

# **Transitions to Sustainable Forest Management and Rehabilitation in the Asia Pacific Region**

**Indonesia**

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## 1. INTRODUCTION

### 1.1. Introduction to the Country Report

Forest transition is the change from shrinking to expanding forests (Mather 1992, Grainger 1995 in Mather & Needle 1998). Theory of “Forest Transition” developed through several studies in Europe in 1990s by Alexander S. Mather. The definition of “forest transition” then expanded to include “shifting from deforestation to reforestation” (Mather *et al.* 1999) and also “the passage from net deforestation to net reforestation” (Mather 2004). Forest transition could be identified in developing countries through characteristics which occurred in forest transition in France, namely (1) from local use of timber (pre-industrial) to need of urban-industrial forest, (2) agricultural intensification, technological improvement and rural exodus, (3) timber trade & fuel wood requirement, and (4) perception & paradigms shift (Mather *et al.* 1999).

This Country Report is part of research project on “**Comparative Analysis of Transitions to Sustainable Forest Management and Rehabilitation**” conducted by the Asia Pacific Association of Forestry Research Institutions (APAFRI) and funded by the Asia-Pacific Network for Sustainable Forest Management and Rehabilitation (APFNet) with Renmin University of China (China), Seoul National University (Korea), and Kyoto University (Japan) as Technical Partners. The purpose of this research project is to identify factors that can help to reduce deforestation, induce rehabilitation, and foster sustainable forest management. This research project include nine countries in Asia-Pacific, namely Japan, Korea, China, Laos, Vietnam, the Philippines, Malaysia, Indonesia, and India.

Indonesia (Sumatera, Indonesian Borneo, and West Papua) is classified into deforested countries together with Malaysia and Myanmar as results of infrastructure expansion, investment in agriculture, and establishment of cash crop plantations (FAO 2011). Using the objectives of the research project, this Country Report tried to show what has been happening in Indonesia in relation to the shrinking forest (deforestation) and expanding forests (afforestation, reforestation, regreening, forest and land rehabilitation). Throughout this Country Report, the characteristics of forest transition (Mather *et al.* 1999) in Indonesia will be explained. First, Chapter 1 sub-chapters 1.2 to 1.5 will explain briefly about Indonesia. Shrinking and expanding forests are related with how the forests are managed. Therefore, Chapter 2 will focus on the Forests and Forestry in Indonesia: the definition, diversity, regulation, administration, values, and how it is monitored. After understanding how the forests are managed, Chapter 3 will focus on the Forest Cover and Major Drivers of Deforestation. In this chapter, deforestation process will be analyzed. Though deforestation has been slowing down, Indonesia is still in the ‘deforested countries’ category, efforts to rehabilitate the deforested areas has been done since the beginning of forest exploitation too. Chapter 4 will focus on The Key Points Leading to Afforestation and Forest Rehabilitation. The last chapter will conclude of what have been happening to the Indonesian forests and recommendation for Sustainable Forest Management and Rehabilitation.

## 1.2. Ecological Factors

### 1.2.1. Geography and climate

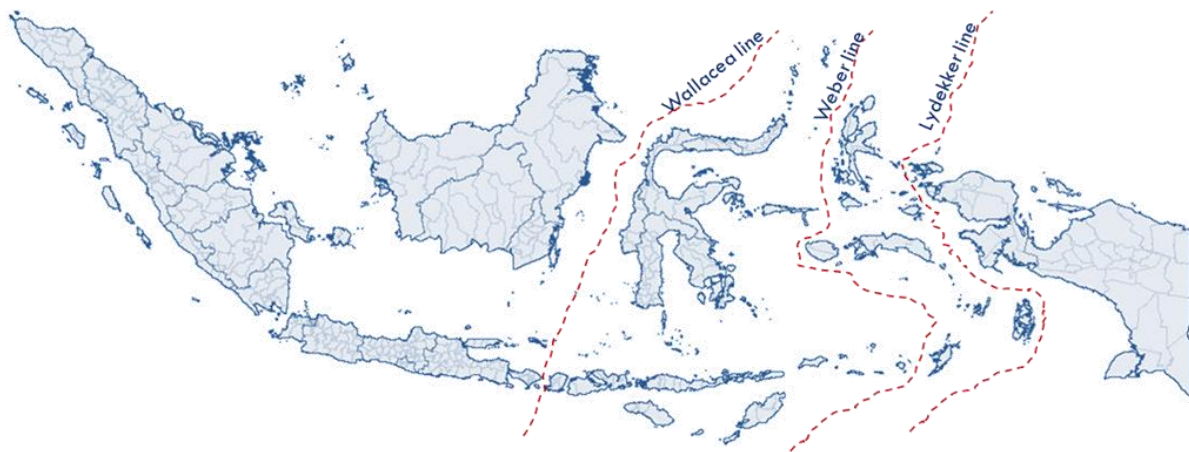


**Figure 1.1.** Indonesia and its location

Indonesia is a country in South East Asia, lies in the equator, between two continents: Asia and Australia and between two oceans: Indian Ocean and Pacific Ocean (Figure 1.1). Indonesia consists of 17 508 islands with 6 000 of them inhabited. Because of the location in between two continents and two oceans with so many islands, Indonesia is called *Nusantara* or inter-archipelago. Because it lies in the equator, climate in Indonesia is tropic. Astronomic location of Indonesia is between 6°8' North Latitude and 11°15' South Latitude, and along 94°45' to 141°05' East Longitude. Total area of Indonesia is 1,910,931.32 sq km which place Indonesia rank number 15th in the world. The land area is 1 811 569 sq.km, water area is 93 000 sq.km, the boundary is 2 830 km, and coastline is 54 716 km. In the North, Indonesia is bordered by Malaysia, Singapore, the Philippines, and South China Sea. In the South, Indonesia is bordered by Australia and Indian Ocean. In the West, Indonesia is bordered by Indian Ocean. While in the East, Indonesia is bordered by Papua New Guinea, Timor Leste, and Pacific Ocean.

### 1.2.2. Flora and fauna

Owing to its geographical location and climate, Indonesia is blessed with biological diversity (biodiversity). Biodiversity in Indonesia is unique. In western part of Indonesia from the west tip in Sabang to the Wallacea line, it is influenced by biodiversity from Asia. This region is called Sunda Shelf. The eastern part from the border of Papua New Guinea to the Lydekker line, it is influenced by biodiversity from Australia. This region is called Sahul Shelf. Between Wallacea line and Lydekker line which is famous as the Wallacea Area, the biodiversity characteristic is endemic, but also influenced by both Asia and Australia. Weber line is the meeting line between Asian and Australian influences (Figure 1.2).



**Figure 1.2.** Wallacea, Weber, and Lydekker lines divided Indonesian biodiversity into three main biogeographies: Sunda Shelf, Wallacea Area, Sahul Shelf

The National Development Planning Agency/*BAPPENAS* (2003) reported that Indonesia is estimated to have 90 types of ecosystem, from snow peaks at Jayawijaya (Papua), alpine, subs-alpine, montane to lowland rainforests, coastal forest, grasslands, savannah, wetlands, estuaries, mangrove and marine and coastal ecosystems, including sea grass and coral reefs to deep sea ecosystems. Although it covers only 1.3% of the total landmass in the world, Indonesia harbors very high flora and fauna species diversity.

Indonesia has 515 species of mammals which represents 12% of the world's mammal and becomes rank 2 in the world. Thirty nine percent (39%) of these mammals are endemic to Indonesia. Among these mammals, 35 species are primates and 18% of them are endemic. This posed primates of Indonesia rank 4 in the world. Not only mammals, number of birds, amphibians, freshwater fish, and plant species posed Indonesia in the top 1 to 6 in the world. Damayanti (2008) summarized the diversity of flora and fauna in Indonesia and each state as shown in Table 1.1. No wonder, Indonesia becomes one of the three mega-biodiversity countries in the world.

**Table 1.1.** The state of flora and fauna in Indonesia

Category	Number of species	Percentage to the total species in the world	Endemic species	Rank in the world
Mammal	515	12	39%	2
Primates	35		18%	4
Reptile	511	7.3	150 species	4
Bird	1,531	17	397 species	5
Amphibian	270		100 species	6
Invertebrate	2,827			
Butterfly	121		44%	
Freshwater fish	1400			3
Plants	38,000		55%	5
Palm	477		225 species	1
Timber	350	50	155 species	

Source: Damayanti 2008

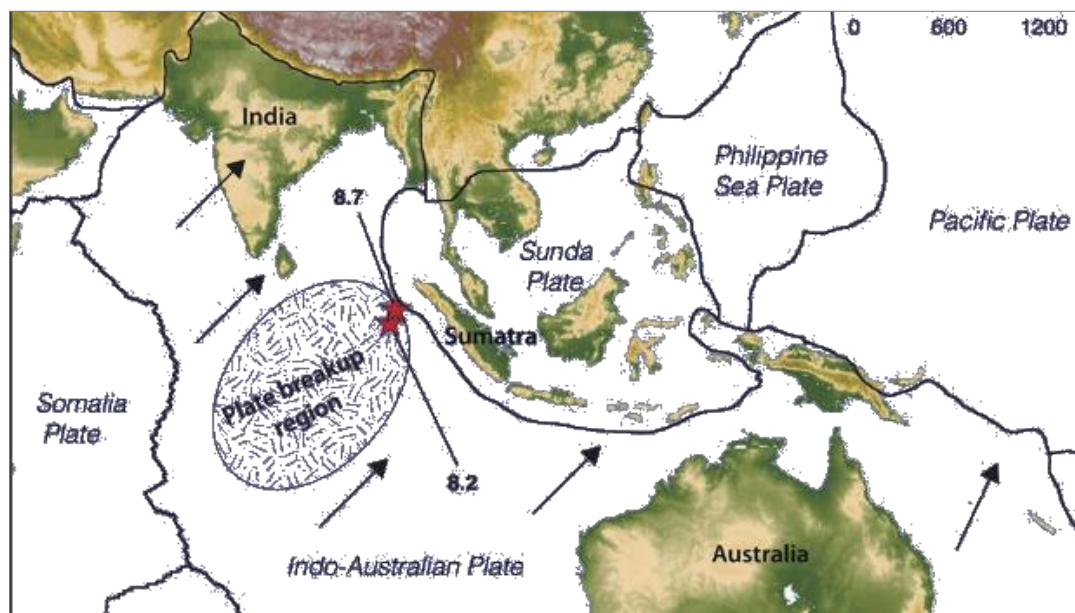
### 1.2.3. Land use

In 2011, Indonesia through National Standardization Agency issued *SNI* 7645: 2010 (Indonesian National Standard/*SNI* number 7645 of 2010) on Land Cover Classification. *SNI* 7645:2010 was prepared based on Un-FAO land cover classification and ISO 19144-1 on Geographic Information – Classification Systems – Part 1: Classification System Structure. Land cover represents the use of the land identified from satellite images. There are 23 classes of land cover, namely: (1) primary dry-

land forest, (2) secondary dry-land forest, (3) primary swamp forest, (4) secondary swamp forest, (5) primary mangrove forest, (6) secondary mangrove forest, (7) industrial plantation forest, (8) plantation, (9) upland agricultural land, (10) upland agricultural land mixed with shrub, (11) shrub/bush, (12) swamp shrub/bush, (13) savanna, (14) paddy field, (15) swamp, (16) embankment (shrimp/fish ponds, lake), (17) transmigration, (18) settlement, (19) airport, (20) mining, (21), barren-land, (22) water bodies, and (23) cloud.

#### 1.2.4. Major ecological concerns

It has been stated in Section 1.2.2 that Indonesia's geographical location and climate influence biodiversity characteristics. Another factor influences biodiversity and ecology in Indonesia is Indonesia's geological location. Indonesia is situated on three major tectonic plates: Sunda plate (some experts consider this as part of Eurasia plate) on the western part, Indo-Australia plate on the southern part, and Pacific plate on the eastern and north-eastern part of Indonesia (Figure 1.3). As a result, Indonesians are accustomed to tectonic earthquakes. There are so many volcanoes in Indonesia which occasionally produce volcanic earthquake too. Indonesia is one of countries in the ring of fire (Figure 1.4). The "fire" is coming from hundreds of volcanoes scattered in Indonesia (Figure 1.5). When tectonic plates are moving, they produce earthquake. The earthquake influences the volcanoes to become active and they also caused tsunami, when the epicentrum is 30 km under the sea. The most catastrophic earthquake and tsunami recorded recently was in Aceh on 26 December 2004. Figure 1.6 shows seismicity map and seismic hazard map for Indonesia (USGS 2013).



**Figure 1.3.** Three major tectonic plates in Indonesia (Wikipedia 2013)

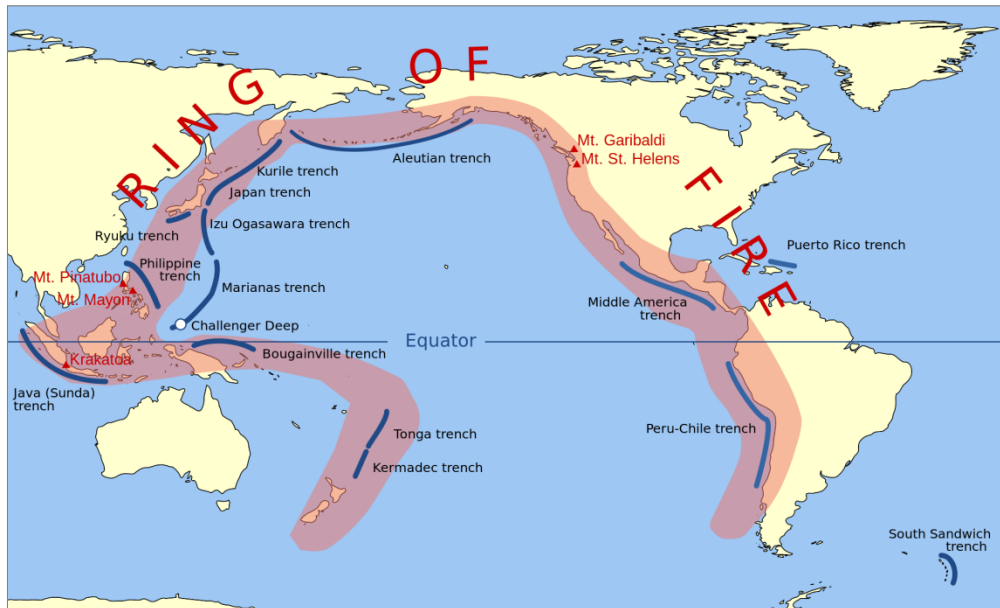


Figure 1.4. Ring of fire (Wikipedia 2013)

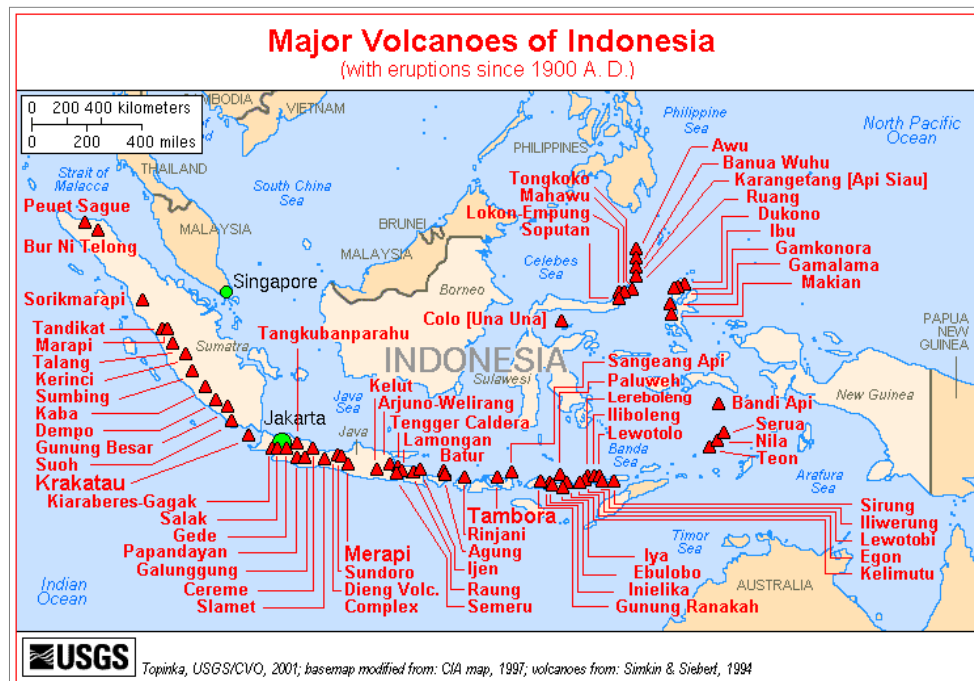
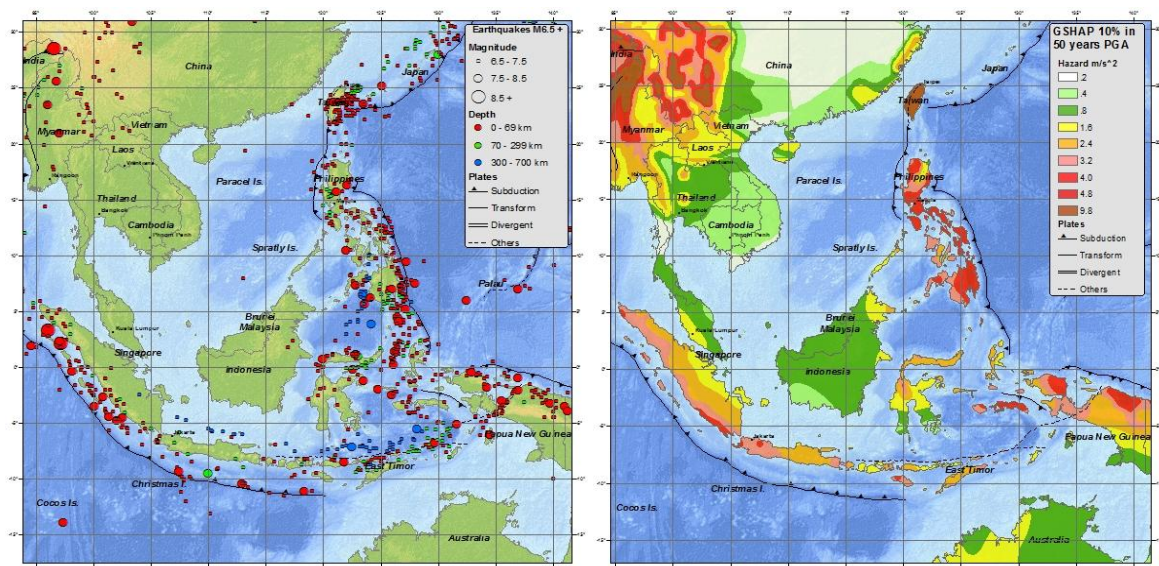


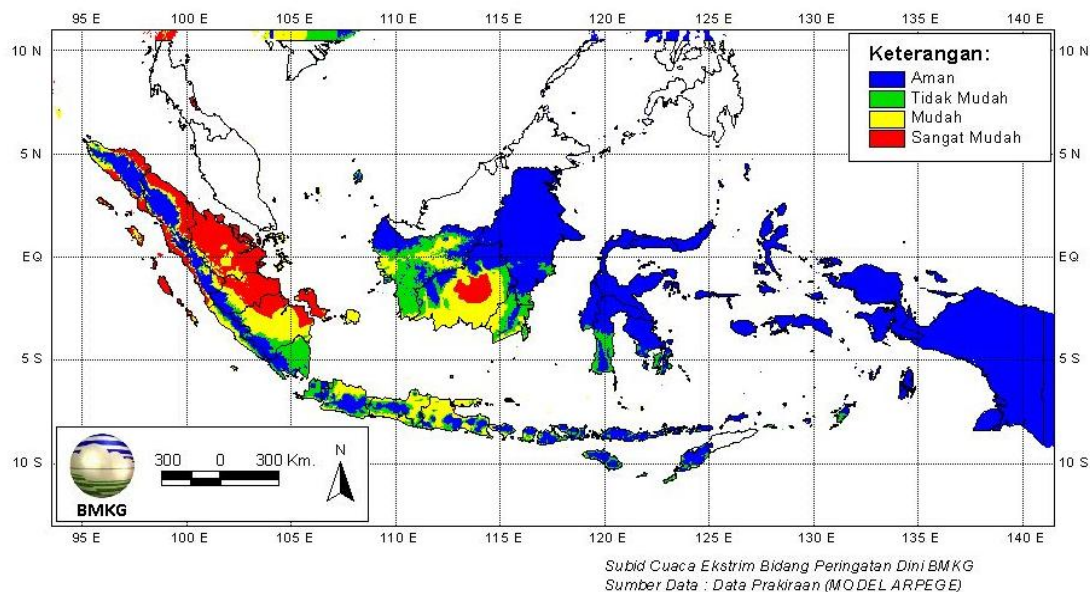
Figure 1.5. Volcanoes of Indonesia (USGS in Wikipedia 2013)





**Figure 1.6.** Seismicity map (left) and seismic hazard map (right) for Indonesia (USGS 2013)

Thanks to geographical and geological locations and climate of Indonesia, the country is not only rich in biodiversity, but also rich in natural hazards and environmental problems. Volcanic earthquake, tectonic earthquake, volcanic eruption, tsunami, and severe droughts are natural hazards that familiar to Indonesian throughout the year. Human activities are adding these hazards: forest (and peatland) fires, smoke and haze from forest fires, deforestation, floods, air, and water pollution, though sometimes forest fires occur naturally. Figure 1.7 shows map of forest fire potentiality in Indonesia.



**Figure 1.7.** Forest fire potential map (BMKG 2013)

### 1.3. Economic Factors

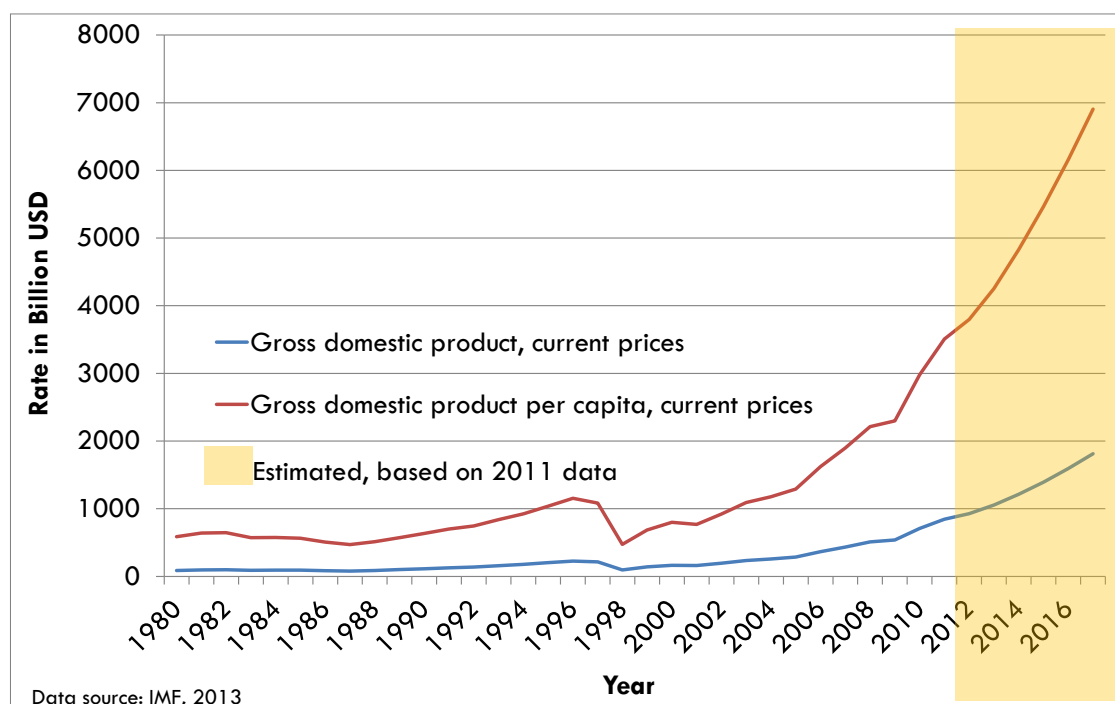
#### 1.3.1. Gross Domestic Product (GDP)

Gross Domestic Product (GDP) of Indonesia increased relatively since 1980. Sudden drop in GDP current prices was caused by economic crises in 1997–1999. Main products are agriculture and forestry. Agricultural products which contribute to the country's GDP are rice, cassava (manioc), peanuts, rubber, cocoa, coffee, palm oil, copra; poultry, beef, pork, and eggs, while plywood remain the main forestry product. Figure 1.8 shows the GDP of Indonesia (IMF 2013).

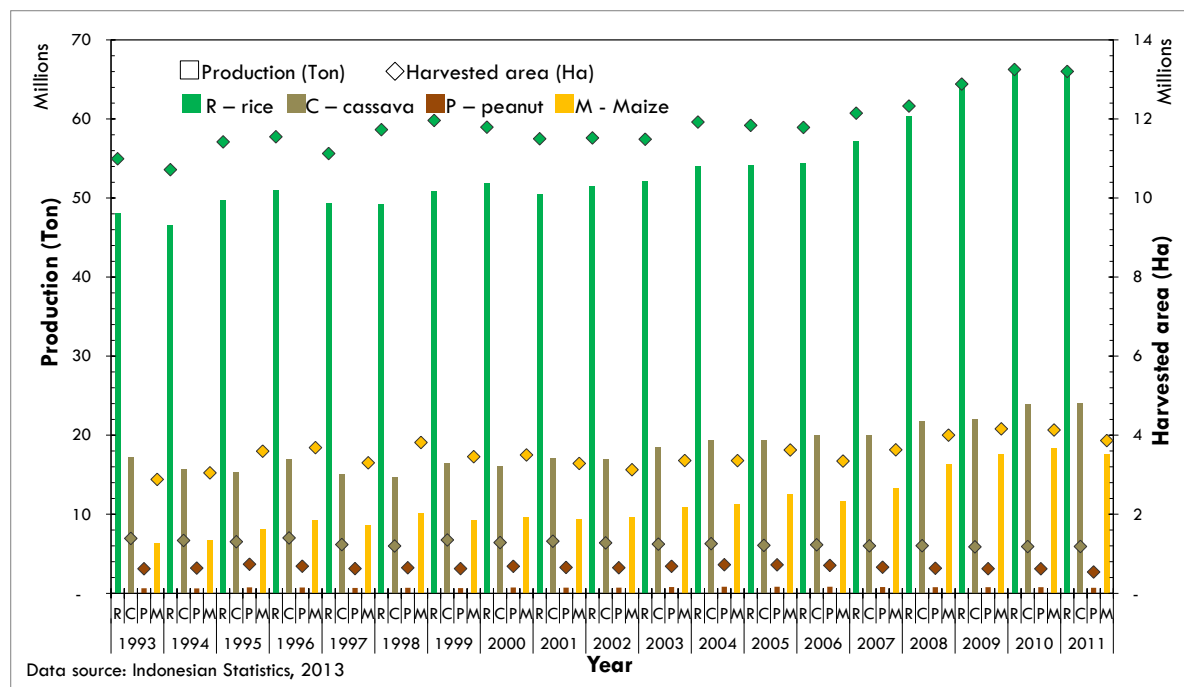
#### 1.3.2. Main production of agriculture and forestry

##### 1.3.2.1. Agricultural products

Main agricultural products for food are rice, cassava, and peanut. Rice had been the main agricultural product that was aimed at autonomically produced since the first five-year plan (1969–1974) to the fifth (1989–1994). Rice fields (*sawah*) were extensively made throughout the country. Extension and facilitation to farmers had been intensively conducted. Though the Statistic Agency does not publicized data before 1993, it is clear that rice fields and yield are still relatively increasing even after the fifth-year plan up to now (Figure 1.9 and **Appendix 1**).



**Figure 1.8.** GDP of Indonesia (1980–2011)



**Figure 1.9.** Agricultural production and harvested area (1993–2011)

After rice, cassava has been the second agricultural product, positioned as complement of rice as staple food. Cassava even positioned as staple food in some areas that are not suitable for rice fields. Its production has been relatively increasing, while the planting areas are slightly increasing. Cassava is produced not only for staple food, but nowadays become material for cassava flour (*tapioka*), tomato and chili sauce filler, and distilled to become methanol for chemical industries and renewable fuel resources.

Although far smaller than rice and cassava, peanut is another agricultural product which takes more than five hundred thousand ha of agricultural land each year. Peanut production is relatively steady since 1993 to 2011. Peanut has been planted as intercropping plant in the dry season and functioned as returning the soil fertility.

Corn or maize has been produced throughout Indonesia as inter cropping as the third crop after two cycles of wet-paddy in one year or planted in upland/dry agricultural land. Maize was one of the main staple foods of Indonesian people until 1960s, until when the rice planting was expanded to all Indonesia and eating rice campaign as the only main staple food was implemented by the Government of Indonesia. Expansion of rice fields was aimed at fulfilling rice self-sufficiency. One of the negative impacts to this policy was the disappearance of maize and other traditional food in the daily diet of Indonesian people. Although the harvested area of maize has been in small fluctuation, the production has been increasing from 1993 to 2011.

Rubber, palm oil, cacao, coffee, tea, and sugar cane are main agricultural products from plantation. These crops were planted mainly since the Dutch colonial period. Although the harvested area is not as vast as palm oil, Indonesian rubber export has been the competitor of Malaysian for its quality. There are two kinds of rubber plantation: state plantation and smallholder private/community plantation. Dutch colonial government's rubber plantations were nationalized into the State Corporation Company since Indonesia's Independence. Smallholder/community's rubber plantations are mainly planted in homegardens or agroforests, mixed with other crops. Thus, it is difficult to be incorporated into the national statistics.

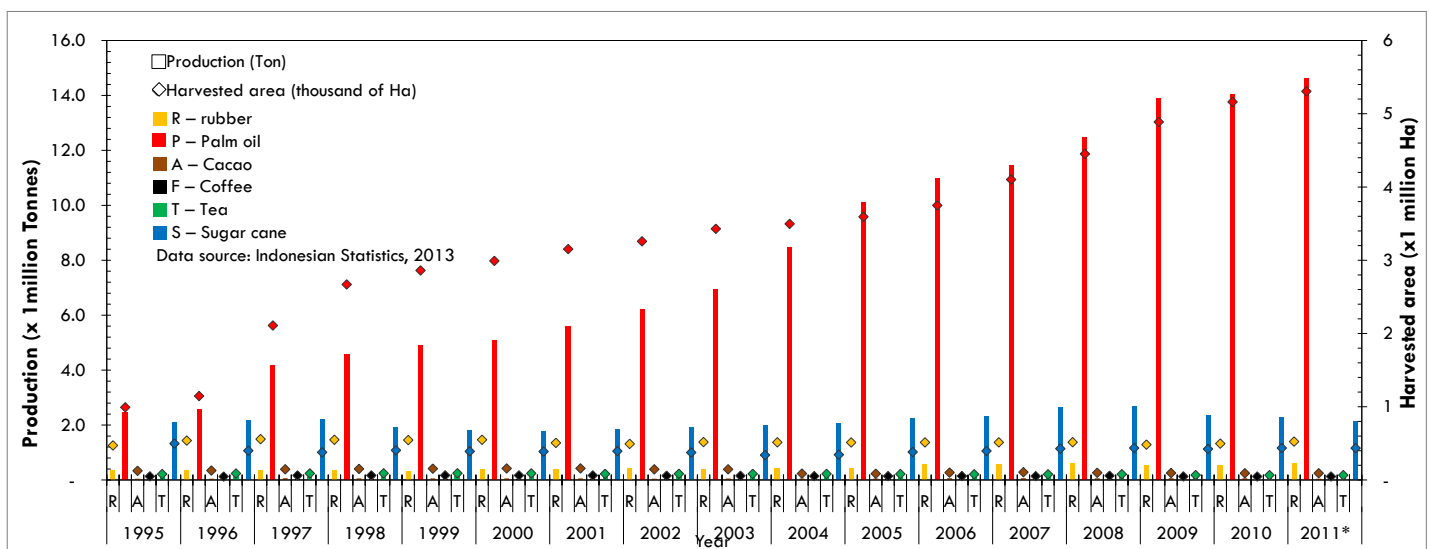
Oil Palm is phenomenal crop for its vast and speedy expansion both the area and the yield. Oil palm plantations were developed by the Dutch colonial government in several islands in Indonesia. At that time, the Dutch colonial government could produce and export palm oil and beyond the exports from African countries (BUMN 2013). After Indonesia's independence, the remaining oil palm plantations were nationalized and the Government of Indonesia kept encouraging the expansion and improvement of productivity and quality of palm oil. Palm oil harvested areas increased more than

500% and the yield almost reaches 600% within 15 years (**Appendix 2**). Pros and contras between economic and ecological impacts on oil palm plantation have also been happening. To some extent, oil palm plantation expansion has been said as the cause of deforestation.

Indonesia is also well-known for its cacao and coffee production. Coffee plantation was also started in Dutch colonial period, mainly in Cirebon, Central Java, and East Java. Similar to community's rubber plantation, cacao and coffee harvested areas now are mainly belong to communities and usually planted under the shade of forests. Located in East Java, there is a Research Center on Cacao and Coffee under the Ministry of Agriculture. However, there are very limited state-owned cacao and coffee plantations. There are two kinds of coffee: arabica (from *Coffea arabica*) and robusta (from *Coffea robusta*). Indonesian local coffee plantations are scattered throughout the country and each has its own characteristics, combination of the species and the soil where it grows. Among others are: Gayo, Mandailing, Lintong, and Lampung in Sumtera island; Banaran and Jember in Java island; Toraja in Sulawesi island; Kintamani in Bali island; Manggarai in Nusa Tenggara islands; and Wamena in Papua island. Unlike palm oil, harvested areas and production of both cacao and coffee are relatively stable between 1995 and 2011 (**Appendix 2**).

Tea has been planted since the Dutch colonial period in several mountainous areas in Java. Since Indonesia's independence, the plantation areas were nationalized and managed by the State Corporation Company (PT. Perkebunan Nusantara). Unlike rubber plantation consists of state plantation and smallholder private/community plantation, tea plantation is rarely developed by smallholder/community. The possible causes are for producing tea need high capital, for the tea plantation, maintenance, infrastructure and processing, and also expertise. In **Appendix 2**, it can be notified that harvested areas and production of tea are relatively stable.

Sugar processed from sugarcane was the favorite product in Dutch colonial period. Sugar price was high and it is needed in Europe. The Dutch through its *Cultuur Stelsel* policy (1830–1870) made people in Java to produce high value export crops, including sugarcane. Sugarcane plantations were made throughout Java Island using people's land. Sugarcane planted area has similar characteristics to wet-paddy field (*sawah*), thus at that time, very limited area to plant rice. High demand on sugar had made the Dutch colonial government invited foreign investment for sugar processing factory. All sugar factories remaining in production until now are mostly the legacy of the Dutch colonial period. Since 1995 to 2011, harvested areas of sugarcane and production of sugar has been in the second rank, after pal oil. Figure 1.10 shows the extent of harvested area and production of the cash crops.



**Figure 1.10.** Rubber, palm oil, cacao, and coffee production and harvested area (1995–2011)

To fulfill protein from animal, Indonesia also produces eggs and meat. In the past, almost each household maintain livestock, especially chicken, duck, goat, and sheep. Farmers often have cow and buffalo, for milk, or meat. Cow and buffalo are also beneficial on rice planting season, for plowing the rice field. As demand in the urban areas is increasing, animal husbandry companies are also

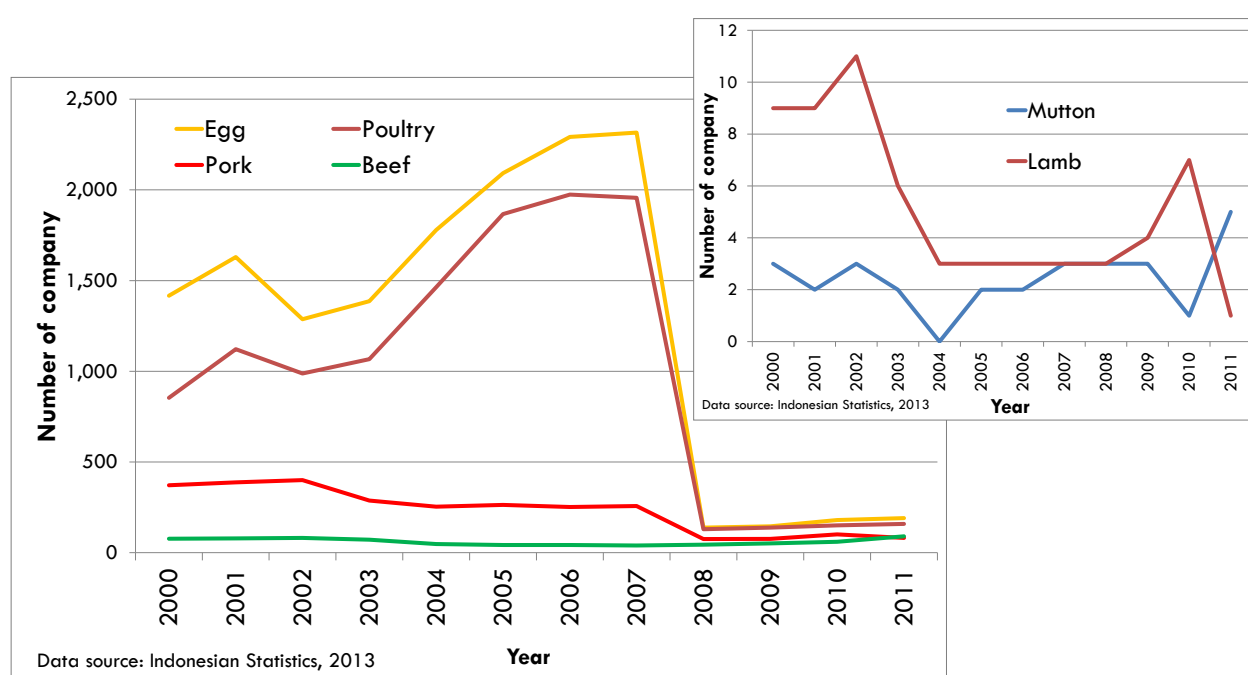
increasing. Table 1.2 and Figure 1.11 show the status of animal husbandry companies from year 2000 to 2011.

**Table 1.2.** Status of animal husbandry companies producing eggs and meat (2000–2011)

Year	Egg	Poultry	Beef	Buffalo	Mutton	Lamb	Pork
2000	1,417	854	77	17	3	9	372
2001	1,630	1,122	79	16	2	9	388
2002	1,287	988	81	14	3	11	400
2003	1,386	1,067	72	15	2	6	287
2004	1,779	1,464	48	9	0	3	254
2005	2,092	1,867	42	9	2	3	263
2006	2,292	1,974	42	9	2	3	252
2007	2,316	1,956	40	12	3	3	257
2008	138	129	44	6	3	3	75
2009	145	138	51	6	3	4	76
2010	180	151	60	6	1	7	101
2011	191	159	90	1	5	1	81

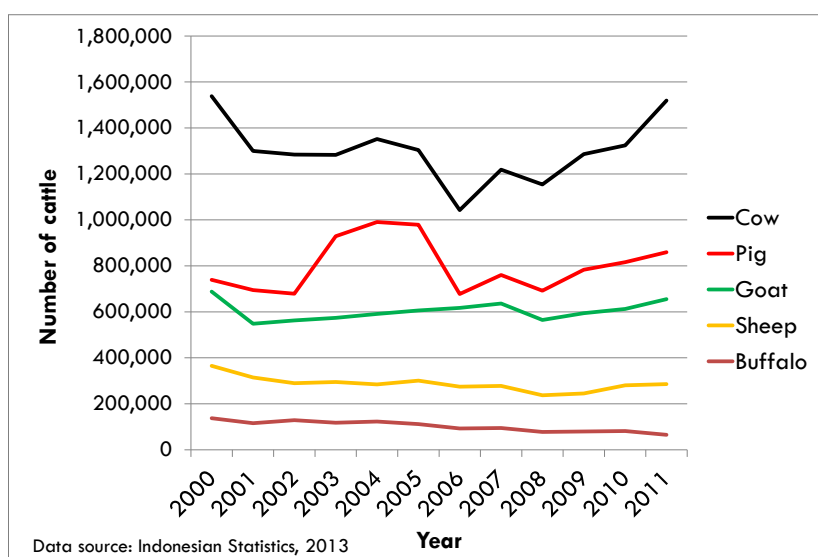
Data source: Indonesian Statistics 2013

Companies producing eggs and poultry had been increasing from 2000 to 2007 and the number suddenly dropped in 2008. Most probably, avian influenza caused this. Number of companies running for beef production is limited compare to eggs and poultry. To fulfill domestic demand until 2012, Indonesia had been importing beef, especially from Australia, US, and New Zealand. Since 2012, importing quota was reduced to give chance for development of domestic farms.



**Figure 1.11.** Animal husbandry companies (2000–2011)





**Figure 1.12.** Number of cattle slaughtered for meat production (2000–2011)

**Table 1.3.** Number of cattle for meat production (2000–2011)

Year	Cow	Pig	Goat	Sheep	Buffalo
2000	1,538,420	739,666	688,047	365,030	137,470
2001	1,300,241	694,668	548,451	314,922	115,686
2002	1,284,282	679,284	562,845	289,703	128,992
2003	1,283,009	929,076	574,258	295,011	117,749
2004	1,351,711	990,743	590,827	284,452	122,762
2005	1,303,575	978,919	606,384	301,088	112,134
2006	1,042,579	677,848	617,498	274,644	92,636
2007	1,218,560	760,438	636,133	277,971	94,799
2008	1,154,167	691,837	564,815	237,497	77,854
2009	1,286,305	783,156	594,516	245,063	79,436
2010	1,324,154	816,416	612,765	280,610	81,622
2011	1,519,178	859,546	655,517	285,676	64,923

Data source: Indonesian Statistics 2013

While Table 1.2 shows very small number of companies that had been producing mutton and lamb, number of goats and sheep slaughtered was relatively comparable to pig (Table 1.3; Figure 1.12). It is very common in Indonesia, that goat and sheep are maintained individually by communities. Goat and sheep together with cow and buffalo are cattle for the Ied Adha, one of the biggest ceremonies among Moslems. On the day of Ied Adha every year, Moslems who are capable of buying goat, sheep, cow, or buffalo will slaughter the animal and distribute the meat to poor peoples who live nearby. Each goat or sheep belong to one person, while each cow or buffalo belong to seven persons.

#### 1.3.2.2. Forestry products

Indonesia is well-known as exporter of timber since 1960s. Number of logging concession companies had been increasing from 1968 to 1993, extent of forest concession areas had been increasing until 1994 (Figure 1.13). This was because of the policy at that time, which encouraged timber extraction from primary forests throughout Indonesia. Logging concession firstly recorded in 1968 after the enactment of Foreign Investment Act (Act No. 1 of 1967) and Domestic Investment Act (Act no. 6 of 1968). The two Acts included investment for forestry. At first, logging concession was given for exploitation of natural forests for timber production, with the rights given to logging companies that literally called as Forest Management Right (*Hak Pengusahaan Hutan/HPH*). In 1984, the Minister of Forestry issued a decree (hereinafter called Ministerial Decree) on the development of timber

estate/Industrial Plantation Forest (*Hutan Tanaman Industri/HTI*) to produce timber for pulp and paper from fast growing forest tree species. Few years after that, timber production came from felling the natural forest trees and from timber plantation.

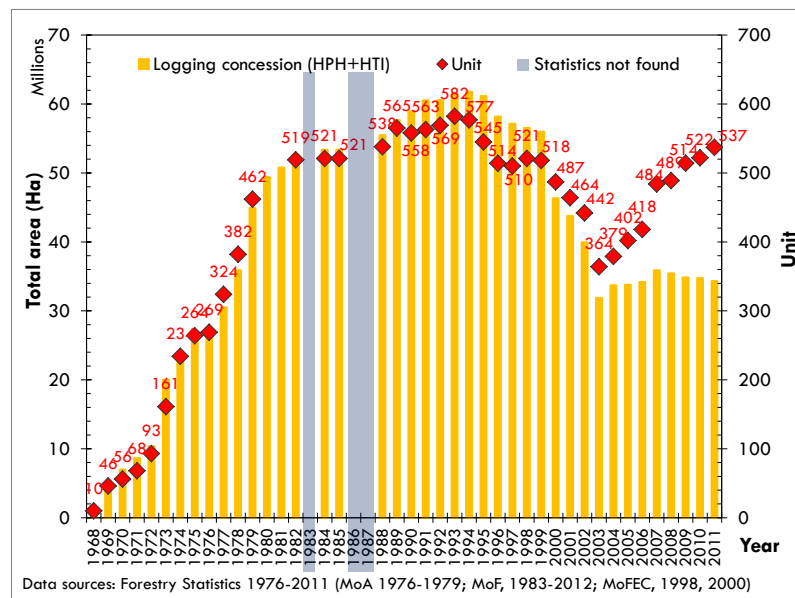


Figure 1.13. Number and extent of logging concessions (1968–2012)

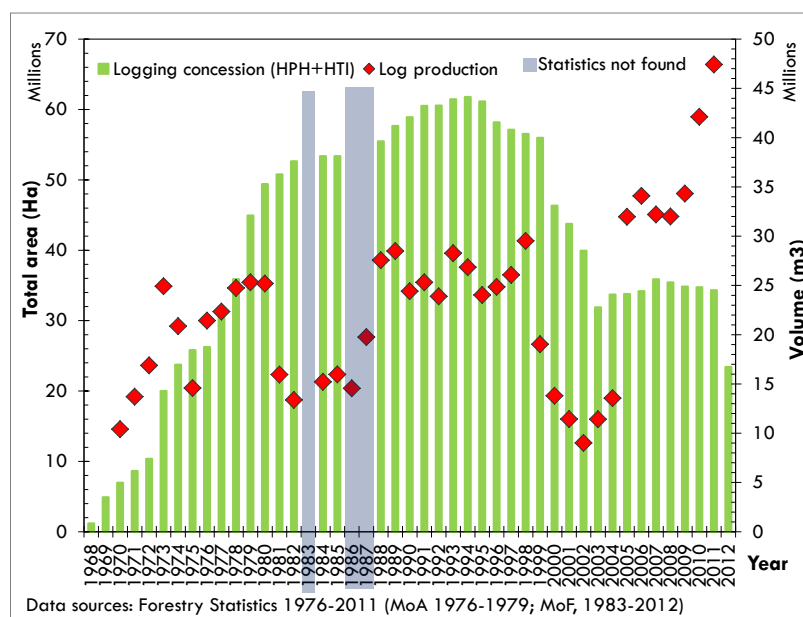


Figure 1.14. Logging concession area and log production (1968–2011)

From 1994 to 2003, both number of logging concession companies and extent of forest concession areas were decreasing and reaching the lowest level in 2003. This was possibly driven by the economic crises that made more than 200 logging companies had to stop their investment in logging concession. At this period, reviews on the performance of logging concession companies were conducted by the Ministry of Forestry (MoF) and Ministry of Forestry and Estate Crops (MoFEC). Companies which did not have good performance were not given renewal of the concession rights.

From 2004 to 2011, although the number of logging concession companies is increasing and almost reaching the level as in 1993, the extent of forest concession area did not increase as much as that in 1993. Most probably, small areas have been allocated to each of the companies. Comparing between the number of HPH and HTI, the ratio in 2011 was 57% and 43%.

Timber production (timber felled from the forests) has been recorded since 1961, even before logging concession with silviculture system<sup>1</sup> was formally started in 1970 (**Appendix 3**). Timber production has been fluctuated and reached the lowest in 2002. Though the logging concession area became less than 50% from that in 1994, the log production keep increasing until 2011 (Figure 1.14). Timber produced from HPH and HTI then processed into several wood products, namely sawn timber, plywood, pulp, veneer sheet, particle board, and fiber board. Further explanation on the timber products is provided in Sub-section 2.7.4.1.

## 1.4. Social Factors

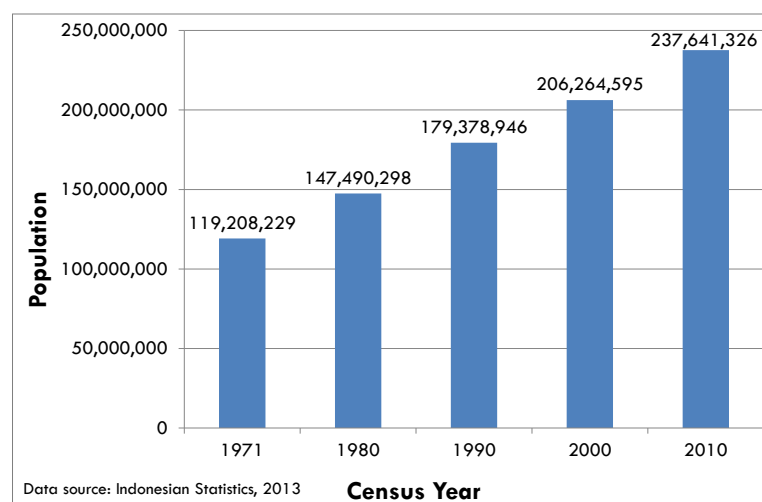
### 1.4.1. Population

Indonesian population has been increasing since the first population census in 1971 up to the recent one in 2010. Annual growth rate from 1971 to 1980 was 2.6% and continue decreasing between 1980 and 1990 (2.2%), 1990–2000 (1.5%) and 2000–2010 (1.5%). If the annual growth rate is remaining the same between 2010 and 2020, in 2020 the population of Indonesia will reach 273,791,049. Table 1.4 and Figure 1.15 show the increase of Indonesian population in each census year.

**Table 1.4.** Indonesian population and annual growth (1971–2010)

Census Year	1971	1980	1990	2000	2010
Population	119 208 229	147 490 298	179 378 946	206 264 595	237 641 326
Annual Growth (%)		2.6	2.2	1.5	1.5

Data source: Indonesian Statistics 2013



**Figure 1.15.** Population of Indonesia (1971–2010)

### 1.4.2. Culture and language

Indonesia is a diverse country, not only in biological aspect, but also in socio-cultural aspect. According to Encyclopedia of Ethnic Groups in Indonesia (Hidayah 1997), there are 568 ethnic groups in Indonesia. These ethnic groups spread throughout Indonesia from Sabang (the most west) to Merauke (the most east), including Timor Leste. Identities of each ethnic group are (1) someone's emotional bond with his/her place or group, (2) social unit that provide his/her basic social position, and (3) ethnic language that becomes main communication tool between him/her with his/her ethnic group. If each ethnic group is identified by their own ethnic language they use, language experts could record more than 500 ethnic languages in Indonesia (Grimes 1984 *in* Hidayah 1997). However, ethnic language is not always becoming indicator to differentiate one ethnic group to another. Some ethnic groups in western part of West Java use Sundanese language that becomes the identity of Sunda Priangan ethnic group (spread on eastern part of West Java): Baduy, Banten, Bogor, Cirebon, Naga, etc. Likely, Melayu language is used by most of ethnic groups in Sumatera Island and western part of Kalimantan (Borneo Island).

<sup>1</sup> Further explanation on the silviculture system is provided in Sub-section 2.6.3.1.



With so many ethnic groups in Indonesia, there must be many cultures exist in Indonesia. The cultures of each ethnic are influenced by the characteristics of each ethnic and religion. C. Geertz (1963) in Hidayah (1997) classified two cultures developed in Indonesia, namely: “Inner Indonesia” and “Outer Indonesia”. While H. Geertz (1963) in Hidayah (1997) classified three cultures developed in Indonesia, namely: culture of irrigated farming communities, culture of coastal which colored by Islamic culture, and culture of nomadic upland farming and hunting. Until now, both of these opinions are still exist in Indonesia, where “Inner Indonesia” that includes Java, Madura, and Bali islands is characterized by irrigated farming and coastal cultures with intensive agricultural technologies. While the three cultures of H. Geertz are still exist in “Outer Indonesia” which means other parts of Indonesia other than Java, Madura, and Bali.

All of those cultures and ethnic groups emerged and acknowledged for the first time in 1928 when Youth Pledge was made by the youth from almost all major ethnic groups throughout Indonesia in October 28, 1928. The Youth Pledge was acknowledgement for one country, one nation, and one language: INDONESIA. Although the cultures, ethnic groups, religions are diverse, with one INDONESIA, we become a Unity in Diversity (*Bhinneka Tunggal Ika*; Sanscrete language).

### 1.5. Governance Issues

Indonesia is implementing presidential republic government with democratic multiparty. It means that the head of the government and the head of the country is president. Similar to other democratic countries, Indonesia's political system is based on *Trias Politica*, namely power of legislative, executive, and judicative. Legislative power is held by People's Advisory Assembly (*Majelis Permusyawaratan Rakyat/MPR*). Members of MPR are all members of House of Representative (*Dewan Perwakilan Rakyat/DPR*) and Local Representative Council (*Dewan Perwakilan Daerah/DPD*). DPR members are representatives of political parties, while DPD members are directly elected by the people in respective election areas. MPR members serve for the period of five years.

Executive power is centered at the president, vice president, and the cabinet. Indonesian cabinet is presidential cabinet that all ministers are responsible to the president and they are not representative of political party in the parliament (*DPR*). However, some of ministers in the current cabinet are leaders in some political parties. The President decided to choose these ministers in order to maintain stability of the government due to their strong political position in the *DPR*. Fortunately, strategic and important ministries are led by ministers who have expertise in their fields.

Before amendment of 1945 Constitution (*Undang-undang Dasar 1945/UUD 1945* hereafter is called the 1945 Constitution), judicative power is implemented by Supreme Court (*Mahkamah Agung/MA*) only. After the amendment, since 2004, judicative power has been implemented by Supreme Court, Judicial Commission (*Komisi Yudisial/KY*), and Constitutional Court (*Mahkamah Konstitusi/MK*). Judicative power includes administering judges. Nevertheless, Ministry of Law and Human Rights is still governing the topic.

### 1.6. Summary of Chapter 1

Indonesia as a fertile-agricultural country – in the mountainous geologic natural landscape and richness of biological diversity – has played an important role in producing agricultural products since the colonial period. Thirty years after Indonesian Independence, in 1970s, timber as forest products from natural forest at production forest areas dominated the country's revenue. However, thirty years later, in year 2000s, timber from natural forests has been replaced by timber from plantation forests. The change in forest structures was following the growth of population, reaching two folds from 1971 to 2010. The change in forest stand structures and population growth did not spread evenly throughout Indonesia. With different socio-cultural conditions, factors determining change in forest cover and forest transition cannot be generalized for the whole Indonesia.

## 2. FORESTS AND FORESTRY IN INDONESIA

### 2.1. Types of Forests Based on Ecosystems and Biogeography

Forest is a unit of ecosystem in the form of lands comprising biological resources, dominated by trees in their natural forms and environment, which cannot be separated each other (Act No. 41 of 1999 on Forestry). Types of forest are influenced by types of ecosystem and biogeography. Ecosystem is influenced by edaphic, climate, and elevation factors. Based on edaphic factor, types of forest are: coastal forest, mangrove forest, swamp forest, limestone forest, peat forest, peat swamp forest, and heath (*kerangas*) forest. Based on climate, Indonesia is divided into three categories: type A (very wet) covers Sumatera Island, Kalimantan Island, western and central part of Java Island, and western part of Sulawesi Island; type B (wet) covers eastern part of Sulawesi Island, Maluku Islands (the Moluccas), and most part of Papua Island; and type C (semi-arid) covers eastern part of Java Island, some part of Madura Island, Bali Island, Nusa Tenggara (Lesser Sunda Islands), and southern tip of Papua Island. Based on these climate types, types of forest in each island in Indonesia are: rainforest, evergreen forest, deciduous forest, monsoon forest, and savanna forest, respectively. Finally, based on elevation, type of forest are: coastal forest, lowland forest, sub-montane forest, montane forest, mist forest, and alpine forest. Types of forest can also be classified based on its origin (primary forest or secondary forest) and how the forest re-grows (natural, artificial, or mixed).

Section 1.2.2 explained three main biogeography of Indonesia, namely Sunda Shelf, Wallacea Area, and Sahul Shelf, which show influences of mainland Asia vegetation and Australian vegetation to Indonesia. Within these three main biogeography types of forests in each location of Indonesia could be forest as combination of edaphic, climate, and elevation factors, as well as originality and re-growth.

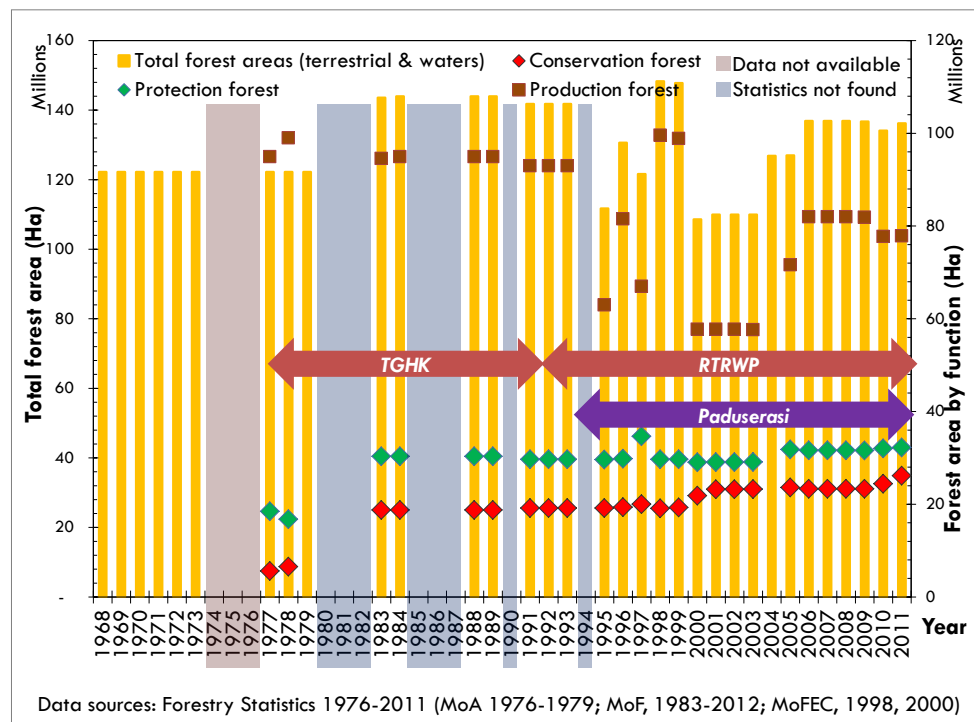
### 2.2. Forest Land Use Planning (*TGHK*), Provincial Spatial Planning (*RTRWP*), and Synchronization of Provincial Land-use Planning (*Paduserasi*)

Based on Act of the Republic of Indonesia No. 41 of 1999 on Forestry (UU No. 41/1999 hereafter called Forestry Act) Article 4 (2) and Article 19 (1), the State gives authority to the government to stipulate the status of certain area as forest area or forest area as non forest area, and stipulate the change of designation and function of forest area. During the enforcement of Basic Forestry Law (UU No. 5 of 1967), that later repealed and replaced by the Forestry Act, in order to ensure the law enforcement to forest area, Minister of Agriculture or Minister of Forestry had designated forest areas in each province throughout Indonesia, based on Forest Land Use Planning by Consensus (*Tata Guna Hutan Kesepakatan/TGHK*). Two ministers were involved, because before Ministry of Forestry was established; all forest and forestry aspects were under the control and management of Minister of Agriculture. Forest *TGHK* is a consensus between stakeholders in the province to determine spatial allocation of forest area and its function that realize by signatures on the map (Ministerial Regulation No. P50/2009).

In 1992, by the enactment of Act of the Republic of Indonesia No. 24 of 1992 on Spatial Layout, Governor as the head of provincial government conducting spatial layout and making a planning for their respective provincial area (*Rencana Tata Ruang Wilayah Provinsi/RTRWP*). *RTRWP* is an operational strategy of national policy direction and utilization strategy of national spatial at the provincial areas (Ministerial Regulation No. P50/2009). In 1994, through Minister of Internal Affairs' Instruction No. 474/4263/Sj, synchronization between *TGHK* map and *RTRWP* map must be done. This synchronization is called *Paduserasi*. *Paduserasi* is harmonization of forest area function and Non-forest Area (*Areal Penggunaan Lain/APL*) based on *TGHK* that are different with forest area function and *APL* based on *RTRWP*, so that forest area function and *APL* could be agreed (Ministerial Regulation No. P50/2009). Until 2009, *paduserasi* has been conducted throughout Indonesia, except for Central Kalimantan, Riau, and Riau Islands Provinces.

The result of proses *TGHK* and *paduserasi* process has been recorded in the Forestry Statistics annually. Though the collection of Forestry Statistics is incomplete, Figure 2.1. shows the total of forest areas and by function as the result of *TGHK* and *paduserasi*. From the figure, it is shown that extent of forest area, bith total and based on function is fluctuating. This caused by incomplete

process of either *TGHK* and *paduserasi* in each province, as shown from 1994 to 2005. Other reason is the possibility of de-designation of forest areas to become Non-forest Area (APL), which can only be applied in Convertible-Production Forest Area (*Hutan Produksi yang dapat Dikonversi/HPK*). Or the combination of both, such as shown from 1994 to 2006. From 2006, most provinces had finalized their *RTRWP* and *paduserasi* had also been expressed in the extent of forest areas as designated by the Ministry of Forestry. Extent of protection forest has been stabil, while there was an increase in conservation forest areas from year 2000, because of new establishment of some national parks. Detailed explanation on the forest area status and function is in Section 2.3.3.



