# Department of Forestry Lao PDR



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# ENVIRONMENTAL BASELINE SURVEY REPORT

# **CIRAD-Forêt - MIDAS - Burapha**

Lao-ADB Plantation Forestry Project - Loan No, 1295 (SF)

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#### 1. Introduction

The Environmental Monitoring Specialist began his assignment in December 1995, following the 1995 tree planting season. Intermittent visits to the project sites were made in March, July, and November 1996, during which time the environmental baseline survey (EBS) was designed and conducted. The focus of the EBS was the pilot block plantation (PBP) sites selected by the project as demonstration sites for tree plantations under the Lao-ADB Plantation Forestry Project.

Training for the Department of Forestry (DOF) personnel assigned to the Monitoring and Evaluation Section (MES) of the Lao-ADB Plantation Forestry Project's Project Coordination Unit (PCU) and for Provincial Project Coordination Units (PPCUs) took place during both the March and November 1996 visits, on use of the EBS forms. The EBSs all sites had been completed by October 1996, and analysis and evaluation of data began during the November 1996 visit; continuing through the end of February 1997.

This Draft Final Environmental Baseline Survey Report is being submitted to the Lao-ADB Plantation Forestry Project in line with the Terms of Reference for the Environmental Monitoring Specialist, based on the Project Administration Memorandum dated May 1994. This draft final report reviews the environmental aspects of the Project area and presents the findings of a baseline environmental survey conducted at eight PBP sites during 1996. It also meets the condition that the Environmental Monitoring Specialist prepares a comprehensive environmental baseline survey report.

As part of the review of environmental aspects of the project and in preparation of the EBS form, training of PCU and PPCU staff, as well as other DOF staff at the provincial level was conducted during the three visits in 1996. Through this in-service training process, DOF staff responsible for project implementation at the field level were trained in: identifying and monitoring environmental factors that could be impacted by the project; awareness of the importance of environmental protection in effective implementation of the project; and, processes of community participation in environmental protection, including rapid environmental appraisal and participatory environmental appraisal.

The Draft Final Report is being submitted to the Lao-ADB Plantation Forestry Project and the Project Officer/Task Manager from the Asian Development Bank (ADB) for review, consideration, and comment. This report should not be disseminated until it receives final approval from the Project Director and the Asian Development Bank.

A Final Report will be prepared by the Environmental Monitoring Specialist following the receipt of comments, recommendations, and discussions with project management and advisors, the MES of the PCU, and the ADB's Project Officer/Task Manager. Feedback received will be incorporated into the Final Report as appropriate.

# 2. Environmental Baseline Survey Process

#### 2.1 Baseline Monitoring

Baseline monitoring functions to identify and characterize important features of the existing natural resource base at the sites selected for establishment of tree plantations. The baseline monitoring format will form the basis for impacts monitoring, against which changes in the status of the present environment will be measured. As the monitoring process develops and environmental data is analyzed, the magnitude and significance of any changes taking place can be assessed. The Environmental Baseline Survey (EBS) Process will be modified as necessary in response to impacts on environmental parameters in the course of Project implementation and maturity of trees growing in plantations established as a result of the Project interventions.

# 2.2 Environmental Baseline Survey and Data Analysis

The Project will undertake environmental baseline surveys in areas proposed as sites for establishment of fast-growing tree plantations, for the purpose of establishing an environmental database for several environmental parameters, including:

- land use;
- alternative forest areas;
- expansion of agricultural production to degraded forest lands; and,
- increased demand for wood and wood and non-wood forest products.

The natural resource base in rural areas in the vicinity of large block plantations, may be affected by Project interventions. The exact size of a plantation that will have significant impacts on the environment continues to be a subject for debate among environmental specialists. Several consulted in the course of designing this EMS proposed that plantation sizes of less than 10,000 to 50,000 ha likely will not have impacts of any significant magnitude. Others propose that plantations larger than 50 ha will have impacts; but, that these impacts will be more local in nature. Local environmental impacts will include those related to village-specific socio-economics and local biodiversity; these will be more significant specifically if land is taken out of food production or is withdrawn from the natural forestry sector, for tree plantations, for example.

The EBS process will undertake environmental baseline data collection and environmental monitoring of the natural resource base at all locations where the Project will intervene to support establishment of tree plantations.

# 2.2.1 Indicators Selected to Measure the Status of the Natural Resource Base

Impacts on the key environmental parameters of the natural resource base that are likely to be affected by the establishment of large block plantations will be measured by monitoring the following indicators:

**Biological and Physical Indicators** 

•	land	•	vegetation	•	soils
•	water	•	wildlife		

# Socio-Economic Indicators

productivity •

home/farm economy

social/historical/cultural

The individual environmental parameters used to measure the impacts on each of these indicators are described in detail in Appendix 8 of the Environmental Monitoring System Report and have been incorporated in the environmental baseline survey (EBS) form attached as Appendix 2 of this document.

The environmental baseline survey will be conducted using a data collection format (the EBS form) that can be used for the lifetime of the Project. The format establishes a base against which subsequent monitoring will be compared; data analyzed; and, an annual report prepared for consideration and operation of any subsequent action by the DOF. With the assistance of the Project, specifically the MES of the PCU and utilizing existing equipment and manpower at DOF, specifically the PPCUs, the environmental data collected will be stored at DOF, interpreted, and analyzed by the MES of the PCU. As a result of the analysis, the MES will make recommendations for mitigation, and if an impact is severe and obvious, mitigation measures will be proposed at once.

#### 2.2.2 Impact Predictions

The Project identified impacts likely to occur during the Project's lifetime, including preparation of sites for establishing tree plantations, post-preparation, and regular operations phases.

Impact predictions were made by the consultants engaged by the ADB in the course of preparing an IEE. This led to recommendations that largely have avoided many environmental impacts from occurring; including inappropriate site selection for PBPs and PFPs.

A process for screening impacts likely to occur during Project implementation was undertaken in December 1995. This resulted in a long-list of possible impacts. A further scoping procedure was undertaken with Project staff to refine this list in order to pinpoint key issues or concerns related to establishment of the PBPs and the PFPs within the context of socio-economic and agro-ecological conditions existing in Lao PDR. These potential impacts were confirmed in village consultations in the course of pre-testing the EBS. This process was necessary to reduce collection of vast amounts of irrelevant data.

# 3. Analysis of the Environmental Baseline Surveys Conducted at Pilot Block Plantation Sites

# 3.1 Description of Each Tree Plantation (PBP) Site

Field visits were made by the Environmental Monitoring Specialist to planted and PBP sites being prepared during February/March, July, and November 1996 as follows:

Savannakhet Province, 3-5 March 1996 Ban Phonsin, Mouang Khanthabouly, 4 March 1996 Ban Beungbouathong, Mouang Xaibouly, 5 March 1996

Bolikhamsay Province, 6 March 1996

Ban Songkhonmai, Mouang Paksane (With a follow up visits in July and November 1996) Ban Phonsavan, Mouang Thaphabath Ban Phabath, Mouang Thaphabath (With a follow up visit in November 1996)

Vientiane Province, 8 March 1996 Ban Phontong, Mouang Phonhong (With a follow up visits in July and November 1996) Ban Phonkham, Mouang Thoulakhom

Vientiane Municipality, 8 March 1996 Ban Nakha, Mouang Naxaithong

The following observations were made from an environmental perspective as a result of these and subsequent field visits.

# 3.1.1 Savannakhet Province

#### Ban Phonsim, Mouang Khanthabouly

Brief Site Description: The project has a demonstration of approximately 30 ha. at this site, of which 10 ha was planted in 1995, and an additional 20 ha on land adjacent to the 10 ha site in 1996. The area is generally flat and is located approximately 3 km from the village of Ban Phonsim. The PBP site was a degraded forest, having been logged in the 1960s, and later used intermittently by villagers for shifting upland agriculture. The site is bordered by a provincial conservation forest to the east and by unstocked forest to the north, south, and east. A degraded forest serving as a buffer zone, approximately 100 m wide, has been retained between the PBP and the provincial conservation forest. No streams or rivers (either perennial or seasonal) run through or are located adjacent to the PBP. A natural pond (Nong Tao), that has been enlarged by a weir constructed by the Irrigation Department, is located approximately 3 km from the PBP. Also, dry season salt flats are located approximately 5-6 km from the PBP; that are operated by village women for three months during the dry season (March-May). Eucalyptus camaldulensis (8 ha) and Acacia mangium (2 ha) have been planted on the site. Two hectares of E. camaldulensis is expected to be intercropped with banana trees.

# Ban Beungbouathong, Mouang Xaibouly

Brief Site Description: The project has a demonstration of approximately 14 ha. at this site, planted in the 1996 wet season (June-October), covering an area of 440 x 800 m. The area is generally flat and is located on National Route 13, approximately 5 km form the village of Ban Beungbouathong. The PBP site was a degraded forest, having been logged in the past (exact dates unknown) by French and Chinese companies; and later used intermittently by villagers for shifting upland agriculture. The site is bordered by Route 13 to the east and degraded forest to the north, south, and west. Between Route 13 and the plantation, villagers have decided to retain a plot of land 100 m wide and 600 m long running parallel to the highway, for use by villagers who claimed customary rights to the land. Also, a parcel of land measuring 250 x 300 m has been carved out of the south-west corner of the rectangular parcel. This parcel is occupied by an individual who had already planted his land with eucalyptus trees, and did not want his plot incorporated into the PBP. The PBP is not near any water bodies or wells. A small plot (approximately -- ha) of Eucalyptus camaldulensis planted by Burapha in mid-1995, is located directly opposite the PBP. The village of Ban Beungbouathong has two natural ponds. The larger of the two, called Beungbouathong, is located closer to the plantation, but is still 3-4 km distance. It is an important source of fish for the villagers. The smaller, Nong Boua (Lotus), Pond, is respected by villagers as a sacred water body, where fishing and boating are not permitted. It contains crocodiles and is a resting stop for migratory birds during April and May of each year. While resting at the Lotus Pond, the birds are protected by the villagers; but are fair game once they fly off the pond. The Lotus Pond is located approximately 6 km from the PBP and it is surrounded on three sides by protected forest. The Lotus Pond serves as a source of fresh water for household use by the villagers. It is used to water livestock and for bathing.

# 3.1.2 Bolikhamsay Province

#### Ban Songkhonmai, Mouang Borikhan

<u>Brief Site Description</u>: The project has a demonstration of approximately 21 ha at this site, that was planted beginning in June 1996. The area is an undulating area, located 2-3 km from the village of Ban Songkhonmai. The village is located on the San River, upon which it is dependent for fish and water. The PBP site was a degraded forest, having been logged between 1960 and 1972, and later used intermittently by villagers for shifting upland agriculture. The site is bordered by degraded forest to the north; while paddy land is located to the south, and west, with a buffer area of approximately 40 m between the plantation and the paddy land. Upland agriculture and paddy land is found to the east of the plantation. The parcel is transected by a drainage channel at the eastern end of the parcel, that drains the site during the wet season. The slope leading down to the channel is initially slight, but becomes steeper as one moves closer to the channel. When visited, the area had recently been cleared by the villagers, with all natural growth on sloped areas leading to the channel having been cut down. No water bodies or wells were reported in the vicinity of the PBP. Tree planting is scheduled to begin in June 1996, with a spacing of 2 x 3 m. Both *E. camaldulensis* and *Acacia mangium* will be planted.

# Ban Phonsavan, Mouang Thaphabath

<u>Brief Site Description</u>: The project established a demonstration at this site in 1995, covering an area of approximately 7 ha. No expansion is planned at this time. The site is well located, being isolated from villages and water bodies used by villagers. The area is slightly undulating, located

approximately 2 to 2.5 kilometers from National Route 13, and the roadside village of Ban Phonsavanh. Other than the fact that the PBP site was a degraded forest, and used intermittently by villagers for shifting upland agriculture, little is known about the history of the area. The site is bordered by the a track on the north, across which is thick secondary growth forest. The area to the east is mostly unstocked forest; to the south is upland agricultural land and some brushland; and to the west is unstocked forest and brushland. In establishing of the plantation, only a minimal buffer of brush remained along a drainage channel that cuts through the area. The area was planted in 1995, and based upon initial observations, all natural growth on sloped areas leading to the channel had been removed. No large economically important trees remained on the site and young trees left standing on the site had died. Based on the project's plans, a pure stand of *E. camaldulensis* was planned on 2.3 ha; a mixed plantation of *E. camaldulensis* and *Acacia mangium* will be planted on 2.4 ha; and, intercropping of bananas and *E. camaldulensis* will be planted on 2.3 ha.

# Ban Phabath, Mouang Thaphabath

Brief Site Description: The Ban Phabath PBP was visited on three different occasions (March, July, and November 1996), specifically to examine environmental conditions in the area and to assess early signs of any environmental impacts. The project established a PBP on a gross hectare of 12 ha at this site during 1996. No expansion is planned at this time. The area is generally flat, with a gentle slope toward the Mekong River to the south of the site, and toward a seasonal stream to the west of the site. The area is located approximately 2 kilometers from the village of Phabath: 1 kilometer from National Route 13: 1 kilometer from the Mekong River: and, 20 meters from the seasonal stream. Based on the information obtained from villagers and on the STP, the area was virgin growth, until a Thai logging company was given a concession by the Lao Government to log the area between 1965 to 1975. Following withdrawal of the concession, villagers used the area intermittently for production of upland rice and field crops. The site is bordered by upland field crop production and vegetable gardens and the Mekong River to the south; degraded forest to the north, between the site and Route 13; unstocked forest serving as a 300 meter buffer between the PBP site and paddy areas to the east; and, protected forest across the seasonal stream to the west. A 20 meter buffer of natural growth vegetation remains in place between the PBP and the seasonal stream to the west. The PBP site was visited during site preparation activities. Nearly all economically important trees had been removed from the site by the villagers, and even young trees had been either removed or burned. Based on the project's operations, a total net hectare of 10.5 ha was planted in 1996 consisting of: a pure stand of E. camaldulensis was planted on 5.1 ha; a pure stand of E. tereticornis was planted on 3.4 ha; a mixed plantation of mixed local species, E. camaldulensis, and Acacia mangium was planted on 1 ha; a pure stand of Acacia mangium was planted on 1 ha; and, intercropping of upland rice, groundnuts, and mixed vegetables were planted throughout the plantation.

# 3.1.3 Vientiane Province

# Ban Phontong, Mouang Phonhong

<u>Brief Site Description</u>: Due to the challenge of this site, Ban Phontong was visited several times during 1996 (March, July, November), and was used also as a training site for the MES and the PPCU. It also has been used as a training site on digitized mapping by the MES due to its complex environmental situation. The PBP covers an area of approximately 52 ha. The area is

undulating, with some steep slopes, located approximately 2 km from National Route 13 and less than 1 km from the village of Phontong. An estimated 8.2 ha of the PBP was planted in 1995. Thick grass grew between the trees in the 1995 plantation site, and no damage from erosion was evident. Aspects of the site that make it environmentally challenging include the location of a large, long reservoir inside the site, divided into two tanks by a road leading from Ban Phontong to the PBP. The tank to the south of the road is surrounded on three sides by tree plantations. The tank on the north side of the road is bordered by plantations along an estimated 30 percent of its length. Due to the undulating geography of this PBP site, several long drainage channels cross the plantation. One of the drainage channels is wide and long enough to provide space for rice paddy fields during the wet season, in the middle of the plantation. Fish ponds are located within 100-250 meters from the plantation site, and a well is located approximately 200 meters from the site. Only paddy and upland rice is grown on areas adjacent to the plantation. Villagers were clearing the PBP site for the 1996 planting when the site was first visited by the environmental specialist in March 1996. The Environmental Monitoring Specialist was given to understand at that time that much land clearing had taken place prior to the beginning of project operations at this site. A follow up visit in July 1996 revealed that most vegetation had been removed from the site, including vegetation around ponds, drainage channels, and streams, much of which had been removed prior to plantation establishment. A subsequent visit in November 1996 showed improvement in the situation, as natural growth had been allowed to re-grow during the wet season on slopes leading down to all drainage channels, and buffers were being rehabilitated around ponds. However, little natural vegetation remained on the site. The forest on the Ban Phontong site was logged between 1972 and 1980 by a private sawmill. Villagers were settled in adjacent areas between 1968 and 1972, and used any land available for planting paddy rice. This was supplemented by shifting cultivation, that has continued to be a major source of income and food, on land allocated to them by district officials. The PBP site was not allocated to Ban Phontong, but with establishment of the PBP, the site will be used for cultivating upland rice for 2-3 years. In 1980, the office of the Prime Minister allocated the PBP site as a communal cattle grazing area, and created the reservoirs mentioned above. The grazing project failed in 1984, and the land was allocated to the provincial forestry office, who established a eucalyptus plantation on part of the PBP site in 1992. Natural forest is found adjacent to the site to the west and south. Degraded forest is to the north and production forest to the east of the PBP.

