CHAPTER 3

STUDY SITE DESCRIPTION

3.1 General natural conditions

3.1.1 Location

Thua Thien Hue is one province in the Central Coastal Economics Region of Vietnam. It is the Southern most province of the North Central Coast region of the country. Its mainland ranges from $16^{0}00'$ to $16^{0}45'$ North latitude and $107^{0}00'$ to $108^{0}15'$ East longitude. Total area of the province is about 506,000 ha, of which about 70% is classified as forestland and plantation forest (Figure 3.1) (TTH-DFD, 2004).

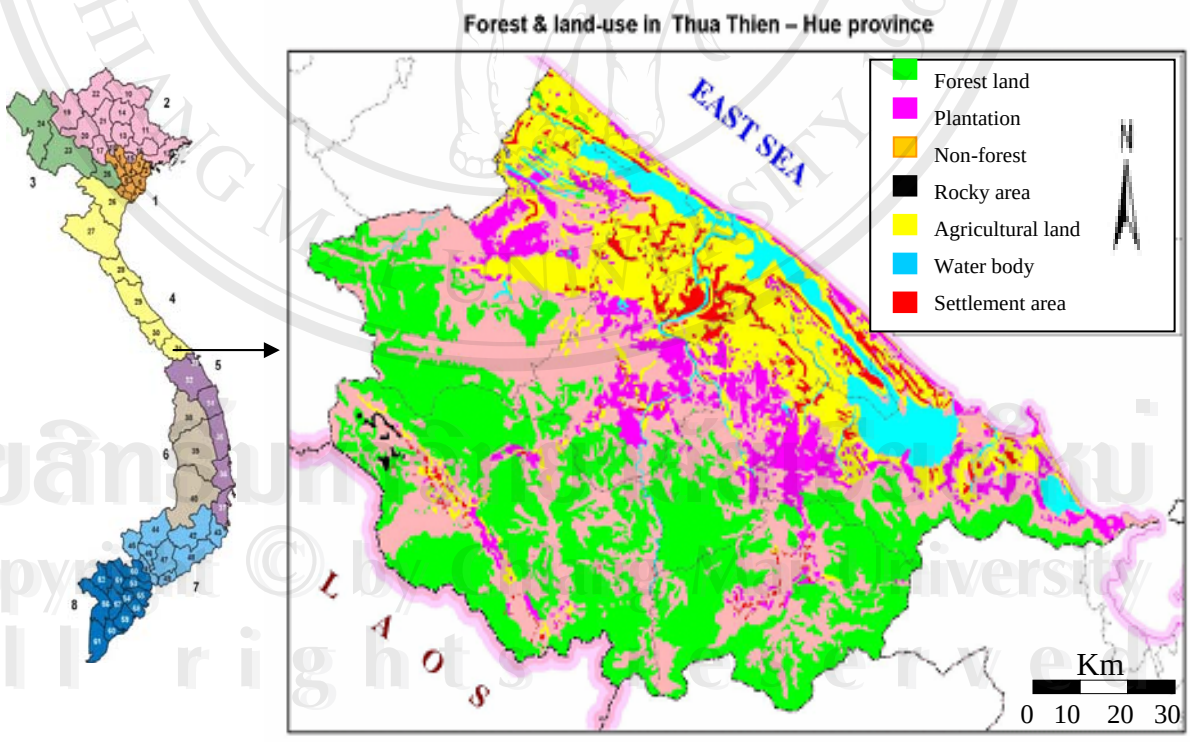

Figure 3.1: Location and land-use of Thua Thien Hue province.

(Source: www.tropenbos.nl/images/ sites/MapThuaThienHue.gif).

Thua Thien Hue province is bordered on the North by Quang Tri province, on the West by People's democracy republic of Lao, on the East by East-sea (South China sea), and on the South by Quang Nam province and Da Nang city. It is 660 kilometers South of Hanoi and 1,080 km North of Ho Chi Minh City. It is divided into nine administrative units including one municipal city (Hue) and eight districts and two of those are highland and mountainous districts. Agricultural land accounts for only 12% of the total natural land area. However, agriculture employs about 70% of the population (Tam, 2003). Thua Thien Hue has many advantages. It is located on national highway and railway, which are the two of the most important national communications. In addition, it has the Phu Bai domestic airport, the Chan May deep-water port and the Thuan An seaport. Furthermore, Cu Tai - Hong Van and A Dot - Ta Vang frontier passes create the suitability for national and international trade in the province (TTH-DFD, 2004).

