

APPENDIX J : FOREST MANAGEMENT

APPENDIX-J FOREST MANAGEMENT

TABLE OF CONTENTS

	<u>Page</u>
J.1 Current Conditions of Forestry in the Study Area	J - 1
J.1.1 Forest Vegetation	J - 1
J.1.2 Current Forest Conditions.....	J - 1
J.1.3 Scattered Plantations.....	J - 4
J.1.4 Forest Management	J - 4
J.1.5 Forestry Production	J - 6
J.1.6 Consumption of Forest Products	J - 6
J.1.7 Estimation of Fuelwood Demand	J - 7
J.1.8 Stand Increment	J - 8
J.1.9 Forest Fires	J - 8
J.1.10 Wood Price	J - 9
J.1.11 Rural Questionnaire Survey.....	J - 10
J.1.12 Existing Planting Plans.....	J - 10
J.2 Master Plan	J - 12
J.2.1 Objective.....	J - 12
J.2.2 Planning Items	J - 12
J.2.2.1 Concentrated Planting at Government Forestry Areas.....	J - 12
J.2.2.2 Concentrated Planting Outside Government Forestry Areas	J - 12
J.2.2.3 Environmental Conservation Forest Zone	J - 13
J.2.2.4 Border Protection Forest.....	J - 13
J.2.2.5 Scattered Planting	J - 14
J.2.2.6 Extension Program.....	J - 15
J.2.2.7 Annual Work Plan and Project Cost Estimate.....	J - 15
J.2.3 Effect of Plan Implementation of Fuelwood Supply	J - 15
J.2.4 Recommendations.....	J - 17

LIST OF TABLES/FIGURE

	<u>Page</u>
Table J-1-1 Existing forest conditions in the Study Area	J - 19
Table J-1-2 Change of forest area in the Study Area	J - 20
Table J-1-3 Current conditions of forestry work sites in the Study Area (June, 1999).....	J - 21
Table J-1-4 Existing tree number of scattered plantation in the Dong Thap province area within the Study Area	J - 22
Table J-1-5 Existing tree species of the scattered plantation in the Dong Thap province area within the Study Area (1/10/1996)	J - 23
Table J-1-6 Yearly forest products in the Dong Thap province area within the Study Area	J - 24
Table J-1-7 Consumption of forest products in Cai Be and Cai Lay district of Tien Giang province in year 1998.....	J - 25
Table J-1-8 Mean increment of Melaleuca cajuputi and Eucalyptus camaldulensis in Mekong Delta	J - 25
Table J-2-1 Concentrated planting plan at government forestry areas.....	J - 26
Table J-2-2 Concentrated planting plan outside government forestry areas	J - 26
Table J-2-3 Environmental conservation forest zone plan.....	J - 27
Table J-2-4 Border protection forest plantation plan	J - 27
Table J-2-5 Scattered planting plan.....	J - 28
Table J-2-6 Planting density for the scattered planting.....	J - 29
Table J-2-7 Annual work plan	J - 30
Table J-2-8 Project cost estimate	J - 31
Table J-2-9 Yield table of Melaleuca forest in Mekong Delta	J - 32
Table J-2-10 Estimated yield following the implementation of the Plan (yield from existing plantation is excluded)	J - 33
Figure J-2-1 Zoning for forest management plan.....	J - 34

J.1. Current Conditions of Forestry in the Study Area

J.1.1 Forest Vegetation

Forest vegetation in Vietnam is classified as mountainous hardwood forests, tropical deciduous broad-leaved forests, tropical dry deciduous broad-leaved forests, tropical lowland evergreen broad-leaved forests, tropical swamp forests and mangrove forests. The Study Area is located in the tropical swamp forest zone.

An extensive swamp (closed flood plain) called the Plain of Reed lies to the northwest of the Mekong River which runs along the southwestern boundary of the Study Area and acidic sulfate soil is distributed at the closed flood plain. While natural forests of *Melaleuca cajuputi* which can withstand such acidic sulfate soil and which grow in standing water used to be distributed in this area, the construction of irrigation channels has now turned most of the area into paddy fields. Today, no natural forests are observed in the Study Area and most forests are plantations of *Melaleuca cajuputi*. In addition, *Eucalyptus camaldulensis*, *Bambusa* spp. and others have been planted, mainly along roads and canals.

J.1.2 Current Forest Conditions

In general, the subject area of forestry is divided into stocked areas and unstocked areas. As of June, 1999, the forestry area in the Study Area is 14,850 ha, of which stocked areas comprise 8,994 ha and unstocked areas 5,856 ha (source: Department of Agriculture and Rural Development of Dong Thap Province and Tien Giang Province).

All forests statistically accounted for are plantations and no natural forests are said to exist. In 1994, the total forest area in the Study Area was 9,455 ha, indicating a subsequent decline of the forest area by 4.9% to the present size. Forests currently cover a mere 3.1% of the entire land. With the addition of the area of fruit and perennial crop cultivation of 26,981 ha (source: GIS survey by Sub NIAPP in 1999), green tracts of land account for approximately 12% of the entire land. From the viewpoint of environmental conservation, the role played by fruit trees in the Study Area cannot be ignored.

Forests in the Study Area are found predominantly in three districts, i.e. Tam Nong, Thap Muoi and Cao Lanh. Tam Nong District accounts for 38.5% or 3,467 ha of the entire forest area, followed by Thap Muoi District at 37.6% or 3,384 ha and Cao Lanh District at 20.7% or 1,866 ha. Therefore, these three districts account for some 97% of the entire forest area.

From the functional point of view, forests in the Study Area are classified as protection forests (2,287 ha), special use forests (2,821 ha) and production forests (3,886 ha). Protection forests consist of 2,203

ha of environmental conservation forests in Tam Nong District and 84 ha of national border protection forests in Thanh Hong District. Special use forests consist of 2,808 ha of national park in Tam Nong District and 13 ha of historic sites in Cao Lanh District. Production forests are found in Cao Lanh District (1,853 ha), Thap Muoi District (1,182 ha), Tam Nong District (659 ha), Cai Be District (161 ha) and Thanh Hong District (31 ha).

In terms of the planted species, *Melaleuca cajuputi* is by far the most popular species, accounting for 98.4% (8,847 ha) of the forest area, followed by *Eucalyptus camaldulensis* (1.6% or 147 ha). 54.7% of *Eucalyptus* forests are national border protection forests in Thanh Hong District. The reason for this overwhelming dominance of *Melaleuca cajuputi* is that the widely distributed acidic sulfate soil in the Study Area acts as a restricting factor for the selection of species. It appears certain that *Melaleuca cajuputi* is primarily selected as a useful species because of its suitability for this type of soil.

The tree age composition of *Melaleuca cajuputi* (except Tien Giang Province) is 17.3% for trees of 1 - 3 years, 43.0% for trees of 3 - 6 years, 27.8% for trees of 6 - 9 years and 11.9% for trees of nine years or more. In the case of *Eucalyptus camaldulensis*, trees of 1 - 3 years account for 31.6%, trees of 3 - 6 years account for 29.7%, trees of 6 - 9 years account for 29.0% and trees of 9 years or more account for 9.7%. The tree age composition of *Melaleuca* production forests is 23.9% for trees of 1 - 3 years, 17.1% for trees of 3 - 6 years, 31.1% for trees of 6 - 9 years and 27.9% for trees of nine years or more. Given the cutting period of some 10 years for *Melaleuca cajuputi*, the tree age composition is not particularly bad as trees of 6 years or more enjoy a high proportion despite the relatively small proportion of trees of 3 - 6 years. *Melaleuca* protection forests show that they are in the midst of improvement because of the dominance of young stands with trees of 3 - 6 years accounting for 75.3%, followed by trees of 1 - 3 years accounting for 14.2% and trees of 6 - 9 years accounting for 10.5%. In the case of special use forests, most of which are *Melaleuca* forests in national parks, trees of 1 - 3 years account for 11.4%, trees of 3 - 6 years account for 51.5% and trees of 6 - 9 years account for 37.1%. As there are sites waiting for planting, it can be inferred that some 30 years or more will be required for these forests to achieve the target forest type.

In terms of ownership, national forests account for 65.1% (5,851 ha) of the forest area while private forests account for the remaining 34.9% (3,143 ha). The largest concentration of national forests is found in Tam Nong District (3,172 ha), accounting for 54.2% of the entire national forest area. National forests are also found in Cao Lanh District (1,866 ha), Thap Muoi District (729 ha) and Thanh Hong District (84 ha). Private forests are predominantly found in Thap Muoi District (2,655 ha or 84.5%), followed by Tam Nong District (295 ha), Cai Be District (161 ha) and Thanh Hong District (31 ha).

The current forestry work sites in national forests are described below.

- (1) Gao Giong Agroforestry-Fishery Enterprise
This production forest of 1,407 ha is located on a work site of 1,658 ha in Cao Lanh District. The planting species is *Melaleuca cajuputi* and the tree age composition (in terms of area) is 19.4% for trees of 1 - 3 years, 7.9% for trees of 3 - 6 years, 24.8% for trees of 6 - 9 years and 47.9% for trees of nine years or more.

- (2) Cao Lanh Prison Camp
This production forest of 62 ha is located on a work site of 82 ha in Cao Lanh District. The planting species is *Melaleuca cajuputi* and the tree age is 1 - 3 years.

- (3) Dong Thap Province Police's Prison Camp
This production forest of 384 ha is located on a work site of 501 ha in Cao Lanh District. The planting species are *Melaleuca cajuputi* (363 ha) and *Eucalyptus camaldulensis* (21 ha). The tree age composition (in terms of area) of the former is 70.2% for trees of 1 - 3 years, 23.7% for trees of 6 - 9 years and 6.1% for trees of nine years or more. All *Eucalyptus camaldulensis* trees fall in the age bracket of 1 - 3 years.

- (4) Xeo Quyt Historical Vestiges Area
This special use forest of 13 ha is located on a work site of 50 ha in Cao Lanh District. The planting species is *Melaleuca cajuputi* and the tree age is nine years or more.

- (5) Dong Cat Agroforestry-Fishery Enterprise
This production forest of 590 ha is located on a work site of 745 ha in Thap Muoi District. The planting species are *Melaleuca cajuputi* (575.5 ha) and *Eucalyptus camaldulensis* (14 ha). The tree age composition (in terms of area) for the former is 14.4% for trees of 1 - 3 years, 63.3% for trees of 3 - 6 years, 19.5% for trees of 6 - 9 years and 2.8% for trees of nine years or more. All *Eucalyptus camaldulensis* trees are nine years old or more.