**Figure 2.1.** Progress of *TGHK* & *Paduserasi* on forest areas designation

## 2.3. Forest Areas

### 2.3.1. Definition of forest

Forestry Act defines 'Forest' as a unit of ecosystem in the form of lands comprising biological resources, dominated by trees in their natural forms and environment, which cannot be separated each other. The Forestry Act definition is broad yet descriptive. Subordinate legislation detailing the meaning of forest is not available. However, Indonesia through National Standardization Agency issued SNI 7645: 2010 (Indonesian National Standard/SNI number 7645 of 2010) on Land Cover Classification, as already explained in Section 1.2.3. **There are 7 classes of forests out of 23 land cover classes, namely: (1) primary dry-land forest, (2) secondary dry-land forest, (3) primary swamp forest, (4) secondary swamp forest, (5) primary mangrove forest, (6) secondary mangrove forest, and (7) industrial plantation forest (Table 2.1).**

### 2.3.2. Definition of forest areas (forestland)

Forest area is defined as an area designated or stipulated by the government to be retained as a permanent forest (Forestry Act 1999). Such designation or stipulation is important to maintain legitimate status of forest area, boundary demarcation, and the size of particular areas. This is also intended to maintain and secure the existence and integrity of forest area.

**Table 2.1.** Definition of forests

Classification of forest			Definition
Forest*			a unit of ecosystem in the form of lands comprising biological resources, dominated by trees in their natural forms and environment, which cannot be separated each other
(1)	primary	dry-land forest **	Forests which grew and developed at dry-land habitat, such as lowland forest, hill forest, and montane forest or tropical montane forest, which are compact and without human intervention or there is no evidence of felling.
(2)	secondary	dry-land forest**	Forests which grew and developed at dry-land habitat, such as lowland forest, hill forest, and montane forest or tropical montane forest, which already experiencing human intervention or showing evidence of felling (tracks or ex-felling print).
(3)	primary	swamp forest**	Forests which grew and developed at wetland habitat, especially swamp, both brackish-swamp and peat-swamp, and without human intervention.
(4)	secondary	swamp forest**	Forests which grew and developed at wetland habitat, especially swamp, both brackish-swamp and peat-swamp, and already experiencing human intervention.
(5)	primary	mangrove forest**	Forests which grew and developed at wetland habitat, without human intervention, with mangrove as dominant vegetation.
(6)	secondary	mangrove forest**	Forests which grew and developed at wetland habitat, already experiencing human intervention, with mangrove as dominant vegetation.
(7)	industrial	plantation forest***	Forests which are planted or developed on production forests areas by forestry industrial groups to improve the potential and quality of production forests by implementing silvicultural system in order to fulfill industrial raw materials demand.

Source: \* Forestry Act 1999, \*\* SNI 7645: 2010, \*\*\* Government Regulation No.6, 2007

The definition of forest area refers to the land or boundary of an area, whether or not forest is existed. Article 18 of the Forestry Act stated:

*“(1) Government shall stipulate and maintain the adequacy of forest area and forest cover for each watershed and or island in order to optimize the environmental, social and economic benefits of local communities.*

*“(2) the extent of forest area to be retained as referred to in paragraph (1), is at minimum 30% (thirty percent) of the total area of watershed and or island which should be evenly (or proportionally) distributed”.*

Considerations for determination of 30% were explained the Elucidation of the Forestry Act, that Indonesia is a tropical country with high precipitation intensity, having terrestrial configurations/topographies which are wavy, hilly, and mountainous that is sensitive to disturbances of hydrological balance, such as flood, erosion, sedimentation, and drought. Therefore, the minimum forest area in each watershed and or island is set to 30% from the terrestrial area. Next, the government designates forest area for each province and district/city based on the following conditions: biophysics, climate, demography, socio-economic condition of local communities.

Forest area in Indonesia is determined by the Minister of Forestry through issuance of Ministerial Decree on the Designation of Provincial Forest Area and Inland Water, Coastal and Marine Ecosystem. Therefore, the definition of forest area also includes inland waters which usually surround conservation forest areas. Based on 2011 Forestry Statistics (MoF 2012), the total forest area of Indonesia is 136 173 847.98 ha.

### 2.3.3. Types and extent of forest areas

The Forestry Act categorizes forests based on the ownership status and the function. There are two ownership statuses, namely **state forest** (*hutan negara*, or interchangeably is called national forest) and **titled-forest** (*hutan hak*). State forest is a forest located on lands bearing no ownership rights. Titled-forest is a forest located on lands bearing ownership rights. In the Elucidation of the Forestry Act, titled-forest is generally known as private forest (*hutan rakyat*; hereafter is called private forest).

Irrespective of the ownership status, the Forestry Act defines three categories of forest functions: conservation (*konservasi*), protection (*lindung*), and production (*produksi*). Based on these functions, the national forest areas then are categorized into conservation forest (*hutan konservasi*), protection forest (*hutan lindung*), and production forest (*hutan produksi*). Conservation forest is forest area with specific characteristics with main function of preserving the diversity of plants and wildlife and their ecosystems. The Forestry Act further mentions that the conservation forest areas consist of nature reserve forest area (*kawasan hutan suaka alam*), nature conservation forest area (*kawasan hutan pelestarian alam*), and hunting park (*taman buru*). Protection forest is a forest area with the main functions of protecting life support systems for managing hydrology, preventing floods, controlling erosion, preventing sea water intrusion, and maintaining soil fertility. Production forest is a forest area with the main function of producing forest products. Ministry of Forestry/MoF made further categorization of production forest. Based on the utilization, the production forest is categorized into fixed-production forest (*hutan produksi tetap/HP*), limited-production forest (*hutan produksi terbatas/HPT*), and convertible-production forest (*hutan produksi yang dapat dikonversi/HPK*). The last category is the only forest areas that can be de-designated for non-forestry purposes activities, for example transmigration projects, mining, and agricultural plantation (MoF 2012). The Forestry Act also regulates globally on affirmation processes of forest areas, while the details of the processes, including de-designation processes, are determined in the subordinate regulation.

As mentioned in the previous section, the Minister of Forestry issued Ministerial Decree on the Designation of Provincial Forest Area and Inland Water, Coastal and Marine Ecosystem to each province. Table 2.2 shows the extent of forest areas based on each category. From this extent of forest areas, until today only about 17% finished the legal process to stipulate them as forest areas (*pengukuhan hutan*). The remaining areas are still in the status of ‘designated’, it means the areas are not having the status of ‘forest areas’ yet and could be ‘de-designated’ when the evidence of owned-property could be shown. In this extent of forest areas, “*Adat forests*” are also included<sup>2</sup>.

Moreover, those ministerial decrees only designated forest areas for each province, which means national forest. Designation on private forest is not becoming part of MoF job description. Nevertheless, MoF has been facilitating people to develop private forest in their abandoned or degraded lands. MoF is also defining the characteristics of private forest as a piece of forest that belong to the people with minimum size of 0.25 ha and having canopy of woody trees or other plants with more than 50 % tree’s crown cover or other plant which planted at the first year minimum density of 500 trees per hectare (MoF 2012). In their publication, MoF often called right forest as private forest or community-owned forest, interchangeably.

**Table 2.2.** Extent of National Forest Areas

Category of forest areas	Area (ha)	% to total
1. Sanctuary Reserve + Nature Conservation forests		
1) Waters	4 894 732	0.036
2) Terrestrial	21 232 007	0.156
Total	26 126 739	0.192
2. Protection forest	32 211 815	0.237
3. Production forest		
1) Limited production forest	22 818 159	0.168

<sup>2</sup> Further explanation on “*Adat forests*” is given in Sub-section 2.6.1.1.

2) Permanent production forest	34 142 046	0.251
3) Convertible production forest	20 875 089	0.153
4. Hunting Parks	220,951	0.002
Total of terrestrial forest areas	131 279 116*	1
Total forest areas (terrestrial & waters)	136 173 848*	1

Note: \* excluding hunting parks. Source: MoF 2012

## 2.4. Protected Areas

### 2.4.1. Types of protected areas

Based on the Presidential Decree on Protected Areas, there are four main classifications of protected areas, namely: (1) areas that protect its subordinate areas, (2) Local protection areas, (3) sanctuary reserves and cultural sanctuaries, and (4) areas sensitive to natural hazards. Areas that protect its subordinate areas include protection forest areas, peat areas, and water infiltration areas. Local protection areas include coastal areas, riverbank areas, areas surrounding lakes or water dams, and water spring areas. Sanctuary Reserves and Culture Sanctuary includes sanctuary reserve areas, marine sanctuary reserve and other waters areas, coastal areas with mangrove forests, national parks, grand forest parks, nature recreation parks, and areas for culture sanctuary and science. The Presidential Decree mentioned the purpose of protecting each of the types and criteria of protected areas, as summarized in (Appendix 4).

Based on Conservation Act, there are two main classifications of conservation areas: (1) sanctuary reserves (*kawasan suaka alam*) and (2) nature conservation areas (*kawasan pelestarian alam*). Sub-classes of sanctuary reserves are strict nature reserves (*cagar alam*) and wildlife sanctuaries (*suaka margasatwa*). The Conservation Act mentioned that strict nature reserves and other particular areas can be established as biosphere reserves (*cagar biosfir*) based on the framework of international conservation activities. Meanwhile, sub-classes of nature conservation areas are national parks (*taman nasional*), grand forest parks (*taman hutan raya*), and nature recreation parks (*taman wisata alam*). However, this Act does not include hunting parks as one of areas for conservation, even though the Presidential Decree on Protected Areas mentioned it in the type of 'recreational forest' (Appendix 4). It is possibly because one of its allowable activities is wildlife hunting that against conservation meaning. Nevertheless, MoF each year publishes the extent of conservation areas, including hunting parks. The latest data is presented in Table 2.3 and definition of each type is shown in Table 2.4.

**Table 2.3.** Extent of conservation areas

Classification/Type	Terrestrial		Aquatic	
	Units	Areas (ha)	Units	Areas (ha)
<b>Sanctuary reserves</b>				
Strict nature reserve	222	3,957,691.66	5	152,610.00
Wildlife sanctuary	71	5,024,138.29	4	5,588.25
<b>Nature conservation areas</b>				
National park	43	12,328,523.34	7	4,043,541.30
Grand forest park	23	351,680.41	0	0.00
Nature recreation park	101	257,323.85	14	491,248.00
Hunting park	13	220,951.44		
Nature sanctuary reserves	18	275,190.30		
Total: 521 units in 27,108,486.84 Ha	491	22,415,499.29	30	4,692,987.55

Source: MoF 2012

## 2.5. Forestry Regulation

Since the independence of Indonesia in 1945, the Constitution has already mentioned about regulating the control and management of natural resources, including forest. It is stated in Article 33 Paragraph 3 that “the land and the waters as well as the natural richness therein are to be controlled by the State to be exploited to the greatest benefit of the people”. However, until the enactment of Act of the Republic of Indonesia No. 5 of 1967 on Basic Forestry Law, Indonesia was using regulations inherited from the Dutch Colonial Government to regulate forestry affairs. Same faith happened to protected areas and natural living resources, until enactment of Presidential Decree on Protected Areas (*Keppres* No. 32/1990) and Conservation Act (*UU* No. 5/1990). Then in 1999 the Forestry Act (*UU* No. 41/1999) was enacted and replacing Act of the Republic of Indonesia No. 5 of 1967 on Basic Forestry Law. Unlike other countries, when mentioning forest or forestry, it is not only the forest itself or about forest management, but also includes resources therein, the plants, wildlife, their ecosystems, and people related to forest. Therefore, currently there are two Acts and a Presidential Decree that regulate forest resources and related affairs, namely Act of the Republic Indonesia No. 41 of 1999 on forestry (the Forestry Act) and Act of the Republic Indonesia No. 5 of 1990 on conservation of living resources and their ecosystems (Conservation Act), and the President of the Republic of Indonesia Decree No. 32 of 1990 on management of protected areas (the Presidential Decree on Protected Areas).

**Table 2.4.** Definition of each type of conservation area based on Conservation Act

Classification/Type	Definition
<b>Sanctuary reserves</b>	a specific terrestrial or aquatic area having sanctuary as its main function preserving biodiversity plant and animal as well as an ecosystem which also acts as a life support system
Strict nature reserve	a sanctuary reserve area having a characteristic set of plants, animals and ecosystems, which must be protected and allowed to develop naturally
Wildlife sanctuary	a sanctuary reserve area having high value of species diversity and/or a unique animal species, in which habitat management may be conducted, in order to assure their continue and existence
Biosphere reserves	an area of native, unique, and/or degraded ecosystems, where all natural components need to be protected and sustained for its importance research and education
<b>Nature conservation areas</b>	a specific terrestrial or aquatic area whose main function are to preserve diversity of plant and animal species, as well as to provide a sustainable utilization of living resources and their ecosystems
National park	a nature conservation area which possesses native ecosystems, and which is managed through a zoning system utilized which facilitates research, science, education, breeding enhancement, recreation, and tourism purposes
Grand forest park	a nature conservation area intended to provide a variety of indigenous and/or introduced plants and animals for research, science, education, breeding enhancement, culture, recreation and tourism purposes
Nature recreation park	a nature conservation area mainly intended for recreation and tourism purposes
Hunting park*	a forest area determined as a park area for hunting

Sources: Act No.5, 1990; \*Definition from No. 41, 1999

### 2.5.1. Definition of protected areas

According to Decree issued by the President of the Republic of Indonesia No. 32 of 1990 on management of protected areas (*Keppres* No. 32/1990 hereafter is called the Presidential Decree on Protected Areas), protected area is an area stipulated with main function to protect environment sustainability that consists of natural resources, artificial resources, and historical and cultural values for the sake of sustainable development. This decree classified protected areas into 4 main categories with sub-categories each. Classification of protected areas based on this Presidential Decree is explained in Section 2.4.1.

Meanwhile, within fifteen (15) days after the issuance of the Presidential Decree No. 32 of 1990, an act which regulates conservation of living resources and their ecosystems is enacted and put in the State Gazette. It is Act of the Republic of Indonesia No. 5 of 1990 on Conservation of living resources and their ecosystems (*UU* No. 5/1990 hereafter is called Conservation Act). The Conservation Act regulates classification of nature conservation areas. In this Act, conservation areas are classified into two main classes with sub-class/type in each. When compared to the Presidential Decree on Protected Areas, these classifications are parts of two out of four main categories. Classification of conservation areas based on this Act is explained in Section 2.4.1.

### 2.5.2. Forestry Act

Forestry Act is giving power to the State to control all forests within the territory of the Republic of Indonesia for the maximum welfare of the people. The control over forests is authorizing the Government of Indonesia (GoI) to regulate and organize all aspects related to forest, forest area, and forest products. It is also authorizing the GoI to stipulate the status of certain area (non-forest area, as forest or non-forest) as a forest area or non-forest area, and to regulate and stipulate legal relations between people and forest, and regulate legal actions on forestry. Forest control by the State remains taking into account the rights of customary law communities, as long as they actually still exist and the existence is recognized, and does not contradict the national interests (Article 4). Elucidation of the Forestry Act stated that the control of forests by the State does not constitute ownership but the State grants authority to the government to regulate and take care of everything related to forests, forest areas and forest products, stipulate forest areas and or change the status of a forest areas, regulate and stipulate legal relationships between people and forests or forest areas and forest products and regulate legal acts about forestry. Further, the government is authorized to grant licenses and rights to other parties to undertake activities in the forestry sector. However, in certain very important cases of a large scale and with a broad impact and a strategic value, the government must take account of people's aspirations through the approval of the House of People's Representatives. The term "control" does not mean "own" but a definition containing obligations and authorities in public law.

Forestry Act regulate and organize all aspects related to forest, forest area, and forest products arranged in chapters, namely: status and function of forest, forest administration, forestry planning, forest management, forestry research and development, education and training, and forestry extension, supervision, delegation of authority, customary law community, community participation, class action, resolution of forestry disputes, investigation, provisions of criminal conducts, compensation and administrative sanction, transitional provisions, and concluding provisions.

Following the characteristics of a higher legislation in Indonesia (Damayanti 2008), Forestry Act is not described in detail. Therefore, it needs lower legislation and subordinate regulations to form the details. Lower legislation to an Act will be government regulation substituting act (*peraturan pemerintah pengganti undang-undang*), government regulation (*peraturan pemerintah*), presidential regulation (*peraturan presiden*), and regional regulation (*peraturan daerah*). Subordinate regulations are presidential decrees (*keputusan presiden*), presidential instructions (*instruksi presiden*), ministerial decrees (*keputusan menteri*), ministerial regulations (*peraturan menteri*), and circulars within the departments (*surat edaran*) related to the certain topic of the Act. Since its enactment in 1999, Forestry Act has both lower legislations and subordinate regulations detailing each article in the Act. Almost all lower legislations and subordinate regulations of this Act have been renewed, but there might be some that still relevant to the Act even though those lower legislation or subordinate regulation are attached to the previous Forestry Act (Act no. 5/1967 on Basic Forestry Law).



An Act needs examination and approval from the House of Representatives before being signed by the President and then enacted in the State Gazette of the Republic of Indonesia. Thus it has strong position in front of Indonesian Law. Although, an Act (as one of higher legislations) and lower legislations are considered as having strong position in front of the Law, their contents can be challenged in the Constitutional Court (MK). An Act can also be replaced by a new Act replacing it through amendment of certain Articles or the whole content of the Act.

### 2.5.3. Presidential Decree on Protected Areas

President of the Republic of Indonesia No. 32 of 1990 on management of protected areas (*Keppres* No. 32/1990 hereafter is called the Presidential Decree on Protected Areas) has been the only subordinate regulation containing management of protected areas. Although in a few days after its issuance, Conservation Act (Act No. 5/1990) was enacted, the contents of the Act (as described in Section 2.5.1) are not as broad as the Presidential Decree.

As already mentioned in Section 2.4.1, the Presidential Decree on Protected Areas put out the main policy of protected area into four main classifications of protected areas, which then breakdown into specific areas with certain purposes and criteria. The Decree then stated the stipulation of protected areas, control over protected areas, utilization of protected areas, and review on protected areas once in five years whenever considered necessary. Each Provincial Government was obliged to issued Regional Regulation on the stipulation of protected and areas within two years after the issuance of the Presidential Decree and followed by the implementation in each province.

### 2.5.4 Conservation Act

Act of the Republic Indonesia No. 5 of 1990 on conservation of living resources and their ecosystems (Conservation Act) is the first Act in Indonesia that regulates conservation of living resources and their ecosystems. This Act repealed previous Acts inherited from the Dutch Colonial Period, namely: (1) Act on Hunting (*Ordonansi Perburuan/Jachtordonnantie* 1931 *Staatsblad* 1931 Nummer 133); (2) Act on Wildlife Protection (*Ordonansi Perlindungan Binatang-binatang Liar/Dierenbeschermingsordonnantie* 1931 *Staatsblad* 1931 Nummer 134); (3) Act on Hunting in Java and Madura (*Ordonansi Perburuan Jawa dan Madura/Jachtoddonnantie Java en Madoera* 1940 *Staatsblad* 1939 Nummer 733); and (4) Act on Nature Protection (*Ordonansi Perlindungan Alam/Natuurbeschermingsordonnantie* 1941 *Staatsblad* 1941 Nummer 167).

An Act is prepared and then enacted usually considering or referring other related Acts already enacted or other higher legislation, so that it will not contradict horizontally and vertically. Therefore, whenever referred Act is amended or replaced by a new one, the respected Act needs to be reviewed. Conservation Act is considering and referring several Acts and one of them is Act No. 5 of 1967 on Basic Forestry Law. The Basic Forestry Law was replaced by Forestry Act in 1999. As an Act prepared and enacted in 1999, it becomes and confusing situation that the Forestry Act is now considering and referring Conservation Act, while Conservation Act is considering and referring the Act replaced by Forestry Act. There has been an effort in preparing a new Conservation Act to replace the current one. However, the assessment and approval seems still need time.

Based on Conservation Act, there are three activities for the conservation of living resources and their ecosystems, namely (1) protection of life support systems; (2) preservation of plant and animal species diversity and their ecosystems; and (3) sustainable utilization of living resources and their ecosystems. For the first activity, the Conservation Act gives the definition, and giving order to the government to enact certain areas as a life support system protection area, basic guidelines for regulating a life support system protection area, and procedures for utilization of life support system protection areas, including rights and obligation to the land holders where the first activity is conducted and giving order to the government to regulate and conduct law enforcement of land management and utilization, and concession right to aquatic areas.

For the second activity, the Conservation Act stated that it has to be conduction through (1) preservation of plant and animal diversity within their ecosystem and (2) preservation of plant and animal species in an individual sense, in the form of Sanctuary Reserves Areas. Details on the establishment of Sanctuary Reserves Areas are stated to be regulated in the subsequent Government

Regulation. Conservation Act described broadly on the utilization, research and development, and prohibited actions within Sanctuary Reserves.

Finally for the third activity, Conservation Act stated that it must be accomplished through (1) utilization of the environmental condition of nature conservation area itself and (2) utilization of wild species of plant and animal, with establishment of nature conservation areas. Detail on the establishment of Nature Conservation Areas is stated to be regulated in the subsequent Government Regulation. Conservation Act described broadly on the utilization, research and development, and prohibited actions within Nature Conservation Areas. Conservation Act is also regulating citizen participation and sanction when the Act is violated.

## 2.6. Forestry Administration (Governmental)

### 2.6.1. Forest ownership

Section 2.3.3. already explained the classification of forest based on ownership, namely state forest/national forest and titled-forest/private forest. Further explanation on each is presented in the following Sub-section.

#### 2.6.1.1. State Forest (*Hutan negara*)

Forestry Act defines State Forest (or interchangeably is called national forest) as a forest located on lands bearing no ownership rights. Section 2.3.3 already mentioned the categories and extent of national forest areas based on the functions. The definition of State forest includes *adat* or customary forest. Forestry Act defines *Adat* or customary forest as state forest that is located in the territory of community upholding customary Acts.

The elucidation of the Act mentioned the following:

*In anticipation of the development of community aspirations, in this law forests in Indonesia are categorized into state forests and titled forests. State forests are forests located on land on which land titles pursuant to Act No. 5/1960 are not conveyed, including the forests which were previously controlled by the communities upholding customary Acts called communal forests, clan forests or other terms. The inclusion of forests controlled by the communities upholding customary Acts in the definition of state forests is the consequence of the presence of the right to control and handle on the part of the State as an organization of power of the entire people in the principle of the Unitary State of the Republic of Indonesia. Therefore, the communities upholding customary Acts, as far as they actually still exist and their existence is recognized, may undertake forest management and forest product collection activities.*

Although legislations including Acts have strong position in the law of Indonesia, their contents can be challenged in the Constitutional Court (*MK*). Recent update from the Constitutional Court (*MK*), dated May 16, 2013, that the *MK* granted some of the challenged material on Forestry Act filed by CSO (Civil Society Organization), namely Indigenous Peoples' Alliance of the Archipelago (*Aliansi Masyarakat Adat Nusantara/AMAN*) and two *adat* communities, namely *Kanegerian Kuntu* and *Kasepuhan Cisit*. *AMAN* and two *adat* communities challenged some articles related to *Adat* forest in Forestry Act, that *Adat* forest is not State forest. The *MK* granted this and in its decision, *MK* abrogated some words, phrases, and paragraphs in Forestry Act. For example, the *MK* abolished the word "state" in Article 1 number 6 of the Forestry Act, so it becomes "*Adat* forest is forest that is located in the territory of community upholding customary Acts". Article 5 paragraph 1 of the Forestry Act becomes "State forest as referred in paragraph (1) letter a does not include *Adat* forest, and the *MK* abolished the frase "and paragraph (2)" in the Article 5 paragraph (3).

The *MK* has opinion that State forest and *Adat* forest must have different management, so arrangement on the relation between the rights of the State to control on State forest and the rights of the State on *Adat* forest. On State forest, the State has full authority to regulate the purpose, utilization, and law relations within State forest areas. Meanwhile on *Adat* forest, the State's authority is limited as far as the authority within *Adat* forest. *Adat* forest is in the customary rights within one unitary area of communities upholding customary Acts. Therefore, in the concluding decision of the *MK*, forest is categorized into two statuses, namely State forest and Titled-forest. Titled-forest is classified into *Adat* forest (customary rights) and individual/corporate body. These three statuses at the highest level are controlled by the State.

As the result of the appeal by AMAN and two Adat communities, millions of hectares of *adat* forests which were claimed as State forest are now recognized as *Adat* forest and can be managed by *Adat* communities who inhabited the *Adat* forests (Amri & Sukmawati, 2013).

#### 2.6.1.2. Titled-Forest (*Hutan hak*)

Forestry Act defines private forest as a forest located on lands bearing ownership rights. Elucidation of the Act mentioned that:

*Titled-forests, meanwhile, are the forests located on the land on which land titles are conveyed pursuant to the provision in Act No. 5/1960 on basic regulation on agrarian principles such as the proprietary rights, land titles for business purposes and the rights of use.*

The Forestry Act does not regulate the Titled-forest in detail. In several Articles, it only stated the utilization and protection of Titled-forest are conducted by the land-holders based on the functions as stated in the Act: protection, production, and conservation. Titled-forest is also known as private forest.

There has been no lower legislation on Titled-forest/private forest. Subordinate regulation that issued related with private forest is usually the Minister of Forestry's regulation (hereafter is called Ministerial Regulation), although designation on private forest is not becoming part of MoF job description. The MoF has been facilitating people to develop private forest in their abandoned or degraded lands. MoF is also defining the characteristics of private forest as a piece of forest that belong to the people with minimum size of 0.25 ha and having canopy of woody trees or other plants with more than 50 % tree's crown cover and/or the first year minimum density of 500 trees per hectare (MoF 2012). In their publication, MoF often called right forest as private forest or community-owned forest, interchangeably. Ministerial regulations on the guidelines for private forest utilization (P26/2005), administration on forest product from private forest (P30/2012), and utilization of Notification Letter on the Origin of Timber Forest Product to be used in the transportation of timber forest product from private forest (P51/2006 as amended by P62/2006 and then amended by P33/2007) are the samples of Ministerial regulations regarding private forests. Further explanation on private forest is given in Sub-section 2.7.3.

#### 2.6.2. Forest administration

Article 2 and 3 of the Forestry Act regulate forestry administration. Article 2 stated that forestry administration shall be based on benefit and sustainability, democracy, equity, togetherness, transparency, and integration. Meanwhile, in the Article 3 it is stated the forestry administration shall be oriented for people's maximum welfare based on equity and sustainability principles. This can be achieved through ensuring that (1) forests are sufficient in area and evenly distributed; (2) optimizing the variety of forest functions which cover conservation, protection, and production functions in order to gain balance and sustainable benefits of environment, social, culture and economy; (3) improving the carrying capacity of watershed; (4) improving the capacity to develop community potentials and empowerment through participatory, equal and environmental-friendly ways so as to establish an endurance against the external change; and (5) securing equal and sustainable distribution of benefits. Damayanti (2008) classified forest administration into two levels, namely forest areas under the direct control of Central Government and forest areas under the direct control of local government. Some regulations as the basis of the classification are: Forestry Act; Conservation Act; Government Regulation No. 62/1998 and No. 34/2002, Ministerial Decree No. 107/2003 and No. 394/2004, and Ministerial Regulation No.P.13/2005. Government Regulation No. 34/2002 was repealed and replaced by Government Regulation No. 6/2007 and its amendments. Summary of the forest administration is given in Table 2. 5.

#### 2.6.3. Forest utilization and management

##### 2.6.3.1. Sylviculture system

Sylviculture system is a system for forest cultivation or system of planting the forest, started from choosing the seed or seedling, nursery, planting, maintaining the plants, and harvesting (Government Regulation No. 6, 2007). Based on the felling cycle, sylviculture system can be classified into two (Manan 1995 in Indrawan 2008a): (1) polycyclic system and (2) monocyclic system. Polycyclic system has more than one felling cycle in one management rotation. Monocyclic system has only one felling

in a management rotation. There are 6 silviculture systems has been implemented in Indonesia, as summarized from Indrawan (2008a) as follow:

**Table 2.5.** Administrative organizations of forests and protected areas in Indonesia

Category	Administration	Management
Conservation forest		
Sanctuary reserves		
Strict nature reserves	Central Government	Natural Resources Conservation Offices (NRCOs)
Wildlife sanctuaries		
Nature conservation areas		
National parks	Central Government	National Park Offices
Grand forest parks	Local Governments	Provincial/District Forestry Offices
Nature recreation parks	Central Government	Natural Resources Conservation Offices
Hunting parks	Central Government	NRCOs
Protection forest	Central Government	License holders
	Local Governments	Provincial/District Forestry Offices Licenses holders
Production forest		
Permanent production forest	Central Government Local Governments	Provincial/District Forestry Offices; Licenses holders (private)
Limited production forest	Central Government Local Governments	Provincial/District Forestry Offices; License holders (private)
Convertible production forest	Central Government	Ministry of Forestry

Notes: Local government means Provincial of District Forestry Offices. Licenses for protection forest: utilizing areas, environmental services, or non-timber forest product (NTFP). Licenses for production forest: utilizing areas, exploitation of timber, NTFP, or environmental services.

Source: Damayanti 2008

Development of silviculture system in Indonesia is related to the timber exploitation for the national income. Government Regulation No. 21 of 1970 on forest concession right/license and forest product acquisition right (*Hak Pengusahaan Hutan/HPH* dan *Hak Pemungutan Hasil Hutan/HPHH*) was the starting momentum of timber exploitation in Indonesia, though the timber exploitation has been practiced since 1961. Soon after, by the Forestry Director General Decree No. 35/Kpts/DD/1/1972 on Guidelines for Indonesian Selective Felling (*Tebang Pilih Indonesia/TPI*), Clear Felling with Planting (*Tebang Habis dengan Penanaman/THP*), Clear Felling with Natural Regeneration (*Tebang Habis dengan Permudaan Alam/THPA*), and Monitoring Guidelines was issued and silviculture systems in Indonesia were started. Silviculture systems implemented were *TPI*, *THP* and *THPA*. In 1980, a refinement of *TPI* system was made by the Directorate Reforestation and Rehabilitation. In 1984, the Minister of Forestry issued a decree on the development of timber estate/Industrial Plantation Forest (*Hutan Tanaman Industri/HTI*).

In 1989, through the issuance of Ministerial Decree No. 485/Kpts-II/1989 on the silviculture system for management of natural production forest in Indonesia, the government changed the silviculture system to Indonesian Selective Felling and Planting (*Tebang Pilih Tanam Indonesia/TPTI*), Clear Felling with Natural Regeneration (*Tebang Habis dengan Permudaan Alam/THPA*), and Clear Felling with Artificial Regeneration (*Tebang Habis dengan Permudaan Buatan/THPB*). At that time, *TPTI* became a remarkable silviculture system for Indonesia.

Table 2.6 shows the comparison of requirements between the two systems: *TPI* vs. *TPTI*, in forest ecosystem, minimum diameter that allowed to be cut, the felling cycle, number of core trees (trees must be left in the plot for the next felling cycle), and minimum diameter of core tree. There almost no

difference between *TPI* and *TPTI*, for the minimum diameter of allowable cut and felling cycle for natural-mixed forest. However, *TPTI* has more strict requirements regarding number and diameter of core trees. In the natural-mixed forest when using *TPTI* system, number of core trees was 25 trees per hectare and diameter of 20–49 cm, when commercial species are felled. However, if diameter 20–49 cm of commercial species felled (CF) were less than 25 trees per hectare, the remaining trees could be replaced by commercial species not felled with more than 50 cm in diameter. Number of core trees for swamp forest, especially *Ramin*-mixed forest and *Ramin* species, was set to 25 trees per hectare and diameter of more than 15 cm. From the difference of the two systems, Indrawan (2008a) concluded that the government has been trying to preserve Indonesian tropical rainforest through refinement of the guidelines.

Only four years after the launching of *TPTI*, the government again introduced new silviculture system, which is called Indonesian Strip Felling and Planting (*Tebang Jalur Tanam Indonesia/TJTI*), through the issuance of Director General of Forest Business Decree No. 40/Kpts/IV-BPHH/1993. The target of this system is damaged-logged over areas of *TPTI* that sensitive to encroachment, not suitable for *THPB* system, and in the primary forest that was appointed by the Director General of Forest Business. *TJTI* was also having two kinds of regeneration, as also implemented in the *TPI* and *TPTI*, namely Strip Felling with Artificial Regeneration (*Tebang Jalur Permudaan Buatan/TJPB*) and Strip Felling with Natural Regeneration (*Tebang Jalur Permudaan Alam/TJPA*). *TJTI* was a silviculture system conducted by opening a strip with certain width (50 m, 100 m, and 200 m of open strip; distance between open strip were 50 m, 100 m, and 200 m) by felling trees of diameter more than 20 cm, so that the sunlight could reach the land surface. Indrawan (2008a) recorded that *TJTI* was launched as pilot system only and was not continued with implementation.

The fourth silviculture system was Strip Planting Selective Felling (*Tebang Pilih Tanam Jalur/TPTJ*). This system was introduced by Ministerial Decree No. 435/KPTS II/1997 and Minister of Forestry & Estate Crop Decree No. 625/Kpts-II/1998 on Silviculture System of Selective Felling and Strip Planting in Production Forest Management. *TPTJ* is a silviculture system with preparation felling on logged-over area (LOA) of *TPTI* by selective felling to trees of minimum 40 cm in diameter and making a 3 m wide-clear strip opening and a 27 m wide-gross strip opening. On the clear strip, commercial species was planted with 5 m distance between the trees. Seedling was prepared from natural seeds (natural spread or seedling naturally grown under the trees) and from cuttings of *Dipterocarpaceae* family or *Peronema canescens*. *TPTJ* system was implemented in two forest concession holders, but then repealed by the Minister of Forestry in 1999.

**Table 2.6.** Comparison of requirements between *TPI* and *TPTI* silviculture systems in Indonesia

Silviculture system - Regulation	Forest ecosystem type	Allowable cut (min. Ø cm)	Felling cycle (year)	Number of core trees (trees/ha)	Diameter of core tree (cm)
<b>Indonesian Selective Felling (Tebang Pilih Indonesia/TPI)</b>					
1972*	Any forest ecosystem	50	35	25	≥35
	Any forest ecosystem	40	45	25	≥35
	Any forest ecosystem	30	55	40	≥20
1980*2	Natural-mixed forest	50	35	25	≥20
	Ebony-mixed forest	50	45	16	≥20
	Ramin-mixed forest	35	35	15	≥20
<b>Indonesian Selective Felling and Planting (Tebang Pilih Tanam Indonesia/TPTI)</b>					
1989*3	Natural-mixed forest	50	35	25	CF 20–49; CNF ≥50*4
	Swamp forest				
	Ramin-mixed forest*5	35	35	25	≥15
	Specific for Ramin				

Notes:

\*Director General of Forestry Decree No.35/Kpts/DD/I/1972

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\*2Directorate of Reforestation and Rehabilitation (1980)

\*3Directorate General of Forest Business (1989) in Indrawan (2008a)

\*4if diameter 20–49 cm of commercial species felled (CF) are less than 25 trees/hectare, the remaining trees could be replaced by commercial species not felled with more than 50 cm in diameter

\*5 when  $\geq 50$  Ramin is not available

CF: commercial species – felled (*komersil ditebang/KD*)

CNF: commercial species – not felled (*komersil tidak ditebang/KTD*)

Source: Indrawan 2008a

The fifth silviculture system implemented in Indonesia was Intensive Indonesian Selective Felling and Planting (*Tebang Pilih Tanam Indonesia Intensive/TPTI*) with Intensive Silviculture Techniques (*Silvikultur Intensif/Silin*). This system was using genetic engineering, environmental engineering, and protection of trees from pest and diseases. This system was firstly implemented from 2005 in 6 companies holding Business Permit for Utilization of Timber Forest Products at natural forest (*Izin Usaha Pemanfaatan Hasil Hutan Kayu-Hutan Alam/IUPHHK-HA* or formerly called forest concession holders/*Hak Pengusahaan Hutan-Hak Pemanfaatan Hasil Hutan/HPH-HPHH*), and then expanded to 25 companies in 2007. This system was a modification and integration of two former systems, namely *TJTI* and enrichment planting of *TPTI*. Economic cycle for prime species is 30 years. While this system is said to have many advantages in increasing timber production, it also has disadvantage. This system is implemented in the LOA of *TPTI* without paying attention to the felling cycle of *TPTI* (35 years for felling cycle and 70 years for felling rotation).

The last and the newest silviculture system which was proposed in 2008 by academicians is Silvicultural Multisystem. Indrawan (2008b) defined silvicultural multisystem as a system of sustainable production forest management by implementing two or more silviculture system in a forest concession area and in a form of multi-business activities for maintaining and improving timber production and other forest products and to preserve the certainty of production forest area.

#### 2.6.3.2. Social Forestry

There are many definitions on social forestry available, but for Indonesia, social forestry has two main definitions: definition by the government through Minister of Forestry's decrees and regulations and definition by the people through academicians' researches results on natural resources management, NGOs movement, and several forums. Ministerial regulation No. P.1/2004 (although it was already repealed and replaced by Ministerial regulation No. P.37/2007) defined **social forestry** as a system for forest resources management at national forest areas and or private forest, that providing chance to the local communities as key player and or primary partner in order to improve their prosperity and to perform forest sustainability. The government's definition put timber management as the main activity in the social forestry, how the people could participate in the timber production and forest management. Within the governments definition, social forestry has been encouraged by the government are in the forms of Empowerment of Forest Village People (*Pemberdayaan Masyarakat Desa Hutan/PMDH*) conducted at logging concession and industrial plantation forests areas, Community Forest (*Hutan Kemasyarakatan/HKM*), People's Plantation Forest (*Hutan Tanaman Rakyat/HTR*), Adat Forest (*Hutan Adat/HA*), and Village Forest (*Hutan Desa/HD*). Especially for forest management in Java & Madura Island, Management of Forest Resources with Communities (*Pengelolaan Sumberdaya Hutan Hutan Bersama Masyarakat/PHBM*) has been implemented since 2001. Village bordering forests or villages in which forest areas administratively inside village boundaries have been engage by Perhutani in *PHBM* program. These forests area become Village-managed Forest (*Hutan Pangkuan Desa/HPD*) through memorandum of understanding (*Naskah Kesepahaman Bersama/NKB*) between Perhutani's Forest Management Units and villages. All of these programs are implemented in National forest areas. **Appendix 5** summarizes characteristics of *HKM*, *HTR*, *HD*, *HA*, and *PHBM*. Figures 2.2 and 2.3 show the progress of *HKM* and *HTR* developments, respectively.

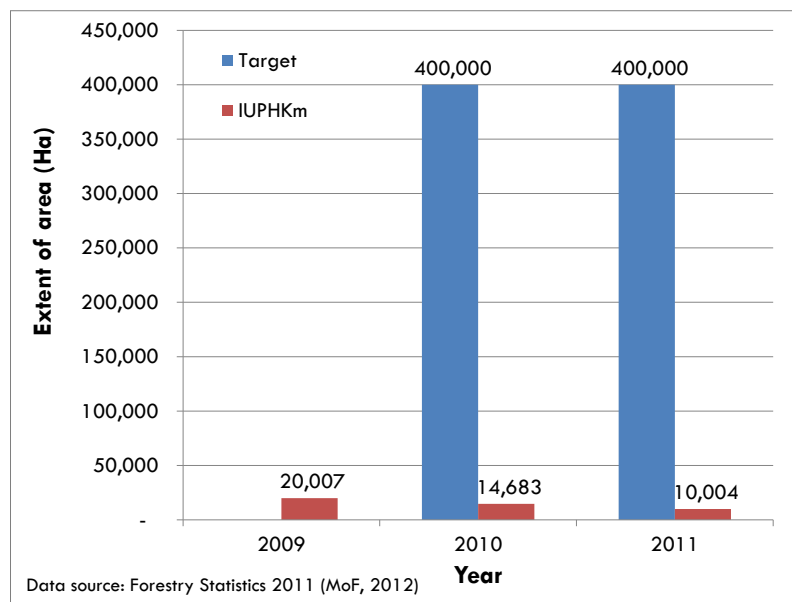


Figure 2.2. Progress of *HKM* development (2009–2011)

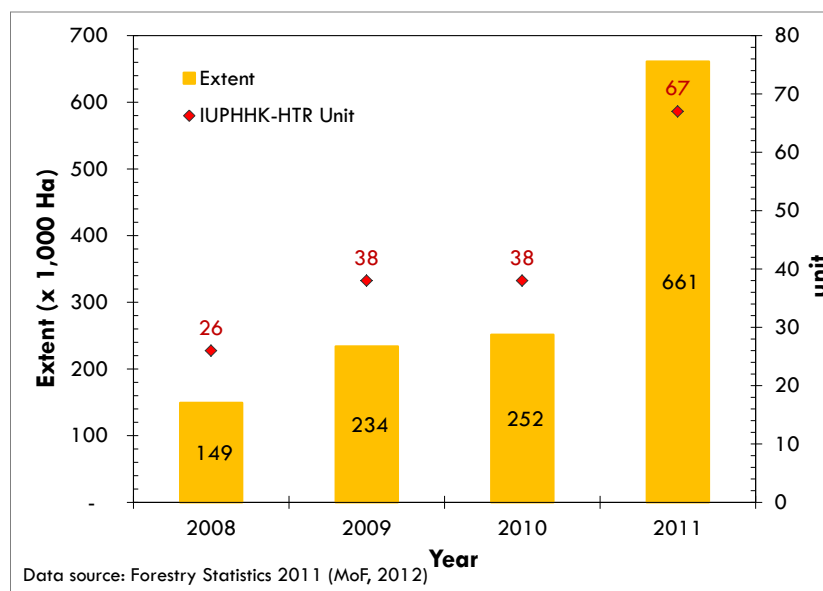


Figure 2.3. Progress of *HTR* development (2008–2011)

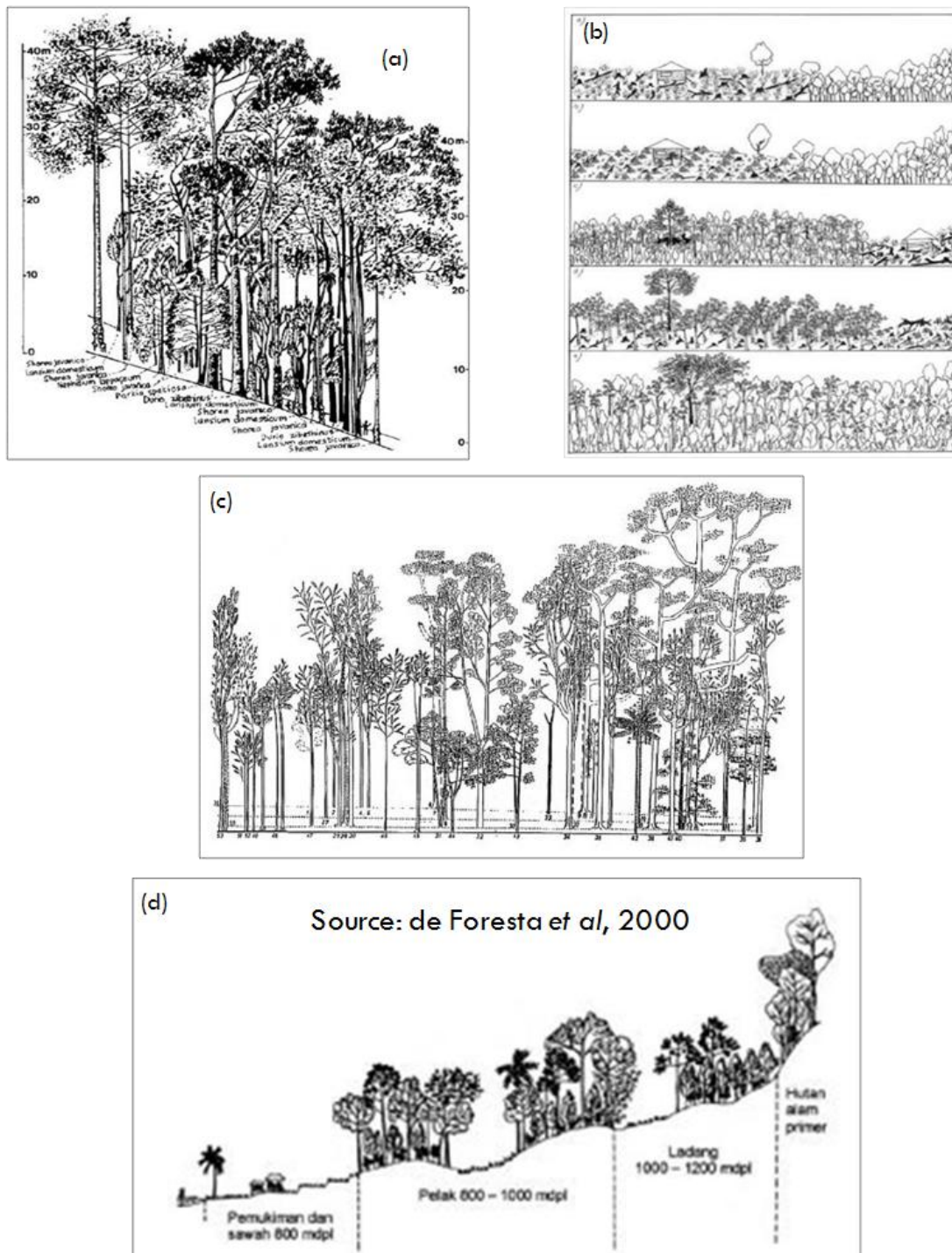
Other than the forms of social forestry mentioned above, which all are types of social forests, the Ministry of Forestry (MoF) has been reporting some activities in the Forestry Statistics as social forestry activities such as development of private forests, natural silk cocoon farming/sericulture, honey bee farming/apiculture, and forest trees' seeds cultivation and nursery.

Meanwhile, the people's definition sees **social forestry** as management of certain areas for livelihood and the form of these areas are private forests and agroforests. There are many types of agroforests already identified by scientists, such as published by International Centre for Research in Agroforestry (de Foresta *et al.* 2000). Among many types of agroforests have been living in Indonesia are *Repong Damar* at Krui (Lampung), Mixed-rubber gardens in Jambi and South Sumatera, *Tembawang* at West Kalimantan, *Pelak* at Kerinci (Jambi), Mixed-durian gardens at Gunung Palung (West Kalimantan), *Parak* in Maninjau (West Sumatera), and Mixed-gardens in Bogor (West Java). Figures 2.4 and 2.5 show the profiles of agroforests in Indonesia.

Agroforests have several roles which are very important to forestry, agriculture, natural resources management and preservation, and economy, as follow (ICRAF 2000):

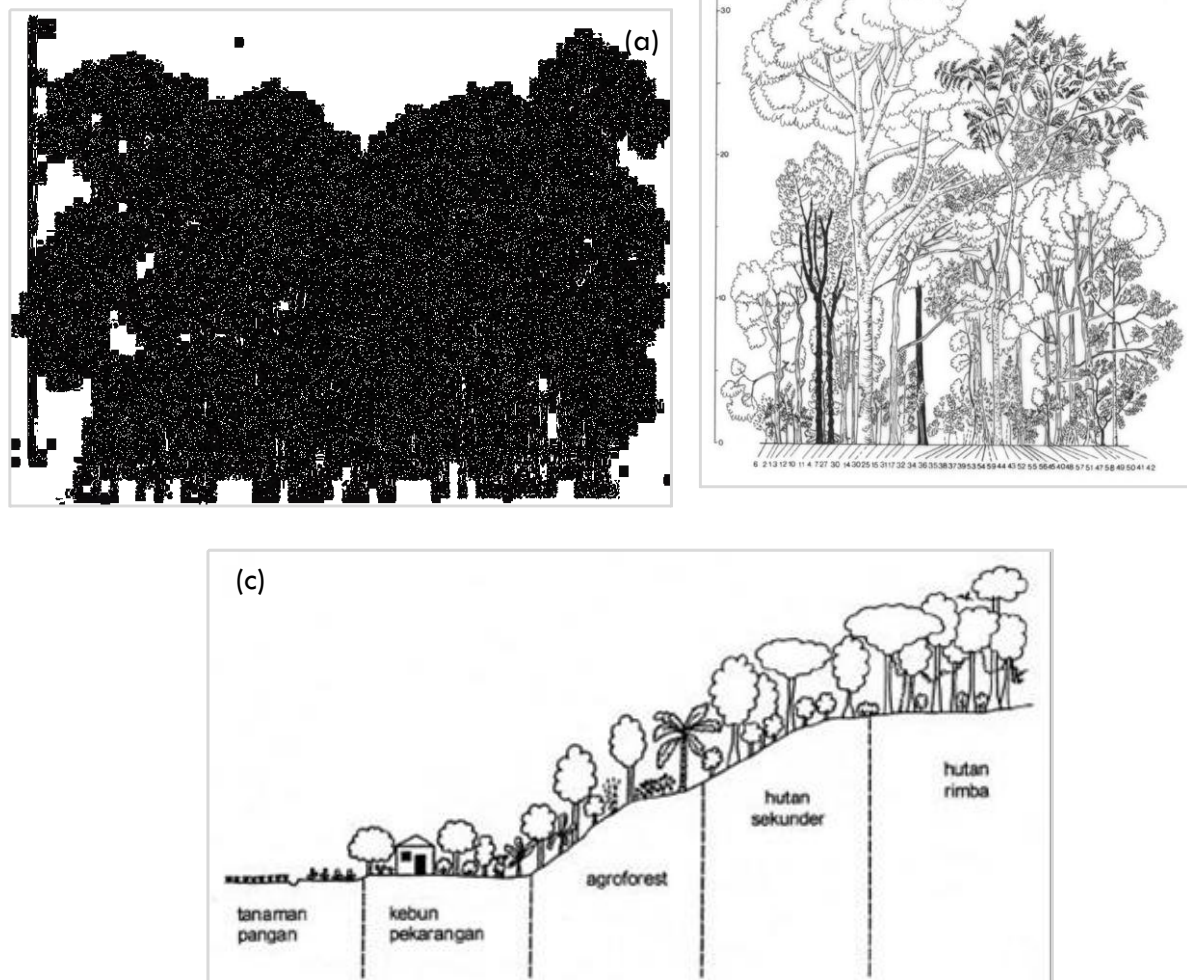
- (1) Roles of agroforests in Forestry:
  - a) Sustainable forest management
  - b) Preservation of forest resources
  - c) Biodiversity conservation
  - d) Change from shifting cultivation into settled-agriculture that reduces deforestation and forest degradation, intensification and improvement of forestry plant cultivation.
  - e) Sylviculture system model that developed by farmers
  - f) Wood production model
  - g) Replacing natural forest roles in providing commodities that are getting rare and expensive, such as rattan, wood, roofing material, medicinal plants, hunting prey, etc.
- (2) Roles of agroforests in Agriculture:
  - a) Model of commercial agriculture
  - b) Diversification of commercialized plants which guarantee the safety and elasticity
  - c) Mixed-plants encounter plants pest and diseases
  - d) Changing in economic value of commodities
  - e) Change from shifting cultivation into settled-agriculture that intensifies and improves forestry plant cultivation
- (3) Roles of agroforests in management and preservation of natural resources:
  - a) Forest resources preservation
  - b) Conservation of biodiversity
  - c) Change from shifting cultivation into settled-agriculture that reduces deforestation and forest degradation
  - d) Alternative to industrial sylviculture as dominant model:
    - Utilization of space and plant-based resources
    - Formation of forest through agroforest system is a simple mechanism to manage diversity
    - Agroforest as improvement of non-wood forest products
  - e) New framework toward re-ownership of forest resources by local communities
- (4) Roles of agroforests in Economy:
  - a) Change from shifting cultivation into settled-agriculture which means low or minimum investment and labor
  - b) Agroforest functions as bank:
    - Periodic-routine harvests which supply daily needs
    - Seasonal harvest which supply annual needs
    - Wood harvest which as saving for incidental needs
  - c) Elasticity to change of economic value of commodity:
    - "Kitchen garden" provides daily food material, such as vegetable, fruits, condiments, and spices





**Figure 2.4.** Profiles of agroforests: (a) *Repong Damar* at Krui (Lampung), (b) Mixed-rubber gardens in Jambi and South Sumatera, (c) *Tembawang* at West Kalimantan, and (d) *Pelak* at Kerinci (Jambi) (Source: de Foresta *et al.* 2000)

Source: de Foresta *et al.* 2000



**Figure 2.5.** Profiles of agroforests: (a) *Parak* in Maninjau (West Sumatera), (b) Mixed-gardens in Bogor (West Java), and (c) Mixed-durian gardens at Gunung Palung (West Kalimantan) (Source: de Foresta *et al.* 2000)

#### 2.6.3.3. Forest Management Unit/KPH

Article 17 of Forestry Act regulates establishment of forest management areas in three levels: province, district/municipality, and management unit. Establishment of forest management area at management unit level shall be implemented by considering land characteristics, forest types, forest functions, conditions of watershed, social and culture, economy and local community institutions, including customary laws and administrative boundaries. The Minister of Forestry has a mandate to make a specific arrangement or regulation for stipulating forest management unit that crosses administrative boundaries due to forest condition, characteristics and types.

Based on Government Regulation No. 6 of 2007, Forest Management Unit (*Kesatuan Pemangkuan Hutan/KPH*) is defined as a forest management area based on main function and designation that can be managed efficiently and sustainably. *KPH* is categorized into three: Forest Management Unit – Conservation (*KPH Konservasi/KPHK*), Forest Management Unit – Protection (*KPH Lindung/KPHL*), and Forest Management Unit – Production (*KPH Produksi/KPHP*). This categorization is based on the three functions of forest area: conservation, protection, and production. However, the Elucidation of Article 17 of the Forestry Act explained three more categories, either based on the characteristics of the manager of the forests or based on the biophysical condition of the forest within a watershed area, namely Forest Management Unit – Community Forestry (*KPH Hutan Kemasyarakatan/ KPHKM*), Forest Management Unit – Adat Forest (*KPH Hutan Adat/KPHA*), and Watershed Management Unit (*Kesatuan Pengelolaan Daerah Aliran Sungai/KPDAS*).

Although the Forestry Act was enacted in 1999, the Government Regulation currently in force to regulate KPH is Government Regulation No. 6/2007, which repealed and replaced the Government Regulation No. 34 of 2002. Subordinate regulation which specifically regulates the establishment of KPH areas is Ministerial Regulation No. 6 of 2009, as a replacement of Ministerial Decree No. 230 of 2003. The first KPH was established in Yogyakarta Province in 2007. The category of the KPH was KPHP. In 2008, there are no KPH established, but since 2009, within 6 months after the issuance of Ministerial Regulation No. 6/2009 up to 2012, KPH areas have been gradually stipulated by the Minister. The total number of KPH is 511 and total forest areas have been stipulated is 83,557,630.7 ha (MoF 2012). Compare to the extent of national forest areas, the KPH areas are only covered 61.36%. Establishment and stipulation of KPH will be continued until all national forest areas are covered. Progress of KPH stipulation since 2007 up to 2012 is presented in Figure 2.6.

It should be noted here that stipulation of KPH area is not necessarily the same as stipulation of forest areas concerned. Stipulation of forest areas is the last step of the forest areas gazettement, after a long process from forest area designation to boundary demarcation, and mapping (Article 15 of the Forestry Act). These four steps of forest area gazettement must be conducted to provide the legality of a forest area (Article 14 of the Forestry Act).

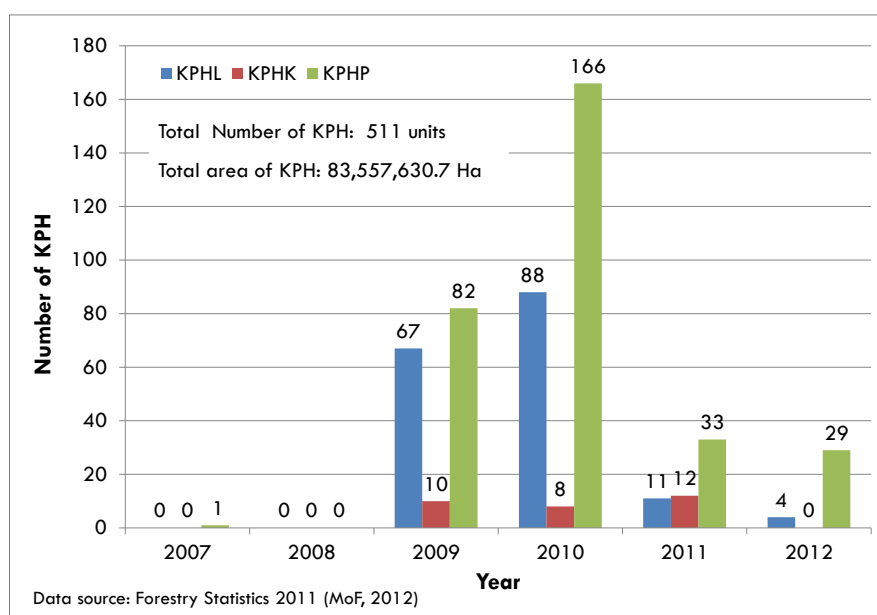


Figure 2.6. Progress of KPH stipulation (2007–2012)

## 2.7. Social, Environmental, and Economic Values of Forests

### 2.7.1. Adat/Customary Forest/HA

Forestry Act defines *Adat* or customary forest as state forest that is located in the territory of community upholding customary Acts. Since the end of 1990s, there has been a long discussion on *Adat* forest and *Adat* communities. A preparation of Government Regulation (*Rancangan Peraturan Pemerintah/RPP*), as the lower legislation to the Forestry Act, on *Adat* forest has also been discussed on and off by stakeholders. The *RPP* is prepared by stakeholders with the lead of the MoF. Among the topics discussed is the definition of *Adat* forest, definition and arrangement regarding management of *Adat* forest by *Adat* communities, and how *Adat* forest could be established and stipulated (CIFOR 2002). However, until now the *RPP* has not been enacted yet. It shows that *Adat* forest matters are not easily settled-up.

Section 2.6.1.1 has explained that recently, the Constitutional Court (*MK*) has abrogated this definition in respond to the appeal filed by *AMAN*, *Kanegerian Kuntu*, and *Kasepuhan Cisitu*. The new definition of *Adat* forest based on the *MK* is forest that is located in the territory of community upholding customary Acts. This new definition and related amended articles and paragraph of Forestry Act are

necessary to be legislated through an Act amending the Forestry Act and/or its lower legislation and subordinate regulation.

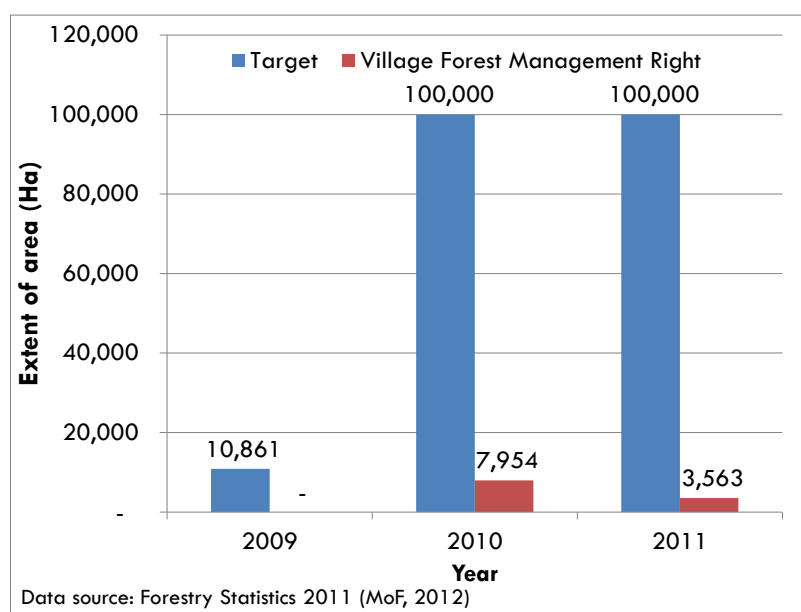
### 2.7.2. Village Forest/HD

Village Forest (*Hutan Desa/HD*) is a State forest that is not bearing ownership rights and is managed by the village and utilized for village prosperity (Government Regulation No. 6, 2007). This government regulation is the first lower legislation to Forestry Act that regulates village forest, although village forest is mentioned in the Elucidation of the Forestry Act. The former government regulation, Government Regulation No. 34 of 2002, that was repealed and replaced by Government Regulation No. 6/2007 did not mention about village forest in any of its article. Though it is very late, eight years after the enactment of the Forestry Act and it is too late, sixty two years after independence of Indonesia, finally villagers could be involved in managing the national forest.

Ministerial Regulation that technically regulated establishment of *HD* is Ministerial Regulation No. 49/2008. National forest area status that can be assigned as village forest is protection forest or production forest areas. Both areas must not have any management right or permit for utilization and must be located in respective village administrative boundary. Three steps must be taken in order the village can manage a forest area in their administrative boundary: (1) stipulation of working area by the Minister of Forestry, (2) issuance of Village Forest Management Right by the Governor of respective province, where in certain condition, the Right could be issued by the head of district or mayor of respective district/province where the village is located, and (3) issuance of Business Permit on the Utilization of Timber Forest Product (*Izin Usaha Pemanfaatan Hasil Hutan Kayu/IUPHHK*) by the Minister of Forestry (in case of *IUPHHK* of Natural Forest inside *HD*, permit could be issued by the Governor; and by the Head of District or Mayor for *IUPHHK* at Production Forest inside *HD*). There is no limitation for maximum working area, but there is limitation for period of Village Forest Management Right. The Right could be granted for 35 years, and could be extended for another 35 years based on evaluation every 5 years. *IUPHHK* for *HD* could be used since the date of its issuance until the end of Village Forest Management Right or when repealed by the issuance authority and based on annual evaluation. Figure 2.7 shows the progress of Village Forest development (2009–2011).

