



DEPARTMENT OF FORESTRY

Feasibility Study Report
on afforestation project
for serving biodiversity conservation
in Long An Province

Book 8-4: F/S Long An

THE DEVELOPMENT STUDY ON CAPACITY BUILDING
FOR PREPARING FEASIBILITY STUDIES AND IMPLEMENTATION PLANS
FOR AFFORESTATION PROJECTS IN THE SOCIALIST REPUBLIC OF VIETNAM
---FICAB---

Preface

This report represents the results of the site survey conducted by the Long An Provincial Study Team at Lang Sen Wetland Reserve in 2006. The site survey followed the Scope of Work (hereinafter referred to as “The Study”) signed by the Government of Vietnam and the Japan International Cooperation Agency in December 2004 endorsing the FICAB project’s framework.

Through a rich set of on the job training programs (OJT) carried out in 2006 for from Work Unit 1 to Work Unit 4, as well as through Thai Nguyen’s report models, a wide range of site survey assignments were conducted to collect the needed data for the Feasibility Report with provincial differentiation.

The ultimate goal of the study is to enhance the capacity of different provincial agencies in preparing Feasibility Studies and Project Implementation Plans for Afforestation projects, thus promoting State, private and foreign investment in forestry sector. Through a wide range of exercises, the Provincial Study Team also aims at putting the projects’ contents into practice, which explains why all the data and analysis presented in the report are actual ones and to call for investment in the provincial project. Investments would therefore bear testimony to the meaningfulness of the project and the active participation of all Long An PST members over the past period.

This report was prepared using the set of reference materials produced by the project including the Model Feasibility Report on household base production forest establishment project in Thai Nguyen, the Framework for Implementation Feasibility Report, analysis data and site survey outcomes compiled jointly by the PST Long An, Can Tho University and the Sub- Forest Science Institute of Vietnam in the South.

We would like to express our sincere thanks to all the related parties for their valuable contribution to this report. We highly appreciate the active participation of the JICA Study Team (comprised of JAFTA members) and the Forest Inventory and Planning Institute.

We would also like to thank various provincial authorities for their roles in creating favorable conditions for us to complete this report.

Long An, February 07, 2007

Long An PST

List of Long An Provincial Study Team

No.	Full name	Organization	Position
1	Mr. Trần Minh Tùng	DARD of Long An	Vice Director of Department
2	Mr. Lê Phát Đạt	DARD of Long An	Vice chief of forestry section
3	Mr. Lê Văn Thanh	DARD of Long An	Staff of Forestry section
4	Mr. Đỗ Hữu Vinh	DARD of Long An	Staff of Forestry section
5	Ms. Đinh Thị Phương Khanh	DARD of Long An	Staff of Planning section
6	Mr. Lương Lễ Dũng	Extension center	Vice Director of the Extension Center
7	Mr. Ngô Quang Phục	Lang Sen Wetland Reserve	Director of the Wetland Conservation Site
8	Ms. Trần Thị Cẩm	Lang Sen Wetland Conservation Site	Accountant

Figure 1. Location of Long An in Vietnam



IV.

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Figure 3. Project proposed area

Bản đồ 3:

VỊ TRÍ VÙNG ĐỀ XUẤT CHO DỰ ÁN

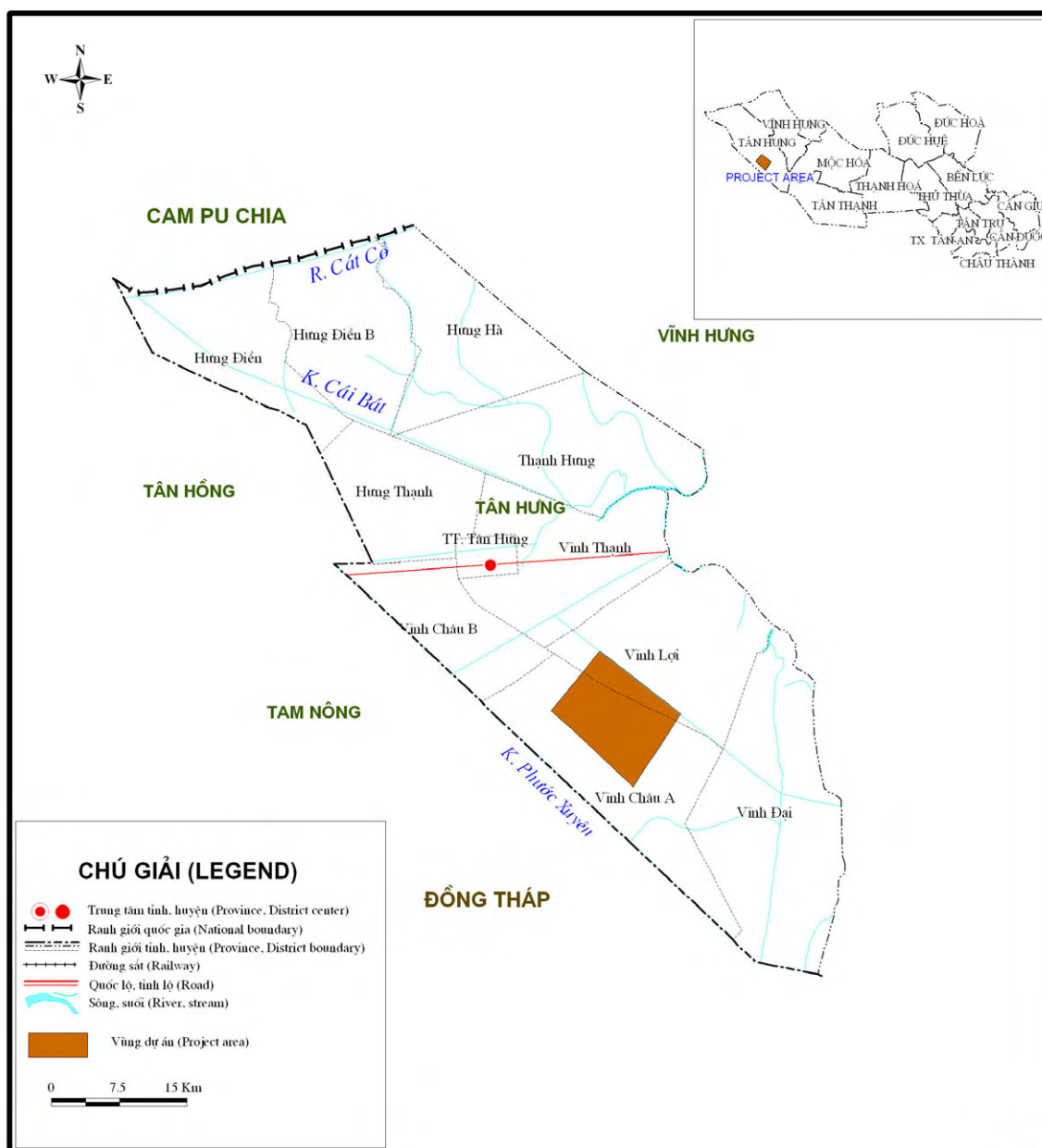


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Abbreviations

5MHRP:	Five Million Hectare Reforestation Programme
ASEAN:	Association of Southeast Asian Nations
B/C:	Cost-Benefit ratio
CoP:	Core Province
DoF:	Department of Forestry
EIRR:	Economic Internal Rate of Return
FIPi:	Forest Inventory and Planning Institute
FIRR:	Financial Internal Rate of Return
F/S:	Feasibility Study
GoV:	Government of Vietnam
PIP:	Project Implementation Plan
IRR:	Internal Rate of Return
JAFTA:	Japan Forest Technology Association
JICA:	Japan International Cooperation Agency
JST:	JICA Study Team
MARD:	Ministry of Agriculture and Rural Development
MPI:	Ministry of Planning and Investment
NPV:	Net Present Value
PFEP:	Production Forest Establishment Project
CPIU:	Commune Project Implementation Unit
PMB/:	Project Management Board
PPs:	Participating Provinces
PST:	Provincial Study Team
Sub-DoF:	Sub-Department of Forestry at province level
WTO:	World Trade Organization
PPC:	Provincial People Committee

Summary

Part I Project Background

Chapter 1 General Context

Forestry activities have changed to sustainable forest development with the participation of various sectors especially local households. As a result, forests in many provinces have been managed and protected effectively. However, the contribution of forestry activities to the economic development has been limited. The new development strategy of forestry sector is focused following aspects: managing and utilizing forest resources in a sustainable manner; promoting socialization in forest production; promoting investment from private sector and so on. In Long An province forestry is identified as one important sector for economic development. In December 2006, Long An PPC decided that part of Lang Sen Wetland Reserve convert into production forest. This is a very important legal basis for the formulation of this project.

Chapter 2 Natural and Socio-economic Conditions

The project area belongs to Lang Sen Wetland Reserve located in Vinh Loi and Vinh Chau A commune, Tan Hung district, Long An province. The Reserve is 10 km away from Tan Hung town and about 120 km away from Tan An town. Total area of the Reserve is 2,016 ha of which the project area is 1,061 ha. The project area is typically sunken land and is annually affected by flood of Mekong River. Soil of the project area is classified into a group of active alum and alum affected ones. Fauna and flora of the Reserve is extremely diverse. Total population of Tan Hung district is 42,000 people of Kinh ethnic group only. Major economic activities of the district are agriculture, forestry and fishery production, in which, agriculture and forestry productions take up major share of 83%, and the majority of households living nearby the project area depend on agriculture, fishery and forestry activities for a living.

Chapter 3 Land condition and forest resource

Among 2,016ha of the Reserve, 647ha is Melaleuca plantation, remaining 1,400ha is covered by grass, rush and small number of regenerated Melaleuca trees. Among 647 ha of Melaleuca plantation, 473ha is plantation with good quality trees, DBH ranging from 4-10 cm and height ranging from 3-5 m. The remaining plantation of 164 ha is covered by poor quality trees.

Chapter 4 Market for selling Melaleuca log

Melaleuca is now mainly utilized as stakes for house construction. Average price for one hectare of Melaleuca stands at 40-50 million VND. Supply of Melaleuca log is always bigger than demand. Supply in 2006 is 280 million stems while demand was only 106 million stems. However supply of Melaleuca log is going to reduce, in the market of Mekong river delta and Ho Chi Minh City area from 2008 onward, the supply will not be met with demand.

Chapter 5 Experience learnt from development project and challenges

There are some advantages for implementing the project as follows; i) Demand of Melaleuca log in the future is projected to remains high. Due to decrease of timber volume

harvested from natural forest, Melaleuca logs is become more valuable in the market, ii) The transportation system, especially water way in the area have been well developed creating advantages for transporting. On the other hand, there is high risk of forest fire in the dry season and flood in the planting season.

Chapter 6 Activities of the Wetland Reserve

The main function of Lang Sen Reserve is to protect bio-diversity and to utilize natural resource in wetland area in sustainable way. Operation of the management board is based on revenue taken from agricultural land and fishery resource.

Part II Project Content

Chapter 1 Project rationale

Diverse fauna and flora have been found in the Thap Muoi Delta Region, in particular, many species are endemic to Lang Sen. Over several decades, agricultural cultivation and inappropriate natural resource exploitation has led to reduce biodiversity. Based on the assessment its biodiversity value, in 2004, Lang Sen Wetland Reserve was officially established. Since establishment, Lang Sen MB has encountered many problems. In line with the results of the re-demarcating three categories of forest, the reserve was officially planed as production forest. This is important supporting policy for formulating a production forest project.

Chapter 2 Key Design Considerations

The area of planting site is 1,057 ha. In 2007, infrastructure construction such as canal system, establishment of compartments and plots for planting, and procurement of equipments are planned. From 2008 to 2013 planting is carried out. Technical norm such as planting method, seedling standard and so on are based on the technical guideline issued by DoF. As anti-forest fire measures, it is planed supplementary canal system, forest fire watch towers and patrolling. Project activities such as infrastructure construction, plot designing are conducted by companies and consultants selected through bidding. PMB will directly contract with local people for conducting afforestation activities. Long An Development Bank is selected as financing institution Training is planned for PMB staff and other related participants on project management, silviculture and marketing.

Chapter 3 Project

1 Project Objective

Overall objective is to enhance economic utilization of the buffer zone and to generate more income in order to strengthen conservation of the core zone. Immediate objective is to establish Melaleuca production forest.

2 Project Components:

Various project activities are grouped into three components such as: i) Forest plantation component, ii) Support to sustainable forest plantation component iii) Management, monitoring and evaluation component.

3 Project Cost

Total estimated cost of the project including physical contingency and price contingency is about 23.2 billion VND. That of the production forest development (Forest

plantation component) is 20.9 billion VND. Support to capacity building (Support to sustainable forest plantation component) and project management and M&E (Management, monitoring and evaluation component) is estimated at 0.2 and 2.0 billion VND respectively.

4 Finance and time of disbursement:

There are three financial sources funding to the project. The Wetland Reserve contributes about 27% of the total basic project cost. About 63% of total cost is mobilized from bank loan. Bank loan is mainly used for infrastructure construction. The government budget is used for employment of consultants and project management, 3 and it is estimated about 10% of total cost.

Chapter 4 Arrangement and organizing the implementation of the project

Project management board (PMB) is established as an individual supporting body of the project. The PMB is responsible for overall management of the project to make sure the achievement of the goal. In order to conduct the project activities, the PMB make contract with relevant organizations. These organizations who are called contracted implementation units, conduct construction work, afforestation activities. As related organizations, DOF, Long An PPC, DARD, Tan Hung DPC and so on are listed up and explained their roles and responsibilities.

Chapter 5 Monitoring and Evaluation

Monitoring and evaluation is aims to evaluate progress and results of project implementation. Based on the results, adjustment of the plan and supplementary actions are introduced to ensure the project implementation as expected for attaining the project objectives. Detail description of indicators for monitoring and evaluation are shown in the monitoring system section in the Project Matrix Design.

Chapter 6 Sustainability

Parallel with the significant economic growth, the demand for house construction increase. Small scale buildings are adopted Melaleuca log for cheaper construction cost. Demand for Melaleuca is remain high. Afforestation will create positive impact on soil quality. Profits generated from production forest are transferred to conservation activities. PMB staffs and participated personnel are equipped relevant knowledge and skills through project training. These contribute to sustainable land management of the reserve.

Part III Project Evaluation

Chapter 1 Financial analysis

The project develops production forests with Melaleuca with a cycle of seven years. The financial analysis was conducted on a one ha production forest model. The net benefits arising from the without-project case are expected to be marginal and the only with-project case is considered for the analysis. The results of the analysis shows that the production forest with Melaleuca is viable as the financial internal rates of return (FIRR) show 16% in the base cases. The conclusion suggested by the analysis that Melaleuca plantations are viable is confirmed by farmers' behaviour – those who have funds are undertaking plantations on their own.

Chapter 2 Economic Analysis

The economic analysis of the project shows that the Net Present Value (NPV) is calculated at VND 5.7 billion (at the economic discount rate of 10%) and the Economic Internal Rate of Return (EIRR) are at 17.6%. The results confirm the feasibility of the project from a view point of the society.

Chapter 3 Environmental impact assessment

Positive impacts of Melaleuca plantation are indicated as follows: i) Improving ecological environment, ii) Contributing to flood prevention and natural disaster elimination by constraining water current and iii) Lessening acidity of soil after one cycle of Melaleuca plantation.

Chapter 4 Social impact

New employment is created and additional income for local people is also created during off-farm season by attending project activities. Owing to meetings and discussions of local people, forest fire and wild animal hunting is minimized. Through participating the project, management capacity and skill for forestry technology is disseminated and public awareness about preservation of the reserve is increased.

Chapter 5 Project Risks

There are a number of project risks that could possibly pose threats to realization of the outputs and project objectives as follows; lack of appropriate loan scheme, unstable market and price, forest fire, forest disease, unsteady state policies and so on. As mitigating measures, close dialogue with the government organizations etc are listed up.

Part IV Conclusions and Recommendations

Chapter 1 Conclusion

The financial analysis shows that this investment is viable. The project increases wood supply and satisfy demand of local and neighboring area. Part of revenue from production forest is reinvested into conservation of the reserve, which helps the PMB to conduct the tasks for rehabilitating biodiversity of the typical wetland in Thap Muoi Delta Region. Moreover, forest establishment improves environment and minimizes impact of natural disaster in the region constraining water current in flooding season.

Chapter 2 Recommendations for upcoming activities

As for strengthening organizational structure, it is important that the local government need to provide support and maintain close communication with the PMB. It is important that the provincial government keep stable policy on production forest in the buffer zone of the reserve. District and communal government are expected to participate actively and support strongly in forest fire prevention.

Legal framework

1 Legal framework for project establishment:

+ Decision no. 661/QĐ-TTg dated July 29, 1988 of the Prime Minister on the objectives, responsibilities, policies and arrangement for implementation of new afforestation of five million hectares of forest;

+ Decision no. 801/QĐ dated September 26, 1986 on the promulgation of guidelines for forest fire protection and prevention applied to pine, Melaleuca forests and other inflammable forest types;

+ Decision number 199/QĐ-BNN dated January 22, 2002 of MARD on approval forestry development strategy of Vietnam, period 2001 – 2010

+ Resolution of Long An's the eighth communist party congress and Economic development strategy of Long An for achieving 70,000 ha of forest in the whole area of Long An province.

+ Decision No. 199/QĐ-UB dated January 19, 2004 of the Long An Provincial People Committee on the establishment of Langsen wetland conservation park.

+ Decision No. 229/QĐ-UB dated 19 January 2004 of Long An PC on approval of the results of reclassifying three types of forests to 2010 in Long An

2 Legal basis for calculation of the project

+ Decision no. 22/QĐ-KT dated January 13, 1987 on the guidelines for afforestation and trade of Melaleuca forest of the former Ministry of Forestry;

+ Technical guideline on intensive plantation of Melaleuca of Sub – FSIV in Ho Chi Minh city;

+ Decision No 2456/QĐ.BNN-LN, dated November 26, 2003 of MARD on cost norms for afforestation under 661 Program;

+ Decision No 38/2005/QĐ-BNN, dated July 6, 2005 of MARD on technical – economic norms for forest plantation;

+ Decision No 06/2005/BNN, dated January 24, 2005 of MARD on afforestation inspection procedure;

+ Decision No 1587/2005/QĐ-UBND, dated October 10, 1997 of Long An People Committee on technical – economic norms for forest plantation in Long An;

+ Based on real situation of local market to identify price units of labor and materials.

Introduction

Tan Hung Forest- fishery enterprise was officially renamed and restructured to be Lang Sen Wetland Reserve since 2004 under the decision of the Provincial People Committee no.199/QD-UB, January 19, 2004. With the total area of 5,030 ha of land covered with water, located on the two communes Vinh Chau and Vinh Chap A, the Conservation Park is responsible for maintaining and conserving typical ecology system in the area covered with water in Thap Muoi Delta Region. Under difficult context of switching its operation from State forest enterprise into an Administrative Unit, the Conservation Management Board has identified its top priority task is to carry out conservation activities and accelerating further a sustainable ecological model in Thap Muoi Delta Region in parallel with enhancing efficiency of the utilisation of the buffer zone in order to create additional income for conservation purpose while allocated budget is limited as well as help improving living standard of staff members working for the Lang Sen Reserve.

Being recognise that this is a sound direction and it is to help manage the Reserve sustainable, as the results of rechecking three kinds of forest in Long An, the Lang Sen Reserve was officially allowed to use part of the buffer zone to develop Melaleuca production forest by Long An PC. And this new direction was approved by the Provincial People Committee.

In the context of demand for Melaleuca stakes in the region is relative high plus the increasing market demand for Melaleuca timber for processing various wood- based products while the available bare land in the buffer zone has not yet utilised though can not cultivating agriculture crop. Consequently, the idea of developing Melaleuca production forest is not only suitable with current context of the Conservation Park but also could be perfectly applied to other areas within the large Thap Muoi Delta Region.

Melaleuca forest model is not a fresh idea here though a model of Melaleuca plantation forest implemented by business cycle with thorough calculation, applying suitable silviculture techniques, having proper credit scheme as well as combining objectives of developing the buffer zone and goals of conservation activities would surely become a good model which would be disseminated through out Thap Muoi Delta Region. The model does not only ensure sustainability of conservation activities but also creates fresh ideas in accessing to service channels, market, input materials and credit in a systematic way that can be applied in other places.

Therefore, though this may be just an initial step of the new development approach, we firmly believe that the Project on Developing Melaleuca production forest on Lang Sen Wetland Reserve, if being approved, would bring about huge benefit for achieving conservation's objectives as well as developing forestry sector of the province and nation wide.