#### Ban Phonkham, Mouang Thoulakhom

Brief Site Description: The Ban Phonkham PBP site was visited only once, in March 1996. The project established a 8.2 ha PBP at this site during 1995. No expansion is planned at this time. The area is undulating, with some steep slopes, located approximately 5 km from a main road, and 2 km from the village of Ban Phonkham. Based on the information obtained from villagers and on the STP, the area was logged by the Lao Government beginning in 1965. This logging continued through 1985, with State Forestry Enterprise No. 3 working the concession. Following completion of the logging, villagers expanded shifting cultivation into the logged areas. When yields began to fall due to deterioration of the soil, the area was used for grazing and thatch production. The site is bordered by upland field crop production and shifting agriculture in all directions. The site is located within 15 meters from a perennial stream, the Huay Nam Ang, to the east, that has headwaters approximately 4 km from where the stream passes the site. No buffer was left along the stream at one corner of the plantation, over a distance of about 20 meters, when the site was visited in March 1996. Another stream, the Huay Nam Bon is located 2

km from the site to the east; and the Huay Phon is located approximately 400 m to the west of the PBP site. The PBP site was visited eight months following planting. Almost no natural growth was seen on the site, even on steep slopes. The project had planted, a total of 8.2 ha was planted in 1995 consisting of: a pure stand of *E. camaldulensis*, planted on 3 ha; a mixed plantation of *E. camaldulensis* and *Acacia mangium* was planted on 2 ha; and, intercropping of bananas and *E. camaldulensis* was planted on 3.2 ha.

# 3.1.4 Vientiane Municipality

#### Ban Nakha, Mouang Naxaithong

Brief Site Description: The Ban Nakha PBP site was visited once, in March 1996, and a second time in July 1996. The project established a 14.9 ha PBP at this site during 1995, and expanded the PBP an additional 14.9 ha in 1996. The area is only slightly undulating, located approximately 5 km from Ban Nakha, but only 3 km from National Route 13. A conservation forest is located to the east of the PBP site; private land to the north; degraded forest to the south; and, paddy rice fields to the west. Based on the information obtained from villagers and on the STP, the area was logged by a private sawmill, beginning in the 1960s, until 1982. Refugees from northern Laos were settled nearby during the 1970s, who used the are for shifting cultivation. This form of land use has been stopped and the land was used mostly for thatch and grazing until the PBP was established. The 30 ha PBP is part of a 200 ha degraded forest area owned by the Phabath Temple. The temple leased the land to a private individual for 20 years. The holder of the lease offered 30 ha of the land to the DOF for establishment of a PBP. When observed in March 1996, the area not yet planted had good natural vegetative cover. On the 15 ha area planted in trees, low areas were observed, that served as drainage channels during the wet season. None of these channels were protected by buffer areas of natural vegetation. The site is surrounded by degraded forest. The closest water body observed is the large Nam Souang reservoir, located 2 km from the PBP. The project had planted a 14.9 ha in 1995 consisting of: a pure stand of E. camaldulensis, planted on 8.9 ha; a 2 ha stand of Acacia mangium; and, a mixed plantation of E. camaldulensis and Acacia mangium on 4 ha. An additional 14.9 ha was planted in 1996, consisting of: a pure stand of E. camaldulensis, planted on 12.2 ha; a 1.4 ha stand of E. tereticornis; a 0.3 ha stand of Acacia mangium; and, a 1 ha mixed plantation of Acacia mangium and Acacia chinensis.

# 3.2 Analysis of EBS Summary Sheet

# 3.2.1 Land Data (EBS No. 8)

# Official Status of the Forest Lands for Plantation Establishment (EBS No. 8.1)

The official status of the land is an important factor that should be determined during the STP/EBS. Should the surveyor discover that the official status of the land is other than degraded or fallow land, or land used for shifting cultivation, district and provincial authorities should be contacted to clarify the official status. Natural forest, conservation forest, sacred forests, and production forests are not suitable as sites for tree plantations.

<u>Results of the EBS</u>: All 8 PBP sites were found to be unstocked or degraded forest, fallow land, or land used for shifting cultivation.

# Size of Plantations (EBS No. 8.2.1)

The size of tree plantations is one of the key indicators determining the level of impacts that a plantation will have on the local environment. Environmentalists differ on an appropriate size of a tree plantation, but generally agree that the species of trees planted also is a key factor determining an appropriate size for a tree plantation. For example, fast growing species are likely to have a more immediate and visible impact if planted in a large enough plantation.

<u>Results of the EBS</u>: The maximum size of the PBP is 50.2 ha at Ban Phontong, Mouang Phonhong, Vientiane Province, that is the most environmentally challenging plantation, and without careful plantation management, the site where the highest impacts are anticipated. One positive management decision was to plant this plantation using a mosaic planting pattern. The smallest PBP is located at Ban Phon Savan, Bolikhamsai province, covering an area of 7 ha. The average size of the PBPs is approximately 21 ha. These sizes of plantation are not expected to have any impact on local environments, with the exception of the Ban Phontong site, where water bodies may be effected and erosion may occur. The project has undertaken mitigation measures to ensure that natural vegetation is being allowed to regenerate, to serve as a natural buffer along streams and drainage channels and around ponds and paddy areas inside the plantation.

#### Current Land Use/Previous Land Use

Land used as common areas by villages that have been designated as sites for establishment of tree plantations, although of marginal agricultural production and timber value, may serve as a reserve of non-wood forest products, food, and medicines, for poor villagers. Products that may have been obtained from degraded or unstocked forest lands selected as PBPs include fuelwood, food products (red ant eggs, insects, tubers, wild fruit, mushrooms, bamboo shoots, spices, kapok, medicines natural herbs). The area also may have been used for grazing of large livestock (cattle and buffalo). The change in the physical status of the common area, with land clearing and planting of exotic species, will result in pressures being placed on villagers to identify alternative areas for obtaining the products to which they have become accustomed to extract from the PBP area.

# 3.2.2 Site Data (EBS No. 9)

# Distance from the Village (EBS No. 9.1)

To minimize potential impacts that tree plantations may have on village life, plantations should be established a reasonable distance from a village. Plantations could bring the danger of fire closer to villages; could impact on the underground water table, impacting on wells located in a village; and, drive some species of wildlife from the village, particularly those species that prefer natural forest habitat to exotic species frequently used in tree plantations. Although no references to definitive research have been found, a reasonable distance could be determine to be from one to three kilometers from the village, depending on the size of the plantation. Larger plantations should be located further from villages, while smaller plantations, likely to have less of an impact may be located closer to villages.

<u>Results of the EBS</u>: In the case of the PBP sites, the longest distance from the closest village is 15 kilometers, at Ban Phabath, Bolikhamsai province and Ban Phon Kham, Vientiane province. The closest distance is 200 meters, at Ban Phonsavan, near the Ban Phontong site, Vientiane province, where one corner of the PBP is deemed to be too close to the village. The average distance from villages participating in the project is 5.84 kilometers. Only at the Ban Phontong site could the tree plantation have an impact on a nearby village.

#### Distance from Water Bodies and Wells (EBS No. 9.2)

Fast growing tree species are very efficient consumers of water. One of the issues with which conservationists are concerned is that cultivation of fast growing tree species (particularly *Eucalyptus spp.*) may have negative impacts on nearby wetlands, natural and man made ponds, wells, and other water bodies; more specifically that water levels will decrease significantly or even be drained as a result of accelerated underground water use by the fast growing trees.

To ensure that tree plantations facilitated by the Project do not have significant negative impacts on water bodies and wells that villagers use for their livelihood and consumption, water supplies that may be effected will be monitored by the Project through the EMS. The quality and quantity of water in streams, rivers, natural and man-made ponds, wetlands, lakes, and wells will be monitored, with the significance of impacts being based on observable factors or differences reported by villagers in the course of environmental monitoring. Of particular importance are water bodies and wells that are located inside or adjacent to plantations, since they may be impacted the most. Also, water bodies and wells situated on land adjacent to the plantations will be observed, up to a distance of approximately 500 meters.

<u>Results of the EBS</u>: All 8 PBP sites were found to have water bodies or wells either inside the plantation or within one kilometer from the plantation. Rivers and perennial streams likely will not be effected by the relatively small PBPs (all of which are 50 ha or less in size), but they too will be observed; taking into careful consideration feedback from villagers familiar with the area. Also due to the small size of the PBPs, natural ponds inside the site are expected to be effected only insignificantly; but they will be monitored carefully. Wells and man-made fish ponds located within 100-200 meters of the plantation site, may be effected, and thus will be monitored closely; with a focus on those that provide drinking water for villagers.

Sites with drinking water wells within 100-200 m of the PBPs include those at Ban Nakha, Vientiane Municipality and Ban Phontong, Vientiane Province. Drinking water sources for other villages near the tree plantations are a sufficient distance away from the site; ranging from 0.9 km to 3 km from the PBP site, or have no drinking water source nearby. Ban Phontong, Vientiane province is the only site that may experience an impact from the PBP plantation. The only well in the village used as a source of drinking water is 300 meters from the tree plantation. The size of the tree plantation however, approximately 52 ha, likely is not large enough to impact on the village well. The well at this site will however be monitored closely. Ban Phontong also has a man-made lake (created by a dike road) inside the PBP, that will be monitored closely.

# Use of Land Surrounding the Plantation Site (EBS No. 9.3)

In some cases, the land surrounding the PBP may be effected by conversion of a natural (unstocked or degraded) forest area into a plantation of fast growing trees. Through operation of the EMS, the Project will monitor use of land surrounding each plantation site, to determine if cropping patterns or land use changes are a result of establishment of tree plantations. Also, to determine if soil and/or land productivity is effected by plantations, the Project also will monitor yields of crops grown on lands adjacent to the plantations. Further, the integrity of the conservation and protected forests and buffer zone forests adjacent to or nearby the plantations will be monitored (particularly those placed under the protection of the village), as will the value of non-wood forest products and frequency of wildlife sightings.

<u>Results of the EBS</u>: Four of the eight PBP sites are adjacent to conservation or protected forest areas, specifically: Ban Nakha, Vientiane Municipality; Ban Phonkham, Vientiane Province; Ban Phabath, Bolikhamsai Province; and, Ban Phonsin, Savannakhet Province. One site is adjacent to a sacred forest: Ban Beungbouathong, Savannakhet Province. Six PBP sites are adjacent to rice paddy fields, mainly: Ban Nakha, Vientiane Municipality; Ban Phonkham, Vientiane Province; Ban Songkhonmai and Ban Phabath, Bolikhamsai Province; and, Ban Phonsin and Ban Beungbouathong, Savannakhet Province.

Through operation of the EMS, the Project will monitor several factors at these sites, including:

- expansion of the tree plantation into buffer zones and conservation, sacred, and protected forest areas;
- the possible impacts, if any, of increased pressure on conservation and protected forests as a result of villagers losing access to non-wood forest products that may have been present in the previous unstocked forest, that has been replaced by the tree plantation; and,
- potential impacts on flora and fauna at these sites, using techniques being developed by the biodiversity monitoring specialist working on the World Bank/GEF assisted Wildlife and Protected Areas Conservation Component of the Forest Management and Conservation Project, implemented by DOF.

<u>Crop Yields on Lands Surrounding the Plantation</u>: As noted above, most rural people in Lao PDR are directly, and almost completely, dependent on food crops produced on their land for a livelihood. The introduction of a tree plantation on land adjacent to land used for agriculture production has the potential of impacting on the productivity of crops being cultivated. As the biodiversity of the tree plantation site is diminished significantly as a result of plantation establishment, crops that were dependent on that biodiversity also may be impacted negatively. Populations of insects that function as pollinators; predators of insects that spread viruses and harmful fungi; fungi that are beneficial to cultivated crops; and, other beneficial insects, reptiles, birds, and amphibians, that may have thrived, even in natural degraded forest that covered the proposed plantation site, will be negatively impacted and diminished, and may even be destroyed as a result of site clearing operations and establishment of a tree plantation. With such a significant change of the neighboring ecosystem, crops (particularly horticulture crops) cultivated on land adjacent to the tree plantation site have a high likelihood of being impacted by a change of vegetative cover and a loss of natural protectors of crops.

<u>Results of the EBS</u>: Both upland and paddy rice are cultivated on lands surrounding all PBP sites. Paddy rice yields are likely to be the same or very similar to those obtained by villagers working the land where the plantation is to be established. Therefore, yield figures collected from local villagers on the STP form will in future EBS be assumed to be indicative of those in the area surrounding the plantation. Yield figures collected as part of this first EBS range from a high of 3 tons per ha at Ban Beungbouathong, Savannakhet province, to a low of 1.5 tons per ha at Ban Phontong, Vientiane province. Upland rice yields range from a high of 1.2 tons per ha at Ban Beungbouathong, Savannakhet province, to a low of 0.5 tons per ha at Ban Phontong, Vientiane province, to a low of 0.5 tons per ha at Ban Phabath, Bolikhamsai province. At Ban Nakha, Vientiane province, banana and cane sugar are cultivated on adjacent lands; with cane sugar obtaining a reported yield of 18 tons per ha; and, banana obtaining 8 tons per ha.

# 3.2.3 Land Use Data (EBS No. 10)

The purpose of collecting land use data is to obtain information from villagers related to use of forest lands allocated to the village. Some of this information was obtained from the existing STP and some directly from villager interviews during visits to the plantation sites.

The data reveals how the villagers have been using the plantation site; the benefits they have been receiving from the site; and, the availability of alternative forest areas to obtain both forest and non-forest products. This data is linked closely to the socio-economic well-being of the villagers who often are subsistence farmers, largely dependent on non-wood forest products for consumption and both forest and non-wood forest resources for off-farm family income.

<u>Results of the EBS</u>: In summary, the survey indicate that villagers in 6 of the 8 PBP sites were practicing shifting agriculture; 7 of 8 were using forests to obtain timber; and, 6 of 8 were harvesting poles, used mostly for fencing. All villages have income from sale of non-timber forest products obtained from nearby forests. All villages reported that forest lands were used for grazing large livestock. Details follow.

# Flood Prone, Saline, and Grazing Lands (EBS No. 10.1, 10.2, 10.3)

Flood prone and saline soil lands are often suitable for establishing tree plantations. Flood prone land however, should not be subject to long duration (2-3 weeks) nor deep water floods that will destroy the trees. Good drainage is also required. Also, saline soil areas have been found suitable for cultivating some species of fast growing trees and may contribute to rehabilitation of the area.

<u>Results of the EBS</u>: All PBP village sites reported using the plantation site for grazing (EBS No. 10.17, discussed in more detail below). Based on the EBS data, all but one village (Ban Phontong, Vientiane Province) had relatively large tracts of alternative grazing lands for raising large livestock, and likely would not be impacted by the withdrawal of 7 to 50 ha for the PBPs, from lands available for grazing.

Ban Phontong, Vientiane Province reported having only 9 ha alternative site available for grazing following withdrawal of the 50.2 ha PBP site. Part of the PBP in this village will be available for grazing in 1997, with the opening of a plot of 8.5 ha of a mixed species plot of trees planted in 1995. This will nearly double the area available for grazing for Ban Phontong. In the interim, and perhaps until the trees in the remaining 40 ha of the plantation are two years old (1998), the

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number of large livestock (perceived as farm assets by the villagers) in this village will be monitored (by the BME). Also, the impacts of over-grazing in natural and production forests allocated to the village, some of which is located adjacent to the PBP, will be observed.

# Wood and Non-Wood Forest Products from Forests Allocated to the Villages (EBS Nos. 10.5, 10.6, 10.7, 10.8,)

#### Results of the EBS:

<u>Timber, Timber Products, and Poles:</u> Seven of the 8 PBP villages reported producing timber or timber products from forests allocated to the village. The average volume of timber produced is 111 cubic meters per village, ranging from 0 timber production in Ban Phontong, Vientiane Province, to 708 cubic meters in Ban Songkhonmai, Bolikhamsai Province. One timber product of greater importance to villagers is poles, used primarily for fencing. Six of the 8 PBP villages reported collecting poles from allocated forests, with an average of 22,000 poles from each village, ranging from 0 to 70,000 poles per village.

With the PBP site now not available for timber, timber products, and poles (at least until the plantation trees are harvested), villagers will be required to identify alternative site to compensate for the loss of the PBP area, or reduce their production of timber products and poles. The BME reporting will monitor this situation.

Non-Wood (or Non-Timber) Forest Products: The forest serves as a daily fresh market or a supermarket for Lao villagers. Numerous food, medicine, and household products are obtained from the forest. Data from all 8 PBP villages indicated that villagers go to the forest once daily, in both the wet and dry seasons, for both wood and non-wood forest products. This is an indication of their dependency on the forest for many if not most items consumed in the household.

Examples of the types of wood and non-wood forest products obtained from the PBP sites selected for establishment of tree plantations, reported on the EBS forms (EBS No. 10.16) include the following:

Food bamboo shoots wildlife fruit vegetables insect eggs insects leaves honey edible roots fish rattan shoots mushrooms Medicines medicinal plants medicinal roots medicinal leaves Household Dry Goods bamboo rattan grass (for thatch) poles gum (for glue) fuel wood laq (for dye & glue)

These forest products are the same as those listed by the villagers that they obtained from forests generally. With establishment of a tree plantation on unstocked forest lands, villagers will be required to obtain these products from other forest lands. In most cases this should not be a serious problem, although the distance from the village to the forest may be further. Most villages will continue to have access to degraded or unstocked forests, production forests, natural forests, and regenerated forests.

Concern is expressed however, at sites that villagers reported obtaining most non-timber forest products from conservation forests (Ban Nakha, Vientiane Municipality and Ban Phonsin, Savannakhet Province) and from protected, regenerating, or production forests (Ban Phonkham, Vientiane Province; Ban Phon Savan and Ban Songkhonmai, and Ban Phabath, Bolikhamsai Province; and Ban Beungbouathong, Savannakhet Province). With the withdrawal of the tree plantation site from the natural forest sector, increased pressure may be placed on these categories of forest as villagers continue to make their daily trips to the only fresh markets that are available to them and with which they are most familiar. In summary, establishment of the PBPs may have an impact on conservation and protected forests, particularly at sites where no alternative degraded, production, natural forests are available. These locations will be carefully monitored through subsequent environmental monitoring undertaken by the Project.