- (6) Environmental Conservation Forest
This protection forest of 140 ha is located on a work site of 140 ha in Thap Muoi District. The planting species is *Melaleuca cajuputi* and the tree age is 1 - 3 years.

- (7) Tram Chim National Park
This special use forest of 2,808 ha is located on a work site of 7,588 ha in Tam Nong District. The planting species is *Melaleuca cajuputi* and the tree age composition (in terms of area) is 11.4% for trees of 1 - 3 years, 51.5% for trees of 3 - 6 years and 37.1% for trees of 6 - 9 years.

- (8) Giong Gang Agroforestry-Fishery Enterprise

This production forest of 364 ha is located on a work site of 394 ha in Tam Nong District. The planting species is *Melaleuca cajuputi* and the tree age composition (in terms of area) is 15.0% for trees of 1 - 3 years and 85.0% for trees of nine years or more.

(9) **Border Protection Forest**

This protection forest of 84 ha is located on a work site of 94 ha in Thanh Hong District. The planting species are *Melaleuca cajuputi* (4 ha) and *Eucalyptus camaldulensis* (80%). The tree age composition (in terms of area) for the latter is 31.6% for trees of 1 - 3 years, 15.3% for trees of 3 - 6 years and 53.1% for trees of 6 - 9 years. All *Melaleuca cajuputi* trees are 1 - 3 years old.

J.1.3 Scattered Plantations

In Vietnam, plantations are created in the form of scattered plantations where trees are planted along roads, irrigation channels and rivers and around houses in a scattered manner and concentrated plantations where trees are planted in a concentrated manner on bare land, etc. The forest area referred to in 1.2 is that of concentrated plantations.

In the Dong Thap Province area within the Study Area, 39,719,000 trees were found in scattered plantations as of 1st October, 1997, showing a year on year increase of 5.6%. By district/town, Thap Muoi District accounted for the largest share of 46.1%, followed by Cao Lanh District (18.8%) and Thanh Hong District (14.0%). These three districts, therefore, accounted for 79% of all scattered trees. As of 1st October, 1996, the principal species planted were *Eucalyptus camaldulensis* (Bach dan), *Melaleuca cajuputi* (Tram), *Bambusa* spp. (Tre; Truc; Tam vong), *Samanea saman* (Cong), *Sarcocephalus* sp. (Gao) and *Hopea odorata* (Sao). The most eminent was *Eucalyptus camaldulensis*, accounting for 42.6%, followed by *Melaleuca cajuputi* (34.6%) and *Bambusa* spp. (19.2%). These three species accounted for 96% of all trees.

In the Tien Giang Province area within the Study Area, 11,100,000 scattered trees were found as of 1996, consisting of 7,800,000 trees in Cai Be District and 3,300,000 trees in Cai Lay District.

J.1.4 Forest Management

The interview survey conducted at four national forest sites (Gao Giong Agroforestry-Fishery Enterprise, Dong Thap Province Police's Prison Camp, Dong Cat Agroforestry-Fishery Enterprise and Giong Gang Agroforestry-Fishery Enterprise) found the following forest management techniques for production forests.

The planting stock is either purchased from a nursery or other sources. In the case of *Melaleuca cajuputi*, the seeds collected from one's own stand may be used. The purchase price per planting stock is 60 - 70 VND (maximum of 100 VND) for *Melaleuca cajuputi* and 40 - 60 VND for *Eucalyptus camaldulensis*. The height of the planting stock is 0.9 - 1.5 m for *Melaleuca cajuputi* and 0.1 - 0.2 m for *Eucalyptus camaldulensis*. In the case of *Eucalyptus camaldulensis*, tall planting stock tends to die. Ground preparation is conducted manually or is assisted by machinery.

The planting season is around October for *Melaleuca cajuputi* and March - April or around November for *Eucalyptus camaldulensis*. Bare stock is used for *Melaleuca cajuputi* while potted seedlings are used for *Eucalyptus camaldulensis*. The planting distance is 0.4 x 0.4 m, 0.5 x 0.5 m, 0.7 x 0.7 m or 1 x 0.5 m for *Melaleuca cajuputi* and 0.5 x 0.5 m or 1 x 2 m for *Eucalyptus camaldulensis*. The direct seeding of *Melaleuca cajuputi* is conducted at a rate of 40 liters/ha (20 kg/ha).

While fertilizer is not used for *Melaleuca cajuputi*, fertilizer is used at some sites for *Eucalyptus camaldulensis*.

The survival rate of *Melaleuca cajuputi* is 60 - 90% and a planting density of some 20,000 seedlings/ha can achieve a survival rate of 85 - 90%.

Weeding is not conducted in the case of *Melaleuca cajuputi* but the practice varies from one site to another in the case of *Eucalyptus camaldulensis*. If weeding is conducted, it is conducted once or twice within one year of planting.

Thinning may be conducted once or twice for *Melaleuca cajuputi*. The first thinning is conducted for 5 - 6 year old trees and the second thinning is conducted when the trees are 7 - 8 years old although thinning is not conducted at all at some sites. In the case of *Eucalyptus camaldulensis*, thinning is not carried out at a majority of sites. Thinning is conducted by farmers free of charge and the thinned wood is given to these farmers.

The cutting period is 10 - 13 years (minimum tree height of 6 - 7 m) for *Melaleuca cajuputi* and 6 - 12 years (minimum tree height of 12 m) for *Eucalyptus camaldulensis*. While clear cutting is the normal practice, selecting cutting at a rate of 1,500 trees/ha/year is conducted at some *Melaleuca cajuputi* plantations. The produced wood is used as construction timber. *Melaleuca cajuputi* is particularly used as piles.

J.1.5 Forestry Production

In the Dong Thap Province area within the Study Area, the annual production volume of industrial roundwood was 111,000 m³ as of 1st October, 1997, showing a year on year increase of 53%. Of this volume, 53% came from concentrated plantations and 47% came from scattered plantations, indicating the importance of the latter. Production from concentration plantations predominantly took place in Thap Muoi District (75%) and Cao Lanh District (23%). Thap Muoi District had a production forest area of 1,181 ha, equivalent to 64% of the 1,853 ha production forest area in Cao Lanh District. The high production volume level of the former implies that production activities took place at 2,203 ha of protection forests. By district/town, Thap Muoi District was the leading production district with 50,000 m³, followed by Cao Lanh District with 43,000 m³ and Hong Ngu District with 7,000 m³. Combined together, these three districts accounted for 89% of the industrial roundwood produced in Dong Thap Province.

The annual production volume of fuelwood as of 1st October, 1997 was 186,000 ste (1 ste = 0.75 m³), a year on year increase of 22%. 30% and 70% of this 186,000 ste were produced by concentrated plantations and scattered plantations respectively, indicating the principal importance of the latter in terms of fuelwood production. By district/town, Thap Muoi District produced the largest volume of 51,000 ste, followed by Cao Lanh District with 48,000 ste and Thanh Binh District with 28,000 ste. Combined together, these three districts accounted for 68% of the fuelwood produced in Dong Thap Province.

The production volume of *Bambusa* spp. in the same one year period was 2,238,000 pieces, a year on year increase of 32%. By district/town, Cao Lanh District produced the largest number of 694,000 pieces, followed by Cao Lanh District with 490,000 pieces and Thanh Binh District with 326,000 pieces. Combined together, these three districts accounted for 67% of bamboo production in Dong Thap Province.

The production volume of bamboo shoots in the same one year period was 147,000 kg, a year on year increase of 232%. By district/town, Cao Lanh District was the largest production area, accounting for 60,000 kg, followed by Cao Lanh Town with 45,000 kg and Tam Nong District with 13,000 kg. Combined together, these three top bamboo shoot production districts and town accounted for 80% of the bamboo shoot production in Dong Thap Province. No statistics on forest products are available for the Tien Giang Province area within the Study Area.

J.1.6 Consumption of Forest Products

The consumption volume of sawn timber in Dong Thap Province in 1996 was 54,360 m³, consisting of 43,360 m³ for rural houses, 5,000 m³ for urban houses, 2,000 m³ for boats, 1,600 m³ for school fixtures, 1,400 m³ for roads and bridges and 1,000 m³ for furniture. This volume can be converted to 83,630 m³ of logs (conversion rate of 65%) (source: Department of Agriculture and Rural Development of Dong Thap Provincial Government). Given the population of 1,553,000 in 1996, the annual wood consumption per capita (excluding fuelwood; converted to logs) was 0.05 m³. However, the same Department estimates that the minimum annual consumption per capita was 0.1 m³ for wood (excluding fuelwood) and 0.5 ste for fuelwood. In addition, 51,000 m³ of sawn timber (equivalent to 78,461 m³ of logs) is said to be imported annually from Cambodia and other provinces.

In 1998, Cai Be and Cai Lay Districts in Tien Giang Province consumed 52,000 m³ of industrial roundwood (piles accounting for 15,000 m³), 15,000 m³ of fuelwood and 30 tons of honey (source: Department of Agriculture and Rural Development of Tien Giang Provincial Government). Given the combined populations of Cai Be and Cai Lay Districts of 635,000 in 1997 and the population growth rate of Tien Giang Province in 1997, the combined population of these two districts in 1998 is estimated to be 645,000, resulting in an annual consumption per capita of forest products for these two districts of 0.08 m³ of logs, 0.02 m³ of fuelwood and 46.5 g of honey.

J.1.7 Estimation of Fuelwood Demand

The Sub-FIPI conducted a fuelwood consumption survey in six provinces lying along the southwestern border of Vietnam, i.e. Song Be, Tay Ninh, Long An, Dong Thap, An Giang and Kien Giang, and established an annual fuelwood consumption per capita of 0.2 m³. The master plan for 2010 for Dong Thap Province predicts that the provincial population in 2010 will be 1,870,000. The population of Dong Thap Province in 1997 was 1,581,000 while the population of the Dong Thap Province area within the Study Area was estimated to be 849,000 (based on the district/town population in 1997, the district/town area and the district/town area within the Study Area). Accordingly, the population of the Dong Thap Province area within the Study Area in 2010 is estimated to be 1,004,000. Assuming that the annual fuelwood consumption per capita in the Dong Thap Province area within the Study Area is 0.2 m³, the fuelwood demand in 2010 is estimated to be 200,800 m³.

