and re-machining timber prior to machining processing to higher value end products such as furniture, doors and windows as the initial outputs targeted to meet the needs of the of the NTPC resettlement project building development. Kiln drying of wood has been considered. However experience will be obtained with air drying and the volume likely to be available before consideration can be given to purchasing a kiln dryer.

Most plant and equipments required for the operations will be purchased second hand for two reasons:

- Purchase prices of new products are too high for a viable investment for the low planned production levels.
- There is substantial excess saw milling and logging equipment capacity in Laos. Some of this capacity should be bought, refurbished or overhauled and relocated to a more favourable production site with regular volume supplies.

14.9 COMPONENT 4: FOREST REGENERATION AND IMPROVEMENT

Left alone, the 7,793 ha of degraded forest will regenerate naturally and gradually recover a full forest cover and its productive potential, but it will not be able to contribute any production and income to NPVFA members for a long period of time (at least 50 years into the future). To accelerate forest restoration, the degraded forests will be either (a) subject to an assisted regeneration program, or (b) some may be converted into forest plantations with local species suited to the production of both timber and non-timber forest products. Assisted regeneration (see section 23.7.3) will be the preferred option, and is already underway. However, plantations would be beneficial if they were proven to be technically and financially feasible based on a proper selection of intended sites, products, species, and markets.

Technical and financial evaluations will cover the following topics:

- Survival and growth of a number of local species in different sites;
- Plantation management regimes to optimize growth and development of local species;
- Market and pricing study of different plantation products;
- Financial feasibility of forest plantations of different species, products, and markets.

Incorporation of livestock grazing into forest management (*silvipastoral systems*) will also be considered for forest restoration, to deal with the likely pressures to be caused by loss of grazing areas during reservoir formation.

14.10 INDICATIVE IMPLEMENTATION PLAN

Chapter 18 presents an indicative implementation plan for the four main components of the forestry program. As discussed, the plan is generally based around two phases;

- (a) A Development or Transition Phase, covering the period from Preliminary Works through Financial Close until completion of physical village relocation and the NT2 Project's construction; in which mainly salvage logging is undertaken in the Resettlement Area Project Lands; and
- (b) Long term Sustainable Forest Management Phase.

14.11 FINANCING PLAN

14.11.1 Costs

The main costs involved in the operation of the NPVFA and its forest management and forestry business activities will include the following items :

Capital Costs;

- construction of offices, and purchase of office equipment;
- purchase of survey and forest protection and management equipment and vehicles;
- purchase of logging and transportation equipment;
- construction of a sawmill factory and purchase and installation of log handling sawmilling and wood treatment equipment; and
- construction of a wood processing and furniture factory, purchase of wood processing equipment.

Recurrent Operational Costs;

- Payment of salaries of NPVFA permanent staff;
- Payments to Government staff for administrative or support services required;
- Payment of salaries and per diems to villagers undertaking seasonal work; and
- Operation and maintenance of logging, transportation, wood processing facilities etc.

Resource Costs;

- These relate to payment of Government log taxes and other charges (development and reforestation levies) on logs harvested. Adjustments have been made for local experience with log grade out turns to be expected containing a higher proportion of lower quality logs due to the previous logging history of the area.
- No provision is made for the payment of the GoL reforestation levy as the NPVFA will be paying for the costs of forest rehabilitation and improvement.
- No changes are required for GoL log tax rates on logs with high density wood. However, in the case of logs with low and medium density, special tax rates will be negotiated with the Government of Laos: In the first three years start up phase where uneconomic harvesting conditions are present, a \$10 per cu.m. administration levy will be paid . After harvesting starts in the fourth year in better stocked stands retained for sustainable forest management in the fourth year log taxes will reflect open regional market conditions and allow profits from the investment to be made. Realistic tax rates of around 35% of present levels will be adopted, being \$16 per cu. m. for low density hardwood and pinewood and \$25 per cu. m. for medium density hardwoods.