### 2.7.3. Private Forest/HR

As already explained in Sub-section 2.6.1.2, private forest (legally known as Titled-forest or Rights Forest), the elucidation of the Forestry Act defined “private forest” as forest that are grown on the land bearing property rights. Technical definition of private forest is given in the Ministerial Decree No. 49/Kpts-II/1997:



**Figure 2.7.** Progress of Village Forest development (2009–2011)



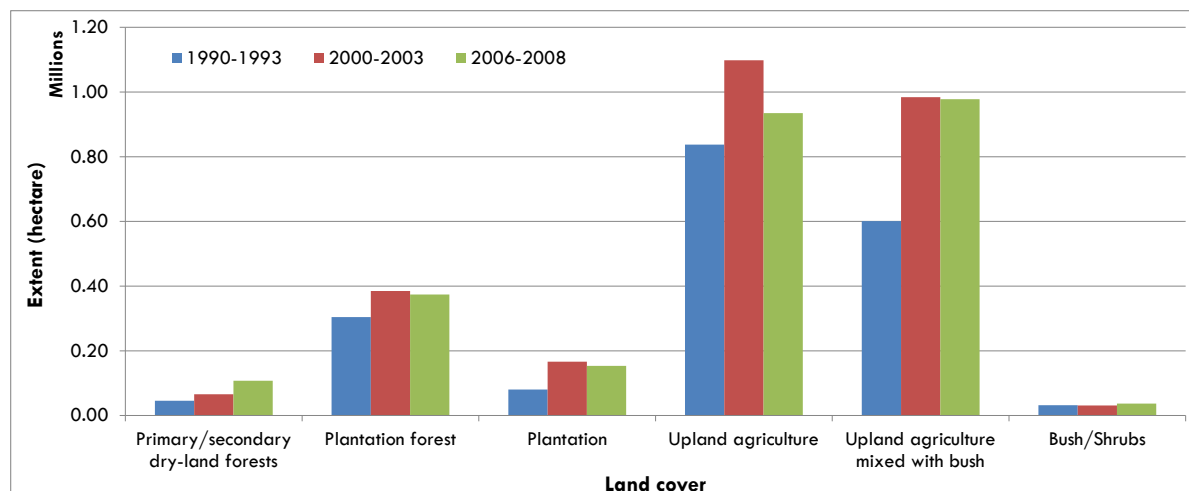
*“Forest that belong to the people with minimum size of 0.25 ha and having canopy of woody trees or other plants with more than 50 % tree’s crown cover and/or at the first year having a minimum density of 500 trees per hectare”.*

On other regulation, private forest is defined as forest that situated on a land that bearing ownership rights that is proven with land title or land ownership rights, usually called “private forest”, dominated by trees in such an ecosystem, and assigned by the Head of the District or Mayor (Ministerial Decree No. P26/Menhut-II/2005). However, such perspective, that limiting on the land ownership status (land title, owned-land, individual land) has been criticized by academicians. The perspective was said to ignore the capacity of communities as actors in forest management, considering that national forest area is controlled by the State and people cannot be involved in administering and managing forest, people do not have rights to obtain direct benefit from the national forest and controlling what the government does on the forest (Darusman & Hardjanto 2006, Awang 2007). Therefore, definition of private forest is suggested to be extended to forest that management is conducted by community organization on individual land, communal land, customary land, as well as national forest.

Identification of private forest characteristics is varying depending on the aspect of classification. Based on the land status of the forest, private forest could grow on national land, communal land, customary land, or individual land/land title (Suharjito 2000, Awang 2007). Based on the tree species, private forest could be pure private forest with timber trees, forest with timber and fruit trees, and forest with timber and fruit trees and mixed with zingiberaceae (ginger, turmeric, etc.) and vegetables (Jariyah & Wahyuningrum 2008, Bismark *et al.* 2007, Winarno & Waluyo 2007). Based on the management aspect, characteristics of private forest are small in area and scattered, small-scale business, mixed-crop pattern, manage by household, no formal management, not responsive to market, subsistence, using simple silviculture technique, timber quality and continuity of the supply are not guaranteed, and usually treated as savings for the owner (Purwanto *et al.* 2004 in Winarno & Waluyo 2007). Based on the development, private forest could be classified into (Winarno 2007): (1) self-generating pattern/*pola swadaya* is private forest that developed by group/individual using their own capital and workforce; (2) subsidized pattern (*pola subsidi*) is private forest that developed through subsidy and using partial/full-subsidy in the cost for development; (3) business loans pattern (*pola kredit usaha*) is private forest that developed based on cooperation between communities and private companies, using capital incentive in the form of soft loans.

National inventory on private forest has not finished yet, so formal data on the area and distribution are not available yet. Unpublished data from Watershed Management and Community Forestry Office (*Balai Pengelolaan Daerah Aliran Sungai dan Perhutanan Sosial/BPDASPS*) of the MoF recorded an estimate of private forest until 2011 was 7.025 million ha. Better data available but rather older is on private forest in Java and Madura Islands. The history of private forest development in Java dated back to early 20<sup>th</sup> century, with the development of *pekarangan* (garden, yard nearby the house; homegarden) in Central and East Java and *talun* in West Java. In 1930s, the Dutch Colonial Government continued to develop private forest. After Indonesia’s Independence, the Indonesian Government promoted “Karang Kitri” Movement in 1952, and finally development of private forest was brought under the greening program started in 1960s (Awang 2007).

Identification of private forest in Java and Madura Islands was started in 2009 by Forest Area Consolidation Office (*Balai Pemantapan Kawasan Hutan/BPKH*) Regional XI Java-Madura in cooperation with Multi-stakeholders Forestry Program (MFP), using Landsat-7 ETM+ image analysis on 7 land cover classes (from 23 classes). The 7 classes are: (1) primary dry-land forest, (2) secondary dry-land forest, (3) plantation forest, (4) plantation, (5) upland agriculture, (6) upland agriculture mixed with bush, and (7) bush & shrub. The result of the identification is presented in Table 2.8. From the extent of private forests, it was also identified that 85.5% are located in the middle or upper watershed, timber potential was reaching 28.92 cu m/ha, and aboveground carbon stock potential was 40,724,689.47 tons (BPKH XI & MFP-II 2009).



**Figure 2.8.** Identification of private forest in Java and Madura Islands

Private forest entrepreneurship is involving many actors and providing economic benefit to stakeholders, including land owners, farm labor, peasant, trader, processing industry, the government, and it also provide environmental benefit to broader stakeholders. Problems on private forest, if any, then are not only becoming forestry sector's problem, but also cross-sector problem. Several problems identified in the management of private forest are: (1) production aspect, in relation to how to maintain the forest productivity, not only the timber but also the non-timber forest products; (2) processing aspect, in relation to all actions that changing raw material into semi-finished goods, and finished goods; (3) marketing aspect, in relation with the distribution system, market structure, price fixing, market behavior, and market variability; (4) institutional aspect, in relation with the necessity in institution improvement at all private forest entrepreneurship sub-systems; and (5) infrastructure aspect, in relation to the government's support that enable efficiency in production process and products transport.

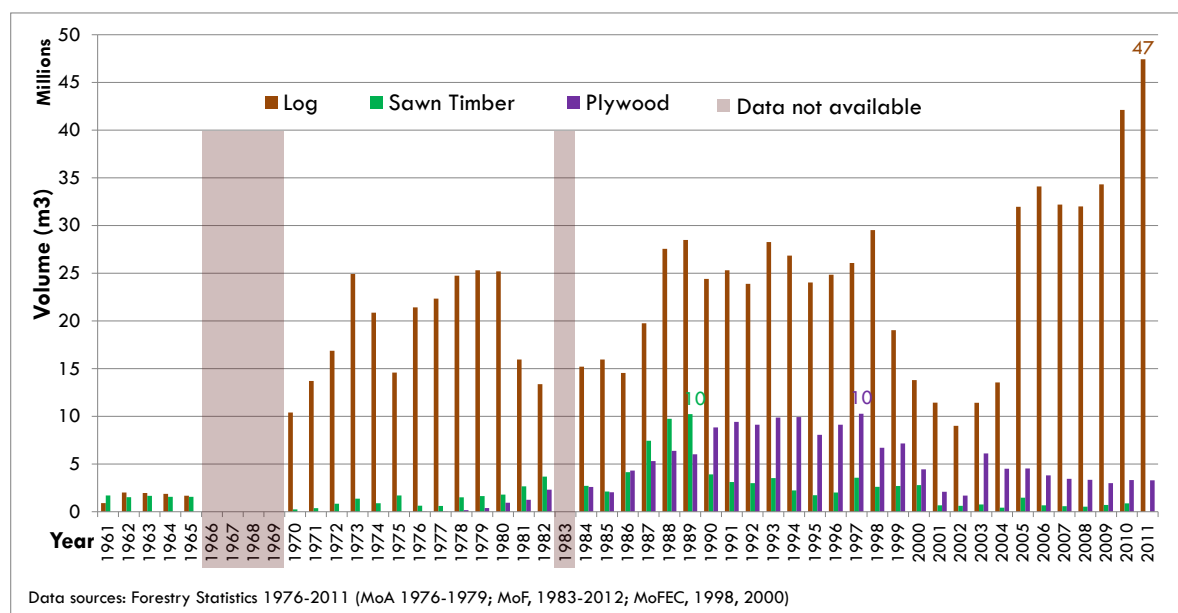
Private forest could grow not only because of communities' efforts but also because of support from various stakeholders, such as the government, NGOs, international donor agencies, and also private companies. The supports were aimed for extending the area of private forest as well as improving the communities' capacities and institutions to manage their forests. Private forest owners and managers have been encouraged to improve their management performance by implementing principles of sustainable forest management and legality aspects. In the past 5 years (2006–2010), the government has supported development of private forest and reached 660 798.80 ha. Especially for 2010, it reached 23 697 ha (MoF 2012).

In order to improve the performance of sustainable private forest, Indonesian Ecolabel Institute (*Lembaga Ekolabel Indonesia/LEI*) has been implementing certification for Sustainable Community Based Forest Management (CBFM LEI/*Pengelolaan Hutan Berbasis Masyarakat Lestari/PHBML*) since 2004. Based on the record of LEI (unpublished), there have been 22 units (32 683.57 ha) of private forest management from West Kalimantan, East Java, Central Java, Yogyakarta, and West Nusa Tenggara certified by CBFM LEI standard. Moreover, there are also 5 private forests units (1.376 ha) certified by Forest Stewardship Council (FSC) standard. From the total of 27 units of certified private forests, the government (through the MoF) has supported the funding for facilitation of certification preparation to 9 units and for the certification process to 5 units of private forest management. Besides that, the government is also supporting the implementation of Timber Legality Verification System (*Sistem Verifikasi Legalitas Kayu/SVLK*) which is mandatory to all management units of production forest, processing industries, and trades, including those from the private forest. Up to now, there have been 14 units (7 688 ha) of private forest management certified by VLK. These kinds of forest management certification have been the entrance for various incentives given by the governments (central and regional) and the market.

#### 2.7.4. Forest products processing and marketing

As explained in sub-section 1.2.2.2 that there had been an increased in the number of logging companies and extent of forest concession areas from 1968 to 1993, a decrease from 1994 to 2003, and then again an increased from 2004 up to now. Timber production has been recorded since 1961, even before logging concession with silviculture system was formally started in 1970, though fluctuated and reached the lowest in 2002 (**Appendix 3**, Figure 1.14, Figure 2.9). Illegal logging, log smuggling, and economic crises might be the causes and made the recorded legal logs was very less. The log production kept increasing and reached the highest level in 2011, even though the logging concession areas became less than 50% from that in 1994. Timber produced from HPH and HTI (or currently called IUPHHK-HA and IUPHHK-HT) then processed into several wood products, namely sawn timber, plywood, pulp, veneer sheet, particle board, and fiber board. Sawn timber had been produced from the beginning of timber production recorded, while plywood had been produced since 1975.

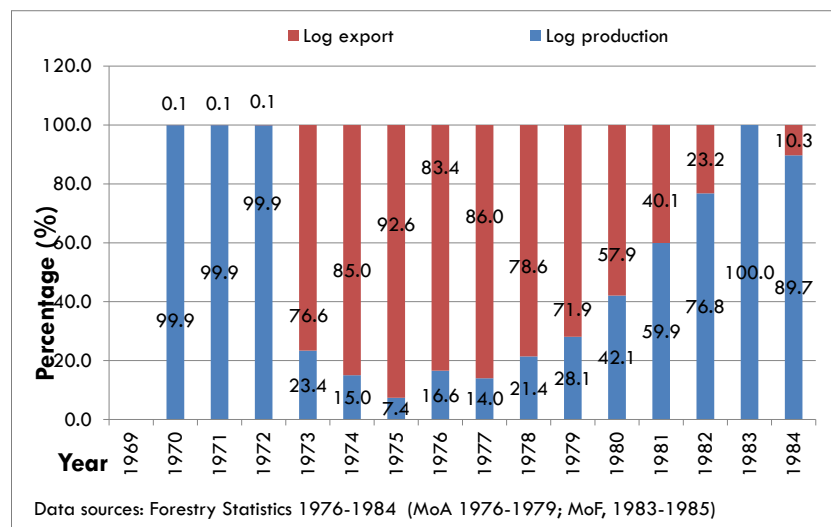
The fluctuation of timber production and processed into sawn timber and plywood is illustrated in Figure 2.9. The low production of processed timber into sawn timber and plywood until 1985 most probably because of most of the timber were sold and exported in the round timber/log form. The share of log production and log export is presented in Figure 2.10. Ban of exporting log was issued in 1980 and total ban were implemented from 1985 to 1997. Along with the ban, the Government of Indonesia ordered the logging concession companies to invest in timber production processing, such as plywood, and increase timber product export (Figure 2.11).



**Figure 2.9.** Timber extraction and products (1961–2011)

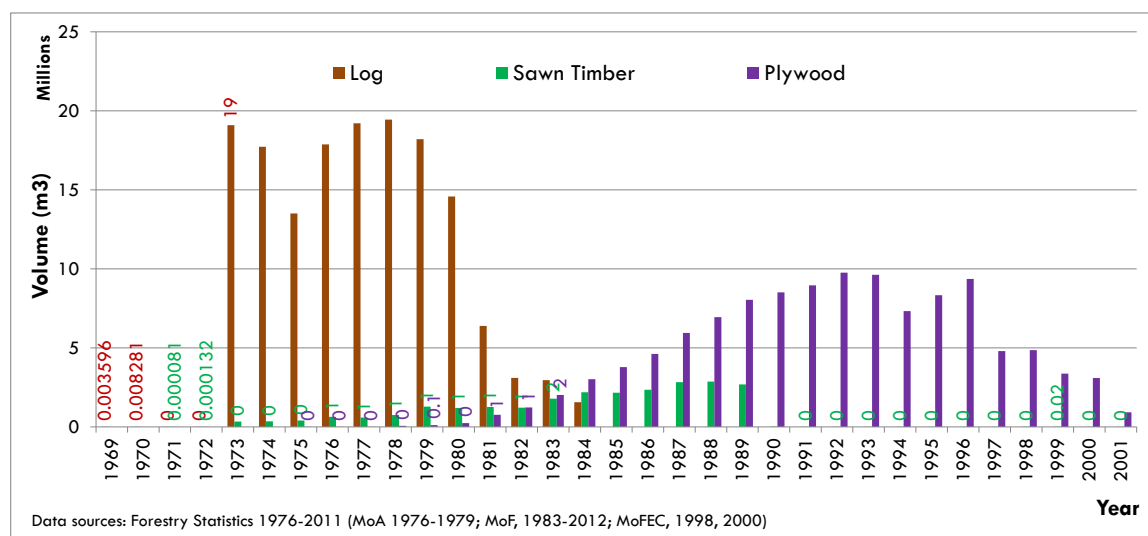
Until 2001, timber products export was recorded in cu m and timber products exported were log (until 1984), sawn timber and plywood. From 2002, exported timber products were recorded in kg and timber products varies, from only sawn timber and plywood, to pulp, veneer sheet, particle board and fiber board (Figure 2.12).

Apart from timber production, non-timber forest products (NTFP) have also been extracted from the forests. NTFP extraction from the forest that had been recorded since 1968 were varied: rattan (*rotan*), gum resin (*gondorukem*), resin (*damar*), turpentine (*terpentin*), cajuput oil (*minyak kayu putih*), charcoal (*arang*), fuelwood (*kayu bakar*), copal (*kopal*), and gaharu. Table 2.7 and figures in **Appendix 6** show the NTFP extraction records and the fluctuation of the extracts. Both timber and NTFP products have made Indonesia well-known for its forest resources products.

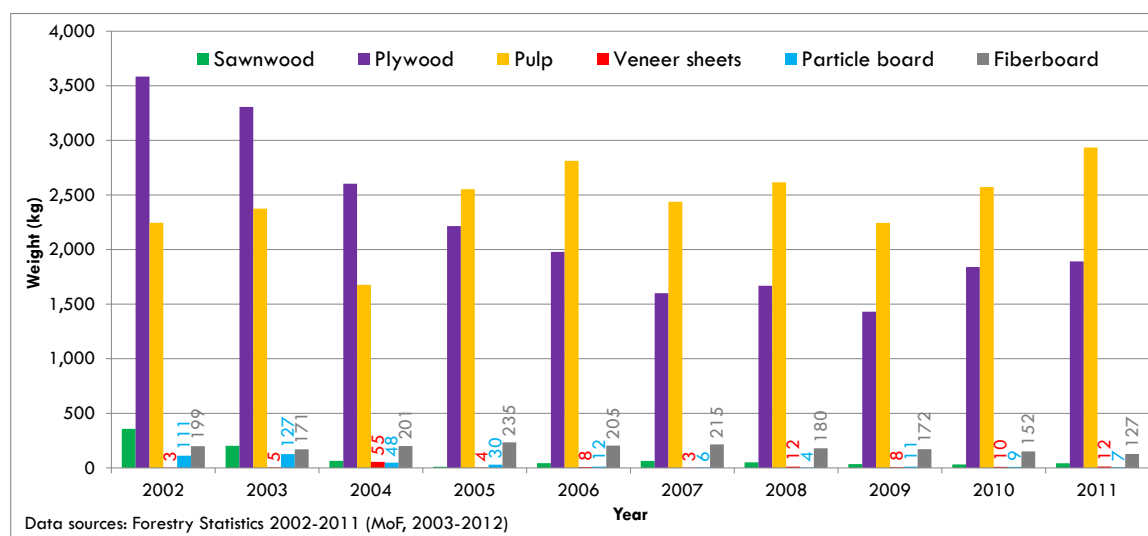


Note: Log production data in 1969 & log export data in 1983 not available

**Figure 2.10.** Share of log production and log export (1969–1984)



**Figure 2.11.** Timber and timber products export (1969–2001)



**Figure 2.12.** Timber products export (2002–2011)



Table 2.7. Non-timber forest product extraction

Year	Rattan (ton)	Gum Resin (ton)	Resin/Damar (ton)	Turpentin (ton)	Cajuput Oil (liter)	Charcoal (ton)	Fuelwood (sm)	Copal (ton)	Gaharu (ton)
1968	305	9	2	-	-	646	1,665	-	-
1969	58	1	1	-	-	120	1,009	-	-
1970	226,482	-	219,554	-	255,979	6,517	500,858	-	-
1971	20,906	4,257	4,102	477	95,215	33,651	685,901	-	-
1972	48,674	-	6,679	1,203	70,658	31,295	713,778	-	-
1973	19,612	4,104	7,237	85,159	121,519	38,773	1,004,590	-	-
1974	128,780	39,568	2,194		157,397	75,822	4,738,212	-	-
1975	37,358	41,254	3,059	470,020		30,566	567,190	-	-
1976	28,057	1,425	978	154,948		12,434	105,902	-	-
1977	37,884	2,693	2,027	441,741	160,661	34,280	377,319	-	-
1978	67,993	5,364	2,517	554,701	224,029	34,280	315,850	-	-
1979	70,476	6,483	2,867	698,822	6,483	28,540	356,220	-	-
1980	53,908	7,135	2,450	838,831	221,745	20,654	417,385	-	-
1981	28,921	9,310	7,137	813,966	113,633	3,657	364,711	-	-
1982	835	5,963	1,137			6,070		-	-
1983	19,654	4,234	1,449	710,577	120,426	3,423	134,983	-	-
1984	53,781	1,356	4,538		39,644	32,081	1,198,781	-	-
1985	40,422	6,551	4,704	854,095	106,181	43,038	254,933	-	-
1986	143,716	16,094	350,384	1,413,852	176,792	32,145	442,380	-	-
1987	199,144	24,807	3,179	4,006,284	178,507	23,632	404,881	-	-
1988	74,210	31,858	3,580	5,262,386	207,822	19,832	356,699	-	-
1989	101,702	29,763	6,307	1,741	87,199	23,678	9,948	-	-
1990	52,171	38,150	10,496	2,191	167,646	-	-	-	-
1991	64,020	37,141	9,539	8,593	274,124	-	-	-	-
1992	69,384	53,090	14,253	9,038	280,305	-	-	-	-
1993	88,149	78,369	5,149	11,439	312,831	-	-	-	-
1994	78,340	74,204	-	13,175	332,478	-	-	2,057	-
1995	36,256	47,960	3,869	8,975	235,497	-	-	816	-
1996	51,564	53,736	1,556	10,294	469,948	-	-	821	-
1997	32,389	69,658	6,423	13,700	331,457	-	-	764	-
1998	62,644	43,785	7,887	7,633	357,035	-	-	516	-
1999	38,417	24,025	6,310	2,667	63,465	-	-	114	-
2000	94,752	-	3,342	-	-	-	-	647	-
2001	23,836	580	2,921	-	-	-	-	428	-
2002	17,779	-	1,131	-	27,925	-	-	442	-
2003	127,295	4,592	4,401	544	28,138	-	-	403	-
2004	1,880,503	38,435	2,722,866	7,684	31,978	5,057,390	-	318	6,175
2005	221,381	27,098	9,131	36,958	275,192	33,117	-	320	231
2006	24,554	3,210	11,087	5,152	20,010	-	-	149	668
2007	3,153	850	648	-	324,019	-	-	-	-
2008	132,579	-	24,867	-	-	-	-	-	-
2009	78,910	56,817	1,612	12,147	74,333	-	-	414	714
2010	-	-	-	-	-	-	-	-	-
2011	81,690	118,325	6,539	-	20,500	-	-	-	964

Data sources: Forestry Statistics 1976–2011 (MoA 1976–1979, MoF 1983–2012, MoFEC 1998, 2000)

### 2.7.5. Forest environmental benefit

Forest has been known to have enormous benefits to human and to other living things in the forest, including the plants themselves. In term of products, forest benefits usually classified as tangible and intangible benefit, while in term of subjects who benefited, forest benefits could be classified as internal and external benefit. Tangible benefit means benefit in the form of visible measureable real products that can be valued through market price. For example timber and non-timber forest products (NTFP). On the other hand, intangible benefit means benefit which cannot be measured yet through market price; usually invisible but we can feel it and we can value it once we experience or use the benefit. For example environment protection, genetic diversity, fresh air, carbon storage, water supply, and other ecosystem functions & services, and ecological benefit. Constanza *et al.* (1997) classified ecosystem services into 17 groups: gas regulation, climate regulation, disturbance regulation, water regulation, water supply, erosion control and sediment retention, soil formation, nutrient cycling, waste treatment, pollination, biological control, refugia, food production, raw material, genetic resources, recreation, cultural.

Internal benefit means benefit which can be “collected” or “consume/utilized” within the forest, either by human, wildlife and plants. For example fresh air, carbon sink, water, timber, NTFP, etc. Meanwhile, external benefit means benefit which can be “consume/utilized” from outside forest, for example water, environmental protection from natural hazards (landslides, floods, etc.), etc. Benefit usually recognized through valuing the quantity of the goods or services. Before quantifying and valuing forest environmental benefit, classification of values is usually be done (Pearce 1992, 1994, Barbier 1994, Pagiola *et al.* 2004, Mertz 2007). Methods to quantify and economically value benefit from forest have been well-explained, for example, by Pearce (1992), Pearce (1994), and Constanza *et al.* (1997), etc. Comparing with substitution value to the services if the services are gone is one example of how to economically value forest ecosystem services. Willingness to pay (WTP) for certain forest ecosystem services and willingness to accept (WTA) if such services are no longer available are other examples.

Quantifying and economically valuing benefit until now are not yet becoming favorite research in Indonesia. There are only limited studies about this in Indonesia and have been done only in limited areas. Indonesia with 131.5 million ha of National Forest areas plus 7.025 million ha of private forest areas definitely has all of those environmental benefits. Sub-section 1.3.2.2 and sub-sections in Section 2.7 explained about the tangible benefit from Indonesian forests. Though those sub-sections only showed the quantities, the economic value of those benefits has made Indonesia financed its development and livelihood of the people. Intangible benefits such as classified by Constanza *et al.* (1997) have been recognized, research on these are limited. It seems impossible to quantify and put the value on it. Some argue that it is unwise to value intangible benefit, such as environmental aesthetics or long-term ecological benefit. Protecting ecosystems is purely moral or aesthetic reasons and there is no need to do valuation of ecosystem for these purposes (Constanza *et al.* 1997).

## 2.8. Forest Inventory and Monitoring

### 2.8.1. Development of Permanent Sample Plot

Indonesia through Ministry of Forestry (MoF) has been implementing four types of forest inventory, namely: (1) National Forest Inventory/NFI (*Inventarisasi Hutan Nasional/IHN*), (2) Periodical Comprehensive Forest Inventory (*Inventarisasi Hutan Menyeluruh Berkala/IHMB*), (3) Pre-logging Tree Stand Inventory (*Inventarisasi Tegakan Sebelum Penebangan/ITSP*), and (4) Post-logging Tree Stand Inventory (*Inventarisasi Tegakan Tinggal/ITT*). The first type has been conducted nationally, while three others have been conducted in production forest concession areas.

The first and the only complete NFI ever implemented in Indonesia was from 1989 to 1996. It covered 2 735 plots already established throughout Indonesia, both permanent (Permanent Sampling Plot/PSP) and temporary (Temporary Sampling Plot/TSP). The next inventories were conducted as follow: 1996–2006 (1 149 plots), 2000–2006 (406 plots), 2006–2010 (2 997 plots), and 2010–2014 (599 plots/year is planned).

PSP and TSP were established systematically throughout Indonesia, except Java Island. PSP is established for estimating forest resources potential (volume, condition of stand, species distribution and diversity) and TSP is established to monitor the change in forest resources and tree-growth. The size of each plot is 1 ha on 20 km x 20 km grid. The plots are located in all function of forest areas, with priority to areas with elevation of below 1000 m above sea level, in the dry lowland forest, swamp, and mangrove ecosystems. Information gathered from the plot are: species, diameter and height of each tree, location of the plot (province, district, status, function, type of forest area), canopy characteristics, damage/disturbance to the tree, seedlings/regeneration condition. Information on non-tree species have also been collected, such as for bamboo, rattan, etc.

*IHMB* has been implemented in all production forest areas in each management unit areas, both for natural forest and plantation forest areas. It has been conducted once in 10 years to obtain information on timber standing stock. The size of each plot is 0.25 ha, with rectangular-shape for natural forest areas (width 20 m, length 125 m). In plantation forest, the plots are in the circular-shape with various sizes; depend on the age of the stand. *ITSP* has been conducted 1 year before logging/felling in order to record, measure, and to mark trees to be felled next year. Information recorded are species, diameter, height of the trees will be felled next year, the core trees (trees will be felled in the next rotation, with diameter of 20–49 cm), and protected trees. *ITT* has been conducted a year after felling to record the trees and natural regeneration on the post-logged stand that will be maintained until the next felling rotation. Information taken at *ITT* are species composition, distribution and density of trees, number of trees, and condition of core trees, whether damaged/destroyed or not during felling activities.

#### 2.8.2. Development of Land Cover Data

Forest monitoring has also been implemented by MoF. Monitoring has been conducted is not only to monitor the forest cover change through comparison of satellite images, but also utilizing the result of forest inventory, mapping the result of forest cover change, and data sharing and exchange through spatial data network. Using remote sensing infrastructures with visual classification method, land cover data has been produced once in three years. Deforestation rate has been calculated with digital techniques. Spatial analysis has been conducted using GIS applications to produce maps. The result of forest monitoring has been published annually in the Forestry Statistics. All information on forest monitoring has also been published in the WebGIS of MoF website for data sharing and exchange. Users can browse and download the forest cover deforestation maps from the website. Upon request, original data can also be accessed.

### 2.9. Summary of Chapter 2

Forests in Indonesia have very high diversity, both the types and functions. However, in the management and governance, the forests diversity was only classified into three forest functions: conservation, protection, and production. These forest functions were stipulated in the Forestry Act and become part of spatial planning functions, or usually stated as spatial pattern in the Spatial Planning Act (Act No. 26/2007), so that forest and non-forest areas become one landscape that cannot be separated. In forest utilization, timber, non-timber, and environmental services are separated. Thus, permit to utilize each are also separated based on the scale of the utilization or business.

From early 1970s to 1990s, almost all production forest areas were extracted by big logging companies as concession holders. Meanwhile, conservation forest areas remain in the Government's management and protection forest areas have been managed by the Regional Government. Except conservation forest areas, other forests in Indonesia were not intensively and properly maintained in the field by the Government. All production forests have been maintained by concession holders, so if concession holders are no longer operated due to various reasons, these production forests then become open access, due to the fact that there are no managers in the field. This fact become the cause of information weakness own by the government as base of forest management, conflicts in the field, illegal logging, encroachment, even plantation and mining concession permits that overlapping or violating the laws. Based on these facts, various efforts have been and kept in process, such as Forest Management Unit (FMU/KPH) development, forest resources inventory, one map, etc.

### 3. FOREST COVER AND MAJOR DRIVERS

#### 3.1. Forest Cover Changes

In order to understand whether there are forest transitions in Indonesia, we used Indonesian land cover data published by the Directorate General of Forestry Planology (MoF) and regional boundary data published by the Geospatial Information Agency (*Badan Informasi Geospasial*/BIG) to analyze the land use/land cover and forest cover changes. Processing was done by using the Geographical Information System/GIS, ERDAS Imagine. Due to very large area of Indonesia with very diverse land covers, thousands of islands, various biogeography, uneven development throughout the country, and other limiting factors, we conducted analysis of land use/land cover change throughout Indonesia, but conducted forest cover change analysis only to five main islands of Indonesia: Jawa, Sumatera, Kalimantan, Sulawesi, and Papua.

##### 3.1.1. Land Use and Land Cover Change of Indonesia

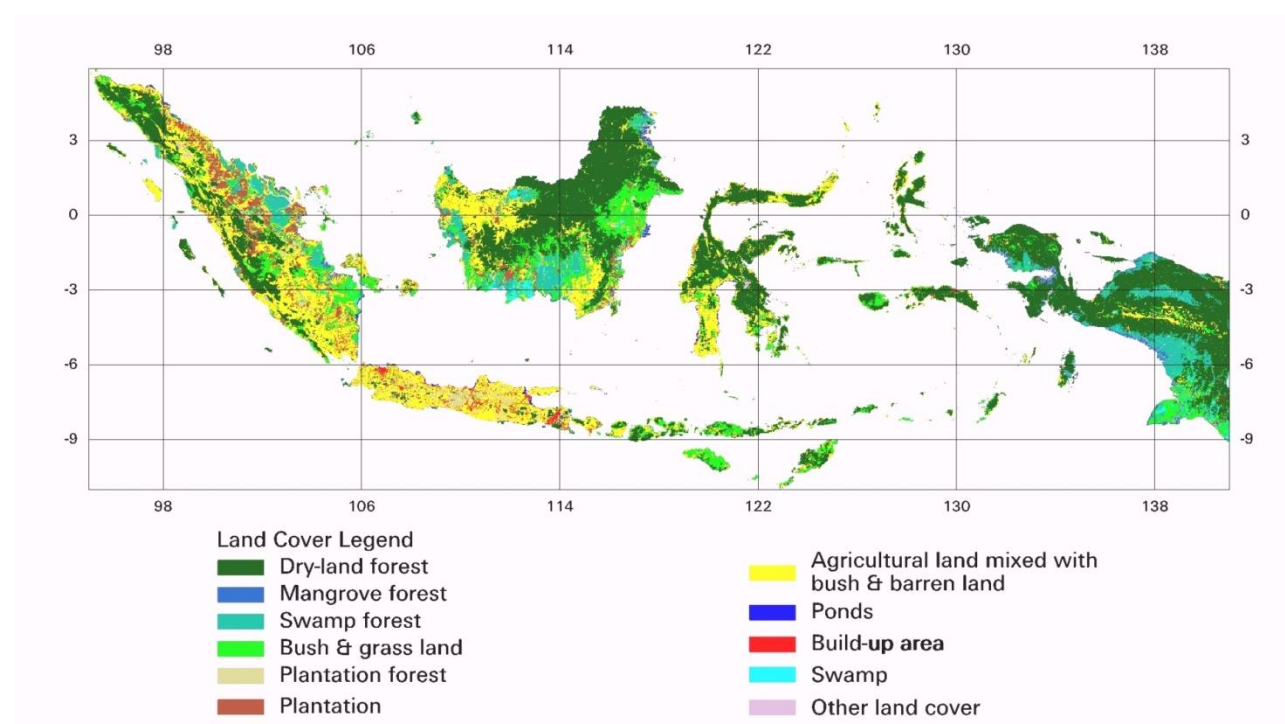
Ministry of Forestry of Indonesia formally conducts periodic national forest mapping for every 3 years since 2000. The latest available data were published in 2011. The data were developed based on the visual classification of satellite imagery on a scale of 1:250 000, by classifying land cover/land use into 23 classes, namely: (a) primary dry-land forest (b) secondary dry-land forests, (c) primary mangrove forest, (d) secondary mangrove forest, (e) primary swamp forest, (f) secondary swamp forest, (g) industrial plantation forest, (h) bush/shrubs, (i) swamp bush/shrub, (j) upland agriculture, (k) paddy field, (l) embankment (shrimp/fish ponds, lakes), (m) upland agriculture mixed with bush, (n) Plantation, (o) barren lands, (p) savanna, (q) settlement, (r) airport, (s) transmigration, (t) mining, (u) swamp, (v) water bodies (lakes & rivers) and (w) cloud. For the purposes of analysis, the land covers were reclassified into 11 classes of land cover (Table 3.1). Spatial patterns of LULC of Indonesia for 2000, 2003, 2006, 2009 and 2011 are shown in Figures 3.1, 3.2., 3.3, 3.4 and 3.5. Deforestation between 2000 and 2011 is presented in Figure 3.6. Table 3.2 represent the total area and proportion of each land cover/land use for each study year.

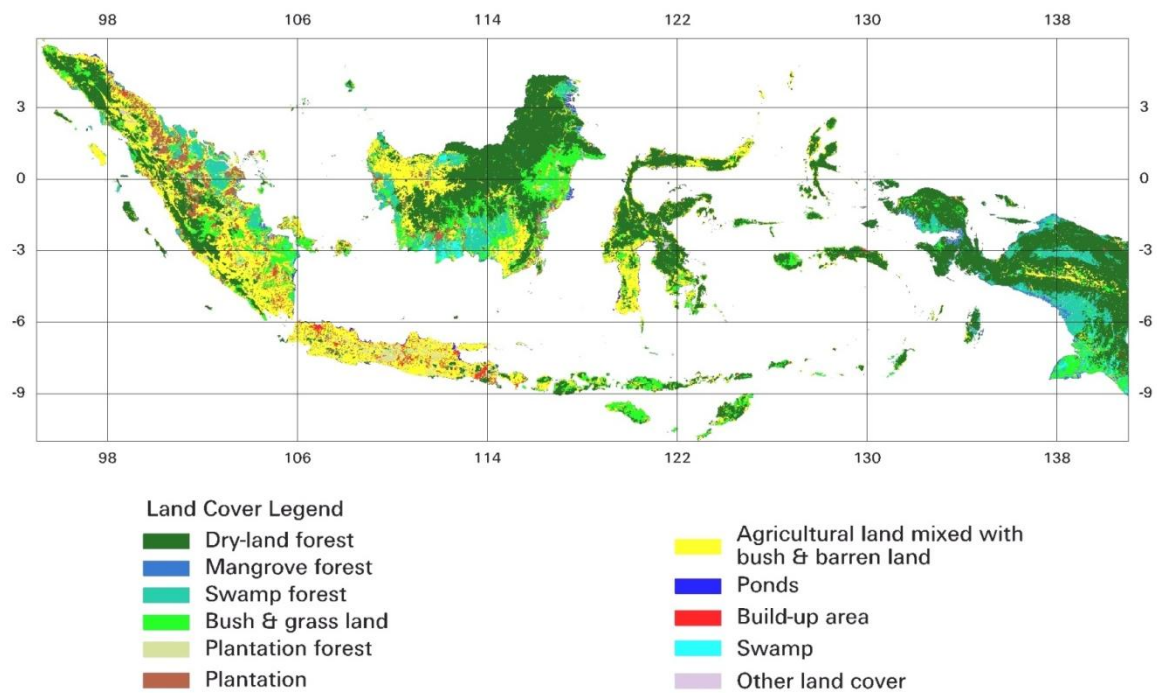
**Table 3.1.** Land use/land covers reclassification

No	Land cover classification	No	Land cover reclassification
1	Primary Dry-land Forest	1	Dry-land forest
2	Secondary Dry-land Forest		
3	Primary Mangrove Forest	2	Mangrove Forest
4	Secondary Mangrove Forest		
5	Primary Swamp Forest	3	Swamp Forest
6	Secondary Swamp Forest		
7	Savanna	4	Bush and Grassland
8	Bush/Shrubs		
9	Swamp Bush/Shrubs		
10	Industrial Plantation Forest	5	Plantation Forest
11	Plantation	6	Plantation
12	Upland Agriculture Mixed with Bush	7	Agricultural land mixed with bush & barren land
13	Upland Agriculture		
14	Paddy Field		
15	Barren Land		
16	Embankment (Shrimp/Fish Ponds)	8	Ponds
17	Airport	9	Build-up area
18	Settlement		
19	Transmigration		
20	Swamp	10	Swamp
21	Mining	11	Other Land Cover
22	Water bodies (lakes & rivers)		
23	No data (Cloud)		

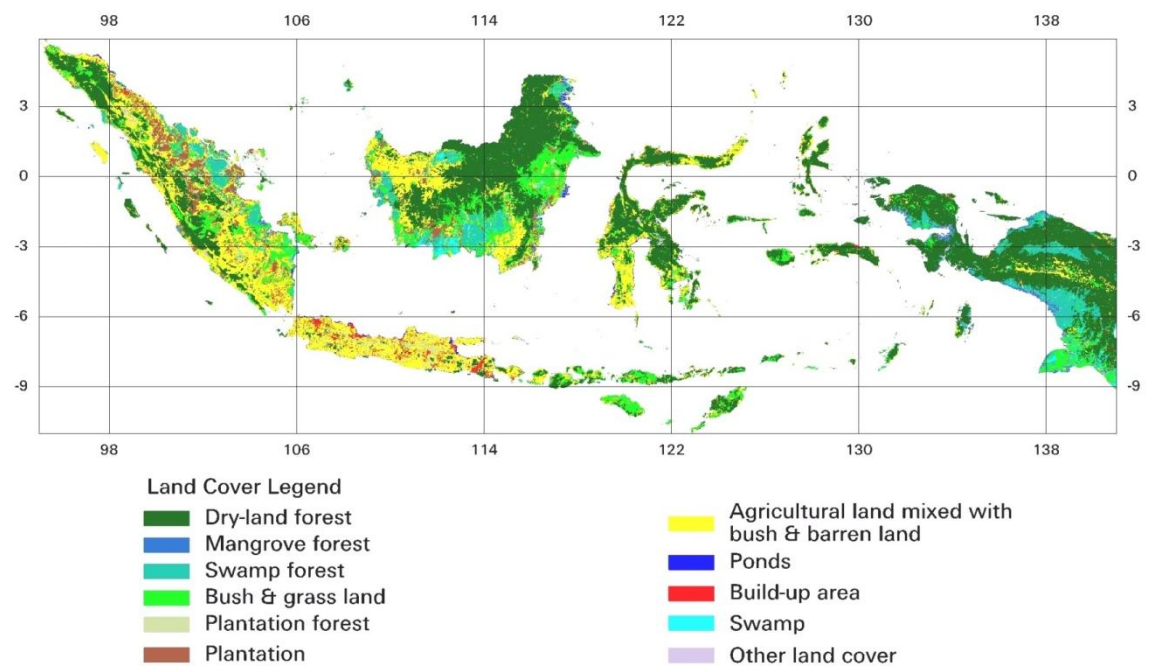
**Table 3.2.** Land Use/Land Cover area (million ha) and its proportion

Land cover	Year									
	2000		2003		2006		2009		2011	
	Area	%	Area	%	Area	%	Area	%	Area	%
<b>Dry-land Forest</b>	81.86	42.99	81.29	42.69	79.89	41.95	78.45	41.19	78.39	41.16
<b>Mangrove Forest</b>	3.11	1.63	3.04	1.60	2.92	1.53	2.90	1.52	2.84	1.49
<b>Swamp Forest</b>	15.55	8.17	15.20	7.98	14.47	7.60	13.50	7.09	12.67	6.65
<b>Total Natural Forest</b>	100.52	52.78	99.52	52.26	97.28	51.08	94.84	49.81	93.90	49.31
<b>Bush &amp; Grassland</b>	26.68	14.01	26.95	14.15	27.70	14.54	28.31	14.87	27.08	14.22
<b>Industrial Forest Plantation</b>	4.15	2.18	4.17	2.19	3.70	1.94	3.88	2.04	4.36	2.29
<b>Plantation</b>	7.73	4.06	7.83	4.11	8.28	4.35	9.29	4.88	9.63	5.06
<b>Agricultural land mixed with bush &amp; barren land</b>	43.26	22.72	43.64	22.92	44.83	23.54	45.48	23.88	47.22	24.79
<b>Ponds</b>	0.77	0.40	0.82	0.43	0.88	0.46	0.91	0.48	0.91	0.48
<b>Build-Up Area</b>	2.86	1.50	2.95	1.55	3.14	1.65	3.19	1.68	2.96	1.55
<b>Swamp</b>	1.67	0.87	1.74	0.91	1.78	0.94	1.76	0.92	1.56	0.82
<b>Other Land Cover</b>	2.80	1.47	2.81	1.48	2.83	1.49	2.77	1.45	4.83	2.53

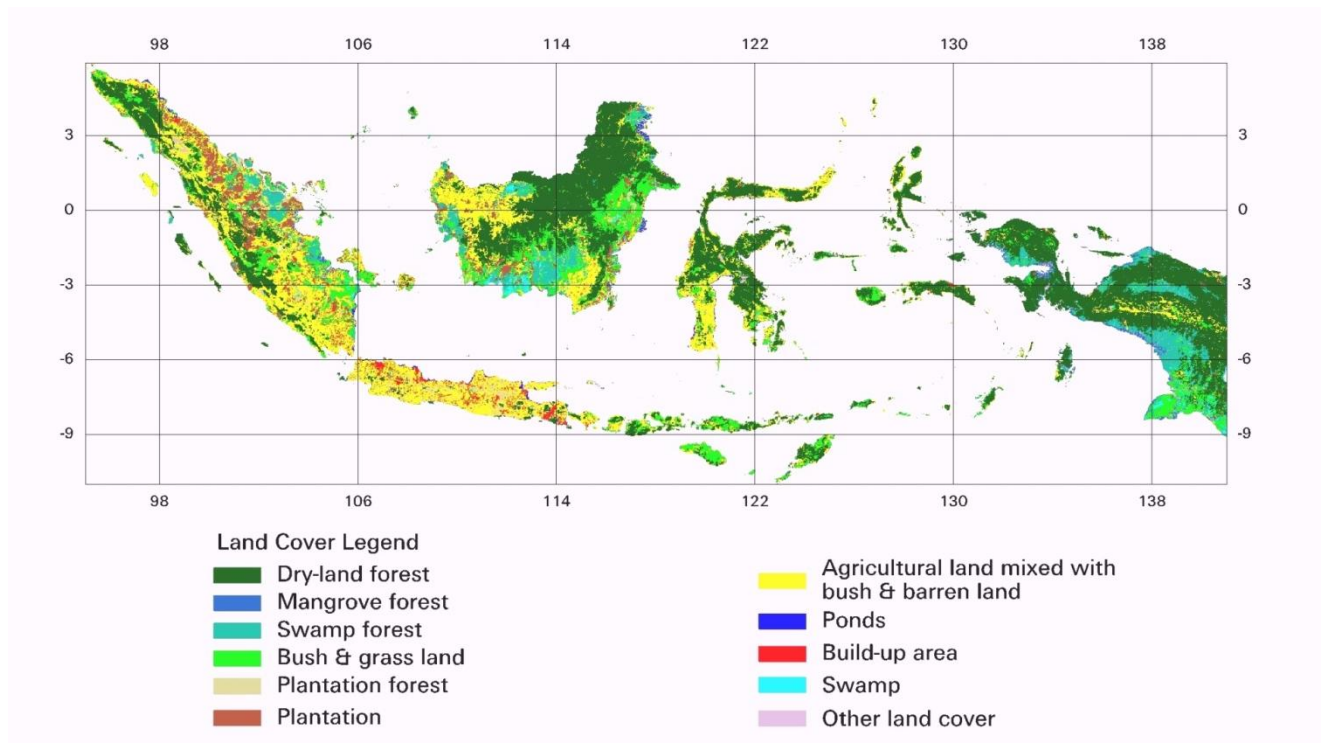
**Figure 3.1.** Land cover of Indonesia in 2000



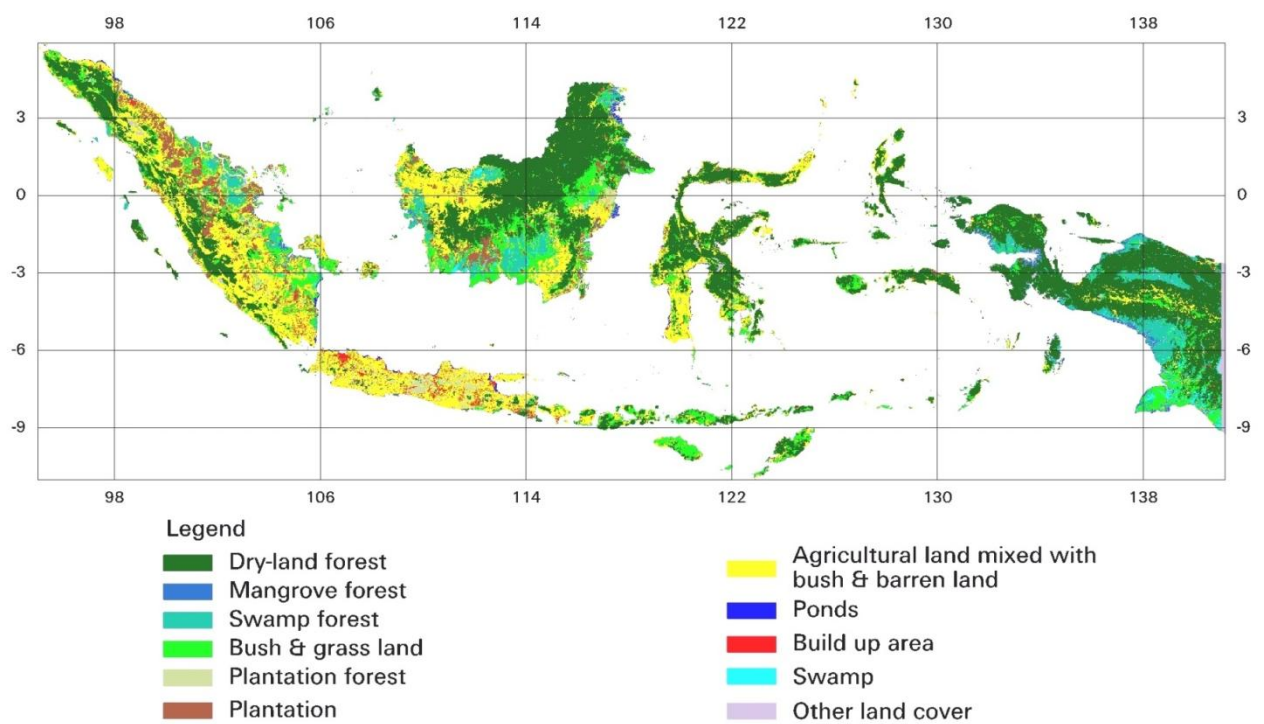
**Figure 3.2.** Land cover of Indonesia in 2003



**Figure 3.3.** Land cover of Indonesia in 2006



**Figure 3.4.** Land Cover of Indonesia in 2009



**Figure 3.5.** Land cover of Indonesia in 2011

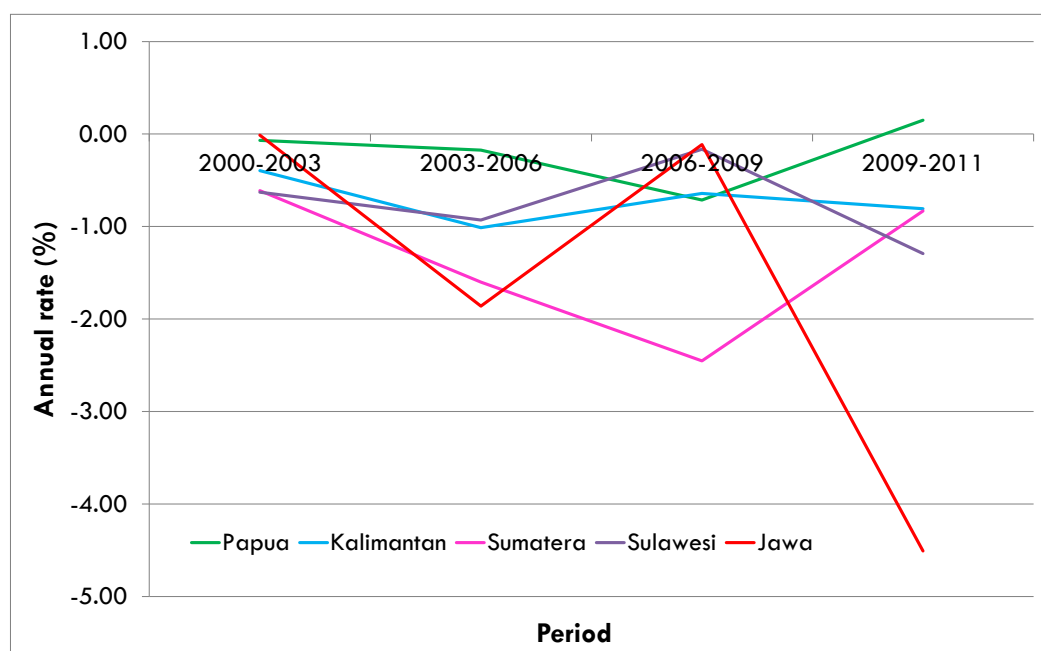


Based on these data, during the period of analysis 2000–2011, natural forest was the largest land cover, however, the proportion had been decreasing. Meanwhile, the second and the third largest land cover, namely agricultural land mixed with bush & barren land, and bush & grassland had been increasing.

With regard to forest type, dry-land forest & swamp forests were decreasing faster than mangrove. The analysis of land use land cover (LULC) also revealed the expansion of plantation, from 7.73 million ha in 2000 to 9.63 million ha in 2011. It is also interesting to note that deforestation pattern among main islands in Indonesia during period of analysis were varies. Forest areas in Java & Sulawesi Islands were slightly decreasing, while, Papua, Kalimantan and Sumatera Islands decreased significantly after 2006 (Table 3.3). Nevertheless, the annual rate of forest cover change in Java, Kalimantan, and Sulawesi has the same pattern, while Sumatera and Papua seemed to reach the transition turning point in between 2006 and 2009 (Figure 3.6).

**Table 3.3.** Forest cover area by province (in million ha)

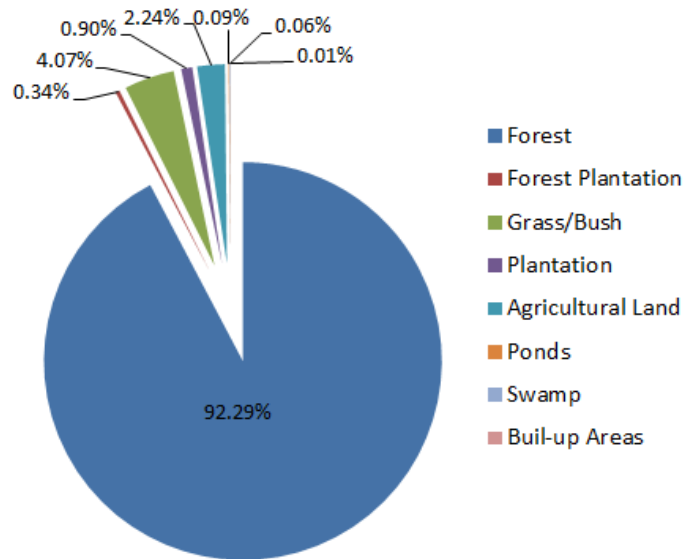
Province	2000	2003	2006	2009	2011
Papua	34.38	34.31	34.13	33.40	33.50
Kalimantan	30.34	29.98	29.07	28.51	28.05
Sumatera	15.27	14.99	14.27	13.22	13.00
Sulawesi	10.59	10.39	10.10	10.05	9.79
Java	0.92	0.92	0.87	0.87	0.79



**Figure 3.6.** Annual rate of forest cover changes in major islands of Indonesia 2000-2011

Further GIS analysis showed that the loss of natural forest in 2000 for the period of 11 years was 7.8 million ha (7.71%). This means there were 7.8 million ha of forest cover areas in year 2000 that were converted to non-forest cover areas and remained as non-forest cover areas in year 2011. The loss was due to conversion into bush/shrubs (4.07%), agricultural areas (2.24%) and plantation (0.09%) (Figure 3.7). Spatial deforestation during 2000 –2011 is presented in Figure 3.8.



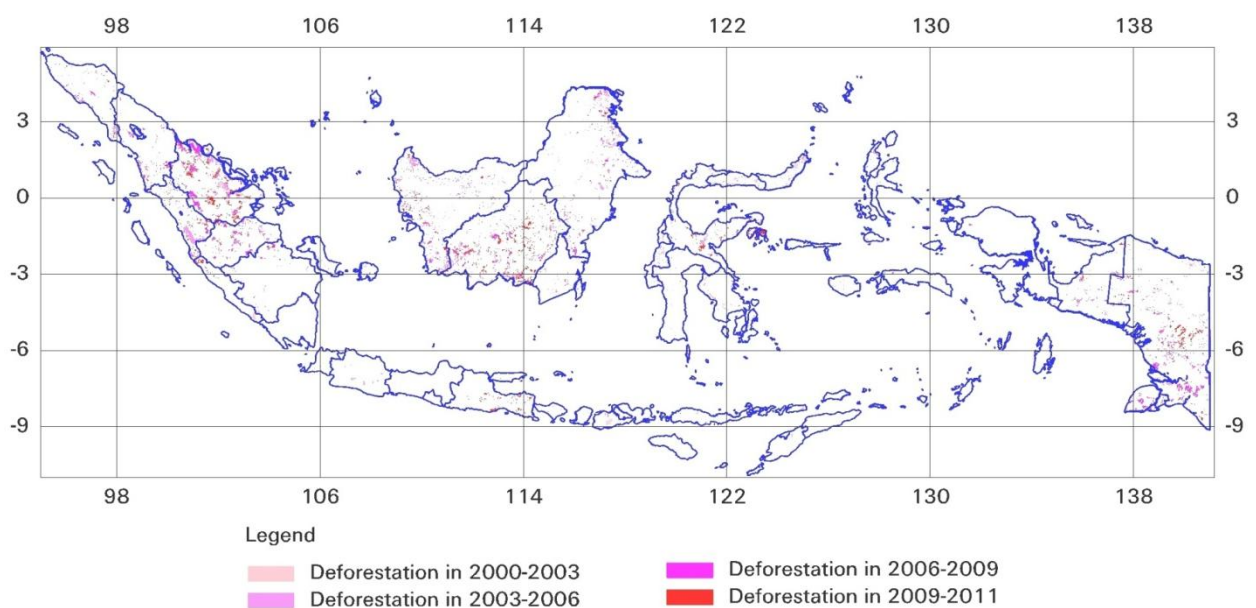


**Figure 3.7.** Conversion of natural forest (2000–2011)

### 3.1.2. Deforestation in Some Main Islands

#### 3.1.2.1. Java

Java Island is the most populated island in Indonesia, well developed with infrastructures, and it is occupied with large settlement. Moreover, Java Island is still the center of food production and therefore, it is dominated by agricultural landscape. In 2000, agricultural land covered 55.67% (7.9 million ha) and it slightly decreased to 55.34% (7.8 million ha) in 2011. Most of forest areas were already converted to other land cover, especially at flat areas (Verburg *et al.* 1999). The remaining forests were situated in the mountainous areas, in the form of national parks and other protected areas. In 2000, only 6.48% (924.8 thousand ha) of forest areas were only left and decreased to 5.6% (791.5 thousands ha) in 2011. In contrast, built-up area had been increasing from 7.7% (1.1 million ha) in 2000 to 9.45% (1.3 million ha) in 2011 (Table 3.4).



**Figure 3.8.** Deforestation 2000-2011

**Table 3.4.** Land cover area of Java (in thousand ha) and its proportions

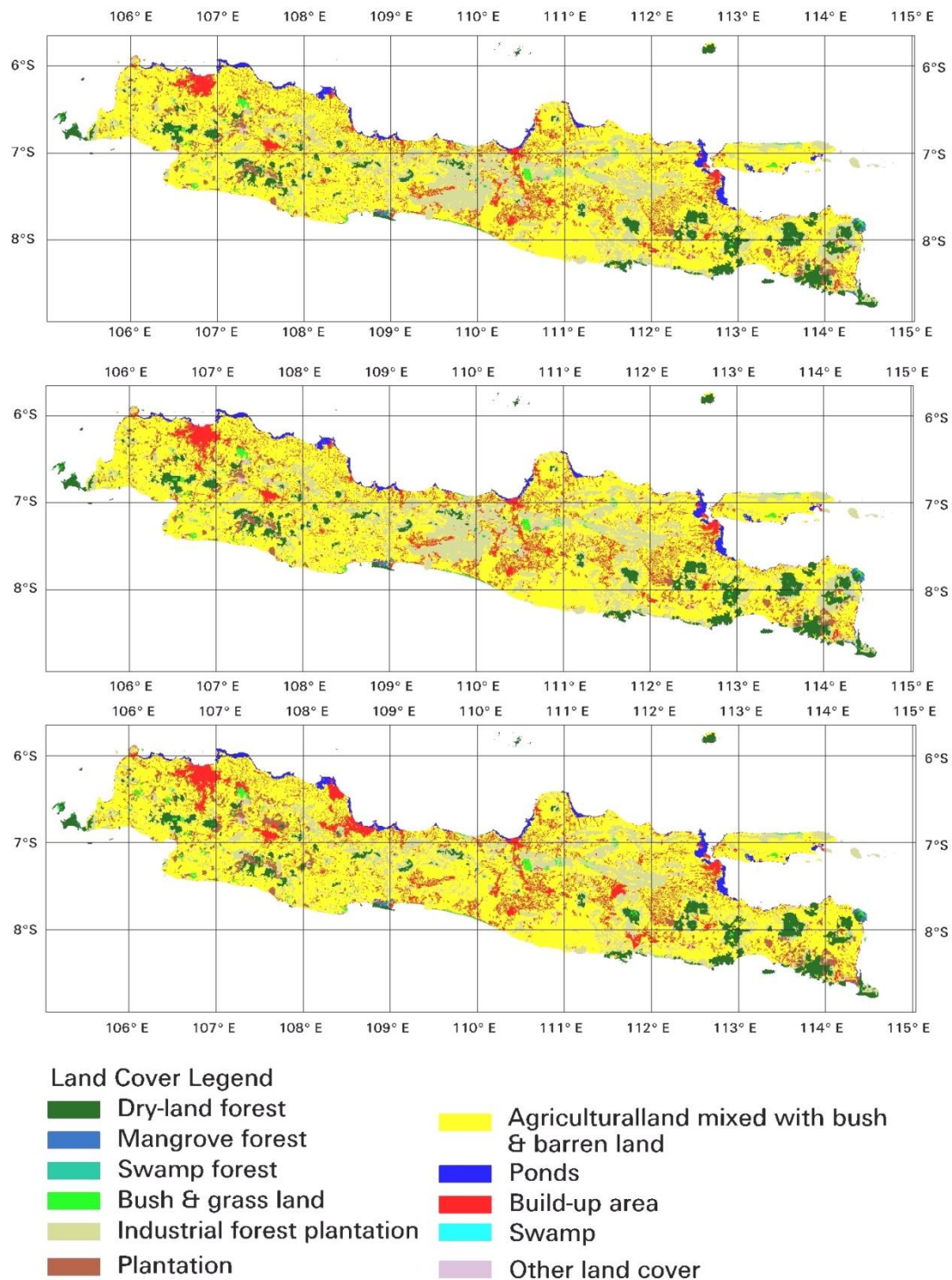
Land cover	2000		2003		2006		2009		2011	
	Area	%	Area	%	Area	%	Area	%	Area	%
Dry-land Forest	891.80	6.25	891.48	6.24	341.08	5.89	338.11	5.87	169.54	5.44
Mangrove Forest	33.04	0.23	33.04	0.23	31.85	0.22	31.85	0.22	31.95	0.16
Swamp Forest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
<b>Total natural forest</b>	<b>924.84</b>	<b>6.48</b>	<b>924.51</b>	<b>6.47</b>	<b>372.93</b>	<b>6.11</b>	<b>369.96</b>	<b>6.09</b>	<b>191.54</b>	<b>5.60</b>
Industrial Plantation Forest	2,600.04	18.21	2,600.13	18.21	2,028.20	14.20	1,985.27	13.90	2,437.05	17.23
Bush & Grassland	135.95	0.95	134.84	0.94	155.16	1.09	157.63	1.10	164.38	1.87
Plantation	334.65	2.34	335.25	2.35	393.41	2.76	391.07	2.74	391.31	2.77
Agricultural Land mixed with Bush and Barren Land	7,948.12	55.67	7,854.96	55.01	3,224.10	57.60	3,264.62	57.88	1,827.70	55.34
Ponds	231.90	1.62	232.61	1.63	233.71	1.64	233.71	1.64	233.25	1.65
Build up area	1,101.38	7.71	1,194.54	8.37	1,369.97	9.59	1,382.03	9.68	1,337.00	9.45
Swamp	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.01
Other Land Cover	76.70	0.54	76.74	0.54	76.09	0.53	39.28	0.49	39.04	0.49

Spatial distribution of land cover in 2000, 2003, 2006, 2009 and 2011, and deforestation, are presented in Figures 3.9 and 3.10, respectively.