The annual fuelwood consumption volume per capita in Cai Be and Cai Lay Districts in Tien Giang Province in 1998 was 0.02 m³. The master plan for 2010 for Tien Giang Province predicts that the provincial population in 2010 will be 2,176,000. The population of Tien Giang Province in 1997 was 1,744,000 while the population of the Tien Giang Province area within the Study Area was estimated to be 473,000 (based on the district/town population in 1997, the district/town area and the district/town area within the Study Area). Accordingly, the population of the Tien Giang Province area within the

Study Area in 2010 is estimated to be 590,000 and the fuelwood demand in the Tien Giang Province area within the Study Area in 2010 is estimated to be 11,800 m³.

J.1.8 Stand Increment

According to Axel Bergman (1990), the average annual increment of *Eucalyptus camaldulensis* and *Melaleuca* spp. in the Mekong Delta was 15 - 25 m³/ha (rotation period of 5 - 8 years) for the former and 7 - 10 m³/ha (rotation period of 10 - 12 years) for the latter (Overseas Agricultural Development Association, "Study Report for Fast Growing Species Processing and Utilization Project in the Mekong Delta", 1998).

Nguyen Van Duyet conducted an increment survey on *Eucalyptus camaldulensis* and *Melaleuca* spp. in the Phung Hiep area in the Mekong Delta (Forest Inventory and Planning Institute, "Study on Forestry Development, General Development Project of Quan Lo, Phung Hiep Area - Mekong Delta", 1991). According to the survey, the average annual increment of *Eucalyptus camaldulensis* is less than 2 cm for DBH, less than 1.5 m for tree height and 10 m³/ha for volume at sites with poor growth conditions, 2 - 4 cm for DBH, 1.5 - 2.5 m for tree height and 12.8 m³/ha for volume at sites with moderate growth conditions and 4 cm or more for DBH, 2.5 m or more for tree height and 15.6 m³/ha for volume at sites with excellent growth conditions. The annual volume growth of *Eucalyptus camaldulensis* reaches its peak at an age of 5 - 10 years.

The average annual increment of *Melaleuca* spp. is less than 0.4 m for DBH, less than 0.4 cm for tree height and 4.3 m³/ha for volume at sites with poor growth conditions, 0.5 cm for DBH, 0.6 m for tree height and 6.0 m³/ha for volume at sites with moderate growth conditions and 0.6 cm or more for DBH, 0.8 m or more for tree height and 7.7 m³/ha for volume at sites with excellent growth conditions. The growth of *Melaleuca* spp. is fast upto an age of 10 years and slows down thereafter. At an age of 25 years, *Melaleuca* spp. can reach a DBH of 18 cm, a tree height of 13 m and a volume of 120 m³/ha.

J.1.9 Forest Fires

In Dong Thap Province, forest fires have occurred every year since 1994: 25 cases in 1994, 38 cases in 1995, 15 cases in 1996, five cases in 1997 and 19 cases in 1998. The forest area lost due to fire was 138 ha in 1994, 682 ha in 1995, 64 ha in 1996, 12 ha in 1997 and 9 ha in 1998. The amount of damage was 200 million VND in 1994, 3,200 million VND in 1995, 130 million VND in 1996, 60.5 million VND in 1997 and 56 million VND in 1998. However, the number of forest fires, the forest area lost and the amount of damage have generally begun to decline since 1995. In 1998, even though the number of forest fires increased compared to 1997, the small scale of these fires meant a decline of both the forest

area lost and the amount of damage to their lowest levels since 1994. Forest fires are said to be caused by hunters of birds, snakes and field mice and by those collecting honey.

No forest fires have been recorded in Cai Be and Cai Lay Districts in Tien Giang Province since 1994. *Melaleuca* spp. is liable to fire damage because its high essential oil content makes it more combustible than other species. At concentrated plantations in particular, fire damage tends to spread because of the extensive area of these plantations and monitoring difficulties, making the implementation of forest fire prevention and control measures extremely important.

J.1.10 Wood Price

According to the results of interviews which took place at national as well as private forests in the Study Area, the standing tree price per ha of *Melaleuca cajuputi* is 35 - 60 million VND for trees of 10 - 13 years of age.

Interviews at national forests in Cao Lanh District found the following log price at the roadside for *Melaleuca cajuputi*.

4.8 m in length, 3.8 - 4.5 cm in top end diameter	: 10,000 VND
4.8 m in length, 3.0 - 3.5 cm in top end diameter	: 4,500 VND

Interviews at private forests in Thap Muoi District found a standing tree price of 15,000 VND for trees of 10 years of age or more (6 - 7 m in height), 200,000 VND for trees of 20 years of age or more (15 m in height) and the following log price at the roadside for *Melaleuca cajuputi*.

4.7 m in length, 4 cm or more in top end diameter	: 12,500 - 13,000 VND
4.7 m in length, less than 4 cm in top end diameter	: 11,500 VND
4.0 m in length, 4 cm or more in top end diameter	: 10,000 VND
4.0 m in length, less than 4 cm in top end diameter	: 7,000 VND
2.8 m in length, 4 cm or more in top end diameter	: 6,000 VND
2.8 m in length, less than 4 cm in top end diameter	: 5,000 VND

Interviews at private forests in Thap Muoi District found that *Melaleuca cajuputi* sold as fuelwood is normally cut to some 30 cm in length and that a bundle of 0.3 m in width, 1 m in length and 1 m in height is sold as a unit. The unit price is 35,000 VND.

At the Gao Giong Agroforestry-Fishery Enterprise site in a national forest in Gao Lanh District, a bundle of fuelwood (0.3 m in width, 1 m in length and 1 m in height) is sold at 20,000 VND.

Interviews with middlemen operating in Cai Lay District found that they purchase *Melaleuca cajuputi* logs in Long An Province and sell them in My Tho City in Tien Giang Province at the following prices.

4.7 m long log: purchase price - 10,500 VND, sales price - 11,000 VND

4.0 m long log: purchase price - 4,000 VND, sales price - 4,500 VND

3.0 m long log: purchase price - 2,500 VND, sales price - 3,000 VND

J.1.11 Rural Questionnaire Survey

The results of the questionnaire survey conducted on 500 rural households in the Study Area as part of the Study show that income from forest products accounts for an average of a mere 0.9% of the total household income. The highest proportion of 1.3% is recorded in Thap Muoi District. The ratio of households using fuelwood is as high as 80% and Hong Ngu and Cao Lan Districts show an especially high ratio of more than 90%.

The planting area per household is 643 m² for concentrated plantations and 93 m² for scattered plantations. The planting purposes include the sale of wood, collection of daily necessities, collection of fuelwood and production of building timber. The most popular planting species is *Melaleuca cajuputi*, accounting for 81% of the planted trees, followed by *Eucalyptus* sp. at 14%. Other planting species include *Bambusa* spp., mango, longan, orange and papaya.

J.1.12 Existing Planting Plans

The planting plan upto 2010 for Dong Thap Province has a target of concentrated plantation area of 19,289 ha and the target of planting 200 million trees in scattered plantations. In the case of Tien Giang Province, while there is no plan for concentrated plantations in Cai Be and Cai Lay Districts, the target planting of 10,300,000 trees and 8,800,000 trees, totalling 19,100,000 trees, in scattered plantations in Cai Be District and Cai Lay District is planned.

Given the forest area of 8,833ha in Dong Thap Province as of June, 1999, the new planting of 10,456 ha will be required to meet the target for concentrated plantations. This figure can be translated to the new planting of 7,391 ha in the Dong Thap Province area within the Study Area. As the Study Area only has some 2,000 ha of unused land where new planting can be conducted, excluding the Tram Chim National Park (based on the results of the GIS survey conducted by the Sub-NIAPP in 1999), it will be extremely difficult to meet the target.

In regard to scattered plantations, as the number of trees in scattered plantations in Dong Thap Province as of 1996 was 54,859,000, 145,141,000 new trees, a 265% increase, must be planted to meet the target. The number of trees in scattered plantations in Cai Be District and Cai Lay District as of 1996 was 7,800,000 and 6,300,000 respectively, totalling 14,100,000. In order to meet the target, therefore, the planting of 5,000,000 new trees, i.e. a 35% increase, will be required in these two districts.

Given the present total road length (of national, provincial, inter-district and inter-commune roads) of 712 km, the total canal length (of the national waterway system and main, Grade 1, Grade 2 and Grade 3 canals) of 4,760 km and the total embankment length of 264 km (source: Dong Thanh Provincial People's Committee, "Project on Establishment of Greenbelts for Flood Prevention in Dong Thanh Province 1995 - 2000"), planting along roads and canals at 1 m intervals will require a planting width of 35 m to achieving the planting of 200 million trees in scattered plantations. Even if the planting distance is narrowed to 50 cm, a planting width of 9 m will still be required. This target appears quite difficult in view of the present land use.

In Tien Giang Province, existing canals (Grade 1 and Grade 2) and roads (national, inter-provincial and inter-district roads) have a total length of 1,199 km and 619 km respectively (source: FIPI, "Planning for Scattered Tree and Forest Plantation, Mekong Delta Area", 1997). Based on the respective area of each district, Cai Be and Cai Lay Districts are estimated to have a combined canal length of 418 km and road length of 216 km. The planting of new trees along these roads and canals with a planting distance of 1 m will require a planting width of 30 m to achieve the target planting of 19,100,000 trees. A planting distance of 0.5 m will reduce the required planting width to 8 m. Planting along Grade 3 canals or lower grade canals will be necessary to approach the planting target.

J.2. Master Plan

J.2.1 Objective

The objective of the Study on forest management is to contribute to improving the rural environment, stabilizing and increasing the income of farm households and enhancing the living standard of farmers through forest conservation and the supply of fuel wood required by local people.

J.2.2. Planning Items

In regard to national forests, the present forests will be further fostered together with concentrated planting at appropriate sites. Border protection forests will be created along border zones. Environmental conservation forests will be created mainly in private forest areas where there is concern in regard to a decrease of the forest area and also in areas which are unsuitable for agriculture. Scattered planting will be conducted along roads, canals and embankments for the purpose of supplying fuel wood for local people. Concentrated planting will also be conducted at unused land which is located outside government forest areas. Extension activities will be conducted for plantation management by local people.