#### Villager Use of the PBP Plantation Sites (EBS No. 10.9)

<u>Results of the EBS</u>: All 8 PBP sites were reportedly being used by villagers for grazing of large livestock and shifting agriculture, upland rice, or upland agriculture production. Only Ban Phontong and Ban Phonkham, Vientiane Province and Ban Phonsavan, Bolikhamsai Province reported not using the plantation site for shifting agriculture. Five of the 8 villages reported obtaining non-wood forest products from the plantation sites. Six of the 8 villages reported cultivating upland rice or upland agriculture crops at the plantation sites. Only Ban Phontong, Vientiane Province and Ban Phabath, Bolikhamsai Province reported not using the plantation site for upland crop production.

Based upon discussions with villagers and observations by the Specialist and the MES, only small areas of the PBPs were in fact used for shifting agriculture and upland rice and crop production. All who were using the land were able to find other sites to cultivate the same crops, although the alternative site may be further from the village.

Among the PBP villages, 6 of the 8 villages reported villagers using shifting agriculture practices. An average of 10.28 ha were being cultivated using shifting agriculture techniques; ranging from 0 to 28 ha per village. An average of 12.75 households, or 15.38 percent of the villagers in each of the 8 villages, are using unstocked forests for shifting agriculture.

The results of the EBS indicate that there continues to be a dependency on using unstocked or degraded forest lands for subsistence agriculture, focusing on production of upland rice. Only a very small number of people reported using PBP sites prior to establishment of tree plantations for production of upland rice and other upland crops. At most PBP sites sufficient degraded (or other) forest areas are available to allow upland crop production to continue. The possibility exists at some sites that villagers may encroach on conservation and other protected and stocked forests for subsistence rice and upland crop production. This situation will be monitored closely by the Project in the course of conducting the BMEs and environmental monitoring.

Together, the BME and the EMR will monitor these situations and report on any negative socioeconomic impacts that may result from the inaccessibility of tree plantation land to villagers after the trees are too large to allow inter-cropping.

# 3.2.4 Wildlife Data (EBS No. 11.1)

The purpose of this data is to determine the impacts on wildlife due primarily to the loss of habitat, resulting from establishment of a tree plantation. Although in the case of the PBPs, the impact on wildlife likely will be insignificant, this parameter should be examined in preparation for establishment of larger plantations by the private sector.

Based upon village interviews, knowledge of the local culture and agro-socio-economic situation, as well as previous social research in the Lao PDR (Dennis et al., ADB/UNDP, 1991), wildlife continues to be consumed by rural households, and is a source of family income, as well as a product frequently used for bartering. The importance of wildlife as a source of food and income requires that its availability is monitored through the EMS process. Although it is beyond the scope of this Project to undertake an extensive wildlife monitoring program (although elements of the program being introduced by the World Bank/GEF Forest Management and Conservation Project have been incorporated in the environmental monitoring and reporting system), the EMS includes the monitoring of the frequency of wildlife sightings and evidence of the presence of wildlife in forests allocated to villages participating in the Project. The monitoring will be conducted with community participation, primarily through interviews and consultations.

<u>Results of the EBS</u>: The EBS goes into some detail regarding the species of wildlife (animals and fish) most frequently sighted, infrequently sighted, and rarely sighted. The EBS form also includes questioning villagers about the sighting of evidence (droppings, tracks) indicating the presence of a species.

Frequently sighted wildlife on the tree plantation sites as well as in other forests allocated to each of the villages includes:

Animal Species	No. of Sites Species were Frequently Sighted
Wild chicken	5 of 8 sites
Rabbits	4 of 8 sites
Mixed bird species	5 of 8 sites
Wild pig	2 of 8 sites
Deer	2 of 8 sites
Mixed snake species	3 of 8 sites
Forest rats	4 of 8 sites
Squirrels	2 of 8 sites
Chipmunks	1 of 8 sites (Ban Beungbouathong)
Mongoose	1 of 8 sites (Ban Beungbouathong)
Fish	1 of 8 sites (Ban Songkhonmai)
Water fowl (ducks)	1 of 8 sites (Ban Phonsin)
Swans	1 of 8 sites (Ban Phonsin)
Wild dogs	1 of 8 sites (Ban Phonsin)

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Based on the data above, one can assume that wild chicken, rabbits, mixed bird species, and forest rats likely will not be impacted by establishment of the PBPs. The situation in Ban Phonsin and Ban Beungbouathong, Savannakhet Province is somewhat different however, in that these are the only locations where several wildlife species continue to be frequently sighted. These species will be monitored carefully at these sites.

Wildlife that are rarely sighted, or are determined to be present based on evidence, rather than on actual sightings, include the following:

Village	Wildlife Species Infrequently Sighted	Wildlife Species Rarely Sighted
Ban Nakha, Vientiane Municipality	Porcupine Wild duck	
Ban Phontong, Vientiane Province	Forest chicken	Forest duck Wild dog Opossum
Ban Phabath, Bolikhamsai Province	Wild pig Squirrel	Deer
Ban Phonsavan, Bolikhamsai Province	Wild pig Squirrel	
Ban Songkhonmai, Bolikhamsai Province	Wild pig Deer Opossum Porcupine Swan	
Ban Beungbouathong, Savannakhet Province	Forest chicken Wild dog Snakes Tree lizards Squirrels	Deer Wild pig
Ban Phonsin, Savannakhet Province	Tree lizards Wild dogs Rabbits	Barking deer

The Project will monitor these infrequently and rarely sighted species carefully through the environmental monitoring form prepared for this purpose. In future village level consultations, the Environmental Monitoring Specialist in collaboration with the MES will discuss these wildlife species in more detail, to determine their importance to the rural communities, in terms of subsistence and income. Should these species prove to be of importance to the community, mitigation measures will be recommended by the Project to address further endangering these wildlife species.

# 3.2.5 Unique Areas (EBS No. 12)

The purpose of this section is to ensure that tree plantations are not being established on lands of special, scientific, cultural, historical, religious, recreational, or scenic importance; nor that they will be impacted as a result of establishment of a tree plantation. Such sites include sacred forests, historic sites, unique flora or fauna, archaeological sites, hot springs, ritual areas (either water or land or both) or traditional monuments.

<u>Results of the EBS</u>: None of the PBPs have been established in unique areas. Only one area is of some concern, that of Ban Beungbouathong, Savannakhet Province. This village (see map in Appendix ---) is located between two natural, fresh water lakes: one is the Lotus Pond (*Nong Boua*) and the other is Golden Lotus Lake (*Beung Boua Thong*). The Beung Boua Thong is a wetland area, that serves as a rest stop for migratory birds. The Nong Boua is a sacred lake, surrounded by a protection (sacred) forest. Water in the Nong Boua is used by villagers for household purposes, but not for drinking. The Nong Boua reportedly contains fresh water crocodiles and rare fish, which are not harvested by the villagers.

Although the PBP is sufficiently distant from both of these lakes so as to have no impacts on them, the Project will be encouraged to carefully obtain additional information on the biodiversity importance of these lakes. Any expansion of large scale tree plantations into the degraded forest area that lies between the lakes and the PBP site, will have negative environmental impacts on one or both of these lakes, including: water levels, water quality, wildlife presence, and the integrity of the sacred forest in the village.

# 3.2.6 Physical Conditions Data (EBS No. 13)

The purpose of this section is to describe physical conditions at tree plantation sites and to identify potential environmental impacts. Assessment of the physical conditions is required to ensure that the Project has an understanding of the factors that may lead to soil erosion, sedimentation of streams, natural lakes, and adjacent paddy areas, and drainage patterns at plantation sites.

# Sloped Areas (EBS Nos. 13.1, 13.2)

Environmental recommendations made by previous ADB advisory technical assistance determined that trees should not be planted on slopes greater than 15 degrees (footnote reference). Subsequent assessments of conditions in Lao PDR carried out by the Project determined that slopes of between 15 and 30 degrees could be cultivated, so long as planting techniques were modified for the increased slope of the land (see Preliminary Environmental Guidelines in Appendix 1 of the EMS report of August 1996).

The EBS examines both the sloped areas and drainage patterns of tree plantation sites, to ensure that environmental recommendations made by the IEE have been complied with, and that opportunities for gullying and serious soil erosion are minimized. <u>Results of the EBS</u>: The 8 PBP sites were examined for slopes greater than 15 degrees. Only the PBP site at Ban Beungbouathong, Savannakhet Province had no sloped land more than 15 degrees. Other sites had between 1 and 6 sloped areas greater than 15 degrees, covering an area of between 0.02 to 4.1 ha.

The most undulating site is that at Ban Phontong, Vientiane Province, with 6 slopes greater than 15 degrees, covering an area of approximately 1.4 ha. The Project is aware of the hilly nature of this site and has implemented measures to protect these slopes.

The PBP site at Ban Songkhonmai, Bolikhamsai Province has 4 sloped areas of greater than 15 degrees, covering an area of approximately 4 ha. The Project has implemented protection measures at this site also, and initial fears of the possibility of gullying and extensive erosion have been allayed.

The EBS reports that most of the slopes at the PBP slope down to drainage channels (or wet season watercourses), seasonal streams, and forested areas. At three PBP sites, the slopes lead down to rice paddy lands, mainly at: Ban Phontong and Ban Phonkham, Vientiane Province; and, Ban Songkhonmai and Ban Phabath, Bolikhamsai Province. Monitoring at these three sites will ensure that paddy lands are not damaged from potential soil erosion run-off.

#### Drainage Channels (EBS No. 13.3)

Wet season drainage channels are prevalent on undulating lands. They will become more predominant at tree plantation sites further away from the plains around Paksane, Vientiane, and Savannakhet. The Project has given careful consideration to this situation and is experimenting with suitable plantation techniques and planting methods to deal with the numerous drainage channels on plantation sites in central and northern Lao PDR. This issue will become more urgent as the DOF proceeds to expand the tree plantations program into the northern provinces of Lao PDR.

<u>Results of the EBS</u>: The issue of drainage channels is not relevant to the PBP sites in Savannakhet province. They may become an issue if more undulating sites are selected for plantation establishment to the east, south, and north of the Savannakhet Plain.

Drainage channels become a more serious issue at PBP sites in Vientiane and Bolikhamsai provinces. The PBP at Ban Phontong, Vientiane Province has 6 wet season drainage channels, 720 m in length, that are prone somewhat to gullying. The Project has taken action to retain natural growth on the lip and insides of these drainage channels, thus minimizing opportunities for erosion. The PBP site at Ban Songkhonmai, Bolikhamsai Province has a similar problem, with 4 drainage channels, 1,220 m in length. The Project's response at this site was addressed in the same manner as at Ban Phontong. Ban Nakha, Vientiane Municipality, has 3 drainage channels, 1,500+ m in length, in which natural vegetation will be left alone to prevent soil erosion.

The EMS provides mechanisms for monitoring these drainage channels for evidence of soil erosion, gullying, and removal of natural growth for the duration of the Project.

# 3.2.7 Natural Vegetative Cover Data (EBS No. 14)

The purpose of this section is to obtain data related to the natural vegetative cover of the tree plantation site. Data on vegetative cover also will allow for a better understanding of how the local ecology may be effected by establishment of tree plantations. Depending on the species of trees planted and the care provided to ensure natural growth regeneration following tree planting, establishment of fast growing tree plantations is expected to improve the vegetative cover of unstocked forest lands. The tree plantations are expected to restore stability to degraded forest lands, promote sustainable land use practices, and may decrease pressure on natural forests.

# Natural Vegetative Cover of Plantation Site (EBS No. 14.1, 14.2)

The purpose of this data is to establish baseline data against which changes in the composition and density of natural vegetative cover on the proposed plantation site will be recorded, and measured regularly following establishment of a tree plantation.

<u>Results of the EBS</u>: The results of the EBS are presented on the table below and in the photographs presented in Appendix 4. In that most of the PBP sites are on degraded forest lands, the vegetative cover of the areas are largely unstocked forests, shrubs, scrub forest, grass, and thin ground cover. Areas of this type largely are used for grazing by Lao villagers, having been logged one or more times over the last 20-30 years.

Unstocked forest was the most common vegetative cover, ranging from a high 75 percent of the plantation area in Ban Phonkham, Vientiane Province and Ban Phabath, Bolikhamsai Province; to a low 30 percent in Ban Nakha, Vientiane Municipality, Ban Phontong, Vientiane Province, and Ban Beungbouathong, Savannakhet Province.

1	2	3	4	5.	6	7
Species	Bamboo (percent)	Shrubs (percent)	Big trees (percent)	Unstocked Forest	Thick Grass	Thin Ground
Province/				(percent)	(percent)	Cover
Village						(percent)
Vientiane Municipality						
Ban Nakha		40	l	30	20	10
Vientiane Province						
Ban Phontong		20		60	10	10
Ban Phon Kham		30		40	25	5
Bolikhamsai Province						
Ban Phonsavan		30	•	60		10
Ban Songkhonmai		25		70		15
Ban Phabath		15		75		10
Savannakhet Province						
Ban Phonsin		30		60		10
Ban Beungbouathong		35		50		15

# Names and Percentage of Dominant and Sub-Dominant Species (EBS No. 17.2)

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# 3.2.8 Soils Data (EBS No. 15)

The purpose of this data is to assess impacts on erosion and soil productivity as a result of plantation establishment. Information on trends in soil productivity is a particularly crucial indicator of the impact of tree plantation establishment, as most rural people in Lao PDR are directly, and almost completely, dependent on food crops produced on their land. If soils become depleted and/or degraded, their livelihood is seriously threatened.

# Depth of Topsoil at Tree Plantation Sites (EBS No. 15.1)

The average depth of topsoil at sites selected for establishment of tree plantations should be measured and reported on the EBS form. Since spacing of trees in some plantations may be too close to allow for regeneration of natural vegetation, in areas prone to high winds and large amounts of rainfall in short periods, topsoil may be lost due to wind and/or water erosion. Should natural vegetation not regenerate, topsoil depth measurements should be taken annually on a random basis throughout the site. Should thick natural vegetation re-appear evenly throughout the site, topsoil measurements may not be necessary. If natural regeneration of vegetation is spotted, topsoil depth measurements should be taken annually at locations prone to erosion.

<u>Results of EBS</u>: The depth of topsoil at PBP sites established in 1995 and 1996, will be undertaken during environmental monitoring (BME/EMR) that will take place during 1997. Data on soil depth at PBP and private sector tree plantation sites proposed for establishment in 1997 should be collected when conducting the STP/EBS for these sites.

# **Evidence of Existing Erosion (EBS No. 15.2)**

Examination of areas around the base of remaining vegetation should indicate the existence or lack of erosion that is already taking place at the proposed site. It is important to record this fact so that erosion is not seen as a negative impact of the establishment of a tree plantation during follow up environmental monitoring.

<u>Results of the EBS</u>: Evidence of erosion at PBP sites established in 1995 and 1996, will be undertaken during environmental monitoring (BME/EMR) that will take place during 1997. Data on soil depth at PBP and private sector tree plantation sites proposed for establishment in 1997 should be collected when conducting the STP/EBS for these sites.

#### Soil Productivity

The measurement of yields is the most direct way to determine the productivity and fertility of soils. As trees will occupy the PBP and other sites on which tree plantations have been or will be established, measuring yields from crops inter-cropped with the trees will be difficult. Also, intercropping likely will be possible only during the first one or two years following plantation establishment, as crops will be shaded out by the trees. Therefore, a more in-depth analysis of soils at proposed tree plantation sites is necessary. The 1996 EBSs at PBP sites were undertaken prior to the project making a final decision whether or not soils analyses would be required as part of the EBS process. Thus, the EBS conducted at the 8 PBP sites established in 1995 and 1996, plus any EBS conducted by PPCU during late 1996 and the first part of 1997, did not include soils analyses that would provide baseline environmental data regarding the structure and productivity of soils at proposed tree plantation sites.

The project decided in March 1997 to require that soils analyses be undertaken at all tree plantation sites proposed by the Lao Government and the private sector. The EBS form found in Appendix 1 has been modified to take this recent decision into consideration.

The Environmental Monitoring Specialist proposes that the soil samples needed to undertake soils analyses be collected by the MES and the PPCU at all 8 original PBP sites during the follow up BME/EMR, scheduled to be undertaken in April/May/June 1997. For guidelines related to the taking of soil samples, the PCU is referred to "Soil Survey and Analysis" (produced by the Royal Forest Department, Bangkok, Thailand, and the Japanese International Cooperation Agency or JICA, available in he MES/PCU library). The results of the soils analysis will be reported in this space with the preparation and submission of the 1997 EMR. Similarly, soils samples should be collected from tree plantation sites at which the EBS was conducted in late 1996 and early 1997, during the BME/EMR conducted in late 1997 and early 1998, and the results of soils analyses reported in this space in the 1998 EMR.

#### 4. Conclusions, Recommendations, and Issues

#### 4.1 Conclusions

4.1.1 Savannakhet Province

#### **Ban Phonsim, Mouang Khanthabouly**

<u>Conclusions</u>: The site is well located for the establishment of a fast growing tree plantation. The area is isolated from the community and a reasonable distance from any water bodies that might be impacted. Sufficient unstocked (degraded) and conservation forests remain in the immediate area of the village, so that the 30 ha PBP is not expected to impact on the socio-economics of the village.