3.1.2 Topography

Thua Thien Hue extends about 60 km in width and 127 km in length from North to South. It slopes from West to East. It is divided and complicated by many stream and river systems. In the South, there are some mountain ranges stretches to the sea that create mountain passes. Lagoons and narrow agricultural land come between these passes (TTH-DFD, 2004). The province can be divided into five zones:

(i) ***Mountainous Western Zone****:* the average height of the area is 1,000 m a.m.s.l., and the slope is more than 30^0.

(ii**)** ***Hilly Zone:*** the areas located between mountainous zone and plain zone. It consists of waved hilly ranges and its altitude is smaller than 300 m a.m.s.l., its slope is from 15^0 to 25^0.

(iii) ***Plain zone:*** It is narrow land located along the national highway the average altitude in this area is from five to 15 m a.m.s.l.

(iv) ***Lagoon zone***: there are five lagoons in the province, namely Tam Giang, Sam, An Cu, Cau Hai, and Lang Co.

(v) ***Sandy coastal zone***: It is mainly located in the East; the average altitude is from three to six m a.m.s.l. (TTH-DFD, 2004).

3.1.3 Climate

Thua Thien Hue has a monsoon tropical climate. It can be distinguished two seasons in the year. The rainy season is cold and wet. The sunny season is from the time between mid-May to mid-September and it is usually hot and dry during the time. The annual average air temperature in the Province varies among different geological zones. It is 24 - 25^{0}C in plain zone, and 21 - 22^{0}C in mountainous zone. The average maximum temperature is 38 - 40^{0}C, and the minimum is 10^{0}C. Annual total rainfall is 3,000 - 3,500 mm. The rainfall amount is irregularly distributed during the year. About 70 - 80% of the rainfall occurs in four months of the rainy season (from mid-September to mid-January), which usually brings about waterlogged and flood. The annual average humidity is quite high, 85-86% (Thua Thien Hue Meteorological Station, 2004).

In summary, the climate brings about not only advantages but also disadvantages in the province. The wet-hot climate and huge rainfall are the favorable conditions for the development and growth of many species. However, the cold and wet, or hot and dry weather, storm, waterlogged, flood were the obstacles for production and livelihoods (TTH-DFD, 2004).

3.1.4 Land resource

Total area of the province is about 506,000 ha. The mainland can be classified into five categories that are shown in Figure 3.2. The largest proportion was forestry, followed by unused land, which has been planned for forest plantation, and the lowest proportion was land for residence. The coastal lagoons occupy a large area of the

coastal area. In the coastal plain area a considerable area is used for agriculture, in which rice is the most primary crop. Land used for agricultural production is 59,710 ha, accounting for 11.8% of the natural area (average agricultural land per capita is 553 square meter). Agroforestry and livestock are the dominant activities in the remaining lowland areas of the province. Most forests and protected areas are located in the interior mountainous areas of the province (TTH-DFD, 2004).

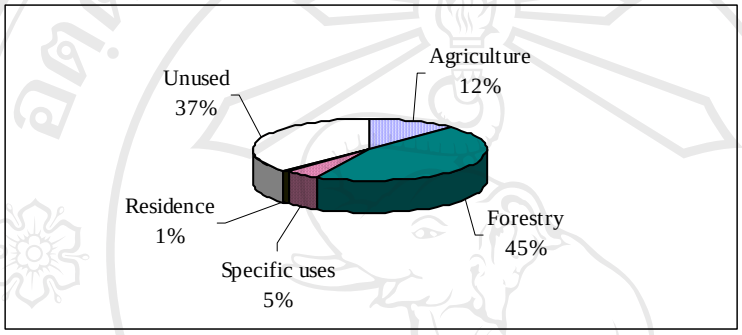

Figure 3.2: Land categories in Thua Thien Hue province.
(Source: TTH-DFD, 2002).

3.2 Social economic characteristics

3.2.1 Population and labors

The population of the province is just over one million. According the statistics in 2003, the population of Thua Thien Hue province is 1,105,494 persons, of which 542,650 males (49.3%), and 562,844 females (50.7%). There are 344,952 persons living in or around the capital city, Hue, and 760,542 persons in rural area (Thua Thien Hue Statistical Office, 2004). Most of the province's population is living in the areas within 25 km from the coast. The average population density in the province is lower than 50 people per square kilometer, the highest density is found in the plain area**.** There are four different ethnic groups, namely the Ta Oi, Ca Tu, Van Kieu, and Kinh; in which Kinh is the predominant group and it is also the majority group in Vietnam. The natural population growth rate was 2.7% and 2.0% in the 1980s and 1990s respectively. However, there was a decreasing trend in population growth rate during the next decade, the rate was only 1.4% in 2003.