J.2.2.1 Concentrated Planting at Government Forestry Areas

Unused land where planting appears feasible in government-owned production forest areas includes 47 ha at the Gao Giong Agroforestry-Fishery Enterprise site, 7 ha at the Cao Lanh Prison Camp site, 31 ha at the Dong Thap Province Police's Prison Camp, 15 ha at the Dong Cat Agroforestry-Fishery Enterprise site and 3 ha at the Giong Gang Agroforestry-Fishery Enterprise site, totalling 103 ha. Concentrated planting will be planned for these areas. *Melaleuca cajuputi* will be planted and management will be conducted by each body in accordance with its own management principles.

Although the Tram Chim National Park has 4,307 ha of unused land, this unused land cannot be entirely converted by forests given the prime objective of restoring the wetland vegetation described as the "Plain of Reed". Of the 4,307 ha of unused land, 370 ha has been secured for planting and concentrated planting will be planned for this area. *Melaleuca cajuputi* will be planted and the administrative body of the National Park will manage the plantations in accordance with its development principles.

J.2.2.2 Concentrated Planting Outside Government Forestry Areas

The GIS land use survey conducted by the Sub-NIAPP in 1999 in the Study Area found 574 ha and 148 ha of unused land in Thanh Hong District and Thanh Binh District respectively, totalling 722 ha.

Concentrated planting in these areas will be planned for the purposes of supplying fuelwood for local people and preventing soil erosion, floods and wind damage. Prior to the preparation of a detailed plan, work to confirm the location, shape, size, number of sites, land ownership and other relevant matters relating to this unused land will be necessary.

Melaleuca cajuputi will be planted at a density of 20,000 trees/ha. Thinning will be conducted annually for trees of four years of age through nine years of age to lead the forest to a stand density of 4,000 - 5,000 trees/ha at an age of 10 years old, followed by selective cutting with a cutting cycle of 10 - 13 years. Cutting sites will be regenerated. Plantations will be managed by the People's Committee of the relevant communes.

J.2.2.3 Environmental Conservation Forest zone

Environmental conservation forest zone will be created in an area of approximately 17,000 ha mainly located in three communes lying in the northern part of Thap Muoi District, namely Thanh Loi Commune, Hung Thanh Commune and Truong Xuan Commune, for the purposes of preventing floods, conserving water, ensuring biological diversity and regulating the climate. This area will include an existing 2,063 ha of private forests and 140 ha of national forests. Concentrated planting will be planned at 900 ha of unused land. *Melaleuca cajuputi* will be planted at a planting density of 10,000 trees/ha. Thinning will be conducted annually for trees of four years of age through nine years of age to lead the forest to a stand density of 2,000 - 3,000 trees/ha at an age of 10 years old. Scattered planting along roads, canals and ridges between paddy fields will be planned for a paddy field area of approximately 14,000 ha which excludes the planned area for concentrated planting and existing private and national forests. 660,000 *Melaleuca cajuputi* trees will be planted for this purpose. The planting method will be double line planting with a planting distance of 1 m. In the case of planting along ridges, single line planting with a planting distance of 1 m will be employed for ridges running north-south and the planting distance will be increased to 10 m for ridges running east-west.

New canals with a total length of 80 km will be created at existing forests without canals and at the newly planned concentrated planting sites for forest fire control. A watch-tower and monitoring station will be constructed at five sites. The DARD of the Dong Thap Provincial Government will be responsible for the supervision of planting and the management of new plantations.

J.2.2.4 Border Protection Forest

A border protection forest will be planned for the border zone with Cambodia in Hong Ngu District and Thanh Hong District for border security and flood prevention. This forest will be 46 km in length and 100 m in width and will cover a total of 460 ha. *Bambusa* spp. will be planted at a distance of 10 x 10

m. The DARD of the Dong Thap Provincial Government will be responsible for the supervision of planting and management of this border protection forest.

J.2.2.5 Scattered Planting

Scattered planting along roads, embankments and canals will be planned in areas other than Cai Be District and Cai Lay District for the purposes of supplying fuelwood for local people and preventing soil erosion, floods and wind damage. No scattered planting will be planned for Cai Be District and Cai Lay District under the Study because of the facts that (i) the fuelwood consumption in these two districts is lower than in other areas, (ii) the limbs and tops of abundant fruit trees can be available as fuelwood and (iii) there are already many scattered plantations.

A total of 13,826,000 trees will be planned for scattered planting and these will be distributed in Thanh Hong District (1,931,000), Hong Ngu District (1,350,000), Tam Nong District (3,071,000), Thanh Binh District (1,212,000), Cao Lanh Town (241,000), Cao Lanh District (2,904,000) and Thap Muoi District (3,117,000). The planting species will be *Melaleuca cajuputi* (60%), *Eucalyptus camaldulensis* (20%) and other species (20%), such as *Acacia auriculiformis*, *Acacia hybrid*, *Hopea odorota* (Sao den), *Dipterocarpus alatus* (Dau), *Mangifera* sp. (Xoai), *Bambusa* spp., *Sarcocephalus* sp. (Gao), *Samanea samana* (Cong), *Combretum quadrangulare* (Tram bau) and *Pithecellobium dulce* (Me nuoc).

The planting density will be 20,000 trees/ha (planting distance of 0.5 x 1 m) for *Melaleuca cajuputi* and 10,000 trees/ha (planting distance of 1 x 1 m) for *Eucalyptus camaldulensis*. Planting will be conducted in August through December for *Melaleuca cajuputi* and May through December for *Eucalyptus camaldulensis*. Fertilizer will be applied in the case of the latter. Supplementary planting will be conducted if the dead tree ratio is high. Weeding will be conducted in the first three years if necessary.

In the case of *Melaleuca cajuputi*, thinning will be commenced at four years of age and will be continued annually upto nine years of age. The thinning rate will be around 20% for the first thinning and around 10% thereafter. The cutting period will be approximately 10 years. The annual cutting rate will be 10% or less and cutting sites will be regenerated.

In the case of *Eucalyptus camaldulensis*, thinning will be conducted twice at 3-4 years of age and 6-7 years of age. The thinning rate will be around 30% each. The cutting period will be approximately 10 years. The annual cutting rate will be 10% or less and cutting sites will be regenerated. Scattered plantations will be managed by the People's Committee of the relevant communes.

J.2.2.6 Extension Program

Extension training will be planned to facilitate scattered planting and concentrated planting outside government forest areas. The People's Committee of the relevant communes will be approached to select approximately two members for training and those selected will receive training on the management method in the first, third and five years of planting operation. As there are 83 communes in the relevant districts, the total number of trainees is expected to be approximately 170. Training will be conducted at the extension training station to be set up under the Agricultural Support Plan.

J.2.2.7 Annual Work Plan and Project Cost Estimate

The Project term will be 6 years and Project cost is estimated to be 25,769 million VND.

J.2.3 Effect of Plan Implementation of Fuelwood Supply

The likely supply volume of fuelwood for the year 2010 following the implementation of the Plan is estimated for the Dong Thap Province area within the Study Area.

While the planned area for concentrated planting in national production forests is 103 ha, the total planned area for concentrated planting and the number of trees for scattered planting under the Environmental Conservation Forest Zone Plan are 900 ha and 660,000 trees respectively. Outside government forestry areas, concentrated planting is planned for 722 ha and the scattered planting of 14,549,000 trees is planned (concentrated planting and scattered planting by the Environmental Conservation Forest Zone Plan is excluded). Assuming the *Melaleuca cajuputi* is the sole planting species with a planting density of 10,000 trees/ha for scattered planting to create environmental conservation forest zone and 20,000 trees/ha for other sites, scattered planting is equivalent to a planting area of 793 ha (of which 66 ha is inside environmental conservation forest zone), resulting in a total planned planting area of 2,518 ha. The expected yield with the planting through 6 years (the planting of 420 ha a year for five years and of 418 ha in the sixth year) and with the cutting period of 10 years (cutting sites are regenerated following year) is calculated using the yield table for *Melaleuca* stands in the Mekong Delta area given in the Handbook of Forest Inventory and Planning of the FIPI.

The final cutting volume in the 10th year will be 67,000 m³, by that time 129,000 m³ of wood will be produced by thinning. Assuming that the branch volume percent is 30%, the branch volume will be 59,000 m³. The planned planting area mainly aimed at producing fuel wood is 1,449 ha, accounting for 58% of the total planned planting area. Accordingly, the supply of 39,000 m³ of fuel wood is feasible from the final cutting volume. The total yield until 10th year, including the thinned volume and the branch volume, which can be supplied as fuel wood is 227,000 m³ or an average of 23,000 m³ a year.

Similarly, total yield from 11th year to 20th year was calculated. The total final cutting volume will be 403,000 m³ and total thinning volume will be 174,000 m³. The total yield, which can be supplied as fuelwood is 580,000 m³ or an average of 58,000 m³ a year.

At present, the Dong Thap Province area within the Study Area has 3,725 ha of production forests, 2,287 ha of protection forests and 2,821 ha of special use forests in addition to an estimated 39,719,000 trees in scattered plantations. Using the yield table for *Melaleuca* forests in the Mekong Delta area mentioned earlier, the feasible fuel wood supply volume from existing production forests is estimated. The expected stand volume at 10 year old production forests is 596,000 m³ with a thinned wood volume of 257,000 m³. Assuming a branch volume percent as 30%, the branch volume is 256,000 m³. Accordingly, 3,725 ha of production forests is expected to supply 60,000 m³ of industrial round wood and 51,000 m³ of fuel wood on annually average.