<u>Cautions/Considerations/Recommendations</u>: The appropriateness of the PBP site notwithstanding, the project should take into considerations the following points:

- Although the PBP would appear to not endanger the water level in the Nong Tao reservoir located approximately 3 km from the PBP, the EMS recommends that the EBS include site investigations at Nong Tao to determine its present use and status and an effort made to assess the potential of any possible impacts from the PBP.
- The EMS is concerned about maintenance of the natural (unstocked) forest buffer zone between the PBP and conservation forest to the east of the site. Should the village population expand and/or the demand for land for shifting and/or upland agriculture expand, increased pressure can be expected on the unstocked forest and eventually on the conservation forest. The EMS recommends that the EBS focus on this buffer zone and the conservation forest to attempt to measure current use of both of these areas.
  - The spacing of trees on the currently planted 10 ha at this PBP site is  $2 \times 3 \text{ m}$  on 8 ha (1,666 trees per ha), and  $2 \times 5 \text{ m}$  on 2 ha. Intercropping is anticipated on the 2 ha with 2 x 5 m spacing (1,000 trees per ha). As recommended by project preparation documents, the preferred spacing for retaining some natural ground cover is  $2 \times 4 \text{ m}$ , or 1,100 trees per ha, that still will allow investors to benefit from tax incentives provided by the 1996 Forestry Law. The  $2 \times 3 \text{ m}$  spacing is expected to allow for little or no natural ground cover, that may result in soil erosion. The EMS recommends that the current spacing being promoted by the project be reviewed and a  $2 \times 4 \text{ m}$  spacing be encouraged.

#### Ban Beungbouathong, Mouang Xaibouly

<u>Conclusions</u>: The site is well located for the establishment of a fast growing tree plantation. The area is isolated from the community and a reasonable distance from any water bodies and wells that might be impacted. The Lotus Pond and Beungbouathong are both located sufficiently distant from the PBP and are not expected to be impacted Sufficient unstocked (degraded) and protected forests remain in the immediate area of the village, so that the 14 ha PBP is not expected to impact on the socio-economics of the village. The parcel carved out of the south-east corner of the PBP should not be effected by the plantation, and ecologically may be considered part of the plantation. Crops planted in the 100 m wide ban running parallel to the highway also are not expected to be impacted by the plantation.

<u>Cautions/Considerations/Recommendations</u>: The appropriateness of the PBP site notwithstanding, the project should take into considerations the following points:

- In discussions with villagers working at the PBP site, the EMS was informed that DAFI had established 100 ha plantation on unstocked forest lands allocated to the village; and were planning to expand their activities in the same area. Provincial Project Coordinating Unit staff informed the EMS that the DAFI and other plantations planned by private firms were being established, without any STP or EBS being completed prior to planting. The establishment of such plantations without careful site assessment will endanger the industrial tree plantations project, particularly if plantations are located on lands not appropriate for this activity; or, if insufficient unstocked forest lands remain to meet present and future need of wood and non-wood forest products of villagers. The EMS recommends that the EBS be designed so as to provide a careful inventory of remaining unstocked forest areas, and that they be located (as accurately as possible) on 1 : 100,000 scale maps that will be part of the EBS.
- The DAFI plantation was not visited by the EMS on this field trip. The description of its location however indicated that it was closer to the village of Ban Beungbouathong and to the two important water bodies located in the village (the Lotus Pond and the Beungbouathong). The EMS recommends that the DAFI plantation be carefully located on a map and visited during preparation of the EBS.
- Although access to the protected forest is not forbidden, villagers likely have been able to provide for most if not all of their need for forest and non-wood forest products from unstocked forests allocated to the village. With the establishment of the PBP, the DAFI plantation, the Burapha plantation, and the anticipated expansion of the DAFI plantation, villagers may be required to increase their dependence on these products from the protected forest. The EMS recommends that the source of forest products of villagers from Ban Beungbouathong be carefully monitored as part of the environmental monitoring system to assess the impact of reduced access to unstocked forests as a result of establishment and expansion of industrial tree plantations.

# 4.1.2 Bolikhamsai Province

# Ban Songkhonmai, Mouang Borikhan

<u>Conclusions:</u> The site is not the best for an industrial tree plantation, but is a good site at which the project can demonstrate spacing and the use of natural cover to control erosion. The site is more typical (than those in Savannakhet, which are located on flat lands) of the type of undulating land that will be most available for plantations. The 5-10 m distance between the paddy lands and the PBP should be sufficient to mitigate impacts to the wet season rice crop, so long as a buffer of natural vegetation is retained between the two areas.

<u>Cautions/Considerations/Recommendations</u>: The project should give special attention to PBP sites such as that at Ban Songkhonmai, in light of the presence of the wet season drainage channel on the site. Particularly, the following recommendations are offered:

• In that the PBPs are demonstration plots, the project can address the issue of steep (greater than 15 degrees) slopes (particularly those along drainage channels) in several ways, including, but not limited to: establishing spacing trials, that would demonstrate that 2 x 4 m, 2 x 5 m, or 2 x 6 m spacing can be used to allow natural growth to return to the steep sloped areas, while maintaining tree production.

- In some areas, particularly those that have been cleared but have not yet been planted, the project could advise PPCU staff to allow natural ground cover to return to steep sloped areas.
- Prior to the next planting season (beginning in June 1996) the EMS will issue preliminary guidelines that the project should have translated into Lao, that will ensure minimum compliance to ADB recommendations, ensuring that mitigation measures are implemented with the second set of PBPs.
- Should steep-sloped areas that have been cleared and those that have been planted begin to show signs of erosion during the 1996 wet season, the project immediately should instruct PPCU staff to increase spacing between trees, from the 2 x 3 m currently planted, to 2 x 5 m or 2 x 6 m, so as to ensure accelerated natural regeneration of native ground cover, even if this ground cover is in competition with the young trees.

#### Ban Phonsavan, Mouang Thaphabath

<u>Conclusions</u>: The site is well located for the establishment of a fast growing tree plantation. The area is isolated from the community, and thus from wells and other sources of drinking water. The site is typical of the type of undulating land that generally is available for plantations in Bolikhamsai province. From initial observations, any large economically important trees had been removed from the site and no young trees appeared to have survived land clearing.

<u>Cautions/Considerations/Recommendations</u>: Having been one of the sites planted in 1995, prior to careful consideration of environmental factors, the PBP site will require more intensive management if it is to be used as a model for commercial tree plantations. Specifically, the following actions should be considered:

- As much natural vegetation should be returned to the site as possible, taking into consideration plantation management principles. If natural vegetation does not return to the slopes of the drainage channel that crosses the site, project intervention may be necessary through assisted natural regeneration.
- If necessary, native species of trees should be replanted on the site to contribute to restoring an ecological balance to the site. The unstocked forest adjacent to the PBP site should be considered as a source of plant material for native tree and shrub species.
  - The intercropping with bananas should be expanded. The banana trees could be planted on slopes along the drainage channel along with native species of shrubs and native fast growing tree species.

# Ban Phabath, Mouang Thaphabath

<u>Conclusions</u>: The topography of the land at this site is appropriate for a tree plantation. The good quality sandy alluvial soils at this Mekong River location make it an appropriate site at which to demonstrate inter-cropping of trees with fruit trees, vegetables, and legume crops. The tree plantation is anticipated to do well at this site due in large part to the good quality of the soil. The seasonal stream that drains the area is well protected by a natural buffer. The protected forest across the seasonal stream to the west of the site may come under increased pressure from nearby villages who in the past depended on the degraded forest that covered the plantation site for sources of wood and non-wood forest products and wildlife. In addition, more care could have been taken during land clearing to ensure that economically important trees and large trees were retained on the site.

<u>Cautions/Considerations/Recommendations</u>: From an agro-economic, agro-ecological, and environmental perspective if this location was to be cleared for agriculture production, cultivation of horticulture crops would have been a more appropriate use. Nevertheless, this riverine land with rich alluvial soils should provide a good quality tree plantation. The project also should take into consideration the following points:

- The protected forest across the seasonal stream to the west of the site should be monitored close during routine environmental monitoring of the plantation site to determine if logging, encroachment for agriculture production, and/or over-hunting, overgrazing, and over-harvesting of non-wood forest products are taking place.
- The project should ensure that the integrity of the natural buffer zone between the plantation and the seasonal stream, as well as that between the plantation site and the Mekong River be maintained. Not maintaining this natural buffer could lead to soil erosion caused by heavy rains during the monsoon season.
- The project may want to consider assisted natural regeneration of native tree species in buffer areas, to replace some local species of native vegetation that were removed during land clearing.

#### 4.1.3 Vientiane Province

#### **Ban Phontong, Mouang Phonhong**

<u>Conclusions</u>: The Ban Phontong site is the most challenging site the project has selected as a PBP, from both an environmental and management perspective. The undulating topography of the land; water bodies inside the site and adjacent to the site; paddy fields inside the site; location of the plantation within 200 meters of the village and 300 meters from a water well that is the sole source of drinking water for the village; removal of nearly all natural vegetation from the site, other than on sloped areas leading to drainage channels; and, the fact that it is the largest PBP established to date (52 ha), all are factors that will require a more intensive level of plantation management, mainly to ensure that negative environmental impacts are minimized. The project also should monitor this site is very closely to ensure that if implementation of mitigation measures is necessary, they are carried out with reasonable speed, to minimize negative environmental impacts. In addition, in that this area is the first area for planting upland rice (the government allocated site is located some 20 kilometers away) that villagers from Ban Phontong have had that is close to their village, getting the villagers to stop rice planting inside the plantation site after 2-3 years may be difficult. In fact trees may be sacrificed for space to plant upland rice.

<u>Cautions/Considerations/Recommendations</u>: Although the site is seen as a management challenge, it is typical of many sites available for establishment of tree plantations in Vientiane Province and Vientiane Municipality. The project and eventually DOF will need to develop plantation establishment and management techniques as well as community development processes that will allow DOF to support, and the private sector to establish, tree plantations at similar such sites. Consideration should be given to several points in regards to the Ban Phontong site, including:

- It is recommended initially that environmental monitoring of selected factors take place at this site on a quarterly basis. This should not be too difficult as the PPCU officer responsible for this site should be visiting the site regularly, both to follow up on the status of the plantation as well as to bring villagers and private sector representatives from the area who are interested in establishing tree plantations to visit the PBP. A detailed environmental monitoring program for this site should be developed, so that abbreviated monitoring of selected factors can be conducted more frequently than on an annual basis.
- Due to the undulating topography of the land at this site, typical of the Vientiane Plain, monitoring soil erosion resulting from monsoon rains should be a key element of the monitoring activity at this site. Since most natural vegetation was removed from the site (including economically valuable large and small trees), the project initially should monitor this site more carefully than others to determine if soil erosion takes place. In addition, natural and man-made water bodies, as well as paddy fields are located inside the site; and, much natural vegetation has been removed from along drainage channels and water bodies. If natural ground cover vegetation is regenerated quickly, thus contributing to erosion control, and once new drainage patterns have been established and natural vegetation returns to the site, intensive (quarterly) monitoring can be reduced.
- As a result of the plantation being located within 200 meters of a village and 300 meters from a water well that is the sole source of drinking water for the village, impacts of the plantation on the village should be monitored carefully. Fire protection for the village should be undertaken as a village development activity, organized by the project, but implemented by the villagers themselves. Also, although the main body of the plantation is located more than one kilometer from the village and likely will not have an impact on the drinking water well, the potential impact of the plantation on the water well should be monitored intensively during each long dry season. If necessary, mitigation measures for dealing with this situation should be developed with the participation of the villagers.
- The project should consider providing site specific plantation management training for PPCU and MES personnel for this site. Because of the large number of environmental factors at this site that make it a management challenge, PPCU personnel should be given special classroom and field instruction on how to deal with each environmental factor that may be impacted as result of plantation establishment, at this specific location.
- As a result of nearly all natural vegetation being removed from the site during land clearing, other than on sloped areas leading to drainage channels, the project should consider implementing an assisted natural regeneration activity. This should include planting of native tree species in buffer areas, to replace the economically valuable trees that were removed during land clearing.
- One of the benefits that villagers in Ban Phontong have derived from the project is access to land on the PBP, that they have used to cultivate upland rice. In that villagers from Ban Phontong have not had easy access to land for rice production since they moved into this village (having been resettled here in the 1970s), they may decide to continue upland rice production on the plantation site due to its close proximity to the village. The project should be aware that they may decide to sacrifice trees, thus allowing them to continue planting rice, once the trees grow too tall to allow intercropping. This may be an important point for discussion between villagers and the project. If this situation arises, the project will be required to develop one or more village development processes to address this problem. The project should explore opportunities to have the Agriculture Promotion Bank provide credit

to farmers in this village for investments in on-farm, but non-rice, income generating activities. Such projects could include, but not be limited to small livestock raising; cage culture of fish; kitchen gardens, with surpluses to be marketed; and, production of horticulture crops that are appropriate for family-based micro-enterprises (such as chili peppers, garlic, bananas, etc.).

#### Ban Phonkham, Mouang Thoulakhom

<u>Conclusions</u>: Although the topography of this site is undulating, it is seen as a satisfactory site for a tree plantation. Access can be somewhat difficult during the wet season, but not impossible. This site is located 2 km from the village of Phonkham, sufficiently isolated from the village so as to not to impact on community activities. Unfortunately natural vegetation was not left standing on steep slopes nor as a buffer along the banks of the perennial stream that flows immediately adjacent (15 <u>meters</u> distance) to the site. All economically valuable small trees and any large trees had been removed from the site during land clearing. Although the site is small (8.2 ha), soil erosion during the monsoon season may have a negative impact on topsoil and result in contributing to sedimentation of the adjacent perennial stream.

<u>Cautions/Considerations/Recommendations</u>: With the use of proper tree plantation management techniques, this plantation could be successful. Several points related to environmental management should be taken into consideration, mainly:

- The spacing of trees on steep slopes should be reduced if necessary, allowing for natural regeneration of ground cover and native vegetation as quickly as possible. In addition, the project should consider implementing assisted (or accelerated) natural regeneration on the steepest slopes, using native species of economically important trees, planted with the native vegetation. The main reason for promoting natural vegetation to regenerate on steep slopes is to attempt to minimize soil erosion during the monsoon season and prevent increased sedimentation of the immediately adjacent perennial stream.
- A buffer zone between the plantation and the Huay Nam Ang perennial stream, located 15 <u>meters</u> to the east of the plantation, should be established as quickly as possible. If necessary, the project should undertake an immediate program of assisted natural regeneration along this stream, at all locations where a buffer zone has been removed and is immediately adjacent to the PBP site. A buffer zone of at least 20 meters should be maintained. Establishing a buffer zone will contribute to minimizing the negative environmental impact of sedimentation occurring in the Huay Nam Ang stream. As noted, this stream is used for watering of livestock, irrigating paddy fields during the monsoon season, and for irrigating vegetable gardens during the cool season.
- Applying accelerated natural regeneration techniques, using native species of economically important trees in all buffer zones, will contribute to restoring some of the native vegetative cover and contribute stabilizing the ecological balance at the site.
- The project should consider using tropical legumes as a ground cover crop between rows of trees inside the plantation, during early stages of tree development, if signs of serious erosion appear. Use of legume ground cover (hamata, centrosema, siratro, etc.) beginning in the first wet season following plantation establishment, would serve two purposes, mainly: by contributing to the accelerated natural regeneration of ground cover, it would help to control soil erosion during the monsoon season; and, as legumes, the planted ground cover would add nitrogen to the soil and thus contribute to the natural fertility of plantation soils. Tropical

legumes are used elsewhere in the region both as a ground cover in para-rubber tree plantations and as part of a mix of tropical grass seeds planted in pastures for livestock grazing. Plant material and seeds for tropical legumes is available at Department of Livestock research and development centers in Thailand, two of which are located within 50 km of Vientiane; one in Nongkhai province and another in Udon Thani province.

#### 4.1.4 Vientiane Municipality

#### Ban Nakha, Mouang Naxaithong

<u>Conclusions</u>: Based on the information provided and the observations of the Environmental Monitoring Specialist, this site appeared to be satisfactory for a PBP. The site is easily accessible by all-weather road and is located a reasonable distance from the village. The site was cleared in the 1970s and used for upland agriculture, but has been used much less intensively following the relocation of those occupants. The site belongs to the local temple (and could thus be considered public land) and is therefore an appropriate site for a demonstration plantation. Due to the high level of private land ownership in the area, compounded by the still relatively simple living conditions of the villagers, the conservation forest that is located to the east of the site may be threatened as a result of establishment of the tree plantation. With the withdrawal of the plantation site as a source of non-wood forest products for food and small trees cut as posts for sale in local markets, the conservation forest is likely to come under increasing pressure from villagers who are dependent on these forest resources for food and off-farm cash income. Contributing to this situation is the fact that other degraded forest in the area is privately owned (actually privately leased from the local temple).

<u>Cautions/Considerations/Recommendations</u>: The appropriateness of the PBP site notwithstanding, the project should take into considerations the following points:

- Sources of non-wood forest products and posts should be monitored carefully as part of the annual environmental monitoring of the plantation site. Should the source of these products differ significantly from the information collected in the baseline STP or the EBS, more careful follow up of the situation will be required. The important point is to determine if additional pressure is being placed on the nearby conservation forest as a result of establishment of the tree plantation.
- Similarly, the source of thatch and the area used for grazing should be examined carefully in the course of environmental monitoring. This is necessary since the tree plantation site was used by local villagers as a source of thatch and as a grazing area for large livestock prior to establishment of the PBP.