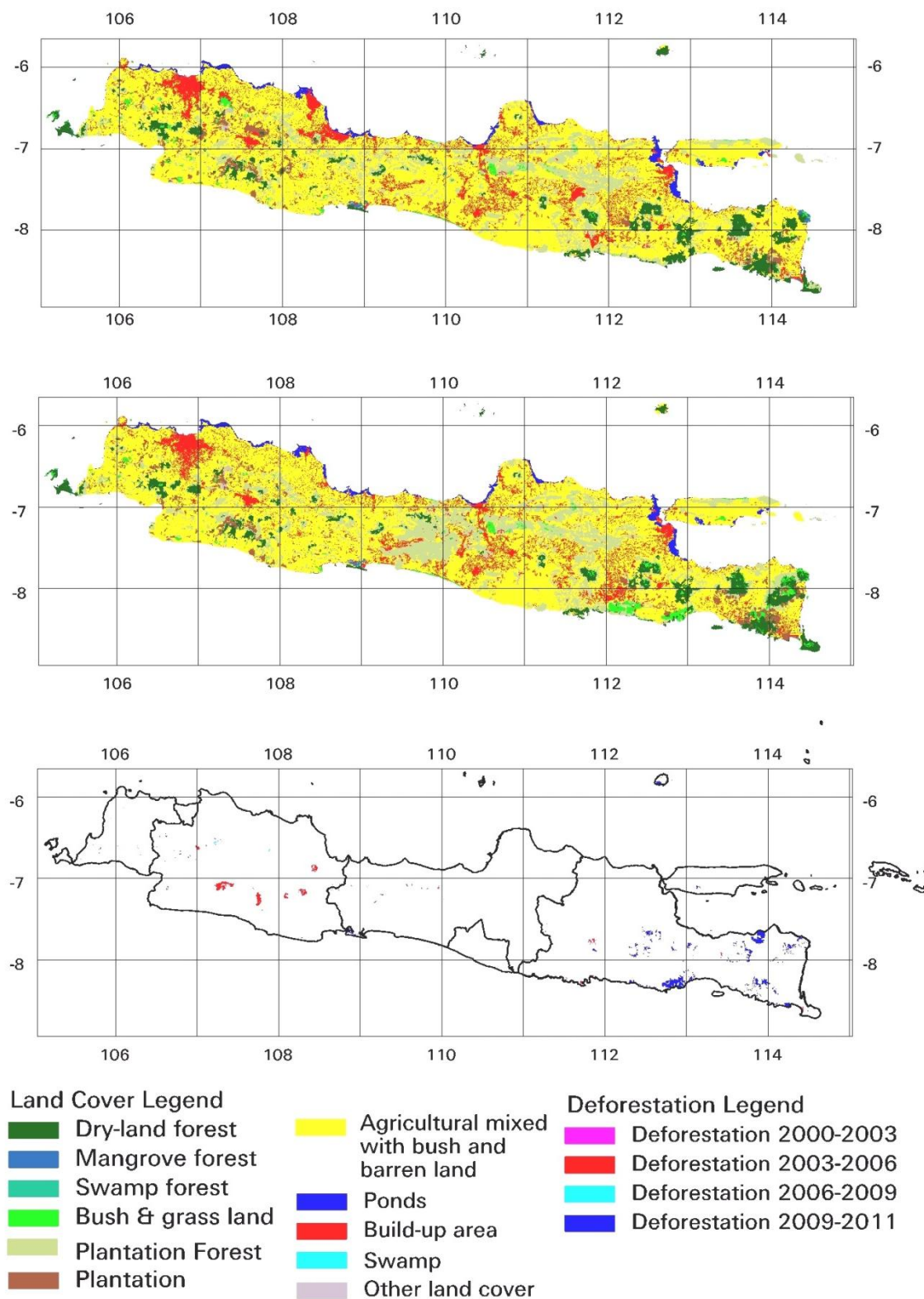
Further analysis of deforestation showed that deforestation among provinces in Java was varies. After 2003, forest cover areas in Jakarta, Central Java, Yogyakarta, and Banten were relatively unchanged, meanwhile, East Java was deforested and West Java was reforested (Table 3.5 and Figure 3.11). Table 3.5 presents the area of forest and Figure 3.12 presents the magnitude change of forest cover.

**Table 3.5.** Forest cover area in Java by province (in ha)

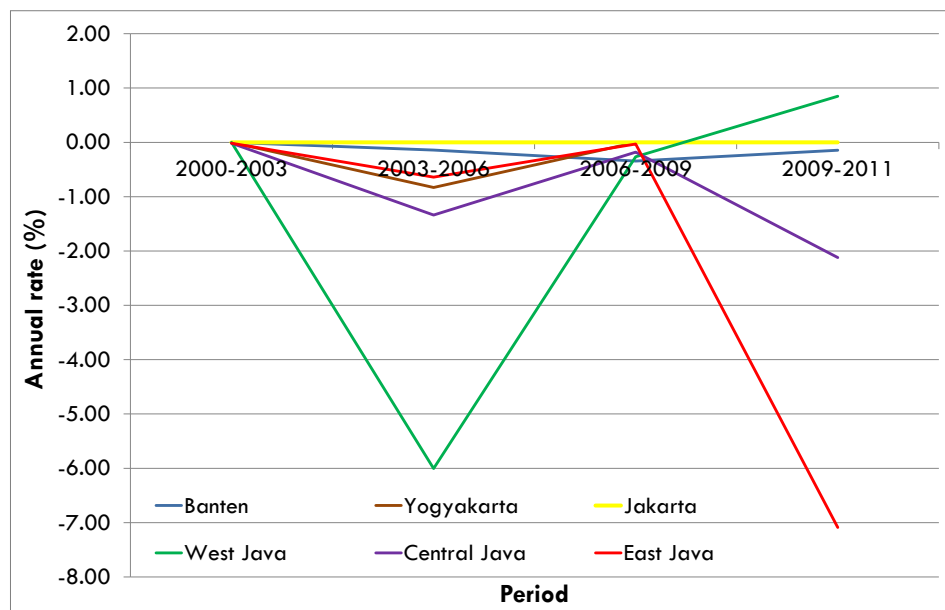
Provinces	Area				
	2000	2003	2006	2009	2011
Banten	72,131	72,131	71,823	71,078	70,873
Yogyakarta	813	813	793	793	793
Jakarta	57	57	57	57	57
West Java	207,141	207,141	169,828	168,479	171,334
Central Java	74,789	74,755	71,754	71,365	68,338
East Java	557,709	557,419	546,696	546,206	468,781



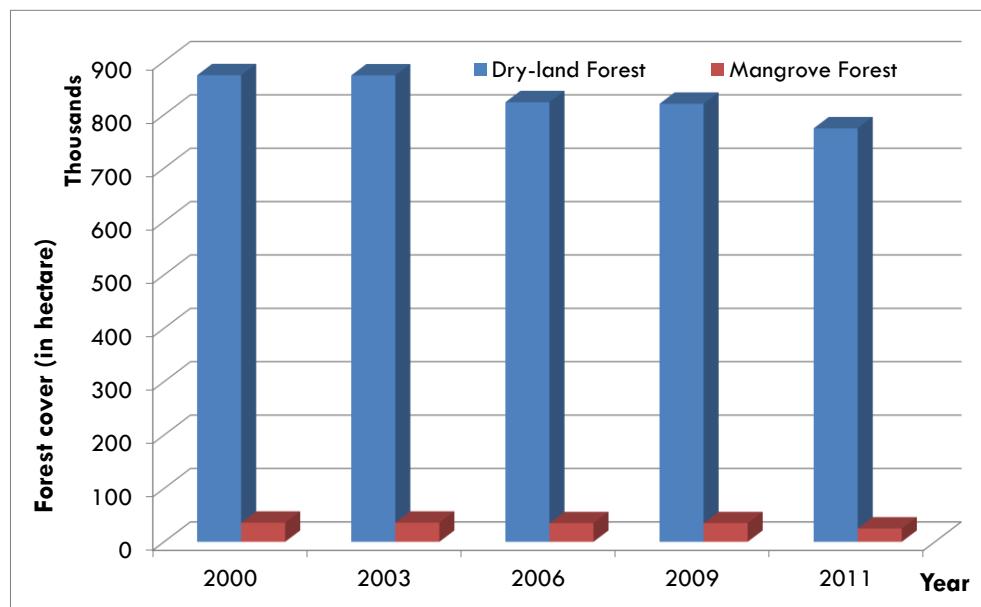
**Figure 3.9.** Land cover of Java in 2000 (top), 2003 (middle), and 2006 (bottom)



**Figure 3.10.** Land cover of Java in 2009 (top), 2011 (middle), and deforestation (bottom)



**Figure 3.11.** Annual rate of forest cover changes in Java



**Figure 3.12.** Forest cover changes in Java based on forest type

### 3.1.2.2. Sumatera

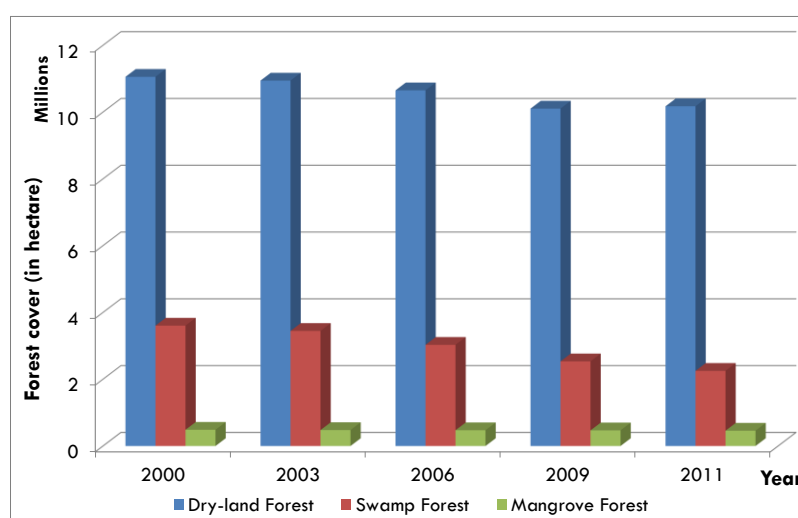
After Java, Sumatera Island is the next island that experienced deforestation process. Since the Dutch Colonial Government successfully introduced rubber and oil palm in Indonesia, plantations spread very quickly in Sumatera. To provide labor for the plantation and also to reduce population pressure of Java, Dutch Colonial Government resettled landless farmers to Sumatera (Elmhirst 2000). The resettlement program was continuing after the independence of Indonesia and it was well known as transmigration program (*Program Transmigrasi*). Local community also adopted the rubber, but by practicing shifting cultivation with *taungya* (*tumpang sari*) system for the food crops. Under the system, rubber was planted as the main trees; meanwhile food crops were cultivated in between the rubber trees for only 2–4 years. The area to plant rubber trees then left idle (fallow) to let natural succession. The early stage of shifting cultivation was easily recognized in the form of shrubs. The initial fallow period was easily recognized as bush/shrubs, which was growing until climax condition in the form of rubber agro-forest (Beukema & van Noordwijk 2004). Beside cash crops plantation, oil mining has been operating since the Dutch Colonial Government. Good infrastructure of mining facilitated people mobility and led to deforestation.

Pressure on forest cover increased after the promulgation of Domestic and Foreign Direct Investment (1970s), in the form of forest concession (*Hak Pengusahaan Hutan/HPH*). All of these factors caused forest cover decline. In 2000, land cover area was left only about 32% and continues to decrease till to 27% in 2011. Table 3.6 represents land cover changes of Sumatra Island during 2000–2011.

**Table 3.6.** Land cover area of Sumatera (in million ha) and its proportions

Land cover	2000		2003		2006		2009		2011	
	Area	%	Area	%	Area	%	Area	%	Area	%
Dry-land Forest	11.09	23.21	10.97	22.98	10.68	22.37	10.13	21.24	10.20	21.36
Mangrove Forest	0.56	1.18	0.55	1.16	0.55	1.15	0.54	1.14	0.53	1.12
Swamp Forest	3.62	7.58	3.46	7.25	3.04	6.37	2.55	5.34	2.26	4.73
<b>Total Natural Forest</b>	<b>15.27</b>	<b>31.97</b>	<b>14.99</b>	<b>31.38</b>	<b>14.27</b>	<b>29.88</b>	<b>13.22</b>	<b>27.72</b>	<b>13.00</b>	<b>27.22</b>
Bush and Grassland	7.49	15.69	7.63	15.98	7.75	16.22	7.97	16.70	7.60	15.91
Industrial Plantation Forest	0.93	1.95	0.94	1.97	1.04	2.18	1.26	2.63	1.09	2.29
Plantation	5.52	11.57	5.53	11.57	5.65	11.84	6.05	12.69	5.94	12.44
Agricultural land mixed with bush and barren land	16.38	34.30	16.50	34.55	16.87	35.32	17.11	35.87	18.02	37.74
Ponds	0.20	0.41	0.21	0.44	0.21	0.44	0.22	0.45	0.22	0.45
Build-Up Area	0.88	1.84	0.88	1.84	0.88	1.84	0.89	1.87	0.88	1.85
Swamp	0.23	0.49	0.23	0.49	0.23	0.49	0.23	0.49	0.22	0.46
Other Land Cover	0.85	1.78	0.85	1.78	0.85	1.78	0.76	1.59	0.78	1.64

There were 3 dominant land covers in Sumatra Island: forest, agricultural land mixed with bush and barren land, and bush and grassland. Further, forest can be categorized into dry-land, swamp and mangrove forest. The three forest types have difference deforestation rate. Since 2000, rate of deforestation of swamp forest was higher than dry-land forest, meanwhile mangrove relatively stable (Figure 3.13). Price hike of Crude Palm Oil (CPO) in international market after economic crisis in 1998 might be one of the reasons of the conversion of swamp forest.

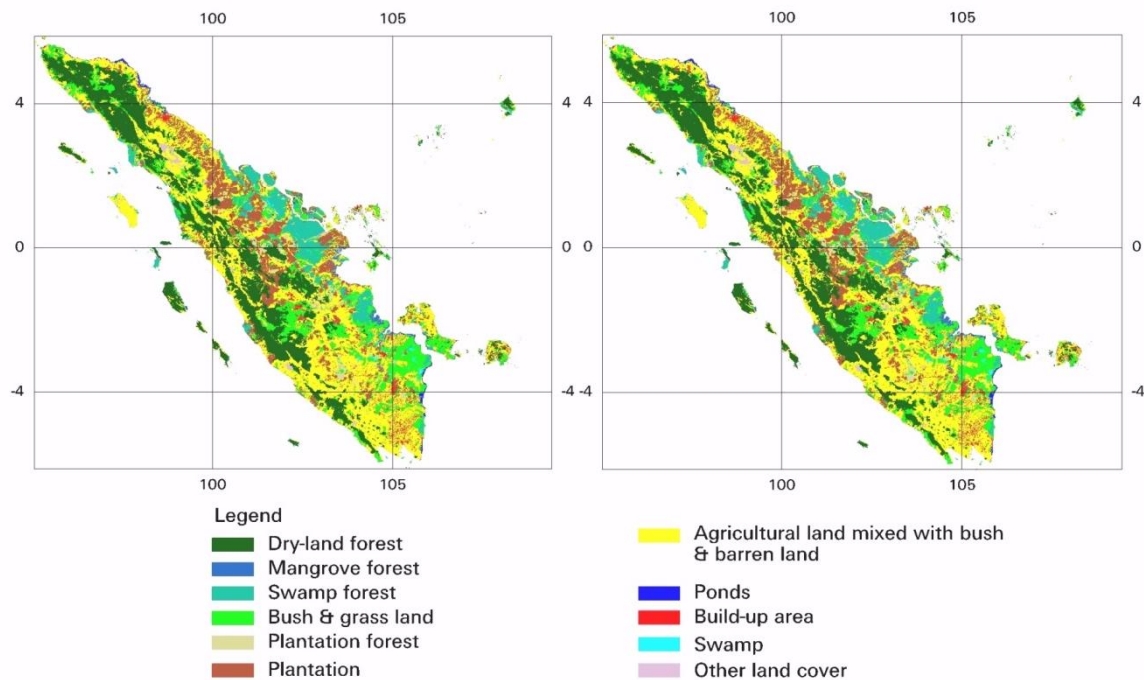


**Figure 3.13.** Forest cover changes in Sumatra based on forest types

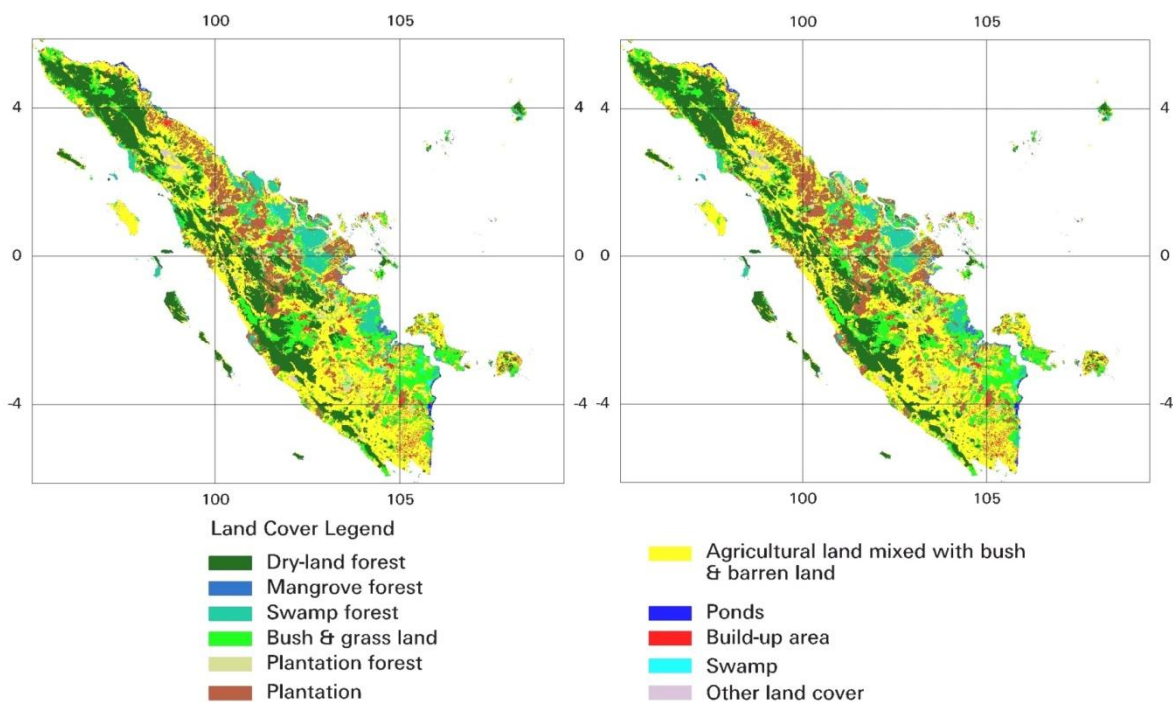
Figures 3.14, 3.15 and 3.16 show the spatial distribution of land cover of Sumatra Island in 2000, 2003, 2006, 2009, 2011 and deforestation between 2000–2011, respectively. The figures clearly shown that the remaining dry-land forests were situated at the mountainous area in the western part, meanwhile the swamp forest and mangrove forest were in the eastern part of the island. Spatial distribution of deforestation also depicted that most deforestation had occurred at Riau Province and Jambi Province.



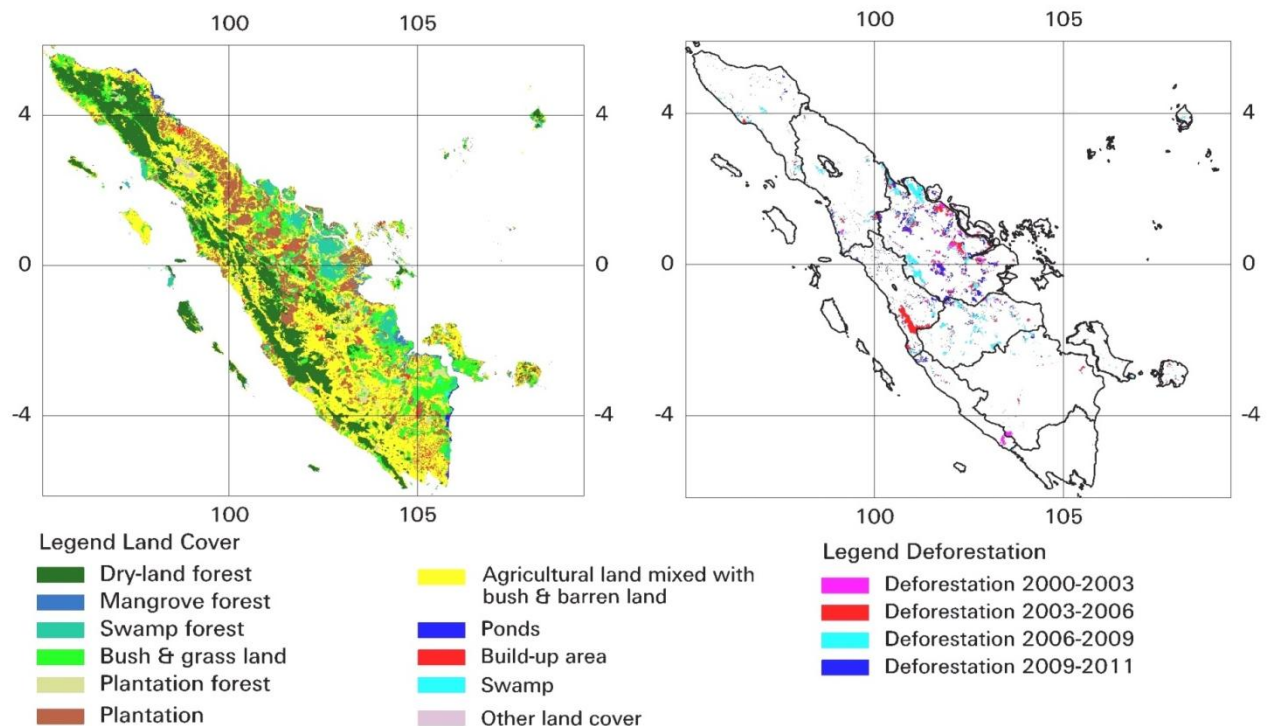
Even rate of deforestation in the National level had showed gradual decrease, deforestation rate in Sumatra has not decline yet. Deforestation in the period of 2000–2003, 2003–2006, 2006–2009 and 2009–2011 was 93 853 ha, 238 464 ha, 357 735 ha, and 505184 ha, respectively. Further analysis showed that most of deforestation that took place in 2000 was situated at swamp and peat ecosystem at eastern coast of Sumatra. Distribution of deforestation area from 2000–2011 is presented in Figure 3.16(right).



**Figure 3.14.** Land cover of Sumatra in 2000 (left) and 2003 (right)



**Figure 3.15.** Land cover of Sumatra in 2006 (left) and 2009 (right)



**Figure 3.16.** Land cover of Sumatra in 2011 (left) and Deforestation 2000–2011 (right)

It is interesting to see also the variation of deforestation rate in provincial level. Rates of deforestation at provincial level are varied and it is not depend on the area of forest cover. Aceh Province as one of the rich forest cover province in Sumatra in fact having lower rate of deforestation when compared to other provinces. In contrast, rate of deforestation and forest cover of Riau Province was very high. In the period of 2009–2011, Riau Province was a province with high deforestation rate (3.54%), followed by Jambi (1.94%), and North Sumatra (1.22%). Lampung, Jambi and West Sumatra Provinces have become reforested province after 2009. Table 3.7 presents the area of forest cover changes and Figure 3.17 present the annual rate of forest cover changes in Sumatera.

**Table 3.7.** Forest cover area in Sumatera based on province (in ha)

Provinces	Area				
	2000	2003	2006	2009	2011
Lampung	262,282.05	261,225.81	261,194.22	257,418.00	294,385.59
Riau Archipelago	264,513.60	264,288.42	264,090.78	252,399.24	252,370.89
Riau	3,459,565.89	3,293,040.42	2,946,304.53	2,479,984.29	2,178,423.72
Bangka & Belitung	305,826.03	302,769.90	291,736.89	262,175.94	261,537.66
Bengkulu	830,125.26	793,460.61	786,510.00	773,254.35	738,075.24
South Sumatra	1,036,805.67	1,010,908.35	990,648.63	939,066.21	928,582.38
Jambi	1,596,053.97	1,577,103.21	1,547,236.08	1,330,983.90	1,374,433.11
North Sumatra	1,921,578.39	1,910,298.33	1,854,129.69	1,748,617.47	1,732,168.80
West Sumatra	2,161,987.20	2,154,964.50	1,942,397.01	1,892,113.83	1,985,218.47
Aceh (NAD)	3,308,431.23	3,299,035.23	3,268,741.23	3,171,848.22	3,137,166.45



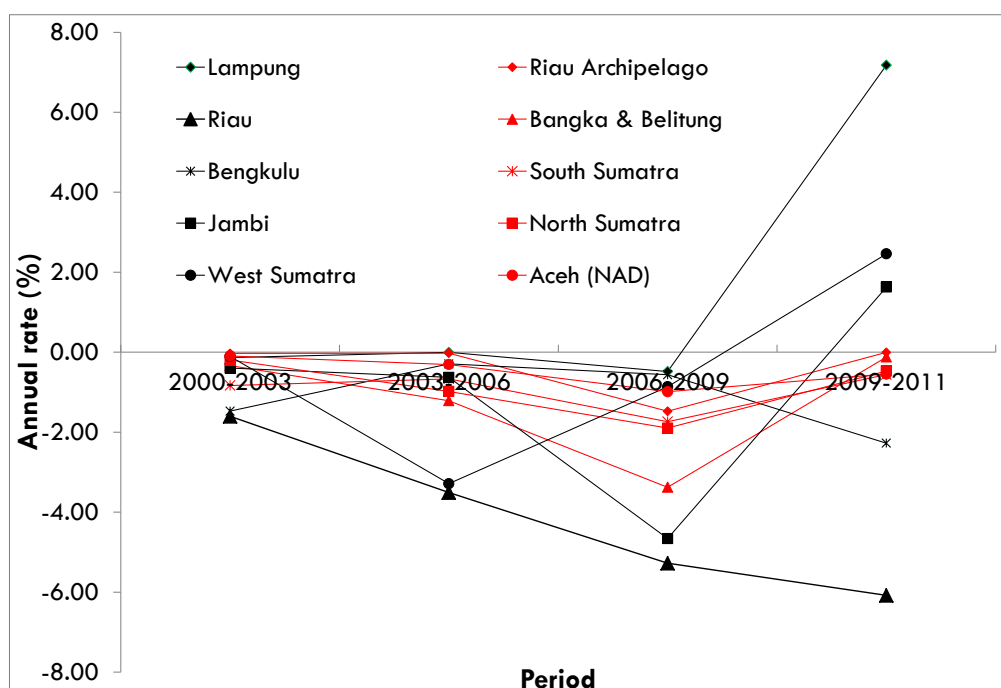


Figure 3.17. Annual rate of forest cover changes in Sumatera

### 3.1.2.3. Kalimantan

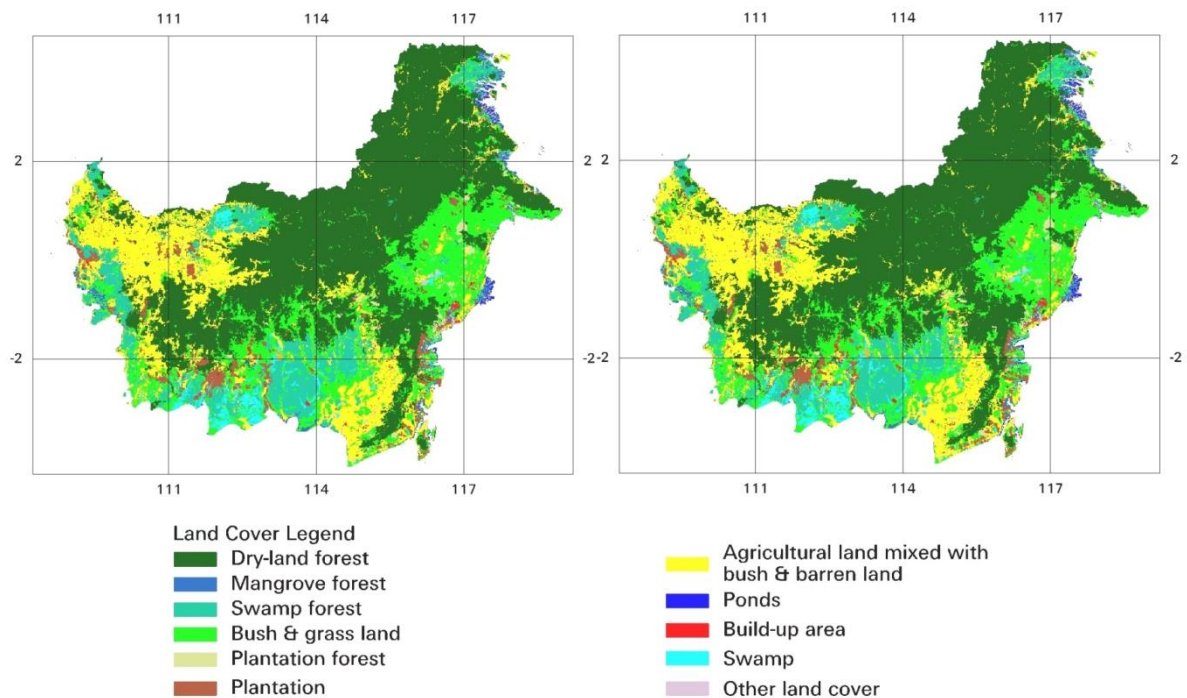
Forest in Kalimantan is dominated by dry land forest, followed by swamp and mangrove forest. Dry forest are distributed in East and West Kalimantan, meanwhile, swamp (including peat) forests are mostly distributed in Central and South Kalimantan. Similar to Sumatra Island, there had been some major drivers of deforestation took place, such as forest concession, plantation, agricultural area expansion, coal mining, forest fire as well as shifting cultivation practices. One million ha mega rice project in 1997 is one of the causes of forest lost (Boehm & Siegert 2001). Forest fire during El Nino-Southern Oscillation (ENSO) phenomena, uncontrolled fires have destroyed 1.8 million ha (Siegert & Hoffmann 2000) was also important factor of forest lost. Table 3.8 presents dynamics change of land cover during 2000-2011 and its spatial distribution is presented in Figure 3.22.(right).

Table 3.8. Land cover area of Kalimantan (in million ha) and its proportions

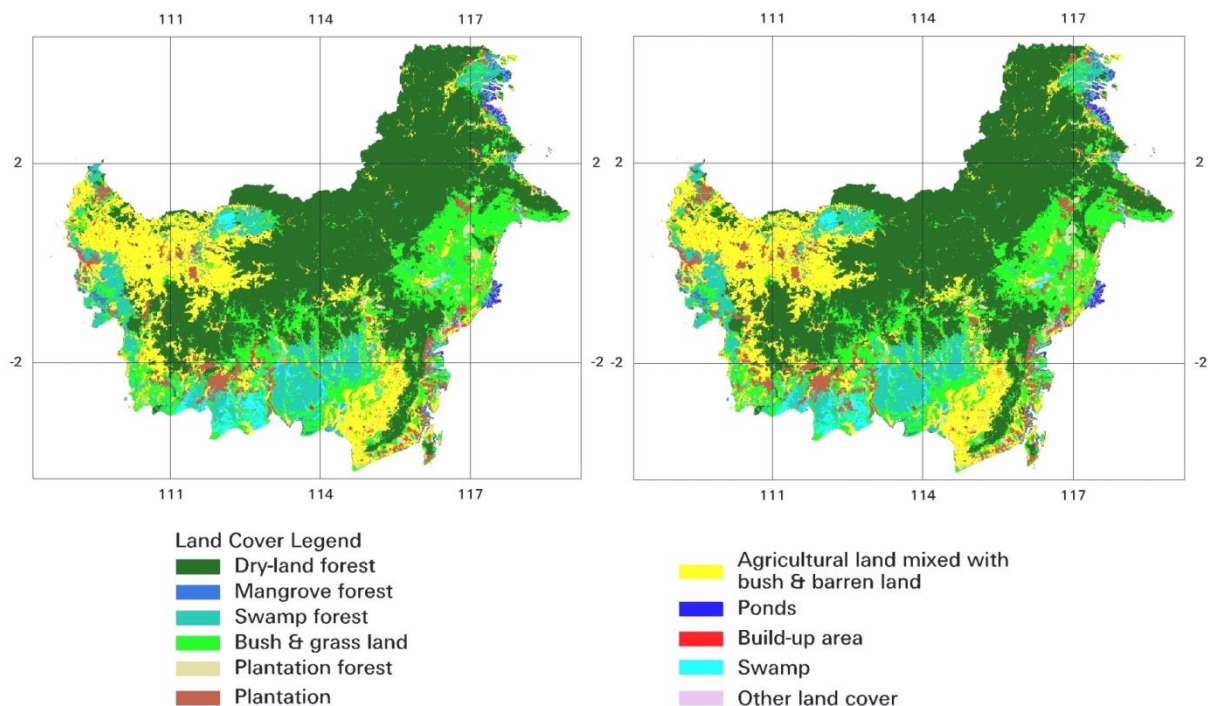
Land cover	2000		2003		2006		2009		2011	
	Area	%	Area	%	Area	%	Area	%	Area	%
Dry-land Forest	24.60	46.21	24.45	45.92	23.90	44.89	23.59	44.30	23.56	44.26
Mangrove Forest	0.64	1.21	0.59	1.11	0.50	0.95	0.49	0.92	0.47	0.88
Swamp Forest	5.09	9.55	4.94	9.28	4.66	8.76	4.43	8.32	4.02	7.55
<b>Total Natural Forest</b>	<b>30.34</b>	<b>56.97</b>	<b>29.98</b>	<b>56.31</b>	<b>29.07</b>	<b>54.59</b>	<b>28.51</b>	<b>53.54</b>	<b>28.05</b>	<b>52.68</b>
Bush and Grassland	9.73	18.27	9.74	18.29	10.11	18.99	9.90	18.60	9.05	17.00
Industrial Plantation Forest	0.51	0.96	0.51	0.96	0.52	0.98	0.53	1.00	0.74	1.38
Plantation	1.47	2.77	1.56	2.93	1.82	3.43	2.46	4.61	2.87	5.40
Agricultural land mixed with bush and & Barren land	9.25	17.38	9.40	17.66	9.57	17.97	9.67	18.15	10.59	19.89
Ponds	0.15	0.28	0.19	0.35	0.23	0.44	0.24	0.46	0.25	0.46
Build-up area	0.29	0.54	0.29	0.54	0.29	0.55	0.30	0.55	0.30	0.55
Swamp	0.83	1.56	0.90	1.69	0.93	1.74	0.90	1.69	0.59	1.10
Other land cover	0.67	1.26	0.68	1.27	0.70	1.32	0.74	1.38	0.81	1.52

Total area of Kalimantan is 53.2 million ha. There were 3 dominant land cover classes, namely forest, bush and grassland, and agricultural land mixed with bush and barren land. In the year of 2000, forest area was the largest land cover, representing 56.97% of Kalimantan or approximately 30.34

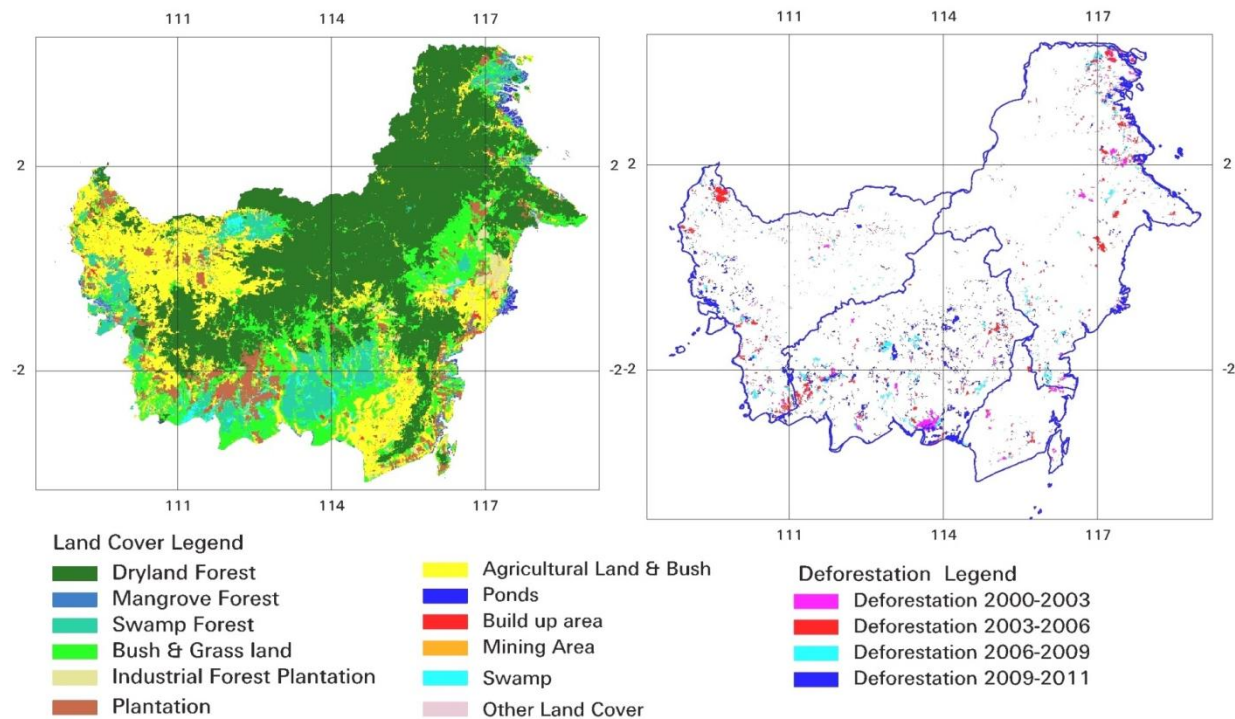
million ha. In this year, already millions hectare of forest was converted to other uses. In 2011, proportion forest area had decreased to 52.68% (28.05 million ha). This was due to conversion of forest into plantation and agricultural land mixed with bush and barren land (Table 3.8). The agricultural land that mixed with bush and barren land is fallow land of less intensive agricultural, such as shifting cultivation/slash and burn farming. This kind of agricultural technique is easily found in Kalimantan (Hashimoto *et al.* 2000). Spatial distributions of land cover between 2000 and 2011 are presented in Figures 3.18, 3.19 and 3.20.



**Figure 3.18.** Land cover of Kalimantan in 2000 (left) and 2003 (right)

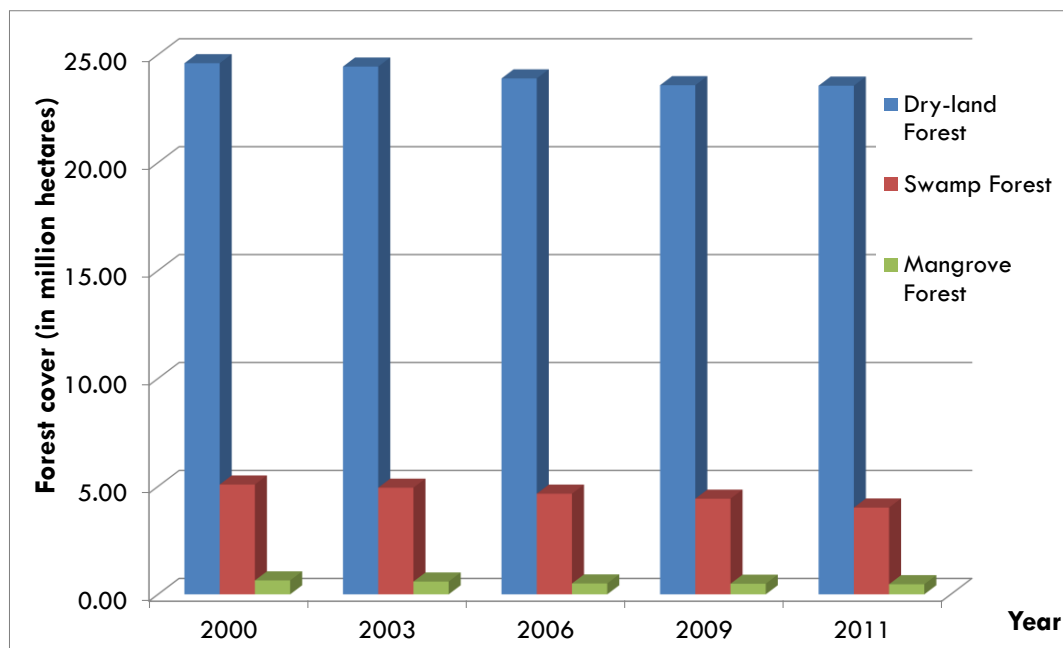


**Figure 3.19.** Land cover of Kalimantan in 2006 (left) and 2009 (right)



**Figure 3.20.** Land cover of Kalimantan in 2011 (left) and Deforestation 2000–2011 (right)

Further analysis showed that forest lost since 2003 was mostly came from swamp forest (Figure 3.19), which was located in Central Kalimantan (Figure 3.20 [right], Figure 3.21, Figure 3.22, and Table 3.9). This lost was due to the expansion of plantation and agricultural land mixed with bush & barren land. Area of plantation in 2011 was 2.87 million ha, almost twice compared to area in 2000. It is important to note also that dry-land forest had slightly increased, and it had happen in East Kalimantan District.



**Figure 3.21.** Forest cover changes in Kalimantan based on Forest Type

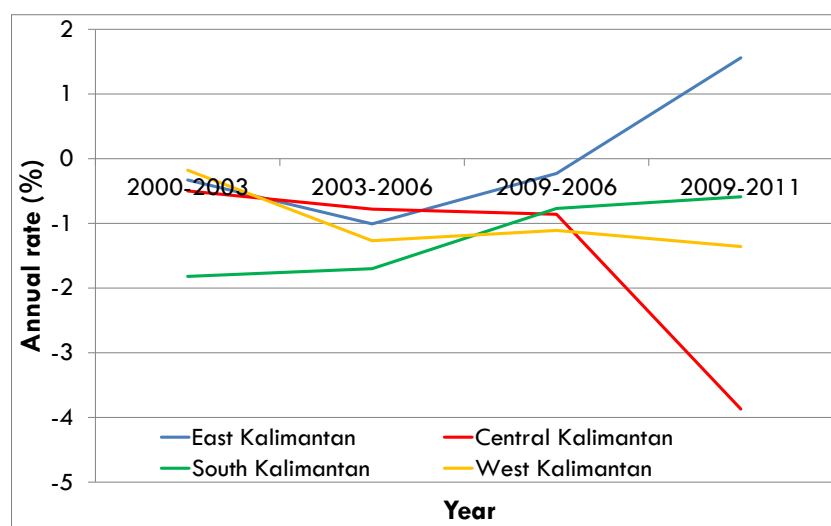


Figure 3.22. Annual rate of forest cover changes in Kalimantan

Table 3.9. Forest cover area in Kalimantan based on province (in ha)

Provinces	Area				
	2000	2003	2006	2009	2011
East Kalimantan	13 310 702.46	13 179 251.61	12 780 410.85	12 691 295.46	13 086 668.61
Central Kalimantan	9 209 287.71	9 070 977.78	8,857,835.19	8 628 306.30	7 960 932.72
South Kalimantan	842 265.54	796 371.75	755,801.28	738 323.10	729 589.68
West Kalimantan	6 974 117.82	6 935 442.75	6,671,908.44	6 450 166.89	6 275 147.76

#### 3.1.2.4. Sulawesi

Area of Sulawesi islands is about 18.46 million ha and dominated by forest, agricultural land mixed with bush & barren land, and bush & grassland. Mangrove and swamp forests were very small. In 2000, dry-land forest occupied 54.22% of area (10.01 million ha) and decrease to 49.87% (9.20 million ha) in 2011. Meanwhile, mangrove had increased and swamp forest relatively unchanged (Table 3.10 and Figure 3.23). Agricultural land mixed with bush & barren land had gradually increased from 29.22 % (5.39 million ha) in 2000 to 32.39% (5.98 million ha) in 2011. Spatial distribution of land cover in 2000, 2003, 2006, 2009 and 2011 are presented in Figure 3.25, 3.26 and 3.27, respectively.

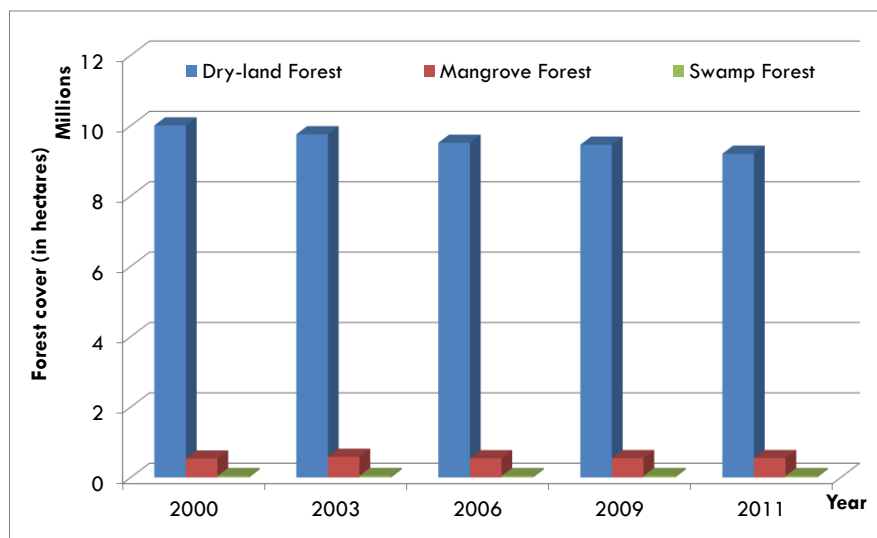
Table 3.10. Land cover area of Sulawesi (in million ha) and its proportions

Land cover	2000		2003		2006		2009		2011	
	Area	%	Area	%	Area	%	Area	%	Area	%
Dry-land Forest	10.01	54.22	9.76	52.86	9.51	51.55	9.46	51.25	9.20	49.87
Mangrove Forest	0.54	2.91	0.59	3.18	0.55	2.96	0.55	2.98	0.55	2.98
Swamp Forest	0.04	0.22	0.04	0.23	0.04	0.21	0.04	0.22	0.04	0.21
<b>Total Natural Forest</b>	<b>10.59</b>	<b>57.36</b>	<b>10.39</b>	<b>56.27</b>	<b>10.10</b>	<b>54.72</b>	<b>10.05</b>	<b>54.45</b>	<b>9.79</b>	<b>53.07</b>
Bush & Grassland	1.78	9.67	1.79	9.71	1.93	10.44	1.93	10.44	1.94	10.50
Industrial Plantation Forest	0.02	0.09	0.02	0.09	0.02	0.09	0.02	0.09	0.02	0.09
Plantation	0.22	1.17	0.22	1.18	0.22	1.19	0.23	1.23	0.24	1.31
Agricultural land mixed with bush & barren land	5.39	29.20	5.58	30.21	5.72	30.99	5.75	31.16	5.98	32.39
Ponds	0.13	0.71	0.14	0.74	0.14	0.75	0.14	0.76	0.14	0.76
Build-Up Area	0.11	0.62	0.11	0.62	0.12	0.63	0.13	0.69	0.13	0.68
Swamp	0.01	0.04	0.01	0.04	0.01	0.04	0.01	0.04	0.01	0.04
Other Land Cover	0.21	1.14	0.21	1.14	0.21	1.15	0.21	1.15	0.21	1.16

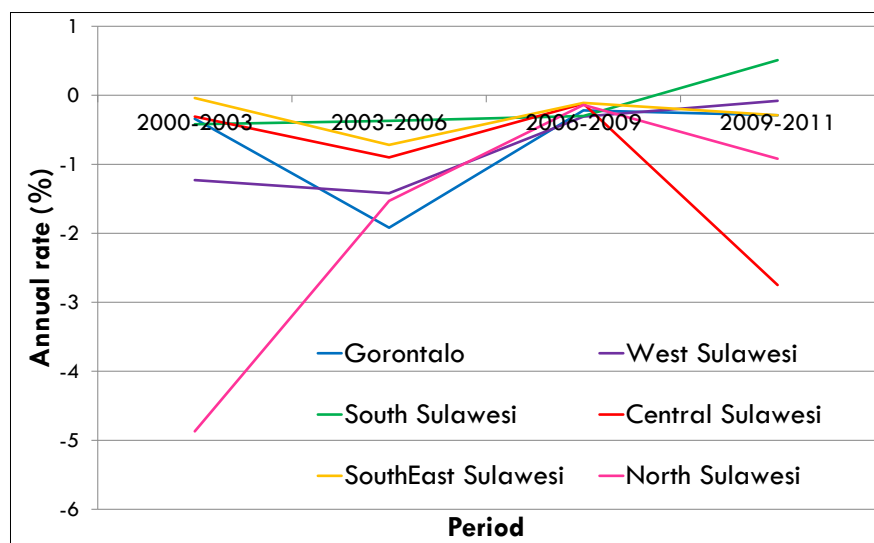
In term of provincial distribution, Central Sulawesi has larger forest cover compares to other provinces. The second largest province was Southeast Sulawesi, followed by South Sulawesi (Table 3.11). Deforestation rate of each province during analysis periods were varies. In 2000–2003, North Sulawesi had the largest annual deforestation rate of about 4.87%, but it gradually had declined to 0.92% in the period of 2009–2011. In contrast, deforestation of Central Sulawesi showed an increase from 0.04% in the period of 2000–2003 to 2.75% in the period of 2009–2011 (Figure 3.24). Spatial distribution of deforestation is presented in Figure 3.27(right).

**Table 3.11.** Forest cover area in Sulawesi based on provinces (in ha)

Provinces	Area				
	2000	2003	2006	2009	2011
<b>Gorontalo</b>	781 142.13	773 114.22	728 570.70	723 766.59	719 636.40
<b>West Sulawesi</b>	582 347.88	560 853.72	536 900.40	531 978.84	531 125.91
<b>South Sulawesi</b>	1 780 569.54	1 757 956.77	1 738 353.15	1 722 807.63	1 740 289.86
<b>Central Sulawesi</b>	4 653 143.01	4 610 459.25	4 485 392.82	4 469 357.25	4 223 702.88
<b>Southeast Sulawesi</b>	2 080 016.01	2 077 468.56	2 032 422.03	2 025 866.70	2 014 112.79
<b>North Sulawesi</b>	709 085.34	605 568.15	577 810.26	575 463.69	564 862.41

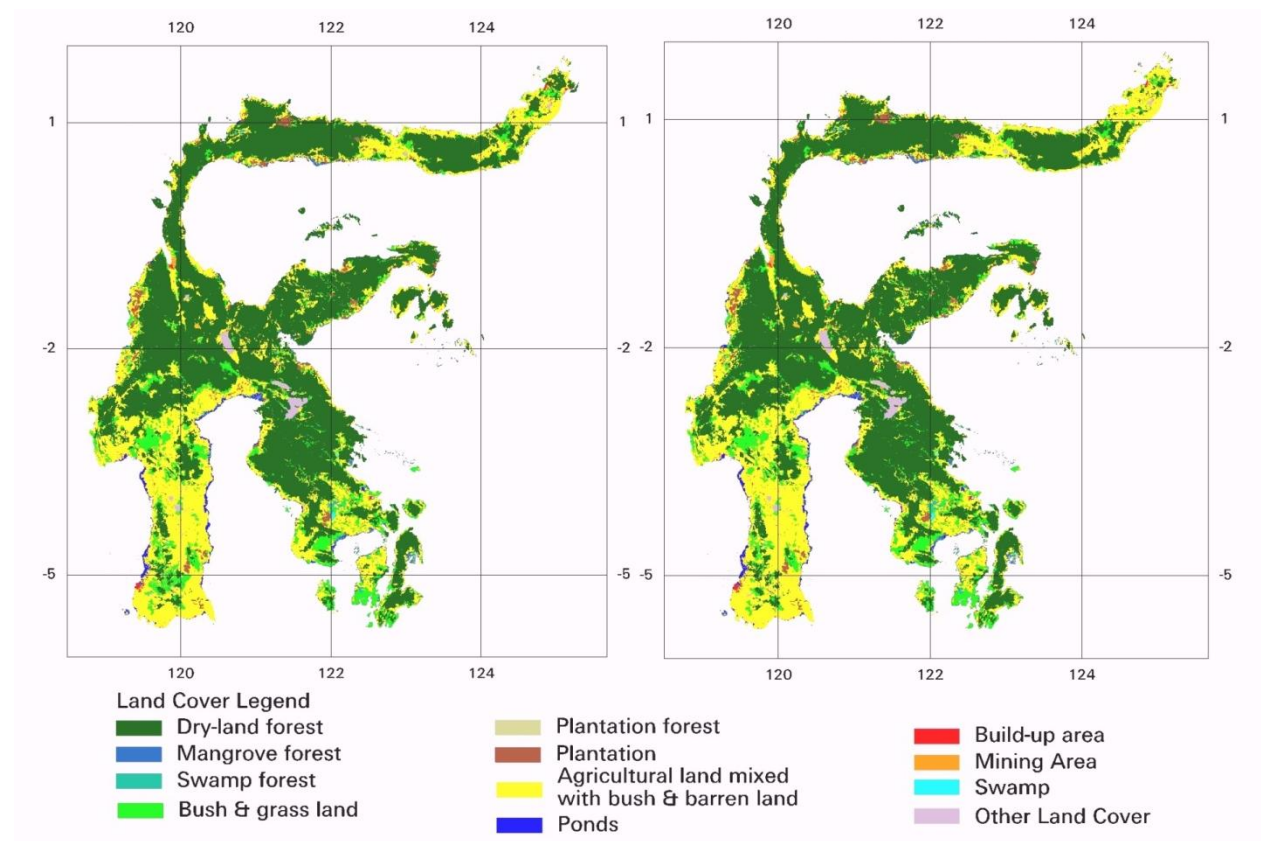


**Figure 3.23.** Forest cover changes in Sulawesi based on forest types

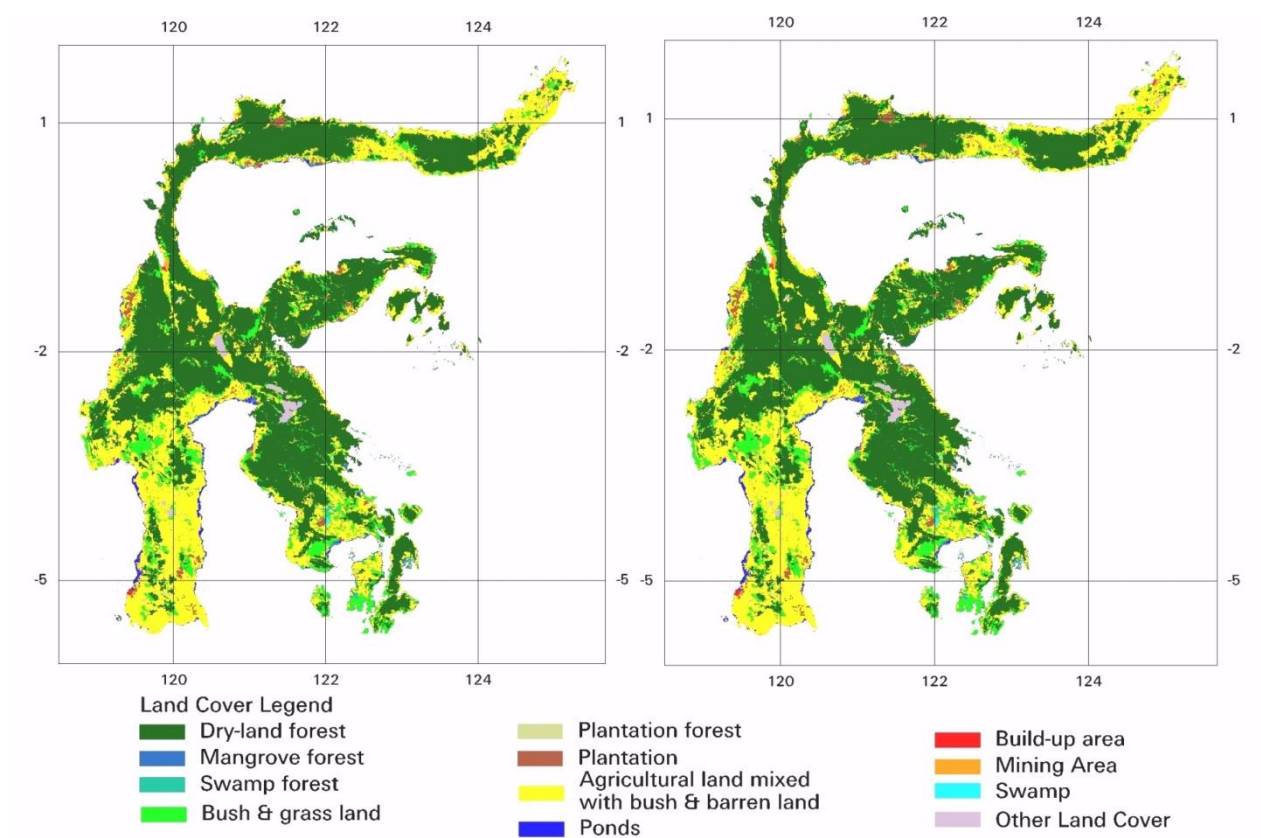


**Figure 3.24.** Annual rate of forest cover changes in Sulawesi

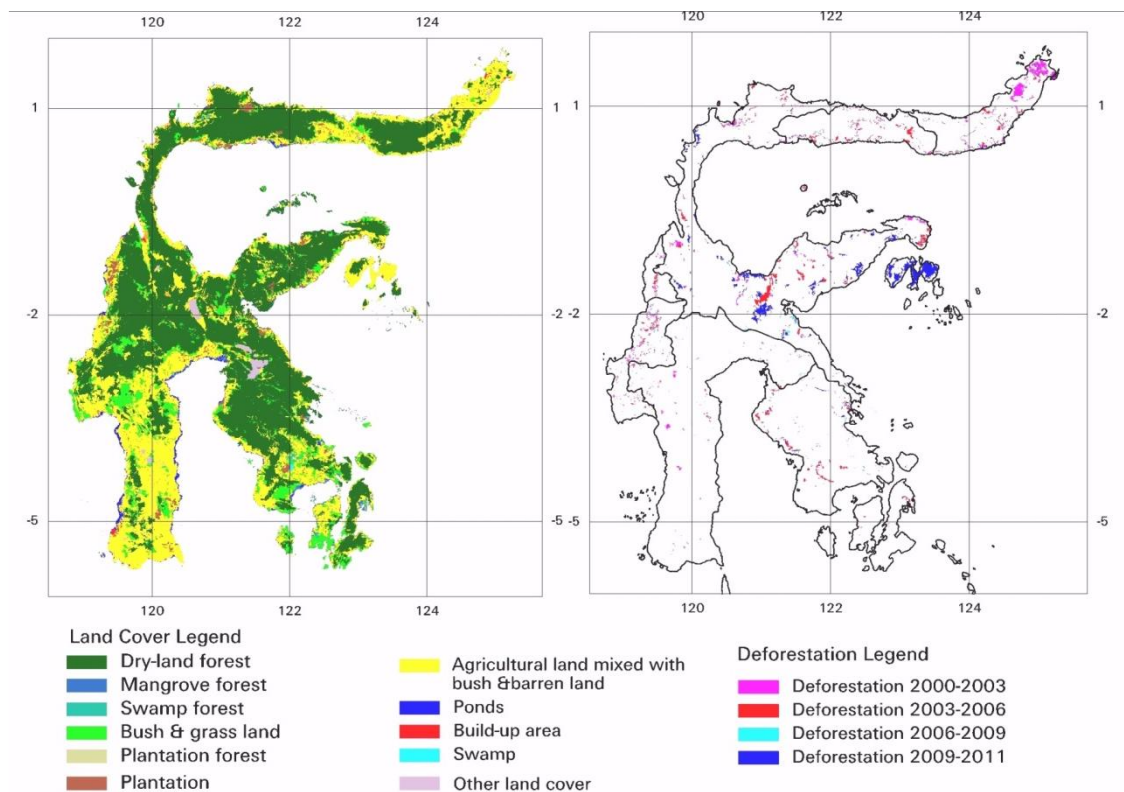




**Figure 3.25.** Land cover of Sulawesi in 2000 (left) and 2003 (right)



**Figure 3.26.** Land cover of Sulawesi in 2006 (left) and 2009 (right)



**Figure 3.27.** Land cover of Sulawesi in 2011 (left) and Deforestation 2000-2011 (right)

### 3.1.2.5. Papua

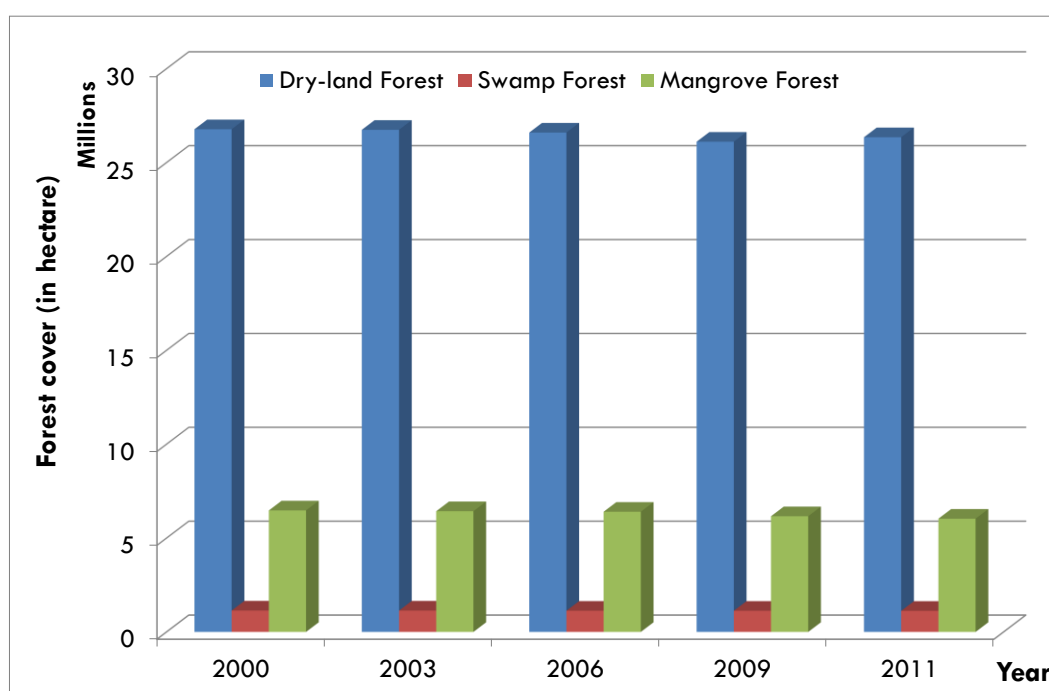
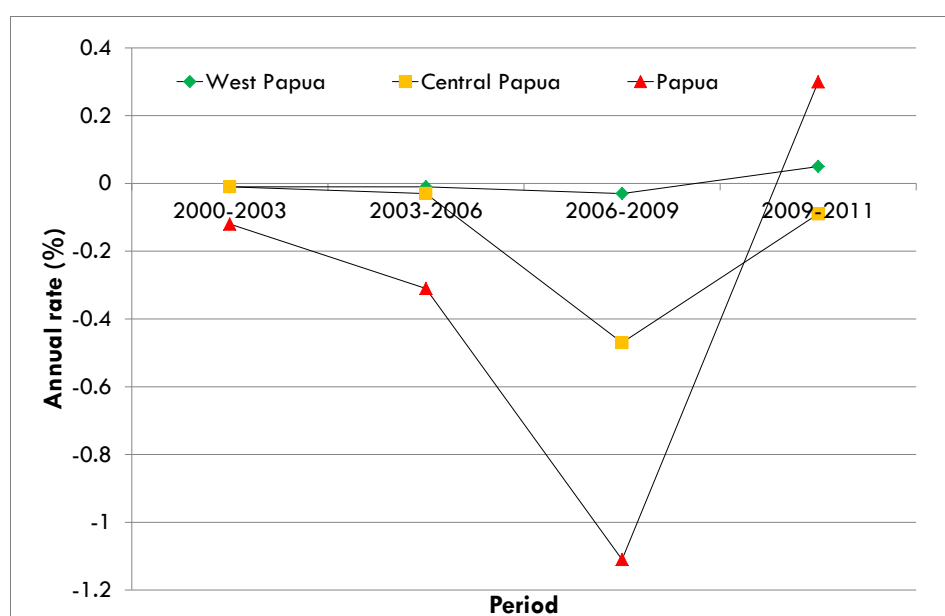
Compare to the other island, Papua is less developed. Limitation of road access as well as low population density have made ecosystem in of Papua relatively untouched. Naturally, Papua are dominated by dry-land forest in the middle part, swamp forest and mangrove forest are mostly situated in the Western part. Savanna grasslands are also found in lowland in the western part of Papua. In 2000, 84.92 % (34.4 million ha) of the area were still under forests and decreased to 82.7% (33.5 million ha) in 2011 (Table 3.12 and Figure 3.27). Table 3.12., also revealed that development of agricultural land was not significant. During 2000–2011, agricultural land mixed with bush just increased 0.15 million ha. Most of deforestation in 2000–2011 took place at Papua and Central Papua Province (Figure 3.29). Spatial distribution of Land cover in 2000 and 2003, 2006 and 2009, 2011, and deforestation, are presented in Figures 3.30, 3.31, 3.32, respectively.