3.2.2 Social economic development situation of the province

During the last decade, Thua Thien-Hue presents a stable growth rate of economic development. The annual growth rate of GDP was 8.8% and 7.1% for the period of 1991- 1995 and 1996-2000 respectively. The average economic growth rate for the 10 years period 1991 - 2000 was 7.3%, especially it peaked at 11.2% in 2000 (Tam, 2003). The average GDP per capita in 2000 reached 376 USD/year, and it was 1.28 times as much as that in 1995 (179 USD/year). The GDP was higher than the average GDP of Central region of Vietnam, but lower than national GDP. The economic structure has changed significantly. The services have become the biggest sector, which contributed 44.1% to provincial GDP, followed by industrial sector with 32.5% of provincial GDP. Agriculture, forestry and aquaculture together contributed only 23.4% of provincial GDP. Agricultural, forestry, and livestock production have been improved, which tend toward the commercial production, and contributed to improvement of people living standard. In 2000, total agricultural production (converted to rice) attained 239,647 tons, (of which, rice production was 235,736 tons). The average annual food quantity per capita was 217 kg. Total domestic cattle were 49,688 heads (buffaloes were 29,289 heads, cows 20,399 heads). It is projected that the number of cows will increase rapidly due to the application of advanced breeds and modern feeding system instead of natural grazing system. With 128 km length of coastline and more than 20,000 ha of lagoons that make aquaculture become one of the key economic elements in the province (TTH-DFD, 2004).

3.3 Forest and forestland resource

In the past, the forests of Thua Thien Hue province have been seriously destroyed during war times. Illegal forestry exploitation and shifting cultivation of the ethnic groups have been other factors that caused a remarkable decrease in the natural forestry area. The obvious consequences of the mass deforestation have been the degradation of arable land, increase in soil erosion, destruction of water catchments, diminution of volume of groundwater sources, ecological degradation of coastal and submerged area, and the loss of overall biodiversity. By the year 1989, the

government had been facing with the problem of serious decease in forest area. To protect the forests and recover the lost areas, many projects were implemented for the purposes of forest conservation, reforestation and forest plantation (sub-FIPI, 1999).

By 2003, Thua Thien Hue province had planted 61,170 ha of plantation forest, adding to 177,500 ha of natural forest that increased the forest cover up to 46%. However, the denuded hills and barren land still occupy a large of 114,868 ha which accounts for 32% of the forestland. The forests are categorized into three types. They are protection forests, special use forests and production forests. The Figure 3.3 and Figure 3.4 shows proportion of forestland and different types of forests, respectively.

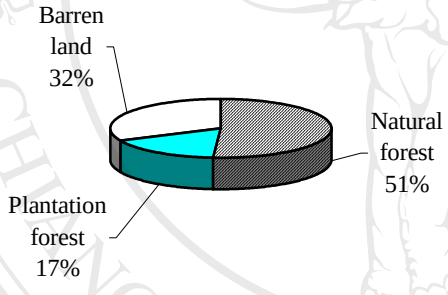

Figure 3.3: Distribution of forest and forestland in 2003.

(Source: TTH-DFD, 2004).

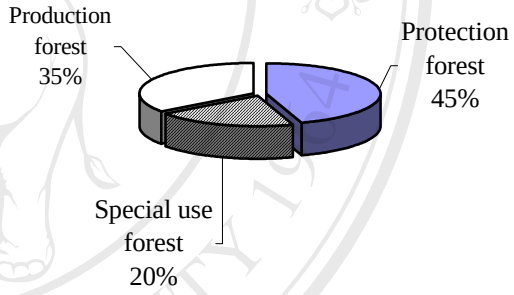

Figure 3.4: Distribution of three types of forest in 2003 of Thua Thien Hue.

(Source: TTH-DFD, 2004).

3.3.1 Natural forests

Natural forests in Thua Thien Hue province are the diversified forests. They are classified as evergreen forests with abundant in species components. The study conducted by the sub-FIPI (1999) shows that, in Thua Thien Hue province, forestry flora has 120 families with more than 1,400 species and some of those are very valuable species. Forestry fauna has 969 species in 64 families belonging to 23 orders. Table 3.1 provides basis statistics of the natural forests in the province.