The feasible supply volume of fuelwood from existing scattered plantations is also estimated. Of the existing 39,719,000 trees in these plantations, 31,752,000 are for wood production (bamboo is excluded). Percentage of number of trees by species in existing scattered plantation was estimated using the survey results in 1996. By species, *Eucalyptus camaldulensis* and *Melaleuca cajuputi* are believed to account for 53% and 43% respectively. In calculating the feasible fuelwood supply volume, 31,752,000 trees for wood production are assumed to entirely consist of these two species. Using the relative ratio of each species, the number of *Eucalyptus camaldulensis* trees and *Melaleuca cajuputi* trees is assumed to be 17,464,000 (55%) and 14,288,000 (45%) respectively. The standing tree volume of trees aged 10 years is assumed to be 0.06 m³ (calculated assuming stand density of 10 years old forest of *Eucalyptus camaldulensis* as 2,000 – 2,500 trees/ha in the results of forest growth in the report by FIPI; 'Study on forestry development, General development project of Quan Lo, Phung Hiep area-Mekong delta') for *Eucalyptus camaldulensis* and 0.03 m³ (calculated using yield table) for *Melaleuca cajuputi*. Based on an assumed branch ratio of 30%, the feasible annual supply volume is put at 192,000 m³. As of October, 1997, the production volume of scattered plantations in the area in question was broken down to 35% of industrial roundwood and 65% of fuelwood. Based on the same ratios, 31,750,000 trees in scattered plantations can presumably produce an average of 67,000 m³ of industrial roundwood and 125,000 m³ of fuelwood annually. Accordingly, it is estimated that existing production forests and scattered plantations in the Dong Thap Province area within the Study Area have combined potential to produce 176,000 m³ of fuelwood annually on average.

Given the above estimates, the Dong Thap Province area within the Study Area will be able to supply 199,000 m³ of fuelwood a year on average up to 10th project year, and 234,000 m³ of fuelwood a year on average afterward with the implementation of the Plan. As the estimated fuelwood demand in the area in 2010 is 201,000 m³, there should be sufficient supply capacity to meet the fuelwood demand in

future. This prospect is further boosted by the availability of additional fuel wood supply from existing bamboo stands and protection forests.

Economic benefit of fuel wood production with the implementation of the Plan was estimated. Of fuel wood production, final cutting volume was estimated by stumpage price, and thinning volume and branch volume and fuel wood price. As the planned planting area mainly aimed at producing fuel wood is 1,449 ha, total final cutting area is 1,449 ha. Final cutting area is assumed to be 242 ha a year from 10th project year to 14th project year and to be 239 ha in 15th project year (final cutting sites are regenerated the following year), and the first final cutting site of 242 ha is assumed to be cut again as final cutting in 20th project year. Total volume of thinning wood and branch is estimated to be 188,000 m³ up to 10th project year and 346,000 m³ after 10th project year up to 20th project year. The stumpage price of *Melaleuca cajuputi* of 10 years old is assumed to be 60,000,000 VND/ha. The fuelwood price of *Melaleuca cajuputi* is assumed to be 35,000VND for a stacked volume of 0.3 m in width, 1 m in length and 1 m in height. The solid volume percentage is assumed to be 70%. The total benefit is estimated to be 45,900,000,000VND up to 10th project year, and 144,600,000,000VND after 10th project year up to 20th project year. Annual average benefit is calculated to be 4,590,000,000VND up to 10th project year, and 14,460,000,000VND after 10th project year up to 20th project year.

J.2.4 Recommendations

- (1) While *Melaleuca* spp. are very important planting species for acid sulfate soil areas, their present use is mainly restricted to producing piles for building materials and fuel wood. It is, therefore, essential for the scope of use to be expanded. *Melaleuca* spp. can be used as charcoal, pulpwood and floor wood. A minimum diameter of approximately 5 cm and 25 cm will be necessary for pulpwood and floor wood respectively. As the normal planting density of 20,000 trees/ha or more is designed to produce piles, new silviculture techniques, including those regarding the planting density and thinning method, must be introduced to make new uses possible. The preferred diameters for charcoal wood, pile wood, pulpwood and floor wood are all different, making the effective use of thinned wood possible. From this viewpoint, the establishment of a production method which promises optimal production efficiency is essential. In addition to the development of new uses, efforts must be made to improve the quality of *Melaleuca* spp. and to promote their growth. A *Melaleuca* hybrid which is currently at the experimental stage is said to enjoy some 50% faster growth than *Melaleuca cajuputi* and the introduction of this hybrid will certainly increase the increment. Another effective way is to select fine trees in the present *Melaleuca* forests for breeding purposes. What appear to be crucial here is the early implementation of an experimental project for (i) the breeding of *Melaleuca* spp. as well as the introduction of a *Melaleuca* hybrid for increased increment and qualitative improvement, (ii) tests to develop new

wood uses, such as charcoal, pulpwood and floor wood, etc. (iii) establishment of a production system to cater for new uses, and (iv) examination of the profitability of operation.

- (2) Suitable planting sites for *Melaleuca cajuputi* extend widely in Dong Thap Province, Tien Giang Province and Long An Province and, therefore, the formulation of an integral forest management plan for these three provinces will be effective in terms of forest conservation and forest management.
- (3) In many parts of eastern Tam Nong District and northern Thap Muoi District, the single cropping of rice is currently conducted despite the poor local soil conditions which are unsuitable for farming. Attempts should be made to obtain the consent of local people for comprehensive operation involving agriculture, forestry and fishery.
- (4) While the introduction of various facilities for visitors in the Tram Chim National Park is desirable, proper attention should be paid to the construction work of such facilities so as to avoid any adverse impacts on the ecosystem of the National Park.

Table J-1-1. Existing forest conditions in the Study Area

Province		Dong Thap				Tien Giang	Total
		Cao Lanh	Thap Muoi	Tam Nong	Tan Hong	Cai Be	
Existing forest area		1,865.72	3,384.23	3,467.44	115.46	161	8,993.85
Tree species	Melaleuca	1,844.71	3,370.02	3,467.44	3.90	161	8,847.07
	Eucalyptus	21.01	14.21	0.00	111.56	0	146.78
Forest function	Special use forest	13.18	0.00	2,808.05	0.00	0	2,821.23
	Protection forest	0.00	2,202.56	0.00	84.20	0	2,286.76
	Production forest	1,852.54	1,181.67	659.39	31.26	161	3,885.86
National forest/ private forest	National forest	1,865.72	729.27	3,172.07	84.20	0	5,851.26
	Private forest	0.00	2,654.96	295.37	31.26	161	3,142.59

Source: Surveyed by DARD of Dong Thap and Tien Giang Province at June 1999

Table J-1-2 Change of forest area in the Study Area

(unit: ha)

Item	Province	Classification	Year1994	1995	1996	1997	1998	
By town/ district	Dong Thap *1	Town: Cao Lanh						
		District:	Tan Hong	120	134	164	165	202
			Hong Ngu					
			Tam Nong	2,987	3,060	3,076	2,869	2,833
			Thanh Binh					
			Cao Lanh	1,866	2,080	2,005	1,776	1,951
		Thap Muoi	4,321	4,154	4,192	4,182	3,936	
	Subtotal		9,294	9,428	9,437	8,992	8,922	
	Tien Giang *2	District:	Cai Be	161	161	161	161	161
			Cai Lay					
Subtotal			161	161	161	161	161	
Total		9,455	9,589	9,598	9,153	9,083		
By tree species	Dong Thap *1	Melaleuca	9,174	9,294	9,273	8,827	8,720	
		Eucalyptus	120	134	164	165	202	
		Subtotal	9,294	9,428	9,437	8,992	8,922	
	Tien Giang *2	Melaleuca	161	161	161	161	161	
		Eucalyptus						
		Subtotal	161	161	161	161	161	
	Total	Melaleuca	9,335	9,455	9,434	8,988	8,881	
		Eucalyptus	120	134	164	165	202	
Total		9,455	9,589	9,598	9,153	9,083		
By forest function	Dong Thap *1	Special use forest	2,100	2,200	2,200	2,100	2,118	
		Production forest	7,094	4,471	4,431	4,055	4,035	
		Protection forest	100	2,757	2,806	2,837	2,769	
		Subtotal	9,294	9,428	9,437	8,992	8,922	
	Tien Giang *2	Special use forest						
		Production forest	161	161	161	161	161	
		Protection forest						
		Subtotal	161	161	161	161	161	
	Total	Special use forest	2,100	2,200	2,200	2,100	2,118	
		Production forest	7,255	4,632	4,592	4,216	4,196	
Protection forest		100	2,757	2,806	2,837	2,769		
Total		9,455	9,589	9,598	9,153	9,083		

Source: Department of Agriculture and Rural Development of Dong Thap and Tien Giang provinces

*1: Including only towns/ districts located in Study Area: Cao Lanh town, Tan Hong district, Hong Ngu district, Tam Nong district, Thanh Binh district, Cao Lanh district, Thap Muoi district

*2: Including only towns/districts located in Study Area: Cai Be district, Cai Lay district

Table J-1-3. Current conditions of forestry work sites in the Study Area (June, 1999)

Province	District	Forestry work site	National forest/ private forest	Forest function	Total forestry area (unit:ha)															
					Existing forest										Unused land					Others
					Melaleuca forest					Eucalyptus forest					Wild land	Wild land covered by water				
					Forest age*		Forest age		Forest age		1-3	3-6	6-9	over 9			1-3	3-6	6-9	
1-3	3-6	6-9	over 9	1-3	3-6	6-9	over 9													
Dong Thap	Cao Lanh	Gao Giong Agroforestry Fishery Enterprise	National	Production	1,657.51	1,407.12	273.30	111.00	349.03	673.79	0.00	0.00	0.00	118.65	46.63	72.02	131.74			
		Cao Lanh Prison Camp	National	Production	82.32	61.81					0.00			16.59	7.03	9.56	3.92			
		Dong Thap Provincial Police's Prison Camp	National	Production	501.09	383.61	254.57		86.06	21.97		21.01		31.17	31.17			86.31		
		Xeo Quit Historical Monument	National	Special use	50.00	13.18					13.18		0.00		14.86	14.86			21.96	
Thap Muoi		Dong Cat Agroforestry -Fishery Enterprise	National	Production	745.16	589.67	82.59	364.52	112.16	16.19	14.21			72.97	14.97	58.00	82.52			
		Environmental Conservation Forest	National	Protection	139.60	139.60						0.00		0.00						
		Environmental Conservation Forest	Private	Protection	2,496.61	2,062.96	169.96	1,662.29	230.71			0.00		381.98	376.07	5.91	51.67			
		Private forest	Private	Production	592.00	592.00			592.00			0.00		0.00						
Tam Nong		Tram Chim National park	National	Special use	7,588.00	2,808.05	320.52	1,445.60	1,041.93			0.00	4,307.02	4,307.02			472.93			
		Giong Gang Agroforestry-Fishery Enterprise	National	Production	393.70	364.02	54.48			309.54		0.00		3.18	2.73	0.45	26.50			
		Private forest	Private	Production	317.52	295.37	146.85	146.52				0.00		7.41		7.41	14.74			
		Border Protection Forest	National	Protection	93.88	84.20	3.90					80.30	25.39	12.30	4.43		5.25			
Tien Giang	Cai Be	Private forest	Private	Production	31.26	0.00					31.26		0.00							
		Private forest	Private	Production	161.00	161.00					0.00		0.00							
Total					14,849.65	8,993.85	8,847.07	1,507.58	3,731.93	2,411.89	1,034.67	146.78	46.40	43.56	42.61	14.21	4,958.26	4,804.91	153.35	897.54