**Table 3.12.** Land cover area of Papua (in million ha) and its proportions

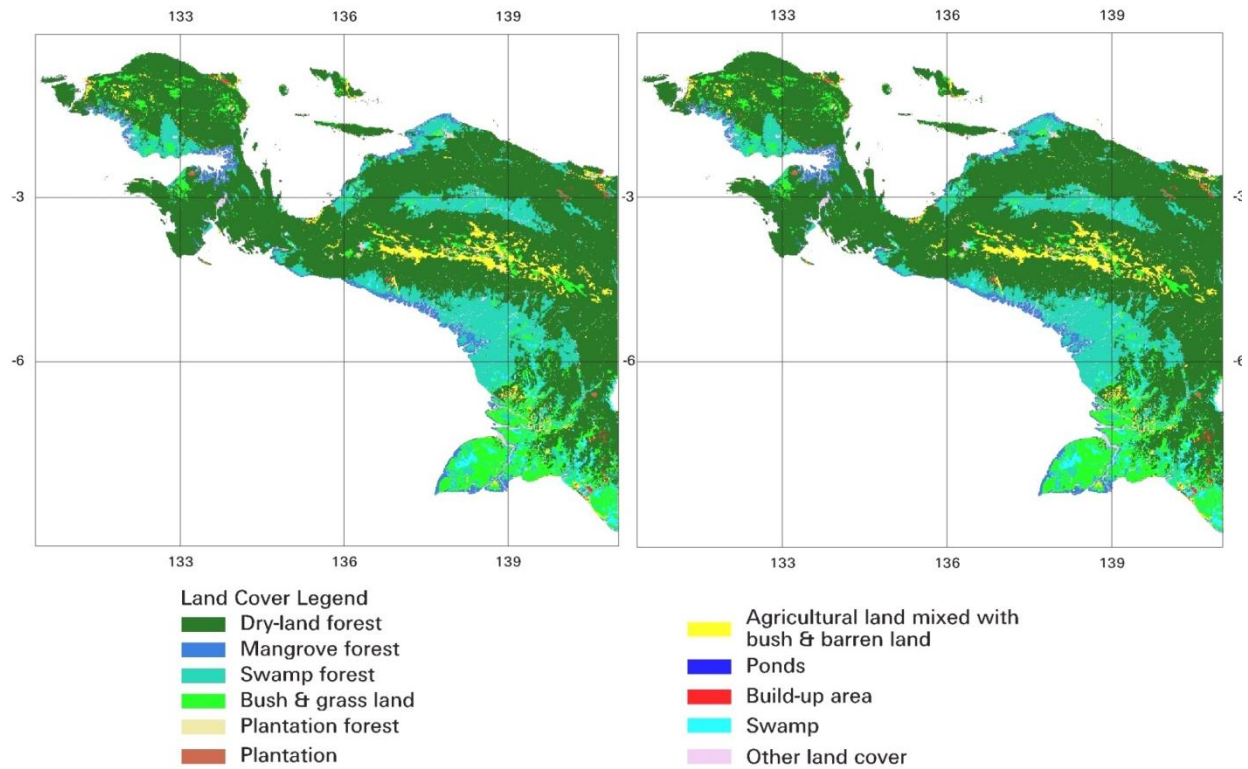
Land Cover	2000		2003		2006		2009		2011	
	Area	%	Area	%	Area	%	Area	%	Area	%
Dry-land Forest	26.77	66.12	26.74	66.05	26.60	65.68	26.11	64.48	26.35	65.06
Mangrove Forest	1.14	2.82	1.14	2.81	1.13	2.79	1.13	2.78	1.12	2.77
Swamp Forest	6.47	15.98	6.43	15.88	6.40	15.81	6.16	15.22	6.03	14.89
<b>Total Natural Forest</b>	<b>34.38</b>	<b>84.92</b>	<b>34.31</b>	<b>84.74</b>	<b>34.13</b>	<b>84.28</b>	<b>33.40</b>	<b>82.48</b>	<b>33.50</b>	<b>82.73</b>
Bush and Grass land	3.47	8.57	3.52	8.68	3.54	8.74	4.11	10.16	3.99	9.84
Industrial Plantation Forest	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.00
Plantation	0.06	0.16	0.06	0.16	0.07	0.18	0.09	0.21	0.09	0.23
Agricultural land mixed with bush & Barren land	1.29	3.18	1.31	3.23	1.45	3.57	1.61	3.98	1.54	3.81
Ponds	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Build-up area	0.13	0.32	0.13	0.33	0.13	0.33	0.14	0.34	0.12	0.31
Swamp	0.54	1.34	0.55	1.35	0.56	1.39	0.56	1.39	0.69	1.71
Other land cover	0.61	1.50	0.61	1.50	0.61	1.50	0.58	1.44	0.55	1.37

**Table 3.13.** Forest cover area in Papua based on province (in million ha)

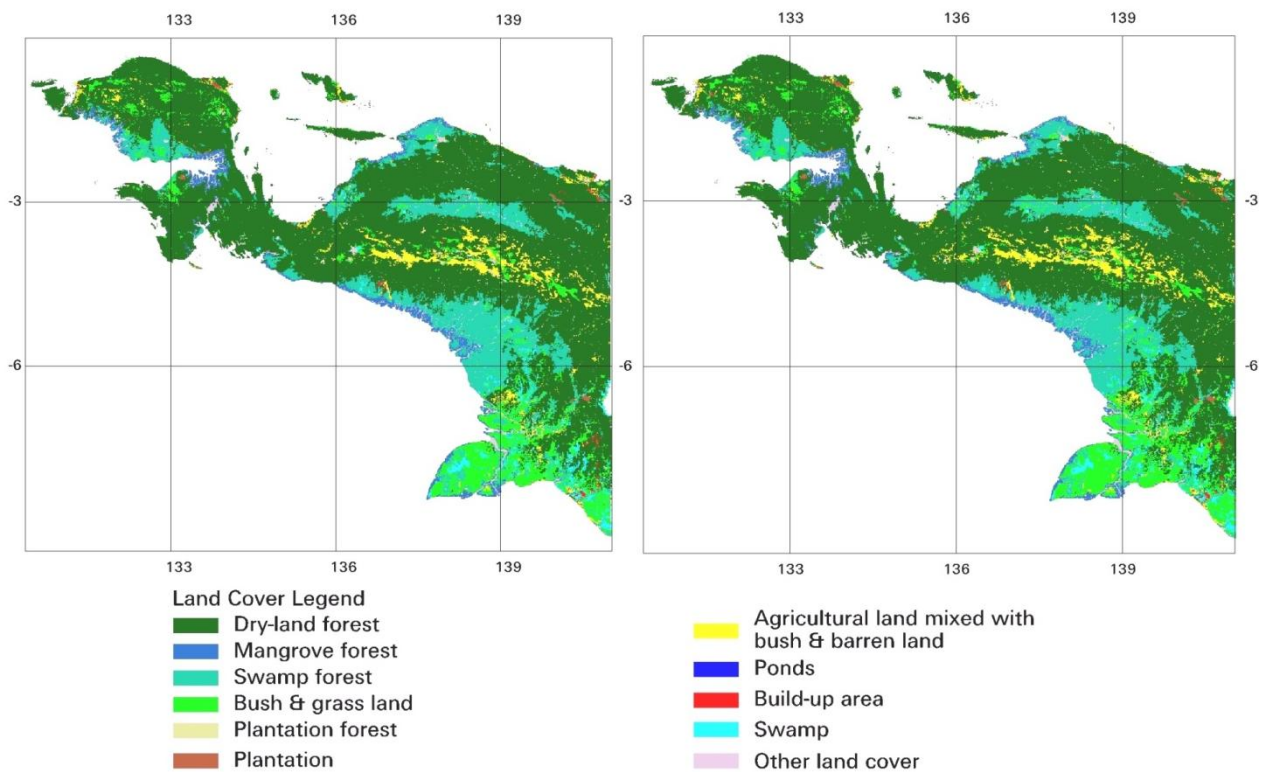
Province	Area				
	2000	2003	2006	2009	2011
West Papua	8.82	8.82	8.81	8.81	8.81
Central Papua	6.48	6.48	6.47	6.38	6.37
Papua	19.08	19.01	18.84	18.21	18.32

**Figure 3.28.** Forest cover changes in Papua based on forest types**Figure 3.29.** Annual rate of forest cover changes in Papua

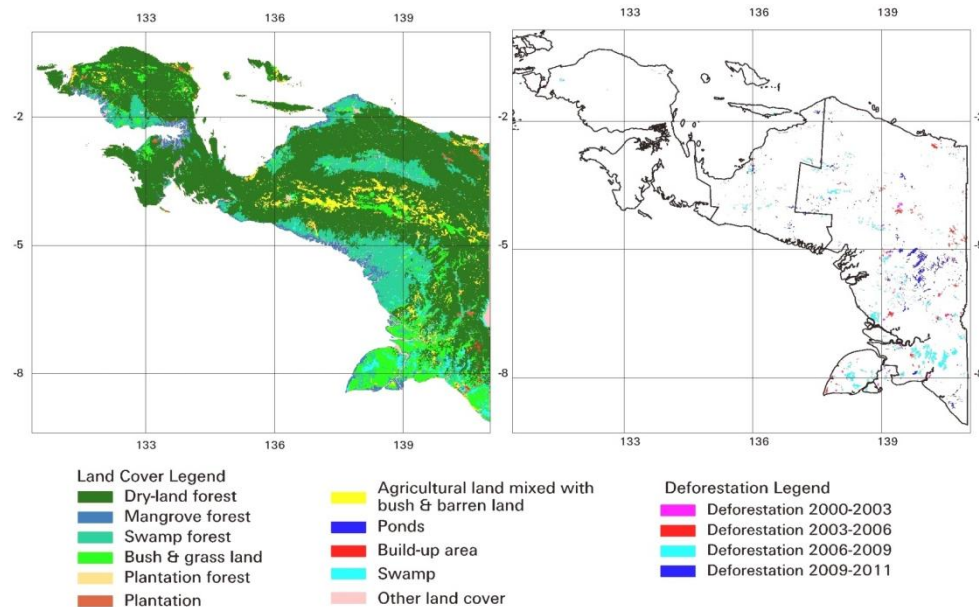




**Figure 3.30.** Land cover of Papua in 2000 (left) and 2003 (right)



**Figure 3.31.** Land cover of Papua in 2006 (left) and 2009 (right)



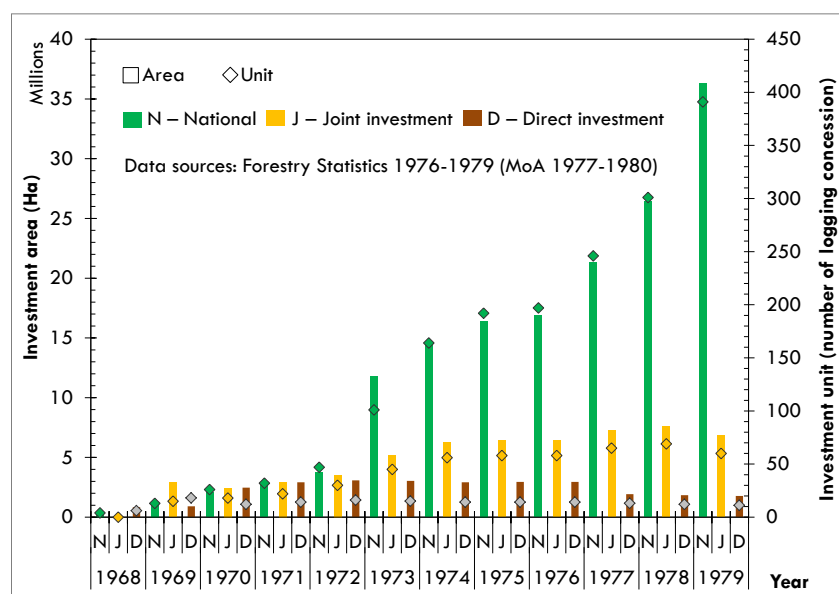
**Figure 3.32.** Land cover of Papua in 2011 (left) and Deforestation 2000-2011 (right)

### 3.2. Drivers of Deforestation

Several topics which considered as the drivers of deforestation and forest degradation in Indonesia are: foreign direct investment, timber production/logging concession, population growth, transmigration, shifting cultivation, cash crops, forest fires, illegal logging, economic crisis, and transition of autonomy. The following sub-section will explain each topic briefly.

#### 3.2.1. Foreign Direct Investment

The starting year of deforestation in Indonesia was in 1968 when the government started timber exploitation/production through logging concession rights, either by national, foreign, or joint investment. The investments were possible through the enactment of Foreign Investment Act (Act No. 1 of 1967) and Domestic Investment Act (Act No. 6 of 1968). After the enactment of the two Acts, number of logging companies were increasing and investment area for timber production were also increasing (Figure 3.33). These investments were the beginning of Indonesian deforestation.



**Figure 3.33.** Initial direct investment to logging concession (1968 – 1979)

### 3.2.2. Timber production/Logging concessions

Along with the increase in investment to logging concession, number of logging concession and areas given for timber exploitation were also increasing. Timber produced, log consumption and export, as well as processed timber and export were also increasing. Though experiencing fluctuation in timber production, processes, consumption, and export, timber production with clear cutting system has caused temporary deforestation that if not balanced with good reforestation still contribute to the rate of net deforestation.

### 3.2.3. Population growth

Indonesian population has been increasing, though the population growth rates were decreasing. The population reached 237 641 326 in 2010 and will increase to 273 791 049 in 2020. Population growth means more land needed for agriculture to produce food, more land for infrastructure and housing, more energy to support various activities, more timber to produce various construction, and minerals as means for living. Demand for timber also requires more land for timber plantation. Most minerals are deposited in land. The only land which is available to be converted for agriculture, infrastructure, housing, timber plantation, and mining is forested lands, both forest area and non-forest area. Conversion of forest areas to non-forest areas keep happening in Indonesia, especially for agriculture, transmigration, and mining. Through their studies, FAO (1990), Barbier *et al.* (1993) and Fraser (1996) concluded that demographic factor/human population size has negative correlation with area size of forest coverage.

### 3.2.4. Transmigration

Transmigration is migration from an area (island) with dense population to another area (island) with less population. In colonial era, transmigration was used by the colonial government for fulfilling labor scarcity in rubber plantations in Sumatera. Since the independence, transmigration in Indonesia has been implemented either because of the population density, disaster, or because of development of infrastructure in the original place. The original provinces of transmigrants are Lampung, Banten, Jakarta, West Java, Central Java, East Java, Yogyakarta, Bali, West Nusa Tenggara, and East Nusa Tenggara. The target provinces for transmigration are other provinces in Sumatera, Kalimantan, Sulawesi, Papua, and the Moluccas.

There are three types of transmigration, namely common transmigration (*Transmigrasi Umum/TU*), spontaneous-facilitated transmigration (*Transmigrasi Swakarsa Berbantuan/TSB*), and spontaneous-autonomous transmigration (*Transmigrasi Swakarsa Mandiri/TSM*). Common transmigration (TU) is transmigration which is conducted by the government program and budget, mainly because of disaster, development of infrastructure (such as water dam), labor, and to reduce density of a certain area. Spontaneous-facilitated transmigration (TSB) is transmigration which is conducted by the transmigrants' own will and with budget facilitated by the government and private business sector. Spontaneous-autonomous transmigration (TSM) is transmigration which is conducted by the transmigrants' own will and budget.

Transmigration in Indonesia was started since 1969 and mainly programmed by the government. At the transmigration location, a 2-ha land for farming has been allocated to each household. The allocated land is given in three-year steps: (1) the first year, the trans household will obtain a house with 0.25 ha yard and groceries for one year, (2) the second and third year, the trans household will obtain 0.75 ha land for farming, and (3) the fourth year, the trans household will obtain the remaining 1 ha land for farming or other business. These facilities (land, house, and groceries) will be provided to all transmigration type. Thus, TSM is not purely autonomous, because the trans household will receive the same facilities as received by other type of transmigration. Common transmigration (TU) record is shown in Figure 3.34.

TSB and TSM had not been very popular, though the program was launched in 1993. In 2005, the government started to popularize the two types of transmigration, but it seems the TSB was not attractive enough for the private business sector. TSM, however, has been demanded by poor people in Jakarta, West Java, Central Java, East Java and Yogyakarta. Those people aimed at improvement of livelihood and welfare through transmigration program. Number of households that joined TSM is shown in Figure 3.35.

Sunderlin and Resosudarmo (1996) mentioned the effects of transmigration, namely direct forest cover removal, movement of because of insufficient income, and land pressure induced by transmigration. Dick (1991) in Sunderlin (1997) viewed that “spontaneous transmigration” as having unsustainable practices and accounting for the largest share of deforestation. Using characteristics of transmigration above, we can roughly calculate the extent of land must be provided for transmigration. The total number of trans households from 1969 to 2013, for both TU and TSM, is approximately 2 million households. Each household receives 2 ha of land. So, total area had been allocated for transmigration all these years is approximately 4 million ha and forest area has been the only land available for conversion, thus causing deforestation. Figure 3.36 shows the record of conversion of forest areas for agriculture (cash crops) and transmigration.

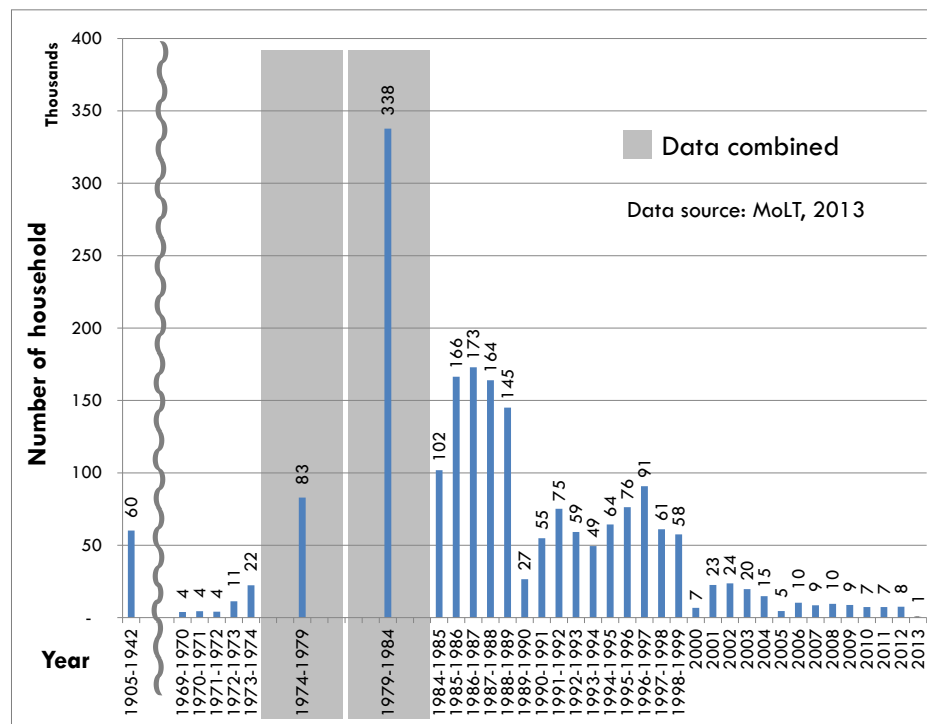


Figure 3.34. Statistic of Transmigration in Indonesia (Colonial Era –2013)

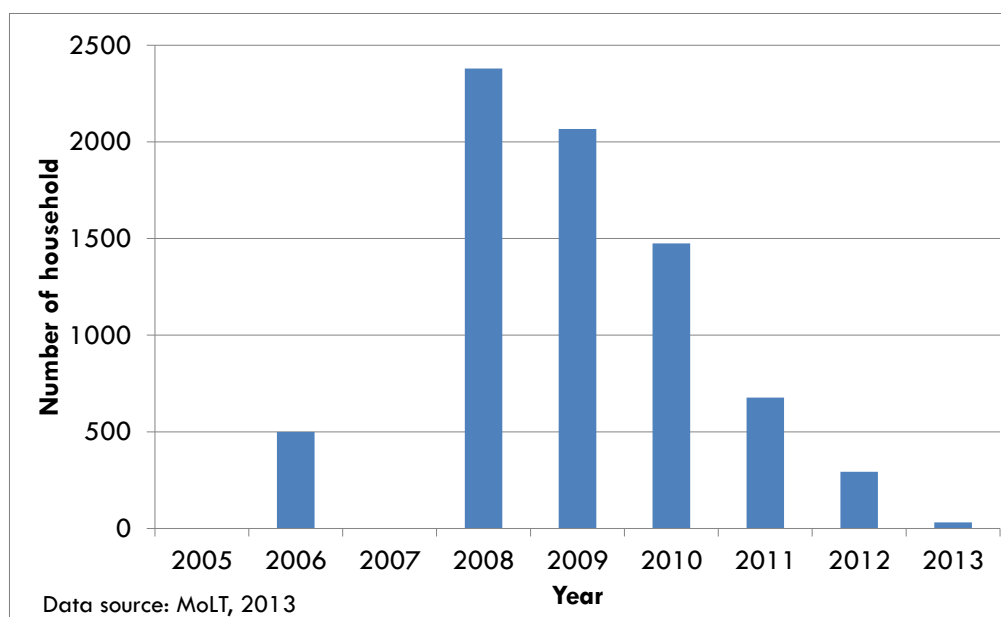
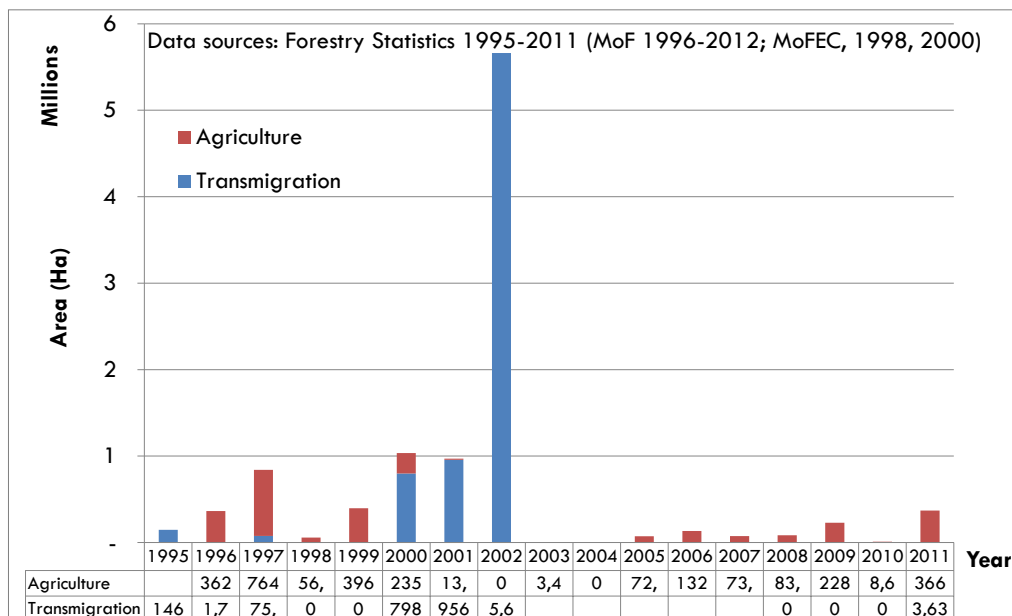


Figure 3.35. Spontaneous-autonomous transmigration in Indonesia (2005–2013)

### 3.2.5. Cash crops

FAO (2011) stated that Indonesia is categorized into deforested countries in the Southeast Asia as results of infrastructure expansion, investment in agriculture, and establishment of cash crop plantations. Rubber, palm oil, cacao, coffee, tea, and sugarcane are cash crops that Indonesia produced since the Dutch colonial period. These crops were introduced to Indonesia and become cash crops to fulfill the Dutch income. After Indonesia's independence, all plantations were nationalized and managed by the State Corporation Companies (PT. Perkebunan Nusantara).



**Figure 3.36.** Conversion of forest areas for agriculture (cash crop) and transmigration (1995–2011)

Using Indonesian Statistics data, sub-section 1.3.2.1 has briefly explained the harvested areas and production of each crop. Comparing to each other, harvested areas of five crops relatively stable within 15 years (1995–2011). However, harvested areas of palm oil, has increased more than 500% and the yield almost reaches 600%. It has been in the news for several years, that development of oil palm plantation had taken so called “degraded” forest areas. Ministry of Forestry, through the ministerial decree on the Designation of Provincial Forest Area and Inland Water, Coastal and Marine Ecosystem, has been allocating forest areas to be converted under the status of Convertible Production Forest (*Hutan Produksi yang dapat Dikonversi/HPK*). In 2012, it is account for 20 875 089 ha or 0.15% of total forest areas in Indonesia. This type of forest has been decreasing and converted for non-forestry purposes, including mining, transmigration, and agriculture (mainly oil palm plantation). Although ‘designated’ forest areas now are not cannot be categorized as forest areas yet, converting it for non-forestry purposes, means clearing any forests therein forever. Thus, forest areas conversion is deforestation. Figure 3.36 shows the record of conversion of forest areas for agriculture and transmigration. Noting that the harvested areas of the five cash crops are in stable level, it is obvious that palm oil production has caused deforestation.

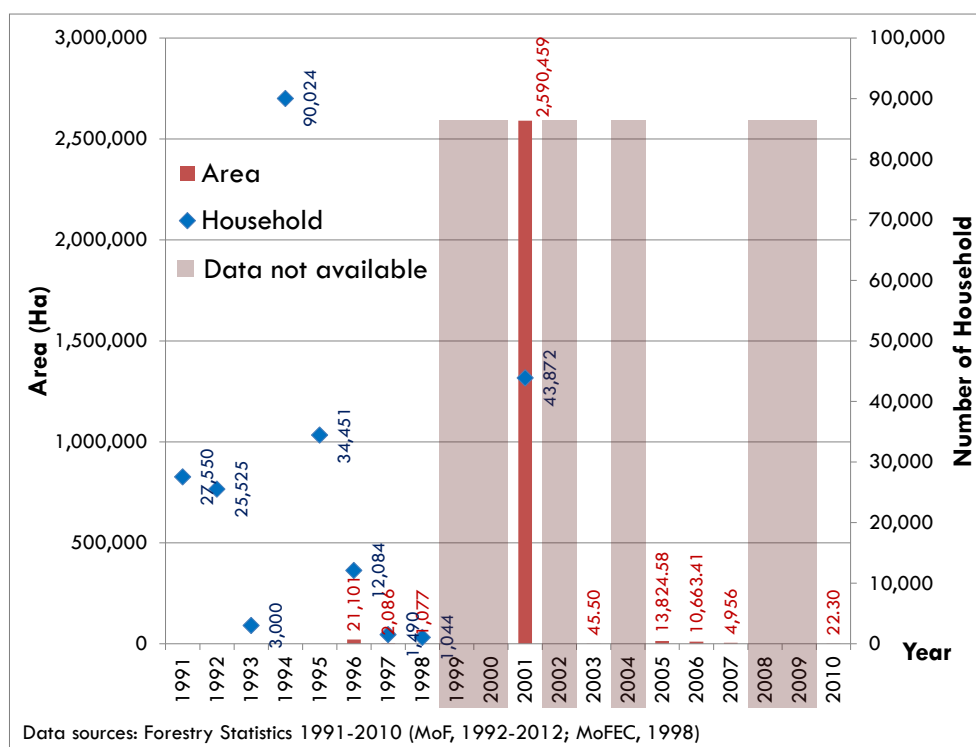
### 3.2.6. Shifting cultivation

Experts (e.g. Soemarwoto 1984, Eden 1987, Angelsen 1995, Sunderlin 1997, Tacconi & Vayda 2006, Mertz *et al.* 2009a, etc.) agreed that ‘shifting cultivation’ refers to a system in which a small tract of land/forest is cleared (mostly by cutting and burning vegetation or usually known as ‘slash and burn’ or ‘swidden’; or few by fire-free land clearing) in the dry season, then crops are planted in early rainy season. After one to two years of cropping, or two to three harvests, when the soil fertility declines, the land will be abandoned and other types of vegetation will replace. This usually called “fallow period”. When abandoning the land, the people will clear another tract of land/forest and repeat the process. After many years (usually 5-20 years), the fallowed land will turn into secondary forest and the people who previously did the land will return here to repeat the process. Several definitions of ‘shifting cultivation’ relevant to Southeast Asia and Indonesia are given by Sunderlin (1997) and

Mertz, *et al.* (2009a). In this Country Report, we use “shifting cultivation” broadly to represent “swidden cultivation” and “slash and burn” agriculture.

Shifting cultivation only suitable to an area with low human population (Soemarwoto 1984). Mertz, *et al.* (2009b) mentioned that shifting cultivation demographic data is lack. It is difficult to assess the number of shifting cultivators, because in censuses, these people are usually grouped into “farmers”. There has been no differentiation of “farmers” in term of how they do the farm. Meanwhile, Mertz *et al.* (2009a) mentioned that shifting cultivation is often difficult to detect, because the field may appear as agricultural land on national land cover maps, yet fallow land at various successional stages of woody regrowth is often categorized as ‘unclassified’ or ‘degraded’ land. Foley *et al.* (2005) and Ramankutty and Foley (1999) in Mertz *et al.* (2009a) also clarified that shifting cultivation field is also not captured well in global land use mapping exercises and reviews because of their scale of landscape analysis. Those experts’ explanations could be understood as a fact that MoF could record only a small number of forest areas as shifting cultivation areas and household engaged in shifting cultivation (Figure 3.37).

Shifting cultivation is the main cause of deforestation (FAO 1990, World Bank 1990, Barbier *et al.* 1993). Shifting cultivators are often seen as the primary agents of deforestation in developing countries; estimates of their share range as high as 45% (UNEP 1992 *in* Sunderlin 1997) to 60% (Myers 1992 *in* Sunderlin 1997). Although not as the main cause, shifting cultivation and other forest disturbances causes unsustainable rates of deforestation (Casson & Obidinski 2002). However, these opinions were challenged by other experts that stated effects of shifting cultivation on forest cover loss (deforestation) have been overstated in past studies (Dick 1991, WALHI 1992, Ascher 1993, Dauvergne 1994, Porter 1994, Thiele 1994, Dove 1996, Ross 1996 *in* Sunderlin 1997, World Bank 1994, Angelsen 1995). While other experts claim that shifting cultivation is important for the future conservation and management of Indonesia’s remaining forests, thus far from being danger to forests (Zerner 1992, Colfer & Dudley 1993, Hasanuddin 1996, de Jong 1997 *in* Sunderlin 1997). Dick (1991) in Sunderlin (1997) mentioned that traditional shifting cultivators account for only 21% of total deforestation, and even this may be an overstatement as many of the forests they clear are part of a long-standing rotation on clan lands. Using 2009-2012 deforestation rate announced by the MoF of 450 000 ha/year, and using shifting cultivation data in 2020 (MoF 2011), this Country Report calculates shifting cultivation only account for 0.005%.



**Figure 3.37.** Shifting cultivation record (1991–2010)



Angelsen (1995) reviewed the definition and estimates of deforestation in Indonesia given by several experts, such as WRI (1992), Myers (1992), Houghton (1993), FAO (1991, 1993), World Bank (1990), and concluded that most “deforestation” definition which resulted in high rate of deforestation and included shifting cultivation as the cause of deforestation was because there was no distinction between permanent and temporary conversions of forests, between conversion and alterations, or between deforestation and forest degradation. This Country Report agrees with Dick (1991) in Sunderlin (1997), Angelsen (1995), and Sunderlin (1997) that shifting cultivation is not the main cause of ‘deforestation’, because in its fallow period, trees are grown, the field is not converted to other types of land use forever (settlement, mining, transmigration area, and agricultural crops plantation [oil palm, rubber, coffee, and cacao]). Shifting cultivation caused temporal deforestation at the land clearing stage and lead to deforestation.

### 3.2.7. Forest fires

Forest fire is another driver of deforestation and forest degradation. It always happens every year in the dry season in Indonesia. Goldammer & Hoffmann (2002) mentioned that the fires occurred in 1980s to 1990s was largely influenced by brought caused by the El Niño-Southern Oscillation (ENSO). Figure 3.38 shows the fires in forest areas between 1978 to 2011 (MoA 1979, MoF1983–2012, MoFEC 1998, 2000). As can be seen in Figure 3.38., the year of 1982–1983, 1991, 1994, and 1997–1998 were the peaks of ENSO and affected millions of hectares forests. While the figures in Figure 3.38. shows only approximately 779 thousands ha affected by fires for the whole Indonesia in 1997–1998, surprisingly other studies mentioned that fires affected approximately 9.755 million ha throughout Indonesia (BAPPENAS-ADB 1999 in Tacconi 2003), 3.6 million ha for East Kalimantan only (BAPPENAS-ADB, 1999 in Tacconi, 2003) while 5.2 million ha or 25% of total land area in East Kalimantan Province only between 1997–1998 (Hoffmann *et al.* 2000), and 1998 almost 3 million ha burned in Kalimantan alone (Liem *et al.* 1998 in Shields *et al.* 2006). These differences most probably were because the Forestry Statistics only records forest areas that really affected by fires reported from the down-line offices of the MoF. Meanwhile, the studies were using remote sensing technologies, such as ERS-SAR radar for forest fire inventory as stated by Hoffmann *et al.* 2000.

FAO (2001) reported that in 1997–1998 extended droughts favored the application of land-use fires, forest conversion burning (use of fire in land-use change) and extended wildfire situations. The fires have caused impoverishment or destruction of primary and secondary equatorial rain forest ecosystems over large areas. Indonesia was the main source of smoke-haze that affected the entire Asian region for almost one year and affected the health of more than 100 million people living in the region. Makarim & Radiansyah (1997) stated that there are three groups of sources that caused forest and land fire, namely: (1) Fire originating from land preparation for agriculture by shifting cultivators and other community groups, (2) Fire originating from land preparation for plantation, transmigration, ranching, etc., and (3) Spontaneous fire incidents originating from hot spots in coal seams, eternal fire, lightning, friction and volcanic activities. From the study of Gönner (2000) in East Kalimantan, which interviewed key informants through semi-structured interview and field observation during fires, it was revealed that major groups of fire sources are: (1) fires caused by oil palm company’s land clearing activities, (2) arson linked to financial compensation of forest garden, (3) other kinds of arson, and (4) incidental fires.



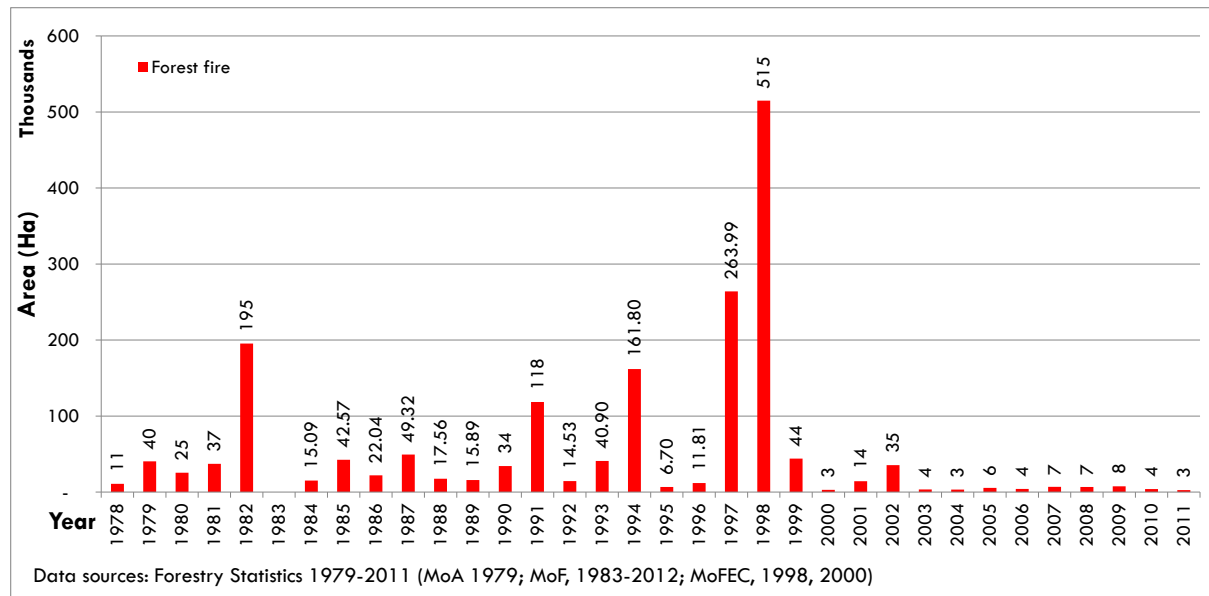
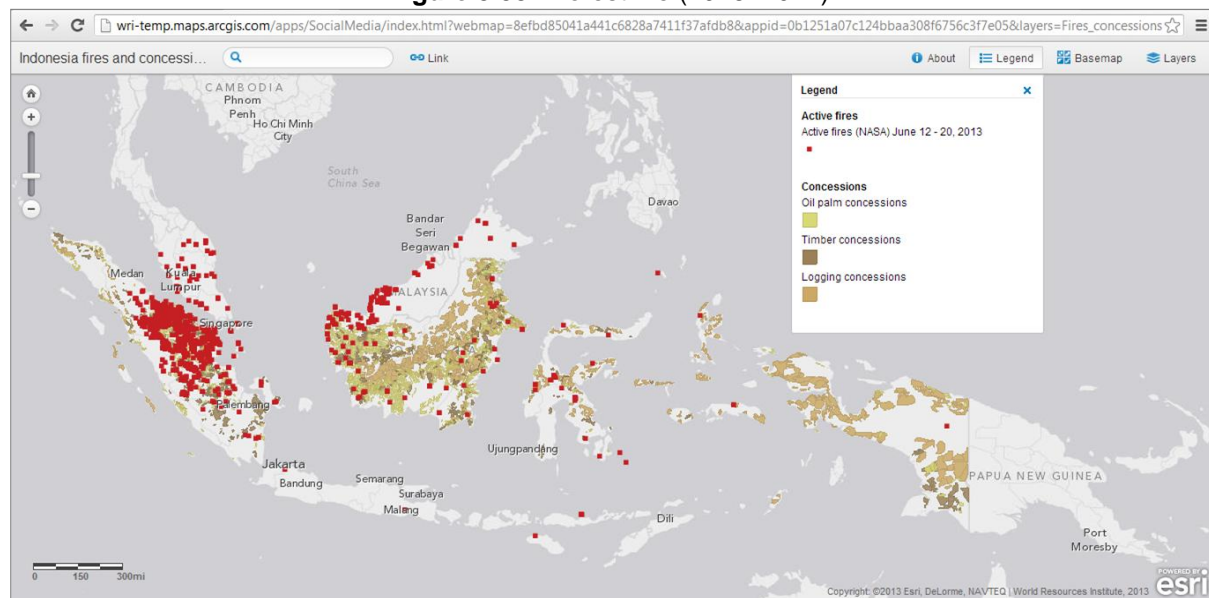
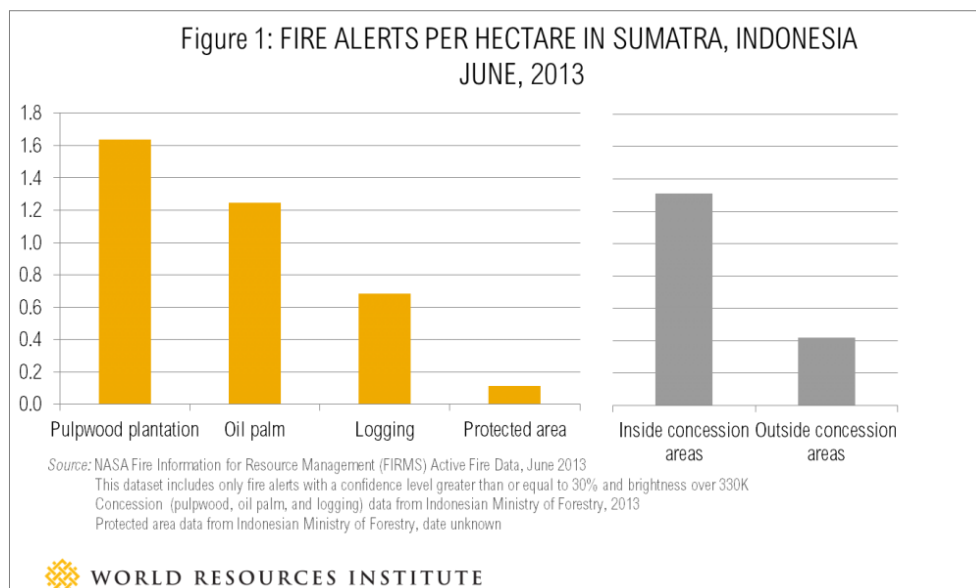


Figure 3.38. Forest fire (1978–2011)

Figure 3.39. Active fires and concessions in Indonesia within June 12-20, 2013 (Sizer *et al.* 2013)

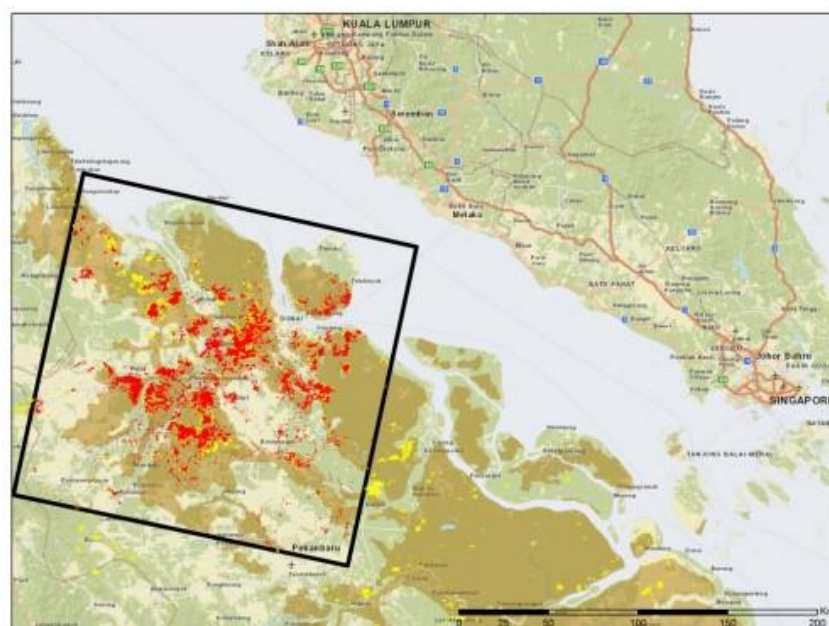
In June 2013, Indonesia's fires caused smog and haze to the neighboring countries, Malaysia and Singapore. Using data provided by NASA's fire alert system, Sizer *et al.* (2013) conducted analysis on the fires alerts and summarized: (1) Fire alerts are much more concentrated within concession areas, (2) Most of the fire alerts took place on peat soils with degraded or secondary forest, and (3) Most importantly, there is a high risk of repeated fire and haze crises in the coming months and years. Figure 3.39 shows the location of active fires in 12-20 June 2013 (Sizer *et al.* 2013) and Figure 3.40 shows the share of active fires alerts in various land use types in Sumatera (Sizer *et al.* 2013).



**Figure 3.40.** Fires alerts in various land use types in Sumatera (Sizer *et al.* 2013)

Using NASA daily fire alerts, Gaveau and Salim (2013) conducted similar study to Sizer *et al.* (2013), but in more detail analysis for Riau Province, the source of the trans-boundary haze. The study made seven observations by combining NASA daily fire alerts and Landsat 8 imageries. One of the key observations was that a very high proportion of fire scars are on peatland, as opposed to mineral soil (Figure 3.41). The figure shows 100,000 ha area mapped as burned (in red) within the worst-affected LANDSAT scene (black outline box). Within and outside the black outline box, NASA's fire alerts are marked with yellow points. It is shown in the figure also that most fires are located on peat soils (brown areas).

Fires in the forest areas will make the quality of the forests decreasing, thus degrading the forests. Degraded forest areas have been reforested through various MoF's programs, but sometimes degraded forest areas become the easiest target areas for forest conversion into non-forest areas, which means deforestation. The sources and impact of fires could also become indicators of forest degradation and deforestation.

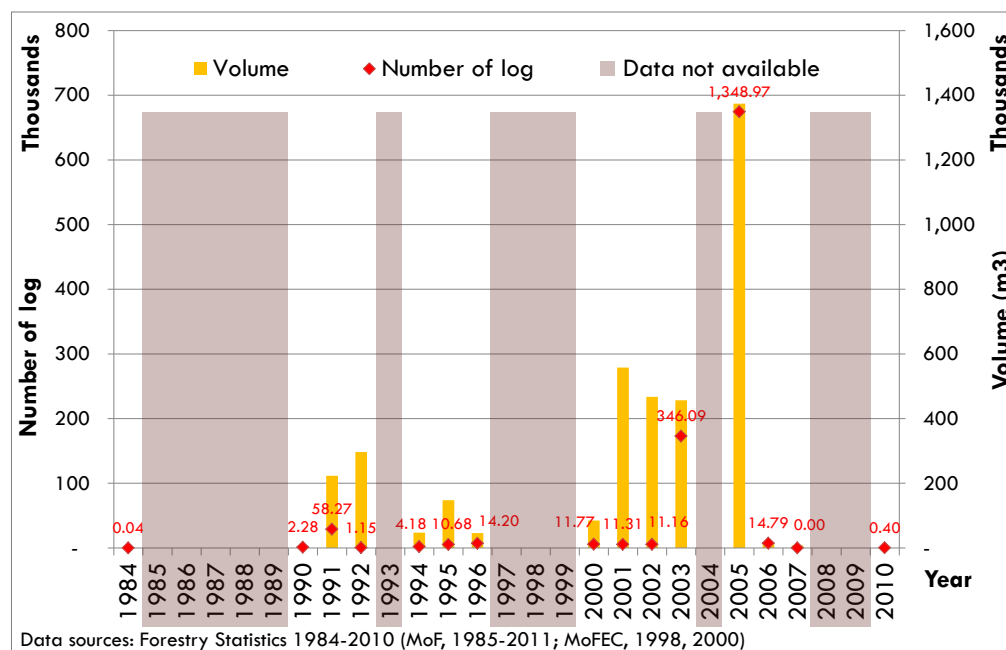


**Figure 3.41.** Fires in Riau Province mostly occurred in peat soils (Gaveau and Salim 2013)

### 3.2.8. Illegal logging

Illegal logging is defined as a range of illegal activities related to forest ecosystems, forest industries, and timber and non-timber forest products (NTFP) (Tacconi 2007). Chatham House (2013) defined “illegal logging” as illegal practices related to the harvesting, processing, and trade in wood. In the international forum, the debate on illegal logging has been focused on illegal cutting of timber from the forest. FWI/GFW (2002) defined “illegal logging” as all forestry practices or activities connected with wood harvesting, processing, and trade that do not conform to Indonesian law. There are essentially two kinds of illegal logging, namely (1) logging carried out by legitimate operators who violate the terms of their licenses and (2) logging involves outright timber theft, whereby trees are felled by people who have no legal right to cut trees at all.

Illegal logging has been very difficult to be proven. WWF (2005) in Goncalves *et al.* (2012) has found that “most illegal logging cases brought to trial are dismissed because ... evidence has been lacking, cases have been poorly put together, insufficient evidence has been collected or the wrong type of evidence has been collected; or because judges, prosecutors and the police lack knowledge about important forest laws and regulations”. However, by the report of EIA & Telapak (1999) which alerting the public on how severe illegal logging in Indonesia, the MoF in collaboration with the police department, the army, judges, NGOs, and communities, put big efforts to combat illegal logging in Indonesia. The Forestry Statistics did not defined the term “illegal logging”, but it is recorded under category of “forest stand disturbances”. Illegal logging recorded in 1984, but from 1985 to 1989 the data was not available, either because of no reports from the down-line offices of MoF on illegal logging, or because of no illegal logging at those years. Recorded data were also various, in some years, the number of logs, volume, and areas were recorded, while in other years, only number of log and volume recorded. Number of illegal log and volume was increasing from 2000 to 2005, and sudden drop begin in 2006 up to now. Figure 3.42 shows the illegal logging record.



**Figure 3.42.** Illegal logging record (1984–2010)

There are extensive studies on illegal logging in Indonesia, with various objectives, scales, and time periods. Illegal logging in Indonesia has been said to have relation with corruption either as the cause of or the impact of illegal logging (Barbier *et al.* 1994, FAO 1999, Callister 1999 *in* Palmer 2001, EIA & Telapak 1999, Seneca Creek Associates & Wood Resources International 2004, Lawson & MacFaul 2010, Illegal Logging Portal 2013). Many illegal operations in the forestry sector are the consequence of corruption (FAO 1999 *in* Palmer 2001). Corruption operates either to allow illegal logging to occur in the first place, or to allow many of these activities to proceed unchecked or unpunished (Callister 1999 *in* Palmer 2001). Illegal logging in Indonesia caused by the worsening national economy and regional standard of living, the abuse of long-term political power and socially fixed customs, an unstable political situation, rapidly introduced democracy, and hasty and ill-prepared decentralization

(Sato, 2002). Socio-economic factors, such as poverty, lack of education, lack of economic freedom, and population growth, are contributing factors to illegal logging (Seneca Creek Associates and Wood Resources International 2004). Log export ban and high export levies was intended to improve the wood processing industry in Indonesia, however, the installed capacity of wood processing industries was beyond the supply capacity (Day 1998 and Barr 1999 in Palmer 2001), thus leading to illegal logging for the supply.

Casson and Obidinski (2002) studied illegal logging in two districts in East and Central Kalimantan Provinces. They mentioned that the recent boom in 'illegal' logging can be attributed to a number of factors including changes arising from the economic crisis, a decline in law and order, regulatory changes arising from *reformasi* (a movement calling for democracy, reform and change) and the new decentralization laws (Casson & Obidzinski 2002). From the study, they concluded that illegal logging is not necessarily a phenomenon driven by macroeconomics considerations, such as processing overcapacity, inefficiency, flawed pricing, rent seeking; and general socio-political ills, such as patronage and corruption alone, but also the fact that 'illegal' logging has been operating in a greater variety of forms and guises since the fall of Suharto in May 1998. ITTO (2001) in Casson and Obidinski, 2002 stated that by the year 2001, illegal logging was thought to be one of the most critical threats to Indonesia's forest capital, accounting for 50–70% of total log production. While study by Tacconi (2007) stated that causes of illegal logging were institutional problems, lack of government capacity, corruption, the role of business, the timber trade, and the economics of forest management.

Indonesia is one of the wood producer countries. From the study of Chatham House (Lawson & MacFaul, 2010), among the five producer countries in the study: Brazil, Cameroon, Ghana, Indonesia, and Malaysia, Indonesia had the lowest performance in major policy areas, namely high-level policy arrangements, legislative framework, checks and balances, international trade cooperation, ensuring the balance between supply and demand, tenure and use rights, timber-tracking systems, transparency, allocation and management of rights to harvest, institutional and operational factors in law enforcement, information management, and financial management. Slightly different to Chatham House study, Seneca Creek Associates and Wood Resources International (2004) put Indonesia in five key producer countries together with Brazil, Malaysia, West/Central Africa, and Russia. Illegal logging in this study means: (1) harvesting without authority in designated national parks or forest reserves, (2) harvesting without authorization or in excess of concession permit limit, (3) failing to report harvesting activity to avoid royalty payments or taxes, and (4) violating international trading rules or agreements, such as export bans or CITES. From the study, it was revealed that illegal forest production in Indonesia reached 70-80%, it consisted of 60% of hardwood production, 100% of log exports, 65% of lumber exports, and 55% of plywood exports. Using the data from Transparency International and WRI/SCA estimates of illegal logging, this study also put Indonesia in the highest corruption and the highest percentage and volume of suspicious log supply among all producer countries in analysis.

Several impacts from illegal logging were discussed in Tacconi (2007). Negative impacts of illegal logging were: (1) cause deforestation and loss of biological diversity; (2) result in government revenue losses of billions of dollars; (3) foster a vicious cycle of bad governance (corrupt individuals gain power through illegal revenues and then may support bad governance to maintain revenues and acquire more power); (4) contribute directly to increased poverty when people lose their resources, and indirectly as a result of a reduction in government revenues, which could in turn be made available for poverty reduction programs; (5) contribute to funding national and regional conflicts, thereby exacerbating them; and (6) distort forest product markets. Meanwhile, there were also positive impacts on illegal logging: (1) The establishment of alternative land uses on illegally deforested land may provide benefits to those involved; (2) National or local governments may receive higher revenues as a result of illegal or legalized land conversion and increased timber production from illegal logging; (3) Military and police forces derive income from illegal logging and may be more willing to support the government; (4) Many people, including the poor and unemployed, derive an income from illegal logging; (5) Lower timber prices increase the competitiveness of national industries; and (6) Consumers may benefit as a result of lower prices (Tacconi *et al.* 2003).

Lawson and MacFaul (2010) mentioned that the immediate drivers of reductions in illegal logging were the increase of enforcement and improvements in broader governance, where there is a close correlation between reductions in illegal logging and reductions in general corruption. This study also mentioned that illegal logging and associated trade in illegally sourced wood products are important

causes of deforestation and forest degradation in many developing countries. It was seen as roughly the same important as legal clearance for agriculture. Palmer (2001) made a very clear statement that illegal logging is causing higher rate of deforestation than otherwise would be the case and hence there is a need to slow the rate down. Other studies stated that: (1) illegal logging is the most recent moniker for addressing environmental degradation in tropical and sensitive boreal forests (Seneca Creek Associates & Wood Resources International 2004), (2) illegal logging cause deforestation and loss of biological diversity (Tacconi 2007), and (3) The ceaseless spread of 'illegal' logging, together with agricultural expansion, large-scale commercial logging, urban development, shifting cultivation, transmigration, mining and forest fires is contributing to these unsustainable rates of deforestation (Casson & Obidinski 2002). However, based on the definition of 'deforestation' in this Country Report, 'illegal logging' when it affected or even cleared a vast forest area, at this time the area is in deforestation status. When the forest area remains as forest area (e.g. turned into industrial timber plantation forest [HTI/IUPHHK-HT], primary forest became degraded and turned into secondary forest, etc.) and the status is not converted to 'Non-Forest Area' (*Area Penggunaan Lain/APL*, e.g. for agriculture, transmigration, mining, development infrastructures, etc.), then it will cause forest degradation, and temporary deforestation.

### 3.2.9. Economic crisis

Economic crisis in 1997-1998 made Indonesia's economic collapse and became the most severe in Asia (Evans 1998 in Sunderlin *et al.* 2000). It was a very phenomenal tragedy that made many researchers and experts published their analysis on the impacts of economic crisis. Most authors wrote about the social, socio-economic, or economic impact of economic crisis (Thornbecke (1998), Levinshon *et al.* (1999 & 2003), Firdausy (2002), Knowles *et al.* (1999a & 1999b), Ode (2009), Cameron (2001), Fallon & Lucas (2000), Poppele *et al.* (1999), Suryahadi *et al.* (2003), Lee & Rhee (1999), etc.). A few others also wrote about the impacts of economic crisis to forest, forest product & processing, and forest-dependent people (FWI/GFW (2002), Sunderlin *et al.* (2000 & 2001), Wulan *et al.* (2004)). Effects of economic crisis to Indonesia among others are: contraction of economy, currency value (Rupiah/Rp.) declined, increase in poverty, increase in unemployment, rampant inflation and loss of consumer purchasing power, grave social instability, the collapse of the 32-year tenure of Suharto as president in May 1998 (Sunderlin *et al.* 2000 & 2001), increase of conflicts in forestry sector, forest encroachment, and mass-illegal logging (Wulan *et al.* 2004).