Taxation: Surplus income over revenue in each operating year is treated as not assessable for income tax prior to distribution of dividends and support to community projects. The basis of this assumption is that the NPVFA is a non-profit organization and dividends paid are tax assessable in the hands of villagers.

14.11.2 Sales Revenues

All logs are to be sawn. Sawn wood sales revenues are based on Thakhek and Vientiane retail rough sawn prices less the freight cost differential from Nakai. Prices have been adjusted for value added by planer / gauging boards and framing grades and upgrading end use properties by timber treatment. Average sales values that can be expected are summarized in Table 14-10.

Table 14-10: Sawn Wood Average Sale Prices (per cu. m. ex Mill Yard)

| Wood Density Class Kg/Cu. m. @ 15% moisture content | Rough Sawn Price off Saw | Value Timber end use upgrade Treatment | Drying & Size Gauging Premium | Transport Differential | Sale Value ex Nakai Mill Yard |
|---|-----------------------------|--|-------------------------------------|---------------------------|-------------------------------------|
| 250 – 450 (Low to medium density Pines, Anisoptera & Dipterocarps) | 190 | 80 | 20 | 10 | 280 |
| 450 – 750 (Shorea and Hopea spp) | 340 | | 20 | 10 | 350 |
| 750+ ((Pterocarpus & Afzaelia spp) | 490 | | 20 | 10 | 500 |

14.11.3 Project Financial Returns

The financial feasibility of four alternative strategies for forest timber utilization have been evaluated based on the following forestry business enterprise options :

- **Business Option 1** – Harvesting and marketing of 6000 cu.m. of logs only annually, with tax concessions;
- **Business Option 2** – Harvesting of 6000 cu.m. of logs annually, followed by sawing, planer gauging, and preservative treatment of timber and marketing, with tax concessions;
- **Business Option 3** – Harvesting and marketing of 6000 cu.m. of logs only annually, followed by sawing, planer gauging, preservative treatment and added value processing of timber and marketing, with tax concessions;
- **Business Option 4** – Harvesting and marketing of 8,000 cu.m. of logs annually, followed by sawing, planer gauging, preservative treatment and added value processing of timber and marketing, with no tax concessions.

Table 14-11 summarizes the net financial forecast results, for each investment option, with provision for a US\$ 100,000 annual dividend to affected households after the close of the second financial year. The results show that:

- Harvesting and marketing of logs only is unprofitable due mainly to the high percentage of low density hardwood and pinewood species.
- Harvesting of a minimum of 6,000 cu. m. of logs a year, followed by sawing and preservative treatment is the most favourable option. Under this option, if the project is permitted to operate under normal private sector management and operating conditions, reasonably strong cash flows can be expected, due in particular to the favourable financing conditions proposed as part of the hydropower project impact compensation and mitigation measures and strong sales demand opportunities. A project internal financial rate of return of 61% is indicated, and this potential return would have to be considered the minimum necessary to justify the investments required after considering the commercial management and institutional risks associated with operating rural enterprise businesses in Laos.
- Harvesting ,sawing and treatment with added value processing to doors and furniture etc. is the next best option with a potential return of 32%. This could possibly be developed by a joint venture with an experienced partner once the sawmill operation was well established.
- If no taxation concessions are available a minimum log harvesting level of 8,000 cu.m. is required with sawing and timber treatment. The investment return of 11% is a margin too low for local investment risk, and the volumes are not likely to be achieved.

14.11.4 Financing

Financing of the operations of the NPVFA will come from two main sources, over two main periods of time, as follows:

- (a) **finance provided by the NT2 Project**, as start up funds and TA, during the first 3 to 4 years operation of the NPVFA, which is also the NT2 construction period and the Projects Lands salvage logging period; and
- (b) **self financing**, whereby some of the **profits of the operation** of the forestry business of the NPVFA are re-invested in capital and operating cost of the company.

NPVFA initial financing of equipment and other capital works required will be \$0.9 million in the first year. An additional \$0.4 million short term operating expenditure advance would also be required in the first year to eighteen months to cover short term financing requirements and this should be repaid from sales in the first 2-3 years operations as annual cash flows stabilize.