Source: Department of Agriculture and Rural Development of Dong Thap and Tien Giang provinces

* Data of Tien Giang province is not included regarding forest age

Table J-1-4. Existing tree number of scattered plantation in the Dong Thap province area within the Study Area (unit: trees)

Survey date	Item	Cao Lanh town	Tan Hong district	Hong Ngu district	Tam Nong district	Thanh Binh district	Thap Muoi district	Cao Lanh district	Total
1/10/96	Study area (ha)	8,362	29,153	22,696	46,033	24,402	51,887	46,165	228,698
	Total number of existing trees	1,248,304	5,592,810	2,142,199	2,662,625	1,920,820	17,781,203	6,281,550	37,629,511
	For wood	278,769	3,540,735	1,881,442	1,662,887	828,776	16,731,680	5,092,669	30,016,958
	Bamboo	955,248	1,841,959	246,189	996,055	1,038,199	967,248	1,184,128	7,229,026
	Other forestry plants	14,287	210,116	14,568	3,683	53,845	82,275	4,753	383,527
	New planting trees of year	88,989	705,842	213,239	289,899	276,762	753,947	746,651	3,075,329
1/10/97	For wood	61,426	689,680	209,160	277,714	255,465	741,994	717,354	2,952,793
	Bamboo	27,563	6,120	2,664	11,700	19,386	5,247	28,541	101,221
	Other forestry plants	0	10,042	1,415	485	1,911	6,706	756	21,315
	Total number of existing trees	1,684,554	5,580,012	1,967,590	2,992,675	1,885,352	18,321,000	7,288,132	39,719,315
	For wood	540,576	3,538,820	1,911,076	1,963,030	910,405	17,158,570	5,729,280	31,751,757
	Bamboo	1,129,769	1,835,658	40,619	997,305	918,880	1,076,940	1,498,896	7,498,067
New planting trees of year	Other forestry plants	14,209	205,534	15,895	32,340	56,067	85,490	59,956	469,491
	For wood	117,356	740,657	170,162	302,710	262,377	793,000	1,211,808	3,598,070
	Bamboo	88,519	723,015	166,470	300,000	241,539	769,850	999,864	3,289,257
	Other forestry plants	28,837	8,360	2,343	2,190	17,905	9,340	197,854	266,829
	Total number of existing trees	1,684,554	5,580,012	1,967,590	2,992,675	1,885,352	18,321,000	7,288,132	39,719,315
	For wood	540,576	3,538,820	1,911,076	1,963,030	910,405	17,158,570	5,729,280	31,751,757
New planting trees of year	Bamboo	1,129,769	1,835,658	40,619	997,305	918,880	1,076,940	1,498,896	7,498,067
	Other forestry plants	14,209	205,534	15,895	32,340	56,067	85,490	59,956	469,491
	For wood	117,356	740,657	170,162	302,710	262,377	793,000	1,211,808	3,598,070
	Bamboo	88,519	723,015	166,470	300,000	241,539	769,850	999,864	3,289,257
	Other forestry plants	28,837	8,360	2,343	2,190	17,905	9,340	197,854	266,829
	Total number of existing trees	1,684,554	5,580,012	1,967,590	2,992,675	1,885,352	18,321,000	7,288,132	39,719,315
New planting trees of year	For wood	540,576	3,538,820	1,911,076	1,963,030	910,405	17,158,570	5,729,280	31,751,757
	Bamboo	1,129,769	1,835,658	40,619	997,305	918,880	1,076,940	1,498,896	7,498,067
	Other forestry plants	14,209	205,534	15,895	32,340	56,067	85,490	59,956	469,491
	For wood	117,356	740,657	170,162	302,710	262,377	793,000	1,211,808	3,598,070
	Bamboo	88,519	723,015	166,470	300,000	241,539	769,850	999,864	3,289,257
	Other forestry plants	28,837	8,360	2,343	2,190	17,905	9,340	197,854	266,829
New planting trees of year	For wood	540,576	3,538,820	1,911,076	1,963,030	910,405	17,158,570	5,729,280	31,751,757
	Bamboo	1,129,769	1,835,658	40,619	997,305	918,880	1,076,940	1,498,896	7,498,067
	Other forestry plants	14,209	205,534	15,895	32,340	56,067	85,490	59,956	469,491
	For wood	117,356	740,657	170,162	302,710	262,377	793,000	1,211,808	3,598,070
	Bamboo	88,519	723,015	166,470	300,000	241,539	769,850	999,864	3,289,257
	Other forestry plants	28,837	8,360	2,343	2,190	17,905	9,340	197,854	266,829
New planting trees of year	For wood	540,576	3,538,820	1,911,076	1,963,030	910,405	17,158,570	5,729,280	31,751,757
	Bamboo	1,129,769	1,835,658	40,619	997,305	918,880	1,076,940	1,498,896	7,498,067
	Other forestry plants	14,209	205,534	15,895	32,340	56,067	85,490	59,956	469,491
	For wood	117,356	740,657	170,162	302,710	262,377	793,000	1,211,808	3,598,070
	Bamboo	88,519	723,015	166,470	300,000	241,539	769,850	999,864	3,289,257
	Other forestry plants	28,837	8,360	2,343	2,190	17,905	9,340	197,854	266,829
New planting trees of year	For wood	540,576	3,538,820	1,911,076	1,963,030	910,405	17,158,570	5,729,280	31,751,757
	Bamboo	1,129,769	1,835,658	40,619	997,305	918,880	1,076,940	1,498,896	7,498,067
	Other forestry plants	14,209	205,534	15,895	32,340	56,067	85,490	59,956	469,491
	For wood	117,356	740,657	170,162	302,710	262,377	793,000	1,211,808	3,598,070
	Bamboo	88,519	723,015	166,470	300,000	241,539	769,850	999,864	3,289,257
	Other forestry plants	28,837	8,360	2,343	2,190	17,905	9,340	197,854	266,829
New planting trees of year	For wood	540,576	3,538,820	1,911,076	1,963,030	910,405	17,158,570	5,729,280	31,751,757
	Bamboo	1,129,769	1,835,658	40,619	997,305	918,880	1,076,940	1,498,896	7,498,067
	Other forestry plants	14,209	205,534	15,895	32,340	56,067	85,490	59,956	469,491
	For wood	117,356	740,657	170,162	302,710	262,377	793,000	1,211,808	3,598,070
	Bamboo	88,519	723,015	166,470	300,000	241,539	769,850	999,864	3,289,257
	Other forestry plants	28,837	8,360	2,343	2,190	17,905	9,340	197,854	266,829
New planting trees of year	For wood	540,576	3,538,820	1,911,076	1,963,030	910,405	17,158,570	5,729,280	31,751,757
	Bamboo	1,129,769	1,835,658	40,619	997,305	918,880	1,076,940	1,498,896	7,498,067
	Other forestry plants	14,209	205,534	15,895	32,340	56,067	85,490	59,956	469,491
	For wood	117,356	740,657	170,162	302,710	262,377	793,000	1,211,808	3,598,070
	Bamboo	88,519	723,015	166,470	300,000	241,539	769,850	999,864	3,289,257
	Other forestry plants	28,837	8,360	2,343	2,190	17,905	9,340	197,854	266,829
New planting trees of year	For wood	540,576	3,538,820	1,911,076	1,963,030	910,405	17,158,570	5,729,280	31,751,757
	Bamboo	1,129,769	1,835,658	40,619	997,305	918,880	1,076,940	1,498,896	7,498,067
	Other forestry plants	14,209	205,534	15,895	32,340	56,067	85,490	59,956	469,491
	For wood	117,356	740,657	170,162	302,710	262,377	793,000	1,211,808	3,598,070
	Bamboo	88,519	723,015	166,470	300,000	241,539	769,850	999,864	3,289,257
	Other forestry plants	28,837	8,360	2,343	2,190	17,905	9,340	197,854	266,829
New planting trees of year	For wood	540,576	3,538,820	1,911,076	1,963,030	910,405	17,158,570	5,729,280	31,751,757
	Bamboo	1,129,769	1,835,658	40,619	997,305	918,880	1,076,940	1,498,896	7,498,067
	Other forestry plants	14,209	205,534	15,895	32,340	56,067	85,490	59,956	469,491
	For wood	117,356	740,657	170,162	302,710	262,377	793,000	1,211,808	3,598,070
	Bamboo	88,519	723,015	166,470	300,000	241,539	769,850	999,864	3,289,257
	Other forestry plants	28,837	8,360	2,343	2,190	17,905	9,340	197,854	266,829
New planting trees of year	For wood	540,576	3,538,820	1,911,076	1,963,030	910,405	17,158,570	5,729,280	31,751,757
	Bamboo	1,129,769	1,835,658	40,619	997,305	918,880	1,076,940	1,498,896	7,498,067
	Other forestry plants	14,209	205,534	15,895	32,340	56,067	85,490	59,956	469,491
	For wood	117,356	740,657	170,162	302,710	262,377	793,000	1,211,808	3,598,070
	Bamboo	88,519	723,015	166,470	300,000	241,539	769,850	999,864	3,289,257
	Other forestry plants	28,837	8,360	2,343	2,190	17,905	9,340	197,854	266,829
New planting trees of year	For wood	540,576	3,538,820	1,911,076	1,963,030	910,405	17,158,570	5,729,280	31,751,757
	Bamboo	1,129,769	1,835,658	40,619	997,305	918,880	1,076,940	1,498,896	7,498,067
	Other forestry plants	14,209	205,534	15,895	32,340	56,067	85,490	59,956	469,491
	For wood	117,356	740,657	170,162	302,710	262,377	793,000	1,211,808	3,598,070
	Bamboo	88,519	723,015	166,470	300,000	241,539	769,850	999,864	3,289,257
	Other forestry plants	28,837	8,360	2,343	2,190	17,905	9,340	197,854	266,829
New planting trees of year	For wood	540,576	3,538,820	1,911,076	1,963,030	910,405	17,158,570	5,729,280	31,751,757
	Bamboo	1,129,769	1,835,658	40,619	997,305	918,880	1,076,940	1,498,896	7,498,067
	Other forestry plants	14,209	205,534	15,895	32,340	56,067	85,490	59,956	469,491
	For wood	117,356	740,657	170,162	302,710	262,377	793,000	1,211,808	3,598,070
	Bamboo	88,519	723,015	166,470	300,000	241,539	769,850	999,864	3,289,257
	Other forestry plants	28,837	8,360	2,343	2,190	17,905	9,340	197,854	266,829
New planting trees of year	For wood	540,576	3,538,820	1,911,076	1,963,030	910,405	17,158,570	5,729,280	31,751,757
	Bamboo	1,129,769	1,835,658	40,619	997,305	918,880	1,076,940	1,498,896	7,498,067
	Other forestry plants	14,209	205,534	15,895	32,340	56,067	85,490	59,956	469,491
	For wood	117,356	740,657	170,162	302,710	262,377	793,000	1,211,808	3,598,070
	Bamboo	88,519	723,015	166,470	300,000	241,539	769,850	999,864	3,289,257
	Other forestry plants	28,837	8,360	2,343	2,190	17,905	9,340	197,854	266,829
New planting trees of year	For wood	540,576	3,538,820	1,911,076	1,963,030	910,405	17,158,570	5,729,280	31,751,757
	Bamboo	1,129,769	1,835,658	40,619					