PART I: PROJECT BACKGROUND

1 General context

1.1 Forestry sector context

After more than twenty years of renovation, the forestry sector of Vietnam has achieved remarkable results. Under the renovation, forestry activities which mainly focus on harvesting natural forest carried out by state forest enterprises have changed to sustainable forest development with the participation of various economic sectors especially local households. As a result, forests in many provinces have been managed and protected effectively. The total of new plantation forest has increased significantly. According to MARD, over the last seven years, forest area in Vietnam has increased 1.4 million ha. Moreover, thousands of forest-farms nation wide have played important roles in providing farm products to the society and creating jobs for local people. Millions ha of recovered forests has created great value in protecting environment and natural landscape.

However, in general the contribution of forestry activities to the social economic development has been limited compare to its potential. In fact, total forest area which was planned to forestry purposes in the whole country is 14.7 million ha, but economic value created still remained low – economic value brought about by forestry activities accounts for only 2% to 3 % of the total annual GDP. Currently, about 25 million people are living in the forest areas, but forestry activities have not neither created not many opportunities for the participation of local people nor improved livelihood of these people.

Responding to the above mentioned issues, the new development strategy of forestry sector has been identified as follows: managing and utilizing forest resources in a sustainable manner; promoting socialization in forest production; diversifying resources; promoting investment from private sector, mobilizing investment capital from ODA, FDI sources. For forestry sector, this orientation has become a sound basis to reorganizing forest production activities more effectively. New development orientation aims at mobilizing resources to invest in forestry activities in order to maximize benefits from forest potential, increasing the contribution of forestry activities to overcome issues in economic, society and environment, and meeting demands for both short and long term development of the country.

1.2 Area's context

Long An is one of the provinces located in Cuu Long Delta River Region with the geographical location as follows: 105⁰30'30" to 106⁰47'02" East longitude, 10⁰23'40" to 11⁰02'00" North latitude (detail available in the map). The total natural area of the province is 449.239 ha¹, account for 1.3% of total country area and 11.28% area of Cuu Long Delta River Region.

Despite of locating in the dynamic economic zone in the South, nearby Ho Chi Minh City where is the biggest finance and economic centre of Vietnam, enjoying many advantages in attracting investment and accessing to markets, current economy of Long An

¹ Department of Natural resources and Environment in Long An, 2005

mainly based on agricultural, forestry and aquaculture activities. According to statistics data agriculture, forestry and fisheries products make up 48.63% of the province total products.

Economic structure strategy of Long An by 2010 and Vision until 2020 is to reduce share of agriculture and increasing share of industries and services in the province economy. Though forestry activity was identified an important sector to social economic development of the province. According to the resolution issued at Long An the eight Communist Party Congress and results of reclassifying three forest types conducted in September 2006, total area planned for forest in Long An by 2010 is 70,000 ha (including continuous forest areas and scattered plants converted into ha unit), accounting for 15.28% of province's total natural area. The development orientation of Long An from 2006 to 2010 also clearly stated that *“developing production forest system while strengthening special use forest system in order to successfully conserve biodiversity especially high value, rare and endangered species in alum wetland eco-forest system” in Dong Thap Muoi region*). Furthermore, production forest development focuses on quality of production forest, creating high economic return and fulfills demand of biodiversity and environmental protection.

Being characterized by alum wetland region, the most suitable species in Thap muoi Delta Region and Long An Province is *Melaleuca cajuputi*. Over the past few years, Melaleuca forest development have created great economic benefits, improved eco-environment, increased forest coverage and ensured national security and defend as well as contributed to the goal of forest development programme of the province and the whole country.

Currently, besides providing logs for construction, firewood, Melaleuca forest has become great sources of non-timber forest products such as honey, birds, and aquatic products. In addition, thanks to advanced technology, Melaleuca wood might be used not only in construction but for other purposes. In particular, research conducted by VINAFOR recently shows that Long An has great potential in producing mass Melaleuca wood materials for wood processing industry producing future products such as artificial board, wood chip, etc.

Recently, Long An PC has adopted various policies to promote Melaleuca forest development such as providing preferential credit program, applying resource tax-free for first cycle of Melaleuca plantation, land- use tax free, encouraging various economic sectors investing into Melaleuca processing, applying advanced technologies in intensive Melaleuca forest production. As a result, quality of Melaleuca forest in the province so far has improved significantly and attracted various economic sectors participating in afforestation. Large area of Melaleuca forest have been planted by farmers' self-capital² – from 1998 to 2005 more than 250 billions of farmers, about 6 billions of provincial budget and about 6 billions of central government budget were invested in Melaleuca production forest plantation. Furthermore, Melaleuca production forest has been received remarkable support from Long An Development Bank. In fact, this bank has offered loan of more than 20 billions dong for production forest purposes. Responding to the requests by the Prime Minister on rechecking three kinds of forests, in December 2006, Long An Province has completed re-planning three types of forest, and Long An PC has achieved a consensus

that converting part of Lang Sen Wetland Reserve into production forest. This is a very important legal basis for the formulation of this project.

1.3 Condition in the conservation area

Lang Sen wetland Reserve is an entity that responsible for the implementation of biodiversity conservation of natural resource in watered areas. The organization is operating on the basic of self balancing their income with a small State's subsidy annually. In line with this purpose, the development and expansion of utilization of unused land areas are potential orientation so that it does not only help increasing earnings that serves the conservation work but also help the creation of marginal eco-system of proximity to the core zone. This feature is very much helpful for the protection and development of conservation work in the entire area.

For many years, large areas of the buffer zone have not been properly utilized, in the mean time, there are about 1,061 ha among total area of the conservation site is in the fallow state. In the coming time, if there is no clear utilization objective, the areas will be left as it is and it will be of no help to the conserving work of the core zone that is increasingly facing with influences of fishing, hunting, and land conquering activities of surrounding inhabitants.

Also, to some extends, difficult living conditions of conservation staff would probably a pressure to continue working for the conservation park, they may give up their job resulting in negative impacts on the management and maintenance of the conservation site.

The orientation of using buffer zone for increasing income for the conservation site, creating additional budgets for the conservation park has been foreseen a right orientation in the coming period of the Wetland Reserve Management Board (WRMB) and the local government. The budget burden shall be reduced partially through supplementing with income obtained from exploiting buffer zone, implementing of sustainable utilization of typical ecological model within core zone and developing eco-tourism.

Main obstacle for bringing these orientations into reality in the past and in time to come is due to lack of a financial mechanism of the State that enable the WRMB to approach preferential loans for development of Melaleuca production forest in the area. In the time to come, with the emerging trend of socialization of forestry activity along with wider participatory of various economic sectors, a more opened policy on management and utilization of reserve site shall be fundamental factors to realize these orientations.

2 Natural condition and socio-economic situation of project area

2.1 Natural condition

2.1.1 Geographical location

Project area belongs to Lang Sen Wetland Reserve located on the administrative area of Vinh Loi and Vinh Chau A commune, Tan Hung district, Long An province. Total natural area is 2,016 ha of which proposed area for the project is 1,061 ha.

The conservation area is 10 km away from Tan Hung town and about 120 km away from Tan An town, the whole area is in conjunction with a relatively developed transport network that links to market centers of various districts of Dong Thap Muoi and Dong Thap province. Convenient waterway transport network through canals in the region in both dry and rainy season is a very important supplementary for current road system. They are good conditions for developing a forestry sector with market orientation of the province. Furthermore, with gradually improved accessibility to the area, development of services based on bio-diversification as well as typically ecological system will be certainly achievable.

2.1.2 Topography

The entire topography of the project is typically sunken with mean elevation ranging from 0.42 m – 1.80 m above standard sea level at Nai isle - Ha Tien, Kien Giang province. Therefore, this area is a wetland area influenced by hydrology regime of Mekong River with annual flood season, however there is no soil erosion. The planned area that Melaleuca plantation will be implemented individually is a relatively flat area without slopes, its center and south-eastern parts are relatively high in comparison to the remaining parts, and beside these there are also some partially sunken and scattered areas. Mean altitude of the entire area is about +1.00 m, the highest altitude is 1.20 m and the lowest altitude is 0.7 m.

It can be said that this type of topography is relatively suitable for the growth and development of various tree species, especially Melaleuca. Moreover, this is also good condition for forest maintenance, protection and management activities. However, because of sunken condition, forest plantation in the area requires certain technical solution in order to achieve expected productivity.

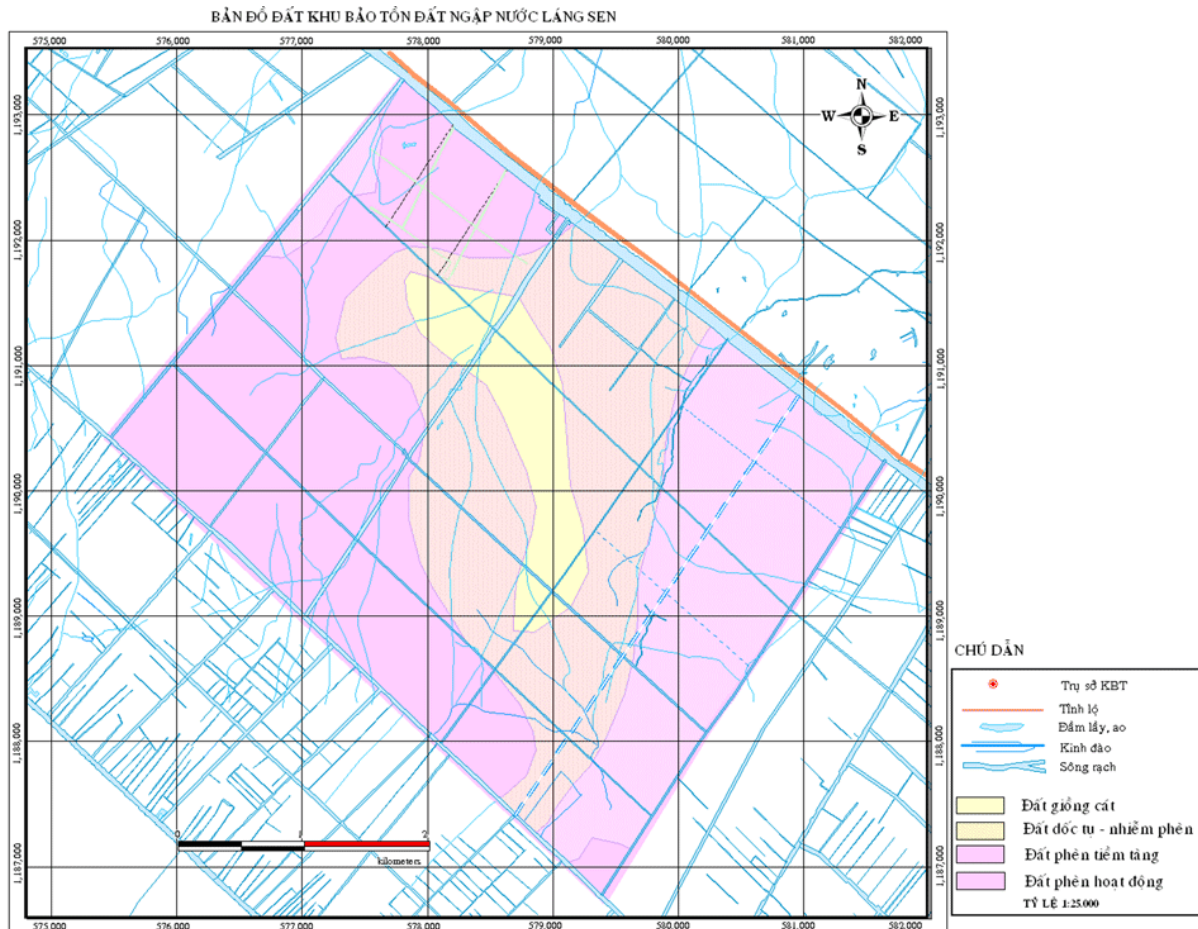
2.1.3 Soil condition

Soil in the whole proposed project area is classified into a group of active alum and alum affected ones. According to the survey result of Can Tho University, this type of soil is rich in nutrition but maintains a low rate of absorbing, and contains a high content of toxicant ingredients, such as Fe^{2+} , Fe^{3+} , Al^{3+} , SO_4^{2-} that cause negative effects to agricultural crops but reversely good for Melaleuca growth. However, to increase standing volume of plantation forest, it is necessary to have proper soil treatments, such as washing & flushing alum matter. In the proposed project area, there are 4 types of soil affected with alum”: sandy alum cultivating land (153.83ha); Dat doc tu nhien phen (606.43ha);

Potential alum infected soil (763.38ha) and Active alum soil (492.74ha). (See attachment II for more detail on types of soil).

According to soil survey, the active alum soil type causes certain influence on Melaleuca productivity, however, there is very little difference between productivity of Melaleuca planted on active alum soil and other soil types. It is necessary to have irrigation solutions, land preparation when implementing the project in order to obtain expected forest productivity of the project

Figure 4. Figure I-1: Map of soil types distribution in the project area



2.1.4 Climate

The project area is located in the Cuu Long Delta Region with tropical monsoon climate. Annually, there are two distinguished seasons:

- Raining season lasts from May to November with West-West Southern wind; the rainfall is quite high which accounts for more than 85% of total rainfall in the year. During this season, forest fire hardly happens; trees grow and develop very well. Mean rainfall is 1,440 mm/year (See attachment II for detail information).

- Dry season starts in December and ends in April of the following year, prevailing wind regime is East-Northeast, rainfall is relatively low, high temperature and water evaporates very quickly. This is the season of high risk of forest fire therefore; forest patrol,

supervision, inspection and protection activities should be strengthened. Forest fire extinguishment methods should be well prepared.

Mean annual temperature is 27.5⁰C. Mean annual humidity is 80.7%. This climate creates following advantages and disadvantages for Melaleuca plantation.

- Advantages: the temperature, humidity and rainfall are very suitable with the ecological characteristics of Melaleuca species.

- Disadvantages: The uneven distribution of rainfall and high evaporation during dry season leads to low level of water in canals and rivers, those make forest fire risk at high alert

2.1.5 Hydrology

Like other parts of Mekong River Delta, proposed project area are annually affected by flood of Mekong River, which is started in August and end in November. Water level during crest of the flood (by mid of October to beginning of November) is usually ranged from 1.5 - 2.0 m; in high flood level year (1996, 2000) water levels reached to 3-3.5 m. Nowadays, canals system have been widened, flood therefore is drained faster and the flood period in the year is shorter than before. However, the flood time in low topographical places of proposed project area is still longer than the others.

Water quality of proposed project area is changed in accordance with seasons and directly affected by canal No. 79 and Phuoc Xuyen canal which brought fresh water from Tien River to heavy alum land areas, water therefore maintains a relatively low pH and muddy rate (in dry season, pH can even be maintained at 4.5). Water quality (included muddy rate) is considerably improved in the raining season especially in flooding time. Flood annually leaves depositing fertile carried by flooding currents, washes out alum matter in soils that help Melaleuca develops well.

Study and practice experiences in the last few years have shown that the mentioned hydrological conditions are very appropriate for Melaleuca species. However, it is required special silviculture regime, especially with seedling, seasonal plantation, and land reparation in order to achieve fast growing speed of the trees in the first year to cope with annual flood - if planted trees are sunk under water during the flood season, they will die and more investment is required for re-plantation.

2.1.6 Bio-diversification characteristics of the area

Fauna and flora system in Lang Sen Wetland Reserve in general and in the project site in particular is extremely diverse. Besides the vegetation system with 156 wild species of which 152 species belonging to 60 families were identified with scientific names, there are diverse fauna in the region such as Loc Bong fish, Lang Vang fish, Trach fish, That Lat fish, anabas, Linh fish, Me fish, Loc fish, Thia Lia fish, eal, frog, snakes (3 sub-species), reptiles (17 sub-species) and birds (101 sub-species).

Recently, due to over-exploitation of local inhabitants (hunting and cutting down trees surrounding the Conservation area), quantity of some species likes snakes, Lang Vang fish, Sac ran fish and birds such as Diec, Gia day, Giang Sen etc. has reduced significantly.

If being implemented, this project would provide more favorable living conditions for the above mentioned vegetations, aquatic creatures and other animals. If the project is well managed and protected, it would be a safe protective shield to protect the core zone, fauna and flora system therefore will become diverse and abundant.

2.2 Socio - economic condition

2.2.1 Population, poverty and Labor force

According to the survey results in 2005, total population of Tan Hung district is 41.814 people of Kinh ethnic group only; population density is 87 people / km². Major economic activities of the District are agriculture, forestry and fishery production. According to statistic data, economic structure of the district is agriculture- forestry-fishery, industries and services. In which, agriculture and forestry productions take up major share of 83% (see attachment III).

In the project area, there is no outside people residing but some staffs of the Conservation area who live in temporary accommodation. In the North of the area, there are residents of Vinh Loi commune living but it is far away and having very little influence from them to the proposed project area so far. The proposed project area is bordered with Vinh Chau A and directly influenced by the people living in this commune. Vinh Chau A commune has an area of 6,399ha with 3,104 people (in labor age : 1,711 people) ; People live along canals with major income sources from rice cultivation, Melaleuca plantation and catching fish in flooding season. Some households raise livestock (pigs, buffalos, cows, poultry and fresh water fish) in a very small scale, mostly under extensive production method.

According to a survey conducted on 35 households living nearby the proposed project area, the majority of them (88%) living on agriculture, fishery and forestry activities. Other industries accounts for only 12%. The highest income generation field is cultivating. Number of households with low income makes up nearly 30%. Over 20% of total household have income from catching fishery.

Table I-1: Income sources of households by economic activities

Income amount (million dong)	Cultivating (household)	Animal raising (household)	Fishery (household)	Forestry (household)	Others (household)	Total
< 5	0	3	5	1	1	10
5 – 15	2	6	2	5	1	16
15 – 25	4		1		1	6
> 25	2				1	3
Sum	8	9	8	6	4	35

Labor mobilization ability of the project:

- Households families living nearby the Commune central or alongside main roads can earn from providing services. Those families are not going to participate in to the forest planting of the project.

- Households doing agriculture, Melaleuca plantation and animal raising have free time at off-farm seasons (in dry season and end of flooding season). Because the proposed project located far away and no industrial zones nearby, the labor force is mostly unskilled labor. The project could mobilize local labor for project work, though the labor force is low education level they have accumulated experience in forest planting, tending and harvesting.

Beside the above advantages, project would face with some challenges including: Education level of the local people is low, mostly at secondary school level hence, their ability in applying science and technology in production is limited. During the off- farm season, activities of the local people which are harmful to forest resources such as: fishing, catching birds, etc. These activities influence to conservation activities though these happen outside the Conservation area (close to the proposed project area). Therefore, once the project come into implementation, it is necessary to attract these people into project's work in order to help them have other income source to prevent harmful activities on natural resources.

2.2.2 Education & health care

Although education and health care of the district and communes in the surrounding project have been improved very much, there are limitations in compared with current requirements. All the communes have primary and secondary schools and health care station for primary health care, but the quantity as well as quality is still very poor. Normally, people living closely to the commune central are beneficiaries; people living far away from communal centers have received very little benefit, especially about health care. In the proposed project area, there is a secondary school with five classrooms for children of staff working for Lang Sen Wetland Reserve and surrounding local households; there is no health care station for primary health care in the project area. Education and health care for local people are limited.

Such mentioned conditions have led to difficulties in attracting labor with high education and working skills to work for the Wetland Reserve.

2.3 Infrastructure

2.3.1 Transport & irrigating system

Transport system in the project area and surrounding locations is mainly based on water ways and major means are junk boats, canoes ... The management board of the Lang Sen Reserve has 1 canoe and 7 junk boats for conservation activities. For the road, a small road connecting Tan Hung town, along canal 79 with national road No 62 is now under construction.

The current canal system in the reserve area includes: Canal 79, Canal Cái Nga, Canal 81, Canal T1, T3, T4, T5 ...