#### 4.2 Issues for Consideration

#### 4.2.1 Land Clearing

The most serious environmental problem encountered in the course of undertaking the Environmental Baseline Surveys is that of land clearing. Academic training of foresters worldwide traditionally has taught that land clearing and leveling (if possible) should be thorough. Only recently have environmental factors been taken into consideration. As a result, at most sites,

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villagers failed to understand the need to retain local species of native vegetation, particularly young trees on the plantation sites. Instead, land was cleared by hand, burned, then mechanically cleared. Much native vegetation (including local species of trees) was removed from every site. In some places buffer areas of native vegetation and ground cover separating the plantation site from drainage channels, streams, water bodies, and agricultural lands adjacent to the sites, were removed.

The Environmental Monitoring Specialist brought these issues to the attention of project managers throughout 1996; and, the project has taken action to address these issues as appropriate. The project has reviewed and reconsidered its land clearing techniques and guidelines, and is improving site establishment supervision by site supervisors; mainly PPCU personnel. The project has developed and trained project personnel in the use of a set of "Preliminary Environmental Guidelines for Plantation Forestry Operations" (Environmental Monitoring System Report, Appendix 1); and, has developed a user-friendly environmental monitoring system, that will contribute to the long term process of re-training foresters to be environmentally sensitive. Changing habits and techniques learned over a long period is a learning process that will take time.

# 4.2.2 Spacing of Trees

Based on observations at the PBP sites, tree spacing appears to be standard for trees at each plantation, without taking into consideration micro-level topographic conditions, such as steep slopes. Although standardized guidelines for spacing in tree plantations are necessary, the guidelines should be sufficiently flexible to ensure that spacing can be altered for planting of trees on steep slopes. A wider spacing would allow for the natural regeneration of ground cover on these slopes, providing natural protection against soil erosion.

Improved management of tree spacing alone would help to mitigate some of the problems related to removal of native vegetation and ground cover during site clearing. Promoting the natural regeneration of local vegetation and tree species, would contribute to the slowing down of monsoon run-off that can cause serious soil erosion and sedimentation of streams, water bodies, and rice paddies. The planting of tropical legumes at points of serious erosion or potentially serious erosion if necessary would also serve to mitigate soil erosion.

# 4.2.3 Pressure on Protected and Conservation Forests

At many tree plantation sites, protected, conservation, sacred, or other types of preservation forests can be found, either immediately adjacent to, or nearby the plantation sites. With the withdrawal of degraded forest areas for establishment as tree plantations, other forests will be required to absorb human pressures from largely hunter-gatherer rural communities. If another area of degraded forest is nearby, these pressures likely will be absorbed by these unstocked forests. If however, degraded forests are not readily available, establishment of a tree plantation may result in additional pressure on the protected and other preserved forests.

One way of mitigating this situation is to ensure that buffer zones of natural vegetation are retained at each tree plantation site that is established near a protected forest hectare. The project has demonstrated this well at the Ban Phonsim PBP, Savannakhet province. In addition, buffer zones left along streams, drainage channels, and water bodies, as well as buffer zones randomly

retained around the plantation site, can serve as a source of some forest products as well as prevent soil erosion and contribute to the local ecological balance.

#### 4.2.3 Ban Phontong, Vientiane Province

In that this site among the 8 PBP sites is the most challenging from both an environmental and a plantation management perspective, it will require special attention as pointed out above. One portion of the plantation is located surrounds the water bodies, paddy fields, and steeper slopes, while however, the site may be considered satisfactory as a tree plantation. The relatively high dependency of the village on the village well, water bodies, and paddy fields however, as well as the location of a potential fire hazard so close to the village, should have been a warning to the project that any portion of the plantation should be located further away from the village. These issues notwithstanding, the site will serve as an excellent training ground for both plantation management and environmental monitoring.

As recommended above, this site will require intensive tree plantation management as well as more frequent environmental monitoring. Careful consideration should be given to the development of mitigation measures for this site, in anticipation of the occurrence of negative environmental impacts.

#### 4.2.4 Soils Quality and Analysis

The analysis of soils from each tree plantation site is recommended at the time of the environmental baseline survey. The collecting of soils samples and conducting of soils analysis was not undertaken in the course of the 1996 EBS at the first eight PBPs. The Department of Forestry does not operate a soils analysis laboratory. Such analyses can be conducted by either the Irrigation Department or the Agriculture College at Dong Dok, both of which charge a fee for this service.

The purpose of undertaking soils analysis at each site is to determine the structure and characteristics of the soil at the time of the baseline environmental survey. Such analyses should be repeated every two years to determine if the quality of the soil has been changed as a result of establishment of the tree plantation. In addition, it is recommended that topsoil depth be measured at several points in each plantation during the EBS (prior to establishment of the tree plantation), and that it be measured annually at the same points, to determine if topsoil is being lost due to soil erosion.

The project has decide to proceed with laboratory testing of soils from all PBP sites, including the sites planted in 1995 and 1996, and those planned for 1997. The project also will require that soils samples be collected, tested, analyzed and reported on the EBS form, from all proposed private sector sites, prior to plantation establishment. Soils tests and analyses conducted on samples collected during subsequent environmental monitoring, will be compared to results obtained from the EBS and differences noted. In this way sufficient evidence of positive or negative impacts, if any, will be identified. The scientific accuracy of the results should be sound and therefore acceptable to environmentalists, villagers, and scientific communities.

# APPENDIX I

# Lao-ADB Plantation Forestry Project Environmental Baseline Survey Form

# Lao-ADB Plantation Forestry Project Environmental Baseline Survey Form<sup>1</sup>

The information for items 1-7 is already available on the STP form.

1.	Date of EBS:	
2.	Province:	
3.	District:	
4.	Village:	
5.	Responsible:	
6.	Participants	

I. PCU	2. PPCU	3. Villagers
		·
	~	

#### 7. BRIEF DESCRIPTION OF THE PROPOSED PLANTATION SITE AND THE AREA AROUND THE VILLAGE (This section will describe the proposed plantation site from an environmental perspective.)

# 

#### DATA TO BE OBTAINED FROM THE VILLAGE

#### 8. LAND DATA

(The purpose of this section is to provide data related to the status and location of the proposed plantation site, and how the land is currently used.)

8.1 Official status of the plantation site: Public land:

(Current official classification)

Private land:

(Name and address of owner)

8.2 Location of the site: (Use map attached to STP to indicated environmental details as noted.)

Date of Form: March 1997

- 8.2.1 Area of the proposed plantation site: \_\_\_\_\_ ha.
- 8.3 Current land use

# 9. SITE LOCATION DATA

(The purpose of this section is to determine how the proposed plantation site is ecologically and socially linked to the village.)

- 9.1 Distance of the plantation site from the village: \_\_\_\_\_ km
- 9.2 Distance of the plantation site from water bodies and wells:
- 9.2.1 Water bodies

Water Body	Name	Distance from Plantation Site (km/m/inside site)	Used as Source of Water for Village (drinking/household use)	
Rivers			[] used [] not used	
			[] used [] not used	
Streams			[] used [] not used	
	[] perennial [] seasonal		[]used []not used	
	[] perennial [] seasonal			
Natural ponds				
	[] perennial	· ·	[] used [] not used	
	[] seasonal [] perennial [] seasonal		[] used [] not used	
Constructed ponds (Reservoirs created as a result of small dams,	[] perennial		[] used [] not used	
spillways, weirs, or other irrigation structures)	[] seasonal [] perennial [] seasonal		[]used []not used	
Other water bodies	[] boubonai		[] used [] not used	
	[] perennial [] seasonal		[] used [] not used	
	[] perennial [] seasonal			

9.2.2 Wells (Identify by number on attached detailed map, e.g.	WI,	W2, etc.)
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Well No. Distance	e from Proposed Planta	ation Site
W1		km or m or inside site
W2		km or m or inside site
W3		km or m or inside site
W4		km or m or inside site
W5		km or m or inside site
9.2.3 Fish ponds ( <i>Id</i>	dentify by number on a	attached detailed map, e.g. F1, F2, etc.)
Pond No. Owne	r & <u>Village</u>	Distance from Proposed Plantation Site
F1		km or m or inside site
F2		km or m or inside site
F3		km or m or inside site
F4		km or m or inside site
F5		km or m or inside site
9.3 Use of area su (Indicate on al	urrounding the propos ttached detailed map)	ed plantation site (within 500 m of the site)
[] stocked natural fore (n,s,e,w)	st[] production forest (n,s,e,w)	[] protected forest (n,s,e,w)
[] sacred forest (n,s,e,w)	[] regenerated forest (n,s,e,w)	[] historical site (n,s,e,w)
[] burial grounds (n,s,e,w)	[] buffer zone (n,s,e,w)	[] conservation forest (n,s,e,w)
[] unstocked forest (n,s,e,w)	[] eroded forest land (n,s,e,w)	[] grassland/grazing land (n,s,e,w)
[] private land (n,s,e,w)	[] forest plantation (n,s,e,w)	[] water body (type:) (n,s,e,w)
[] paddy rice fields (n,s,e,w)	[] saline soils areas (n,s,e,w)	
[]other (specify:		) (n,s,e,w)
#### 10. LAND USE DATA

(The purpose of this section is to obtain data from villagers on the status of forest lands and how they use forest lands allocated to the village. Information obtained from the STP also is relevant to this section.)

10.1	Area of flood prone la	nd	ha	
10.2	Area of saline soils (in by the village)	cluding salt flat	s being used ha	
10.3	Area for grazing		ha	
10.4	Distance from village	to closest:		
Stocked	natural forest:	km	Protected forest:k	m
Conserv	vation forest:	km	Buffer zone (around protected forest):k	m
Product	ion forest:	km	Unstocked forest:k	m
Regene	rating forest:	km	Forest plantation:k	m
Refores	tation area:	km		
10.5	Where do villagers cu	rrently obtain n	nost of their non-timber forest products?	
[] Stoc	ked natural forest	[] Protected for	est	
[] Cons	servation forest	[] Buffer zone (	(around protected forest)	
[] Prod	[] Production forest [] Unstocked forest			
[] Regenerating forest [] Forest plantation				
[] Reforestation area				
10.6	10.6 Average number of trips villagers make to forest to obtain non-timber forest products:			
	Dry season (November - April): trip(s) per			

Wet season (May - October): \_\_\_\_\_ trip(s) per \_\_\_\_\_

4

10.7 Types of non-timber forest products mos	frequently	y obtained:
--	------------	-------------

[] bamboo	[] bamboo shoots	[] mushrooms
[] wildlife	[] forest vegetables	[ ] fish
[] forest fruit	[] tree leaves	[] insects
[] insect eggs	[] bird eggs	[] medicinal roots
[] medicinal plants	[] chewing roots	[] root crops
[] honey	[] stick-laq	[] gum products
[] rattan	[] grasses	[]

10.8 Non-timber forest products most frequently obtained from proposed plantation site:

[] bamboo	[] bamboo shoots	[] mushrooms
[] wildlife	[] forest vegetables	[ ] fish
[] forest fruit	[] tree leaves	[] insects
[] insect eggs	[] bird eggs	[] medicinal roots
[] medicinal plants	[] chewing roots	[] root crops
[] honey	[] stick-laq	[] gum products
[] rattan	[] grasses	[] fuel wood
[] fence wood	[]poles	[]

10.9 Village use of proposed plantation site and availability and location of alternative sites:

## [] grazing land

alternative site [] available; distance from village:	km or m or inside
[] unavailable	
[] shifting agriculture	
alternative site [] available; distance from village:	km or m or inside
[] unavailable	
[] permanent upland agriculture	
alternative site [] available; distance from village:	km or m or inside
[] unavailable	
[] source of non-wood forest products	
alternative site [] available; distance from village:	km or m or inside
[] unavailable	
[] other (specify)	•
alternative site [] available; distance from village:	km or m or inside
[] unavailable	

#### 11. WILDLIFE DATA

(The purpose of this data is to determine the impacts on wildlife of the establishment of the tree plantations, due primarily to the loss of habitat. Emphasis is placed on endangered species and wildlife consumed by villagers as part of their normal diet.)

11.1 Number of species and size of population of animals, including fish and game species (*This data will be obtained from villagers familiar with the area.*):

List of wildlife found in forest areas allocated to the village:

	Animals and Fish	Sightings or Evidence of Presence			ce
		Frequent	Infrequent	Rare	Never
1.	Bengteng	[]	[]	[]	[]
2.	Guar	[]	[]	[]	[]
3.	Bear	[]	[]	[]	[]
4.	Brown antlered deer	[]	[]	[]	[]
5.	Hog deer	[]	[]	[]	[]
6.	Gibbons	[]	[] .	[]	[]
7.	Langur	[]	[]	Ĺ)	[]
8.	Deer	[]	[]	[]	[]
9.	Barking deer	[]	[]	[]	[]
10.	Otters	[]	[]	[]	[]
11.	Lesser mouse deer	[]	[]	[]	[]
12.	Hog-nosed badger	[]	[]	[]	[]
13.	Ferret badger	[]	[]	[]	[]
14.	Pangolin	[]	[] .	[]	[]
15.	Monkeys	[]	[]	[]	[]
16.	Fishing cat	[]	[]	[]	[]
17.	Wild dog	[]	[]	[]	[]
18.	Squirrels	[]	[]	[]	[]
19.	Bamboo rat	[]	[]	[]	[]

11.1 List of wildlife found in forest areas allocated to the village (continued):

	Animals and Fish	Sightings or Evidence of Presence			
		Frequent	Infrequent	Rare	Never
20.	Porcupine	[]	[]	[]	[]
21.	Brush-tailed porcupine	[]	[]	[]	[]
22.	Giant flying squirrel	[]	[]	[]	[]
23.	Water monitor	[]	[]	[]	[]
24.	Yellow tree monitor	[]	[]	[]	[]
25.	Calotes spp	[]	[]	[]	[]
26.	Trionyx spp	[]	[]	[]	[]
27.	Testudo spp	[]	[]	[]	[]
28.	Fish	[]	[]	[]	[]
29.	Pied hombill	[]	[]	[]	[]
30.	White breasted waterhen	[]	[]	[]	[]
31.	Intermediate egret	[]	[]	[]	[]
32.	Cattle egret	[]	[] .	[]	[]
33.	Parakeets (Psittacula sps)	[]	[]	[]	[]
34.	Ducks (Anas sps)	[]	[]	[]	[]
35.	Doves (Strepelia sps)	[]	[]	[]	[]
36.	Red jungle fowl	[]	[]	[]	[]
37.	Owls (Glaucidium sps)	[]	[]	[]	[]
38.	Woodpeckers	[]	[]	[]	[]
39.	Pheasants	[]	[]	[]	[]
40.	Partridge (Arborophila)	[]	[] ·	[]	[]

7

#### 11.2 Extent and quality of wildlife habitat:

(This information should be obtained from wildlife specialists familiar with the wildlife and habitats in the area of each proposed plantation. In the case of the Lao-ADB Plantation Forestry Project in Lao PDR, DOF has wildlife specialists engaged on projects funded by IUCN, the Wildlife Conservation Society, and other bilateral and NGO donors who will be consulted to obtain and record this information in the space below or as an attachment to the EBS. Specific information should be obtained for each district, province, and/or region in which a large scale plantation, one of more than 100 ha., is established.)

#### 12. UNIQUE AREAS

(The purpose of this section is to identify areas of special, scientific, cultural, historical, religious, recreational, or scenic importance, including sacred forests, historic sites, unique flora or fauna, archaeological sites, hot springs, ritual areas, or traditional monuments.)

12.1 Inventory of all sites in the village and surrounding areas (*data to be obtained directly from villagers*).

12.1.1 Name of Site:
Type of Site:
Location (Identify by number on attached detailed map, e.g. U1, U2, etc.): U
Description of Current State of the Site :
Potential Hazards to the Site:
·
12.1.2 Name of Site:
Type of Site:
Location (Identify by number on attached detailed map, e.g. U1, U2, etc.): U
Description of Current State of the Site :
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#### DATA TO BE OBTAINED FROM THE PROPOSED SITE

- 13. <u>PHYSICAL CONDITIONS DATA</u>(The purpose of this section is to describe the physical conditions of the proposed plantation site and identify potential environmental problems.)
- 13.1 Approximate degree and area of each sloped area (*Identify location and direction of sloped areas on attached detailed map, e.g. S1, S2, etc.*):

Sloped Area No.	Approximate Slope (d	legrees)	Estimated Area (ha)
S1	degrees		ha
Slope leads to	:		
[] perennial stream	[] river	[] natural pon	d/wetland
[] seasonal stream	[] drainage channel	[] fish pond	
[] rice paddy area	[] forest area	[] buffer zone	area
[]	[]	[]	
\$2	degrees		ha
Slone leads to	uegrees		IIa
[] nerennial stream	· []river	[] natural non	d/wetland
[] seasonal stream	[] drainage channel	[] fish pond	
[] rice naddy area	[] forest area	[] huffer zone	area
[]			ureu
·	L]	L]	
S3	degrees		ha
Slope leads to	:		
[] perennial stream	[] river	[] natural pon	d/wetland
[] seasonal stream	[] drainage channel	[] fish pond	•
[] rice paddy area	[] forest area	[] buffer zone	area
[]	[]	[]	
S4	degrees		ha
Slope leads to	<u>.</u>		
[] perennial stream	[] river	[] natural pon	d/wetland
[] seasonal stream	[] drainage channel	[] fish pond	
[] rice paddy area	[] forest area	[] buffer zone	area
[]	[]	[]	
~			
S5 Slope leads to	degrees		ha
[] nerennial stream	[] river	[] natural por	nd/wetland
[] seasonal stream	[] drainage channel	[] fish pond	ia ii viuliu
[] rice naddy area	[] forest area	[] huffer zone	e area
	[]		
L J	L J	L J	

Sloped Area No.	Approximate Slope (	degrees) Estima	ated Area (ha)
S6 Slope leads to	degrees		ha
[] perennial stream	[] river	[] natural pond/wetla	and
[] seasonal stream	[] drainage channel	[] fish pond	
[] rice paddy area	[] forest area	[] buffer zone area	
[]	[]	[]	
S7	degrees	ha	
Slope leads to			
[] perennial stream	[] river	[] natural pond/wetla	and
[] seasonal stream	[] drainage channel	[] fish pond	
[] rice paddy area	[] forest area	[] buffer zone area	
[]	[]	[]	_
S8	degrees	ha	
Slope leads to	<u>:</u>		
[] perennial stream	[] river	[] natural pond/wetla	and ·
[] seasonal stream	[] drainage channel	[] fish pond	
[] rice paddy area	[] forest area	[] buffer zone area	
[]	[]	[]	

13.2 Total number of sloped areas greater than 15 degrees= \_\_\_\_\_ slopes on \_\_\_\_\_ ha

13.3 Drainage channels (Identify by number on attached detailed map, e.g. D1, D2, etc.)

Drainage Channel No.Approximate Length (meters)D1\_\_\_\_\_mD2\_\_\_\_\_mD3\_\_\_\_\_mD4m

#### 14. NATURAL VEGETATIVE COVER DATA

(The purpose of this section is to obtain data related to the natural vegetative cover of the proposed plantation site and to attempt to determine how the local ecology will be effected by establishment of a tree plantation. This baseline information is needed to record changes in the composition and density of natural vegetative cover on the proposed plantation site, as a result of establishment of a tree plantation.)