Table 14-11: Forest Utilization Investment Alternatives Summary (in US\$ 000's)

| (With Tax Concessions) | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 |
|---|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. Harvest and Market Logs Only – 6,000 cu.m | | | | | | | | |
| Income from Sales | \$520 | \$520 | \$520 | \$520 | \$520 | \$520 | \$520 | \$520 |
| Capital Costs | \$484 | \$39 | \$6 | \$14 | \$29 | \$347 | \$6 | \$0 |
| Operating Costs | \$332 | \$379 | \$381 | \$536 | \$528 | \$521 | \$518 | \$527 |
| Net Cash Flow | \$-296 | \$102 | \$133 | \$-30 | \$-37 | \$-348 | \$-4 | \$-7 |
| ❖ <i>Financial Rate of Return</i> | Neg. | | | | | | | |
| ❖ <i>Dividend</i> | | \$100 | \$100 | - | - | - | - | - |
| ❖ <i>Contingency, extra dividend</i> | | \$2 | \$33 | - | - | - | - | - |
| 2. Harvest, Sawing + Treatment - 6,000 cu.m. | | | | | | | | |
| Sales | \$947 | \$947 | \$947 | \$947 | \$947 | \$947 | \$947 | \$947 |
| Capital Costs | \$912 | \$38 | \$6 | \$12 | \$29 | \$335 | \$56 | \$0 |
| Operating Costs | \$507 | \$559 | \$561 | \$716 | \$708 | \$696 | \$650 | \$703 |
| Net Cash Flow | \$-472 | \$350 | \$380 | \$219 | \$210 | \$-84 | \$241 | \$244 |
| ❖ <i>Financial Rate of Return</i> | 61% | | | | | | | |
| ❖ <i>Dividend</i> | | \$100 | \$100 | \$100 | \$100 | \$100 | \$100 | \$100 |
| ❖ <i>Contingency or extra dividend</i> | | \$250 | \$280 | \$119 | \$110 | \$-184 | \$141 | \$144 |
| 3. Harvest, Sawing + AV Processing - 6,000 cu.m. | | | | | | | | |
| Sales | \$972 | \$972 | \$972 | \$972 | \$972 | \$972 | \$972 | \$972 |
| Capital Costs | \$994 | \$39 | \$6 | \$14 | \$29 | \$330 | \$6 | \$0 |
| Operating Costs | \$585 | \$640 | \$646 | \$797 | \$789 | \$776 | \$778 | \$784 |
| Net Cash Flow | \$-607 | \$293 | \$324 | \$161 | \$154 | \$-134 | \$185 | \$188 |
| ❖ <i>Financial Rate of Return</i> | 32% | | | | | | | |
| ❖ <i>Dividend</i> | | \$100 | \$100 | \$100 | \$100 | \$100 | \$100 | \$100 |
| ❖ <i>Contingency, extra dividend</i> | | \$193 | \$224 | \$61 | \$54 | \$-34 | \$85 | \$88 |
| (No tax concessions) | | | | | | | | |
| 4. Harvest, Sawing + AV Processing 8000 cu.m. | | | | | | | | |
| Sales | \$1,245 | \$1,245 | \$1,245 | \$1,245 | \$1,245 | \$1,245 | \$1,245 | \$1,245 |
| Costs | \$1,928 | \$1,091 | \$1,066 | \$1,082 | \$1,095 | \$1,383 | \$1,062 | \$1,055 |
| Net Cash Flow | \$-684 | \$154 | \$179 | \$163 | \$150 | \$-138 | \$183 | \$190 |
| ❖ <i>Financial Rate of Return</i> | 11% | | | | | | | |
| ❖ <i>Dividend</i> | | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| ❖ <i>Contingency margin</i> | | 54 | 79 | 63 | 50 | -238 | 83 | 90 |

Technical Assistance support to project start up over the first 3 years will require 20 international person months (budget about \$180,000) and 62 regional person months (budget about \$186,000).