This transportation system is favorable for forest planting, forest protection, patrol and forest fire prevention as well as forest harvesting and transportation of harvested goods to market

3 Land condition and forest resource

3.1 Land condition

The proposed project area is under management of management board of Lang Sen Wetland Reserve. According to the data surveyed in 2005, the total natural area is 2,016.38 ha, and status of land use is described as follows:

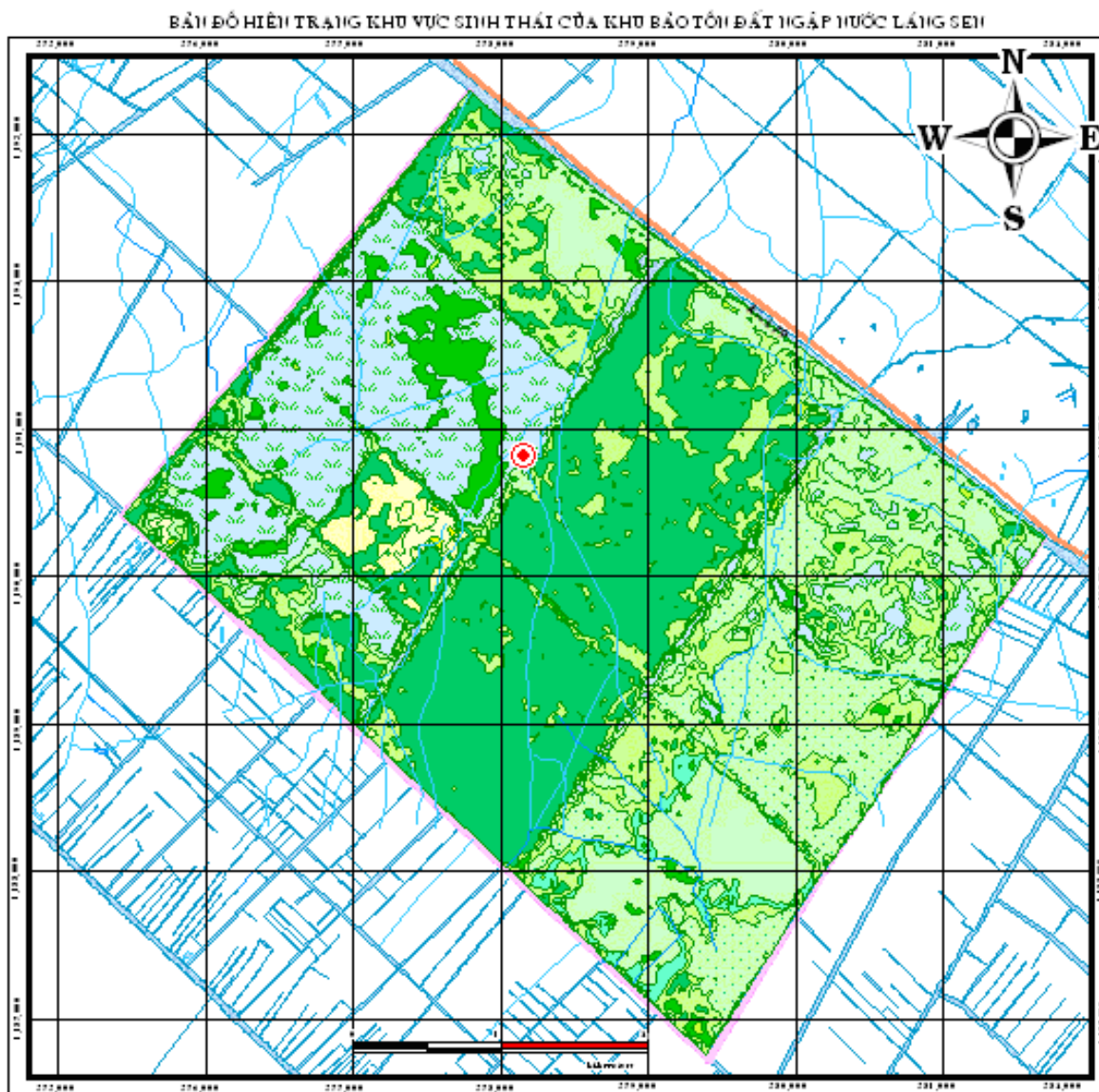
Table I-2: Land use status in proposed project area in 2005

No	Land use status	Area (ha)	Share (%)
1	Continuous Melaleuca forest	647.40	32.11
2	Low land	329.80	16.36
3	Grass (Cỏ năng - cỏ bắc)	364.80	18.09
4	Scattered regeneration area (Melaleuca & Rush)	343.80	17.05
5	Rush & straw grass	237.90	11.80
6	Canal - dyke	92.68	4.60
	Sum	2,016.38	100.00

Beside 647 ha planted forest raging from 7 to 10 years old, seventy percent or the remaining part is land covered by grass, rush and small number of regenerated Melaleuca trees. Those grasses are crawled on the ground, they have no capacity in nutrition competition and they die shortly when the Melaleuca trees grow up.

In the near future, Lang Sen MB plan to plant production forest in non-forest land (grass land and low land), the total plantation site is about 1,061 ha.

Figure 5. Figure I-2: Current status of the proposed project area



3.2 Forest resource

Recently, conservation activities have been mainly focused on preserving the original status of existing forest, no forest tending activities are carried out. This result in poor growth and development of Melaleuca forest.

A rough survey shows that there are around 443 ha forest with straight and good quality trees, mean DBH from 5-8 cm; the height ranges from 3.5 m - 4.5 m; Trees in other 40 ha have DBH ranging from 4 - 10 cm, and mean height ranges from 3 - 5 m; but among them number of straight stem trees is not so many. The remaining area (164.4 ha) is covered by very poor quality forest (big stump but very small tree top).

In the future, new plantation forest is expected to obtain greater yield as proper silviculture regime is plan to apply.

4 Market for selling Melaleuca log

The most common mode of selling forest product in Long An is to sell standing trees at the plantation sites. Forest harvesting, logging and transporting are carried out by traders. This sell method help forest owners overcome difficulties in mobilizing labors for harvesting works and searching for market channel.

Melaleuca is now mainly utilized as stakes for house construction and stems do not meet required specification will be used as fire wood. Thus, demand for and nature of buildings construction are the two key factors determining sale price of Melaleuca as well as influencing on the fluctuation of Melaleuca forest area.

During years before 1988, total area of Melaleuca plantation and its prices were relatively stable; average stumpage price for 1 ha of Melaleuca was ranging from 35 to 40 millions VND. During period of 1999 - 2003, due to the drastically increase of construction works, average stumpage price of 1 ha was around 70 and 80 mil. VND, and many households have converted their water rice field into Melaleuca plantation to generate higher profits and the area of Melaleuca plantation had increased dramatically. Since 2004, due to construction works are stable, and there have replacements of Melaleuca pile by concrete pile, market demand of Melaleuca log has been reduced; at the moment, average price for one hectare of Melaleuca stands at 40-50 mil. VND. However, some research show that the total cost investing into Melaleuca forest from the beginning till harvesting is about 8-15 millions dong (direct cost only) means it is not lost

According to the report “A research on current status of Melaleuca forest development in the Mekong Delta River, solutions to overcome” conducted by the Sub-Forest Science Institute of Vietnam in Ho Chi Minh dated December 28th, 2006, demand for Melaleuca of provinces in Mekong delta region (DBSCL) and Ho Chi Minh city at present and in the future remains relative high.

Demand for Melaleuca in 2006 described in the Table I-3 below show that demand for Melaleuca stakes consumed within Long An is 73.218.311 stems and Ho Chi Minh city consumed 32.735.953 stems (accounts for nearly 43% of the total Melaleuca products in the region)

Table I-3: Forecasting on demand for Melaleuca log in Mekong river delta and Ho Chi Minh city (2006-2010)

Year	Ho Chi Minh city	Mekong delta	Whole area
2006	32,735,953	73,218,311	105,954,264
2007	31,702,678	80,513,651	112,216,329
2008	30,371,887	86,476,912	116,848,799
2009	28,780,688	90,670,370	119,451,059
2010	26,973,151	92,748,467	119,721,619

(Source: Do Van Ban and collaborators)

Based on above analyses, researchers estimated the gap between demand and supply in 2010: It is projected that market of Melaleuca log in Mekong river delta will change significantly and supply is always bigger than demand, especially in 2006, the

volume of Melaleuca could be harvested to provide to the market is 280.510.701 stems while demand was only 105.954.264 stems (table I-4). Potential supply in 2010 is estimated to reach the bottom with only 33,389,784 stems and much lower than demand for Melaleuca at that time.

Table I-4: A comparison of supply-demand of Melaleuca log in period of 2006-2010

Year	Supply (log)	Demand (log)	Gap (log)
2006	280,510,701	105,954,264	+ 174,557,437
2007	145,347,558	112,216,329	+ 207,688,666
2008	92,882,499	116,848,799	- 183,722,366
2009	86,073,527	119,451,059	- 269,795,893
2010	33,389,784	119,721,619	- 183,464,058

In short, in the market of Melaleuca log in Mekong river delta and Ho Chi Minh City from 2008 onward, the supply will not be met with demand.

5 Experience learnt from development project and challenges

5.1 Lessons learnt from development projects in the province

The process of forest plantation in Long An province in the last time shows that:

- During 1980s, a number of SFEs, Forest Station (Thủy Phước SFE, Gò Ngải Forest Station, Bo Bo SFE, Thủ Thừa SFE, Mộc Hóa SFE, Tân Hòa SFE, Tân Thủy SFE, Đức Hòa Forest Station...) had been implemented, because of shortage of financial investment, forests planted by these organizations shown very poor performance. Those forests were often damaged by forest fire because lack of canal system for forest protection. As a result, those organizations are no longer existed and they have been dissolved.

- Dong Thap state forest company No 4 (Thanh Hoa district, Long An): The company was given special credit from Long An Development Bank after its project approved. Based on borrowed capital, the companies operated production forest such as planting, constructing canal for forest fire control and forest protection in accordance with implementation plan written in the project. Since 1994, there have been no forest fire and the company's forests grew and developed very well. The company harvested the forest and repaid loan to the bank as scheduled.

Therefore, if Melaleuca plantation forest on the buffer zone of the Lang Sen Wetland Reserve is approved and financed, with supplementary trainings on management and technical aspects, the project will surely bring about good results.

5.2 Advantages and challenges

5.2.1 Advantages

- All land for proposed project area is directly managed by the Lang Sen MB, this will help land use and project operation more convenient and consistent.

- Soil condition of the proposed project area is favorable for grow and development of Melaleuca species; MB of conservation and local people surrounding the proposed project area have a lot of experiences in planting, tending and protecting Melaleuca forest.

- Demand of Melaleuca log in the future is projected to remains high. Currently, due to decrease of timber volume harvested from natural forest in South-Western provinces and the Central Highlands, Melaleuca logs will become more valuable in the market.

The transportation system, especially water way in the area have been well-developed creating advantages for transporting materials for forest planting as well as for forest patrolling, managing, protecting and logging after harvesting.

5.2.2 Challenges

- The proposed project area is located in the remote area where local people live in very low conditions. The hydrograph and climate conditions are very complicated, there is high risk of forest fire in the dry season, and flood season occurs at the planting season. This is real challenges for production forest.

Although the government has issued various policies on preference credit scheme for forest plantation, but due to limited capacity in project formulation, accession to those financial sources has remained limited.

6 Activities of the Wetland Reserve

Lang Sen Wetland Conservation Area is established under the Decision No 199/QD-UB, dated 19th January, of Long An People Committee. This is a state organization basically its activities bases on government budget in combination with its self-income, under management of provincial people committee. The main function of Lang Sen Reserve is to protect bio-diversification and to utilize natural resource in wetland area in sustainable way. Natural area of the reserve area is divided into three parts with different functions, in which the proposed project area will be on area of production site.

For personnel, there are 32 staffs working in Lang Sen Wetland Reserve with educational level, mandates given below.

In terms of personnel arrangement, the Wetland Reserve currently have 32 staffs, classified by education level and responsibility as follows:

Table I-5: Qualifications of Lang Sen Wetland Reserve' Staffs

No.	Task	Qty	Educational level		
			College	Undergraduate	Conventional school
01	Director	1	1		
02	Administration	7	2	-	5
03	Technical section	7	1	2	4
04	Protection team	17	-	-	17
Total		32	4	2	26

Operation of the management board is based on revenue taken from agricultural land and fishery resource, which is can be taken from canal system, in production site. The provincial authority gives a small mount of money for activities of the MB only. Total revenue collected from fish harvesting is around 90 million VND/year (of which, 40 mill. VND are collected from fishing in proposed project site)

In the past, due to many reasons the MB have not mobilized capital from banks for production activities. Therefore, expenditure for conservation activities is based on not only revenue taken from agricultural land and fishery resource but also some amounts from central government. However, most of annual budget of MB is used for administrative activities; budget for educating staff is very limited.

Table I-6: Balance-sheet of MB of the Lang Sen Wetland Reserve in 2005

No	Item	Revenue (1,000 VND)
I	Sources*	1,118,102
01	- Fishing	75,000
02	- Leasing agricultural land	686,491
03	- Melaleuca harvest	180,756
04	- Others	175.855
II	Expenditure	1.329.856
01	- Salary and allowance	270.945
02	- Payment for public service	55.654
03	- Official supplies	39.683
04	- Telecommunication	6.915
05	- Conference	18.839
06	- Uniform and labor safety	45.788
07	- Fix assets	833.993
08	- Others	58.039
III	Revenue - Expenditure	(211.754)**

Note:

(*) revenue of MB has increased suddenly in comparison with other years because of receiving repayment and harvesting Melaleuca forest.

() Difference between the revenue - expenditure of MB is balanced by the state budget, and annual state budget financed for MB is about 50.000.000 VND/year.**

In 2007- 2013 period, budget needed for operation of the conservation area is about 500 millions VND per year. From 2014 to 2019, the amount will increase to about 1 billion VND each year due to increasing demand of conservation activities, higher labor demand, increase of price and salary.

Also, because of various reasons, production forest of MB has not been implemented yet. This led the MB in particular and the province in general cannot take their advantages, such as using the land for production in order to create more revenue for MB and the province; contribution to environmental protection (ecology, fauna and forest cover in the region), simultaneously contribution to implementing forest development strategy of the province. It has not contributed to ecological system, fauna, flora and forest coverage). In addition, leaving forest-land fallowed, it has not contributed to fulfill provincial objectives as well as objectives of the forestry sector.

In consideration of above mentioned issues, the MB of the conservation area has identified that the first priority for implementing conservation work is to promote sustainable development ecosystem of Thap Muoi Delta Region by utilization effectively production site. This strategy will contribute to contribute to increase the forest coverage and to create favorite living condition for fauna and flora. Moreover, it will create great incomes for management activities, improving living standard of the reserve' staffs.

Finally, this will contribute significantly to achieve forest development strategy of the province.

In order to implement above sound strategy of sustainable conservation, Lang Sen MB requested Long An PC to approve certain area within the reserve area for production forest. In line with the results of rechecking three kinds of forest, proposed project site was officially approved as production forest site by Long An PC.

PART II: PROJECT CONTENT

1 Project rationale

Lang Sen Wetland Reserve is located in the Thap Muoi Delta Region with typical wetland ecological system. Diverse fauna and flora have been found in the area, in particular, many species are endemic to Lang Sen. Over several decades, human activities such as agricultural cultivation and inappropriate natural resource exploitation has led to reduce remarkable biodiversity of the region.

Since 1998, a lot of researches on natural resource have been carried out in Lang Sen in order to assess its biodiversity value. Based on the researches results, in 2004, Lang Sen Wetland Reserve was officially established which directly managed by Long An PC². After that, Lang Sen was selected as a demonstrative model of sustainable natural resource utilization and biodiversity of the wetland reserve funded by IUCN, UNDP³.

Since establishment, Lang Sen MB has encountered many problems as follows: So far, international organizations have not focused their activities on forest rehabilitation, but field survey and scientific researches. The number of Lang Sen Staffs is only 32 people while the Reserve area is very large (5,030 ha). In addition, capacity of Lang Sen staffs is limited especially in management, technique, market and budget mobilization. Further more, allocated budget from government for conservation is limited while large bare land area is followed.

Recently, the government has paid special attention to afforestation. Forest plantation is considered as crucial task of the forestry sector in order to secure forest resource, to protect the environment, to provide timber, to create jobs and incomes for mountainous inhabitants. This orientation of the government is reflected in various policies such as the Decision number 327, 661, forest land allocation program, preferential bank loan for production forest. The forestry development orientation of Long An from 2006 to 2010 also clearly stated that *“developing production forest system while strengthening special use forest system in order to successfully conserve biodiversity especially high value, rare and endangered species in alum wetland eco-forest system of Thap Muoi Delta Region; expanding protection forest size in the West-South; and strengthening anti-forest fire”*. In line with the results of the rechecking three kinds of forest program in Long An, the proposed project site was officially planed as production forest land⁴. This is important supporting policy for Lang Sen MB to formulate production forest project.

There are great advantages when the proposed project is implemented. All proposed project site is under the use right of Lang Sen MB. There is large and continuous area of bare land which was officially planed as production forest area by Long An PC. In addition, Melaleuca is native species to Long An, thus it is fully suitable with natural condition of the project site. Great studies on Melaleuca were already carried out, and silviculture guideline is available to maximize its yield. Furthermore, Lang Sen staffs and surrounding farmers have great experience on Melaleuca plantation. The proposed project naturally posits in the favorable conditions with the network of both land and water

² Decision Number 199/QD-UB, dated 19 January, 2004 of Long An PC

³ Mekong biodiversity management Program

⁴ Decision number 229/QD-UB, dated 23 January, 2007 of Long An PC on approval the results of rechecking three kind of forests to 2010 program in Long An

transportation in the project area that 50 ton – ships can access to the project site. So far, two enterprises have received bank loan from Long An Development Bank for Melaleuca production forest, those enterprises have already harvested their forest and repaid both basic and interest portions to the Bank as the scheduled. This is a good basic for the bank to offer loan when the proposed project obtain approved.

So far, 955 ha has used for reserve purposes including Melaleuca forest, grass-plot, salt marsh. The remaining 1,061 ha of bare land has not been utilized effectively. Planting Melaleuca in the bare land area is necessary and suitable to the development strategy of the province as well as of the central government. Melaleuca plantation forest will contribute to increase the forest coverage of the region. The economical return from production forest will be reinvested in conservation activities for Lang Sen Reserve. This sound strategy is suitable with the development strategy of the local and central government.

In order to implement the proposed project smoothly, it is important to pay attention to possible threats and weaknesses toward project implementation. The results of monitoring over that pass show that there are two main threats to the proposed project: (1) illegal exploitation of forest products (catching aquatic products, birds, wild animals) by local inhabitants especially those from Vinh Chau A Commune and other surrounding Lang Sen Reserve; (2) forest-fire in the dry season because of local people practice such as burning straw in paddy field, bee catching etc. Beside that, Lang sen staffs in some extent are limited in capacity especially, management and technical capacity. Finally, self capital from Lang Sen Reserve is too small to the project budget requirement.

In order to take the opportunities, strengths and to deal with weaknesses and possible threats, it is necessary to design specific intervention in the project plan as follows:

- + Organizing training courses to improve capacity of PMB and other participated people in Melaleuca silviculture technical. Staffs from PMB will be trained in following field: management, budget mobilization, business promotion, marketing etc.

- + Establishing Consultative Council to strengthen communicates among PMB, local authorities and local people to obtain consensus how to deal with forest fire and illegal exploitation.

- + Giving priority to surrounding inhabitants in recruiting laborers for project implementation. This will help improve livelihood of local people and minimize illegal exploitation. .

- + Besides mobilizing bank loan, PMB need subsidy from government budget for constructing canal system, forest-fire watch towers, and partly covering labor and material costs.

2 Key Design Considerations

2.1 Project area and location

Project site is located in the Lang Sen Wetland Reserve, Vinh Loi and Vinh Chau Communes, Tan Hung District, Long An Province.

Based on the results of field survey and analysis conducted during the preparation stage, four (4) criteria were applied for site selection (Section 2.2). Project site belongs to the buffer zone and was officially planed as production forest land. The proposed project site covers 1,061 ha of bare land and scatter regenerated *Melaleuca* forest.

2.2 Criteria for site selection

Project site (1,057 ha) was selected based on evaluation of four following aspects: (i) Current forest land status; (ii) Natural condition; (iii) social – economic conditions; and (iv) accessibility. The detail criteria of each aspect are described as follows:

(1) Current forest status

- (a) Forest land located within administrative border of Lang Sen Wetland Reserve
- (b) Must be planed as forest land
- (c) Having land use right certificate (Red book)
- (d) There is no conflict in land usage

(2) Natural conditions

- (a) Alum wetland in Cuu Long Delta River Region which suitable to *Melaleuca* plantation.

(3) Social economic conditions

- (a) There is no overlap with other projects
- (b) Supporting by local authorities and local people.

(4) Accessibility

- (a) Transportation vehicles can access project plantation sites to ensure inputs materials and output products can be easily transported.

2.3 Project beneficiaries

Main beneficiary from the project is Lang Sen Wetland Reserve. Beside that organizations and local people participating in infrastructure construction and afforestation activities also benefit from the project.

2.4 Species selection

Project sites is located in wetland of Cuu Long Delta River, it is alum soil and submerged in the flooding season. Thus there are not many species can grow in this area. *Melaleuca* has been observed as a suitable species for planting in this area. For other species such as Eucalypt, Acacia were already tested in the area; however, their performance is very poor and requires high cost. Moreover, based on ecological

characteristics of *Melaleuca*, it is tolerant to alum and wetland site and not vulnerable to flood and storm. Therefore, it is clear that *Melaleuca cajuputi* is the most suitable species for production forest in the project site.