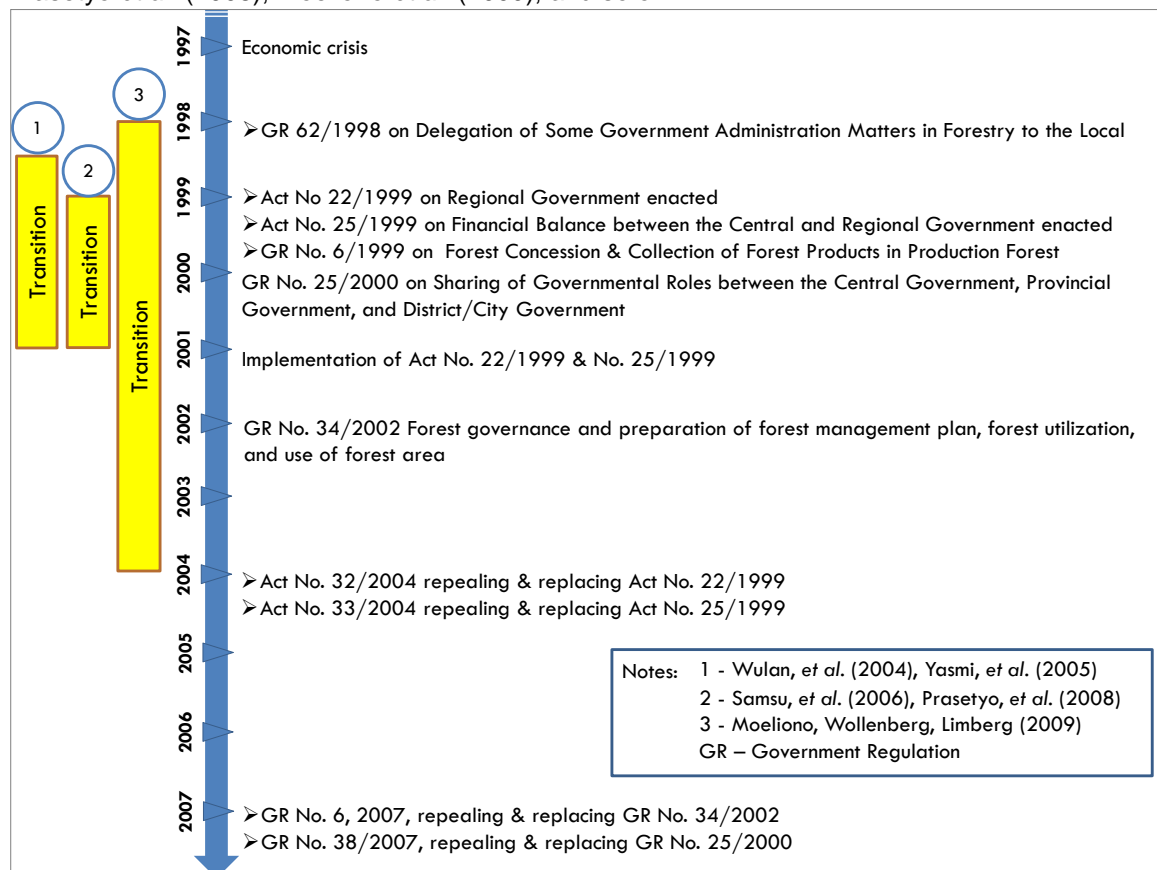
Sunderlin *et al.* (2000 & 2001) conducted a research in outer islands (islands other than Java, Madura, and Bali) to understand the effects of Indonesia's economic crisis on the wellbeing of farmers in or nearby natural forest areas and the effects of the crisis on these small farmers' agricultural practices and how these in turn affect natural forest cover. Several observers (Evans (1998), Hill (1999), Jellinek & Rustanto (1999), and Nooth (1999) in Sunderlin *et al.* (2001)) claimed that most rural Indonesian suffered little from the crisis and that many benefited from the crisis due to the decline of Rupiah against US dollar which enabled them to boost their income from agricultural export commodities. However, Sunderlin *et al.* (2000 & 2001) found the respondents perceived themselves as worse off during the crisis than before the crisis. Though income from agricultural export commodity increase, but the prices of most commodities they need were also rising and caused insufficient cost to offset the sharply rising costs of agricultural inputs and consumer goods. Economic crisis has increased the dependence of households on the forest resources (timber and rattan). Land clearing for food crops declined and land clearing for production of export tree crops increased substantially in 1998–1999. These studies found that economic crisis has caused temporary deforestation through land clearing for expansion of export tree crops (especially rubber, and also cocoa, coffee, and oil palm) plantations.

Wulan, *et al.* (2004) conducted study to analyze conflicts in forestry sector between 1997 and 2003. Using data from mass media, case studies in five districts (Mandailing Natal District, North Sumatera Province; Kampar District, Riau Province; Blora District, Central Java Province; Kotabaru District, South Kalimantan Province; and Kutai Timur District, East Kalimantan Province), and multi-stakeholder workshop, the study found that there were 359 cases of conflict in forestry sector between January 1997 and June 2003. From these cases, 39% happened in HTI areas, 34% in conservation areas, and 27% in HPH areas. Factors that caused the conflicts are forest encroachment (26%), illegal logging (23%), forest/environment destruction (12%), limitation of access of local people to the forest (36%), and function alteration/change of forest area status (3%). Conflicts are mainly between local people and the forest managers (HPH, HTI, and conservation area

managers). Number of conflict cases were increasing since the economic crisis year (1997: 14 cases) to 2000 (153 cases), reached the peak in 2000, and decreased until June 2003 (35 cases). From this study, it is obvious that economic crisis has impact to forest areas throughout Indonesia, which caused forest degradation and deforestation.

### 3.2.10. Transition to regional autonomy

Another impact of economic crisis to Indonesia was the increasing demand and spirit of reformation (*reformasi*: a movement calling for democracy, reform, and change) which led to decentralization/regional autonomy (*otonomi daerah*). This issue became the sexiest topic of researches, discussions, and debates at that time. Many authors studies the causes, processes, challenges, and impacts of this *reformasi* to all aspects of livelihood in Indonesia, including forest & forestry, among others are McCarthy (2001a & 2001b), Barr *et al.* (2001), Casson (2001a & 2001b), Potter & Badcock (2001), Obidzinski & Barr (2003), Casson & Obidzinski (2002), Wulan *et al.* (2004), Yasmi *et al.* (2005), Ngakan *et al.* (2005), Samsu *et al.* (2005), Tokede *et al.* (2005), Sudirman *et al.* (2005), Barr *et al.* (2006), Dermawan *et al.* (2006), Nurrochmat *et al.* (2006), Palmer & Engel (2007), Prasetyo *et al.* (2008), Moeliono *et al.* (2009), and so on.



**Figure 3.43.** Decentralization milestone and transition period from New Order to Regional Autonomy

Due to euphoria for *reformasi*, demand for sharing of revenue to the regional government, and in order to accelerate regional autonomy especially in forestry sector, Government Regulation No. 62/1998 was enacted in June 1998, though there was no specific higher legislation as the base. Government Regulation No. 6/1999 was enacted in January 1999 repealing older versions of government regulations (GR No. 21/1970 j.o. (amended by) GR No. 18/1975, and GR No. 7/1990) on forest concession and forest product concession rights. This government regulation allowed the provincial government to approve forest concession rights application in production forest area not more than 10,000 ha and allowed the districts government to approve forest products collection rights in production forest area not more than 100 ha in extent. These privileges have been said as one of the causes of mass deforestation during transition period to regional autonomy. Regional autonomy was marked with the enactment of Act No. 22/1999 and No. 25/1999. After that, regional governments (provinces and districts/cities) were urged to prepare the soft and hard infrastructures until 31 December 2000 and full implementation of regional autonomy started the next day. Therefore, there has been a period between 1999 to 2001 when Indonesia's governance was in uncertain status,



whether centralized or decentralized, whether certain administration is under the central or regional government, whether certain natural resources could be utilized by permission from central government or regional government, and so on. Samsu *et al.* (2001) and Prasetyo *et al.* (2008) called this period as transition period from New Order to Regional Autonomy. Other researchers stated transition period began from the resign of President Soeharto and replaced by President Habibie (Mei 1998) to end of December 2000 (Wulan *et al.* 2004, Yasmi *et al.* 2005) or to end of 2003 (Moeliono *et al.* 2009). Figure 3.43 shows the transition period and some forestry-related legislation enacted after economic crisis.

### 3.3. Summary of Chapter 3

Forest cover changes analysis from 2000 to 2011 showed that deforestation happened in sequence from Java to Sumatera then Kalimantan, Sulawesi, and the last is Papua. The rate of forest cover change (deforestation or reforestation) is also varied within each island. In Java, all provinces faced deforestation during 2000-2003, reforestation during 2003-2006, but then after 2006 only West Java reforested significantly, while provinces were still in deforested status and East Java is at the worst status of deforestation (Figure 3.11). Sumatera with 10 provinces were still on deforestation process, except Lampung, West Sumatera, and Jambi provinces that in 2011 were reforested. Riau and Bengkulu were still in deforestation progress until 2011, while other provinces showed reforestation efforts but the rates of reforestation were not yet exceeding the deforestation rate (Figure 3.17). East Kalimantan province is the only province out of four provinces in Kalimantan that significantly passed the deforestation threat. Despite the province selected as Pilot Province for the Reducing Emissions from Deforestation and Forest Degradation Plus (REDD+) National Program in 2010, deforestation in Central Kalimantan had been significantly worsen from 2009 to 2011 (Figure 3.22). In Sulawesi, all provinces except North Sulawesi province had similar pattern of forest cover change: deforested in the period of 2003-2006 and reforested in 2006-2009, but after that only South Sulawesi could reach reforestation rate beyond the deforestation rate. North Sulawesi province faced the reversal of other provinces, it increasing forest during 2003-2009, but then deforested again in 2009-2011 (Figure 3.24). Papua that has the vastest remaining forest in Indonesia, experienced uniform pattern of forest cover change: deforestation during 2000-2006, worsened deforestation during 2006-2009, and reforestation after 2009. From three provinces in Papua, Central Papua was the only province that still in deforestation status although reforestation efforts were shown (Figure 3.29).

Drivers of deforestation have been explained can be classified as direct causes (timber production/logging concessions, cash crops, transmigration, shifting cultivation, illegal logging, and forest fires) and indirect causes (investment policy, economic crisis, population, transition to regional autonomy) of forest conversion. In addition to the explanation given in Sub-section 3.2.2, Kartodihardjo (1998) showed that concession holders tend to fell trees more than the quota given by the Government as a result of high transaction cost and natural forest stand in the production forest areas were not considered as asset. High transaction cost would be compensated by felling more trees, while natural forest not as asset tends to be treated inefficiently, e.g. much waste left in the forest, and un-protected, because the loss of timber in the forest is not counted as the companies' lost. Encroachment for cash crop, shifting cultivation, illegal logging, and population growth are the results of unsettled property rights over national forest areas, weak oversight, and weak law enforcement (REDD+ Task Force 2013). These four drivers have become attentions to many parties to be solved immediately. However, by the strength of political parties in ruling the presidential cabinet, Government's programs tend to not prioritizing things related to those drivers. On the other hand, they only prioritize populous programs such as planting trees. Noting such facts, 12 ministries/institutions and encouraged by civil societies movement and coordinated by the Corruption Eradication Commission (*Komisi Pemberantasan Korupsi/KPK*) are working together to solve the problems.



#### 4 KEY POINTS LEADING TO AFFORESTATION AND FOREST REHABILITATION

Since the initial years of the ruling of the Second President, Soeharto, Indonesia had been implementing various efforts for keeping the land and forest green. Since 1960s the forest had been exploited and the Forestry Statistics recorded the greening and reforestation program has been implemented since 1968. The following sub-section will explain several programs related to afforestation, reforestation, forest and land rehabilitation, and ex-mining reclamation, as well as Payment for Environmental Services (PES) initiatives.

##### 4.1 Regreening and reforestation

The first record of regreening and reforestation program was in 1968 (Forestry Statistics 1976). Regreening (*penghijauan*) was a program for planting perennial trees or grassland and building construction to block erosion. Regreening was conducted at non-State Forest area or at other area which was in the land use plan was not designated for forest. Regreening has been implemented also in the Private Forests. Reforestation (*reboisasi*) was a program to plant or regenerate trees and other species, at the State Forest and at other areas that designated as forest in the land use plan (Presidential Instruction No. 8, 1976).

Between 1968 and 1976, the extent of regreening and reforestation program was less than 100,000 Ha. In 1976, the Presidential Instruction on the support program of regreening and reforestation was first enacted. In the following years, the President continued the instruction and the program through this instruction was continued until 2001. In the Presidential Instruction each year, the extent target of regreening and reforestation was set and the funding was provided by the central government. Both the extent target and the funding were increasing year by year. For example, for the program in 1976/1977, the extent target was 300 000 ha for regreening, 100 000 ha for reforestation, and nursery of 2 500 ha at minimum was also prepared for seedling provision. The target numbers in 1977/1978 were: 630 000 ha for regreening, 200 000 ha for reforestation, at least 1 417 seedlings, 3 347 ton of seeds, and 2050 field staffs. The President was also encouraging provincial and district governments as well as Private Forest owners to support the program by their own budget when budget from the Presidential Instruction was not enough.

Other than the funding support from Presidential Instruction, from 1992 to 2001 other funding for regreening and reforestation were also recorded, namely Overseas Economic Cooperation Fund (OECF) and Reforestation Fund (*Dana Reboisasi/DR*). The OECF was providing loan to Indonesia and one of the programs supported by this loan was regreening and reforestation. The DR was fund which has been collected from the logging concession companies that felled trees from natural forest and the fund was especially designated for reforestation and forest rehabilitation and other supporting activities. The DR is one of the Non-Tax State Revenue. Figure 4.1 shows the implementation of regreening and reforestation from 1968 to 2011.

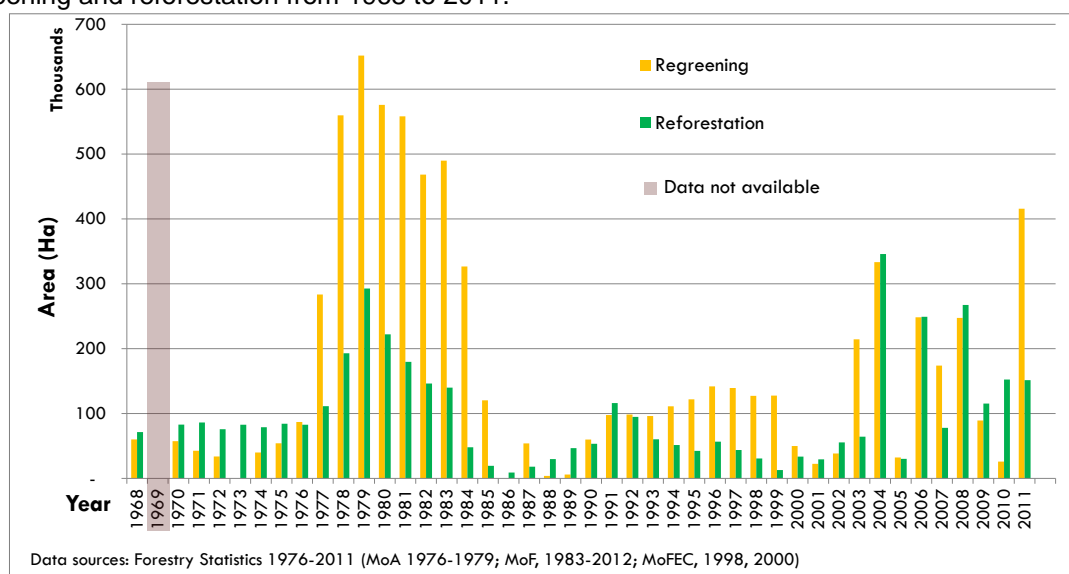


Figure 4.1. Regreening and reforestation (1968–2011)

## 4.2 National Movement for Land and Forest Rehabilitation/GNRHL

Regreening and reforestation has been implemented to rehabilitate degraded land and forests in Indonesia. In 2003, a movement to accelerate the rehabilitation of critical land and forest (*Rehabilitasi Hutan dan Lahan/RHL*) was launched in 2003 through Joint Decree between Coordinating Minister for People's Welfare, Coordinating Minister for Economy, and Coordinating Minister for Politics and Security No. 09/Kep/Menko Kesra/VIII/2003, No. Kep. 16/M ekon/03/2003 dan No. Kep. 08/Menko/Polkam/III/2003 on the establishment of Coordinating Team for Environmental Repair through National Rehabilitation and Reforestation. The movement was named National Movement for Land and Forest Rehabilitation (*Gerakan Nasional Rehabilitasi Hutan dan Lahan/GNRHL*). GNRHL was meant for moral movement for rehabilitating land and forest at national scale to improve environmental quality and people's welfare, which is well-planned and integrated, and involving all stakeholders, such as government, governmental/private-owned corporations, the Army, and society.

GNRHL was implemented through several activities, namely:

- (1) seedling provision (establishment of nursery)
- (2) Planting at protection forest, production forest, and conservation forest (reforestation), private forest, mangrove forest, urban forest, and along road side.
- (3) Plants maintenance
- (4) Specific activities, such as planting with intensive silviculture system, *Muna* Teak development, renovation of seedling production center and small-scale nurseries, and research and development (R&D)
- (5) Institutional development for GNRHL
- (6) Monitoring and oversight on GNRHL implementation.

When launched, GNRHL was planned with full of enthusiasm. Very large areas were planned to be planted by GNRHL and sophisticated budget was also disbursed by the Ministry of Forestry. Target of GNRHL was 3 million ha will be planted in 5 years (2003–2007). Then, it was extended until 2009, with additional areas and budget. However, the records in the Forestry Statistics showed very low performance of GNRHL. Table 4.1 shows the record of plan and implementation of GNRHL and Table 4.2 shows the budget allocated and the expenditure. Although it was not formally stated by the government, we can conclude from the data shown in the tables that the GNRHL was not succeeded.

**Table 4.1.** Plan and Implementation of GNRHL (2003–2009)

Year	Area (in Ha)		Implementation				Road side (Km)
	Plan	Reforestation	Private Forest	Urban Forest	Mangrove Forest	Total	
2003	300,000	19,922	87,965		3,576	111,463	
2004	500,000	296,498	271,575	3,937	1,035	573,045	250
2005	600,000	22,291	19,284		352	41,927	338
2006	700,000	213,028	239,437	1,665	1,610	455,740	1,370
2007	900,000	9,570	17,803		2,381	29,754	141
2008	1,700,000	49,089	26,931		275	76,295	21
2009	1,300,000	14,625	370			14,995	
<b>Total</b>	<b>6,000,000</b>	<b>625,023</b>	<b>663,365</b>	<b>5,602</b>	<b>9,229</b>	<b>1,303,219</b>	<b>2,120</b>

Notes: Blank cells = no data

Data sources: Forestry Statistics 2003 – 2009 (MoF, 2004 – 2010), Press release (MoF 2003)

**Table 4.2.** Budget allocated for GNRHL and its expenditure

Year	Total (in Indonesian Rupiah)	
	Budget	Expenditure
2003	1 463 643 333	659 468 443
2004	1 473 139 372	1 473 139 372
2005	1 681 404 380	923 055 810
2006	1 606 298 013	540 103 601
2007	2 412 953 806 000	1 764 893 246 542
2008	-	-
2009	394 023 657 000	309 055 028 474

Notes: Blank cells = no data; 1 USD = 9,968 IDR as of 10 Jul 2013 (www.xe.com)

Data sources: Forestry Statistics 2006, 2010 (MoF 2007, 2011)

### 4.3 One Man One Tree Movement

At the launching of Indonesia Planting Tree Day and National Planting Month in November 28, 2008, the President of the Republic of Indonesia also launched One Man One Tree (OMOT) Movement for 2009 as one of the efforts to combat deforestation and forest degradation. OMOT was taking the momentum of general election for Indonesia's president for the period 2009–2014. The President of the Republic of Indonesia, Soesilo Bambang Yudhoyono, invited Indonesians to plant trees in this movement. In 2009, the population of Indonesia was about 230 million people, and if everybody plants a tree, there will be 230 million trees planted. Therefore, the Government of Indonesia targeted 230 million trees to be planted in 2009.

Indonesia Planting Tree Day was set on every November 28 and the National Planting Month was set on every December. The target for the first Indonesia Planting Tree Day and National Planting Month launched in 2008 was 100 million trees. Until January 2009, the program had been planted 108.95 million trees.

#### 4.4 One Billion Trees Movement

At the celebration of the 2009 Indonesia Planting Tree Day and National Planting Month, the President launched the One Billion Trees (OBT) Movement for the year 2010. The movement was not only aiming at planting trees, but also to maintain the trees planted in order to reach optimal survival rate.

The OBT Movement reached the target in 2010 with 1 479 014 972 trees planted. The Movement then was continued to 2011, with 1 176 158 912 trees planted in 2011 (MoF 2012).

#### 4.5 REDD+ as one of Payment for Environmental Services (PES)

Increase of Greenhouse Gas (GHG) concentration in the atmosphere has caused climate change that has been widely experienced at global, national and local levels. In Indonesia, the impacts are shifting in seasons, the increase of both in precipitation intensity and drought level, and the increased risk of natural disaster linked to extreme weather. These impacts will not only threaten the economic activities but also will cause fatalities and influence the performance of Indonesia in the sustainable development. As one of the members of UNFCCC, Indonesia is not only ratifying the Kyoto Protocol and made efforts to implement Afforestation/Reforestation of Clean Development Mechanism (A/R CDM), but also fighting together with other developing countries to develop, make preparation, and implement another scheme of Payment for Environmental Services (PES): Reducing Emission from Deforestation and Forest Degradation and the role of conservation, sustainable management of forests, and enhancement of forest carbon stocks in developing countries (REDD+).

The President of the Republic of Indonesia at the G20 meeting in Pittsburgh-Pennsylvania (US) on September 25, 2009 stated Indonesia's commitment to reduce emission as much as 26% in year 2020 from Business as Usual (BAU) with its own efforts and without sacrificing development in other sectors, and with international support it can reach up to 41%. The government expects to accomplish this while aiming for 7% annual economic growth. Various initiatives have been taken at the local and national level in relation to manifestation of the commitment. To realize this commitment, the President has taken several actions, among others were issuing the Presidential Decree No. 19 of 2010 (ended on 30 June 2011) on the establishment of REDD+ Institution (1st REDD+ Task Force), the Presidential Decree No. 25 of 2011 (ended on 31 December 2012) on a Task Force on the REDD+ Institutional Preparation (2nd REDD+ Task Force), and extension of the 2nd REDD+ Task Force to June 30, 2013 by the Presidential Decree No. 5 of 2013. In September 2011, the President was also issuing the National Action Plan on Reducing GHG Emission (NAP-GHG/RAN-GRK) regulated by Presidential Regulation (*Perpres*) No. 61/2011, which are later clarified in Regional Action Plan on Reducing GHG Emission (RAP-GHG/RAD-GRK) and less than a month later Presidential Regulation (*Perpres*) No. 71/2011 on Inventory of GHG emission was issued. Based on NAP-GHG, reduced emission from LULUCF is targeted at around 80% of the total target in emission reduction or around 23% of the total Indonesia's emission in 2020. REDD+ supports the achievement of these targets through management of forests, peatlands, and agricultural areas. Synergy and coordination between REDD+ and NAP-GHG at the national and local level need to be developed from the planning phase (REDD+ Task Force 2012; REDD+ Task Force MRV Working Group 2012).

REDD+ has been identified and declared as a national program that will be implemented at the sub-national scale. More than 60% of the total GHG emission in Indonesia came from LULUCF sectors (MoE 2010), in particular due to the unique condition of Indonesia that has the largest peatland in the world, reaching 11% of Indonesia's land area. Peatland is highly potential to emit GHG if it is dried and burnt, because of very huge amount of belowground carbon stock (REDD+ Task Force MRV Working Group, 2012). REDD+ National Strategy has been launched with the following vision, missions, and goals (REDD+ Task Force 2012):

### Vision

Sustainable management of natural forests and peatlands as national natural resource<sup>1</sup> assets employed to maximize the prosperity of the people.

### Mission

To achieve the vision of sustainable management of natural forests and peatlands through an effective governance system by:

1. Enhancing the functioning of forest and peatland management institutions.
2. Improving laws and regulations and strengthening law enforcement.
3. Improving the capacity to manage forest and peatland resources.

### Goals

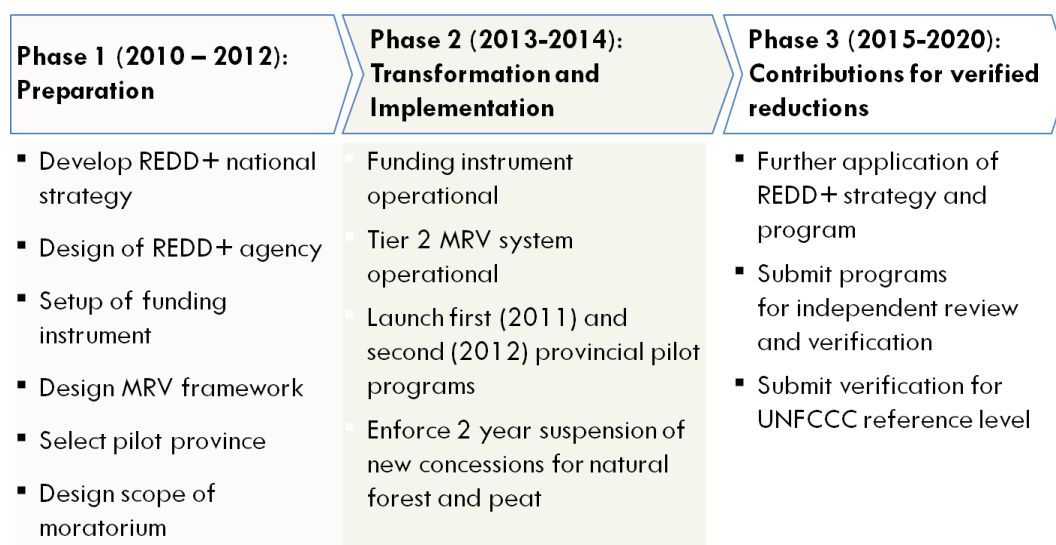
- a. Short-term goal (2012-2014): The strategic improvement of institutions and governance systems, as well as of spatial plans and the investment climate, in order to fulfill Indonesia's commitment to reduce greenhouse gas emissions while maintaining economic growth.
- b. Medium-term goal (2012-2020): The implementation of governance systems in line with policies and procedures developed by forest and peatland management institutions, and their application to the spatial and financial mechanisms developed and established in the previous phase, to achieve the targeted 26% & 41% reduction in emissions by 2020.
- c. Long-term goal (2012-2030): Indonesia's forests and land areas become a net carbon sink by 2030 as a result of the implementation of appropriate policies for sustaining economic and ecosystem service functions of forests.

There are five strategic pillars have been designed to achieve the strategic goals, namely: (1) institutions and processes, (2) legal and regulatory frameworks, (3) strategic programs, (4) changes to work paradigm and culture, and (5) inclusion/involvement of stakeholders. Figure 4.2 illustrates REDD+ National Strategy Framework with Five Main Pillars.



Figure 4.2. REDD+ National Strategy Framework with Five Main Pillars (REDD+ Task Force 2012)

Indonesia is implementing phased approach for REDD+ readiness with three phases, namely preparation phase, transformation & implementation phase, and contribution for verified reductions (Figure 4.3). These three phases were designed in accordance with the Letter of Intent between Indonesia and Norway on REDD+.

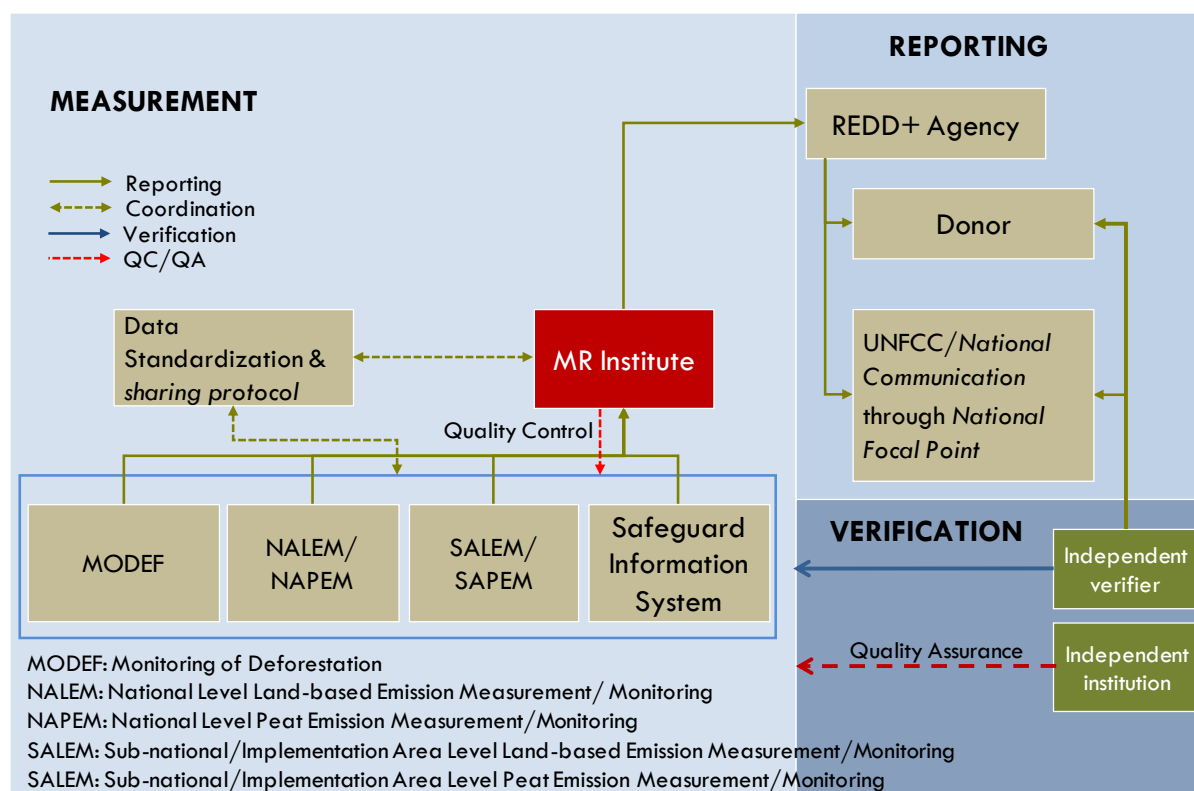


**Figure 4.3.** Phased approach for REDD+ readiness in Indonesia

The REDD+ preparation phase (1st phase) should have been completed by end of December 2012. Activities for the preparation phase are (Figure 4.3): (1) developing REDD+ national strategy, (2) design of REDD+ agency, (3) setup of funding instrument, (4) design MRV framework, (5) select pilot province, and (6) design the scope of moratorium. All of activities in the preparation phase have been conducted and Indonesia is ready for the transformation and implementation phase (2nd phase). The end of the 1st phase and the beginning of the 2nd phase is marked with establishment of REDD+ Agency. The REDD+ Agency establishment is expected to happen by June 2013, through issuance of a Presidential Regulation on the REDD+ Agency.

REDD+ Agency will be the main actor for REDD+ governance in Indonesia. It is established in order to (1) undertake governance at the national level and coordinate all REDD+ activities in Indonesia; (2) oversee and accelerate improvements in forest and peatlands governance in order to reduce the rate of deforestation and degradation; and (3) ensure effective funding services and fair benefit distribution for parties running REDD+ programs/projects/activities in accordance with the integrity requirements for REDD+ implementation systems (REDD+ Task Force 2012).

A REDD+ funding instrument and a REDD+ MRV institution will be established as parts of REDD+ Agency. The objectives of establishing funding instrument are: (1) to support the development of REDD+ activities in line with their potential to reduce emissions from forests and peatlands; (2) to provide an internationally credible funds disbursement mechanism acceptable to potential donors and investors interested in facilitating or benefiting from REDD+ activities; (3) to facilitate the efficient distribution of funds and to ensure the fair distribution of benefits from REDD+ activities; and (4) to ensure adherence to the three key safeguards aspects: fiduciary, social and environmental integrity. Meanwhile, a REDD+ MRV institution is established to develop policies, standards, and work mechanisms for measurement, reporting, and verification that are approved by the REDD+ Agency, as well as for coordinating MRV activities. The MRV Institution operates independently under the coordination of the REDD+ Agency (REDD+ Task Force, 2012). Specific objective of the establishment of MRV institution as stated by REDD+ Task Force MRV Working Group (2012) is to support the National REDD+ Strategy and NAP-GHG (in particular land-based sector) in harmony with the challenges of heterogeneity-complexity of emission behavior at the national and sub-national levels and the demand to fulfill IPCC requirement and beyond IPCC (co-benefits and safeguards). The MRV Working Group has developed REDD+ MRV framework, as shown in Figure 4.4.



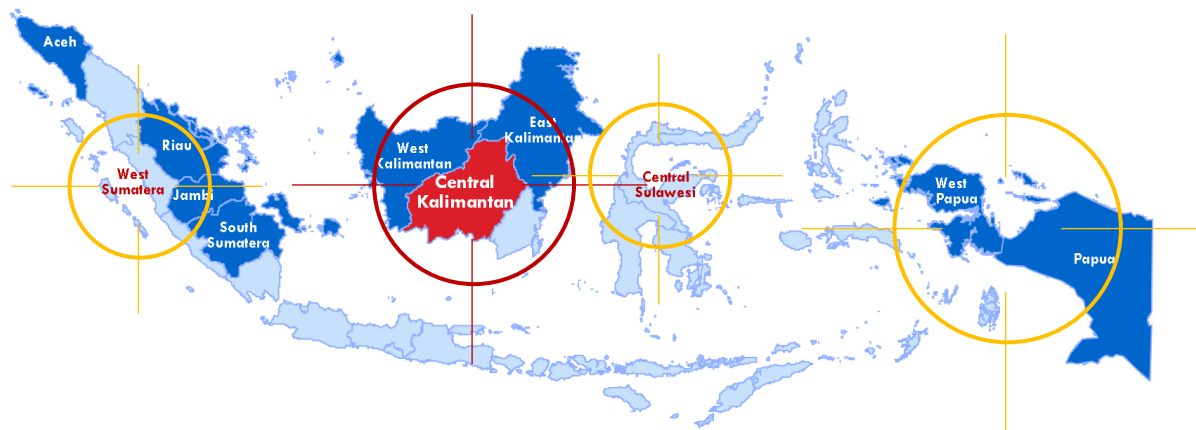
Source: REDD+ Task Force MRV Working Group, 2012

**Figure 4.4.** REDD+ MRV framework for Indonesia

Central Kalimantan province was selected for REDD+ pilot implementation. All instruments which have been prepared by the REDD+ Task Force are piloted in this province. Several activities already piloted in Central Kalimantan are: (1) development of MoU between REDD+ Task Force and Provincial Government, (2) establishment Joint Secretariat, (3) establishing enabling condition for REDD+ readiness, such as implementing Free, Prior, and Informed Consent (FPIC), awareness activities, capacity building, demonstration activities, calculation and stipulation of Reference Emission Level, preparation of MRV for Central Kalimantan, and extension on the Central Kalimantan Provincial Strategy on REDD+. Lesson learned from the pilot province is expected to become an input to the next pilot province. Currently, there are other 10 provinces have been engaged as partner provinces, namely: Aceh, Riau, Jambi, South Sumatera, West Sumatera, West Kalimantan, East Kalimantan, Central Sulawesi, Papua, and West Papua. From those 10 partner provinces, two or three provinces will be selected as the next pilot provinces for the 2nd phase. Pilot province and 10 partner provinces are illustrated in Figure 4.5.

One of the most fantastic movements in REDD+ is the issuance of Presidential Instruction No. 10/2011 on two years suspension of license issuance for new concessions and improvement of forest governance for natural primary forests and peatlands (hereafter is called moratorium), dated May 20, 2011. This momentum was utilized by the Government of Indonesia (GoI) and all stakeholders to solve conflicts related to spatial planning and land tenure, both on state lands and customary lands. Indicative map for new concession license suspension (*Peta Indikatif Penundaan Izin Baru/PIPIB*) has been produced and revised every 6 months.





Source: REDD+ Task Force Pilot Province Working Group, 2012

**Figure 4.5.** Pilot province and 10 partner provinces for REDD+ Indonesia

One Map and One Government License are two other movements taken the momentum of moratorium. One Map is a movement toward one reference, standard, database, and geo-portal in Indonesia. One reference of basic geospatial information is in the form of basic map or geodetic control network. One standard for thematic mapping - sector(s) may produce its thematic map to serve its purposes by utilizing mapping standards approved by Geospatial Information Agency (*Badan Informasi Geospasial/BIG*) so that it can be integrated with other themes to become national thematic map. One integrated database of spatial and non-spatial information, cross sector and cross levels. Integrated license database can be used as starting point to solve land use permit/license overlaps. Any map produced by the national and sub-national government institution has to be accumulated and displayed on one geo-portal system for public transparency and participation: Indonesia National Spatial Data Infrastructures.

One Government License has been implemented through upgrading Remote Sensing Earth Receiving Station of National Institute of Aeronautics and Space (*Lembaga Antariksa dan Penerbangan Nasional/LAPAN*) for direct acquisition of high resolution remote sensing satellite data. This movement has been taken for efficiencies of National Budget for satellite data purchase, mitigation of corruption practices, both in the procurement and distribution, and to provide free distribution of the satellite data to all governmental institutions, both in the central and local, including national academic institutions.

Two years almost passed when an extension for the moratorium was demanded by all stakeholders supporting the moratorium. It was because of the settlement of conflicts was not finished yet, spatial planning, land tenure issues, and overlapping between land functions were not yet been resolved. The President extended of the moratorium for another two years by issuing Presidential Instruction No. 6 of 2013, dated May 13, 2013, just few days before the end of the moratorium.

Through the moratorium extension, it is hoped that forest governance will be improved too. The Participatory Government Assessment (PGA) for REDD+ Implementation was conducted by UN-REDD program in 2011 as a respond to the COP 16 agreements. Indonesia is the first country of four pilot countries that completed the assessment, followed by Vietnam, Ecuador, and Nigeria. Indonesia's PGA results have just been launched in April 2013. It illustrates Indonesia's forest, land, and REDD+ governance index value (Situmorang *et al.* 2013).

The PGA index was a result of assessment using 3 components of governance: (a) law and policy, (b) actors (government, civil society, women, local and *Adat* communities, and business communities), and (c) working performance of each actor. The index was also a result of assessment using 6 principles of governance: participation, transparency, accountability, effectiveness, capacity, and justice. The three components and six principles were used to assess the condition of forest, land, and REDD+ governance in three levels: national (central), 10 provinces, and 20 districts. The PGA index value is an aggregate of average score of component index and aggregate of average score of principle index. The lowest index score is 1 (very bad) and the highest is 5 (best). Based on the PGA, Indonesia's PGA index score is 2.33 from the governance components and 2.35 from the governance principles. Based on the level, the governance component index scores are 2.78 for the central, 2.39

for the provinces, and 1.8 for the districts. While the governance principles index scores are 2.71 for the central, 2.36 for the provinces and 1.98 for the districts. The PGA results show that nationally, the forest, land, and REDD+ governance's index score in Indonesia is low (below 3). Some aspects identified from the index were: (1) low in justice principle, (2) low in capacity, (3) low in accountability, and (4) low in effectiveness (Situmorang *et al.* 2013).

The result of the PGA is a report that also containing policy recommendation, road map and monitoring tools to improve forestry, land, and REDD+ governance in Indonesia. Recommendations in the PGA were based on the low score of the forest, land, and REDD+ governance's index and mainly caused by 4 main problems: forestry conflict, most of forest areas have not yet been gazetted/stipulated, law enforcement, and high transaction cost. The policy recommendations to improve forestry, land, and REDD+ governance in Indonesia are as follow (Situmorang *et al.* 2013):

- 1) Strengthening working performance for improvement of legality and legitimacy of the status of the State forest areas through improvement of forest, land, and REDD+ governance
- 2) Strengthening working performance for consolidation rights on forest resources and reduction of numbers of forestry conflicts
- 3) Strengthening working performance to reduce cost and bribe in the process of forestry permit
- 4) Strengthening working performance for improvement of law enforcement in forestry
- 5) Strengthening working performance to achieve realization of REDD+ infrastructures that implement governance principles.

*“REDD+ for Indonesia is not merely carbon emission and forest sector. REDD+ is about better forests and peatlands governance, for the prosperity of communities, poverty alleviation, and sustainable growth”* (Mangkusubroto in Situmorang *et al.* 2013).

#### 4.6 Summary of Chapter 4

Since 1960s Indonesia implemented reforestation and forest and land rehabilitation. Nevertheless, the extent of critical land in Indonesia in 2011 was ±81,664,294.90 ha (data from 2006; excluding Jakarta), that consisted of: most critical 5,449,299.30 ha, critical 23,955,162.70 ha, and semi-critical 52,259,832.90 ha (MoF 2012). Since the beginning of Regreening Program implemented in 1970s, almost 85% of Ministry of Forestry budget were allocated for this project, but the result was very minimum (Nawir *et al.* 2007). Several factors were identified as the causes, namely:

- 1) Provincial and Districts Governments – where this program is assigned – had been placing forest as the revenue source, instead of rehabilitating the forest for long-term benefit;
- 2) The program was conducted in the period when causes of deforestation were not yet solved, so that the extent of degraded forest areas always bigger than the ability to rehabilitate them;
- 3) Some policies caused disincentive for regreening and rehabilitation initiatives;
- 4) Project-based approach tend to results in failure, because:
  - a. Maintenance was not implemented enough after the seedlings were planted.
  - b. Un-continuous funding, feasibility, and market to absorb the timber produced.
  - c. There was unclear economic-incentive for the communities.
  - d. Low-participation because of tenure problems and low-facilitations to organized the communities.
  - e. Low-consideration on the socio-cultural aspects of communities.
  - f. No mutual understanding on the benefit sharing between regional government, local communities, and Ministry of Forestry.

REDD+ program with five pillars is basically not only adding and/or strengthening already existing programs, but changing working paradigms which have been considered as the cause of continuous failures.

## 5 CONCLUDING REMARKS

Research on forest transition was started by Alexander S. Mather's research, published in 1990 and 1992. Natural forest destruction reforested again through plantation forest as forest cover change forming the U-shape. Mather's early studies were done by analyzing conversion of natural forest in Scotland in 16<sup>th</sup> century and then reforested again in the 20<sup>th</sup> century. It took almost 500 years, while similar condition happened only within 20-30 years in Vietnam (Mather 2004, Mather 2007 in Rudel *et al.* 2010).

A more comprehensive theory of Forest Transition was suggested by Barbier *et al.* (2010) with the following arguments:

- (1) Forest decline in a country was caused by the change of entire landscape in that country. In this case, overall spatial change will determine deforestation or reforestation/afforestation/natural regrowth.
- (2) Change from forest to other type of land use and vice versa will be depended on the value comparison. If other type of land use has higher economic value, then forest conversion to other land use will happen.
- (3) Change from forest to non-forest and vice versa will happen continuously as long as the value of forest relative to the value of its competing use continues to change.
- (4) Forest transition was effected by the presence of market, policy, and institutional failures as well as changes in the structure, technology, and institutions. These will determine the incentive whether forest are worth to be maintained or not, thus determine the overall landscape. In this case, this factor (4) will be the cause of the previous three factors (1, 2, 3).

In Indonesia, there is significant difference between forest in Java and outside Java (islands other than Java and Madura), between western part and eastern part of outside Java. Private forest in Java has developed globally. This condition was caused by the demand, price, and the condition of economic infrastructures, especially road accessibility, which led the farmers to plant trees. In farmers' level, by the growing of farmers groups' organization, the price accepted by the farmers have replaced the working time allocated for household for planting and maintaining trees (Mulyaningrum, 2013). Meanwhile, in some locations there are working contracts between farmers groups with wood processing companies. Within the last 10 years, there has been a shift in the location of wood processing industries, from outside Java to Java Island (Rahardi 2011).

Different from Java, condition of outside Java generally has no enabling conditions yet to promote planting trees as in Java, except for activities conducted by big companies through establishment of plantation forest. Incentive for local/*Adat* communities to plant trees has not yet emerged there, mostly because of unclear status of the land that proven by many land conflicts and low-road accessibility that connects potential locations of planting trees with wood processing industries. Moreover, values of lands for development of agricultural commodities (e.g. oil palm plantation) and mining are higher than if maintained as forest land.

Development of plantation forest by big companies was initiated by government policy that subsidized this activity in the form of soft-loan (loan with low-interest rate). The policy that issued in 1980s had increased the companies' interests, both domestic and foreign, to invest in industrial plantation forest as concession holders. In 1999, there has been a change in the policy that Reforestation Fund allocated for development of plantation forest was stopped. This caused a decrease of private's interests in the investment. Since then, plantation forest development mainly driven by demand of raw material for pulp and paper industries.

Comprehensive analysis and explanation on forest cover and major drivers of deforestation in Chapter 3 showed the position of Forest Transition in Indonesia. Java as the central of Indonesia's development faced deforestation earlier than other islands. Similarly, Java also experiencing reforestation earlier, though in Java itself, the deforestation and reforestation status are varies between province and districts. Following Java, the next islands facing deforestation then reforestation were Sumatera, Kalimantan, Sulawesi, and Papua. In each island, the patterns of forest cover changes were also varied. Indonesian part of Papua Island, consists of Papua and West Papua Provinces, is claimed to have national forest area more than 90% of its terrestrial. Also, its forest cover is generally still intact compared to those at other islands in Indonesia. In this case, Papua

which still needs development in the future cannot be included in the forest transition study yet, since deforestation for development has been planned. We cannot stop or avoid deforestation in Papua, which means to stop development for the prosperity of people there. Nevertheless, forestry development in Papua has been facing problems, since all forests in Papua are under the custody of customary rights and communities (customary forests). Therefore, all forest products utilization must pay certain amount to the customary communities who have been “protecting” these forests. These situations have led to conflicts in several areas. Those conflicts caused the decline of forestry business in Papua.

Based on various situations in Indonesia, conclusions on Indonesia's Forest Transition are as follow:

- 1) By law, national forest areas occupy 73% of Indonesia's terrestrial territory or 71% of Indonesia's territory (both terrestrial and sea). This forest area is maintained as forest and if used for non-forestry purposes, permission must be granted by the Government. Based on this, deforestation and forest development (reforestation, afforestation, and natural regrowth) are caused by the government's policy. The past 10 years, two facts are identified:
  - a. At conservation forest areas, forest decline has been happening, but no forest restoration yet. Similar condition is also happening with protection forest areas. Policy that put through reforestation in conservation forest areas is still prevented by certain legislation (Acts, government regulation) which mentioned that on certain areas human efforts are forbidden. Meanwhile in protection forest areas, the main problem is that there is no manager in the field/site, so that reforestation always tends to be failed.
  - b. At production forest areas, permits/licenses which were dominated by natural forest concession, are now change to plantation forest utilization permit. Nationally, amount of timber from plantation forest is now beyond timber production from natural forest. As already mentioned earlier, that plantation forest grows by high demand of raw material for pulp and paper.
- 2) Generally speaking, national forest areas are still experiencing deforestation and forest degradation. It was caused by unfinished-stipulation of rights on national forest areas, conflicts on land and forest utilization, encroachment by plantation & mining concession holders as well as by local farmers, weak forest management in the field, and weak law enforcement. These factors overall related with the weak of land and forest governance, including corruptions that are still happening in the process of acquiring concession rights, which valuation done by Situmorang *et al.* 2013.
- 3) Private forests are generally developed in Java Island. High demand, price, and access to timber and certainty on land property rights and access to forest resources have been the reasons behind this. Condition of Java Island that gives incentives for the farmers to develop their own forest cannot be replicated yet to outside Java.
- 4) In relation to Forest Transition theory, though Indonesia is considered as still experiencing deforestation, the deforestation status are varied inside Indonesia and there are several provinces that already passed the deforestation phased and turned to reforestation.

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# **Appendices**

## APPENDIX

## Appendix 1. Rice, cassava, and peanut production (1993–2011)

Year	Rice		Cassava		Peanut		Maize	
	Harvested area (Ha)	Production (Ton)	Harvested area (Ha)	Production (Ton)	Harvested area (Ha)	Production (Ton)	Harvested area (Ha)	Production (Ton)
1993	10,993,920	48,129,321	1,388,700	17,215,475	621,088	635,731	2,881,466	6,355,214
1994	10,717,734	46,598,380	1,337,478	15,654,914	638,291	627,367	3,047,378	6,752,146
1995	11,420,680	49,697,444	1,305,265	15,365,837	735,460	756,337	3,595,700	8,142,863
1996	11,550,045	51,048,899	1,401,508	16,948,674	685,705	734,480	3,685,459	9,200,807
1997	11,126,396	49,339,086	1,233,047	15,092,642	624,890	685,043	3,301,795	8,671,647
1998	11,730,325	49,236,692	1,197,357	14,664,111	646,468	687,688	3,815,919	10,110,557
1999	11,963,204	50,866,387	1,350,008	16,458,544	624,980	659,586	3,456,357	9,204,036
2000	11,793,475	51,898,852	1,284,040	16,089,020	683,554	736,517	3,500,318	9,676,899
2001	11,499,997	50,460,782	1,317,912	17,054,648	654,838	709,770	3,285,866	9,347,192
2002	11,521,166	51,489,694	1,276,533	16,913,104	646,953	718,071	3,126,833	9,654,105
2003	11,488,034	52,137,604	1,244,543	18,523,810	683,537	785,526	3,358,511	10,886,442
2004	11,922,974	54,088,468	1,255,805	19,424,707	723,434	837,495	3,356,914	11,225,243
2005	11,839,060	54,151,097	1,213,460	19,321,183	720,526	836,295	3,625,987	12,523,894
2006	11,786,430	54,454,937	1,227,459	19,986,640	706,753	838,096	3,345,805	11,609,463
2007	12,147,637	57,157,435	1,201,481	19,988,058	660,480	789,089	3,630,324	13,287,527
2008	12,327,425	60,325,925	1,204,933	21,756,991	633,922	770,054	4,001,724	16,317,252
2009	12,883,576	64,398,890	1,175,666	22,039,145	622,616	777,888	4,160,659	17,629,748
2010	13,253,450	66,469,394	1,183,047	23,918,118	620,563	779,228	4,131,676	18,327,636
2011	13,203,643	65,756,904	1,184,696	24,044,025	539,459	691,289	3,864,692	17,643,250

Source: Indonesian Statistics, 2013

**Appendix 2. Cash crops production (1995–2011)**

Year	Rubber		Palm Oil		Cacao		Coffee		Tea		Sugar cane	
	Harvested area (x 1,000 Ha)	Production (Ton)	Harvested area (x 1,000 Ha)	Production (Ton)	Harvested area (x 1,000 Ha)	Production (Ton)	Harvested area (x 1,000 Ha)	Production (Ton)	Harvested area (x 1,000 Ha)	Production (Ton)	Harvested area (x 1,000 Ha)	Production (Ton)
1995	472	341,000	992	2,476,400	125	46,400	49	20,800	81	111,082	496.9	2,104,700
1996	538	334,600	1,146	2,569,500	130	46,800	47	26,500	88.8	132,000	400	2,160,100
1997	558	330,500	2,109	4,165,685	146	65,889	62	30,612	89.3	121,000	378.1	2,187,243
1998	549	332,570	2,670	4,585,846	151	60,925	63	28,530	91.2	132,682	405.4	1,928,744
1999	545	293,663	2,861	4,907,779	155	58,914	63	27,493	91.6	126,442	391.1	1,801,403
2000	549	375,819	2,991	5,094,855	158	57,725	63	28,265	90	123,120	388.5	1,780,130
2001	507	397,720	3,152	5,598,440	159	57,860	63	27,045	83.3	126,708	393.9	1,824,575
2002	493	403,712	3,259	6,195,605	146	48,245	58	26,740	84.4	120,421	375.2	1,901,326
2003	518	396,104	3,429	6,923,510	146	56,632	57	29,437	83.3	127,523	340.3	1,991,606
2004	514	403,800	3,497	8,479,262	88	54,921	53	29,159	83.3	125,514	344.8	2,051,642
2005	512	432,221	3,593	10,119,061	86	55,127	53	24,809	81.7	128,154	381.8	2,241,742
2006	513	554,634	3,749	10,961,756	101	67,200	54	28,900	78.4	115,436	396.4	2,307,000
2007	514	578,486	4,102	11,437,986	107	68,600	53	24,100	77.6	116,501	427.8	2,623,800
2008	516	586,081	4,452	12,477,752	98	62,913	58	28,074	78.9	114,689	436.5	2,668,428
2009	483	522,312	4,888	13,872,602	95	67,602	49	28,672	66.9	107,350	422.9	2,333,885
2010	497	541,491	5,162	14,038,148	92	65,147	48	29,012	66.3	100,066	436.6	2,288,735
2011	524	602,404	5,306	14,632,406	92	44,821	48	23,704	66.2	96,559	435	2,126,669

Source: Indonesian Statistics 2013

## Appendix 3. Main forestry products (1961 – 2011)

Year	Logging concession /HPH+HTI		Timber production (cu m)			Timber export								
	Area (Ha)	No.	Log	Sawn Timber	Plywood	Log (cu m)	Sawn Timber		Plywood		Pulp (kg)	Veneer sheets (kg)	Particle board (kg)	Fiberboard (kg)
							cu m	kg	cu m	kg				
1961			906,000	1,714,000										
1962			2,018,000	1,521,000										
1963			1,961,000	1,664,000										
1964			1,870,000	1,568,000										
1965			1,685,000	1,572,000										
1966														
1967														
1968	1,184,000	10												
1969	4,896,000	46				3,596								
1970	6,967,000	56	10,408,000	245,394		8,281								
1971	8,635,000	68	13,706,283	375,010		10,680	81							
1972	10,363,000	93	16,877,000	840,000		13,759	132							
1973	19,998,000	161	24,919,950	1,377,345		19,095,000	338,000							
1974	23,730,000	234	20,860,961	892,060		17,728,000	354,000							
1975	25,801,000	264	14,587,558	1,708,025	17,010	13,511,000	410,000		423					
1976	26,245,000	269	21,427,897	634,841	24,990	17,877,000	644,000		8,348					
1977	30,476,650	324	22,344,844	604,803	25,720	19,212,000	594,000		11,089					
1978	35,887,150	382	24,742,900	1,512,743	168,080	19,444,000	754,000		69,848					
1979	44,930,150	462	25,313,638	1,636,950	385,614	18,205,000	1,284,000		117,138					
1980*	49,407,150		25,190,434	1,793,948	945,500	14,583,000	1,203,000		245,014					
1981*	50,789,150		15,954,426	2,659,300	1,253,400	6,391,000	1,263,000		772,381					
1982	52,632,650	519	13,376,513	3,686,400	2,309,000	3,103,000	1,222,000		1,232,310					
1983*						2,959,000	1,793,000		2,023,000					
1984	53,374,750	521	15,208,568	2,710,682	2,605,141	1,567,000	2,198,000		3,021,000					
1985*	53,375,000	521	15,957,641	2,119,074	2,042,348		2,166,000		3,784,000					
1986*			14,551,451	4,144,617	4,322,443		2,353,000		4,618,000					
1987*			19,758,294	7,442,000	5,312,842		2,833,000		5,951,000					
1988	55,468,350	538	27,565,919	9,750,080	6,385,350		2,874,000		6,951,000					

Year	Logging concession /HPH+HTI		Timber production (cu m)			Timber export								
	Area (Ha)	No.	Log	Sawn Timber	Plywood	Log (cu m)	Sawn Timber		Plywood		Pulp (kg)	Veneer sheets (kg)	Particle board (kg)	Fiberboard (kg)
							cu m	kg	cu m	kg				
1989	57,656,000	565	28,485,000	10,237,500	6,026,679		2,692,000		8,047,000					
1990*	58,910,000	558	24,409,000	3,919,249	8,843,000		25,000		8,513,000					
1991	60,510,000	563	25,312,000	3,117,000	9,415,000		13,000		8,959,000					
1992	60,563,083	569	23,892,000	3,006,046	9,123,500		9,450		9,761,000					
1993	61,463,083	582	28,267,000	3,534,356	9,874,000		5,040		9,626,000					
1994*	61,783,083	577	26,848,011	2,244,000	9,924,000		2,370		7,333,090					
1995	61,144,083	545	24,027,277	1,729,839	8,066,352		800		8,338,820					
1996	58,180,268	514	24,850,061	2,014,193	9,122,401		60		9,366,570					
1997	57,125,809	510	26,069,282	3,565,475	10,270,230		300		4,800,740					
1998	56,525,881	521	29,520,322	2,613,452	6,709,836		15,900		4,863,880					
1999	55,976,741	518	19,026,944	2,707,221	7,154,729		20,500		3,372,880					
2000	46,341,375	487	13,798,240	2,789,543	4,442,735		9,870		3,096,240					
2001	43,738,697	464	11,432,501	674,868	2,101,485		12,310		930,350					
2002	39,943,256	442	9,004,105	623,495	1,694,405		392,590	357,563,156	4,983,030	3,584,237,103	2,245,179,892	3,315,899	111,335,483	198,674,833
2003	31,884,912	364	11,423,501	762,604	6,110,556			202,497,760	31,980	3,306,448,275	2,375,244,333	5,402,807	126,676,019	170,861,581
2004	33,710,295	379	13,548,938	432,967	4,514,392		2,471,682	65,268,004		2,603,043,170	1,676,962,175	55,057,662	48,133,019	200,694,802
2005	33,787,410	402	31,965,725	1,471,614	4,533,749			9,999,918		2,214,770,962	2,552,965,878	3,981,857	30,176,668	234,789,022
2006	34,187,515	418	34,092,484	679,247	3,811,794			43,794,280		1,979,110,376	2,812,624,096	7,920,784	11,673,389	204,948,497
2007	35,867,812	484	32,197,046	587,402	3,454,350			63,721,094		1,599,808,022	2,437,372,466	3,134,035	5,616,468	214,902,295
2008	35,424,832	489	32,000,786	530,688	3,353,479			50,910,120		1,668,337,181	2,615,776,379	11,532,700	4,243,936	180,029,160
2009	34,833,016	514	34,320,536	710,208	3,004,950			35,312,658		1,430,929,252	2,243,968,917	7,658,685	11,286,719	171,679,108
2010	34,745,375	522	42,114,770	885,425	3,324,889			32,201,599		1,839,689,959	2,572,338,903	9,833,994	9,349,469	151,593,453
2011	34,323,579	537	47,429,335		3,302,843			42,911,937		1,891,200,398	2,933,915,991	12,143,057	7,095,360	127,466,677

Notes: HPH = logging concession company, HTI = Industrial Timber Plantation company, \* = Statistics not found, available data from Statistics 5 years or 10 years later

Blank cells = data not available

Source: Forestry Statistics 1976–2011 (MoA 1976–1979, MoF 1983–2012, MoFEC 1998, 2000)

**Appendix 4. Purpose and criteria of protected areas based on Presidential Decree No. 32/1990**

No.	Types of protected areas	Purpose	Criteria
1.	Areas that protect its subordinate areas		
	a. protection forest areas	To prevent erosion, sedimentation, and to protect hydrological function of soil in providing soil nutrient, ground water, and surface water.	<ul style="list-style-type: none"> <li>- Forest area with factors of slope, soil type, and precipitation more than 175, and/or;</li> <li>- Forest area that slope is 40% or more and/or;</li> <li>- Forest area with elevation of 2,000 meter above sea level or more.</li> </ul>
	b. peat areas	To control hydrology in the area, that functions as water-catcher and prevent flood, and to protect the specific ecosystems in respective areas.	Areas with peat land of 3 meters deep or more which are located in the upstream of river or swamp.
	c. water infiltration areas	To create enough space for infiltration of rain water at certain areas in order to provide ground water needs and flood prevention, both downstream or in the areas itself.	Areas with high precipitation, soil structures that infiltrate water, and geo-morphological forms that able to infiltrate maximum rain.
2.	Local protection areas		
	a. coastal areas	To protect coastal areas from activities that disturb sustainability of coastal function.	Terrestrial areas on the seashore with width proportional to the shape and physical condition of the shore, minimum 100 meters from the highest rise of tide to the shore.
	b. riverbank areas	To protect rivers from human activities which can disturb and destruct river water, physical condition of riverbank, and to secure the river flow.	<ul style="list-style-type: none"> <li>- Areas with minimum of 100 meters on both side of the big riverbanks and 50 meters from tributaries outside settlements</li> <li>- For rivers in settlement areas, riverbanks are 10–15 meters wide that estimated enough for inspection road.</li> </ul>
	c. areas surrounding lakes or water dams	To protect lakes or water dams from cultivation activities that can disturb the sustainability of lakes/water dams' functions.	<ul style="list-style-type: none"> <li>- Areas along the lakesides/water dams with width proportional to the shape and physical condition of the lake/water dams, between 50 – 100 meters from highest rise of tide to the shore</li> </ul>
	d. water spring areas	To protect spring from cultivation activities that can destruct the quality of water and physical condition of surrounding areas.	<ul style="list-style-type: none"> <li>- Areas with minimum radius of 200 meters from the center of the spring.</li> </ul>
3.	Sanctuary Reserves and Culture Sanctuary		
	a. sanctuary reserve areas	To protect biological diversity, types of ecosystems, symptoms and uniqueness of nature for the sake of germ plasm,	

No.	Types of protected areas	Purpose	Criteria
		science, and general development.	
	▪ Strict nature reserve		<ul style="list-style-type: none"> <li>- Areas with diversity of plants and wildlife and their ecosystems</li> <li>- Areas having certain biota formation and/or its elements</li> <li>- Areas having natural condition in its origin and not/or without human intervention, both the biota or the physical condition</li> <li>- Areas that having specific characteristics and can be the only sample in certain area and the existence need conservation efforts.</li> </ul>
	▪ Wildlife sanctuary		<ul style="list-style-type: none"> <li>- Areas as the habitat and place for regeneration of certain wildlife that need conservation effort</li> <li>- Areas that are having high population of wildlife</li> <li>- Areas which are vast enough as habitat for respective wildlife.</li> </ul>
	▪ Recreational forest		<ul style="list-style-type: none"> <li>- Areas that are having interesting and beautiful condition, both natural or artificial</li> <li>- Areas that could provide human needs for recreation or sports and located near settlements</li> <li>- Areas that contains hunting animal (game) that can be breed so that possible to engage arranged-hunting with main purpose of recreation, sports, and wildlife sustainability</li> <li>- Areas which are having enough extent and the location are not dangerous.</li> </ul>
	▪ Areas for protection of germ plasma		<ul style="list-style-type: none"> <li>- Areas which are having certain germ plasma not existing in the conservation areas already been designated</li> <li>- Areas of wildlife relocation that become new habitat of the wildlife</li> <li>- Areas which are having enough extent and the location are not dangerous.</li> </ul>
	▪ Areas for wildlife refuge		<ul style="list-style-type: none"> <li>- Areas which are original habitat of the wildlife</li> </ul>