Table 3.1: Natural forest types, area and estimated volume.

Type of natural forest	Total area	Estimated volume
	----ha----	----m^3-----
Rich forest	37,437	8,990,000
Medium forest	43,644	7,360,742
Poor forest	69,538	3,500,117
Regeneration forest	26,931	716,500
Total	177,550	20,568,000

(Source: TTH-DFD, 2004).

Annual average growth of the natural forests reaches two to three m^3/ha/year (Sub-FIPI, 1999). Natural forests are located in remote areas in mountainous western zone with sloping mountain pass which have unfavorable transportation condition. The natural forests, which are considered protected areas in Thua Thien Hue province include both special-use forests and protection forests. In which, the Bach Ma National Park (22,300 ha); the Phong Dien Nature Reserve (41,548 ha); the Bac Hai Van National Park, a proposed Cultural and Historical Site (14,500 ha) are the important areas of special - use forests. In addition, some areas functioned watershed protection forests (including watershed, coastal and wind-break protection forests) (TTH-DFD, 2004).

3.3.2 Plantation forest

The plantation forests are named by the tree species planted in the forests. The total area of the plantation forests in Thua Thien Hue province in 1999 and 2003 are shown in Table 3.2. It is easy to plant Eucalyptuses. However, the species can adapt to fertile land only. Some disadvantages of eucalyptuses are that the leaf canopy is thin, they are not strong in protection function; their leaves are difficult to break up or decompose; and more seriously, they speed up soil degradation. During the recent years, grey-dry-leaf disease has occurred widely for a long time, which caused heavy

affects on the species. As a result, the species is not preferred and the area of Eucalyptuses, therefore, reduced remarkably (TTH-DFD, 2004).

Table 3.2: Area of the forest according to forest tree species.

Type of forest	1999	2003
	----------ha----------	
Pine	10,014	10,331
Acacia	12,893	20,955
Eucalyptus	10,964	8,420
Cinnamon	2,219	2,037
Casuarinas	1,836	2,698
Acacia + Eucalyptus	1,899	1,691
Acacia + Pine	702	2,461
Other (indigenous species, bamboo, other mixed forest…)	16,878	12,577
Total plantation forest	57,395	61,170

(Source: FIPI, 1999 and TTH-DFD, 2004).

Taking the disadvantages of eucalyptus into consideration, Acacia species, especially *Acacia crassicarpa, Acacia auriculiformic,* A*cacia mangium,* and acacia hybrid have been replaced because they have many advantages. First of all, Acacias grow rapidly, and meet the criterion in suitability. Secondly, they have high economic value by providing wood and materials for making paper. Moreover, they are highly appreciated as a good species for environmental improvement and protection. During the last three years, through applying the advanced technique in hybrid-multiplication, many acacia hybrids have been created and become the predominant varieties in plantation forests. Among indigenous species, cinnamon has been prioritized by mountainous people. However, it is necessary to develop other species such as *Erythrophleum fordii*, *Hopea pierrei*, *Hopea odorata*, *Dipterocarpus alatus, Sindora tokinensis, podocarpus annamiensis, Aquilaria crassna*, etc that have high economic value and needed for biodiversity conservation. In general, casuarinas (C*asuariana equisetifolia*) is the dominant tree in sandy coastal area. The preferable species in sandy interior field, on the other hand, is acacia, especially *Acacia crassicarpa* (TTH-DFD, 2004).

Acacia and merkus pine are becoming the main species and covered a large area in plantation forests. Productivity of merkus pine is four to five m ^{3}/ha/year, that of acacia about double at eight to 10 m^3/ha/year. *P. merkusii* and *P. caribea* can grow and develop widely in hilly zone. However, *P. merkusii* is predominant because it has high economic value by providing resin and wood. Moreover, it is a sustainable crop and saplings of the species are abundant in natural generations (TTH-DFD, 2002). In the province, thousands hectares of pine forests have been allocated to households for resin extraction, which provide jobs, generate income and create stable livelihoods for local communities (TTH-DFD, 2004). The main disadvantages of pine forests are that the pine are very vulnerable to fire and the outbreak of pests and diseases. According to Duc (2000), before 1980, though pine forests in Thua Thien Hue were not damaged by pests or diseases, the pests and diseases actually occurred at a low density which did not cause visible affects. The period from 1980 to 1995 was the main stage when foliage-feeding pests and diseases occurred and were expanded at serious level. During this period, some pests such as pine sawflies, *Gilpinia murshalli* and *Diprion sp*., or pine caterpillar, *D. kikuchii* and *D. punctatus* were found and caused the outbreak in large area and scale. However, the most dangerous pest is pine caterpillar named *D. punctatus* that affected thousands hectares of pine forests throughout the province. Between 1995 and 2000 while the foliage-feeding pests decreased, the stem and root destroyers, on the other hand, increased dramatically. Though they causes loss to a small area, their affects caused them are much more serious than those of foliage-feeding pests. Though the pest outbreaks are often localized and controlled these are still the invisible dangers to pine forests.