2.5 Afforestation plan

Afforestation plan is designed in a sustainable manner and suitable with limited existing resources. With total plantation area of 1,057 ha, plantation cycle of 7 years, project site is divided into five (5) compartments with 18 plots and will be carried out in six (6) years. Above plan ensures that after year seven production forest will be available for harvesting every year (200 ha/year). Annual plantation of 200 ha is also in line with capacity of finance, labor, seedling, technique and management. In 2007, it is planned to construct infrastructure such as canal system, dividing project site into compartments and plots, and procuring equipments. From 2008 to 2013 plantation will be carried out as described in the following table:

Table II-1: Annual forest plantation area

Unit: ha

Planting year	2008	2009	2010	2011	2012	2013	Total
Area	172.12	147.46	157.96	162.75	194.56	222.88	1.057

(Detail information for each plot, compartment is available in the annex IV-2)

2.6 Seedling plan

Based on typical characteristics of the wetland region (about 1.5 – 3 meter under water in the flooding season), seedlings have to meet the standard norm in order to reach high survival rate. According to the Technical Guideline⁵ for *Melaleuca* plantation, seedling in the nursery garden must be at least 1 year old, 0.8 – 1.2 m height, and diameter ≥ 0.5 mm. Those technical requirements are crucial to ensure that new plantation forest will not be affected by flood in the following season. Currently, there are several imported genus of *Melaleuca* but still in the process of provenance test. Thus only local *Melaleuca* - *Melaleuca cajuputi* – was assessed as the most feasible genus. This species is original in Tan Hung, Vinh Hung and Moc Hoa Districts, Long An Province⁶. In order to have high quality seedlings, it is important to select reliable seedling supplier (The detail is available in the annex IV – 3).

2.7 Planting design

2.7.1 Total designed area

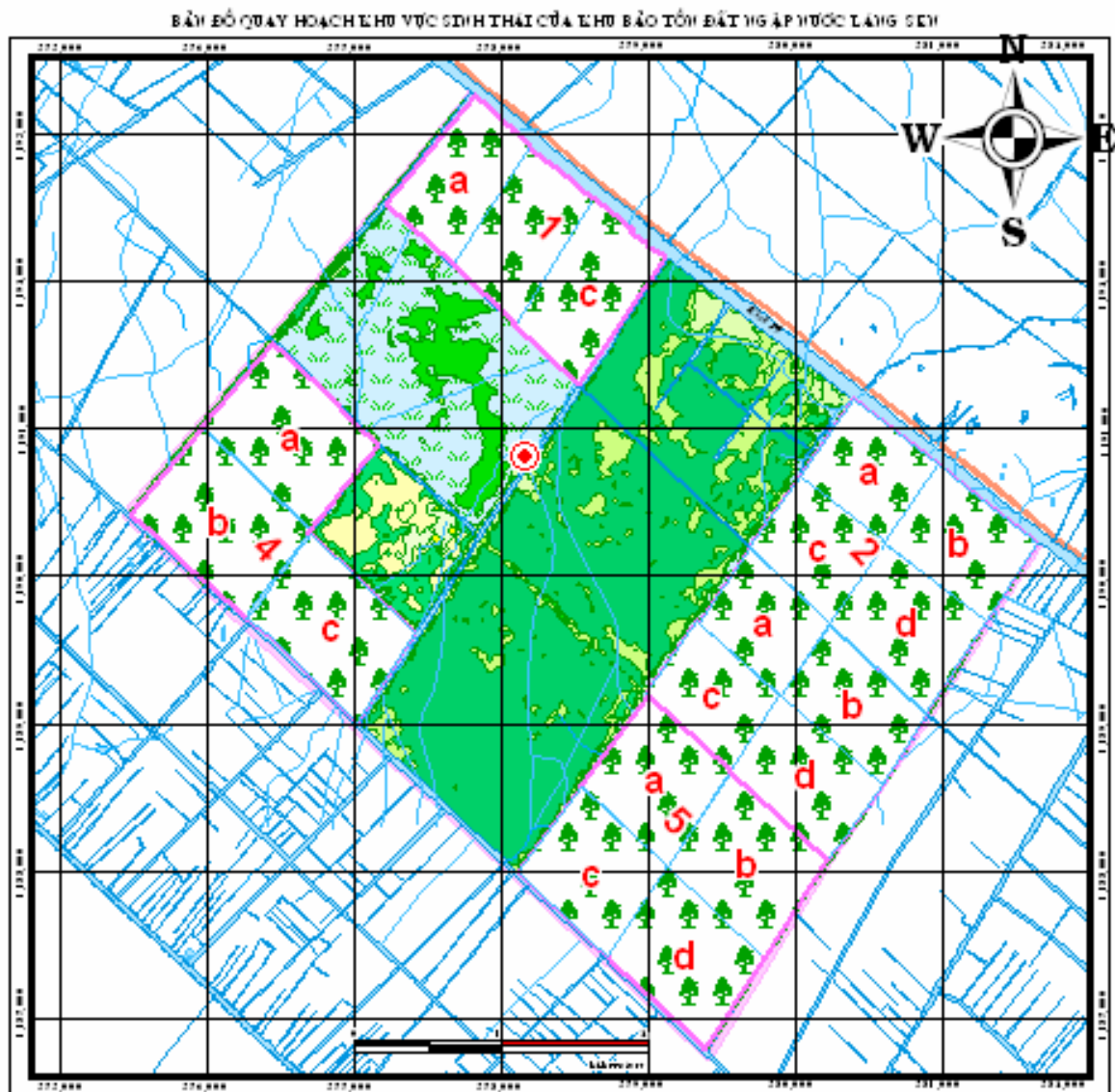
Based on forest measurement data from Tan Hung Division of Resources and Environment, total project site is 1,061 ha. After deducting the area for canal system, actual area for forest planting is 1,057 ha. Based on natural conditions, existing canal system, annual flooding level, project site is divided into compartments, plots in order to

⁵ Good provenance approved by MARD

⁶ Technical guideline on *Melaleuca* plantation (QPN 9 – 86)

be convenient in management, operation, tending and protection. Lesson learns from previous Melaleuca projects shows that those arrangements serve effectively to afforestation operation especially to anti-forest fire work. One of the typical examples is Melaleuca forest managed by Forest Mot Thanh Vien Enterprise Dong Thap 4. This Enterprise is managing about 1500 ha Melaleuca production forest, they divided plantation site into compartments and plots with size of 300 – 400 ha and 50 – 100 ha respectively. Since planted until 2006, there have been no forest fire evens in those forest areas. Therefore, based on natural condition and previous lesson learn, proposed project is planed to divided into 5 compartments and 18 plots. Average size of a compartment is 200 ha, and of a plot is 60 ha.

Figure 6. Figure II- 1: Map on Melaleuca plantation plan



2.7.2 Planting mode

Based on the ecological characteristics of *Melaleuca*, it is intolerant shade species, growing well in alum wetland. Based on natural conditions of the project site, we decided to apply planting mode is mono species.

2.7.3 Planting method

The favorable season for planting *Melaleuca* is at the end of flooding season when water level remains about 0.5 m. Thus *Melaleuca* is planed to plant by seedlings with bare root. Plantation of *Melaleuca* over the pass years in Long An shows that applying bare-root seedling is the most successful plantation method and the seedling cost is also lowest. This planting method was also written in the Technical Guideline issued by DOF.

2.7.4 Planting measure

Project site is alum and wet. Thus, it is planned to plant *Melaleuca* on bed, applying intensive cultivation, and fertilizing in the first three years. By adopting this measure, combine with selection of qualified seedlings, new planting trees will reach their height above water level in the following flooding season.

2.7.5 Technical norms

a) Species selection:

Applying local *Melaleuca* species, it is *Melaleuca cajuputi*.

b) Seedling standard: height: 0.8 to 1.2 m, straight stem, no diseases, diameter: 0.5 to 1 cm.

c) Land preparation techniques: Because of characteristics of wetland and alum project site, it is necessary to plant *Melaleuca* on bed for water drainage and alum wash. Bed direction depends on plot position and ensuring water drainage Detail bed design is available at the annex II).

d) Planting:

- planting specifications: spacing: 0.7m x 0.7 m; planting 17,432 seedlings/ha (including 10% of supplementary seedlings)

- Planting season is at the end of flooding season (November, December).

- Planting technique: seedlings are pulled up, and then transported to planting site in the same day. Preventing seedling from grazing or other damages, organizing about 50 – 100 seedlings/bundle. Shading frame system is prepared at planting site to protect seedlings. After transporting to planting site, seedlings are stood up in flowing water (1/3 stem of a seedling is submerged in water), under the shading frame system. In the planting season, fresh seedlings with white root system are selected and then planted.

e) Tending and fertilizing:

- + Tending: Operating supplementary planting after planting 1 month. When canopy is closed (about year 3rd), thinning is applied: cutting bad quality trees such as trees with curved stems, diseases, topless. Lower branches also are cut down. Spacing after first

thinning is 1m x 1m. In the year fifth, second thinning is applied, density at the harvesting time is over 7,000 trees/ha.

+ Fertilizing: after planting 1 year, when root system is fully developed, it is applied fertilizing in 3 continuous years (from year 2nd to year 4th), applying 200 kg of NPK /ha/year, fertilizing two times/year – first time is at the beginning of the raining season (June, July); second time is at the end of flooding season (December to January) (Detail is available at the annex IV-4).

2.7.6 Anti forest fire measures

Anti-forest fire measures play a crucial role in contributing to the success of the proposed project. Thus it is important to adopt anti-forest measures in the dry season. The most important measure was identified as irrigation measure. In the dry season, channel maintenance activities will be carried out, preserving water for forest-fire fighting. Supplementary canal system will be constructed to separate forest into smaller stands in order to prevent large extent of forest fire. Furthermore, other measures will be cooperated at the same time such as: silviculture measure - clear and pre-burn all dry grass and other organic substances along canals and at the border between agricultural sites and plantation forest, constructing forest fire watch towers, organizing patrol team in the dry season.

2.8 Contracting and labor mobilization

Labor demand of the project is very high annually. However, based on field survey and analysis, this demand can be fulfilled through application of following measures:

- For basic construction: According to current local authority's regulations⁷, basic construction with government budget must organize bidding with local private or stage enterprises. Those enterprises have enough capacity such as digging canal machine to construct project basic infrastructure as the main project works are canal digging.

- For forest planting: Based on current government policy such as 661⁸ program and other regulations, for afforestation activities, it can be apply assigning bids or project owners carry out themselves. Based on lesson learn from previous afforestation project in Long An, for project site of over 100 ha, assigning bids to legal entity organization (private or stage own) is the most feasible measure. Thus, we decided adopting measure of assigning bids for the proposed project.

- For tending and protection: in order to minimize illegal forest exploitation and forest fire, PMB will directly contract with local people for protecting forest annually. This provides incomes for local inhabitants, as the results, reducing pressure from surrounding inhabitants to the forest resource.

2.9 Financial sources

After consulting with Long An Development Bank and Long An Agricultural Bank, we decided to select Long An Development Bank because of following reasons: low

⁷ Decree 16 of The Government

⁸ Decision 661 of the Prime Minister

interest rate (0.65%/month); long grace period – equaling Melaleuca forest plantation cycle of 7 years; so far, this Bank has loaned over 20 billion VND to Dong Thap Forestry Mot Thanh Vien Company Limited (Thach Hoa District) and Lam Hai Company Limited (Duc Hue District) for production forest plantation. Lang Sen PMB operating production forest to generate capital for conservation purposes, thus it is rationale to apply for loan from Long An Development Bank.

Beside the bank loan source, PMB need additional financial subsidy from government budget for labor, materials and basic infrastructure costs.

2.10 Market for Melaleuca wood

Lang Sen PMB is planed to establish market promotion and business unit. Main function of this unit is to contact and establish long-term cooperative relation with potential traders, to update market information on product requirements and prices, to find down potential consumer surrounding project sites to deliver log directly. Those arrangement will help PMB creates stable market channel for maximizing output product value.

2.11 Trainings

In order to implement the proposed project smoothly, it is important to organize training for Lang Sen PMB and other related participants in silviculture, management, market and marketing. For silviculture, it is planed to contract with Long An Extension Office for designing and providing training courses. After training courses, trainees are expected to receive adequate knowledge and skills in land preparation, vegetation treatment, planting, tending and harvesting.

For marketing and management, Can Tho University of Agriculture and Forestry will be a target for contracting as a trainer. After attending training courses, staffs of PMB will have adequate capacity in managing and promoting sell plan in order to maximize project's profits.

2.12 Consultation Council (CC)

In order to address possible risks, it is planed to establish a consultation Council. Members of CC are proposed to comprise of Long An DARD, Long An Extension Office, Lang Sen MB, Economic Division in Tan Hung District, Vinh Chau A Commune PC and representative of local households. Main function of CC is to regularly exchange information with related organizations, local authorities and inhabitants and provide solutions for anti-forest fire, illegal exploitation, and ensuring proposed project is operated smoothly.

2.13 Establishing Project Management Board (PMB)

Based on approved project, the Provincial PC will issue the decision of establishment a Project Management Board (PMB) to implement the proposed project. New PMB will have its own bank account and stamp. This arrangement will help project finance is managed conveniently, and M&E is carried out smoothly. It should be noted that staffs to be selected as the PMB members should be high capable people either in terms of technical issues or financial management ability.

3 Project

3.1 Project Objective

3.1.1 Overall objective

- To enhance economic utilization of the buffer zone;
- To generate more income for the Management Board of Lang Sen Wetland Reserve and help to strengthen conservation of the core zone. From 2007 to 2013, benefits from fishing will be transferred all to conservation activities. From 2014 to 2019, partial cost of conservation will be extracted from 10% of the turnover from production forest project.
- To improve the environment, create favorable living conditions for fisheries and birds to grow in the area.

3.1.2 Immediate objectives

Melaleuca production forest is established in the project site which is located in Lang Sen Wetland Reserve:

- By 2013, 1,057 ha of Melaleuca production forest is established in the bare land area located in buffer zone of the Lang Sen Wetland Reserve;.
- By 2014, over 1 million Melaleuca trees per year will be provided to the local and neighboring construction market.

3.1.3 Expected outputs

Following achievements are expected to reach by the end of the project:

1. About 1,057 ha of Melaleuca forest will be established on the buffer zone of Lang Sen Wetland Reserve.
2. Technical and business promotion capacity of the staff members of the Lang Sen Wetland Reserve will be strengthened.
3. Management and implementation capacity of the Management Board in terms of economic and preservation activities will be improved.
4. Partial cost of Lang Sen conservation activities (management and protection) will be extracted from project's turnover. All project turnover from 2007 to 2013 and 10% or project turnover from 2014 to 2019 will be used for Lang Sen conservation activities.

3.2 Project Components:

The proposed project will include 3 interactive components as following:

3.2.1 Forest plantation component

This component function is to establish plantation forest as planned which meet the requirements in terms of materials provision, labor need and other inputs needed. The focal point of this component is to establish sustainable production forest in the two communes. The project cycle is estimated to last about 7 years. The major output of this

component production forest with high quality and will provide over 1 million Melaleuca trees/p.a when it comes to harvesting at the highest volume. The products are mainly to supply for construction purpose in both local and neighboring areas. This component includes some activities:

- a) The PMB makes overall annually plan.
- b) The PMB prepare loan plan and project plan
- d) The PMB procures needed equipments to construct necessary facility.
- e) The PMB carries out production forest plantation of Melaleuca, including contracting with local enterprises. Target contracting implementers which are available in the province are Dong Thap 4 Forestry Mot Thanh Vien Limited, Dong Thap 1 Forestry Mot Thanh Vien Limited and other private enterprises. It is crucial to examine capacity of those enterprises before contracting.
- f) The PMB harvests and sells forest products from the production forest. Depending on the conditions at the harvest time, PMB may harvest itself or contract with local enterprises or traders.

3.2.2 Support to sustainable forest plantation component

This component is to help the PMB and staff members of Lang Sen Wetland Reserve to obtain access to sufficient financial resources according to the loan plan and help them become capable in exercising technical requirements of forest plantation in line with latest advanced forestry technology as well as supporting to sale of the products by providing stable Melaleuca annually (in accordance with business cycle of forest). This component comprises of following activities:

- a) The PMB consults with potential financial institutions and other related organizations to mobilize capital. It is focused on administrative procedures of financial sources for disbursement. When the proposed project is approved, PMB prepare loan application including credit contract, disbursing a portion of total loan. After that, in order to obtain disbursement of remaining loan, PMB need to conduct inspection of completed activities and establish mortgage which formed from new plantation forest. After that remaining steps will be operated until the end of project.
- b) The PMB organizes capacity building trainings on management, technical matters, marketing, finance, accounting ability for staff members of PMB. Training courses will be taken place before and during afforestation. Target organization participating in capacity building includes Long An DARD, Can Tho University of Agriculture and forestry, Sub –FSIV in Ho Chi Minh.
- c) Making project plan and loan plan;
- d) Establishing a PMB directly under management of Long An PC to implement the project.

3.2.3 Management, monitoring and evaluation component

This component is to monitor and evaluate the progress of project implementation in order to achieve the expected outputs.

Regularly monitoring will be conducted by PMB in order to timely adjust inappropriate project interventions.

At the end of each project stage, evaluation by relevant organizations will be carried out to inspect and approve activity results.

At the end of the project period by 2020, PMB will invite an independent organization (third party) to evaluate project results.

3.3 Project Cost

Project cost is estimated based on a project cycle of 7 years (according to the forest plantation cycle). Total estimated cost of the project including physical contingency and price contingency for a project cycle is about 23 billions VND.

(1) Production forest development: Approximately of 1,057 ha of Melaleuca are established during the implementation period of the project. Average basic cost for one ha plantation is about 16.6 millions VND (about 1,036 USD) and the total of project cost from 2007 – 2013 is about 23 billions VND including contingencies (1,437 million USD). Out of this figure, Planting cost of the Component 1 accounts 85% of the basic cost (33% total forest planting cost is labor cost, labor cost rate is roughly at 49,500 VND/man-day) ; cost for physical facility construction accounts for 5% of total basic cost; other costs make up about 10% of total basic cost.

(2) Support to capacity building: Estimated cost for this component is about 177 millions VND. The majority share of this amount is allocated for training activities to improve management and technical and marketing ability of staff members. .

(3) Project Management and Monitoring and Evaluation: Estimated cost for this component is about 1.5 million VND.

(4) Contingencies: Physical contingency is assumed at 5% and above. Expected inflation rate is about 5% p.a and price contingency is calculated base on this inflation rate.

Table II-2: Project cost allocation

Unit: million VND

Project component	Total cost (2007-2013)	Percentage	Bank	Government Budget	PMB
1. Production forest (Component 1)	15.801	68%	11.061	0	4.740
1-1 Production forest development (Component 1-1)	14.942	64%	10.460	0	4.483
1-2 Infrastructure construction (Component 1-2)	859	4%	602	0	258
2. Supporting afforestation (Component 2)	177	1%	0	177	0
3. Project management, monitoring, evaluation (Component 3)	1.543	7%	0	1.543	0
A) Total basic cost	17.522	76%	11.061	1.721	4.740
B) Physical contingency	876	4%	553	86	237
C) Price contingency	4.770	21%	3.018	459	1.293
Total project cost (A+B+C)	23.168	100%	14.632	2.266	6.271
Percentage of financial sources			63%	10%	27%

Table II-3: Project cost allocation by implementation year (1,057 ha)

Unit: million VND

Year	2006	2007	2008	2009	2010	2011	2012	2013
Implementing year	0	1	2	3	4	5	6	7
Cost								
1. Production forest (Comp. 1)	0	919	1.760	1.894	2.323	2.642	2.976	3.289
1-1 Production forest development (Comp. 1-1)	0	60	1.760	1.894	2.323	2.642	2.976	3.289
1-2 Infrastructure construction (Comp. 1-2)	0	859	0	0	0	0	0	0
2. Supporting afforestation (Comp. 2)	0	60	18	18	18	18	18	27
3. Project management, monitoring, evaluation (Comp. 3)	0	86	171	184	227	257	290	329
A) Total basic cost	0	1.065	1.949	2.096	2.567	2.917	3.284	3.645
B) Physical contingency	0	53	97	105	128	146	164	182
C) Price contingency	0	56	210	347	581	846	1.173	1.558
Total project cost (A+B+C)	0	1.175	2.256	2.547	3.276	3.909	4.620	5.385

Table II-4: Project cost allocation by cost items

Unit: million VND

Project component	Materials	Labor	Contracting	Equipment	Conference	Training, study tour	Experts	Management fee	Basic cost	Physical contingency	Price contingency	Total cost
1. Production forest (Comp. 1)	4.122	3.328	7.724	260	0	0	368	0	15.801	790	4.311	20.903
1-1 Production forest development (Comp. 1-1)	4.122	3.328	7.124	0	0	0	368	0	14.942	747	4.266	19.956
1-2 Infrastructure construction (Comp. 1-2)	0	0	599	260	0	0	0	0	859	43	45	947
2. Supporting afforestation (Comp. 2)	0	0	0	0	84	57	36	0	177	9	35	222
3. Project management, monitoring, evaluation (Comp.3)	0	0	0	0	0	0	0	1.543	1.543	77	423	2.044
Total basic cost	4.122	3.328	7.724	260	84	57	404	1.543	17.522	876	4.770	23.168

3.4 Finance and time of disbursement

3.4.1 Finance and disbursement mode

There are three financial sources funding to the project. The Wetland Reserve will contribute about 27% of the total basic project cost; from harvesting year to the end of the project (2014 – 2019) project cost will be covered by its profits). About 63% of total cost will be mobilized from bank loan. Bank loan will be used for Component 1, infrastructure construction and contingencies. The government budget will be used for Component 2 and Component 3 and partial contingencies.