Table J-1-5. Existing tree species of the scattered plantation in the Dong Thap province area within the Study Area (1/10/1996)

	Cao Lanh town	Tan Hong district	Hong Ngu district	Tam Nong district	Thanh Binh district	Thap Muoi district	Cao Lanh district	Total	
Study Area (ha)	8,362	29,153	22,696	46,033	24,402	51,887	46,165	228,698	
Number of trees	Hopea odorata	16,844	2,212	20,054	3,650	2,127	12,969	53,960	111,816
	<i>Eucalyptus camaldulensis</i>	159,080	3,435,341	1,781,004	929,853	622,240	5,094,542	4,007,748	16,029,808
	<i>Melaleuca cajuputi</i>	25,888	5,945	3,094	702,699	11,516	11,393,230	894,251	13,036,623
	<i>Samanea saman</i>	21,802	45,019	73,468	16,860	150,215	37,805	80,751	425,920
	<i>Sarcocephalus</i> sp.	55,154	52,218	3,822	9,825	42,677	193,134	55,959	412,789
	<i>Bambusa</i> spp.	955,248	1,841,959	246,189	996,055	1,038,199	967,248	1,184,128	7,229,026
	Other forest plants	14,287	210,116	14,568	3,683	53,845	82,275	4,753	383,527
	Total	1,248,303	5,592,810	2,142,199	2,662,625	1,920,819	17,781,203	6,281,550	37,629,509
	Percentage of the number of trees	1.35	0.04	0.94	0.14	0.11	0.07	0.86	0.30
		12.74	61.42	83.14	34.92	32.39	28.65	63.80	42.60
Number of trees	<i>Melaleuca cajuputi</i>	2.07	0.11	0.14	26.39	0.60	64.07	14.24	34.64
	<i>Samanea saman</i>	1.75	0.80	3.43	0.63	7.82	0.21	1.29	1.13
	<i>Sarcocephalus</i> sp.	4.42	0.93	0.18	0.37	2.22	1.09	0.89	1.10
	<i>Bambusa</i> spp.	76.52	32.93	11.49	37.41	54.05	5.44	18.85	19.21
	Other forest plants	1.14	3.76	0.68	0.14	2.80	0.46	0.08	1.02
	Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Note: Above data were estimated using the survey data by Department of Agriculture and Rural Development of Dong Thap province.

Table J-1-6. Yearly forest products in the Dong Thap province area within the Study Area

	Unit	Cao Lanh town	Tan Hong district	Hong Ngu district	Tam Nong district	Thanh Binh district	Thap Muoi district	Cao Lanh district	Total
1, Oct 1996	Study area	8,362	29,153	22,696	46,033	24,402	51,887	46,165	228,698
	Wood	3,589	2,020	4,604	886	5,387	49,929	6,473	72,888
	from concentrated plantation	0	324	0	440	0	42,350	2,213	45,327
	from scattered plantation	3,589	1,696	4,604	446	5,387	7,579	4,260	27,561
	Firewood	10,470	6,763	25,927	12,663	26,509	34,082	36,196	152,610
	from concentrated plantation	0	676	0	2,562	0	20,814	10,798	34,850
	from scattered plantation	10,470	6,087	25,927	10,101	26,509	13,268	25,398	117,760
Bamboo	pieces	178,356	285,080	89,200	306,624	243,198	275,340	224,090	1,601,888
1, Oct 1997	Bamboo-like	37,626	2,124	850	2,128	19,491	13,874	19,381	95,474
	Bamboo shoot	5,724	1,234	3,773	12,020	4,687	4,824	12,043	44,305
	Wood	3,768	2,035	6,760	1,265	4,681	50,408	42,569	111,486
	from concentrated plantation	0	350	0	850	0	44,000	13,710	58,910
	from scattered plantation	3,768	1,685	6,760	415	4,681	6,408	28,859	52,576
	Firewood	10,749	7,860	27,228	13,929	28,077	50,680	47,749	186,272
	from concentrated plantation	0	746	0	2,600	0	37,210	15,628	56,184
from scattered plantation	10,749	7,114	27,228	11,329	28,077	13,470	32,121	130,088	
Bamboo	pieces	177,239	305,289	98,713	206,752	95,770	300,175	259,809	1,443,747
Bamboo-like	pieces	517,080	2,230	3,897	4,215	11,828	25,460	229,831	794,541
Bamboo shoot	kg	44,858	13,020	3,851	13,040	4,392	7,812	59,956	146,929

Note: Above data were estimated using the survey data by Department of Agriculture and Rural Development of Dong Thap province

Table J-1-7. Consumption of forest products in Cai Be and Cai Lay district of Tien Giang province in year 1998

District	Population		Firewood		Industrial roundwood			Pile		Honey	
	Total consumption (m ³)	Consumption per population (m ³ /person)	Total consumption (m ³)	Consumption per population (m ³ /person)	Total consumption (m ³)	Consumption per population (m ³ /person)	Total consumption (ton)	Consumption per population (g/person)			
Cai Be	293,879	0.023	17,193	0.059	6,877	0.023	14	48			
Cai Lay	341,129	0.023	19,906	0.058	7,962	0.023	16	47			
Total	635,008	0.023	37,099	0.058	14,839	0.023	30	47			

Source: Department of Agriculture and Rural Development of Tien Giang province

Table J-1-8. Mean increment of *Melaleuca cajuputi* and *Eucalyptus camaldulensis* in Mekong Delta

Tree species	Item	Site condition		
		Poor	Medium	Rich
<i>Melaleuca cajuputi</i>	DBH (cm/year)	0.4	0.5	0.6
	Height (m/year)	0.4	0.6	0.8
	Production (m ³ /ha/year)	4.3	6	7.7
<i>Eucalyptus camaldulensis</i>	DBH (cm/year)	<2	2-4	>4
	Height (m/year)	<1.5	1.5-2.5	>2.5
	Production (m ³ /ha/year)	10	12.8	15.6

Source: Nguyen Van Duyet, Forest Inventory and Planning Institute, "Study on forestry development, General development project of Quan Lo Phung Hiep area - Mekong delta", 1991

Table J-2-1. Concentrated planting plan at government forestry areas

Forestry region	Forest function	District	Province	Existing forest area	Unused land area	Planned plantation area	Planned tree species
Gao Giong Agroforestry -Fishery Enterprise	Production forest	Cao Lanh	Dong Thap	ha 47	ha 47	ha 47	ha 47 Melaleuca
Cao Lanh Prison Camp	Production forest	Cao Lanh	Dong Thap	62	17	7	Melaleuca
Dong Thap Provincial Police's Prison Camp	Production forest	Cao Lanh	Dong Thap	384	31	31	Melaleuca
Dong Cat Agroforestry -Fishery Enterprise	Production forest	Thap Muoi	Dong Thap	590	73	15	Melaleuca
Giong Gang Agroforestry-Fishery Enterprise	Production forest	Tam Nong	Dong Thap	364	3	3	Melaleuca
Tram Chim National park	Special use forest	Tam Nong	Dong Thap	2,808	4,307	370	Melaleuca
Total				4,255	4,478	473	

Table J-2-2. Concentrated planting plan outside government forestry areas

District	Province	Unused area*	land	Planned plantation area	Planned tree species	tree canal	Planned length of
Tan Hong	Dong Thap	ha 574	ha 574	ha 574	Melaleuca		km 23
Tan Binh	Dong Thap	148	148	148	Melaleuca		6
Total		722	722	722			29

*Unused land area is based on the results of GIS survey by Sub NIAPP in 1999

Table J-2-3. Environmental conservation forest zone plan

Item	Unit	Quantity	Note
Planned region	ha	17,000	Muoi district
Existing forest	ha	140	Melaleuca
	ha	2,063	Melaleuca
Unused land*	ha	900	
Planned area for Concentrated plantation	ha	900	Melaleuca
Planned number of trees for scattered plantation	trees	660,000	Melaleuca
Planned length of canal for new plantation	km	36	
Planned length of canal for the existing forest	km	44	
Planned number of fire tower	towers	5	
Planned number of guard station	stations	5	

*Area of unused land was estimated using the result of GIS survey by Sub NIAPP in 1999 and Land use map of plain of reeds in 1998 (scale: 1/100,000)

Table J-2-4. Border protection forest plantation plan

District	Province	Length of border*	of plantation area	Planned tree species
Hong Ngu Tan Hong	Dong Thap	km	ha	
		24	240	Bambusa spp.
		22	220	Bambusa spp.
		46	460	

*Measured on the map of Dong Thap province (scale 1/100,000)