The NT2 Project, via the Concession Agreement and the Social Development Plan, is committed to providing start-up funds and short term operating capital to NPVFA. These funds are allocated via budget line S (Provision of Livelihood Equipment) and budget line O (Community Forestry Program). These funds will be provided mainly in the first year of the NPVFA to support salvage logging on Project Lands in the Resettlement Area, and to support processing of these timbers for production of semi-finished and finished timber products to be purchased by the NTPC to be used in construction of resettler villager housing and other resettlement infrastructure such as schools and offices. In addition, the NTPCs resettlement offices will provide considerable technical assistance to the NPVFA for both forestry management and forestry business activities.

The provision of financial and TA support from the NT2 Project mainly during the first year will enable the profits generated by the NPVFA during the first 3 to 4 years operation to be invested in its bank account or applied to repayment of operating expenditure advances. Then, starting in the fourth year of operation, the investment and operation costs of the NPVFA will be financed directly from the NPVFAs own funds, from profits generated during the first 3 to 4 years of salvage logging, and after that from the sustainable logging and forestry business.

The disbursement or use of the NPVFAs profits will have to be the subject of an annual business plan approved by the Board of Directors. Decisions will have to be made as how much to reinvest on capital, equipment and facilities, how much to pay for operating costs to ensure fair salaries, and ensure adequate maintenance of equipment. And most importantly, besides these cost, the NPVFA is mandated to provide an annual dividend to all the resettling population.

14.12 BENEFITS

14.12.1 General Benefits

The benefits expected from the community forestry development and business management are as follows:

- Maintenance of a good cover in the forest areas which form part of the watershed of the NT2 Project;
- Positive changes in the forest stand structure leading to higher productivity resulting from sustainable forest management based on appropriate silvicultural systems;
- Protection and conservation of biodiversity and the resource base for NTFPs that form an important part of the livelihood systems of the resettlers;
- No requirement for high-chemical input monoculture forest plantations; any decision to go into forest plantation in degraded (e.g. salvaged) areas to be based on further evaluations;
- Better use of forest resource and timbers through timber treatment for wider uses and higher prices.
- Proper maintenance of an already existing network of logging roads keeping them from deteriorating and from contributing to soil erosion and sedimentation of the reservoir;
- Providing for an active role of villagers thus developing their human resource potential, as well as assisting in developing sustainable social structures through NPVFA;
- Generation of employment and income for the resettlers on a sustained basis, as well as timber and NTFP needed for household and village use and raw materials needed for the development of the local and national economy; and
- Provision of an annual dividend to all relocated families on the Nakai Plateau, the actual amount depending on the profits generated by the business operations of the NPVFA, and these profits depending on the effectiveness of harvest, processing and marketing of commercial forest resources.

14.12.2 Employment

Table 14-12 provides a preliminary estimate of over 100,000 work days annually that could be generated from commercial forestry development operations (not including NTFP and fuelwood collection). The level of employment would be less if forest plantation development were not found to be profitable and thus not pursued. It should be understood that this analysis of labour requirements is indicative only at this stage.

Table 14-12: Potential employment opportunities to be offered by the NPVFA

| Activity | Average Unit Rate | Annual Quantity | Work Days |
|--|---------------------------------|----------------------|----------------|
| Temporary, seasonal labour inputs | | | |
| Pre-harvest inventory | 1 ha/10 persons/day | 373 ha | 3,730 |
| Forest operations planning | 2 persons/village for 5 days | 15 villages | 150 |
| Tree marking | 1 ha/5 persons/day | 373 ha | 5,595 |
| Access road/track clearing | 1 ha/10 persons | 373 ha | 3,730 |
| Logging | 1 m ³ /person | 8,000 m ³ | 8,000 |
| Second landing operations | 2 per landing for 200 days | 4 landings | 1,600 |
| Control of logging | 2 persons/area for 100 days | 4 areas | 800 |
| Post-harvest assessment | 3 persons/village for 2 days | 15 villages | 90 |
| Assist natural regeneration | 10 days/ha | 10 ha | 100 |
| Forest stand improvement | 10 days/ha | 10 ha | 100 |
| Forest plantation | 100 person days/ha | 50 ha/yr | 5,000 |
| Forest protection | 1 person/200ha for 150 days | 10,000 ha | 7,200 |
| Sub-total | | | 36,095 |
| Permanent Staff | | | |
| Nurseries | 5 persons/nursery | 2 nurseries | 3,000 |
| Sawmilling | 40 persons | 200 days x 2 | 16,000 |
| Wood processing and sales | 60 persons | 300 days | 36,000 |
| Administration of NPVFA | 4 per village, 100 days average | 13 villages | 5,200 |
| Forest and Sawmill Staff | Main management office | 12 persons | 5,500 |
| Sub-total | | | 65,600 |
| Total | | | 106,695 |