3.4.2 Procedures of loan disbursement

After being appraised by authorized bodies, the project will be approved by the provincial people committee. Based upon the approval of the project, the PMB will work together with relevant agencies to consult with Development Bank in Long An to discuss a credit plan contract.

The PMB and other related agencies follow procedures set by the bank to have loan disbursement as schedule committed.

3.4.3 Disbursement plan

Tentative disbursement plan is described in the below table. Interest portion will be repaid at the first harvesting year. Principal repayment will be done after 7 years.

Table II-5: Loan and repayment plan

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Implementation year	1	2	3	4	5	6	7	8	9	10	11	12	13
Outstanding at beginning of year		709.348.199	2.190.682.255	3.972.984.689	6.357.899.867	9.331.779.773	12.990.699.704	17.405.211.393	14.504.342.828	11.603.474.262	8.702.605.697	5.801.737.131	2.900.868.566
Disbursement of loan	709.348.199	1.426.004.896	1.611.429.218	2.075.022.372	2.477.963.717	2.931.041.108	3.401.237.112						
Repayment	0	55.329.160	170.873.216	309.892.806	495.916.190	727.878.822	1.013.274.577	4.258.475.054	4.032.207.306	3.805.939.558	3.579.671.810	3.353.404.062	3.127.136.314
Interest	0	55.329.160	170.873.216	309.892.806	495.916.190	727.878.822	1.013.274.577	1.357.606.489	1.131.338.741	905.070.992	678.803.244	452.535.496	226.267.748
Principal								2.900.868.566	2.900.868.566	2.900.868.566	2.900.868.566	2.900.868.566	2.900.868.566
Outstanding at end of year	709.348.199	2.190.682.255	3.972.984.689	6.357.899.867	9.331.779.773	12.990.699.704	17.405.211.393	14.504.342.828	11.603.474.262	8.702.605.697	5.801.737.131	2.900.868.566	0

Terms and conditions of loan will observe the terms and conditions of the bank with preferable adjustment for long grace period.

- (1) Loan amount is 14.632 billions VND;
- (2) Interest rate is 0.65%/month (7.8% per year) and applied to the whole loan period until principal repayment;
- (3) Repayment period: 7 years
- (4) Grace period: 7 years (applied to the principal and interest proportion);
- (5) Repayment of loan: Loan Repayment should be made at the time of forest harvesting with interest rate applied on annual basis.

4 Arrangement and organizing the implementation of the project

4.1 Overview

Project management board (PMB) will be established as an individual supporting body to the project. The PMB will work under the Long An PC and will receive support from the District Planning Division and other technical departments of the DARD on technical matters. The PMB will also receive support from the Sub- Department of Forest Protection, communal people committee of the neighboring communes and Tan Hung District people committee in forest management, protection and forest fire prevention.

The PMB will be accountable for all sources of finance (loan, provincial budget and capital mobilization) as well as accountable for all other overall management of the project to make sure that the project will achieve its goals. Loan will be financed by financial institutions to the project through credit contract agree with the project and the financial institution. Loan disbursement will be done in line with terms and conditions of the bank. The PMB is responsible for reporting to the Provincial PC and related authorities if any problems happened with the disbursement progress to make sure that loan disbursement is done as scheduled.

Due to the nature of forestry work, financial source and labor source for constructing facilities and forest plantation, procurement of equipments and other necessary tools as well as establishing physical facilities will be completed within the first year of the project (2007). From the second year (2008) till year 7th (2013), carrying out land preparation, planting, tending and protection according to plan (average annual area of plantation is about 180ha). Tasks needed doing during forest planting period is the same so it is easy for the PMB to manage the project at this stage. The work will be changed from year 8- get ready for harvesting and making sales network for harvested timber as well as site preparation for the next forest plantation cycle. Therefore, PMB and implementing units should pay special attention to arrange sufficient personnel and other resources for busy time of the project. The project activities from year 9th to the end of project life will be the same with that in year 8th (2014).

4.2 The contracted implementation units

Based on the annual implementation plan, the PMB will carry out steps including: contracting quotation for constructing project facility; appraisal of quotations for equipment procurement, design forest planting, tending in cooperation with authorial bodies.

It is planed to organizing bidding and appointment for forestry facility construction in line with current regulations.

Forest protection and forest fire prevention should be done in collaboration with relevant functional bodies and local authorities who are in charge of managing the preservation area and protecting the area from fire. Also, local people should be mobilized for forest protection activities.

Detail activities of the Project Implementation Unit will be described in the Project implementation plan

4.3 Organizational arrangement for project implementation

Organizational arrangement for project implementation is described in the following figure:

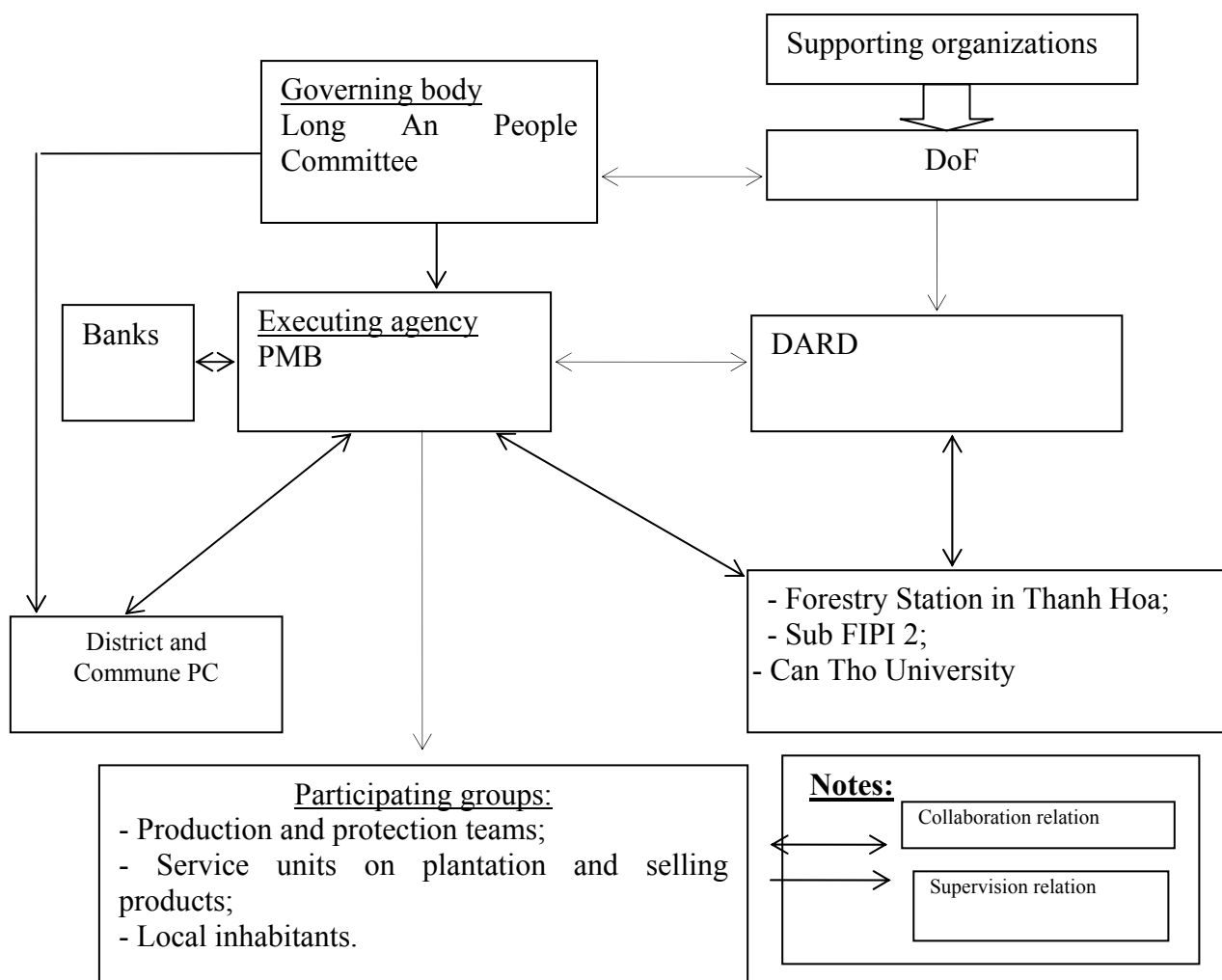


Figure 7. Figure II-2. Organizational chart for project implementation

Tentative roles of related organizations are described as follows:

4.3.1 Governing body

Long An People Committee

- Steering, directing relevant bodies to support to the PMB.

4.3.2 Executing Agency

Production forest PMB

- Managing, implementing, monitoring& evaluating and reporting the progress of the project.
- Directly get benefit from the project.

4.3.3 Supporting organization to the implementation of the project

a) *Department of Forestry*: Supporting in terms forestry management sector.

b) *DARD (Forestry Section, Planning Section, Agriculture extension centre)*: Providing consultancy and support on technical issues and monitoring and evaluating on project progress as required by the PMB.

- Consulting to the Provincial people committee on state management on project.
- Directly get benefit from activities relevant to the project.

Agencies work in collaboration to implement the project includes:

c) *Tan Hung District PC; Vinh Loi Communal PC*:

- Cooperating in land- management and providing human resource for forest protection.

- Directly get payment for job done

d) The bank:

- Providing credit program
- Direct get benefit from loan service

e) Sub- FIPI 2:

- Providing consultation and design forest planting.
- Directly get benefit by being paid for the job done.

f) Thanh Hoa Forestry Centre:

- Providing seedlings
- Getting benefit from selling the seedlings.

g) Can Tho University:

- Providing technical consultation on forest planting, processing and selling of products.

- Directly getting benefit from being paid for the job done.

h) Producing group and protection group of Lang Sen Preservation area:

- Directly implementing forest planting, tending and protection.
- Getting benefit from the project by being paid for the job done.

i) Local labor force:

- Providing labor force for forest establishment
- Directly getting benefit by being paid for the job done.

J) Forest planting service unit and sale service unit:

- Providing service
- Directly getting benefit from the project by being paid for the job done.

5 Monitoring and Evaluation

5.1 Objectives

To evaluate progress and results of implementing work items in reality compared to the set plan at the beginning. Based on the evaluation results, adjustment solutions and supplements action needed will be introduced to ensure all job done as expected at highest effectiveness.

5.2 Major M&E indicators

Detail description of Major assessment indicators and monitoring & Evaluation methods are illustrated in the “Monitoring system” section in the “Project Matrix Design”.

According to the Project goals and project objectives as well as in line with “Expected outputs” stated in the PDM, following indicators should be monitored:

- By the end of the project, about 1,075 ha Melaleuca production forest will be planted on the bare land of the buffer zone of Lang Sen Preservation area.
- By 2007, the PMB receives the institutional credit scheme;
- By 2013, forest planting on the proposed project areas is completed;
- 10 training courses are conducted.
- Annual forest planting area;
- Technical criteria design (density, seedlings; etc.);
- Capital management;
- Training activities and actual performance results;
- Economic efficiency, project turnover and profit

5.3 Monitoring and evaluation cycle

M& E cycle of the project is carried out in accordance with requirements of each project activity:

- Forest planting area: M& E two times/p.a in January and May;
- Capital management: conducting every six months in May and December
- Training: after each training course and on- site performance.
- Economic efficiency: Before and after selling the target products (from 2014 on)

5.4 M& E and information collection methods

- Measurement of areas planted with tree in reality;
- Assessment on the sample plot in line with forest checking procedure;
- Financial reports and auditing
- Interview and practical test to technical staff who attended training courses provided by the project.

5.5 *Members of M&E Team*

Regular monitoring activity is carried out by staffs of PMB. The monitoring results will help PMB prepare necessary adjustments and supplements actions needed to ensure all job done as expected at highest effectiveness

M&E of each project activity for disbursement purposes will be carried out by a team with following members:

- Governmental management on forestry (Forestry Section, Planning Section, Agriculture Extension Service Centre, District Economic Division of project target district):
- Representatives of local authorities at provincial level and communal level;
- Department of finance and the bank;
- Representative of the PMB;
- Facility construction contractor (if relevant) ;

Evaluation at the end of project: it is important to ensure that project results will be evaluated independently. Members of the evaluation team will be decided by relevant higher authorities in order to ensure accurate results of evaluation.

5.6 *Budget for operation*

Financial plan for the M&E activities will be calculated and deducted from the project operation budget in accordance with current applied regulations of the government.

5.7 *Expected results*

It is important to ensure objectiveness and necessity of the monitoring and evaluation activities as well as giving effective and feasible solutions for improving project activities.

5.8 *Implementing M&E*

The PMB are responsible for monitoring PIUs. PIUs are responsible for managing profiles of forest plantation, for monitoring area of newly forested and checking situation of replanting areas. Template forms and tables to monitor project activities should be developed in the project implementation design and those forms will be means for evaluating. The PMB prepares progress report annually to report to the provincial PC, provincial authority and relevant financial institutions.

6 Sustainability

6.1 *Economic sustainability*

Parallel with the significant economic growth trend of the whole country, the demand for house construction will increase. Cuu Long Delta Region is located in a soft ground, thus when constructing houses, it is necessary to use timbers or other substitute substance for stabilizing building foundation. Currently, concrete is sometime used as substitute for Melaleuca log, but this kind of substitute is not suitable for small building of local people because of high cost and it requires large road for machine accessing. In fact, small scale buildings are mainly adopted Melaleuca log for cheaper construction cost. Therefore, demand for Melaleuca in the future still remains high.

6.2 *Other aspects of sustainability*

The continuous high demand of Melaleuca for construction in the future contributes to the sustainability of the proposed project in term of market. In term of capacity, in the project design, PMB staffs and participated personnel will be equipped relevant knowledge and skills via project training program. In addition, afforestation will create positive impact on soil quality. This contributes to sustainable land use of Lang Sen MB. Moreover, profits generated from production forest will be transferred to conservation activities. This will help to reduce financial burden for local government. Beside that, proposed project will take development priorities and orientation of the government of promoting production forest.

PART III: PROJECT EVALUATION

1 Financial analysis

1.1 *Melaleuca Production Forest*

The project is going to establish a production forest of Melaleuca in a cycle of 7 years. Financial analysis of the project is initially calculated on 1 ha model basis. Physical contingency is assumed at 5% of the total base cost and expected inflation rate of 5% per year. The analysis is conducted on constant price basis in 2006 with the real discounting rate at 10%.

1.2 *Cost estimation*

The average cost needed to establish the forest including tending cost and contingencies for a cycle of 7 years is estimated at approximately 22 millions VND per ha. The initial density of the newly established forest is 15,847 seedlings/ha with the supplementary plantation rate of about 10% in the second year. It is estimated that about 17,432 seedlings/ha is needed to establish the forest. About 600 kg of fertilizer (NPK) is needed during the first 3 years (after planting) which cost about 5,000 VND/kg averagely and the total fertilizer's cost is calculated at about 3,000,000 VND/ha. Labor cost of unskilled workers is about 49,500 VND/man-day. Cost for Project formulation, project design and forest tending is estimated at 350,000 VND/ha for 4 years.

1.3 *Expected outputs, sales price and incomes*

1ha of Melaleuca forest is expected to bring about product volume and value as following:

Table III-1: Revenue from selling trees on forest's edge (1 ha)

Item	Unit	Quantity	Unit price	Amount
Melaleuca stake 5	Tree	4,400	9,000	39,600,000
Melaleuca stake 4	Tree	1,280	7,500	9,600,000
Melaleuca stake 3	Tree	1,700	2,100	3,570,000
Fire wood	Ster	28	35,000	980,000
Total				53,750,000

(Detail data is available in the Table IV-5- Attachment IV)

Financial analysis results of the project

Table III-2: Harvesting volume and sale price (1ha model)

Forest planting	Melaleuca stake
Melaleuca stake volume/ha	7,380 stems + 28 Ster fore wood
Income from selling forestry products on forest's edge (million VND)	53.75

(See survey results of sample profile in attachment II)

Table III-3: Results of financial analysis (for the whole project of 1,057 ha)

Item	Melaleuca stake
FNPV (discount rate at 10%)	4,436 millions dong
FIRR Financial Internal Rate of Return of the Project's owner	15.77%

With the sale price of forestry's products on forest's edge and after consideration of project cost inclusive of physical and price contingencies, the analysis table shows that plantation forest project of Melaleuca is feasible.

Moreover, a more favorable living condition will be contributed to birds, beast, and aquatics so that they will be grown in terms of both quality and quantity. Besides, Melaleuca forest also helps reduce alum level in soil and bring about other positive protective functions including: regulating water, preventing flood, creating nice landscape for tourism though no quantitative calculation is available.

Sensitiveness analysis shows that the Project is possibly mainly impacted by change of sale prices of target products. However, even product price is assumed to decline maximum at 20% in the analysis the project remains viable (IRR is 10.56%). Such price decline would hardly happen in a growing upward market. The IRR is also influenced by the rise of Labor cost but in any cases, Labor cost is still lower than sale price- even assumption that Labor cost rises by 50%, the project is still profitable (FIRR is at 11.61 %)

In addition, financial analysis of the project is also conducting the analysis when part of the project's revenue is used for preservation activities of the Preservation Area. Based on annual actual expenses on preservation activities (mainly for management, protection of the preservation area; budget for operation of preservation activities during 2007- 2013 is about 500 millions VND and that of during 2014- 2019 is about 1,000 millions VND due to price increase and target outputs by 2019. If the proposed project is implemented there would be additional funds for preservation activities. After subtracting costs and bank's interest rate payment, 10% of the total project's revenue would be used for the preservation purpose is a rational proportion as analysis of cash flow shows that the expected amount contributed by the proposed project could cover about 63% of the total cost needed for preservation activities. And even contributing to the Preservation Management Board with that amount, the project is still viable with NPV is 2,151,170,842 VND (see Table V-3, attachment V for detail)

2 Economic analysis

Economic analysis shows that the project is feasible from the country's viewpoint. In Vietnam, price mainly reflects the scare of goods and there is no adjustment could be made to make the prices of goods convert to its economic price. Since Melaleuca is going to be traded in the domestic market only, not for international market, financial price of the Melaleuca absolutely reflect opportunity cost and market demand in the local. Melaleuca product is competitive in the market which is also in line with FSDP analysis. However, the assumption of wage rate in rural area is 49.500 VND/man-day while opportunity cost reflects opportunity cost of Labor in the project area is 45,000 VND.

Project cost used in calculation of economic analysis already includes all supporting activities such as: other than income from Melaleuca, income from fisheries is about 40 millions VND per year. Value added tax is converted to calculate the Conversion Rate for calculating project cost as follows:

- VAT 5% including work items: canal digging, making beds, constructing forest fire watch towers, CF = 0,952.

- VAT 10% includes purchasing items: procurement of equipments, input materials, CF = 0,909.

Analysis results illustrated in the following table:

Table III-4: Economic analysis results

Item	Result
ENPV (with discounting rate at 10%)	5,655 millions VND
EIRR	17,56%

Economic analysis shows that after subtracting all actual cost the project economically, Melaleuca production forest plantation is still highly effective although the current situation of declining in sale price of Melaleuca and increasing prices of input materials and Labor cost. If economic analysis of this project takes price of Melaleuca is about 70 – 80 millions VND/ha as the price at the time before 2004 (current price of Melaleuca is 53,000 millions dong/ha) then the feasibility of the project is even higher.

The incremental benefit with project case is: **5,297,019,634 VND**

3 Environmental impact assessment

Over the last few years, forestry institutions (Sub- Forest Inventory and Planning Institute (Sub-FIPI) no.2 in Ho Chi Minh city, sub Forest Science Institute in Vietnam (FSIV) in the southern part) and Universities (Agriculture- Forestry in Ho Chi Minh city, Can Tho University) have conducted research on Melaleuca. However, there are no research results about negative impact of the Melaleuca on environment when planting Melaleuca forest but only positive impacts of Melaleuca as follows:

Improving ecological environment: Melaleuca forest is a favorable living condition for fresh aquatic creatures, birds and other wild animals to live and develop. Moreover, when Melaleuca's canopy is fully closed, moderate climate zone will be formed as well as making a nice landscape for tourism later on.

-Constraining water current in flood season contributes to flood prevention and natural disaster elimination.

- Improving the ecology system in general and generating a favorable living conditions for birds and wild fresh aquatic creatures in particular.

Lessening acidity of soil after one cycle of Melaleuca plantation

Plantation of Melaleuca in large scale, making bed for plantation there would be change in soil layers, alum soil layer from underground will be upside-down that makes the surface soil layer infected with alum. Nevertheless, alum will be washed out to canal system to run to the sea soon since the area is flooded every year. Therefore, this negative impact aspect is not a big matter of concern.