3.3.3 Denuded hill and barren land

By the year 2003, there were still 114,868 ha of uncovered hills and barren land making up about 32% of total natural area. The area is divided into four groups:

(i) Grass barren land (Ia): total area of this group was 15,186 ha. It is located in lowland zone. The majority of the area has been planned for forest plantation. Small area are expected to be used for planting industrial trees and agricultural land.

(ii) Shrub barren land (Ib): total area was 42,721 ha. It is located in low hilly zone. Most of the area has been planned for forest plantation. The remaining area is being used for planting the industrial trees and agricultural land.

(iii) Barren land with scattered trees (Ic): total area was 48,475 ha. The floristic composition in the area consists of vanguard trees, intermix some scattered purpose tree species. The area can be used to recover natural generations.

(iv) Coastal sandy area: total area was 8,486 ha. It can be divided in to sub-groups: coastal sandy area and inland sandy area. Most of the area has been planned to plant protection forests. Some areas will be improved to set up agroforestry systems (TTH-DFD, 2004).

3.3.4 Factors effecting forest resources

The first factor mentioned here are the rights of management of forest and forestland. Initially, the total area of forests and forestland were allocated to state forestry enterprises. The ownership was unchanged until 2003 when the resolution 02 and 163/1999/CP on forest and forestland allocation to the household were promulgated. Implementing the resolutions, 17,275 ha of forestland have been allocated to 12,003 households. In addition, another 39,867 ha of forest and forestland have been allocated to agricultural cooperatives and other organizations by district authorities. From 2000 up to now, the provincial authority has carried out the trial model on allocation of 1,170 ha of natural forests to communities. The ownership of forests and forestland encouraged many households in investing labor and money in forest plantation, forest regeneration, and forest protection. As a result, the natural forests have been better protected and managed and the area of plantation forest has increased. However, forest and forestland allocations have presented some problems. One of these problems has been that the determination of the three types of forests is not clear which caused inappropriate investments. It also slowed down the process of shifting the area of protection forests to industrial tree forests. Furthermore, the

unclear classification of the forest types resulted in low proportion of land used for production. Another matter is that the cycle of forestry trees are normally too long to interest of people (TTH-DFD, 2004).

Natural conditions are the second factor having influence on forest resources. The majority of forests are located in unfavorable areas with complicated topography which causes disadvantages in communication. Moreover, the land used for forest plantation is not fertile, having high slope and being easily eroded. Inclement weather in the province makes the management of forestry production more difficult.

Techniques and human resource may have considerable effect factors. Species patterns have been determined, but people get stuck in application of new technologies into seedling production and it has been one of the main element caused the low productivity of planted forests. Unadvanced techniques being used in forest plantation have resulted in low production of the planted forests; backward technology used for processing forestry products, uneconomical use of materials, and high input cost make the price of the final forestry products uncompetitive. Another problem is that Vietnamese farmers have been influenced by subsidized policies, which lasted for a long time in Vietnam. As a consequence, the farmers are not knowledgeable and active enough to meet the requirements of markets and advanced production techniques in reformed period. Besides, intellectual thinking of the people in remote area is still low that causes a big obstacle in both transferring technology and enhancing their awareness of protection and development of forest.

The last factor affecting forest resources is the management mechanism. Land use planning, the categorization of three types of forests is not finalized; the orientation of the allocation of land used for agriculture and forestry are not stable; the orientation is sometime conflict. State forestry enterprises, which play an important role in forestry resources development and management, have not actively reformed their business to meet the requirements of the market economy. The slow reform process makes the enterprise uncompetitive, inefficient and ineffective (TTH-DFD, 2004).