14.13 RISKS

The attainment of the envisaged (a) annual revenue from wood products that could pay about US\$240,000 in salaries, wages, and allowances; (b) US\$ 100,000 in dividend for timber production; and (c) annual revenues to finance and require re-investments in infrastructure and equipment, and the operation and maintenance of that infrastructure and equipment, could be subject to the following risks.

The FIPC forest inventory of the Resettlement Area is based on a 1% sampling intensity. The estimated 5,590 ha of harvestable forest or the stand volume (estimated average of 151 m³/ha) may turn out to be less in practice. The latter would result in a lower annual sustainable harvesting rate than previously estimated. Experiences elsewhere has shown that annual harvest based on more accurate pre-harvest inventories would generally turn out to be lower than the sustainable harvest volumes estimated in the forest management plan. Removal of non commercial species will assist reduce this risk .The adoption of a 6000 cu.m. annual cut instead of the theoretically available cut of 8000 cu.m and sawing and treatment of species currently considered non-commercial, will reduce this risk

The 5,590 ha of harvestable forests includes about 700 ha of dry evergreen forests on the northernmost part of the Resettlement Area. Only a part of this area was included in the FIPC forest inventory. Furthermore, the area has no existing roads and its accessibility needs to be assessed. There is a risk that the area may not be economically accessible by road. However, selective logging with elephants may be a feasible alternative in this area.

NPVFA will require a joint-venture partner who can provide the needed wood processing and exporting know-how. This, however, may not be required if the NTPC provided TA can transfer technology and skills in the required timeframe.

Export markets for wood products are increasingly demanding raw materials from certified sustainably managed forests. Thus, the NPVFA must become a member of the Khammouane Sustainable Forestry

Group or be certified on its own, or it may not be able to export its wood products to the EU, US and East Asian markets that pay premiums for certified wood.

As the main response to the above risks, the following measures will be introduced in the plan:

- ❖ Annual pre-harvest inventories at 10% sampling intensity with a 100% enumeration and mapping of large trees (>40 cm DBH) will provide an accurate assessment of timber resources in the area.
- ❖ A logging and accessibility assessment of the northernmost part of the Resettlement Area is planned in the dry season of 2007. The assessment will include the location of a preliminary line for forest roads and a 3% inventory of the forest in accessible areas.
- ❖ NPVFA will make the necessary preparations to be able to obtain FSC certification of its forest management and chain-of-custody operations either through the Khammouane Sustainable Forestry Group or on its own.

14.14 SCHEDULE OF COMMUNITY FORESTRY DEVELOPMENT PROGRAM

Table 14-13 below presents the main activities of the Community Forestry Development Program.