14.1 Natural Vegetation Cover:

Attach several photos of the proposed plantation site from different perspectives. Photos should be taken from several points, focusing on a fixed marker, that can be used to compare current (pre-

plantation) natural vegetation; with vegetative cover following land clearing; and once again following establishment of the plantation. Photos should be taken once annually, following establishment of the plantation; at the same time that the BME is carried out. Preferably, photos should be taken just before rice harvest time, October through December, when the difference between naturally covered areas and other types of vegetation coverage is clear.

14.2 Quality of natural vegetative cover of site designated for the proposed plantation

[] well stocked forest cover	percent	[] unstocked forest cover	percent
[] scrub forest	percent	[] shrubs	percent
[] thick grass	percent	[] thin ground cover	percent
[] eroded ground cover	percent	[] rocky area	percent
[] other (specify)	percent		
Total vegetative cover			100 percent

14.2.1 Scrub forest and shrub cover percentage (in most cases this will be 100 percent since preferred sites for proposed plantations are unstocked forest lands): percent

14.2.2 Percent of total area covered by crowns of scrub forest trees and shrubs: percent

14.2.3 If crown cover not 100% scrub forest tree and shrub cover, specify composition and density of natural vegetation cover of the proposed site:

List of Dominant and Sub-Dominant Species	Density (percent)
	%
	%
	%
	%
	%

#### 15. **SOILS DATA**

(The purpose of this section is to assess impacts on erosion and soil productivity as a result of plantation establishment.)

15.1 Approximate average depth of topsoil: cm (Average should be calculated based on measuring topsoil depths at a random sampling of points inside the proposed plantation site.)

15.2 Evidence of existing erosion at the proposed tree plantation site: Roots of trees and shrubs are showing: [] yes; number of centimeters: cm []no

Indicate on attached map the approximate location within the proposed plantation site where the roots of trees and shrubs appear above the ground? (Indicate by marking by E1, E2,.. etc.)

15.3 Soil quality in the proposed plantations: Soil samples will be taken by the PPCU or the PCU and analyzed by a local soils laboratory, prior to establishment of the PBP. Soils analysis will be carried out every 2-3 years. Results of the Soils Analysis for basic elements:

pH	=	organic content	=
infiltration rate	=	salinity	=
soil moisture tension	=	toxicity	=

#### **Basic elements**:

=	potassium	=
=	magnesium	=
=	chlorides	=
=	aluminium sulfates	=
=	calcium humus	=
		=potassium=magnesium=chlorides=aluminium sulfates=calcium humus

END

# **APPENDIX II** EBS Summary and Analysis Sheet

### Appendix II

		Vientiane	Vientiane		Boli-			Savannakhet	1
		Municipalit	Province		khamsai			1	
EBS No.	Parameter/ Indicator	Nakha	Phontong	Phon Kham	Phon Savan	Songkhon Mai	Phabaht	Phonsin	Beung - bouathong
and Di	ata .								
8.1	Official status	Unstocked	Fallow	Fallow	Shifting	Shifting	Shifting	Shifting	Shifting
		Forest	Land	Land	Land	Land	Land	Land	Land
8.2.1	Size (ha)	29.56	50.2	10.5	/	17	10.5	30	13.29
8.3	Current land use				I		l		
0 1	Distance	1 5	0.2	15	1 5	23	15	3.5	5
9.1	village (km)		0.2	15		2.5	1.5	3.5	2
92	Distance:	Streams (2):	Pond: inside	Stream:	Stream:	Stream:	Stream:	Nat.	Straam:
	water body/wells	inside	Stream: inside	inside	5 m	30 m	inside	Pond	1 km
	(>1 km)	W1 = 95 m	W1 = 200 m	River = 0.9 km		River: 1.5 km	Mekong =	800 m	River =
	(name/no./km)		F1-F5 =			w1,2,3 =	0.9 km		<b>O</b> = 20 m
			100-250 m			2-3 km			@ = 60 m
9.3	Use of	n=privateland	n=degrad. for.	n=consv. for.	n=degrad.	n=degrad.	n=con. for.	n=cons. for.	n=degraded for.
	surrounding area	s=degrad.	s=nat. for.	s=consv. for.	s=forest	s=paddy	s=con. for.	s=paddy	s=nat. forest, degrad for., paddy
		e=consv. for.	e≈prodn. for.	e=paddy	e=forest	e=paddy	e=paddy	e=cons. for.	e=priv. land
		w=paddy	w=nat. for.	w=consv. for.	w=forest	w=prod. for.	w=con. for.	w=degrad for.	w=sacred for., paddy
Land U	e Data	1 25			1 0				0
10.1	land (ha)	25	0	0	0	0	0	0	U
10.2	Area of saline soils (ha)	0	0	0	0	0	0		0
10.3	Area for grazing (ha)	500	9	8000	574	100	8000	200	370
10.5	Source for most	Consv.	Nat for.	Nat. for	Nat. for	Nat. for	Net. for	Consv. for	Consv. Reg. for
	nontimber forest	forest	Prodn. for.	Consv. for	Consv. for	Consv. for	Consv. for		
	products		Deg. for	Prodn. for	Regen. for	Prodn. for	Prodn. for		
				Deg. for	Prof. for Deg. for	Deg. for	Regen. for		1
10.6	Average no. of	Dry season	Dry season	Dry season	Dry season	Dry season	Dry season	Dry season	Dry season
	trips for nontimber	= 1/day	= 1/day	= 1/ day	= 1/ day	= 1/ day	= 1/ day	= 1/ day	= 1/day
	forest products	Wet season	Wet season	Wet season	Wet season	Wet season	Wet season	Wet season	Wet season
		= 1/ day	= 1/ day	= 1/day	= 1/ day	= 1/day	= 1/day	= 1/day	= 1/day
10.7	Types of non-	bamboo	bamboo,	bamboo,	bamboo,	bamboo,	bamboo,	bamboo,	bamboo, wildlife, food,
	tumber forest	shoots, wild-	wildlife, food,	wildlife, food,	food, wildlife	wildlife,	wildlife, tood	wildlife, food,	medicine, honey
	products obtained	life, truit, food,	medicine	medicine,	medicine,	medicine,	medicine,	medicine,	
	from torest (list)	insecteggs,	Icaves,	unaten	rattan,	poles, lood,	ratian,	ratian,	
		rettan fence	roots		fish	ICaves, IISIL,	grass	grass, gum	
		wood prasses			lish	grass			
		/thatch							
10.8	Types of non-	food, medicine	bamboo, food,	bamboo,	bamboo,	bamboo,	bamboo,	medicine,	bamboo, mushrooms, wildlife,
	timber forest	plants, fence	medicine	for. veg.,	wildlife,	wildlife ,	veg., food,	poles, rattan	food, poles, fish, fuelwood
	products obtained	posts, thatch,	leaves, poles,	leaves,	honey,	medicine,	medicine,	shoots, veg.,	
	from the plantation	poles, gum	fuelwood,	medicine,	rattan, fish,	poles,	fuelwood	leaves, food,	
	site (list)		roots, honey	fuelwood	medicine,	fish, roots,		fuelwood	
		1			fuelwood,	fuelwood			
10.9	Villager use of	grazing, shift	grazing	grazing,	grazing	grazing, shift	grazing, shift	grazing shift	grazing, shift agr., up. agr.,
	plantation site	agr., upland	non-wood for	rice, upland	nce, up. agr.,	agr., up agr.,	agr.	agr., up. agr.,	non-wood torest
		agr.	prod.	crops	non-wood	non-wood,		non-wood	products
WILdur	Dete	1	1	1	Torest prods.	I Ior. prod,	1	Tor. prods.	1
11 1	Animal fish &	Wildnie	Ichicken	T	Inabbits	Ichicken bird	Inabbits rate	wildnig	chipmonks, rats birds
	game species seen	chicken			birds.	snakes, ants	chicken	deer, chicken	mongoose
	most frequently	rabbits, deer,			snakes,	rats, squirrel,	birds	snakes, ducks	
	(list)	birds				rabbits, fish		rat, squirrel,	,
									]
Unique 12	List types of	Itemple	Icremation	1	Inone	sacred area	Itemple	sacred area	sacred area/pond wetlands
	unique area in the village		ground						, , , , , , , , , , , , , , , , , , ,