No.	Types of protected areas	Purpose	Criteria
	b. marine sanctuary reserve and other waters areas	To protect biological diversity, types of ecosystems, symptoms and uniqueness of nature for the sake of germ plasma, recreation, and science	<ul style="list-style-type: none"> <li>- Areas with certain extent that possible to continue the life process and livelihood and breeding of the wildlife.</li> <li>- Areas of inland waters/sea, freshwaters, coastal areas, estuaries, coral and atoll that have specific characteristic, such as diversity and/or the uniqueness of ecosystem.</li> </ul>
	c. coastal areas with mangrove forests	To preserve mangrove forests as the maker of mangrove forest ecosystems and the place for marine biota regeneration as well as protector of the beach from abrasion and protector of cultivation estate behind the shore.	<ul style="list-style-type: none"> <li>- Areas with minimum of 130 times of average value of difference between the highest and the lowest annual tide, measured from the lowest ebb tide line to the shore.</li> </ul>
	d. national parks	To develop education, recreation and tourism, and to improve the quality of surrounding environment and protection from pollution	<ul style="list-style-type: none"> <li>- Forested or fixed-vegetated areas that having diversity of plants and wildlife, good landscape architecture, and good access for tourism.</li> </ul>
	e. grand forest parks		
	f. nature recreation parks		
	g. areas for culture sanctuary and science	To protect cultural richness, such as historical remains, archaeological buildings and national monument, and diversity geological forms, that useful for development of science from the threat of extinction by human or natural activities.	<ul style="list-style-type: none"> <li>- Places or spaces surrounding buildings with high cultural values, archaeological sites, and areas with specific geological forms that has high benefit for development of science.</li> </ul>
4.	Areas sensitive to natural hazards	To protect human and their activities from hazards caused by nature or un-intentionally human-caused hazards.	<ul style="list-style-type: none"> <li>- Areas that identified as often and high potential to experience natural hazards, such as volcanic eruptions, earthquakes, and landslides.</li> </ul>

Source: Presidential Decree No. 32, 1990

**Appendix 5. Comparison between Community Forest (*HKM*), People's Plantation Forest (*HTR*), Village Forest (*HD*), *Adat* Forest (*HA*), and Village-managed Forest (*HPD*) of *PHBM* program in Production Forest in Java**

No	Characteristics	HKM	HTR	HD	HA	HPD/PHBM
1	Law and regulation					
	Acts	UU No. 41/1999	UU No. 41/1999	UU No. 41/1999		UU No. 41/1999; UU No. 22/1999 (repealed & replaced by UU. No. 32/2004); UU No. 25/1999 (repealed & replaced by UU No. 33/2004)
	Government Regulation	PP No. 6/2007 j.o. PP No. 3/2008	PP No. 6/2007 j.o. PP No. 3/2008	PP No. 6/2007 j.o. PP No. 3/2008	Government Regulation Preparation Draft (RPP) on the Management of <i>Adat</i> Forest by Community upholding <i>Adat</i> / Customary Acts - not yet enacted	PP No. 53/1999 (repealed & replaced by PP No. 30/2003); PP No. 25/2000 (repealed & replaced by PP No. 38/2007); PP No. 30/2003 (repealed PP.14/2001)
	Minister of Forestry Regulation	P.37/2007	P.23/2007	P.49/2008		
	Other related regulation					SK No. 136/KPTS/DIR/2001; SK No. 001/KPTS/DIR/2002; SK No. 660/KPTS/DIR/2003
	Definition by Law/Regulation	State forest that main utilization is to empower local communities (PP No. 6, 2007).	Plantation forest at Production Forest that is developed by individual or cooperation to improve potential and quality of production forest by implementing silviculture in order to	State forest that is not bearing ownership rights that is managed by the village and utilized for village prosperity (PP No. 6, 2007).	State forest that is located in the territory of community upholding customary Acts (UU No. 41/1999)	

No	Characteristics	HKM	HTR	HD	HA	HPD/PHBM
			ensure forest resources sustainability (PP No. 6, 2007).			
2	Land ownership status	State forest	State forest	State forest	State forest; by Constitutional Court Decision on May 16, 2013, the <i>Adat</i> forest status is titled-forest	State forest
3	Forest area status	Protection forest and production forest	Production forest	Protection forest and production forest	Following forest area status in respective location	Protection forest and production forest
4	Working area stipulation by:	Minister of Forestry with suggestion from District Head or Mayor and Governor	Minister of Forestry	Minister of Forestry with suggestion from District Head or Mayor		Head of Forest Management Unit
5	Requirements for stipulation of working area	Protection forest and production forest that are: a. not yet assigned for certain right or permit in utilization of forest product; and b. become the source of local livelihood	Un-productive Production forest and is not assigned for any permit/right and the location is relatively near to forest product industry.	Protection forest and production forest that are: a. not yet assigned for certain management right or permit in utilization b. located in respective village administrative boundary		Protection forest and production forest and outside forest areas in Banten, West Java, Central Java, and East Java provinces.
6	Process for stipulation of working area	Article 8 of 10 P37/2007: 1) Community groups apply for stipulation of HKM area permit to the Head of District/Mayor/Governor 2) Verification by Head of District/Mayor/	Article 2 of P23/2007: 1) Allocation and stipulation of HTR area issued by the Minister of Forestry, 2) Allocation and stipulation of HTR area is then conveyed to the	Article 5-8 of P.49/2008: 1) Head of the village apply for Village Forest permit on the stipulation of Village Forest area to head of district or mayor; 2) Head of district or mayor conveys this application to the		Participatory planning and collaboration between the Perhutani and village forest communities

No	Characteristics	HKM	HTR	HD	HA	HPD/PHBM
		<p>Governor team</p> <p>3) 3) Head of District/ Mayor/Governor submits proposal for stipulation of HKM area to the Minister of Forestry</p> <p>4) Verification by the Minister's team</p> <p>5) Acceptance or refusal of the proposal by the Minister</p>	<p>respective Head of District or Mayor</p> <p>3) Head of District or Mayor will announce to villages relevant to the allocated and stipulated HTR area</p> <p>4) Extension through NGOs in the central, province, district or cities.</p>	<p>Ministry with copy to the Governor</p> <p>3) verification by a ministerial team</p> <p>4) acceptance or refusal to the application issued by the Minister</p>		
7	Types of permit	<p>Business Permit on the Utilization of Community Forest (<i>Izin Usaha Pemanfaatan Hutan Kemasyarakatan/ IUPHKm</i>):</p> <p>1) At Protection Forest:</p> <p>a. Business Permit on the Utilization of the Area (<i>Izin Usaha Pemanfaatan Kawasan/IUPK</i>)</p> <p>b. Business Permit on the Utilization of Environmental Services (<i>Izin Usaha Pemanfaatan Jasa Lingkungan/IUPJ L</i>)</p> <p>c. Business Permit</p>	<p>Business Permit on the Utilization of Timber Forest Product at People's Plantation Forest (<i>Izin Usaha Pemanfaatan Hasil Hutan Kayu (IUPHHK) pada HTR/IUPHHK-HTR</i>)</p>	<p>Village Forest Management Rights;</p> <p>Business Permit on the Utilization of Timber Forest Product (<i>Izin Usaha Pemanfaatan Hasil Hutan Kayu/IUPHHK</i>):</p> <p>1) At Protection Forest:</p> <p>a. Business Permit on the Utilization of the Area (<i>Izin Usaha Pemanfaatan Kawasan/IUPK</i>)</p> <p>b. Business Permit on the Utilization of Environmental Services (<i>Izin Usaha Pemanfaatan Jasa Lingkungan/IUPJ</i></p>		<p>- No permit</p> <p>- Utilization of the forests is based on Memorandum of Understanding (<i>Nota Kesepakatan Bersama/NKB</i>) between the Head of Forest Management Unit (<i>Kepala Kesatuan Pemangkuan Hutan/KKPH</i>) with the Head of the Village and Collaboration Agreement Note (<i>Nota Perjanjian Kerjasama /NPK/NPKs/PKS</i>) between the Head of Divisional Forest Management Unit (<i>Kepala Bagian Kesatuan Pemangkuan Hutan/KBKPH</i>) with the Head of Forest Village</p>

No	Characteristics	HKM	HTR	HD	HA	HPD/PHBM
		<p>on the Utilization of Non-Timber Forest Product (<i>Izin Usaha Pemanfaatan hasil Hutan Bukan Kayu/IUPHHBK</i>)</p> <p>2) At Production Forest:</p> <p>a. Business Permit on the Utilization of the Area (<i>Izin Usaha Pemanfaatan Kawasan/IUPK</i>)</p> <p>b. Business Permit on the Planting of Woody-Forest Trees (<i>Izin Usaha Penanaman Tanaman Hutan Berkayu/IUPTHK</i>)</p> <p>c. Business Permit on the Utilization of Environmental Services (<i>Izin Usaha Pemanfaatan Jasa Lingkungan/IUPJL</i>)</p> <p>d. Business Permit on the Utilization of Non-Timber Forest Product</p>		<p>L)</p> <p>c. Business Permit on the Utilization of Non-Timber Forest Product (<i>Izin Usaha Pemanfaatan hasil Hutan Bukan Kayu/IUPHHBK</i>)</p> <p>2) At Production Forest:</p> <p>a. Business Permit on the Utilization of the Area (<i>Izin Usaha Pemanfaatan Kawasan/IUPK</i>)</p> <p>b. Business Permit on the Planting of Woody-Forest Trees (<i>Izin Usaha Penanaman Tanaman Hutan Berkayu/IUPTHK</i>)</p> <p>c. Business Permit on the Utilization of Environmental Services (<i>Izin Usaha Pemanfaatan Jasa Lingkungan/IUPJL</i>)</p>		Community Institution ( <i>Lembaga Masyarakat Desa Hutan/LMDH</i> )

No	Characteristics	HKM	HTR	HD	HA	HPD/PHBM
		<p>(Izin Usaha Pemanfaatan hasil Hutan Bukan Kayu/IUPHHBK)</p> <p>e. Business Permit on the Harvesting of Timber Forest Product (Izin Usaha Pemungutan Hasil Hutan Kayu/IUPHHK) for timber forest product planted by permit holders</p> <p>f. Business Permit on the Harvesting of Non-Timber Forest Product (Izin Usaha Pemungutan Hasil Hutan Bukan Kayu/IUPHHBK)</p>		<p>d. Business Permit on the Utilization of Non-Timber Forest Product (Izin Usaha Pemanfaatan hasil Hutan Bukan Kayu/IUPHHBK)</p> <p>e. Business Permit on the Harvesting of Timber Forest Product (Izin Usaha Pemungutan Hasil Hutan Kayu/IUPHHK) for timber forest product planted by permit holders</p> <p>f. Business Permit on the Harvesting of Non-Timber Forest Product (Izin Usaha Pemungutan Hasil Hutan Bukan Kayu/IUPHHBK)</p>		

No	Characteristics	HKM	HTR	HD	HA	HPD/PHBM
8	Authority who issued permit	<p><b>Head of the District/Mayor/Governor</b> for IUPHKM (Article 19 of P.37/2007);</p> <p><b>The Minister of Forestry</b> for IUPHHK HKM (in certain case, the Minister can delegate the permit issuance to the Governor (Article 21 of P.37/2007))</p>	<b>The Governor</b> on behalf of the Minister of Forestry (Article 11 & 12 of P.23/2007)	<p><b>The Governor</b> for Village Forest Management Rights (in certain condition could be the Head of District or Mayor);</p> <p><b>The Minister of Forestry</b> for IUPHHK (in case of IUPHHK of Natural Forest inside HD, permit could be issued by the Governor; and by the Head of District or Mayor for IUPHHK at Production Forest inside HD)</p>		<b>KKPH</b> for NKB; <b>KBKPH</b> for NPK
9	Permit holder	Local community groups that form a cooperation to obtain IUPHHK	Individuals (by forming a group) or cooperation	Village institution		Village for NKB; LMDH for NPK
10	Requirements to obtain permit	Already obtaining facilitation from the Government, Provincial Government, District or Municipal Government; Facilitation could be supported by 1) universities/research and community services institution, 2) NGOs, 3) monetary institution, 4) cooperation, or 5) BUMN/BUMD/BUMS (Article 12 of P.37/2007)	<p><b>Individual through groups:</b> 1) copy of ID, 2) Domicile Notification Letter from the Head of the Village, 3) Sketch of work area.</p> <p><b>Cooperation:</b> 1) copy of establishment notarial act, 2) Letter from the Head of the Village mentioning that the cooperation was established by local community, 3) Sketch of the area being applied, or 4) map of area being applied for an extent of</p>	<p>Already obtaining facilitation from the Government, Provincial Government, District or Municipal Government;</p> <p>Facilitation could be supported by 1) universities/research and community services institution, 2) NGOs, 3) monetary institution, 4) cooperation, or 5) BUMN/BUMD/BUMS (Article 9 - 10 of P.49/2008)</p>		LMDH is established



No	Characteristics	HKM	HTR	HD	HA	HPD/PHBM
			more than 15 ha with scale of 1:5000 or 1:10.000 (Article 9 of P.23/2007 )			
11	Procedures to obtain permit	<p><b>IUPHKm</b> (Article 11 - 20 of P.37/2007):</p> <ol style="list-style-type: none"> <li>1) process of working area stipulation that is approved by the Minister of Forestry</li> <li>2) Community group obtains facilitation</li> <li>3) Permit issuance by the Head of the District or Mayor or the Governor</li> </ol> <p><b>IUPHHK HKM</b> (Article 21 of P.37/2007):</p> <ol style="list-style-type: none"> <li>1) IUPHKm permit holder who has formed a cooperation apply for a request for IUPHHK to the Minister of Forestry</li> <li>2) The Minister will accept or refuse the proposal</li> <li>3) IUPHHK-HKM issuance could be delegated to the Governor</li> </ol>	<p><b>Individual</b> (Article 11 of P.23/2007):</p> <ol style="list-style-type: none"> <li>1) Individual/group leader applies for a request to the Head of the Village,</li> <li>2) Head of the Village verifies the proposal and make recommendation to the Head of the District or Mayor with carbon copy to the Head of Sub-district and Head of Technical Implementation Unit (<i>Unit Pelaksana Teknis/UPT</i>)</li> <li>3) Head of UPT verifies the proposal with coordination of Forest Area Consolidation Office (<i>Balai Pemantapan Kawasan Hutan/BPKH</i>), and then provide the verification result to the Head of the District or Mayor as technical</li> </ol>	<p>Details on <b>Village Forest Management Rights</b> are available from Article 13 - 16 of P.49/2008;</p> <p>Details on <b>IUPHHK inside HD</b> are available from Article 18 - 22 of P.49/2008</p>		<ol style="list-style-type: none"> <li>1) Extension on PHBM,</li> <li>2) LMDH establishment,</li> <li>3) NKB preparation, NPK preparation</li> </ol>

No	Characteristics	HKM	HTR	HD	HA	HPD/PHBM
			<p>consideration</p> <p>4) Based on the recommendation of Head of the Village and consideration of the Head of UPT, the Head of the District or Mayor propose a request for issuance of the Governor Decree on IUPHHK-HTR to the Governor</p> <p>5) The Governor on behalf of the Minister of Forestry issued IUPHHK-HTR for individual/group, with carbon copies to the Minister of Forestry and Directorate General of Forestry Product</p> <p>6) The Head of Provincial Forestry Service reports the issuance the Governor Decree on IUPHHK-HTR to the Minister of Forestry every three months.</p> <p><b>Cooperation</b> (Article 12 of P.23/2007):</p> <p>1) Cooperation applies for a IUPHHK-HTR request to the</p>			

No	Characteristics	HKM	HTR	HD	HA	HPD/PHBM
			<p>Governor through Head of the District or Mayor on certain area already allocated,</p> <p>2) Head of the Village verifies the proposal and make recommendation to the Head of the District or Mayor with carbon copy to the Head of Sub-district and Head of Technical Implementation Unit (<i>Unit Pelaksana Teknis/UPT</i>)</p> <p>3) Head of UPT verifies the proposal with coordination of Forest Area Consolidation Office (<i>Balai Pemantapan Kawasan Hutan/BPKH</i>), and then provide the verification result to the Head of the District or Mayor as technical consideration</p> <p>4) Based on the recommendation of Head of the Village and consideration of the Head of UPT,</p>			

No	Characteristics	HKM	HTR	HD	HA	HPD/PHBM
			<p>the Head of the District or Mayor propose a request for issuance of the Governor Decree on IUPHHK-HTR to the Governor</p> <p>5) The Governor on behalf of the Minister of Forestry issued IUPHHK-HTR for cooperation, with carbon copies to the Minister of Forestry and Directorate General of Forestry Product</p> <p>6) The Head of Provincial Forestry Service reports the issuance the Governor Decree on IUPHHK-HTR to the Minister of Forestry every three months.</p>			
12	Extent of permitted area	No maximum limitation	Individual: maximum of 15 Ha; Cooperation: depend on the business scale	No maximum limitation		Extent of Village-managed Forest (HPD) is agreed in the NKB and NPK
13	Period of permit	35 years for IUPHKm and can be extended after evaluation and audit by authority who issued the permit	60 years for IUPHHK-HTR and can be extended once for 35 years; IUPHHK only issued once and could not be extended (Government	35 years for Village Forest Management Rights and could be extended based on evaluation. From the issuance of IUPHHK until the end of		No time limitation

No	Characteristics	HKM	HTR	HD	HA	HPD/PHBM
			Regulation No. 6/2007 j.o. PP 3/2008); 60 year (P. 23/2007).	Village Forest Management Right or when repealed by the issuance authority and based on annual evaluation.		
14	Evaluation	Every 5 years	Every 5 years	Every 5 years		Annually
15	Funding	National Budget (APBN), Regional Budget (APBD), other sources that has no binding commitment	Monetary Management Pattern of Forest Development Funding Public Service Agency ( <i>Pola Pengelolaan Keuangan Badan Layanan Umum Pembiayaan Pembangunan Hutan</i> ): Working Plan for Timber Forest Product Utilization Business is funded by the Government, loan BP2H, revolving fund	Village Treasury		Article 21 of SK No. 136/KPTS/DIR/2001: amount and sharing proportion is decided based on the amount and proportion of production factors contributed by each party.

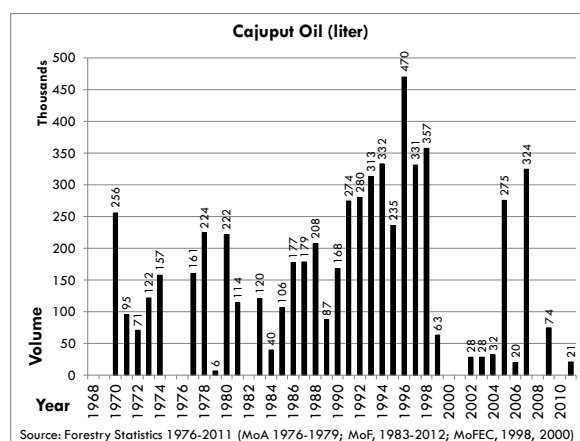
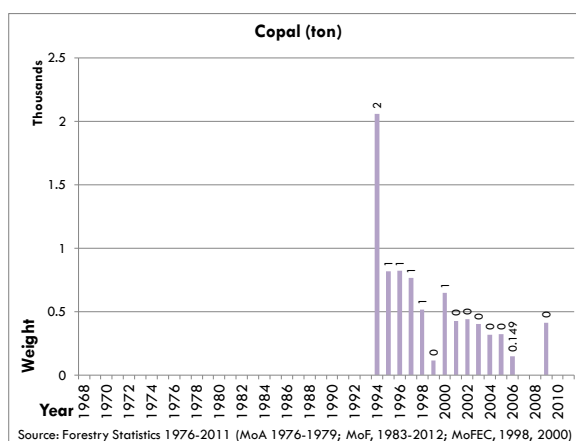
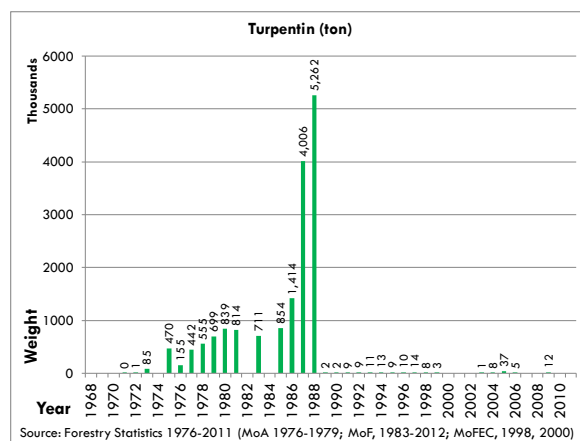
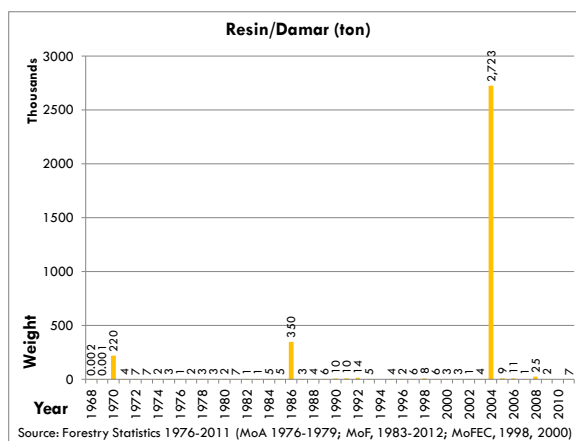
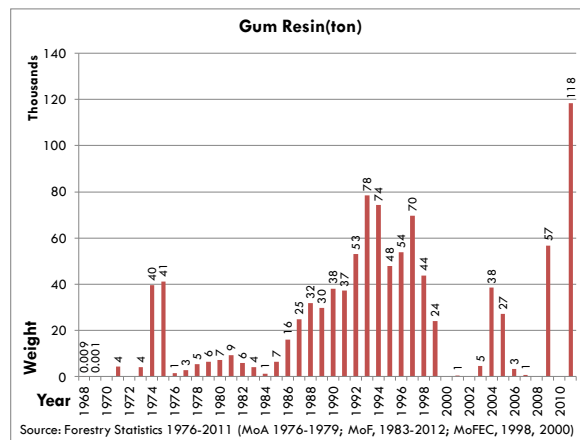
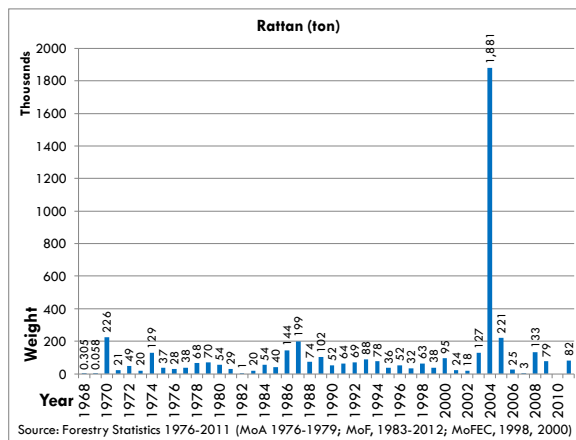
No	Characteristics	HKM	HTR	HD	HA	HPD/PHBM
16	Rights	<p><b>IUPHKm</b> holder has the rights to:</p> <ol style="list-style-type: none"> <li>1) obtain facilitation</li> <li>2) utilize non-timber forest product</li> <li>3) utilize the environmental services</li> <li>4) utilize the area</li> <li>5) Harvest timber forest product (Article 23 of P.37/2007).</li> </ol> <p><b>IUPHHK HKm</b> holder has the rights to:</p> <ol style="list-style-type: none"> <li>1) harvest timber forest products that were planted by the holder for the period of 1 year as stated in the annual working plan of IUPHHK HKm</li> <li>2) harvest timber forest products that were planted by the holder based on operational plan</li> <li>3) obtain legal document on the forest product based on the regulation in place</li> </ol> <p>When the IUPHHK HKm period is finished and within IUPHKm area there are trees to be</p>	<p><b>IUPHHK-HTR</b> holder has the rights to:</p> <ol style="list-style-type: none"> <li>1) implement activities as permitted</li> <li>2) obtain privilege to access funding for HTR development</li> <li>3) guidance and technical extension</li> <li>4) chance to accessing forest product market (Article 19 of P.23/2007).</li> </ol>			

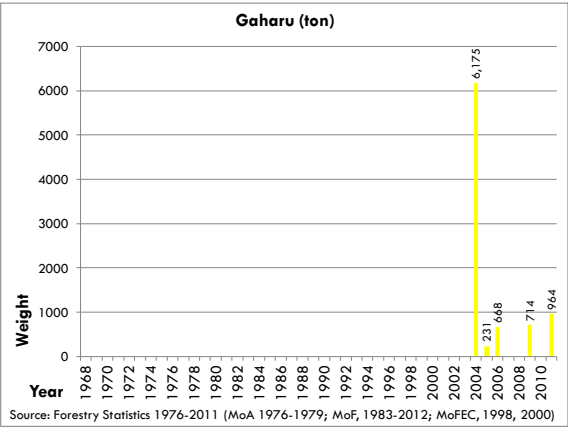
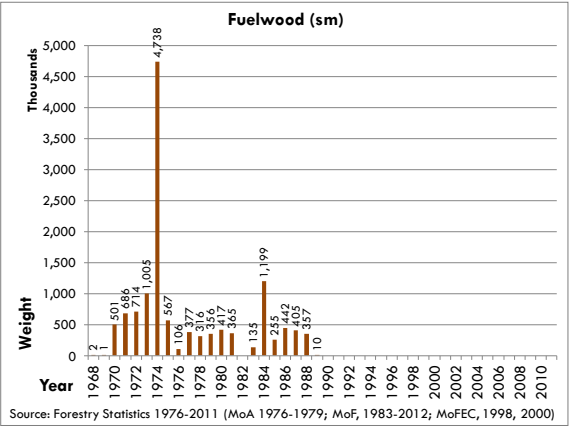
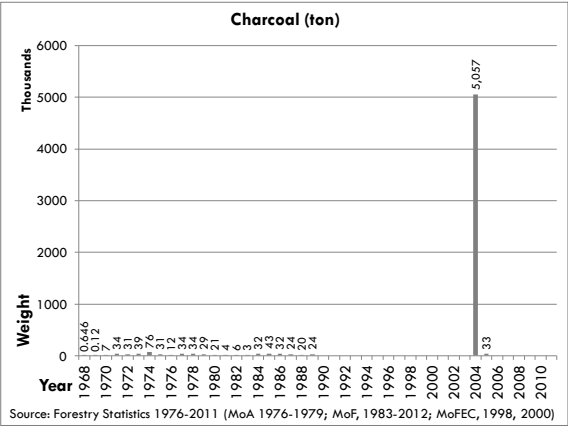
No	Characteristics	HKM	HTR	HD	HA	HPD/PHBM
		harvested left, the IUPHKm holder can propose a new IUPHHK HKM (Article 24 of P.37/2007)				
17	Obligation	<p><b>IUPHKm</b> holder has obligations to:</p> <ol style="list-style-type: none"> <li>1) do boundary demarcation on the working area</li> <li>2) prepare working plan</li> <li>3) do planting, maintenance, and protection</li> <li>4) pay the Forest Resources Tax (<i>Provisi Sumberdaya Hutan/PSDH</i>) based on regulation</li> <li>5) report the implementation of HKM utilization activities to authority who issued the</li> </ol>	<p><b>IUPHHK-HTR</b> has obligations to:</p> <ol style="list-style-type: none"> <li>1) prepare RKU IUPHHK-HTR and RKT</li> <li>2) preparation of RKU IUPHHK-HTR and RKT is done by UPT or consultant or NGOs specializing in forestry</li> <li>3) Fee for preparation of RKUPHHK-HTR and RKT is paid by the Government</li> <li>4) in the case that IUPHHK-HTR holder is borrowing HTR development fund to</li> </ol>			

No	Characteristics	HKM	HTR	HD	HA	HPD/PHBM
		<p>permit (Article 25 of P.37/2007).</p> <p><b>IUPHHK HKM</b> holder has obligations to:</p> <ol style="list-style-type: none"> <li>1) pay the Forest Resources Tax (<i>Provisi Sumberdaya Hutan/PSDH</i>)</li> <li>2) prepare working plan on the utilization of timber forest product for the whole period of permit</li> <li>3) do boundary demarcation of timber forest product utilization area</li> <li>4) protection of the felling area, such as preventing fires, protecting trees which grow naturally (not planted by the permit holder)</li> <li>5) do forest product administration based on planted forest business administration</li> <li>6) report the implementation of HKM utilization activities to authority who issued the permit (Article 26 of P.37/2007)</li> </ol>	<p>BP2H, the holder must repay the loan and obey the regulation in forced (Article 20 of P.23/2007).</p>			



## Appendix 6. Non-Timber Forest Products





# Underlying Causes of Forest Transition in Java: Case Study in Kuningan District

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This Case Study Report is part of research project on “**Comparative Analysis of Transitions to Sustainable Forest Management and Rehabilitation**” conducted by Asia Pacific Association of Forestry Research Institutions (APAFRI) and funded by Asia-Pacific Network for Sustainable Forest Management and Rehabilitation (APFNet) with Renmin University of China (China), Seoul National University (Korea), and Kyoto University (Japan) as Technical Partners.

## EXECUTIVE SUMMARY

Deforestation constitutes the main problem in developing countries, due to some proximate causes and driving forces. Among other proximate causes, agricultural expansion and forest exploitation are very important. Meanwhile, the driving forces include population increase, debt, government policies, and price of export commodity. Based on these, deforestation was site specific event and would be varies depend on biophysical and demographic factors of the site.

Ministry of Forestry of the Republic of Indonesia (MoFRI) regularly announces forest cover changes. They published annual deforestation from period 2000–2003, 2003–2006, 2006–2009 and 2009–2011. Using MoFRI's forest cover change data and regional boundary data published by Geospatial Information Agency (BIG), Damayanti, *et al.* (2013) analyzed land use/land cover and forest cover change in Indonesia. There was increase in the annual deforestation from period 2000–2003, 2003–2006, to 2006–2009, namely 1 million ha (0.33%), 2.24 million ha (0.75%), and 2.44 million ha (0.84%), respectively. Then there was a decline in the annual deforestation between 2009 and 2011 (0.94 million ha or 0.5%). The report by Damayanti, *et al.* (2013) also revealed that the starting period of deforestation, its process, and its magnitude varies among islands in Indonesia. Together with Java Island, Sumatera and Kalimantan Islands started their deforestation since the Dutch colonial government ruling in Indonesia and deforestation increased since the enactment and implementation of Foreign Investment Act (Act No. 1 of 1967) and Domestic Investment Act (Act No. 6 of 1968).

Efforts to push down the deforestation process through some programs in rehabilitating land and forest have been implemented since 1960s. Though the results of those programs at National level were very limited, the analysis of forest covers change conducted by Damayanti *et al.* (2013) showed some provinces in different islands were turning to reforestation in between 2000 and 2011. Java has very long history of deforestation since the Dutch colonial era. Meanwhile, Java Island also has been struggling to extend the forest cover through many programs. Land cover change analysis of Java showed that West Java is one province that experiencing forest transition (Damayanti *et al.* 2013). In order to know further on the possible factors contributed to forest transition in Java, especially West Java province, Kuningan District was selected as case study. Previous study by Prasetyo *et al.* (2012) showed this district experiencing the process of forest transition between 1997 and 2009. The current study employed longer period of land cover data, with objectives were: to analyze forest cover change between 1978 and 2009 and to reveal proximate and driving force behind reforestation in Kuningan District. This study examined land use/land cover changes on forestlands as well as privately-owned land. Meanwhile, underlying causes identified from household survey and secondary data related to government policies on strategies and programs for reforestation and land rehabilitation.

Forest cover change analysis showed a result that the forest cover in Kuningan District decreased during the period of 1978 – 1999 and then increased from 1999–2009. The year of 1999 was point of turning from deforestation to reforestation, both in the private and State Forest land. It is recognized as forest transition.

Some proximate factors contributed to deforestation in the period 1978–1999 were fuel wood scarcity, agricultural expansion, illegal logging, and settlement development. Driving force that might relate to deforestation was the economic crisis in 1979 and 1997. Crisis in 1979 created fuel wood scarcity due to the high price of kerosene (Bee 1986). Meanwhile, economics crisis in 1997 influenced law/regulation uncertainty, resulted in forest land encroachment (Prasetyo *et al.* 2008).

After 1999, forest cover gradually increased due to some reasons. The first factor contributed to forest transition was program on Management of Forest Resources with Community (*Pengelolaan Sumberdaya Hutan Bersama Masyarakat/PHBM*), which was conducted by *Perhutani* (The State Forestry Corporation) in cooperation with District Government. Prasetyo *et al.* (2012) explained that

the program provided current and future benefit both for *Perhutani* and communities, through profit sharing and clearly acknowledged private property rights and the State Forest's boundary. In the private forest, the farmer could get high profit from competitive price of timber due to log scarcity. Difficulty to transport bulky logs that may hamper the intention to plant trees was overcome by good road networks in Kuningan District.

Based on field survey, social background that might be related to forest transition in Kuningan district was temporary migration as well as part-time farming. Many people in Kuningan go to the big cities for their seasonal works and go back to Kuningan on paddy planting or harvesting seasons. Although most of the population in Kuningan District engaged in agriculture (farmers & peasants), people whose main occupations were not agricultural-based had lands and plant trees. These two types of people were part-time farmers. They chose to plant trees for several reasons, such as less maintenance, adaptation to drought, ecologically benefit and profitable.

An interesting note from the household survey that people also planted trees even they had very small dry-agricultural land or even had no land at all. For those who did not have a piece of land, to plant trees in the State Forest land through PHBM has become a good opportunity to obtain benefit from planting trees. Satellite image analysis for the period 2002–2009 revealed that there were some increase and decrease in term of Forest Cover Density (FCD).

## PREFACE

This Case Study Report is part of research project on “**Comparative Analysis of Transitions to Sustainable Forest Management and Rehabilitation**” conducted by Asia Pacific Association of Forestry Research Institutions (APAFRI) with Renmin University of China (China), Seoul National University (Korea), and Kyoto University (Japan) as Technical Partners and funded by Asia-Pacific Network for Sustainable Forest Management and Rehabilitation (APFNet). This project aims to formulate a set of categorization models using data collected from at least eight countries (tentatively China, South Korea, Japan, Indonesia, Malaysia, Nepal, Philippines and Vietnam) that have already experienced net forest cover increase and countries that are still experiencing net forest cover decline. Concepts and theories from ecology, economy, social sciences and political sciences shall be exploited to explain forest cover change, and possibly also changing forest quality.

Kuningan District was chosen as case study for Indonesia, because based on Prasetyo, Damayanti, & Masuda (2012), this district showed the process of forest transition between 1997 and 2009. Analysis of forest cover change using longer period of land cover data (1978–2009), household survey, and other secondary data were conducted to validate the forest transition in this district and to reveal proximate and driving factors behind reforestation in Kuningan District.

The authors of this study would like to thank APFNet, APAFRI, Renmin University of China (China), Seoul National University (Korea), and Kyoto University (Japan) for the invitation and collaboration in this research project. We do hope this study will be beneficial for supporting similar studies and for better forest management.

Bogor, Indonesia, October 2013

Authors

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## I. INTRODUCTION

Deforestation constitutes the main problem in developing countries (Allen & Barnes 1985, Laurence 2007). Debates on who are the causes and perpetrators of such deforestation are still continuing up to now. Demographic factor/human population size has negative correlation with area size of forest coverage (FAO 1990:10, Barbier *et al.* 1993). In term of deforestation actors, there were differences opinions. FAO (1990), World Bank (1990), and Barbier *et al.* (1993) found that activities of small farmers/peasants who possess only small tracts of land might contributed to deforestation. However, World Bank (1994) in some other studies resulted in difference conclusions and according to them; big companies are the causes of deforestation. Moreover, there were various factor (direct & indirect) contributed to deforestation such as population growth (Palo 1994), logging operation (Kummer 1991), debt (Kahn & McDonald 1994), Government policy (Repetto & Gillis 1988). Based on those facts, it was clear evidence that deforestation was site specific event, and would be varies depend on biophysical and demographic factors of the site.

Ministry of Forestry of the Republic of Indonesia (MoFRI) declared that deforestation in 2007–2008 reached 1.1 million hectares, whereas FAO (2007) declared that deforestation rate in Indonesia reached 1.87 million hectares per year. Using land cover data published by the Directorate General of Forestry Planning (MoFRI) and regional boundary data published by the Geospatial Information Agency (*Badan Informasi Geospasial*/BIG), Damayanti *et al.* (2013) analyzed the land use/land cover and forest cover changes in Indonesia. The results show increase in the annual deforestation from period 2000–2003, 2003–2006, to 2006–2009, namely 1 million ha (0.33%), 2.24 million ha (0.75%), and 2.44 million ha (0.84%), respectively. In the period of 2009–2011 the annual deforestation was declined to 0.94 million ha (0.5%). The report also revealed that deforestation's starting period and its magnitude varies among the islands. Sumatera and Kalimantan Islands started their deforestation since the Dutch colonial government ruling in Indonesia and deforestation increased since the enactment and implementation of Foreign Investment Act (Act No. 1 of 1967) and Domestic Investment Act (Act No. 6 of 1968). Between 2000 and 2011, deforestation processes in the some provinces in Sumatera and Kalimantan were getting slower, though some provinces are still in the acceleration stage. Contrary to Sumatera and Kalimantan islands, Indonesian part of Papua Island have been in relatively slow rate of deforestation, because the island has not yet developed as other islands. However, it is predicted that deforestation rate will increase in the future, because of agricultural and forestry estate expansions have been planned in Papua.

Java Island started its deforestation in the same period with Sumatera and Kalimantan Islands. The Dutch colonial government implemented "*cultuur stelsel*" in Java too to produce cash crops. Currently, Java Island is the most densely populated island among 17,000 islands of Indonesian Archipelago. Total area of Java is only 7% of the total area of Indonesia, but it is populated by 57% of Indonesia population, or inhabited by 1,071 inhabitants/sq km (BPS 2012). If population growth cannot be controlled, in year 2050 population density in Java will reach 2,070 individuals/sq km (Prasetyo *et al.* 2009). With such dense population, 23.7% of Java is forestland (Damayanti 2008). Prasetyo *et al.* (2009) found that on the basis of logistic regression analysis, factors of population density, road density, and agrarian density constituted the influential variables on deforestation process in Java. Farmers in Java, who possess only relatively small tract of land, or farm laborers, would attempt to enlarge or search more cultivated land, to obtain greater yield (Prasetyo *et al.* 2009) and to convert forest and agricultural land into settlement (Prasetyo *et al.* 2009).

Efforts to push down the deforestation process through some programs in rehabilitating land and forest have been implemented since 1960s. Though Nawir *et al.* (2007) mentioned that the results of those programs were very minimum, the analyses of forest cover change conducted by Damayanti *et al.* (2013) shows some provinces in different islands were turning to reforestation in between 2000 and 2011. This process is called forest transition. Forest transition is the change from shrinking to expanding forests (Mather 1992 & Grainger 1995 in Mather & Needle 1998).

Some factors might contribute to the process of forestation, namely (a) concentration of agricultural land on better soil quality, resulted forest growth on abandon poor land (Mather & Needle 1998); (b) rural exodus due to agricultural land decrease and more land released for growing forest (Mather *et al.* 1999, Mather 2004), (c) small holder agricultural intensification and emerging market for agricultural input and output (Meyfroidt and Lambin 2008), (d) Log scarcity/timber shortage that creates market incentive to plant trees (Mather 2004). Most works on forest transition analysis were at national scale, in which they have the same stage of development level. If the condition is compared to Indonesia case, it would be very different, since Indonesia is very large in area and having variation in term of biophysical, social-economic, and demographic circumstances. Damayanti *et al.* (2013) concluded that forest in Indonesia should not be seen at National level simultaneously.

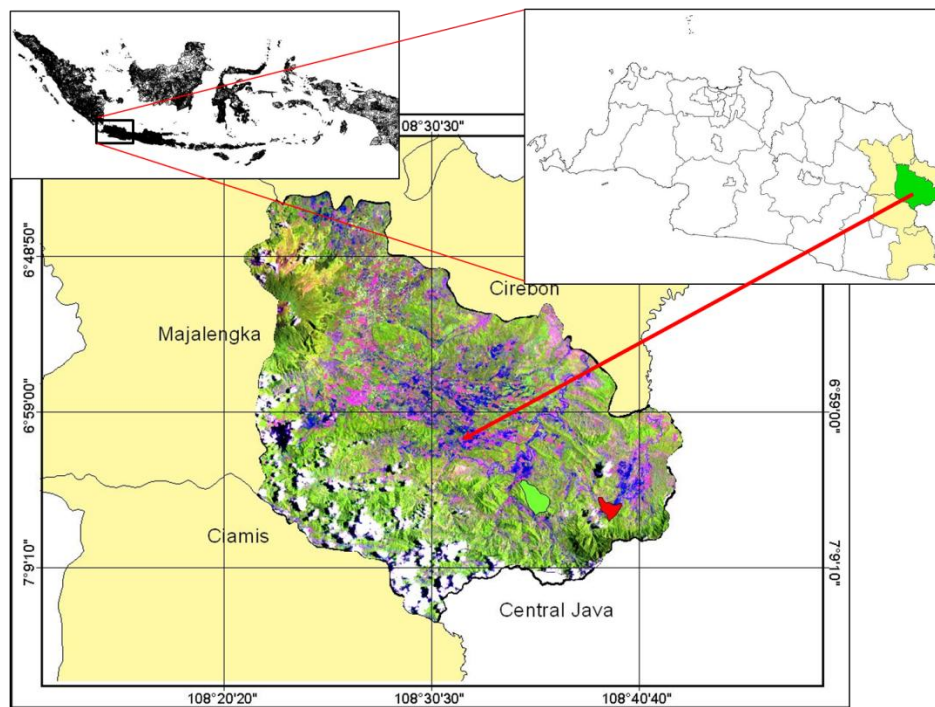
As reported by Damayanti *et al.* (2013), Java has very long history of deforestation since the Dutch colonial era. Meanwhile, Java Island also has been struggling to extend the forest cover through many programs. Land cover change analysis of Java showed that West Java is one province that experiencing forest transition (Damayanti *et al.* 2013). In order to know further on possible factors contributed to forest transition in Java, especially West Java province, Kuningan District was selected as case study. Kuningan District was selected, because in the previous study by Prasetyo, Damayanti, & Masuda (2012), this district showed the process of forest transition between 1997 and 2009. This study will examine land use/land cover changes on forestlands as well as privately owned land, using longer period of land cover data (1978–2009). The underlying causes will be identified from household survey and other secondary data.

The objectives of this study are: (1) to analyze forest cover change between 1978 and 2009, (2) to reveal proximate and driving factor behind reforestation in Kuningan District.

## II. METHODOLOGIES

### 2.1. Location

Location of this study was Kuningan District, West Java Province, Indonesia (Figure 2.1.). Kuningan District is located at 108°23'–108°47'E and 6°47'–7°12'S. The total area of the district is 1,196 sq km. The district consists of 32 sub-districts (*kecamatan*) and 366 villages (*desa*). According to Statistic of Kuningan District 2012 (BPS Kuningan 2012), the total population was 1 280 158, with density population of 1,071 persons/sq km. The majority of the population in the Kuningan District engaged in agricultural activities.



**Figure 2.1.** Location of Study: Kuningan District

### 2.2. Period of Research

The study conducted from January 2012 to May 2013. Field surveys was conducted several times between February to December 2012 and in April–May 2013, including ground checks for the land cover change (LCC) analysis, village and household surveys, and interview to stakeholders and literature studies.

### 2.3. Research Methods

#### 2.3.1. Land cover change analysis

##### 2.3.1.1. Field Survey

Field surveys were conducted to observe land cover conditions of the study area. Information of tree species, planting years, and previous land cover based on local people information were also collected. To clarify trees density per hectare, vegetation inventory was conducted. Meanwhile, photos, hemispherical photos and GPS position were also taken. For the purpose of land cover classification, some reference points from various land cover selected as Ground Control Points. Secondary information from book, report, maps, and statistic data were also considered. The data and information were very important during satellite data classification.

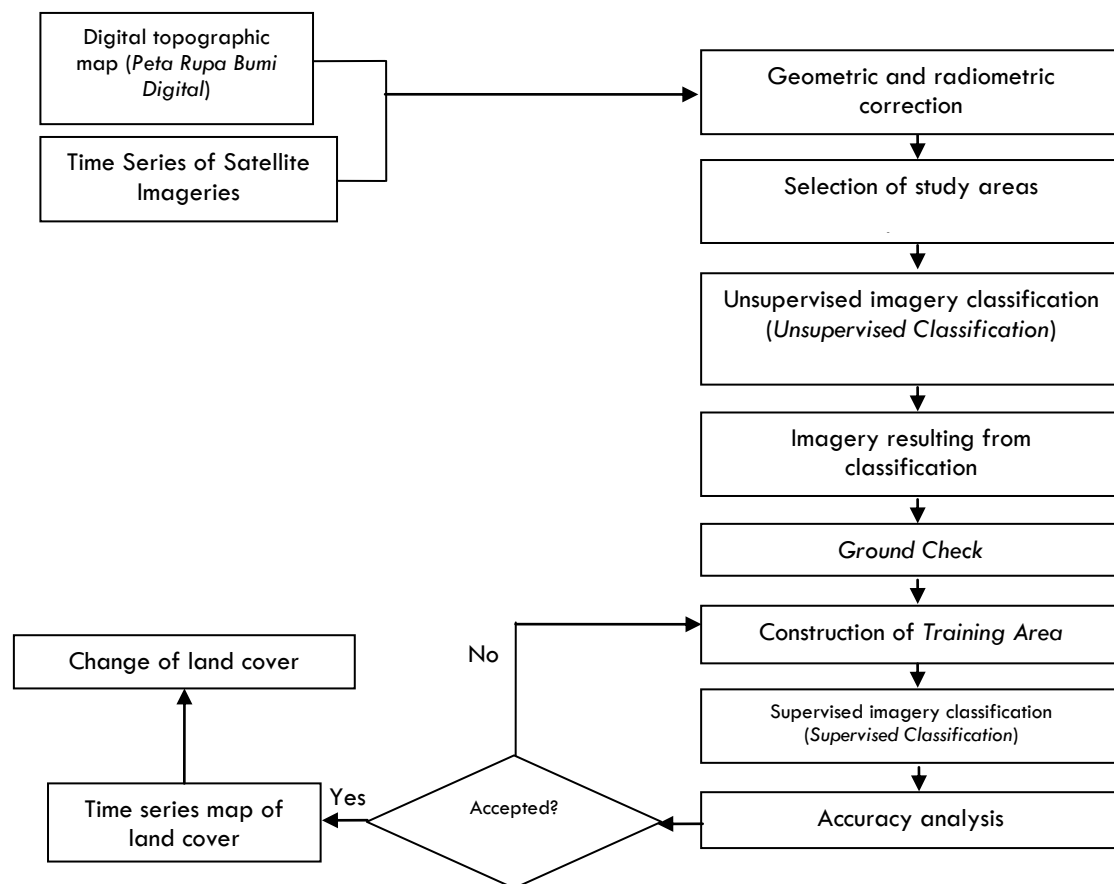
##### 2.3.1.2. Satellite Image Classifications

Historical land cover changes were identified based on interpretation of time series Landsat Imagery data from Landsat Multispectral Scanner (MSS) path 128 row 65 acquired in 25 April 1978 and 20 June 1976, Landsat Thematic Mapper 5 (TM5) path 121 and Row 65 acquired on 6 August 1997, 5

September 1999, 5 March 2002, and 16 March 2009. All of the data were imported into Erdas Imagine version 9.1 format and geo-referenced based on digital topographic maps at a scale of 1:25,000. For Landsat MSS data, due to cloud interference in the 1978 image, the 1976 data was merged with the 1978 data to get best performance data with low cloud coverage and the resolution was adjusted to the resolution of Landsat TM data.

Land cover classifications were performed based on supervised classification with maximum likelihood algorithm for each satellite data. Number of land cover classifications was derived based on the result of field observation, namely: forest, mixed garden, grass and bush, upland and bare land, paddy field, built-up areas, and water bodies. Flow of satellite data classification is presented in Figure 2.2.

“Forest” in this study is various combinations of plants/stands of pine, teak, and various mixtures of tree species and natural forest. Meanwhile, “mixed garden” stands include various tree species grown for the production of fruits or wood and usually grown on private land. Mohri *et al.* (2013) classified mixed garden as home gardens. This type of land cover is part of tree-crops based ecosystem (Myers, 1986). Soemarwoto (1984) referred the ecosystem as *talun-kebun* system, which is modification of shifting cultivation under high population pressure. Torquebiau (1992) found that ecosystem not only contributed to the sustainability of the environment, but also socially and economically meet with farmers’ need.



**Figure 2.2.** Flowchart diagram of imagery data processing

Old mixed garden stands were very dense, so that the structure and canopy cover were similar to forest stands. Visual similarities caused the reflectance (digital number value) of old mixed garden to resemble plantation forest and/or natural forest. Upland agriculture is usually comprised of cultivated food crops which rely on rain (rain fed agricultural systems). Upland agricultural areas which cannot be cultivated are left as idle land in the form of barren lands, and so upland agriculture and barren land were combined into a single upland and barren land type of land cover class. Figure 2.3 is visual presentation of some land cover types.

Upon completion of digital classification, a visual classification was performed through manual correction based on available land cover maps, high resolution images of Google Earth (taken in 2002 and 2009), and the *Perhutani* map. Last, an analysis of accuracy was performed using producer, user, and kappa accuracies as suggested by Congalton (1991). The accuracy of the final classification was compared with land cover at points derived from high resolution image (Google Earth). There were 109 points and 98 points were used for accuracy assessment of land cover in 2002 and 2009, respectively. Accuracy of the other imageries could not be performed due to availability of data.



**Figure 2.3.** (a) Teak plantation, (b) Pine plantation, (c) Mixed garden, (d) Natural forest

#### 2.3.1.3. Analysis of change in land cover

Land cover changes may occur if caused by human disturbance or activities. Such change can also occur gradually during natural succession. A transition matrix was used to make a detail analysis of land cover dynamics. It showed the magnitude of changes to the land cover classes from one period to the other. Cell values located on the diagonal indicate the size of land cover classes (in hectares) which do not change over the time period specified. The other cell values provide an estimate of the change in magnitude in the same period. In this study, transition matrices were made by overlaying land cover in the year 1978–1997, 1997–1999, 1999–2002, and 2002–2009. In addition, dynamic changes of forest cover density during period of 2002–2009 were analyzed by using FCD map.

#### 2.3.2. Village and Household Surveys

##### 2.3.2.1. Village sample

There were 4 villages selected based on several categories (Table 2.1): land cover change (reforestation), micro-climate condition (dry or wet), forest status (State forest or private forest), and location (near each other for similarity in socio-economic-cultural condition). Because of the existence of State Forest area, three selected villages (Sg, Sr, and Sd) are registered as PHBM Villages, while C Village is non-PHBM Village.

**Table 2.1.** Village sample selection

Micro-climate condition		Dry	Wet
Status of forest			
State forest			Sg Village <sup>a</sup>
			Sr Village <sup>a</sup>
Private forest	Sd Village <sup>b, c</sup>		
	C Village <sup>b</sup>		

Notes: [a] data collected in 2009–2010, relatively near to each other; [b] data collected in 2012–2013, relatively near to each other; [c] Respondents in Sd Village were divided into two groups: those who engaged activities in State Forest (Sd-sf) and those who owned lands (Sd-pf). Village data for 2009–2010 was based on studies conducted by Prasetyo, Damayanti, & Masuda in 2009 and Prasetyo & Damayanti in 2010.

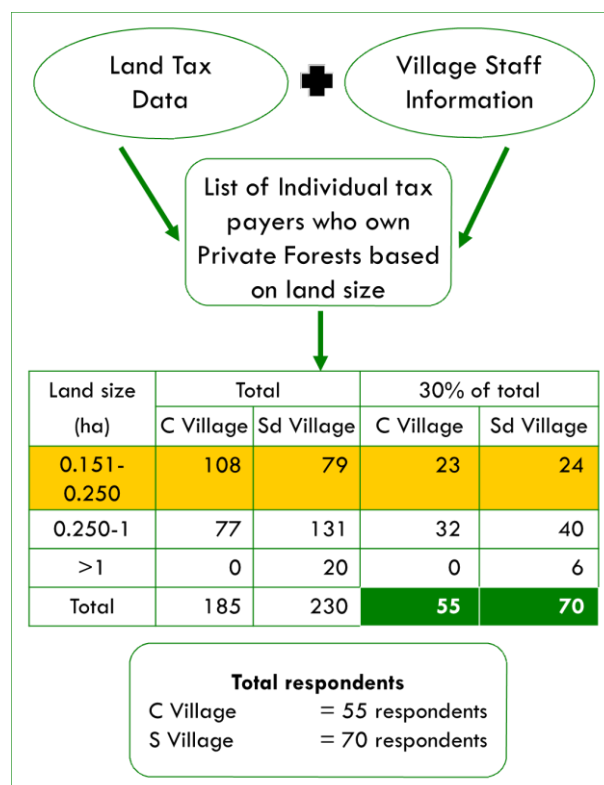
##### 2.3.2.2. Household sample

Respondent data derived from two periods of study: (1) previous study in 2009–2010 for Sg and Sr Villages and (2) current study in 2012–2013 for Sd and C Villages. Respondents for household survey were selected using stratified random sampling. Respondents in Sg and Sr Villages were members of farmers groups that become members of LMDH ("The Forest Village Community Institution" (*Lembaga Masyarakat Desa Hutan*/LMDH). A-10 % sampling intensity were utilized to already stratified LMDH

members based on occupation and additional respondents were selected from the heads of farmers groups and households that owning relatively large land area. Total respondents for Sg and Sr Village were 34 and 30 persons, respectively. Respondents in C Village were households who own relatively large land area (landowners) and that potentially to develop private forest (55 respondents). Respondents in Sd Village were from both LMDH members (16 respondents) and landowners who potentially to develop private forest (70 respondents). Sampling intensity used for the landowners was 30%. Sampling method for landowners is presented in Figure 2.4.

Private Forest is defined as “Forest that belong to the people with minimum size of 0.25 ha and having canopy of woody trees or other plants with more than 50% tree’s crown cover and/or at the first year having a minimum density of 500 trees per hectare”(Minister of Forestry Decree No. 49/Kpts-II/1997). For the purpose of the study, sampling was done not only to households with lands more than 0.25 ha, but also to households with lands area between 0.151 and 0.25 ha.

Each respondents were interviewed using questionnaires comprised personal data of household head, household economic condition (occupation, income, expenditure), land ownership status (privately-owned land, managed land, land use compensation, etc.), private forest ownership, membership in farmers groups (rights, obligation, sanction/penalty for members), activities being conducted (either alone or within the farmers groups) in relation to tree planting, perception toward tree planting, regreening, reforestation, and land rehabilitation, etc.



**Figure 2.4.** Sampling method for selecting landowners as respondents

### III. RESULTS AND DISCUSSION

#### 3.1. Forest cover change analysis

##### 3.1.1. Land cover accuracy assessment

An accuracy assessment was conducted by comparing field data and high resolution images from Google Earth (year 2002 and 2009) with land cover classification of 2002 and 2009. The comparison produced confusion matrix or error matrix that provided three accuracy measurement standards, namely overall accuracy, producer accuracy, and user accuracy. In addition, Kappa statistic was also calculated. Table 3.1 presents the results of the classification from accuracy assessment.

Table 3.1. Result of accuracy assessment

Land use/Land cover class	2002		2009	
	Producer Accuracy	User Accuracy	Producer Accuracy	User Accuracy
Forest	100.00	90.91	100.00	81.25
Mixed garden	88.89	100.00	92.31	100.00
Grass & shrubs	88.89	100.00	87.50	100.00
Upland & bare land	100.00	88.24	100.00	83.33
Paddy field	95.45	91.30	83.33	100.00
Settlement	100.00	100.00	90.48	100.00
Water body	86.67	100.00	100.00	100.00

The results of accuracy assessment showed that producer and user accuracy of classification was high. Attention should be given to producer accuracy of mixed garden and user accuracy of forest, which was relatively low. This was due to the Digital Number (DN) similarity between these two land cover. Overall classification accuracy and Kappa Statistics ( $K^{\wedge}$ ) related to the 2009 land cover classification were 93.88 % and 0.9274, respectively. Meanwhile overall accuracy and Kappa Statistics of the 2002 classification were 94.50 % and 0.9348, respectively. This means the results of classification were accurate enough for the next step in the analysis. Accuracy test for land cover classification in 1978, 1997 and 1999 could not be conducted due data limitation of reference points.

##### 3.1.2. Forest cover change in 1978 – 1997

In 1978, forest cover in Kuningan District was about 24,852.15 ha and then decreased to 14,994.18 ha in 1997. Data showed that the decreased was because of conversion of forest into mixed garden, grass and shrubs, agricultural area (upland & bare lands and paddy field), and settlement. Some areas were left to idle in the form of grass and shrubs. Figure 3.1 shows the size of forest cover in 1978 that remained as forest and that changed to other land covers in 1997 and Figure 3.2. and 3.3. show land cover maps of 1978 and 1997, respectively.

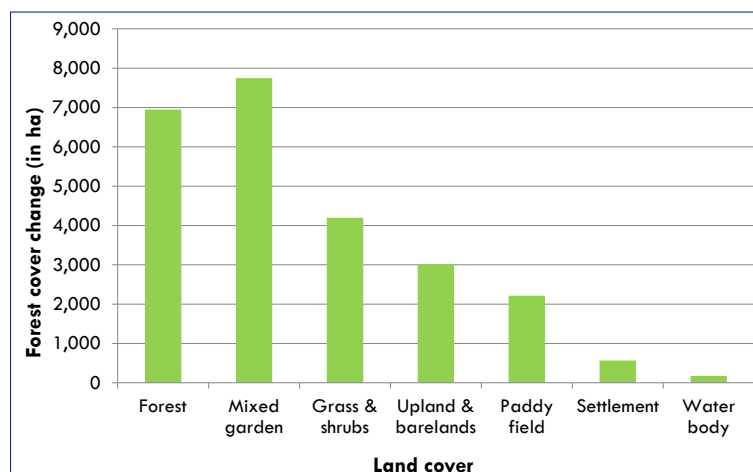


Figure 3.1. Conversion of forest cover in 1978 to other land covers in 1997



It seems that proximate causes of deforestation were agricultural land expansion, forest exploitation/logging, and development of settlement. This was accordance with the finding of Fisher (2012) in his study at West Timor, Indonesia and Pacheco (2006) in Bolivia.

### 3.1.3. Forest cover change in 1997 – 1999

Forest cover decreased dramatically between 1997 and 1999. In 1997, the forest cover was 14 994.18 ha and decreased to 7 146.5 ha in 1999. The forest cover decreased by 7 847.37 ha, while only 2,859.55 ha of those areas were harvested by the *Perhutani* (KPH Kuningan 1998). Figure 3.4 shows the expansion of uncultivated land which was left as grassland and shrub. Driven by economic crisis, uncertainty of the law and status of the use of forest resources increased in many places, including in Kuningan District. Teak forests throughout Java were illegally logged. In Kuningan District, illegal logged-teak timber was increased from 1,200 logs in 1997 to more than 16 000 logs in 1999 (Setiamihardha 2003).