4 Social impact

Regarding social aspect, following positive impacts would be expected if the proposed project is implemented:

About 256,000 man-days of employment will be created for the local people and people in neighbouring areas;

Additional income for the local people is created during off-farm seasons by earnings from forest planting, tending or protection for the project;

Owing to meetings and discussions of the advisory council, forest fire, birds and wild animals hunting would be minimized; management capacity and skills in forest intensive planting technology of participants would be enhanced; public awareness about preservation could be increased.

- With a relative large-size of forest plantation, at the harvesting time, the project area would attract a large number of Melaleuca's purchasers (individual trader or company) come to buy Melaleuca. This is a good chance for the local people to approach to sale channel. However, individual Melaleuca forest owners with scattered forest area as there would be competitiveness in sale price. To overcome this disadvantage, the Project Management Board would recommend forest sector in province to establish Forest plantation household groups and working closely with the Preservation Management Board to protect rights of these households in applying for investment capital and sale of target products. By doing this, the relation between the Preservation Management Board and households would be harmonious in order to tighten mutual support between the parties.

5 Project Risks

Due to the nature of production forest, a production cycle lasts rather long that it takes time for the PMB to get benefit. Banks which finance to the project must give long term loan (inclusive of grace period). As time goes by, bank interest rate often changes (usually with upward trend) that is a negative factor in calculation of cost and financial analysis of the project when preparing and implementing the project. In case of the soar of bank interest rate and inflation, benefit of the project would be lower than expected and influencing level to the feasibility of the project is very high.

Therefore, financing agencies should apply a proper mechanism for forest plantation project. At the same time, the government also should have proper supportive policy for forest plantation project in case of disadvantage change in interest rate.

Market and price: From plantation until end of year 7th, could the Melaleuca production forest be harvested. Though according to analysis and estimation of Sub- FSIV in the South, there is market demand for Melaleuca and sale price currently is stable and expected to rise in the future. However, after a period of Melaleuca plantation forest cycle, there would be some unpredictable change in Melaleuca price. If unstable price of Melaleuca happen, it will strongly influence on feasibility of the project.

Therefore, it is essential to be kept up to date with sufficient information on market demand for Melaleuca, price of Melaleuca and diversification of the product to access to once there are alternative utilization of Melaleuca. Moreover, it is very important that the MARD and DARD keep looking for potential market for Melaleuca to establish an alternative supply network.

Forest fire: For years, Melaleuca plantation farmers, forest enterprises and scientists have long been confirmed that the utmost importance factor that decides successfulness or failure of Melaleuca plantation business is forest fire prevention. The PMB should pay special attention to this matter. By organising consultation meetings to have close cooperation with the local people (explaining to the local people that they should not go to forest to fire bee's nest or catch fish); Controlling agricultural fire activities of farmers to prevent risk of expanding fire, etc); Taking full use of the existing forest fire ditch and canal system and forest fire prevention equipments to minimize the possible loss caused by forest fire.

Nevertheless, even if forest fire happens, feasibility of the project is not much influenced since in reality there have a good system of canals and in the project technical design these existing canals shall be upgraded and completed. More equipment for forest fire prevention will be provided. Moreover, Staff members of the Conservation area receive training on forest fire prevention by Provincial Forest Fire Prevention Police annually (both theories and practice) so the staffs have accumulated experience in this aspect.

Forest Disease: In the Cuu long Delta Region in general and Long An in particular, there have been no disease destroying melaleuca forest happen so far. It means that this risk is not a big matter of concern to the feasibility of the project. However, one should not be too subjectivism but carry out regular forest checking and supervising to identify the risk of being infected with diseases to curb timely.

Stability of the State policy: Long An Province's strategy is to develop the area become a conservation zone to conserve, regenerate and utilize sustainable bio-diversification of the typical wetland in Thap Muoi Delta Region. Besides, the province agreed to let the Conservation Board carry out forest plantation in the sub- area for production in order to utilize the available land effectively, improving living conditions of the staffs working in the Conservation area as well and partially contributing to the conservation activities of the Conservation area.

In case that this policy changes (to a direction that no longer maintain the bio-diversification of the park but allocating land to individual households for agriculture production purpose due to population pressure, etc) would leave a very strong influence on the feasibility of the project.

PART IV: CONCLUSION & RECOMMENDATION

1 Conclusion

The investment project tries to utilize effectively the bare land within Production area under the management of Lang Sen Wetland Reserve Management Board. The proposed area for Melaleuca plantation is 1, 057 ha. At the same time, the proposed project is also aims at supporting people doing forest plantation in the surrounding area to promote marketing and promotion of Melaleuca timber as well as to provide advanced technologies. More importantly, part of revenue from production forest will be reinvested into conservation activities, which help the Conservation Management Board doing better their tasks of rehabilitating bio- diversification of the typical wetland in Thap Muoi Delta Region.

The financial analysis shows that this investment is viable. Measurable benefits that the project shall bring about are: increasing of internal wood supply (Melaleuca stakes and firewood) satisfying demand of local and neighboring areas. Moreover, forest plantation helps improve environment, constraining water current in flooding season, minimizing impact of natural disaster in the region. The IRR shows that the project is viable.

2 Recommendations for upcoming activities

Strengthening organizational structure: Establishing a Project Management Board for Melaleuca production forest to promptly get access to favourable credit for in order to carry out forest planting as scheduled. It is very important that DARD, Provincial and Communal People Committees need to provide sufficient support and maintain close communication with the PMB. It is necessary to enhance communication among members of the advisory board to share management experience to timely correct mistakes if any so as to improve implementation management. It is suggested that extension workers in the province should participate in technical training at Provincial Extension Centre. Moreover, it is important to provide training for staffs of the Conservation on silviculture. Last but not least, it is necessary to organize field visits to current Afforestation projects within Vietnam for PMB members and representatives of implementation units to get lesson learnt to apply into the project.

Provincial government: It is important to keep stable policy on production forest plantation in the buffer zone of the Conversation area. Provincial government should directing relevant bodies in order to ensure timely disbursement, to provide technical support and management support to the Project. Finally, it is necessary to allocate partially financial support from the government budget for infrastructure construction (labor and materials cost of the construction) in order that the Project can be implemented as scheduled.

District and Communal Government: those local authorities are expected to involved actively and support strongly in forest fire plantation.

APPENDICES

Appendix I: Project design matrix

Project name: A project on Melaleuca production forest plantation on Lang Sen Conservation area- Long An Province			Duration: 2007-2013
Target beneficiary: Lang Sen Wetland Reserve Management Board			
Project area: Lang Sen Wetland Reserve Area – Vinh Chau A – Tan Hung district – Long an province			
Items	Indicators	Means of verification	Assumptions
<u>Overall objective</u> 1. Economic utilization of the buffer zone of the conservation area is promoted 2. Conservation of the core zone is promoted.	1. By 2019, the turn-over from the production forest in the buffer zone is 57 billions VND (2006 constant price basis). 2. From 207-2013, all annual revenue from the project area will serve conservation purpose. From 2014- 2019, 1o5 of annual revenue from the project will be spent on conservation activities (mainly for management and protection work).	Evaluation reports of authority agencies and financial reports,	Provincial government does not change policy on supporting conservation efforts of the MB
<u>Immediate objective</u> Melaleuca production forest is established on the conservation area	1.1. By 2013, 1,057ha Melaleuca will be established 2.2. From 2014- 2019, over 1 million Melaleuca trees will be harvested and sold in the market annually.	Records of forest plantation inspection Regular reports	Market for the target products is stable and developed No forest fire No diseases outbreak
<u>Expected outputs</u> 1. The whole area of proposed project site will be covered with Melaleuca production forest. 2. Technical and marketing capacity of the Management Board staff is enhanced. 3. Managerial and implementing capacity of MB for economic and conservation activities are strengthened.	1. By 2013, 1,057ha of Melaleuca forest is established. 2.1 By 2007, 4 training courses will be conducted with 28 staff members attending the trainings and study tour on technical matters: management and financial issue. 2.2 .By 2013, 10 staffs will have received training on sales and marketing of Melaleuca timber. 3. From 2007- 2019, 14,000 forest planting and	Records of annually checking and taking over. Site checking Other types of report	Support of the local authorities to production forest plantation of the conversation area remains unchanged. Interest rates does not change in a way that is disadvantage for the borrowers

	harvesting workers receive technical trainings relevant to their work skills.		
<u>Activity</u> 1.1 The Management Board (MB) makes overall and annual forest plantation plan. 1.2 The MB procures needed equipments for constructing necessary infrastructure. 1.3 The MB carries out planting of Melaleuca production forest. 1.4 The MB harvests and sells products from forest. 2.3 The MB develops loan plan and project plan 2.2 The MB consults potential financial institutions and other relevant organizations to mobilize financial investment. 2.3 The MB conducts capacity building trainings on technical, management, sales and marketing for MB staff members. 2.4 The MB establishes a special unit to implement Melaleuca production forest 3.1 Monitoring and evaluating progress of project implementation.	<u>Inputs:</u> Total project cost 2007- 2013: 17,522 billions VND 1/ Forest planting cost: 28,064 billions VND. 2/ Trainings cost:0, 177 billions VND 3/ Management, Monitoring& evaluation cost: 1,543 billions VND 4/ Contingencies: Physical contingency(5%): 0,876 billions VND 5/ Price contingency (5%): 4,770 billions VND 6/ Labor: 256,000 man-days	<u>Pre conditions:</u> Provincial government approves the project. - Credit scheme is agreed with Vietnam Development Bank	

Appendix II: Characteristic of project area

1 Lands in project area:

a) Soil type in project area

No.	Soil type name	Area (ha)	Rate (%)
1	Sandy land – fluvisolised Distributed mainly in the centre area. On the low hill scattering among sunken site. Major land content is sand and dominated kaolin mineral matter.	153.83	7.63
2	Slope deposit land – fluvisolised Distributed in the centre area surrounded by sandy land	606.43	30.07
3	Potential Acid alum soils Mainly distributed on the West. Almost potential alum land concentrated on the sunken area and developed on the bed of see marsh. pH of surface water is ranging from 6.6 – 7.3.	763.38	37.86
4	Actual Acid alum soils Allocated in the Eastern part. Vegetation cover consists of grasses	492.74	24.44
	Total	2,016.38	100.00

b) Descriptions of soil samples of different soil types

- Sandy land – alum contraction

A: 0 – 17 cm: Soil is in black color, contains few contents of semi-disintegrated and full-disintegrated organics. Soil is not fully familiarized⁹ due to seasonal flooding. Adhesiveness is low due to high content of sand.

Bg1: 17 – 46 cm: Soil is in light grey, main composition of clay mixed with sand, there is some semi-disintegrated residues remained in decayed root stem of trees. Brown and dark-yellow spots account for 30% of the total composition that mostly distributed in small crack lines. Soil is semi to fully familiarized due to flooding; Soil is non-structure, sand accounts for about 37% and the remain is clay with main content of kaolin. Amount of intra-air space¹⁰ ranges from medium to few with average size changes from 1.5 – 2.0 mm.

Bg2: 46 – 92 cm: Soil is in light grey with composition of clay mixed with rich soil. Very low rate of semi-disintegrated organic matter along root straw of tree, stands at only about 7 -10%. Soil is non-structured and relatively solid. There are many brown and dark yellow spot along root straw of tree that accounts for about 20% of thickness of soil layer. Main content is kaolin.

⁹ Not familiarized soils: wet and sticky to container, formless. Semi-familiarized soil: take long time to be dry, sticky to container. Fully-familiarized: formed and does not sticky to container, become dry very fast.

¹⁰ Type of space inside solid composition.

- Slope deposit soil – fluvisolised

A: 0 – 21 cm: Soil is in black-grey color with low content of semi and fully disintegrated organic matter. There are still live tree roots and with uneven distribution. Soil is semi-familiarized due to seasonal flooding. Adhesiveness is low due to high content of sand.

Bg1: 21 – 54 cm: Soil is in light black color with composition of sand mixed with clay and some few residue of semi-disintegrated organic matter distributed along straw or tree root. There are many brown and dark yellow spots along root straw of tree that accounts for about 30% and condensed mainly in cracks. Soil is of semi to fully familiarize due to flood, non-structured, weak, and unclear in some area. Main content is kaolin and silicate. Soil is adhesive and flexible. Amount of intra-air space ranges from medium to few with average size changes from 1.5 – 3.0 mm.

Bg2: 54 – 89 cm: Soil is in light grey with composition of clay mixed with rich soil. Very low rate of semi-disintegrated organic matter along root straw of tree, stands at only about 7 -10%. Soil is non-structured and relatively solid. There are many brown and dark yellow spots along root straw of tree that accounts for about 20% of thickness of soil layer. Main content is kaolin.

Bg3: 89 – 125 cm: Soil is in light grey with composition of clay mixed with powder. There is almost no trace of semi-disintegrated organic matter. Soil is non-structured and relatively solid despite of permanent flooding. Main content is kaolin.

- Potential alum soil

A: 0 – 27 cm: Soil is in black grey with quite high rate of semi-full disintegrated organic matter. Tree root and residue of tree represent redundantly in soil layer. Soil is pasty, non-familiarized and water saturated. Soil is non-structured and loosen. Main composition is clay mixed with rich earth.

C1: 27 – 36 cm: Soil is in black grey with quite high rate of semi-full disintegrated organic matter. But there are few tree roots and residue of tree represent in top layer. Soil is pasty, non-familiarized and water saturated. Soil is non-structured and loose. Main composition is clay mixed with rich earth.

C2: 36 – 78 cm: Soil is in black grey with quite high rate of semi-full disintegrated organic matter. Tree root and residue of tree represent redundantly in soil layer. Soil is pasty, non familiarized, water saturated, high content of pyrite matter, retained pH after being oxidized with water is 2.2

C3: 78 – 134 cm: Soil is in black grey with quite high rate of disintegrated organic matter, there are some tree barks of ancient mangrove trees represented in the soil layer. Residue of tree represent redundantly in soil layer. Soil is pasty, non-familiarized and water saturated. Soil main composition is clay mixed with rich soil. It contains high content of pyrite matter, retained pH after being oxidized with water is 2.2

- Actual alum soils

A: 0 – 24 cm: Soil is in black grey with quite high rate of disintegrated organic matter. Tree root and residue of tree represent redundantly in soil layer. Soil is pasty, non-familiarized and water saturated. Soil is non-structured and loose, saturated with water in

rainy season but become hard in dry season with rifts of 15 mm in diameter. Main composition is clay mixed with rich earth. During dry season, there is a white-thin scum layer of precipitated sulphate aluminum.

Bg: 24 – 42 cm: Soil is clay of light brown, mixed with some semi and full disintegrated organic matter. Live tree roots – mainly Nang grass represent with about 16% of the soil layer. Soil formed with prism structure, weak. Soil is fairly hard, few cracks with dark-yellow and brown streaks of feralite oxide tracking along sides of land formation and cracks as well as root straw at density of 14%.

Bj: 42 – 78 cm: Soil is in grey-brown color with little semi-full disintegrated of organic matter. Soil structure is semi and full familiarized. Jarosite ($\text{KFe}_3(\text{SO}_4)(\text{OH})_6$) in light yellow color ($2.5\text{Y}^8/6$) represents along root straw and on surface of crack with density of about 24 %; there are also some spots of yellow feralite dioxide aligning along Jarosite spots. Obtained value of pH changes accordingly to season: in dry season pH stands at 3.2, but in rainy season, it can top at 3.7.

C: 78 – 140 cm: Soil is in black-grey color with redundancy of semi-fully disintegrated organic matter. Tree residues represents redundantly in the soil layer. Soil is non-structured, saturated with water, pasty and maintained with high content of pyrite, retained pH after being oxidized with water is 2.2.

2 *Rainfall in project area*

There is no specific rain fall monitoring station in the area. The data bellow is from the Moc Hoa monitoring station:

- Perennial average rain fall: 1,440 mm
- Peak annual rain fall : 2,057 mm
- Lowest annual rain fall : 643 mm

Monthly average rain fall:

Month	1	2	3	4	5	6	7	8	9	10	11	12
P(mm)				17	19	110	105	105	162	220	60	11

MAX RAIN FALL IN 1 DAY, 3 DAYS AND 5 DAYS

Month	5	6	7	8	9	10	11	Max
1 day	89	91	67	73	92	80	69	1,226
3 days	110	123	57	106	124	188	94	165
5 days	120	151	112	129	177	168	111	212.2

3 Result of sampling plot survey

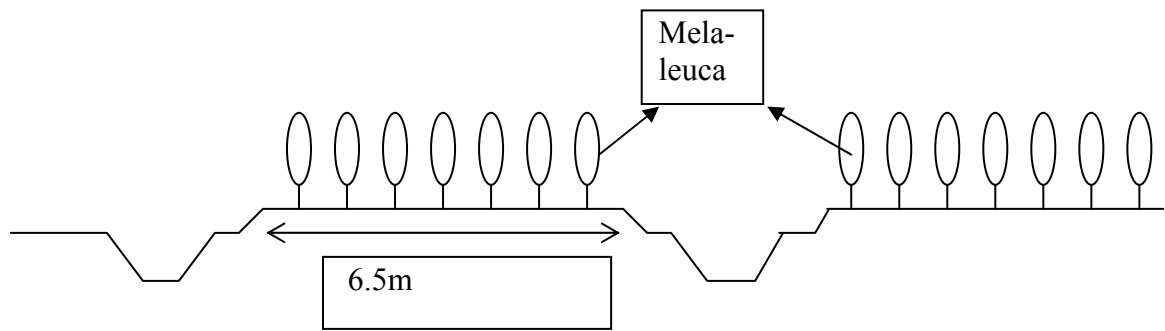
Product	Length (m)	Top diameter (cm)	Amount of harvested volume (trees)
Pile 5			4,400
Class 1	4.8	4.5 – 5.4	1,900
Class 2	4.8	3.8 – 4.4	1,000
Class 3	4.8	3.5 – 3.7	800
Class 4	4.8	3.0 – 3.4	700
Pile 4			1,280
Class 1	3.8	4.5 – 5.4	500
Class 2	3.8	3.8 – 4.4	400
Class 3	3.8	3.5 – 3.7	200
Class 4	3.8	3.0 – 3.4	180
Diameter 3			1,700
Class 1	2.7	4.5 – 5.4	600
Class 2	2.7	3.8 – 4.4	500
Class 3	2.7	3.5 – 3.7	300
Class 4	2.7	3.0 – 3.4	300
Wood fuel			28 ster
Total amount of harvested trees			7,380

Note: This yield of Melaleuca piles were calculated at the neighboring area of the project site, where Melaleuca planting were scattered and the technique of intensive plantation on bamboo match were not applied. This calculation is the baseline for other calculations in the future.