#### EBS Summary and Analysis Sheet

### EBS Summary and Analysis Sheet

		Vientiane Municipality	Vientiane Province		Boli- Khamsai			Savannakhet	
EBS	Parameter /	Nakha	Phontong	Phon	Phon	Songkhon	Phabaht	Phonsin	Beung-
No	Indicator			kham	Savan	Mai			bouathong
Physical	Conditions Date								
13.2	Sloped Areas	No. 2	No. <u>6</u>	No. 2	No. 2	No. <u>4</u>	No. 2	No. <u>1</u>	No. 0
	(>15 degrees)	Total area:	Total area:	Total area:	Total area:	Total area:	Total area :	Total area:	Total area :
		4.1 ha	1.38 ha	0.15 ha	1.4 ha	4 ha	0.15 ha	0.02 ha	o ha
13.3	Slope most	seasonal	drainage	drain, forest,	forest,	paddy, season	drain, forest,	natural	
	frequently leads to	stream	paddy, nat	paddy	seasonal	stream, drain	paddy	pond	
	(name):		pond		stream				
13.4	Total no. of	No. 2	No. 6	No. 2	No. 2	No4	No. 3	No. 0	No. 0
	drainage channels	Length	Length	Length	Length	Length	Length	Length	Length
	& length (m)	<u>1,500</u> + m	<u>720</u> m	<u>100</u> m	<u>550</u> m	<u>1,220</u> m	<u>100</u> m	<u>0</u> m	<u>0</u> m
Zeneral Data									
Vegetat	ive Cover Data								
Vegetat	Vegetative cover	1. Shrubs 40%	1. Scrub = 60	1. unstocked	1. unstocked	1. unstocked	1. unstocked	1. unstocked	1. unstocked
Vegetat 14.1	Vegetative cover (list highest 3 in	1. Shrubs 40% 2. unstocked	1. <u>Scrub = 60</u> 2. unstock=30	1. <u>unstocked</u> 75 %	1. unstocked forest 60%	1. unstocked forest 70%	1. <u>unstocked</u> 75%	1. <u>unstocked</u> 50%	1. <u>unstocked</u> 30%
Vegetat 14.1	Vegetative cover (list highest 3 in terms of %)	1. Shrubs 40% 2. unstocked forest 30%	1. Scrub = 60 2. unstock=30	1. <u>unstocked</u> <u>75 %</u> 2. shrubs	1. unstocked forest 60% 2. shrubs	1. <u>unstocked</u> forest 70% 2. shrubs	1. <u>unstocked</u> <u>75%</u> 2. shrubs	1. <u>unstocked</u> <u>50%</u> 2. nat. for	1. <u>unstocked</u> <u>30%</u> 2. shrubs
Vegetat 14.1	Vegetative cover (list highest 3 in terms of %)	1. <u>Shrubs 40%</u> 2. <u>unstocked</u> <u>forest 30%</u> 3. grass 20 %	1. <u>Scrub = 60</u> 2. <u>unstock=30</u> 3.	1. <u>unstocked</u> <u>75 %</u> 2. <u>shrubs</u> 10 %	1. <u>unstocked</u> forest 60% 2. <u>shrubs</u> 30 %	1. <u>unstocked</u> <u>forest 70%</u> 2. <u>shrubs</u> 25 %	1. <u>unstocked</u> 75% 2. <u>shrubs</u> 10 %	1. <u>unstocked</u> <u>50%</u> 2. <u>nat. for</u> <u>30 %</u>	1. <u>unstocked</u> <u>30%</u> 2. shrubs <u>30 %</u>
Vegetat 14.1	Ive Cover Data Vegetative cover (list highest 3 in terms of %)	1. Shrubs 40% 2. unstocked forest 30% 3. grass 20 %	1. <u>Scrub = 60</u> 2. <u>unstock=30</u> 3	1. <u>unstocked</u> <u>75 %</u> 2. shrubs <u>10 %</u> 3. thin ground	1. unstocked forest 60% 2. shrubs <u>30</u> % 3. thin ground	1. <u>unstocked</u> forest 70% 2. s <u>hrubs</u> 25 % 3. thin ground	1. <u>unstocked</u> 75% 2. shrubs <u>10 %</u> 3. thin ground	1. <u>unstocked</u> 50% 2. <u>nat. for</u> <u>30 %</u> 3. scrub. for	1. <u>unstocked</u> <u>30%</u> 2. shrubs <u>30 %</u> 3. scrub 20%
Vegetat 14.1	Ive Cover Data Vegetative cover ( list highest 3 in terms of % )	1. Shrubs 40% 2. unstocked forest 30% 3. grass 20 %	1. <u>Scrub = 60</u> 2. <u>unstock=30</u> 3	1. <u>unstocked</u> <u>75 %</u> 2. shrubs <u>10 %</u> 3. thin ground cover	1. unstocked forest 60% 2. shrubs <u>30</u> % 3. thin ground cover	1. <u>unstocked</u> forest 70% 2. <u>shrubs</u> <u>25 %</u> 3. <u>thin ground</u> 5 %	1. <u>unstocked</u> 75% 2. shrubs <u>10 %</u> 3. thin ground 10 %	1. <u>unstocked</u> <u>50%</u> 2. nat. for <u>30 %</u> 3. scrub. for cover	1. <u>unstocked</u> <u>30%</u> 2. shrubs <u>30 %</u> 3. scrub 20% thin ground cover
Vegetat 14.1	Ive Cover Data Vegetative cover ( list highest 3 in terms of % )	1. Shrubs 40% 2. unstocked forest 30% 3. grass 20 %	1. Scrub = 60 2. unstock=30 3	1. <u>unstocked</u> 75% 2. shrubs <u>10%</u> 3. thin ground <u>cover</u> 10%	1. unstocked forest 60% 2. shrubs <u>30</u> % 3. thin ground cover 10%	1. <u>unstocked</u> <u>forest 70%</u> 2. <u>shrubs</u> <u>25 %</u> 3. <u>thin ground</u> <u>5 %</u>	1. <u>unstocked</u> 75% 2. shrubs <u>10 %</u> 3. thin ground <u>10 %</u>	1. <u>unstocked</u> 50% 2. <u>nat. for</u> <u>30 %</u> 3. scrub. for <u>cover</u> 10 %	1. <u>unstocked</u> <u>30%</u> 2. shrubs <u>30 %</u> 3. scrub 20% <u>thin ground cover</u> 20 %
Yegetat 14.1	Ive Cover Data Vegetative cover (list highest 3 in terms of %)	1. Shrubs 40% 2. unstocked forest 30% 3. grass 20 %	1. <u>Scrub = 60</u> 2. <u>unstock=30</u> 3	1. <u>unstocked</u> <u>75 %</u> 2. <u>shrubs</u> <u>10 %</u> 3. <u>thin ground</u> <u>cover</u> <u>10 %</u>	1. <u>unstocked</u> forest 60% 2. <u>shrubs</u> <u>30</u> % 3. <u>thin ground</u> <u>cover</u> <u>10 %</u>	1. <u>unstocked</u> <u>forest 70%</u> 2. <u>shrubs</u> <u>25 %</u> 3. <u>thin ground</u> <u>5 %</u>	1. <u>unstocked</u> 75% 2. shrubs <u>10 %</u> 3. <u>thin ground</u> <u>10 %</u>	1. <u>unstocked</u> 50% 2. <u>nat. for</u> 30 % 3. <u>scrub. for</u> <u>cover</u> <u>10 %</u>	1. <u>unstocked</u> <u>30%</u> 2. shrubs <u>30 %</u> 3. scrub 20% <u>thin ground cover</u> <u>20 %</u>
Vegetat 14.1 Natura	Ive Cover Data Vegetative cover (list highest 3 in terms of %)	1. Shrubs 40% 2. unstocked forest 30% 3. grass 20 %	1. <u>Scrub = 60</u> 2. <u>unstock=30</u> 3	1. <u>unstocked</u> <u>75 %</u> 2. shrubs <u>10 %</u> 3. thin ground <u>cover</u> <u>10 %</u>	1. unstocked forest 60% 2. shrubs <u>30</u> % 3. thin ground cover <u>10</u> %	1. <u>unstocked</u> <u>forest 70%</u> 2. <u>shrubs</u> <u>25 %</u> 3. <u>thin ground</u> <u>5 %</u>	1. <u>unstocked</u> 75% 2. shrubs <u>10 %</u> 3. thin ground <u>10 %</u>	1. <u>unstocked</u> <u>50%</u> 2. <u>nat. for</u> <u>30 %</u> 3. <u>scrub. for</u> <u>cover</u> <u>10 %</u>	1. <u>unstocked</u> <u>30%</u> 2. shrubs <u>30 %</u> 3. scrub 20% <u>thin ground cover</u> <u>20 %</u>
Vegetat 14.1 Natura 14.2	Ive Cover Data Vegetative cover (list highest 3 in terms of %) Vegetation Data List name & % of	1. Shrubs 40% 2. unstocked forest 30% 3. grass 20 % 1. 5 50%	1. <u>Scrub = 60</u> 2. <u>unstock=30</u> 3 1. 2 30%	1. <u>unstocked</u> <u>75 %</u> 2. shrubs <u>10 %</u> 3. thin ground <u>cover</u> <u>10 %</u> 1. 2 20%	1. <u>unstocked</u> forest 60% 2. shrubs <u>30</u> % 3. thin ground <u>cover</u> <u>10</u> % 1. 1 40%	1. <u>unstocked</u> <u>forest 70%</u> 2. <u>shrubs</u> <u>25 %</u> 3. <u>thin ground</u> <u>5 %</u> 1. <u>1 50%</u>	1. <u>unstocked</u> 75% 2. <u>shrubs</u> <u>10 %</u> 3. <u>thin ground</u> <u>10 %</u> 1. 2 30%	1. <u>unstocked</u> <u>50%</u> 2. nat. for <u>30 %</u> 3. scrub. for <u>cover</u> <u>10 %</u> 1. 2 50%	1. <u>unstocked</u> <u>30%</u> 2. shrubs <u>30 %</u> 3. scrub 20% <u>thin ground cover</u> <u>20 %</u> 1. 2 50%
Vegetat 14.1 Natura 14.2	Ive Cover Data Vegetative cover (list highest 3 in terms of %) Vegetation Data List name & % of dominant and	1. Shrubs 40% 2. unstocked forest 30% 3. grass 20 % 15 50% 23 10%	1. <u>Scrub = 60</u> 2. <u>unstock=30</u> 3 1. <u>2 30%</u> 2. 1 30%	1. <u>unstocked</u> <u>75 %</u> 2. <u>shrubs</u> <u>10 %</u> 3. thin ground <u>cover</u> <u>10 %</u> 1. <u>2 20%</u> 2. <u>3 50%</u>	1. <u>unstocked</u> forest 60% 2. <u>shrubs</u> <u>30</u> % 3. <u>thin ground</u> <u>cover</u> <u>10</u> % 1. <u>1</u> 40% 2. <u>3</u> 30%	1. <u>unstocked</u> <u>forest 70%</u> 2. <u>shrubs</u> <u>25 %</u> 3. <u>thin ground</u> <u>5 %</u> 1. <u>1 50%</u> 2. 2 30%	1. <u>unstocked</u> 75% 2. <u>shrubs</u> <u>10 %</u> 3. <u>thin ground</u> <u>10 %</u> 1. <u>2 30%</u> 2. <u>3 25%</u>	1. <u>unstocked</u> <u>50%</u> 2. <u>nat. for</u> <u>30 %</u> 3. <u>scrub. for</u> <u>cover</u> <u>10 %</u> 1. <u>2 50%</u> 2. <u>3 30%</u>	1. <u>unstocked</u> <u>30%</u> 2. shrubs <u>30 %</u> 3. scrub 20% <u>thin ground cover</u> <u>20 %</u> 1. <u>2 50%</u> 2. shrub 10%
Vegetat 14.1 Natura 14.2	Vegetative cover (list highest 3 in terms of %) Vegetation Data List name & % of dominant and subdominant	1. Shrubs 40% 2. unstocked forest 30% 3. grass 20 % 1. 5 50% 2. 3 10% 3. 2 10%	1. <u>Scrub = 60</u> 2. <u>unstock=30</u> 3 1 30% 2 30% 3	1. <u>unstocked</u> <u>75 %</u> 2. <u>shrubs</u> <u>10 %</u> 3. <u>thin ground</u> <u>cover</u> <u>10 %</u> 1. <u>2 20%</u> 2. <u>3 50%</u> 3.Big trees 5%	1. <u>unstocked</u> forest 60% 2. <u>shrubs</u> <u>30</u> % 3. <u>thin ground</u> <u>cover</u> <u>10</u> % 1. <u>1</u> 40% 2. <u>3</u> 30% 3. <u>2</u> 20%	1. <u>unstocked</u> <u>forest 70%</u> 2. <u>shrubs</u> <u>25 %</u> 3. <u>thin ground</u> <u>5 %</u> 1. <u>1 50%</u> 2. <u>2 30%</u> 3. <u>3 20%</u>	1. <u>unstocked</u> 75% 2. <u>shrubs</u> 10% 3. <u>thin ground</u> 10% 1. 2 30% 2. 3 25% 3. 1 20%	1. <u>unstocked</u> <u>50%</u> 2. nat. for <u>30 %</u> 3. scrub. for <u>cover</u> <u>10 %</u> 1. <u>2 50%</u> 2. <u>3 30%</u> 3. shrub 10%	1. <u>unstocked</u> <u>30%</u> 2. shrubs <u>30 %</u> 3. scrub 20% <u>thin ground cover</u> <u>20 %</u> 1. <u>2 50%</u> 2. shrub 10% 3. <u>30%</u>
Vegetat 14.1 Natura 14.2	Vegetative cover (list highest 3 in terms of %) Vegetation Data List name & % of dominant and subdominant species	1. Shrubs 40% 2. unstocked forest 30% 3. grass 20 % 1. 5 50% 2. 3 10% 3. 2 10% 4. 1 30%	1. <u>Scrub = 60</u> 2. <u>unstock=30</u> 3 1 30% 2 30% 3 4 10%	1. <u>unstocked</u> <u>75 %</u> 2. <u>shrubs</u> <u>10 %</u> 3. <u>thin ground</u> <u>cover</u> <u>10 %</u> 1. <u>2 20%</u> 2. <u>3 50%</u> 3.Big trees 5% 4. 4 10%	1. <u>unstocked</u> forest 60% 2. shrubs <u>30</u> % 3. thin ground <u>cover</u> <u>10</u> % 1. <u>1</u> 40% 2. <u>3</u> 30% 3. <u>2</u> 20% 4. <u>4</u> 5%	1. unstocked forest 70% 2. shrubs 25 % 3. thin ground 5 % 1. 1 50% 2. 2 30% 3. 3 20% 4. 5 10%	1. <u>unstocked</u> 75% 2. <u>shrubs</u> 10% 3. <u>thin ground</u> 10% 1. 2 30% 2. 3 25% 3. 1 20% 4.Big trees 5%	1. <u>unstocked</u> <u>50%</u> 2. <u>nat. for</u> <u>30 %</u> 3. <u>scrub. for</u> <u>cover</u> <u>10 %</u> 1. <u>2 50%</u> 2. <u>3 30%</u> 3. <u>shrub 10%</u> 4.	1. unstocked   30%   2. shrubs   30 %   3. scrub 20%   thin ground cover   20 %   1. 2 50%   2. shrub 10%   3 30%   4.
Vegetat 14.1 Natura 14.2	Ive Cover Data Vegetative cover (list highest 3 in terms of %) Vegetation Data List name & % of dominant and subdominant species	1. Shrubs 40% 2. unstocked forest 30% 3. grass 20 % 1. <u>5 50</u> % 2. <u>3 10%</u> 3. <u>2 10%</u> 4. <u>1 30%</u> 5.	1. <u>Scrub = 60</u> 2. <u>unstock=30</u> 3 1. <u>2 30%</u> 2. <u>1 30%</u> 3. <u>3 25%</u> 4. <u>4 10%</u> 5. shrub 5 %	1. <u>unstocked</u> <u>75 %</u> 2. shrubs <u>10 %</u> 3. thin ground <u>cover</u> <u>10 %</u> 1. <u>2 20%</u> 2. <u>3 50%</u> 3.Big trees 5% 4. <u>4 10%</u>	1. <u>unstocked</u> forest 60% 2. shrubs <u>30</u> % 3. thin ground <u>cover</u> <u>10</u> % 1. <u>1 40%</u> 2. <u>3 30%</u> 3. <u>2 20%</u> 4. <u>4 5%</u> 5.	1. <u>unstocked</u> <u>forest 70%</u> 2. <u>shrubs</u> <u>25 %</u> 3. <u>thin ground</u> <u>5 %</u> 1. <u>1 50%</u> 2. <u>2 30%</u> 3. <u>3 20%</u> 4. <u>5 10%</u> 5.	1. <u>unstocked</u> 75% 2. shrubs <u>10 %</u> 3. thin ground <u>10 %</u> 1. <u>2 30%</u> 2. <u>3 25%</u> 3. <u>1 20%</u> 4.Big trees 5% 5.	1. <u>unstocked</u> <u>50%</u> 2. <u>nat. for</u> <u>30 %</u> 3. <u>scrub. for</u> <u>cover</u> <u>10 %</u> 1. <u>2 50%</u> 2. <u>3 30%</u> 3. <u>shrub 10%</u> 45.	1. unstocked   30%   2. shrubs   30 %   3. scrub 20%   thin ground cover   20 %   1. 2 50%   2. shrub 10%   3 30%   4

### \* Remarks :

Names of Dominant and Sub-Dominant Species

Number	Name
1	Bamboo
2	Cratoxylon sp.
3	Peltophorum dasyrachis
4	Alstonis scholaris
5	Wrightia tomentosa

# **APPENDIX III** Maps of PBP Sites

# Appendix III

### Appendix 3: Maps of PBP Sites

Vientiane Municipality Ban Nakha

Vientiane Province Ban Phontong Ban Phon Kham

Bolikhamsai Province Ban Phon Savan Ban Songkhonmai Ban Phabath

Savannakhet Province Ban Phonsin Ban Beungbouathong

# Vientiane Municipality Ban Nakha

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Vientiane Province Ban Phontong Ban Phon Kham



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BoliKhamsai Province Ban Phon Savan Ban Songkhonmai Ban Phabath





# Ban Phonsavanh









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Savannakhet Province Ban Phonsim Ban Beungbouatong



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รรณมอาด เมื่อเกี่ย์ บามยัวบอเทสา. 25-11-1994 . لد:ر: إد و ر N , er 0 余余 การเกายา. 介行 0 11 5. 47 0 0.1 มงเกสอม ลายเล PBP 余谷外川 余余个 5 (มอเกปาปกบ/กบาล: wn 和科 余介介 plantation forest AA อ-2. 1.เกา 林 小 千 Vi (IT) upland rive field 100 Y Y Y 217 111 Agrical Di wojin ponde. cauran un Road. ==== inilizou Palh 11 Bon House Contraction and contraction of the second (1) 台 Jo (vat) temple R G B R R R R Miller? E SSI SIN Schoole: Parto สภามาวา clinic. 63 5,2 3 52053 (BB) Una majoria 6 G ปารญา 991 ຍ (10,00) 5/17 (2) 4. il FI infl. wetland Pond wojio 672 18 E-J freshwitter lotus 62 Q cruis. pond ip 12 ... Pap iz G 1 化 ĩ • 62 13 ĉβ (i) 43 43 43 (2) (i) G, G



# APPENDIX IV PHOTOS

#### **Appendix IV**

This appendix presents photographs of the eight PBP sites established in 1995 and 1996, further to item 14.1 of the EBS. The purpose of the photographs is to present visual evidence of the natural vegetative cover of the proposed plantation site in an attempt to determine how the local ecology will be effected by establishment of a tree plantation. This baseline information is needed for comparative purposes, to record changes in the composition and density of natural vegetative cover on the proposed plantation site, as a result of establishment of a tree plantation.

The EBS requires that the surveyor attach several photos of the proposed plantation site from different perspectives. Photos should be taken from several points, focusing on a fixed marker, that can be used to compare pre-plantation natural vegetation; with vegetative cover following land clearing; and, once again following establishment of the plantation. Photos should be taken once annually, following establishment of the plantation; at the same time that the BME/EMR is carried out. Preferably, photos should be taken just before rice harvest time, October through December, when the difference between naturally covered areas and other types of vegetation coverage is clear.

The photos presented here were taken by PCU personnel at different times before, during, and after establishment of the tree plantations. In that the photos were taken prior to operation of the environmental monitoring system, they are not the best photos to provide evidence of vegetative cover prior to plantation establishment. They are satisfactory however, at this preliminary stage of development of an environmental monitoring system for the project. In the future, as each proposed tree plantation site to be established using credit made available through the project will be subject to STP/EBS and BME/EMR processes, through operation of the environmental monitoring system, photographs will be taken prior to land clearing.

## Savannakhet Province

## Bolikhamxai Province

Ban Songkhonmai, Mouang Borikhan



## Vientiane Province

Ban Phonkham, Mouang Thoulakhom



Ban Phontong, Mouang Phonhong



## Vientiane Municipality

Ban Nakha, Mouang Naxaithong



# APPENDIX V

#### INTERPRETATION OF TERMS AND DEFINITIONS

Afforestation is the process of planting trees on bare land where there has been no trees for at least 50 years. All plantation development on grasslands falls into this category.

Agroforestry is a land -use system in which woody perennials are used on the same land as agricultural crops or animals, in some form of spatial arrangement or temporal sequence

Biodiversity is the range of species of plants and animals in an ecosystem.

Buffer Zones are areas surrounding National Parks, Forest Reserves and Protected Areas where minimal activities are permitted. Each forest category should be defined, with specifications on size and activities permitted within the zone.

Conservation Forests are defined in Decree 169/PM as "forest lands which are allocated for the preservation of life, nature and other features which have a special value for the environment, education and culture".

Degraded Forest Land is defined in Article 11 of Decree 169/PM as "forest land where the forest cover is seriously damaged or land without forest cover or bald (bare) land which is allotted for its conversion to use or assigned to the population in permanent agriculture, forestry and livestock production or other purposes".

Degraded Land is not an official land use category; nor is it defined in Decree 186/PM or Decree 169/PM and may or may not fall within the jurisdiction of the MAF. Degraded land can belong to an individual.

Dipterocarp Forests are forests in Southeast Asia dominated by tree species of the Dipterocarpaceae family.

Fallow Land is land designated as forest land which is abandoned for production, and may contain a shrub cover or be degraded.

Farm forestry is forestry carried out on individual's land. Related but not synonymous terms are, community forestry and social forestry. The term refers to the management system, while the actual technical application could be through agroforestry, or as a monoculture.

Flood Prone Land is land which is seasonally inundated by flood waters and not useful for permanent agriculture. This does not include land which is inundated annually for long periods of time, thus making it unsuitable for the survival and growth of young tree seedlings.

Grass Land is infertile land on which no natural trees or shrubs are currently growing. These areas are typical of northern Lao PDR and are characterised by deep sandy soils with a low moisture content. The grass communities could be maintained through the presence of annual fires and grazing. The areas may have had natural forest cover some time in the past.

Gullies are usually bordered by steep sides and can be major or minor according to the following definitions: Major gullies are greater than 3 m deep from the floor to the top of the bank. All others are minor.

Individual's Land is land which has been occupied by heritage, or is permanently used for agriculture (shifting or perennial). It is land on which land holders pay tax based on Form 01. The individual also has the right to occupy the land and to use it for production, the right to transfer it from one holder to another, sell (compensate for the improvements) the land and to be able to use it as collateral. It is land which may be silviculturally suitable for plantation establishment.

Industrial wood is wood for industry mainly consisting of sawlogs, veneerlogs, pulpwood, and/or pitprops. Industrial wood excludes fuelwood and roundwood utilised at village level.

Medium density fibreboard (MDF) is a reconstituted board product formed by reducing wood and other non wood fibres such as bagasse and cotton stalks to their individual fibres and pressing them with resins back into a sheet. The uniform internal structure of MDF, makes it more suitable than particleboard for many furniture and joinery applications.

Natural Forest Land has been classified into the following forest types, Evergreen Forests, Dry Evergreen Forests, Mixed Deciduous Forests, Dry Dipterocarp Forests, Coniferous and Mixed Coniferous Forests, and Regenerated Forests.

Orientated Strand or Structural Board (OSB) is a reconstituted board product made from strands or slivers of veneer, which are pressed together with resins back into a sheet. OSB has similar strength and durability of plywood.

Particleboard the worlds dominant from of reconstituted board product, formed by reducing wood to small flakes and pressing it with resins back into a sheet.

Plantation is a forest crop or stand raised artificially either by sowing seed or planting seedlings as clones raised in a nursery.

Production Forests are defined in Decree 169/PM, as "forest lands in their pristine or disturbed state which are allocated for the sustainable supply of forest products to meet the requirements of national economic development and the living conditions of the people without an adverse impact on the environment. All activities and uses of this forest type must be undertaken in accordance with management plans and all relevant rules and principles".

Protection Forests are defined in Decree 169/PM as "forest lands which are allocated for the protection of water resources, soil erosion on steep slopes, strategic national security, protection against natural disasters, protection of the environment and other features".