Table J-2-5. Scattered planting plan

District/town	Province	Study area ha	Planned number of trees	Planned tree species					
				<i>Melaleuca cajuputi</i>	<i>Eucalyptus camaldlensis</i>	<i>Acacia auriculiformis, Acacia hybrid</i>	<i>Hopea odorata, Dipterocarpus alatus, Mangifera sp.</i>	<i>Bambusa spp.</i>	<i>Sarcocephalus sp., Samanea saman, Combretum quadrangulare, Pithecellobium dulce</i>
Tan Hong district	Dong Thap	29,153	trees	trees	trees	trees	trees	trees	trees
Hong Ngu district	Dong Thap	22,696	2,021,000	1,163,000	386,000	49,000	98,000	56,000	269,000
Tam Nong district	Dong Thap	46,033	1,411,000	796,000	260,000	16,000	85,000	46,000	208,000
Thanh Binh district	Dong Thap	24,402	3,242,000	2,222,000	597,000	43,000	26,000	75,000	279,000
Cao Lanh town	Dong Thap	8,362	1,269,000	741,000	255,000	16,000	47,000	38,000	172,000
Cao Lanh district	Dong Thap	46,165	241,000	79,000	45,000	7,000	34,000	16,000	60,000
Thap Muoi district	Dong Thap	51,887	3,055,000	1,954,000	550,000	20,000	105,000	66,000	360,000
Total		228,698	3,310,000	2,126,000	642,000	48,000	64,000	71,000	359,000
%			14,549,000	9,081,000	2,735,000	199,000	459,000	368,000	1,707,000
			100.00	62.42	18.80	1.37	3.15	2.53	11.73

Table J-2-6. Planting density for the scattered planting

Tree species	Planting density			Density trees/ha
	Distance between trees	Distance between rows	2	
<i>Melaleuca cajuputi</i> (Tram cu) (Bach dan)	m	1	0.5	20,000
<i>Eucalyptus camaldulensis</i>	1	1	1	10,000
<i>Acacia auriculiformis</i> (Tram bong vang)	2	1	1	5,000
<i>Bambusa</i> spp. (Tre, Truc, Tam vong)	4	4	4	625
<i>Hopea odorata</i> (Sao den)	4	4	4	625
<i>Dipterocarpus alatus</i> (Dau)	4	4	4	625
<i>Sarcocephalus</i> sp. (Gao)	1	1	1	10,000
<i>Samanea saman</i> (Cong)	2	2	2	2,500
<i>Pithecellobium dulce</i> (Me nuoc)	2	2	2	2,500
<i>Combretum quadrangulare</i> (Tram bau)	2	2	2	2,500
<i>Mangifera</i> sp. (Xoai)	4	4	4	625

Table J-2-7. Annual work plan

	Unit	Project year						
		Total	1	2	3	4	5	6
Concentrated planting at government								
Gao Prison	ha	47	47					
Cao Lanh Prison	ha	7	7					
Dong Tam	ha	31	31					
Dong Cat	ha	15	15					
Giang	ha	3	3					
Tram Chim	ha	370	70	100	100			
Total	ha	473	173	100	100		0	
Concentrated planting outside								
Tan Hong district	ha	574	74	100	100		100	100
Tan Binh district	ha	148	48	100				
Total	ha	722	122	200	100		100	100
Canal construction	km	29	5	6	6		6	
Environmental conservation forest zone								
Concentrated	ha	900	150	150	150		150	150
Scattered	frees	660.000	110.000	110.000	110.000		110.000	110.000
Canal construction	km	36	7	7	7		7	8
Canal construction	km	44	8	9	9		9	9
Fire tower	towers	5	2	3				
Guard station	stations	5	2	3				
Border protection forest								
Hong Neu district	ha	240	40	40	40		40	40
Tan Hong district	ha	220	20	40	40		40	40
Total	ha	460	60	80	80		80	80
Scattered planting								
Tan Hong district	frees	2.021.000	500.000	500.000	500.000		521.000	
Hong Neu district	frees	1.411.000	411.000	500.000	500.000			
Tan Nong district	frees	3.242.000	492.000	550.000	550.000		550.000	550.000
Thanh Binh district	frees	1.269.000	269.000	500.000	500.000			
Cao Lanh town	frees	241.000	241.000					
Cao Lanh district	frees	3.055.000	500.000	500.000	500.000		500.000	555.000
Thanh Muoi district	frees	3.310.000	550.000	550.000	550.000		550.000	560.000
Total	frees	14.549.000	2.963.000	3.100.000	3.100.000		2.121.000	1.665.000
Extension program								
	(Occasion)	3	1		1		1	

Table J-2-8. Project cost estimate

	Total	Project year					
		1	2	3	4	5	6
Concentrated planting at government forestry areas							
Gao Giong Agroforestry -Fishery Enterprise	1,892,000,000	692,000,000	400,000,000	400,000,000	400,000,000	0	0
Cao Lanh Prison Camp	188,000,000	188,000,000	0	0	0	0	0
Dong Thap Provincial Police's Prison Camp	28,000,000	28,000,000	0	0	0	0	0
Dong Cat Agroforestry -Fishery Enterprise	124,000,000	124,000,000	0	0	0	0	0
Giong Gang Agroforestry-Fishery Enterprise	60,000,000	60,000,000	0	0	0	0	0
Tram Chim National park	12,000,000	12,000,000	0	0	0	0	0
Concentrated plantation planting outside government forestry areas							
Tan Hong district	1,480,000,000	280,000,000	400,000,000	400,000,000	400,000,000	0	0
Tan Binh district	2,888,000,000	488,000,000	800,000,000	400,000,000	400,000,000	400,000,000	400,000,000
Canal construction	2,296,000,000	296,000,000	400,000,000	400,000,000	400,000,000	400,000,000	400,000,000
Environmental conservation forest zone							
Concentrated plantation	592,000,000	192,000,000	400,000,000	0	0	0	0
Scattered plantation	2,320,000,000	400,000,000	480,000,000	480,000,000	480,000,000	480,000,000	0
Canal construction for new plantation	9,637,000,000	1,757,000,000	1,852,000,000	1,807,000,000	1,807,000,000	1,887,000,000	527,000,000
Canal construction for the existing forest	2,700,000,000	450,000,000	450,000,000	450,000,000	450,000,000	450,000,000	450,000,000
Fire tower construction	462,000,000	77,000,000	77,000,000	77,000,000	77,000,000	77,000,000	77,000,000
Guard station construction and fire equipment	2,880,000,000	560,000,000	560,000,000	560,000,000	560,000,000	640,000,000	0
Border protection forest							
Hong Ngu district	3,520,000,000	640,000,000	720,000,000	720,000,000	720,000,000	720,000,000	0
Tan Hong district	75,000,000	30,000,000	45,000,000	0	0	0	0
Scattered planting							
Tan Hong district	2,500,000,000	1,000,000,000	1,500,000,000	0	0	0	0
Hong Ngu district	1,150,000,000	150,000,000	200,000,000	200,000,000	200,000,000	200,000,000	200,000,000
Tan Hong district	600,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000
Extension program							
Tan Hong district	550,000,000	50,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000
Hong Ngu district	10,184,300,000	2,074,100,000	2,170,000,000	2,170,000,000	1,484,700,000	1,120,000,000	1,165,500,000
Tan Hong district	1,414,700,000	350,000,000	350,000,000	350,000,000	384,700,000	0	0
Tan Nong district	987,700,000	287,700,000	350,000,000	350,000,000	0	0	0
Thanh Binh district	2,269,400,000	344,400,000	385,000,000	385,000,000	385,000,000	385,000,000	385,000,000
Cao Lanh town	888,300,000	188,300,000	350,000,000	350,000,000	0	0	0
Cao Lanh district	168,700,000	168,700,000	0	0	0	0	0
Thap Muoi district	2,138,500,000	350,000,000	350,000,000	350,000,000	350,000,000	350,000,000	388,500,000
Total							
Extension program	2,317,000,000	385,000,000	385,000,000	385,000,000	385,000,000	385,000,000	392,000,000
Total	25,769,300,000	5,167,100,000	5,422,000,000	4,983,000,000	4,291,700,000	3,613,000,000	2,292,500,000

Table J-2-9. Yield table of Melaleuca forest in Mekong Delta

Age (year)	DBH(1.3m) (cm)	Height (m)	Remaining trees				Thinning trees			
			Stand density (trees/ha)	Total area (m ² /ha)	basal volume (m ³ /ha)	Stem Growth rate (%)	Stand density (trees/ha)	Total area (m ² /ha)	basal volume (m ³ /ha)	Stem volume (m ³ /ha)
2	2.1	2.3	20,644	7,708	19		8,527	2,984	5	
4	4.0	3.8	13,457	17,006	42	36	2,610	5,808	14	
6	5.8	5.8	8,867	23,642	74	28	2,603	6,877	22	
8	7.3	6.9	6,892	28,766	102	16	1,946	7,726	28	
10	9.2	7.7	4,524	30,785	129	11	1,100	7,468	31	
12	11.0	8.8	3,434	32,632	150	7	770	7,315	34	
14	12.7	9.9	2,664	33,753	168	6	526	6,664	33	
16	14.3	10.9	2,138	34,839	188	5	418	6,809	36	
18	16.0	11.9	1,720	34,589	196	2	318	6,394	36	
20	17.8	12.8	1,402	34,503	205	2	232	5,709	34	
22	19.3	13.8	1,170	34,234	214	2	184	5,389	34	
24	20.9	14.7	830	22,218						

Source: Handbook of Forest Inventory and Planning from FIPI, 1995

Table J-2-10. Estimated yield following the implementation of the Plan
(yield from existing plantation is excluded)

(1) Up to 10th project year		Total	Industrial roundwood	Fuelwood
Final cutting	m ³	67,200	28,224	38,976
Thinning	m ³	129,322		129,322
Branch volume (branch volume 30%)	Final cutting	20,160		20,160
	Thinning	38,797		38,797
Sub total	m ³	58,957		58,957
Total		255,479	28,224	227,255

(2) From 11th project year up to 20th project year		Total	Industrial roundwood	Fuelwood
Final cutting	m ³	402,880	169,210	233,670
Thinning	m ³	173,742		173,742
Branch volume (branch volume 30%)	Final cutting	120,864		120,864
	Thinning	52,123		52,123
Sub total	m ³	172,987		172,987
Total		749,609	169,210	580,399