Table 14-13: Timetable of the Main Activities of the Community Forestry Development Program.

| Activity: Community Commercial Forestry | 2004 | | | 2005 | | | 2006 | | | 2007 | | | 2008 | | | 2009 | | | | | | | | | | | | | | | | | |
|--|-------------|-----|-----|------|-----|-----|------|-----|-----|------|-----|-----|------|-----|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|--|
| | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | | |
| Component 1: Institutional Development | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.1 NPVFA establishment | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.1.1 Organize VFCs and Enlist NPVFA members (Completed) | ALREADY | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.1.2 Formulate and ratify Articles of Association (Completed) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.1.3 Approval of AoA and thus formal recognition of the NPVFA <i>(approved in 2003, expect company seal in Nov 2004)</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.1.4 Prepare NPVFA Logframe Business Plan | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.2 Organisation of NPVFA Units | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.2.1 Organize managerial staff (by annual meeting) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.2.2 Organize different village forestry work teams | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.2.3 Appoint & organize logging staff | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.2.4 Appoint and organize sawmill staff | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.2.5 Organize other wood processing JV | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.3 Capacity Development - infrastructure, equipment | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.3.1 Finalise plan for NPVFA offices | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.3.2 Construct (or refurbish) main office | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.3.3 Construct accommodation | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.3.4 Construct staff/workercanteen | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.3.5 Construct northern and southern offices | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.3.6 Purchase logistics & field equipment, phase 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.3.7 Purchase logistics & field equipment, phase 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.4 Capacity development: Training NPVFA Units | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.4.1 Training of VFC: Village Forestry Committees | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.4.2 Training of NPVFA managerial staff - Production & Inventories | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.4.4 Training of NPVFA in Business Planning and Management | as required | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.4.3 Monthly and quarterly Board reporting/performance | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Component 2: Forest Management | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.1 Resource Assessment and Management Planning | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.1.1 Indicative Survey - 1% (Completed 2004) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.1.2 Survey 100 % of Resettlement Sites (Agric and Housing Land) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.1.4 Survey - 100 % - of Project Lands in RA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.1.5 Investigations to improve Management Zonation | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.1.6 Investigation - develop forest ecotype zonation | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.1.7 Production Forest Survey - 15% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.1.8 Finalises 50 year Forest Management Agreement' | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.1.9 Finalises 5 year Forest Management Plans | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.2 Logging Planning - Project (construction) Lands | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.2.1 Pre-harvest inventory and tree marking | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.2.2 Logging Planning | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.2.3 Apply for quota for salarage logging | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.2.4 Secure salvage harvesting quota | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Activity: Community Commercial Forestry | 2004 | | | 2005 | | | 2006 | | | 2007 | | | 2008 | | | 2009 | | | | | | | | | | | | | | |
|---|------|-----|-----|------|-----|-----|------|-----|-----|------|-----|-----|------|-----|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| 3.4 Infrastructure and equipment - sawmilling | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.4.1 Complete designs and tendering | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.4.2 Site layout, foundation works , security fence | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.4.3 Construct sawmill | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.4.4 Purchase sawmill equipment and Planer /gauger | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.4.5 Purchase treatment plant and chemicals | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.4.6 Install equipment (including electrical works, transformers,lights) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.4.7 Purchase additional sawmill equipment, as required | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.4.8 Purchase Forklift | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.5 Infrastructure and equipment - wood processing | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.5.1 Construct "transition" WP factory | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.5.2 Purchase wood processing machinery (withJV) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.5.3 Construct post transition - long term WP factories | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.5.4 Purchase more wood processing machinery, as required | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.6 Operations - Logging | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.6.1 Conduct salvage logging in RA Project Lands | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.6.2 Provide logs to sawmill | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.6.3 Conduct selective logging in RA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.6.4 Provide logs to sawmill | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.6.5 Sale other logs, if appropriate | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.7 Operations - Sawmilling | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.7.1 undertaking sawmilling of logs from PLs | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.7.2 provide sawn timber etc to wood processing plants | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.7.3 sell sawn timber to house construction | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.7.4 undertaking sawmilling of logs from selective harvest | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.7.5 provide sawn timber to processing factories | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.7.6 market the remaining timber | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.8 Operations - Wood Processing (optional) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.8.1 search for secure markets - regular | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.8.2 search for a secure markets - one time contracts | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.8.3 secure contracts to supply resettlement villages | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.8.4 wood processing for RV - doors, windows etc | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.8.5 wood processing for external markets - doors, windows, furniture | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

***** * * * *****