Pulpwood includes roundwood or slabwood from sawmilling and veneer manufacture, and can be utilised for the manufacture of wood pulp for paper/ paperboard products or for reconstituted board products such as particleboard or fibreboard.

Reforestation is the process of planting trees on land which has carried forest within the last 50 years, but where the previous vegetation has been replaced essentially by a different one.

Regenerated Forests are defined in Decree 169/PM, as "forest lands in their incomplete state which must be regenerated and maintained as production forests or as other natural forest types".

Rotation is the planned number of years between the establishment of a plantation an its felling.

Sawlogs are logs roughly squared or not to be sawn or chipped lengthwise for the manufacture of sawnwood.

Secondary forest is a forest subjected to a light cycle of shifting agriculture or to various intensities of logging, but still containing indigenous trees and shrubs.

Shifting cultivation is a farming system in which land is periodically cleared, farmed and then returned to fallow.

Streams are channels flowing for at least two months following the monsoon or with semi permanent waterholes. Stream width is measured from the lop of the stream bank as follows: small streams are 10 m wide; medium streams are 10-20 m wide and large streams are 20 m + wide

Sustainable development in plantation forestry refers to meeting the present needs of biological, environmental, economic and financial and socioeconomic considerations without comprimising the ability to produce at similar levels in the future.

Unstocked Forest Areas as defined by MAF "are previously forested areas in which the crown density has been reduced to less than 20% because of logging or heavy disturbance. Abandoned "hai" and disturbed stands with a crown density less than 20% should be classified as Unstocked Forest Areas".

Veneer logs are logs for the production of vencer, mainly by peeling or slicing.

Village Administered land is a delineated piece of land allocated to the village by the District and Provincial authorities for village use.

Watercourses are lines of concentrated run off. They can be described as gullies, or waterways depending on size and shape and on the duration of the flow during the monsoon.

Waterways are gentle depressions. Major waterways are more than 10 metre wide. All others are minor waterways.

2.1 Objectives and Scope

#### Chapter I

General Provisions

<u>Article 1</u> Natural forest areas, and unstocked forest land as well as other land types are the resources of the national community of the Lao PDR. All Lao citizens have the common responsibility to occupy, protect, develop and enrich these forests and forest lands.

The terms "forests and forest lands" have been defined in Article 2 of the Decree of the Prime Minister on Management and Use of Forests and Forest Land Decree 169/PM (Decree 169/PM) and also apply to this Decree. However, the terms "natural forest areas and unstocked forest lands" are not defined or interpreted in either Decree 169/PM or Decree 186/PM. The Ministry of Agriculture and Forestry Land Use Classification System has defined these terms and their meanings would apply to this Decree. The terms and their meanings are as follows:

Natural Forest Areas or Forest Land applies to the following classified forest types defined in the Land Use Classification from the National Office of Forest Inventory and Planning in the Ministry of Agriculture and Forestry:

**Evergreen** Forests

Dry Evergreen Forests

Mixed Deciduous Forests

Dry Dipterocarp Forests

Coniferous and Mixed Coniferous Forests

Unstocked Forest Areas as defined by MAF "are previously forested areas in which the crown density has been reduced to less than 20% because of logging or heavy disturbance. Abandoned "hai" and disturbed stands with a crown density less than 20% should be classified as Unstocked Forest Areas.

Article 1 is consistent with the Decree on Land, No 99/PM; where a translation of article 1 reads: "The land is the property of the national community, represented by the State of Lao PDR, which manages the land on a centralised and unanimous basis at the national level". The translation of the English word "manage" in the Decree No 99/PM could be translated or understood to mean "supervise".

The responsibility of all Lao citizens to occupy, protect, develop and enrich the forest land also implies a right to use the forests and forest products in accordance with the existing legislation.

This implies that unstocked forest land, which has been formally classified as such and delineated for many parts of the country during the National Forest Inventory, could be developed and enriched to be made productive for the benefit of Lao people through the establishment of sustainable forestry plantations.

<u>Article 2</u> The State allows and supports the use of forest land as "hai" which contains no commercial tree species, land without forest cover, degraded and eroded forest land to reforest with plantations. At the same time, the State has a policy to allocate forest to villages, institutions and communities for occupation and protection.

A new "forest type" is introduced in this Article along with types of forest land that can be reforested. The new forest type is plantations, and the forest land type is degraded and eroded forest land. Other terms which have also been introduced are reforested, and communes; neither of which has definitions or interpretations presented in this Decree.

Forest Land has been defined in Article 2 of Decree 169/PM as "all areas under the management or control of the Ministry of Agriculture and Forestry whether covered or not in forests, but not used or defined as permanent agricultural land".

The other forest type is plantations. While this is not defined in either Decree 169/PM or 186/PM, a definition proposed by J. Evans in his book, Plantation Forestry in the Tropics, is very useful for the purposes of this Decree. A plantation is " a forest crop or stand raised artificially either by sowing or planting". Plantations can be regular or irregular in shape, with clear or fixed boundaries. A typical industrial plantation has a width of at least 100 m, but this figure is arbitrary, especially in the tropics, where plantations can be in small blocks less than 1 ha, in narrow belts, or of strips of trees usually in single lines. All of these different configurations of planted trees are classified as plantations.

Afforestation and Reforestation also referred to in Decree 186 have also been defined by Evans as follows:

Afforestation is the process of planting trees on bare land where there have been no trees for at least 50 years. Most plantation development on grasslands in the Lao PDR would fall into this category.

Prepared by the Lao-ADB Plantation Forestry Project, Department of Forestry in September 1995

Reforestation is the process of planting trees on land which has carried forest within the last 50 years, but where the previous vegetation has been replaced essentially by a different one.

Degraded Forest Land is defined in Article 11 of Decree 169/PM as "forest land where the forest cover is seriously damaged or land without forest cover or bald (bare) land which is allotted for its conversion to use or assigned to the population in permanent agriculture, forestry and livestock production or other purposes".

Communities is a term used for the first time in this Decree. It is understood that communities mean groups of villagers. However, it raises another issue, that of definition of legal entities.

Family household, people, villagers, communes, State Enterprise, Joint Enterprise are just a few of the different categories discussed and referred to. In more generic terms, it might be useful to refer to legal units such as individual/ household, company (as defined by Business Law) and State Owned Enterprises. Companies might be owned either by the private sector or by the government.

In this article it is clearly indicated that reforestation through plantations is allowed and also supported by the State on "hai". "Hai" means areas where rainfed, or upland agriculture farming practices are undertaken, (or shifting agriculture) in contrast to irrigated farming, e.g. irrigated paddy fields. However here there is reference to degraded and eroded forest land as opposed to unstocked forest land as mentioned in Article 1. This difference in terminology may cause some confusion for those enforcing the Decree and also for investors ( private persons, companies or enterprises) who are identifying areas for their forestry operations.

Here, as in other parts of the legislation, different expressions are used for different forest types and land uses. For example, confusion may arise over what forest type should be legally allocated for plantation development. Other wording may also lead to some confusion over its intent. For example, what does occupation of the forest mean in reality? Can villagers and institutions (companies and enterprises) derive benefits or can they occupy the forest by just dwelling there. However, it should be restated here that in the last sentence, this article refers to forests to be allocated as defined in Article 2 of Decree 169/PM as opposed to forest land also defined in the same article. There is a clear intention in this Article to enable the use of existing forests or to reforest specific forest land with plantations. This Article supports the current practices in many Provinces along the Mekong River, where each village is allocated different types of forest land to *use and protect*.

Land is administered by the village administration. One part of this land may be unstocked forest land, which is used for collection of small size timber or shifting agriculture. Part of this land can also be claimed as

Prepared by the Lao-ADB Plantation Forestry Project, Department of Forestry in September 1995

After consultation and co-ordination with the local administrative authorities and concerned sectors, the Ministry of Agriculture and Forestry's task is to issue decisions or directives on Forest Management Areas.

#### Article 10. Survey, Inventory and Delineation of Forest Areas.

The allotment plans, distribution plans, management plans and plans for the assignment of forest management shall be established on the basis of accurate data on forestry resources and the existing socioeconomic conditions in the region.

The Ministry of Agriculture and Forestry's task is to issue instructions and recommendations on the survey, inventory and delineation of different types of forest and forest land for planning and management.

According to Article 8, the Forest Management Planning should be carried out in order to ensure that the management and use of the forests and forest land conforms with the objectives. The MAF is given the task to coordinate the activities and to issue instructions for the Forest Management Area.

The elaboration of Forest Management Plauning Areas is being carried out at present. So far there has not been any data presented from the concerned areas.

The implication of the provisions in Article 8-10 and how these rules relate to plantation forestry will only be apparent once the instructions are issued.

Article 10 provides support for the Socio-Technical Profile (STP) procedures developed by the PCU in which biological/silvicultural, economic and socio-economic conditions are considered for each area.

According to paragraph 3 of Article 9, at least one Forestry Officer will be appointed in each Forest Management Area. It is important that the rights, duties and responsibilities of these Officers will be clearly defined in order to make sure that the intentions of the MAF are carried out with consistency throughout the country.

#### 3.2 Definition of Forests and Forest Land

#### Article 11. Types of Forests and Forest Land.

After consultation and co-ordination with the concerned parties, the Ministry of Agriculture and Forestry's task is to survey and distribute forest land in accordance with each type of purposes of management and use as follows:

11.1 Protection Forests: are forest land which are allotted for the protection of water sources, protection against soil erosion, of steep slopes, national strategic defence areas, protection against natural disasters, protection of environment and others.

Prepared by the Lao-ADB Plantation Forestry Project, Department of Forestry in October 1995 Working Peper. NC. 2, 3 Nov. 1993 It is strictly forbidden to exploit forest produces in such forest land, except if specially authorised by the Ministry of Agriculture and Forestry.

11.2 Conservation Forests: are forest land which are allotted for the preservation of life, nature and others which hold special value for the environment, education and culture.

It is strictly forbidden to undertake any exploitation of forest produces and hunting in such forest land area, except if specially authorised by the Ministry of Agriculture and Forestry.

11.3 Production forests: are forest land in their complete or incomplete state which are allotted in order to meet the requirements in national economic development and the people's living conditions in terms of the sustainable supply of forest produces without any impact on the environment.

All activities and use of forests existing in such forest land must comply to the forest management plans and all relevant rules and principles.

11.4 Regenerated forests : are forest land in their incomplete state which must be regenerated and maintained into production forests or to other forest types.

All activities and use of forests existing within such forest land shall comply to the forest management plans.

11.5 Degraded Forest lands : are forest land which forest cover is seriously damaged or land without forest cover or bald land which is allotted for its conversion to the use or assigned to the population in permanent agriculture, forestry and livestock production or other purposes.

The classification, delineation and area of each type of forest must be regularly reviewed in each period of the national socio-economic development and may be re-distributed and delineated as appropriate.

The Ministry of Agriculture and Forestry shall define, delineate the area, methods of declaration, including the methods of inspection and re-distribution of forests and forest land throughout the country.

The translation of the word "distribute" should be clarified. The meaning of the Lao original wording is closer to "classify". The scope of the Article is that the MAF is given the responsibility to survey forest land and to classify the different types of forest land.

Article 11.5 on Degraded Forest Land and Article 11.4 Regenerated Forest Land define land available for plantation forestry development. Established forest plantations are encompassed by the Article 11.3 on Production Forest Land.

The activities and use of plantations must comply with the Forest Management Plans. Rules regarding the management of the forests and forest land are provided in Chapter III of this Decree.

Prepared by the Lao-ADB Plantation Forestry Project, Department of Forestry in October 1995

In the newly enacted Decree on the Establishment of National Biodiversity Conservation Areas, No. 164/PM (October 29, 1994), the definitions given in Article 11 above are used. In the Decree No. 164/PM, 18 areas throughout the country are declared Special Conservation Forest Areas. The objectives of the conservation forest areas are to conserve forest resources, wildlife, and watersheds, and to preserve the ecosystem.

The 18 areas constitute approximately 10 percent of the territory of the country. There are villages located inside the protected areas and it is very likely that efforts must be made to develop regulations which will support the conservation as well as the villagers requirements of forestry based produce for subsistence.

The exact boundaries in the terrain regarding Protection Forests are not yet determined. Concerning Regenerated Forests, this type of forest land could be converted into either one of the first three types of forest land.

The term natural forest is not defined (see Article 3 above).

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Changes in the classification of a forest area should only be carried out when there is an urgent need. To encourage and support long term investments in plantation forestry, it should only be possible to change forest that is used for commercial production into Protection or Conservation Forest under certain circumstances. According to the Decree on the Allocation of Land and Forest Land for Tree Plantation and Forest Protection, No. 186/PM, Article 18, land owners are given the right to receive compensation in case the State reassumes plantation land for <u>construction</u> activities. The right of the owner or user to receive compensation should also comprise other reasons for appropriation, e.g.: if Production Forest is turned into Protection or Conservation Forest.

The MAF is given the duty to define and redefine the different types of forests throughout the country. The Forest Management Planning Areas, in which the forest land will be divided into the different types of forest land, are under development at present (see Article 8-10 and Article 13).

The legal definitions of forest land, as in this Decree, and technical definitions, as in the national forest inventory, do differ and are not always compatible. It is expected that this will eventually be addressed. Likewise, it is desirable that the legal categories put forward here are used in conjunction with general land use planning development.

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## <u>APPENDIX VI</u> Official List of Protected Wildlife in Lao PDR

### **Appendix VI**

#### 1. ENDANGERED SPECIES

#### **English Name**

#### **Scientific Name**

Rhinoceros sondaicus Bos sauveli Elephas maximus **Bubalus** bubalis Bos javanicus Bos gaurus Helarctos malayanus Bear spp. Panthera Tigris Panthera Pardus Cervus eldi Cervus eldi Caricornis Sumatrensis Nemornaedus goral Tapirus indicus Phgathrix nemaeus Hylobates sps Presbytes franciosis **Presbytes Cristatus** Cervus nippon

- 1. Javan Rhinoceros
- 2. Kouprey
- 3. Asian Elephant
- 4. Wild Buffalo
- 5. Bengteng
- 6. Gaur
- 7. Malayan Sun Bear
- 8. Bear
- 9. Tiger
- 10. Panther
- 11. Brown Antlered Deer
- 12. Hog Deer
- 13. Serow
- 14. Goral
- 15. Tapir
- 16. Douc langur
- 17. Gibbons
- 18. Francoi Langur
- 19. Silver Langur
- 20. Spotted Deer/Deer

#### 2. <u>CONTROLED SPECIES</u>

	English Name
1.	Sambar Deer
2.	Barking Deer
3.	Otters
4.	Masked Palm Civet
5.	
6.	Lesser Mouse Deer
7.	Hog-nosed Badger
8.	Ferret-badger
9.	Pangolin
10.	Monkeys
11.	Slow Loris
12.	Clouded Leopard
13.	Binturong
14.	Golden Cat
15.	Fishing Cat
16.	Wild dog
17.	Jackal
18.	Marble Cat
19.	Leopard Cat
20.	Squirrels
21.	Bamboo Rat
22.	Porcupine
23.	Brush Tailed Porcupine
24.	Giant Flying Squirrel

#### Scientific Name

Carvus Unicolor Muntiacus Muntjak Lutra sps Paguma Larvata

**Tragulus Javanicus** Arctonyx Collaris Melogale personats Manis Javanicus Macaca sps Nicticebus coucang Neofelis nebulosa Arctictis binturong Felis temmincki felis viverrina Cuon alpinus Canis aureus Felis marmorat Felis bengalensis Ratufa spp Rhizomys spp Hystrix brachyura Atherurus Macroufus petaurista spa

#### 3. ANIMALS FORBIDDEN FROM CONSUMPTION

#### English Name

#### **Scientific Name**

1.Water MonitorVaranus salvater2.Yellow Tree MonitorVaranus bengalensis3.Calotes spp4.Trionyx spp5.Testudo sps

#### 4. **FISH FORBIDDEN**

	English Name	Scientific Name
1.		Preudos clensollado
2.		Pangaslus dangasius
3.		Prodarous juilieni
4.		Wallagonia miostoma
5.		
6.		Pangasianodon gigas
7.		Pangasius sanitwongsai
8.		Datnioides microlepis

#### **BIRDS FORBIDDEN** 5.

#### **English Name**

1.	Pied Hornbill
2.	White Backed Vulture
3.	Brown Wood Owl
4.	White breasted Waterhen
5.	
6.	Intermediate Egret
7.	Cattle Egret
8.	Great Barbet
9.	Mountain Imperial Pigeon
10.	Red Breasted Pakakeet
11.	Common Myna
12.	Duck
13.	Red Turtle Dove
14.	Spotted-necked Dove
15.	Red Jungle Fowl
16.	Hogpoe
17.	Owls
18.	Woodpecker
19.	Koel
20.	Drongo
21.	Purple Gallinule
22.	Purple Heron
23.	Pheasants
24.	Partridge
25.	Eagles
26.	Lapwing
27.	Parakeets
28.	Green Pigeon

#### **Scientific Name**

Preudos clensollado Pangaslus dangasius Prodarous juilieni Wallagonia miostoma

Pangasianodon gigas Pangasius sanitwongsai Datnioides microlepis Ducula badia Prittacula spp Acridotheres tristis Anas sps Strepelia tranquebarica Strepelia Chinensis Gallus gallus Upupa Epops Glaucidium sps Picus sps Eudymamys scolopacia Dicrurus sps Porphyrio porphyrio Ardea purpurea Lophura sps Arborophila sps Fam: Accipitridac Vavellus sps Psittacula sps Treron sps