4 Irrigation system in the project area

#	Name of canal	Width (m)	Depth (m)	Note
1	No 79	35	3.5	Other name: “Xang Thoi”
2	Cai Nga	15	3.5	
3	T 1	12	2.5	
4	T 3	12	2.5	
5	T 4	12	2.5	
6	T 5	12	2.5	
7	No 81	12	2.5	
8	Ranh	12	2.5	

5 Outline of planting beds



11 beds in 1 ha, with 11 ditches

Volume of digging work for 1ha:

$$\frac{(1.5 + 1)}{2} \times 0.7 \text{ m} \times 100\text{m} \times 11 \text{ ditches} = 962.5 \text{ m}^3$$

2

Appendix III: Socio – Economics data

1 Population and labor of Tan Hung District

Unit: Person

#	Commune	Population	Labor
1	Tan Hung township	3,089	1,703
2	Vinh Thanh	3,920	2,161
3	Vinh Loi	3,994	2,174
4	Vĩnh Đại	2,292	1,263
5	Vinh Chau A	3,104	1,711
6	Vanh Chau B	2,487	1,371
7	Hung Ha	3,462	1,908
8	Hung Dien	6,031	3,325
9	Hung Dien B	4,390	2,420
10	Hung Thanh	2,740	1,510
11	Thanh Hung	2,150	1,185
12	Vinh Buu	4,155	2,320
Total of the district		41,814	23,051

2 Economic structure of Tan Hung District in 1995, 2000 and 2003 (Price of 1994)

Unit: %

#	Area	1005	2000	2003
1	Industry	1.5	3.7	6
	Industry and small manufactures	21.7	10.6	13
	Infrastructure	78.3	89.4	87
2	Agriculture – Forestry – Aquaculture	89.7	86.9	83.8
	Agriculture	89.3	92.4	93.4
	Forestry	5.4	3.5	3.2
	Aquaculture	5.3	4.1	3.4
3	Trade and services	8.8	9.4	10.3

Land use in communes of Vinh Loi and Vinh Chau A

Unit: ha

#	Type of land	Vinh Loi commune	Vinh Chau A commune
I	Agricultural land	1,539.6	3,762.9
1	Annual crop land	1,517.7	3,740
1.1	Rice field	1,517.7	3,740
	2-3 crop field	1,517.7	3,740
	1 crop field		
1.2	Other annual crop land		
	Farming and other annual crop/industrial trees		
2	Mixing garden	13	15.5
3	Perennial planting land		
	Other perennial planting land		
4	Grazing land		
5	Land for aquaculture	8.9	7.3
II	Forestry land	3,256.2	2,108.5
1	Natural forest		
2	Plantation forest	3,256.2	2,108.5
III	Specific – used land	431.1	491.9
IV	Residential land	13.2	33.1
1	Urban residential land		
2	Rural residential land	13.2	33.1
V	Un-used land	61.7	2.9
	Of which, un-used land		2.9
	River, ditches and other types	61.7	

Appendix IV: Forest planting plan

Table IV-1: Infrastructure construction and plan of equipments procurement

UNIT: VND

No	Item	Specifications	Unit	Unit price	Quantity	Total amount	Remark
I	<u>Digging Canal</u>	-	-	-	85.612,50	719.287.500	-
1	Area Canal	L=4.125m					
	Canal T6	B=8; b=4; h=2m	m ³	7.000	49.500	346.500.000	
2	Plot Canal						
	- Canal 1	L=1.075m					
		B=6; b=3; h=1,5m	m ³	7.000	7.256	50.793.750	
	- Canal 2	L=1.100m					
		B=6; b=3; h=1,5m	m ³	7.000	7.425	51.975.000	
	- Canal 3	L=1.575m					
		B=8; b=4; h=2m	m ³	7.000	10.631	74.418.750	
	- Canal 4	L=1.600m					
		B=8; b=4; h=2m	m ³	7.000	10.800	75.600.000	
3	Watch tower		unit	30.000.000	4	120.000.000	
II	<u>Procurement</u>	-	-	-	-	140.000.000	-
1	Composite boat		Piece	15.000.000	4	60.000.000	
2	Pump		Set	20.000.000	4	80.000.000	
Total						859.287.500	

Tentative forest plantation schedule as following:

Table IV-2: Plan of Forest plantation of the Melaleuca production forest project

UNIT: Ha

	Implementation year	2006	2007	2008	2009	2010	2011	2012	2013	Total
Area	Plot	0	1	2	3	4	5	6	7	
1	a			54,06						
1	b			62,47						
1	c			55,59						
2	a				45,99					
2	b				55,22					
2	c				46,25					
2	d					62,27				
3	a					44,39				
3	b					51,30				
3	c						45,58			
3	d						56,74			
5	a						60,43			
5	b							69,44		
5	c							59,16		
5	d							65,96		
4	a								74,06	
4	b								77,20	
4	c								71,62	
Total				172,12	147,46	157,96	162,75	194,56	222,88	1,057,73

- Based upon forest planting plan.
- Based upon density of afforestation 0.7 X 0.7m. Number of seedlings per ha is 15,847
- Based upon the diminution of seedlings at 10%. Number of undergone seedlings is: 1,585
- Number of seedlings needed for 1ha is 17,432 Seedlings

Table IV-3: Seedlings supply plan of the Melaleuca production forest

Based on plantation plan.										
Based on planting space 0,7 X 0,7m. Total trees per ha is 15.847 seedlings										
Based on supplementary planting rate 10%. Total supplementary seedling needed : 1.585 seedlings/ha										
Total seedlings needed per ha	17.432		seedlings							
								Unit: seedling		
Implementing year	2006	2007	2008	2009	2010	2011	2012	2013	Total	
	0	1	2	3	4	5	6	7		
<i>Melaleuca cajuputi</i>			172,12	147,46	157,96	162,75	194,56	222,88	1.057,73	
	Total quantity needed		3.000.396	2.570.523	2.753.559	2.837.058	3.391.570	3.885.244	18.438.349	
Seedling suppliers: Thang Hoa Forestry Station.										

UNIT: Tree

Table IV-4: Harvesting plan of Melaleuca Production Forest

Unit : Ha

Implementation year		2014	2015	2016	2017	2018	2019	Total
Area	Plot	8	9	10	11	12	13	
1	a	54.06						
1	b	62.47						
1	c	55.59						
2	a		45.99					
2	b		55.22					
2	c		46.25					
2	d			62.27				
3	a			44.39				
3	b			51.30				
3	c				45.58			
3	d				56.74			
5	a				60.43			
5	b					69.44		
5	c					59.16		
5	d					65.96		
4	a						74.06	
4	b						77.20	
4	c						71.62	
Total		172.12	147.46	157.96	162.75	194.56	222.88	1,057.73

Based upon actual situation, the estimated volume of harvesting Melaleuca is 7,000trees/ha- Breakdown:

- Melaleuca stake 5 4,400 Stems
- Melaleuca stake 4 1,280 Stems
- Melaleuca stake 3 1.700 Stems

▫ Firewood 28 ster/ha

Estimated harvesting volume as following:

Table IV-5: Estimated harvesting volume of the Melaleuca production forest

Implementation year		2014	2015	2016	2017	2018	2019	Total
Year		8	9	10	11	12	13	
Harvesting area		172.12	147.46	157.96	162.75	194.56	222.88	1,057.73
Number of Melaleuca (of various types)		1,270,246	1,088,255	1,165,745	1,201,095	1,435,853	1,644,854	7,806,047
Melaleuca stake 5		757,328	648,824	695,024	716,100	856,064	980,672	4,654,012
Melaleuca stake 4		220,314	188,749	202,189	208,320	249,037	285,286	1,353,894
Melaleuca stake 3		292,604	250,682	268,532	276,675	330,752	378,896	1,798,141
Firewood (ster)		4,819	4,129	4,423	4,557	5,448	6,241	29,616
Number of Melaleuca harvested during 6 years is:		7,806,047		Stems				
Volume of firewood collected during 6 years is:		29,616		Ster				

Table IV-6: Information on weather and season agenda

[illegible]

Table IV- 7: Labor Demand from planting till harvesting on annual basis

Planting area 172,12 ha

Activity		Man-day/ha	Year 2008-2014	Average Labor demand by month (man-day)											
				1	2	3	4	5	6	7	8	9	10	11	12
Forest planting	Vegetation clearance	5	861					861							
	Transporting, planting	17	2,926												2,926
	Replanting (supplementary planting)	10	1,721	1,721											
Tending	Year 2	14	2,410	1,205					1,205						
fertilizer application	Year 3	14	2,410	1,205					1,205						
	Year 4	14	2,410	1,205					1,205						
Thinning	Year 3	10	1,721					17,212							
Checking, supervising	From Year 1 - 4	4	688	172				172	172						172
Forest protection	Year 5 - 6	4	688	57	57	57	57	57	57	57	57	57	57	57	57
Harvesting	Year 7	150	25,818				12,909	12,909							
	Total	242	41,653	5,565	57	57	12,966	31,211	3,844	57	57	57	57	57	3,156
	Labor			253	3	3	589	1,419	175	3	3	3	3	3	143

DT Planting: 147,46 ha

Activity		Man-day/ha	Year 2009-2015	Average Labor demand by month (man-day)											
				1	2	3	4	5	6	7	8	9	10	11	12
Forest planting	Vegetation clearance	5	737					737							
	Transporting, planting	17	2,507												2,507
	Replanting (supplementary planting)	10	1,475	1,475											
Tending	Year 2	14	2,064	1,032					1,032						
fertilizer application	Year 3	14	2,064	1,032					1,032						
	Year 4	14	2,064	1,032					1,032						
Thinning	Year 3	10	1,475					14,746							
Checking, supervising	From Year 1 - 4	4	590	147				147	147						147
Forest protection	Year 5 - 6	4	590	57	57	57	57	57	57	57	57	57	57	57	57
Harvesting	Year 7	150	22,119				11,060	11,060							
	Total	242	35,685	4,776	57	57	11,117	26,748	3,301	57	57	57	57	57	2,712
	Labor			217	3	3	505	1,216	150	3	3	3	3	3	123

Planting area: 157,96 ha

Activity		Man-day/ha	Year 2010-2016	Average Labor demand by month (man-day)											
				1	2	3	4	5	6	7	8	9	10	11	12
Forest planting	Vegetation clearance	5	790					790							
	Transporting, planting	17	2,685												2,685
	Replanting (supplementary planting)	10	1,580	1,580											
Tending	Year 2	14	2,211	1,106					1,106						
fertilizer application	Year 3	14	2,211	1,106					1,106						
	Year 4	14	2,211	1,106					1,106						
Thinning	Year 3	10	1,580					15,796							
Checking, supervising	From Year 1 - 4	4	632	158				158	158						158
Forest protection	Year 5 - 6	4	632	57	57	57	57	57	57	57	57	57	57	57	57
Harvesting	Year 7	150	23,694				11,847	11,847							
	Total	242	38,226	5,112	57	57	11,904	28,648	3,532	57	57	57	57	57	2,901
	Labor			232	3	3	541	1,302	161	3	3	3	3	3	132

DT Planting: 162,75 ha

Activity		Man-day/ha	Year 2011-2017	Average Labor demand by month (man-day)											
				1	2	3	4	5	6	7	8	9	10	11	12
Forest planting	Vegetation clearance	5	814					814							
	Transporting, planting	17	2,767												2,767
	Replanting (supplementary planting)	10	1,628	1,628											
Tending	Year 2	14	2,279	1,139					1,139						
fertilizer application	Year 3	14	2,279	1,139					1,139						
	Year 4	14	2,279	1,139					1,139						
Thinning	Year 3	10	1,628					16,275							
Checking, supervising	From Year 1 - 4	4	651	163				163	163						163
Forest protection	Year 5 - 6	4	651	57	57	57	57	57	57	57	57	57	57	57	57
Harvesting	Year 7	150	24,413				12,206	12,206							
	Total	242	39,386	5,265	57	57	12,264	29,515	3,638	57	57	57	57	57	2,987
	Labor			239	3	3	557	1,342	165	3	3	3	3	3	136

DT Planting: 194,56 ha

Activity		Man-day/ha	Year 2012-2018	Average Labor need by month (man-day)											
				1	2	3	4	5	6	7	8	9	10	11	12
Forest planting	Vegetation clearance	5	973					973							
	Transporting, planting	17	3.308												3.308
	Replanting (supplementary planting)	10	1.946	1.946											
Tending	Year 2	14	2.724	1.362					1.362						
fertilizer application	Year 3	14	2.724	1.362					1.362						
	Year 4	14	2.724	1.362					1.362						
Thinning	Year 3	10	1.946					19.456							
Checking, supervising	From Year 1 - 4	4	778	195				195	195						195
Forest protection	Year 5 - 6	4	778	57	57	57	57	57	57	57	57	57	57	57	57
Harvesting	Year 7	150	29.184				14.592	14.592							
	Total	242	47.084	6.283	57	57	14.649	35.273	4.338	57	57	57	57	57	3.559
	Labor			286	3	3	666	1.603	197	3	3	3	3	3	162

Planting area: 222,88 ha

Activity		Man-day/ha	Year 2013-2019	Average Labor demand by month											
				1	2	3	4	5	6	7	8	9	10	11	12
Forest planting	Vegetation clearance	5	1,114					1,114							
	Transporting, planting	17	3,789												3,789
	Replanting (supplementary planting)	10	2,229	2,229											
Tending	Year 2	14	3,120	1,560					1,560						
fertilizer application	Year 3	14	3,120	1,560					1,560						
	Year 4	14	3,120	1,560					1,560						
Thinning	Year 3	10	2,229					22,288							
Checking, supervising	From Year 1 - 4	4	892	223				223	223						223
Forest protection	Year 5 - 6	4	892	57	57	57	57	57	57	57	57	57	57	57	57
Harvesting	Year 7	150	33,432				16,716	16,716							
	Total	242	53,937	7,190	57	57	16,773	40,399	4,961	57	57	57	57	57	4,069
	Labor			327	3	3	762	1,836	225	3	3	3	3	3	185

Estimation of Labor demand annually

Activity		Man-day/ha	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
			172.12	147.46	157.96	162.75	194.56	222.88						
Forest planting	Vegetation clearance	5	861	737	790	814	973	1,114						
	Transporting, planting	17	2,926	2,507	2,685	2,767	3,308	3,789						
	Replanting (supplementary planting)	10	1,721	1,475	1,580	1,628	1,946	2,229						
Tending	Year 2	14	2,410	2,064	2,211	2,279	2,724	3,120						
fertilizer application	Year 3	14	2,410	2,064	2,211	2,279	2,724	3,120						
	Year 4	14	2,410	2,064	2,211	2,279	2,724	3,120						
Thinning	Year 3	10	1,721	1,475	1,580	1,628	1,946	2,229						
Checking, supervising	Year 1 - 4	4	688	590	632	651	778	892						
Forest protection	Year 5 - 6	4	688	590	632	651	778	892						
Harvesting	Year 7	150	-						25,818	22,119	23,694	24,413	29,184	33,432
Total		242	15,835	13,566	14,532	14,973	17,900	20,505	25,818	22,119	23,694	24,413	29,184	33,432

Table IV-9: Cost Table for 1 ha model

unit: VND

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014
Implementation year	0	1	2	3	4	5	6	7	8
Materials and seedlings cost			1,901,640	1,190,200	1,000,000	1,000,000			
Hiring external Labor			6,737,500						
<i>Labor cost</i>									
Year 1			1,287,000						
Year 2				990,000					
Year 3					1,188,000				
Year 4						693,000			
Year 5							99,000		
Year 6								99,000	
Year 7									7,425,000
Year 8									
Total Labor cost			1,287,000	990,000	1,188,000	693,000	99,000	99,000	7,425,000
Direct cost		0	9,926,140	2,180,200	2,188,000	1,693,000	99,000	99,000	7,425,000
Other costs		347,751							
Total base cost		347,751	9,926,140	2,180,200	2,188,000	1,693,000	99,000	99,000	7,425,000
Physical contingency		17,388	496,307	109,010	109,400	84,650	4,950	4,950	371,250
Price contingency		18,257	1,068,301	360,837	495,104	491,132	35,353	42,318	3,722,362
Total estimated cost including Contingencies		383,396	11,490,748	2,650,047	2,792,504	2,268,782	139,303	146,268	11,518,612

Table IV-10-1: Cost Plan for the whole project (1,057ha)

Unit: VND

Year	2006	2007	2008	2009	2010	2011	2012
Implementation year	0	1	2	3	4	5	6
Cost							
1. Production Forest (Comp. 1)	0	919,142,468	1,759,766,635	1,893,895,437	2,322,620,464	2,641,563,826	2,975,765,991
1-1 Development of production forest (Comp. 1-1)	0	59,854,968	1,759,766,635	1,893,895,437	2,322,620,464	2,641,563,826	2,975,765,991
1-2 Constructing infrastructure(Comp. 1-2)	0	859,287,500	0	0	0	0	0
2. Supporting forest planting (Comp. 2)	0	60,400,000	18,000,000	18,000,000	18,000,000	18,000,000	18,000,000
3. Project Management, monitoring and evaluation of project (Comp. 3)	0	85,928,750	170,848,722	183,896,463	226,602,393	257,390,532	289,836,349
A) Total base cost	0	1,065,471,218	1,948,615,357	2,095,791,899	2,567,222,856	2,916,954,357	3,283,602,340
B) Physical contingency	0	53,273,561	97,430,768	104,789,595	128,361,143	145,847,718	164,180,117
C) Price contingency	0	55,937,239	209,719,728	346,866,658	580,915,199	846,195,743	1,172,575,783
Total project cost (A+B+C)	0	1,174,682,018	2,255,765,853	2,547,448,152	3,276,499,198	3,908,997,818	4,620,358,240

Table IV-10-2: Cost Plan for the whole project (1,057ha)

Unit: VND

Year	2013	2014	2015	2016	2017	2018	2019
Implementation year	7	8	9	10	11	12	13
Cost							
1. Production Forest (Comp. 1)	3,288,701,653	2,494,729,526	1,943,035,910	1,585,054,630	1,249,715,610	1,466,643,420	1,652,656,500
1-1 Development of Production Forest (Comp. 1-1)	3,288,701,653	2,494,729,526	1,943,035,910	1,585,054,630	1,249,715,610	1,466,643,420	1,652,656,500
1-2 Construction of infrastructure (Comp. 1-2)	0	0	0	0	0	0	0
2. Supporting to forest planting (Comp. 2)	27,000,000	29,000,000	18,000,000	18,000,000	18,000,000	18,000,000	18,000,000
3. Project management, monitoring and evaluation (Comp. 3)	328,870,165	249,472,953	194,303,591	158,505,463	124,971,561	146,664,342	165,265,650
A) Total base cost	3,644,571,819	2,773,202,479	2,155,339,501	1,761,560,093	1,392,687,171	1,631,307,762	1,835,922,150
B) Physical contingency	182,228,591	138,660,124	107,766,975	88,078,005	69,634,359	81,565,388	91,796,108
C) Price contingency	1,557,892,064	1,390,284,651	1,247,714,456	1,163,227,461	1,038,744,537	1,363,200,932	1,707,282,021
Total project cost (A+B+C)	5,384,692,474	4,302,147,254	3,510,820,932	3,012,865,559	2,501,066,066	3,076,074,082	3,635,000,279

Table IV- 11: Expenditure rate for 1 ha model.

Item	Unit price	Unit	Quantity	Unit	Amount	Unit
Infrastructure construction					7,417,999	
Digging canals	7,000	VND/m3	85,613	m3	566,970	VND
Building watch-box	30,000,000	VND/ Scheme	4	Scheme	113,529	VND
Making bed	7,000	m3	962,5	m3	6,737,500	
Equipments					132,450	
Pump	20,000,000	Set	4	Set	75,686	VND
Boat	15,000,000	Pcs.	4	Pcs.	56,764	VND
Material					5,091,840	
Year 1					1,901,640	
Material s						
Seedlings	120	VND/Seedling	15,847	Seedling	1,901,640	VND
Year 2					1,190,200	
Seedlings	120	VND/Seedling	1,585	Seedling	190,200	VND
Fertilizer (including tax)	5,000	VND/Kg	200	kg	1,000,000	VND
Year 3					1,000,000	
Fertilizer (including tax)	5,000	VND/Kg	200	kg	1,000,000	VND
Year 4					1,000,000	
Fertilizer (including tax)	5,000	VND/Kg	200	kg	1,000,000	VND
Labor cost	49,500	VND/day			11,781,000	
First year (land preparation/ planting)					1,287,000	
Site clearance	49,500	VND/day	5	Man-day	247,500	VND
Transporting seedlings and planting	49,500	VND/day	17	Man-day	841,500	VND
Checking and monitoring	49,500	VND/day	4	Man-day	198,000	VND
Year 2					990,000	
Replanting	49,500	VND/day	10	Man-day	495,000	VND
Tending, protection	49,500	VND/day	10	Man-day	495,000	VND
Applying fertilizer	49,500	VND/day	4	Man-day	198,000	VND

Item	Unit price	Unit	Quantity	Unit	Amount	Unit
Year 3 (tending)					1,188,000	
Tending, protection	49,500	VND/day	10	Man-day	495,000	VND
Applying fertilizer	49,500	VND/day	4	Man-day	198,000	VND
Thinning	49,500	VND/day	10	Man-day	495,000	VND
Year 4					693,000	
Tending, protection	49,500	VND/day	10	Man-day	495,000	VND
Applying fertilizer	49,500	VND/day	4	Man-day	198,000	VND
Year 5(Protection)	49,500	VND/day	2	Man-day	99,000	VND
Year 6 (Protection)	49,500	VND/day	2	Man-day	99,000	VND
Year 7					7,425,000	
Outsourcing (cutting, logging and transporting to the canal's side)	49,500	VND/day	150	Man-day	7,425,000	VND
Total direct cost for forest plantation					24,423,289	
Other costs					347,751	
Project design and formulation cost	0,650%				158,751	
Forest plantation design cost	100,000	VND/ha			100,000	VND/ha
Forest tending design cost	89,000	VND/ha			89,000	VND/ha
Management cost	10%	Direct cost			2,442,329	

Appendix V: Economic analysis – Financial analysis

1 Financial analysis:

Table V-1: Sales plan

Year	2006	2007	2008	2009	2010	2011	2012	2013
Implementation year	0	1	2	3	4	5	6	7
Discount rate	1.00	0.91	0.83	0.75	0.68	0.62	0.56	0.51
Harvesting area (ha)								
Harvesting volume (Trees)								
Revenue from Melaleuca	0	0	0	0	0	0	0	0
Revenue from fishing	0	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000
Revenue from fishing	0	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000
Revenue from fishing including contingencies	0	42,000,000	44,100,000	46,305,000	48,620,250	51,051,263	53,603,826	56,284,017

Year	2014	2015	2016	2017	2018	2019
Implementation plan	8	9	10	11	12	13
Discount rate	0.47	0.42	0.39	0.35	0.32	0.29
Harvesting area (ha)	172.12	147.46	157.96	162.75	194.56	222.58
Harvesting volume(stems)						
Revenue from Melaleuca	9,251,450,000	7,925,975,000	8,490,350,000	8,747,812,500	10,457,600,000	11,963,675,000
Revenue from fishing	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000
Revenue from fishing	9,291,450,000	7,965,975,000	8,530,350,000	8,787,812,500	10,497,600,000	12,003,675,000
Revenue from fishing including contingencies	13,727,703,383	12,357,841,785	13,895,041,280	15,030,141,590	18,852,181,368	22,634,719,468

Table V-2: Status of Cash flow from total investment viewpoint

Year	2006	2007	2008	2009	2010	2011	2012	2013
Implementation plan	0	1	2	3	4	5	6	7
Discount rate	1.00	0.91	0.83	0.75	0.68	0.62	0.56	0.51
Cash inflow	0	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000
Cash outflow	0	1,118,744,779	2,046,046,125	2,200,581,494	2,695,583,999	3,062,802,075	3,447,782,457	3,826,800,409
Net cash flow(in- out)	0	(1,078,744,779)	(2,006,046,125)	(2,160,581,494)	(2,655,583,999)	(3,022,802,075)	(3,407,782,457)	(3,786,800,409)
BPV (a)	0	36,363,636	33,057,851	30,052,592	27,320,538	24,836,853	22,578,957	20,526,325
CPV (b)	0	1,017,040,708	1,690,947,211	1,653,329,447	1,841,120,141	1,901,759,117	1,946,183,313	1,963,753,697
Net Present Value (a)- (b)(NPV)	0	(980,677,071)	(1,657,889,359)	(1,623,276,855)	(1,813,799,603)	(1,876,922,264)	(1,923,604,356)	(1,943,227,372)
Internal Rate of Return (IRR)								
BC Ratio (a)/(b)								

Year	2014	2015	2016	2017	2018	2019	Tổng
Implementation plan	8	9	10	11	12	13	
Discount rate	0.47	0.42	0.39	0.35	0.32	0.29	
Cash inflow	9,291,450,000	7,965,975,000	8,530,350,000	8,787,812,500	10,497,600,000	12,003,675,000	57,356,862,500
Cash outflow	2,911,862,603	2,263,106,476	1,849,638,098	1,462,321,530	1,712,873,150	1,927,718,258	30,525,861,452
Net cash flow(in- out)	6,379,587,397	5,702,868,524	6,680,711,902	7,325,490,970	8,784,726,850	10,075,956,743	26,831,001,048
BPV (a)	4,334,529,998	3,378,351,026	3,288,819,199	3,080,074,671	3,344,858,872	3,477,037,073	21,098,407,592
CPV (b)	1,358,405,394	959,778,067	713,115,556	512,534,775	545,774,172	558,391,313	16,662,132,913
Net Present Value (a)-(b)(NPV)	2,976,124,604	2,418,572,959	2,575,703,643	2,567,539,896	2,799,084,700	2,918,645,760	4,436,274,679
Internal Rate of Return (IRR)							15.77%
BC Ratio (a)/(b)							1.27

Table V-3: Project cash flow upon the distribution of project revenue to the conservation activities

Year	2006	2007	2008	2009	2010	2011	2012	2013
Implementation plan	0	1	2	3	4	5	6	7
Discount rate	1.00	0.91	0.83	0.75	0.68	0.62	0.56	0.51
Cash inflow for conservation activities	0	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000
Cash outflow for conservation activities	0	500,000,000	500,000,000	500,000,000	500,000,000	500,000,000	500,000,000	500,000,000
Project's Cash inflow after subtracting a portion for conservation activities	0	0	0	0	0	0	0	0
Project's Cash outflow after subtracting a portion for conservation activities.	0	1,118,744,779	2,046,046,125	2,200,581,494	2,695,583,999	3,062,802,075	3,447,782,457	3,826,800,409
BPV (a) after subtracting a portion for conservation activities	0	0	0	0	0	0	0	0
CPV (b) after subtracting a portion of revenue for conservation activities	0	1,017,040,708	1,690,947,211	1,653,329,447	1,841,120,141	1,901,759,117	1,946,183,313	1,963,753,697
Net Present Value (a)-(b)(NPV)	0	(1,017,040,708)	(1,690,947,211)	(1,653,329,447)	(1,841,120,141)	(1,901,759,117)	(1,946,183,313)	(1,963,753,697)

Year	2014	2015	2016	2017	2018	2019	Total
Implementation plan	8	9	10	11	12	13	
Discount rate	0.47	0.42	0.39	0.35	0.32	0.29	
Cash inflow for conservation activities	929,145,000	796,597,500	853,035,000	878,781,250	1,049,760,000	1,200,367,500	5,987,686,250
Cash outflow for conservation activities	1,000,000,000	1,000,000,000	1,000,000,000	1,000,000,000	1,000,000,000	1,000,000,000	9,500,000,000
Project cash outflow after subtracting a portion of revenue for conservation activities	8,362,305,000	7,169,377,500	7,677,315,000	7,909,031,250	9,447,840,000	10,803,307,500	51,369,176,250
Project cash outflow after subtracting a portion of total revenue for conservation activities	2,911,862,603	2,263,106,476	1,849,638,098	1,462,321,530	1,712,873,150	1,927,718,258	30,525,861,452
BPV (a)after subtracting a portion from project revenue for conservation activities	3,901,076,998	3,040,515,923	2,959,937,279	2,772,067,204	3,010,372,985	3,129,333,366	18,813,303,755
CPV (b) after subtracting a portion from revenue for conservation activities	1,358,405,394	959,778,067	713,115,556	512,534,775	545,774,172	558,391,313	16,662,132,913
Net Present Value (a)-(b)(NPV)	2,542,671,604	2,080,737,856	2,246,821,723	2,259,532,429	2,464,598,812	2,570,942,053	2,151,170,842

Table V-4: Sensitiveness analysis

1.1 Sensitiveness changes according to sale price

% Change	Melaleuca stake 5	Melaleuca stake 4	Melaleuca stake 3	Firewood	NPV (VND)	BCR	IRR %
130%	11,700	9,750	2,730	45,500	10,680,556,682	1.64	22.02%
120%	10,800	9,000	2,520	42,000	8,599,129,348	1.52	20.12%
110%	9,900	8,250	2,310	38,500	6,517,702,013	1.39	18.05%
100%	9,000	7,500	2,100	35,000	4,436,274,679	1.27	15.77%
90%	8,100	6,750	1,890	31,500	2,464,488,901	1.15	13.37%
80%	7,200	6,000	1,680	28,000	383,061,567	1.02	10.56%
70%	6,300	5,250	1,470	24,500	(1,698,365,768)	0.90	7.33%

1.2 Sensitiveness changes according to man-day cost

% Change	Price	NPV	BCR	IRR
150%	74,250	1,232,631,134	1.06	11.61%
140%	69,300	1,873,359,843	1.10	12.44%
130%	64,350	2,514,088,552	1.14	13.27%
120%	59,400	3,154,817,261	1.18	14.11%
110%	54,450	3,795,545,970	1.22	14.94%
100%	49,500	4,436,274,679	1.27	15.77%
90%	44,550	5,188,303,573	1.33	16.69%
80%	39,600	5,830,690,910	1.38	17.52%
70%	34,650	6,473,078,248	1.44	18.36%

1.3 Analysis of sensitiveness according to 2 factors (sale price and product volume)

Price change	NPV	Volume				
		100%	90%	80%	70%	60%
		7,380	6,642	5,904	5,166	4,428
100%	7,283	4,436,274,679	2,354,338,508	272,967,711	(1,608,353,716)	(3,718,302,995)
90%	6,555	2,355,195,863	481,876,410	(1,391,443,043)	(3,264,762,496)	(5,138,081,948)
80%	5,827	274,682,420	(1,390,585,688)	(3,055,853,797)	(4,721,121,905)	(6,386,390,014)
70%	5,098	(1,808,688,871)	(3,265,619,850)	(4,722,550,829)	(6,179,481,809)	(7,636,412,788)
60%	4,370	(3,889,202,313)	(5,138,081,948)	(6,386,961,583)	(7,635,841,219)	(8,884,720,854)

2 Economic analysis:

Table V-5: Summary table of project cost by year (1, 057 ha).

Year	2006	2007	2008	2009	2010	2011	2012	2013
Implementation plan	0	1	2	3	4	5	6	7
Cost								
1. Production Forest (component 1)	0	870,038,652	1,652,830,944	1,767,776,043	2,160,680,867	2,452,639,412	2,766,277,400	3,054,647,942
1-1 Development of production forest (component 1-1)	0	57,730,210	1,652,830,944	1,767,776,043	2,160,680,867	2,452,639,412	2,766,277,400	3,054,647,942
1-2 Infrastructure construction (component 1-2)	0	812,308,442	0	0	0	0	0	0
2. Supporting forest plantation (component 2)	0	60,400,000	18,000,000	18,000,000	18,000,000	18,000,000	18,000,000	27,000,000
3. Project management, monitoring and evaluation (component 3)	0	81,230,844	160,337,186	171,479,519	210,609,342	238,738,267	269,162,257	305,464,794
A) Total base cost	0	1,011,669,496	1,831,168,130	1,957,255,562	2,389,290,209	2,709,377,680	3,053,439,657	3,387,112,737
B) Physical contingency	0	50,583,475	91,558,406	97,862,778	119,464,510	135,468,884	152,671,983	169,355,637
C) Price contingency	0	53,112,649	197,079,470	323,938,028	540,652,322	785,978,654	1,090,384,592	1,447,839,778
Total project cost (A+B+C)	0	1,115,365,619	2,119,806,006	2,379,056,369	3,049,407,041	3,630,825,218	4,296,496,232	5,004,308,151

Year	2014	2015	2016	2017	2018	2019
Implementation plan	8	9	10	11	12	13
Cost						
1. Production forest(component 1)	2,267,935,933	1,766,396,282	1,440,958,755	1,136,105,100	1,333,312,200	1,502,415,000
1-1 Development Production forest(component 1-1)	2,267,935,933	1,766,396,282	1,440,958,755	1,136,105,100	1,333,312,200	1,502,415,000
1-2 Infrastructure construction (component 1-2)	0	0	0	0	0	0
2. Supporting for forest plantation (component 2)	29,000,000	18,000,000	18,000,000	18,000,000	18,000,000	18,000,000
3. Project management, monitoring and evaluation (component 3)	226,793,593	176,639,628	144,095,875	113,610,510	133,331,220	150,241,500
A) Total base cost	2,523,729,526	1,961,035,910	1,603,054,630	1,267,715,610	1,484,643,420	1,670,656,500
B) Physical contingency	126,186,476	98,051,796	80,152,732	63,385,781	74,232,171	83,532,825
C) Price contingency	1,265,216,821	1,135,233,151	1,058,560,065	945,533,707	1,240,641,001	1,553,596,271
Total project cost (A+B+C)	3,915,132,823	3,194,320,857	2,741,767,427	2,276,635,098	2,799,516,592	3,307,785,596

Table V-6: Sale plan (revenue)

Year	2006	2007	2008	2009	2010	2011	2012	2013
Implementation plan	0	1	2	3	4	5	6	7
Discount rate	1.00	0.91	0.83	0.75	0.68	0.62	0.56	0.51
Harvesting area (ha)								
Harvesting volume(Tree)								
- Melaleuca stake 5								
- Melaleuca stake 4								
- Melaleuca stake 3								
- Firewood								
Sale plan								
- Melaleuca stake 5								
- Melaleuca stake 4								
- Melaleuca stake 3								
- Firewood								
Revenue from Melaleuca	0	0	0	0	0	0	0	0
Revenue from fishing	0	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000
Revenue from fishing	0	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000
Revenue from fishing inclusive of contingencies	0	42,000,000	44,100,000	46,305,000	48,620,250	51,051,263	53,603,826	56,284,017

Year	2014	2015	2016	2017	2018	2019
Implementation plan	8	9	10	11	12	13
Discount rate	0.47	0.42	0.39	0.35	0.32	0.29
Harvesting area (ha)	172.12	147.46	157.96	162.75	194.56	222.58
Harvesting volume(Cây)						
- Melaleuca stake 5	757,328	648,824	695,024	716,100	856,064	979,352
- Melaleuca stake 4	220,314	188,749	202,189	208,320	249,037	284,902
- Melaleuca stake 3	292,604	250,682	268,532	276,675	330,752	378,386
- Firewood	4,819	4,129	4,423	4,557	5,448	6,232
Sale plan						
- Melaleuca stake 5	6,815,952,000	5,839,416,000	6,255,216,000	6,444,900,000	7,704,576,000	8,814,168,000
- Melaleuca stake 4	1,652,352,000	1,415,616,000	1,516,416,000	1,562,400,000	1,867,776,000	2,136,768,000
- Melaleuca stake 3	614,468,400	526,432,200	563,917,200	581,017,500	694,579,200	794,610,600
- Firewood	168,677,600	144,510,800	154,800,800	159,495,000	190,668,800	218,128,400
Revenue from Melaleuca	9,251,450,000	7,925,975,000	8,490,350,000	8,747,812,500	10,457,600,000	11,963,675,000
Revenue from fishing	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000
Revenue from fishing	9,291,450,000	7,965,975,000	8,530,350,000	8,787,812,500	10,497,600,000	12,003,675,000
Revenue from fishing inclusive of contingencies	13,727,703,383	12,357,841,785	13,895,041,280	15,030,141,590	18,852,181,368	22,634,719,468

Table V-7: Status of cash- flow from total investment viewpoint

Year	2006	2007	2008	2009	2010	2011	2012	2013
Implementation plan	0	1	2	3	4	5	6	7
Discount rate	1.00	0.91	0.83	0.75	0.68	0.62	0.56	0.51
Cash inflow	0	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000
Cash outflow	0	1,062,252,971	1,922,726,536	2,055,118,341	2,508,754,719	2,844,846,564	3,206,111,640	3,556,468,373
Net cash flow (in- out)	0	(1,022,252,971)	(1,882,726,536)	(2,015,118,341)	(2,468,754,719)	(2,804,846,564)	(3,166,111,640)	(3,516,468,373)
BPV (a)	0	36,363,636	33,057,851	30,052,592	27,320,538	24,836,853	22,578,957	20,526,325
CPV (b)	0	965,684,519	1,589,030,195	1,544,040,827	1,713,513,229	1,766,425,892	1,809,766,437	1,825,030,618
Net Present Value (a)-(b)(NPV)	0	(929,320,883)	(1,555,972,344)	(1,513,988,235)	(1,686,192,691)	(1,741,589,039)	(1,787,187,480)	(1,804,504,293)
Internal Rate of Return (IRR)								
BC Ratio (a)/(b)								

Year	2014	2015	2016	2017	2018	2019	Total
Implementation plan	8	9	10	11	12	13	
Discount rate	0.47	0.42	0.39	0.35	0.32	0.29	
Cash inflow	9,291,450,000	7,965,975,000	8,530,350,000	8,787,812,500	10,497,600,000	12,003,675,000	57,356,862,500
Cash outflow	2,649,916,002	2,059,087,706	1,683,207,362	1,331,101,391	1,558,875,591	1,754,189,325	28,192,656,520
Net cash flow (in- out)	6,641,533,998	5,906,887,295	6,847,142,639	7,456,711,110	8,938,724,409	10,249,485,675	29,164,205,980
BPV (a)	4,334,529,998	3,378,351,026	3,288,819,199	3,080,074,671	3,344,858,872	3,477,037,073	21,098,407,592
CPV (b)	1,236,205,372	873,254,192	648,949,303	466,542,917	496,705,804	508,126,163	15,443,275,469
Net Present Value (a)-(b)(NPV)	3,098,324,626	2,505,096,834	2,639,869,896	2,613,531,754	2,848,153,068	2,968,910,911	5,655,132,122
Internal Rate of Return (IRR)							17.56%
BC Ratio (a)/(b)							1.37

Appendix VI: Project Option and Evaluation Report

Project Option Evaluation

1. Introduction

The project option evaluation is part of the feasibility study process to screen various project options and then select the most feasible project option. It will help a project planner identify the most feasible option out of a number of possible options at the early planning stage of the project. It will be conducted also in a less costly manner. Under the FICAB Study, the Study Team has been trying to develop a simple method of the project option evaluation, which should be well adopted into the project formulation method in the Vietnamese forest sector (See Annex).

In phase I of the FICAB Study, the study team has conducted the option evaluation as a part of feasibility study in Thai Nguyen province. And in phase II, four provinces (Son La, Quang Nam, Lam Dong and Long An Provinces) have conducted the option evaluation as well by themselves base on the method developed.

As the next step in the feasibility study, from August 2006 to October 2006, after intensive training course Provincial Study Teams (PST) of Long An have conducted the project option evaluation. This is the result of option evaluation conducted by Long An PST

2. The result of Project Option Evaluation

As the result of pre-site assessment, project area for production forest in Long An is located in Tan Hung District.

Step 1 Identification of possible key project components through data collection and analysis

The possible options of key project components in Long An are presented in the table V-8

Table V-8: Possible project components

Implementer	Lang Sen PMU
Products	Construction Wood
	Pulp-wood
Financial source	Self capital
	Bank loans

Step 2 Preparation of a long-list of project options

The long list of project option for production forest in Lam Dong is presented in the Table V-9

Table V-9: The long-list of project options

Option No.	Implementers	Products	Financial sources
1	Lang Sen PMU	Construction Wood	Bank loans
2	Lang Sen PMU	Construction Wood	Self capital
3	Lang Sen PMU	Pulp-wood	Bank loans
4	Lang Sen PMU	Pulp-wood	Self capital

Step 3 Preparation of a short-list of project options

There are only four project options for production project in Long An, thus it is not necessary to prepare the short list. The long list is directly used to evaluate and to identify the most feasible project option.

Step 4 Option assessment and selection of the most feasible project option

Table V-10: The option evaluation results

Option No.	Implementer	Target products	Financial sources	Evaluation notes	Select/reject
1	Lang Sen PMU	Construction Wood	Bank loans	Suitable	Select
2	Lang Sen PMU	Construction Wood	Self capital	Not suitable in term of finance sources	Reject
3	Lang Sen PMU	Pulp-wood	Bank loans	There is no markets	Reject
4	Lang Sen PMU	Pulp-wood	Self capital	There is no markets	Reject

The project area is in Lang Sen natural reserve area and is owned by Lang Sen NR Project Management Unit. As the project area is in the Mekong River flooded area, applicable tree specie is limited. At the same time, for Lang Sen NR Project Management Unit, it is not possible to provide sufficient funds. Considering these aspects, option No.1 has been selected as a most feasible project option and the key project components as follows:

Implementer: Lang Sen PMU

Financial source: Bank loans

Target products: Construction Wood

Training Package

Book 1:	Training Plan on Capacity Building for Preparing Feasibility Studies and Implementation Plans for Production Forest/Agroforestry Development Projects in Vietnam
Book 2:	Manual for Preparation of Feasibility Study Reports for Production Forest/Agroforestry Development Projects in Vietnam
Book 3:	Manual for Preparation of Implementation Plans for Production Forest/Agroforestry Development Projects in Vietnam
Book 4:	Model F/S of Thai Nguyen Province
	Book 4-1: Model Feasibility Study Report for Smallholder Production Forest Development Project in Thai Nguyen Province
	Book 4-2: Model Feasibility Study Report for Agroforestry Development Project in Thai Nguyen Province
Book 5:	Model IP of Thai Nguyen Province
	Book 5-1: Model Implementation Plan for Smallholder Production Forest Development Project in Thai Nguyen Province
	Book 5-2: Model Implementation Plan for Agroforestry Development Project in Thai Nguyen Province
Book 6:	Monitoring and Evaluation Report on Technical Training of Participating Provinces
Book 7:	Market Trend Reference Book on Wood-based and Agroforestry Products
Book 8:	Feasibility Study Reports of Participating Provinces
	Book 8-1: Feasibility Study Report on Agroforestry Project in Ta Hoc Commune, Mai Son District, Son La Province
	Book 8-2: Feasibility Study Report on Production Forest Establishment Project in Nui Thanh District, Quang Nam Province
	Book 8-3: Feasibility Study Report on Treatment of Exhausted Natural Forest and Production Forest Establishment Project in Da Teh District, Lam Dong Province
	Book 8-4: Feasibility Study Report on Afforestation Project for Serving Biodiversity Conservation in Long An Province
Book 9:	Implementation Plans of Participating Provinces
	Book 9-1: Implementation Plan on Agroforestry Project in Ta Hoc Commune, Mai Son District, Son La Province
	Book 9-2: Implementation Plan on Production Forest Establishment Project in Nui Thanh District, Quang Nam Province
	Book 9-3: Implementation Plan on Treatment of Exhausted Natural Forest and Production Forest Establishment Project in Da Teh District, Lam Dong Province
	Book 9-4: Implementation Plan on Afforestation Project for Serving Biodiversity Conservation in Long An Province