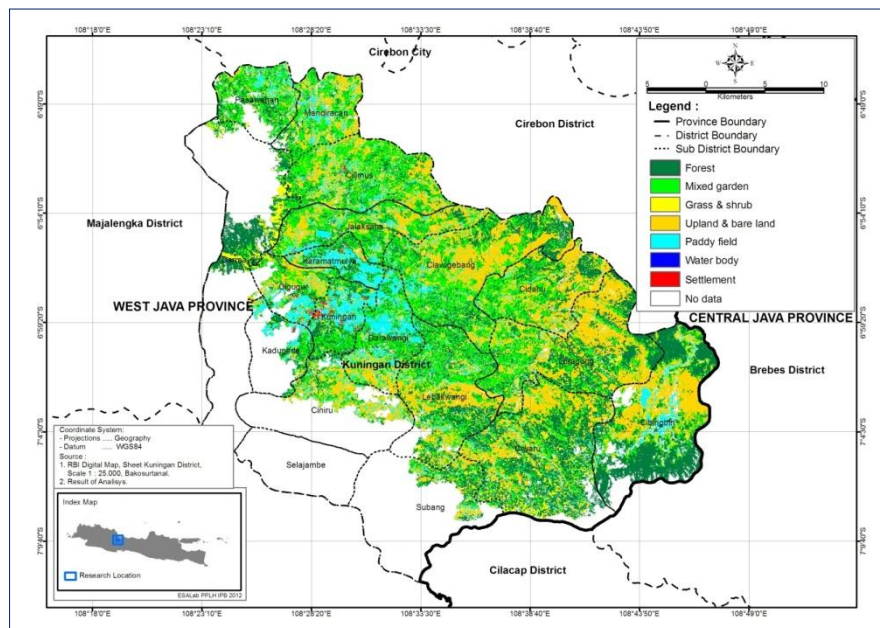


Figure 3.2. Land cover map of Kuningan District in 1978

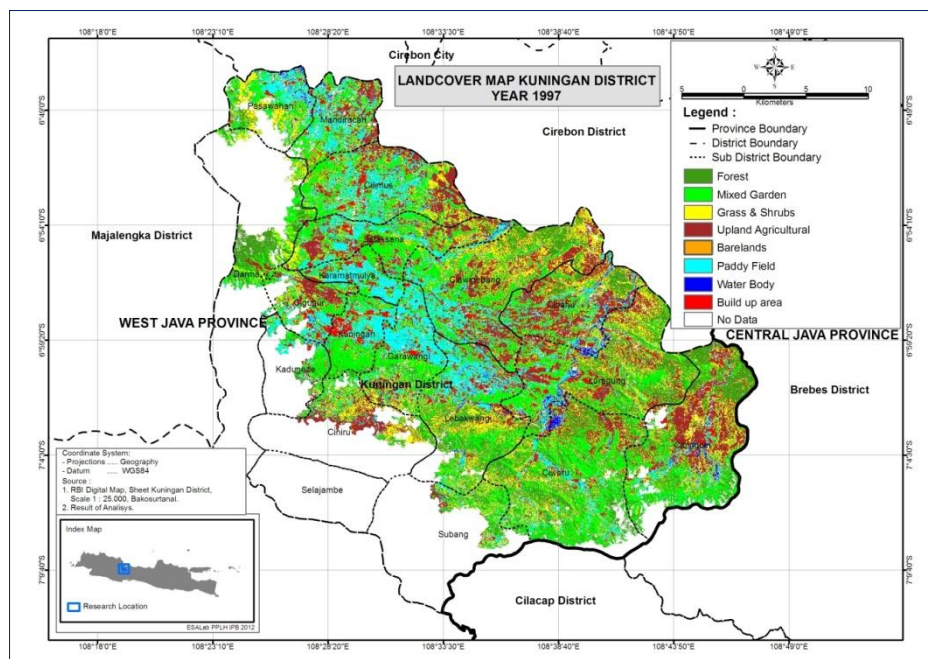


Figure 3.3. Land cover map of Kuningan District in 1997



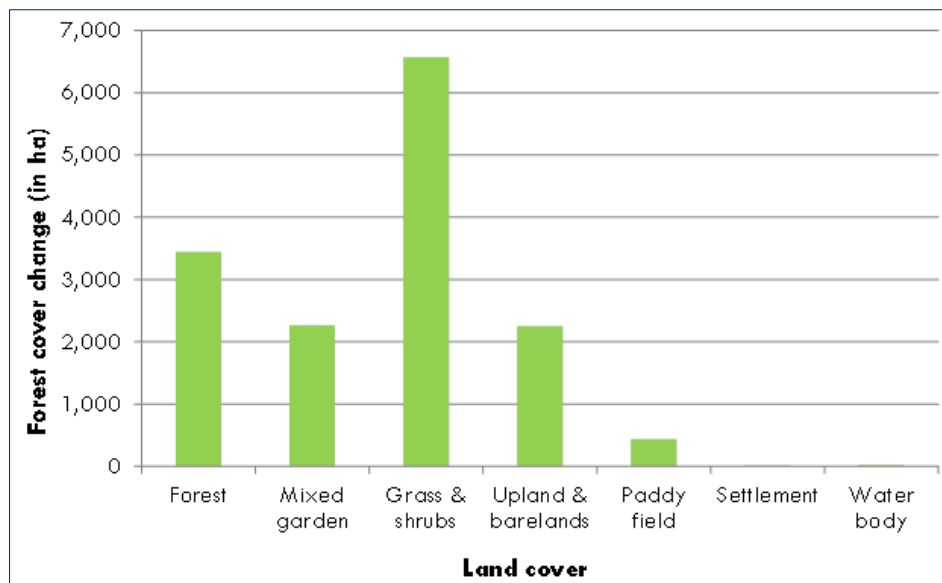


Figure 3.4. Conversion of forest cover in 1997 to other land covers in 1999

#### 3.1.4. Forest cover change in 1999–2002

From 1999, forest cover of Kuningan District increased. In 1999, forest cover was 7 146.5 ha and increased remarkably to 19 900 ha in 2002. Mixed garden, grass & shrubs, and upland & bare lands decreased. Prasetyo, Damayanti, & Masuda (2012) mentioned that implementation of Management of Forest Resources with Community (*Pengelolaan Sumberdaya Hutan Bersama Masyarakat/PHBM*) was one of the reasons of the successful reforestation activities.

They found that reforestation was successful in PHBM villages because the people were aware of the current and future benefits of the PHBM and people realized that the government was acknowledging the property rights of local peoples. The PHBM also provides a secure feeling since the government and the *Perhutani* program assured the people that the program would be fully implemented. Figure 3.5 shows the forest cover in 1999 that remain as forest and changed to other land covers and from other land covers to forest in 2002. Meanwhile, Figure 3.6 and 3.7 show the condition of land covers in 1999 and 2002, respectively.

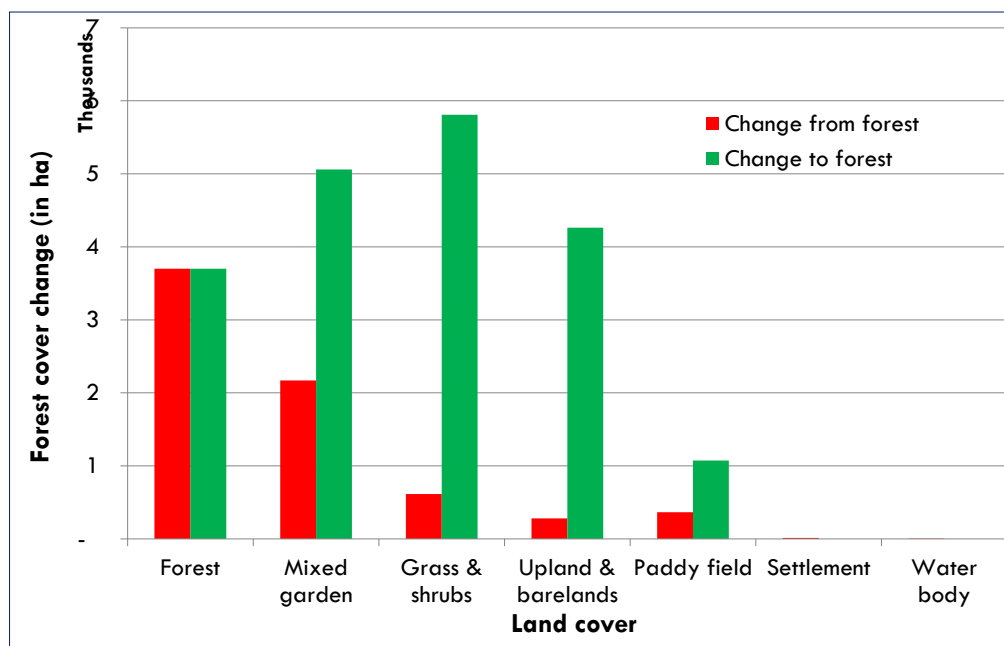


Figure 3.5. Conversion of land covers from and to forest between 1999 and 2002

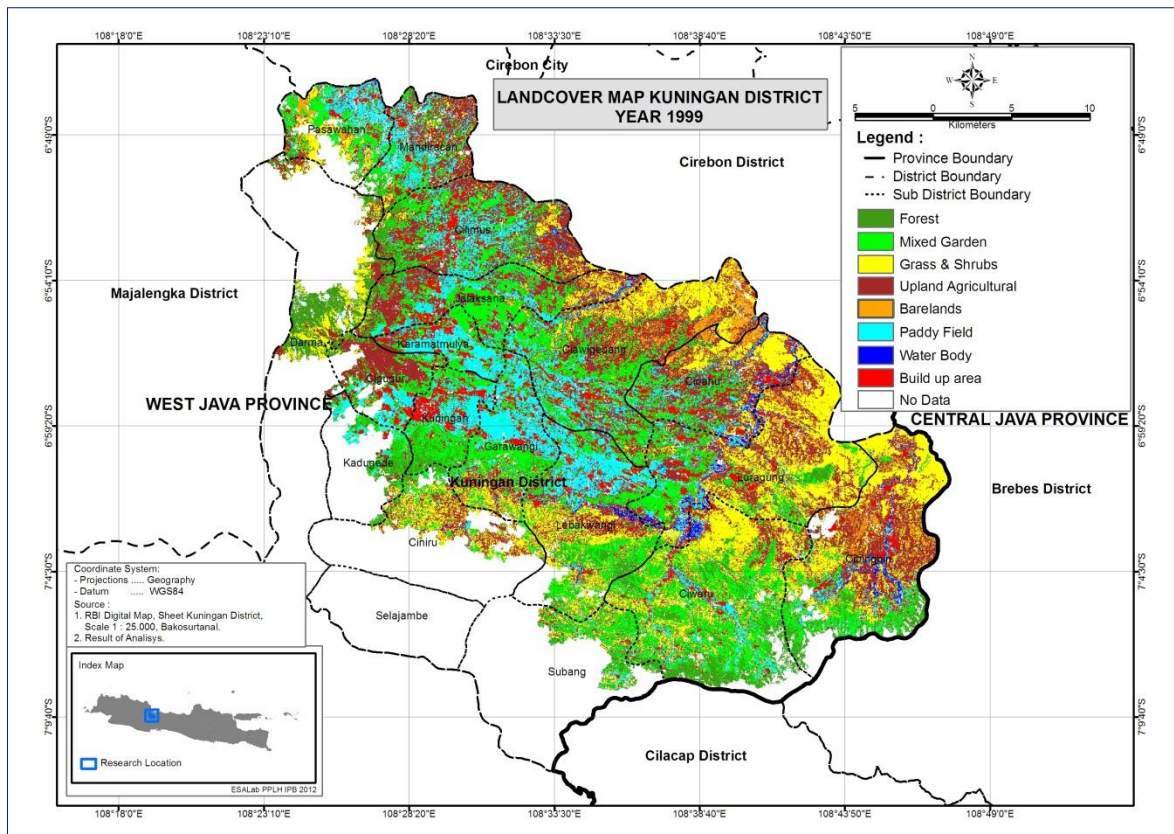


Figure 3.6. Land cover map of Kuningan District in 1999

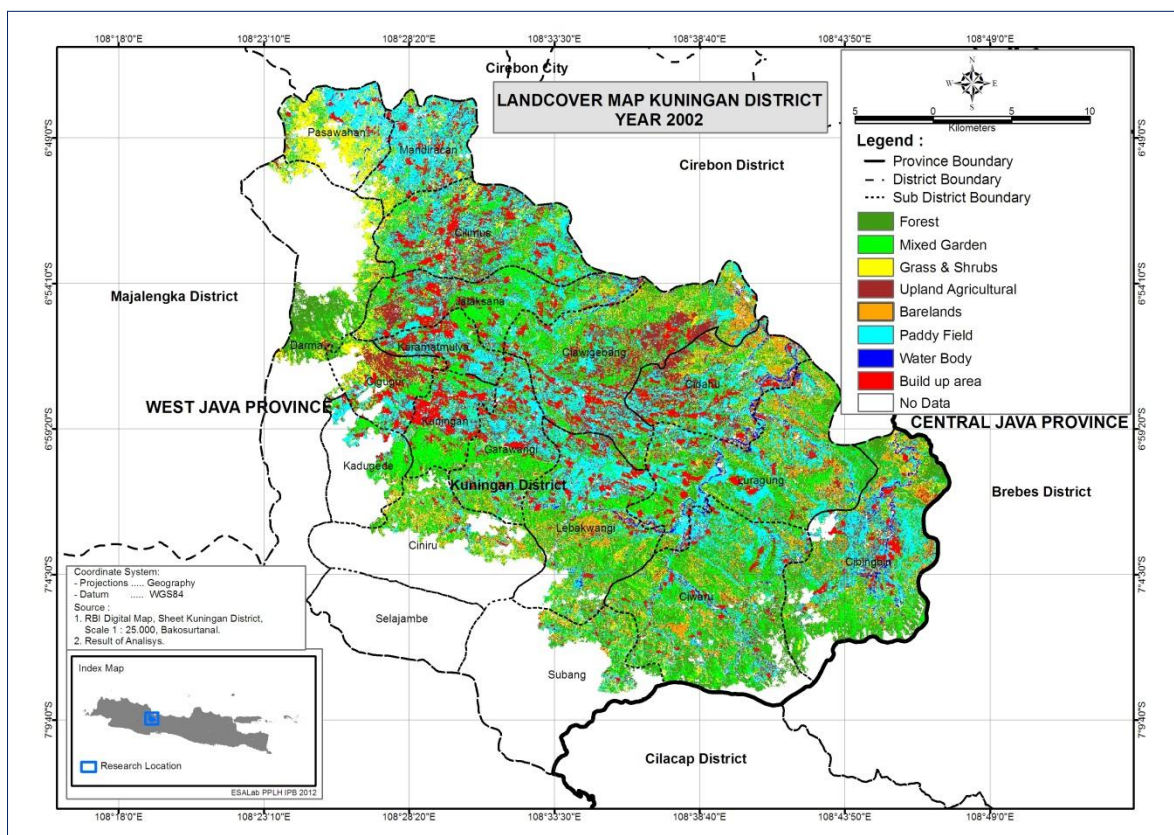


Figure 3.7. Land cover map of Kuningan District in 2002

### 3.1.5. Forest cover change in 2002–2009

Forest cover in 2009 increased 37.7% than that of 2002. Forest cover gained from mixed garden, grass & shrubs, and upland & bare lands (Figure 3.8). The remarkable change from these lands into forest cover was possible happened in the Mount Ciremai, where 15 500 ha of *Perhutani's* protection forests were designated as Gunung Ciremai National Park in 2004. After the designation, all activities in that area were ceased, including the PHBM activities that allowed villagers to utilized allocated forest areas for agricultural activities by *tumpang sari* system (= *taungya* system). As a result, mixed garden, grass and shrubs, and upland and bare lands were changed to forest cover. The land cover condition in 2009 is presented in Figure 3.9.

Further analysis of forest cover density showed that forest cover density of Kuningan District has changed over the period of 2002–2009. The forest cover density decrease was related to the stands cutting; meanwhile forest cover density increase was related to trees growth, replanting or reforestation. The change detection results are presented in Figures 3.10 and 3.11.

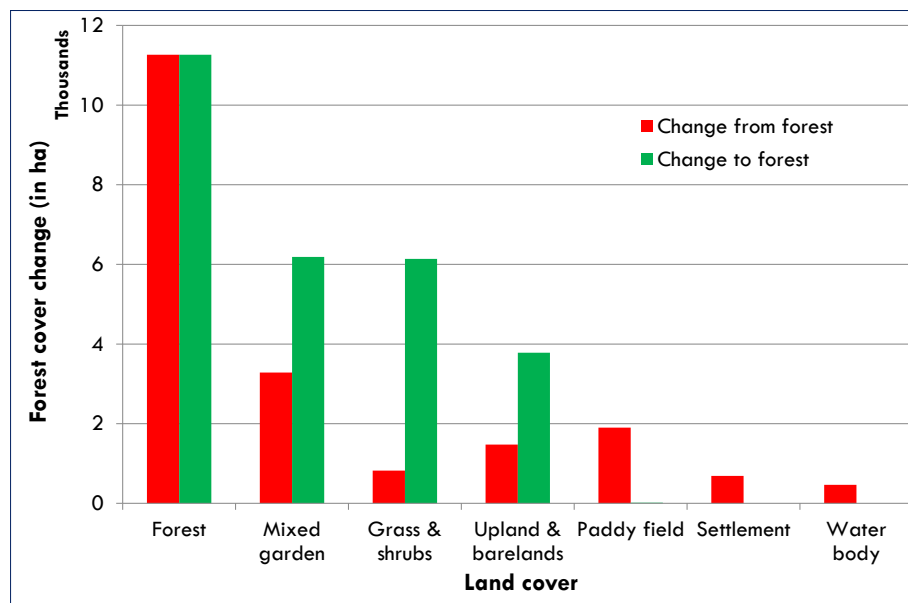


Figure 3.8. Conversion of land covers from and to forest between 2002 and 2009

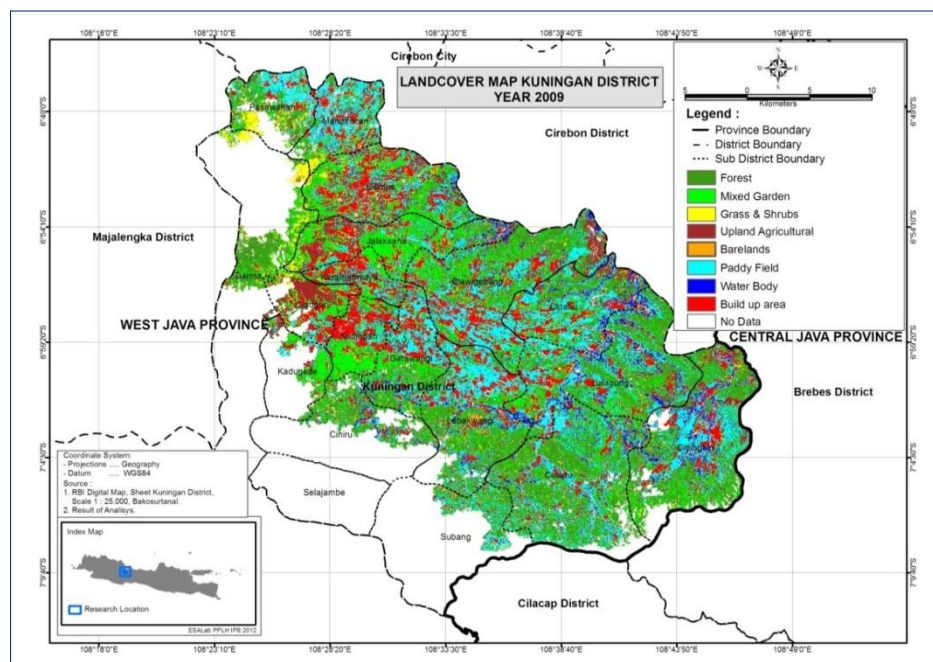
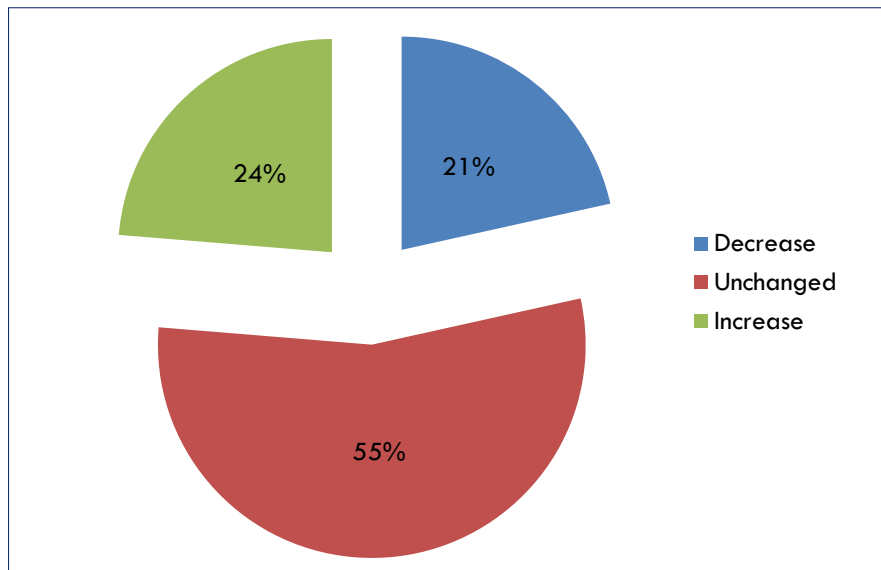
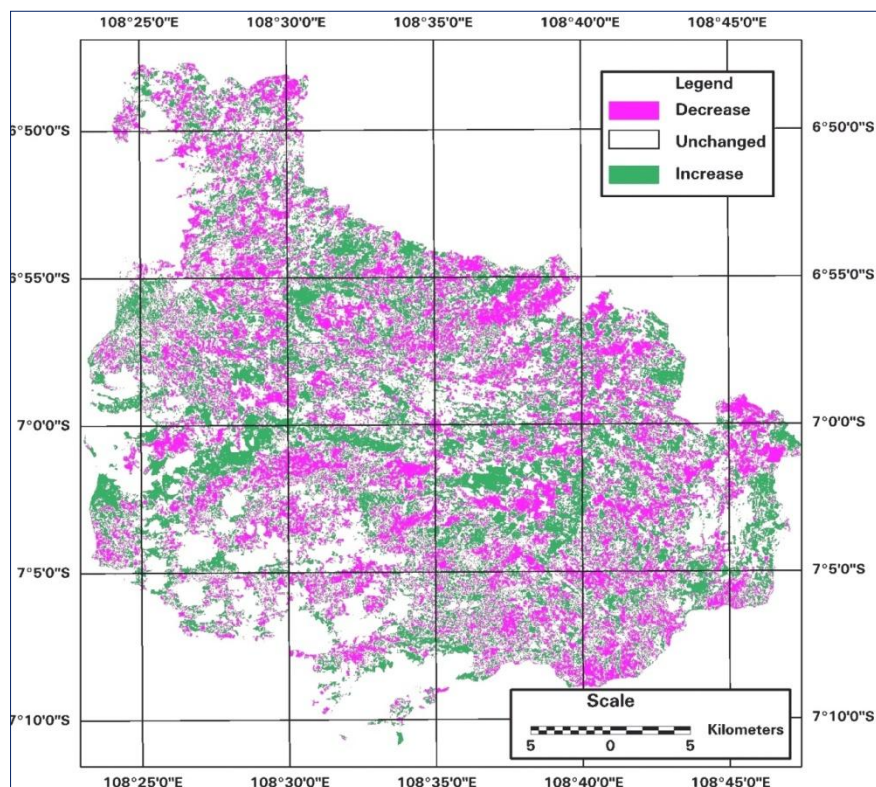


Figure 3.9. Land cover map of Kuningan District in 2009



**Figure 3.10.** Changes of forest cover density between 2002 and 2009



**Figure 3.11.** Changes of forest cover density between 2002 and 2009

### 3.1.6. Forest transition in Kuningan District

The data interpretation from Sections 3.1.1 to 3.1.5. showed that during the period of 1978–1999, forest cover area was decrease and then from 1999–2009, it was increase. The year of 1999 is the year of turning from deforestation to reforestation, both in private and State Forest lands (Figure 3.12). This trend is different to the national level or even island level as reported by Damayanti *et al.* (2013). The report said Indonesia, especially in Java, Kalimantan, Sumatra, and Sulawesi has been and in most provinces are still facing deforestation problem. Figure 3.12 is recognized as “forest transition” as suggested by Mather (1992) & Grainger (1995) in Mather & Needle (1998), Mather (2004), and Rudel *et al.* (2010).



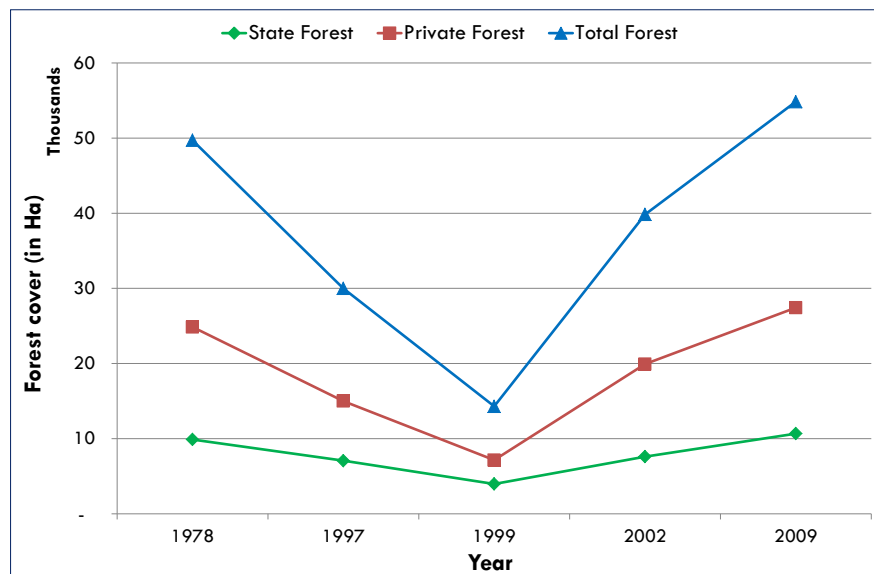


Figure 3.12. Forest cover change in Kuningan District from 1978 to 2009

Driving factor that might be relevant to the deforestation between 1978 and 1997 was economic factor. Period of 1978–1997 was critical, since there were two important economic turmoils. The first was oil shock in 1978 that was led by Iran revolution movement (Archanskaia *et al.* 2012). The second was in 1990, when Iraq government had invaded Kuwait. The above crisis resulted in high price of kerosene, which was utilized by most the people in the rural areas for their daily life. Bee (1986) explained that the high price of kerosene in 1979, have let the people to use fuel wood again and finally the condition induced scarcity of fuel wood. Based on Suganda *et al.* (1980), shortage of fuel wood in Java in 1978 was about 18 million cubic meter. This might influence the dynamic changes of land cover that led to deforestation.

Deforestation between 1997 and 1999 was an impact of the world economic crisis to Indonesia. Among the impact were contraction of economy, currency value (Rupiah/Rp.) declined, increase in poverty, increase in unemployment, rampant inflation and loss of consumer purchasing power, grave social instability, the collapse of the 32-year tenure of Suharto as president in May 1998 (Sunderlin *et al.* 2000 & 2001), increase of conflicts in forestry sector, forest encroachment, and mass-illegal logging (Wulan *et al.* 2004). Kuningan people accustomed to work in large towns. Based on the population census that conducted in 1980, 1990, 1995, 2000, and 2010, the proportion of population of Kuningan compared to West Java Province was 3.00%, 3.03%, 2.76%, 2.62% and 2.41%, respectively. This trend indicated that there was outflow migration from Kuningan to other cities in West Java Provinces. In the period before the crisis, these people worked in Jakarta as laborers or having their own business (shops and various services) and they returned home for certain occasion, such planting and harvesting seasons started in the villages or during holidays for religious activities. Suyatman (1998) mentioned that during economic crisis, jobs became scarce and because of safety reasons, most of these people went home to Kuningan. This led pressures on the forest increased drastically. During this period, uncertainties regarding the law led people to think that the State Forests were open and accessible public assets that could be used by the people without considering the legal implications. A group of people even acted violently and intimidated the *Perhutani* officers as the manager of the State Forests. This phenomenon agrees with Ostrom's statement (1999) on the tragedy of open access resources at the time of crisis. Ostrom explained deforestation and forest degradation may occur if local authorities are not able to manage resources effectively because laws and regulations cannot be enforced.

There has been a period between 1999 to 2001 when Indonesia's governance was in uncertain status, whether centralized or decentralized, whether certain administration is under the central or regional government, whether certain natural resources could be utilized by permission from central government or regional government, and so on (Damayanti *et al.* 2013), which led to mass-illegal logging and forest encroachment (=severe deforestation) in Indonesia. However, *Perhutani* that has long been implementing the social forestry approach in the forest management from 1974 to 2000 through Social Forestry Program, Village Forest Community Empowerment (*Pemberdayaan Masyarakat Desa Hutan/PMDH*), and Community Forestry (*Perhutanan Sosial/PS*) again wanted to

gain the people trust by launching PHBM from 2000 until today. These programs were strategies of *Perhutani* to manage its forests (Simon 2004).

### 3.2. Socio-economic background for reforestation

In order to reveal proximate and driving factors behind reforestation in Kuningan District, village and household surveys combined with data and literature reviews were conducted. Based on literature reviews and interviews to respondents and key persons in each village, it is revealed that main occupations of the people in each village were peasant/farm labor, construction labor, farmer, seasonal worker, and merchant/trader. Meanwhile, randomly selected respondents in each village were mainly farmers and peasants. Basic information of each village is presented in Table 3.2.

**Table 3.2.** Village profiles\*

No	Details	Sg Village	Sr Village	Sd Village	C Village
1	Research period	2009–2010	2009–2010	2012–2013	2012–2013
2	Sub-district	Karangkencana	Cibeureum	Ciawigebang	Ciawigebang
3	Area (ha)	778	354.5	579	369
4	State forest area (ha)	412.9	147.58	127.1	-
5	Population (people)	2,766	4,613	4,280	4,489
6	Population (household)	737	1,257	1,156	1,104
7	Main occupation in the village	Peasant/farm labor	Peasant/farm labor	Farmers, Seasonal workers	Construction labor, merchant
8	Respondents				
	▪ LMDH members	34	30	16 (Sd-sf)	
	▪ Non-LMDH members			70 (Sd-pf)	55
	▪ Main occupation (& %)	Farmer (35.3%)	Farmer (53.3%)	Peasant (43.8%) [Sd-sf] Farmer (45.7%) [Sd-pf]	Farmer (63.6%)
	▪ Managed land				
	• Owned paddy field (ha)	0.011 – 0.7	0.07 – 0.56	0.014 – 1.5	0.07 – 1.4
	• Owned kebun/private forest (ha)	0,035 – 7.14	0.07 – 0.7	0.06 – 2.1	0.11 – 10
	• Peasant/farm labor (number of people)	9	4	7 (Sd-sf) 1 (Sd-pf)	1
	- others' paddy field	67%	-	43% (Sd-sf)	
	- others' kebun/private forest	11%	-	14% (Sd-sf)	100%
	- State forest (by <i>tumpang sari</i> )	33%	100%	71% (Sd-sf)	

Notes: \* = data at the research period; Sd-sf = Sd Village, State Forest; Sd-pf = Sd Village, Private Forest; *kebum* = homegarden, backyard, a piece of upland farm which is planted with various kinds of trees (fruits, timber, etc.) and other useful plants for daily consumption; *tumpang sari* = *taungya* system = intercropping timber trees with food crops at the first three years of planting.

#### 3.2.1. Main occupation

Most respondents in each village that randomly selected were farmers (Figure 3.13.). Sd Village that had more population than other sample villages had more varied occupations. Unemployed respondents were also randomly selected. Nevertheless, these respondents also owned land and plant trees in their lands. Most respondents had no side-job and rely on their main occupation. However, it is also interesting to note that main occupations other than farmer (labor, merchant/trader, private business owner, teacher, and village officer) had “farmer” as side-job. Peasants (or usually also called landless farmer or farm labor) either solely rely on their job as farm labor or doing labor works outside the farm (construction, factory, etc.).

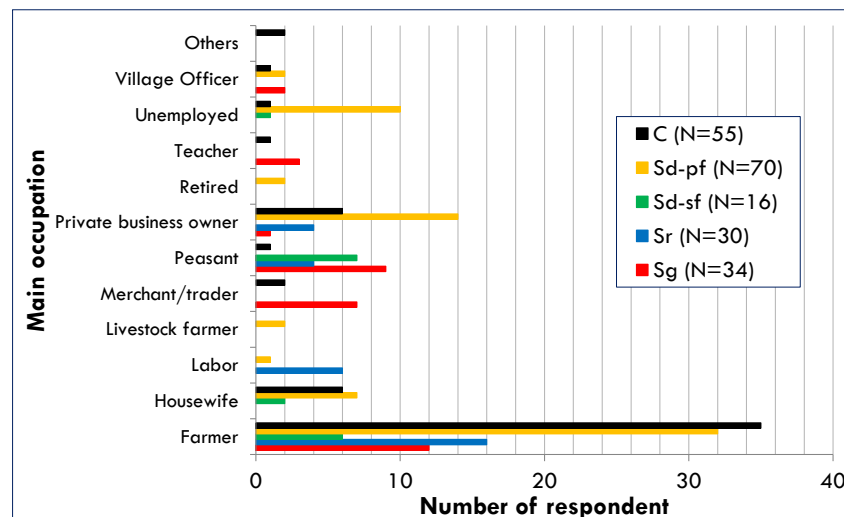


Figure 3.13. Respondents' main occupations

### 3.2.2. Land and tree ownership

Figure 3.14 shows the distribution of lands based on respondents' main occupation. Farmers had more lands than others. There were also respondents who have no land at all (mostly peasants) and they managed rented lands at one or more locations. Owned-land types were wet paddy field, dry agricultural land (either *kebun* or private forest), and other land. Owned-land which leased to other people was also recorded. Three types of land also applied to the management of rented lands. Most respondents had their own lands and the number of respondents who owned dry agricultural lands (*kebun* or private forest) was higher than those who owned wet paddy fields.

Figure 3.15 shows the distribution of trees ownership to the size of dry agricultural land managed by respondents. The figure shows concentration of planted trees at limited extent of land, mostly  $\leq 1.5$  ha with up to 2,000 trees. It means even respondents who owned small size of lands were also planting trees. The trees were mostly planted at dry agricultural lands. In consideration to the Minister of Forestry's Decree on the prerequisites of private forest (minimum size of 0.25 ha, >50% tree crown cover, or a minimum of 500 trees per ha at the first year of planting), Figure 3.15 shows that only some respondents could be classified as "private forest owners", while others were "*kebun* owners".

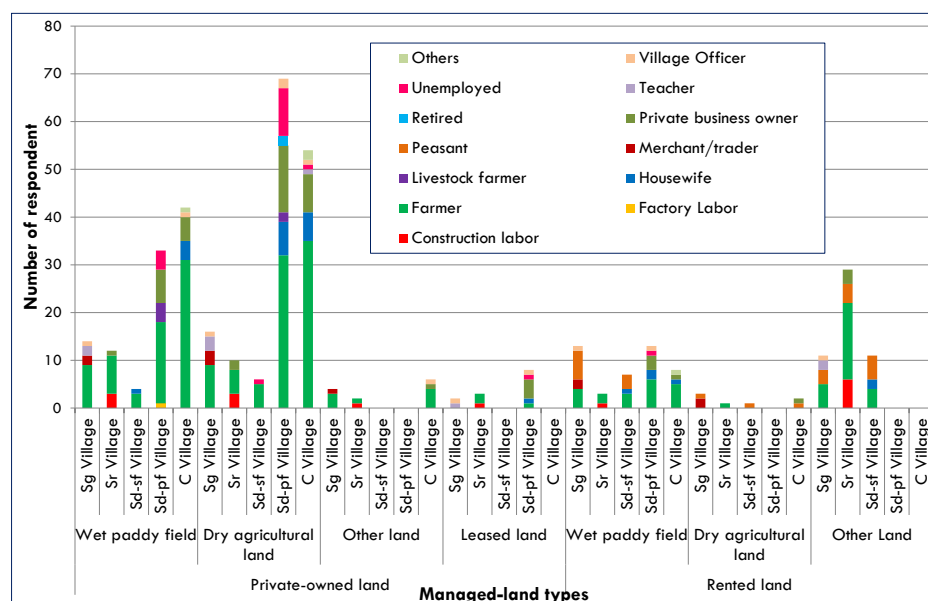
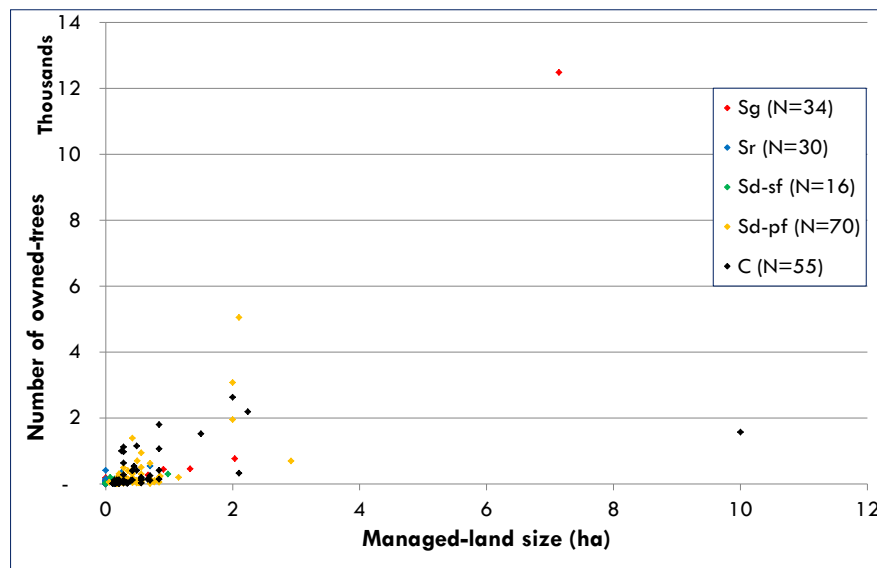


Figure 3.14. Respondents' main occupation and managed-land



**Figure 3.15.** Distribution of trees-ownership to managed-land size (all respondents)

In Sg and Sr Villages, respondents owned trees even though they did not have land. It was possible, because they planted the trees on other people's land or at the State Forest (SF) land (=Perhutani's land allocated for LMDH members) that they managed. Figure 3.16 shows that most respondents owned small size of land ( $\leq 0.25$  ha): Sg Village (22 respondents), Sr Village (24 respondents), Sd-sf Village (5 respondents), Sd-pf Village (15 respondents), and C Village (18 respondents). It could be noticed also that the land size was relatively unified, because mostly they were using the local measurement unit for land called *bata* (1 *bata*  $\approx 0.07$  ha). Compare to Sg and Sr Villages, respondents in Sd and C Villages had relatively broader land size and numbers of trees owned also varied between 10 and 5,050 trees (Figure 3.17).

### 3.2.3. Household income

Figures 3.18 and 3.19 show the average of household annual income (from 1 year prior up to research period) which is grouped based on respondents' main occupations and then detailed into the sources of income. Figure 3.18 shows that among all respondents' main occupations in four villages, private business owners and teachers groups had the highest and the second rank of income, respectively. It is obvious, that income from agriculture and forestry of these two groups were very less compared to their main income, because they farm and plant trees to utilize their lands and income from timber served as saving (=part-time farming).

On the contrary, farmers and peasants groups, as the majority of respondents' main occupation, had the lowest income. Figure 3.19 gives a more detail breakdown of their sources of income. Figure 3.19. shows only some of the households who could have income from the trees they planted, although most of respondents planted trees (as shown in Figures 3.14, 3.15, 3.16, and 3.17). This was because when income was calculated, including from forestry, the components of income derived from 1 year prior up to research period only. Most trees were planted few years back and the trees were not old and economic enough to be cut and sold. Tree species which were usually chosen by the respondents were: teak (*Tectona grandis*), mahogany (*Swietenia macrophylla*), sengon (*Paraserianthes falcataria*), acacia (*Acacia auriculiformis*), and jabon (*Anthocephalus cadamba*). Meanwhile, Kuningan District and surrounding districts (Indramayu, Cirebon, Majalengka) have been well-known as the center for mango (*Mangifera indica*) fruit production. So, mango trees could be found anywhere in Kuningan planted together with other fruit trees, such as jack fruit (*Artocarpus heterophyllus*), sukun (*Artocarpus altilis*), salak (*Salacca zallacca*), banana (*Musa spp.*), papaya (*Carica papaya*), coconut (*Cocos nucifera*), etc. During the interview, some respondents already experienced at least once timber harvest and maximum to six times of harvest, for the period 1980–2012. It should be noted here, that in Sg & Sr Villages, income from forestry could be from the *tumpang sari* or from the sharing of harvested timber<sup>3</sup>.

<sup>3</sup> For better understanding of the sharing system, please refer to Prasetyo, Damayanti, & Masuda (2012)



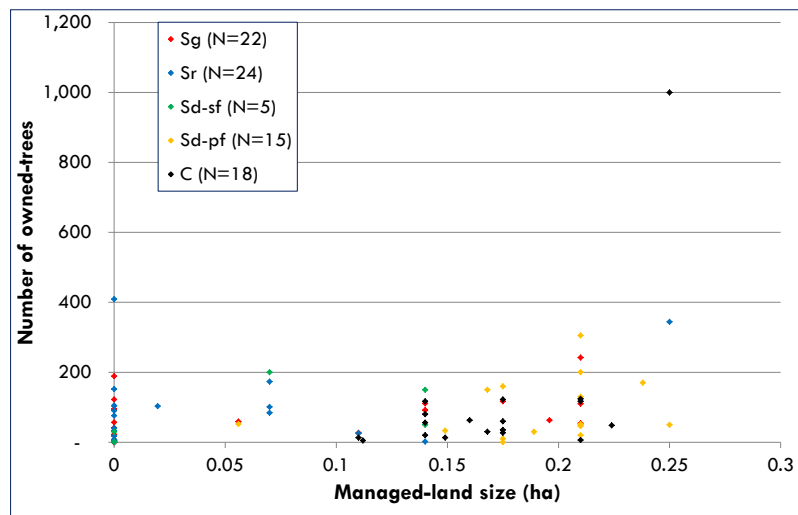


Figure 3.16. Distribution of trees-ownership to managed-land size (respondents with  $\leq 0.25$  ha of land)

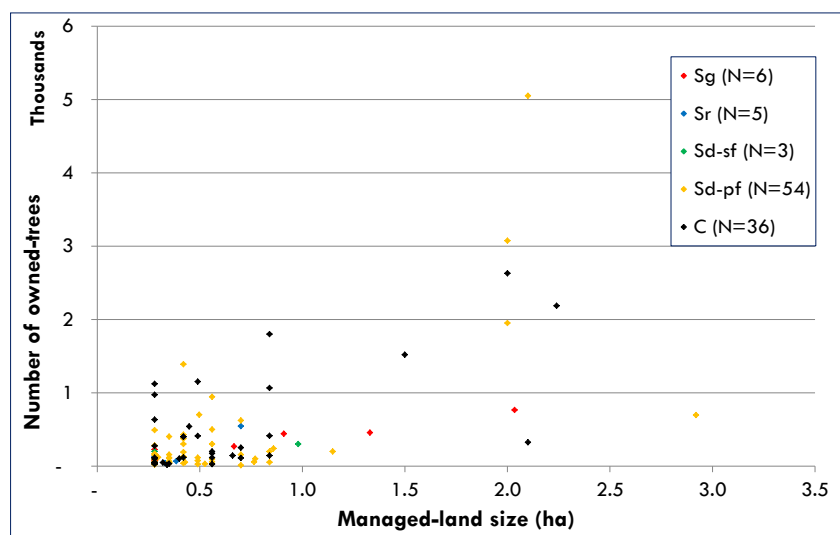


Figure 3.17. Distribution of trees-ownership to managed-land size (respondents with 0.25 – 3 ha of land)

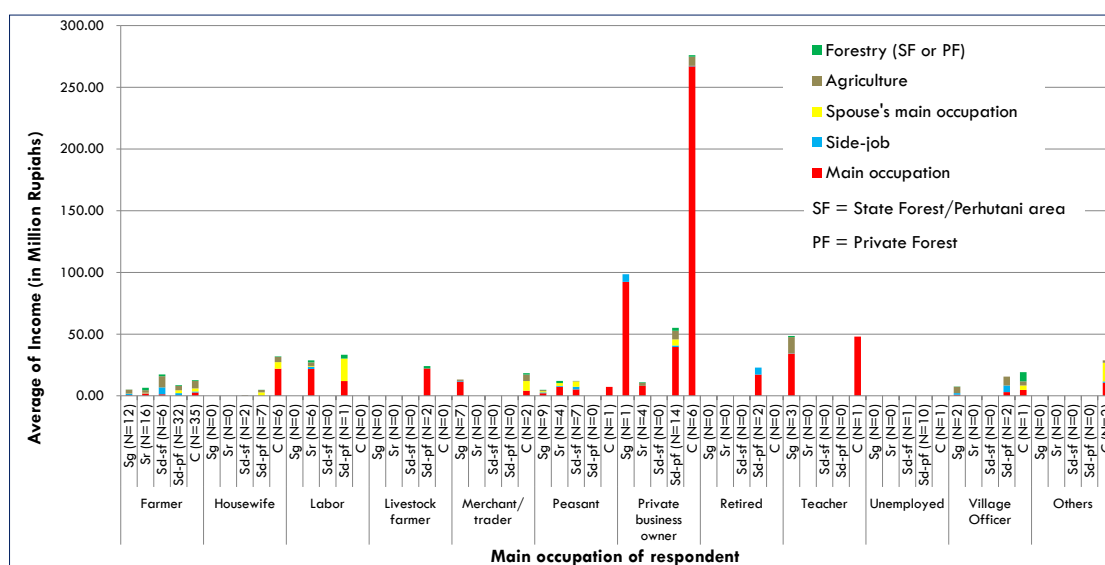
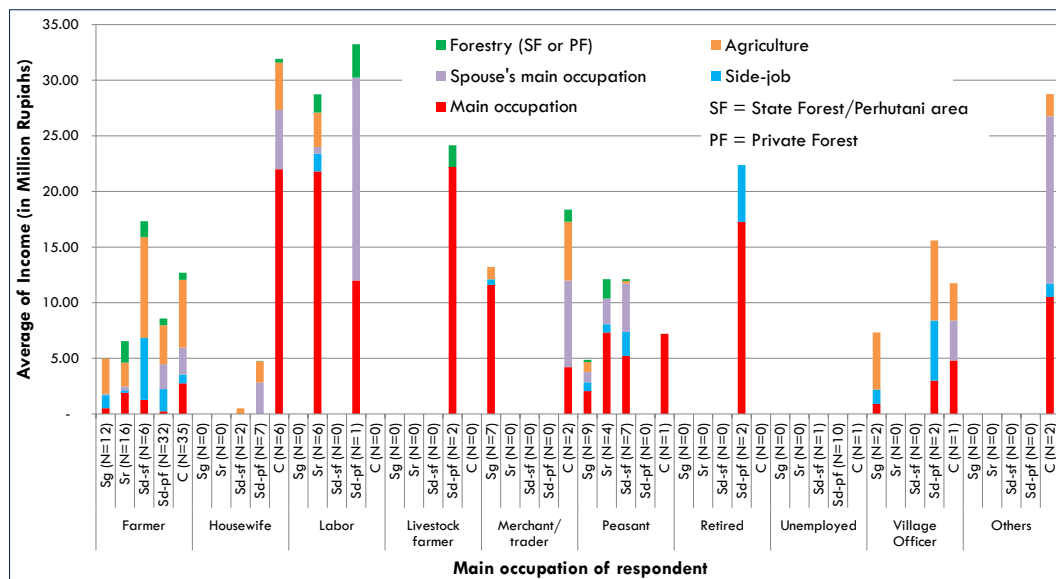


Figure 3.18. Average of household annual income

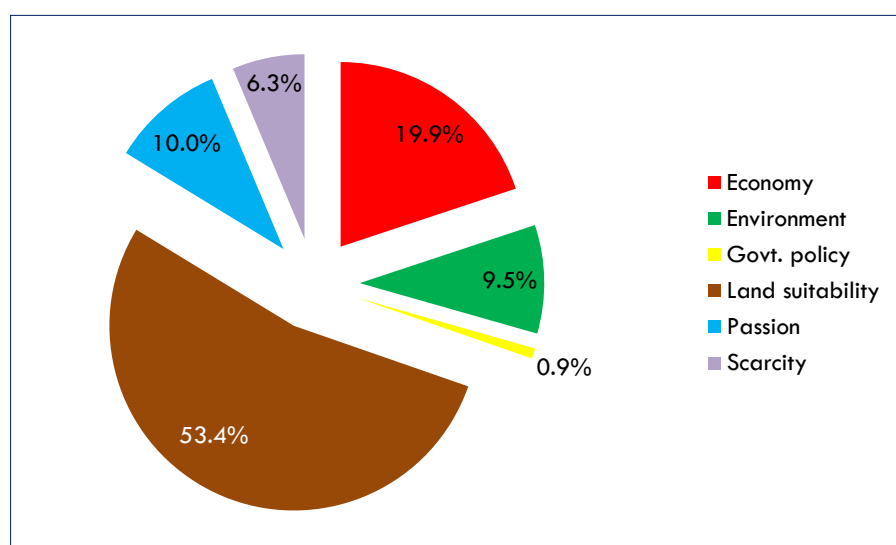


**Figure 3.19.** Average of household annual income (excluding private business owners & teachers)

### 3.2.4. Reasons of planting trees

From the previous sections (3.2.1, 3.2.2 and 3.2.3), there are several points of reality can be recorded: (1) most respondents are farmers and peasants whose income mainly rely on their occupations, because they rarely have side-job, (2) except peasants, all respondents own lands, (3) whether owning dry agricultural land or not, respondents plant trees, and (4) only some of the households could have income from the trees they planted, although most of respondents planted trees; this was because of the limited period of calculating income (1 year). These realities bring about a question of why people want to plant trees, instead of planting agricultural products, such as upland-paddy and horticultural species.

Respondents were asked, “why you want to plant trees, instead of planting agricultural products, such as upland-paddy and horticultural species?”. The question was asked to respondents in Sd and C Villages, with total of 141 respondents. Because the answers of each respondent varied between one to four reasons and there were respondents who did not answer the questions, the total answers were 221. Those reasons then grouped into six categories: economy, environment, government policy, land suitability, passion, and scarcity, summarized in Figure 3.20 below.



**Figure 3.20.** Proportions of the reasons behind planting trees

- 1) Land suitability was the major reasons of why respondents plant trees, accounted for 53.4%. The “land suitability” category includes: dry agricultural land/upland for planting trees; because of dry

- areas, lack of water for planting horticulture; many wild boars, planting horticulture is not safe from wild boars, while planting trees will not be disturbed by wild boars; teak trees is most suitable for clay; land not suitable for horticulture; and no yield if the land planted by horticulture.
- 2) The second rank of the reason for planting trees is in the category of “economy” (19.9%). Among the “economy” reasons are: planting trees for saving; saving trees for building house; trees produce timber for sell; increasing price of timber; for collecting firewood and timber; less financial input; additional income; planting horticulture is expensive; and utilizing land.
  - 3) The third rank is “passion” category (10%). It is the most interesting reason that respondents have passion (willingness) to plant trees, such as just want to plant trees; to have activity after quit job in big city; to have activity in owned land (*kebun*), to have a dense teak trees in *kebun*; want to have a dense *kebun* as other people have; it is better to plant trees, instead of empty land; and having a lot of lands, it is better to plant trees.
  - 4) In the fourth rank is “environment” category, accounted for 9.5%. Reasons in “environment” category are: to prevent land slide; to prevent soil dryness; to restore soil fertility; for better land management; for wildlife; to prevent fire; reforestation; dense trees is better; forest is better for the land; to have fresh air; and to capture water.
  - 5) “Scarcity” category is in the fifth rank, accounted for 6.3%. The “scarcity” category includes: scarcity in labor and accessibility and the reasons recorded are: because trees need less management, so no need intensive work or labor; location of the land is far from home; easy to manage trees; and no one takes care the land, so it is better to plant trees.
  - 6) The last and the least answer was “government policy” (0.9%). Two respondents gave reasons that the government policy said “they must plant teak trees on clay soil”. Although this reason is also grouped into “land suitability” reasons, the respondents clearly stated that it was the government policy.

It is interesting to note that the major reason behind planting trees was land suitability (53.4%). This shows that people have been using their local knowledge and experiences regarding the natural and biophysical condition in their village. People also pay attention to the needs for energy (firewood), timber for construction, income from timber, and saving for the future needs. Planting trees gave economic incentive to the people. As example, price of *sengon* wood has been increasing from IDR 250,000 in 2003 to IDR 600,000 per cubic meter in 2008, and within five years later, the price will reach IDR 1,000,000 per cubic meter (Siregar *et al.* 2007, USD 1 = IDR 11,525, [www.bca.co.id](http://www.bca.co.id), 09 October 2013). *Sengon* wood is widely used for sawn wood, plywood, pulp, and paper, as well as raw material for export to several countries, such as Japan, Korea, USA, and Europe. Therefore, the wood processing industries place a high demand on this wood (Siregar, Yunanto, & Ratnisari, 2008) as well as local wood home industries producing handicraft. Log price incentive is possible due to good road accessibility in Kuningan District. Filius (1997) found the similar case that improvement of infrastructure (road access) encouraged tree growing in Gunung Kidul, Yogyakarta.

### 3.2.5. Energy consumption

One of the reasons of planting trees was firewood for cooking. During household survey, we asked the types of energy consumption in each household. The result is given in Figure 3.21. Most of respondents were using firewood in combination with Liquid Petroleum Gas (LPG) for cooking (Figure 3.22). Only one to three respondents in each village were still limitedly using kerosene.

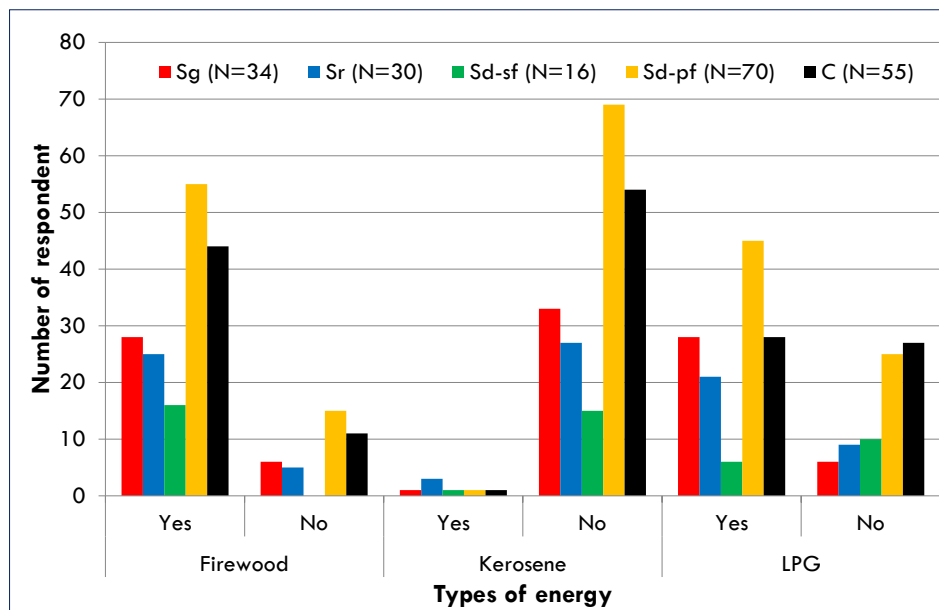


Figure 3.21. Energy consumption by respondents in each village

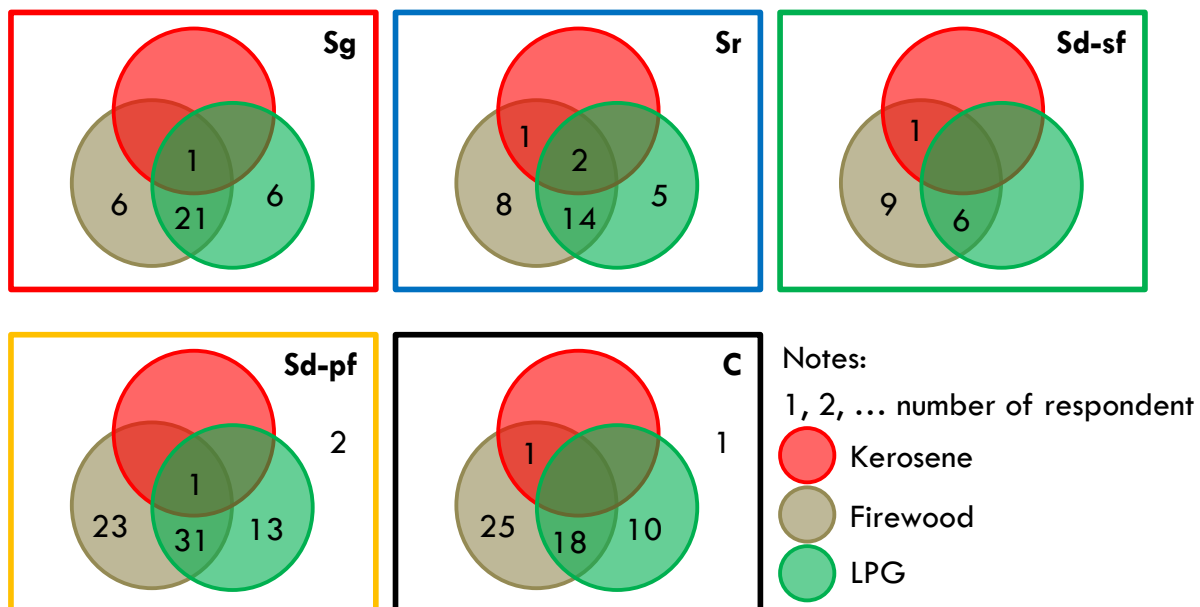


Figure 3.22. Combination of energy consumption by respondents in each village



Respondents were also asked the source of firewood they used. The result is given in Table 3.3. Among all respondents, only 3 who bought firewood, while others using firewood from their owned-land and from the State Forest. Respondents from Sg, Sr, and Sd-sf villages collect firewood from their lands and State Forest land. It is possible, because they are members of the Forest Village Community Institution (*Lembaga Masyarakat Desa Hutan/LMDH*)<sup>4</sup> who has given rights and obligation as members. Seven respondents from Sd-pf Village were also collecting firewood from the State Forest. They recognized that they were collecting firewood from the State Forest and so far they had no problem with the *Perhutani* or LMDH.

<sup>4</sup> For better understanding of the PHBM program & LMDH, please refer to Prasetyo, Damayanti, & Masuda (2012)

**Table 3.3.** Source of firewood

Source of firewood		Total number of respondents who use firewood				
		Sg (N=28)	Sr (N=25)	Sd-sf (N=16)	Sd-pf (N=55)	C (N=44)
Collect	Owned-land	18	13	8	48	43
	Other people's land	1	1	0	0	1
	State Forest land	9	11	9	7	0
Buy		0	0	0	0	3
Total		28	25	17	55	47

Notes:

-  1 respondent overlap (owned-land & State Forest land)
-  3 respondents overlap (owned-land & buy)

### 3.2.6. Forest management and disturbance

Two types of forest exist in sample villages: the State Forest and Private Forest. The State Forest is managed professionally by *Perhutani* with involvement of local communities in the PHBM program<sup>2</sup>. There has been a growing concern about the definition of “Private Forest”. The Government through Minister of Forestry Regulation defined “a forest that situated on a land that bearing ownership rights that is proven with land title or land ownership rights, dominated by trees in such an ecosystem, and assigned by the Head of the District or Mayor” is usually called “Private Forest” (Ministerial Regulation No. P26/Menhut-II/2005). Such definition was criticized by academicians, that it is ignoring the capacity of communities as actors in forest management, considering national forest area (State Forest) is controlled by the State and people cannot be involved in administering and managing forest, people do not have rights to obtain direct benefit from the national forest and controlling what the government does on the forest (Darusman & Hardjanto, 2006; Awang, 2007). Therefore, definition of private forest is suggested to be extended to forest that management is conducted by community organization on individual land, communal land, customary land, as well as national forest.

While the discourse has not yet come to a conclusion and new agreement between the Government and the people has not yet reached on the definition of Private Forest, for the purpose of this study, definition of Private Forest in this study is following the former Ministerial Decree that defined the biophysical and ecological appearance of Private Forest. “Forest that belong to the people with minimum size of 0.25 ha and having canopy of woody trees or other plants with more than 50% tree's crown cover and/or at the first year having a minimum density of 500 trees per hectare” (Minister of Forestry Decree No. 49/Kpts-II/1997). Therefore, Private Forest is developed and managed by the landowner.

The first important thing before managing a forest is acknowledgement on the boundary of the forest, both in the State Forest and Private Forest. State Forest boundary is usually marked with concrete pole that is placed on the border of the forest with certain interval distance. Respondents were asked whether they are familiar with the boundary of the forest. Most of respondents know the boundary of the forest (Figure 3.23), both in the State Forest and Private Forest. For the respondents who participate in PHBM program and become LMDH members, they feel confidence to manage the allocated State Forest land, because their rights on using the State Forest is acknowledged by the government and *Perhutani* and their knowledge on the boundary of the State Forest resulted in zero conflict on the land status (land disputes, land encroachment, illegal land occupation) between people and *Perhutani* (Figure 3.24). Meanwhile, Private Forest is developed on the privately-owned land, so each landowner knows where their lands' boundary. A piece of privately-owned land when border to border with State Forest will also have concrete poles that are placed on the boundary of the State Forest.

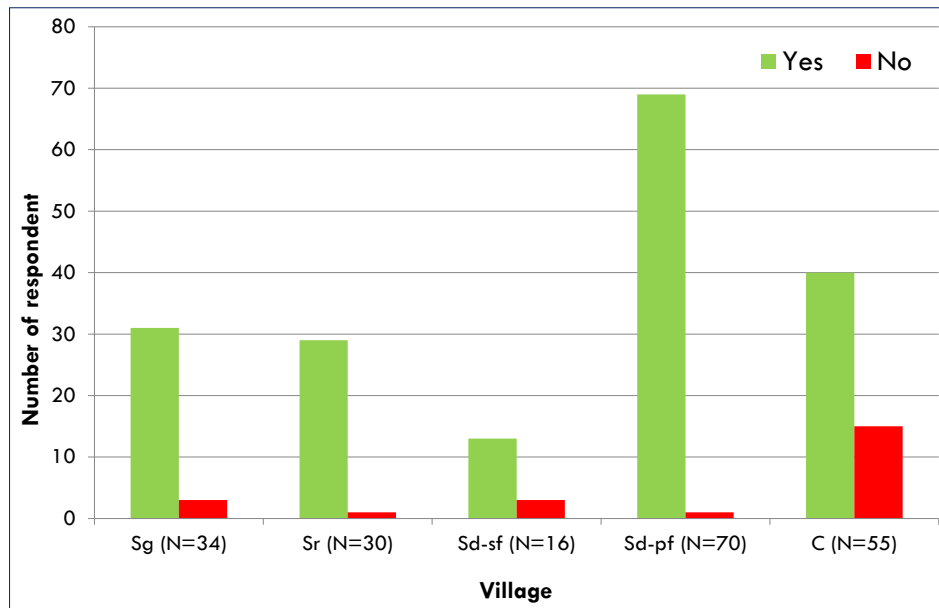


Figure 3.23. Respondents' knowledge on the forest boundary

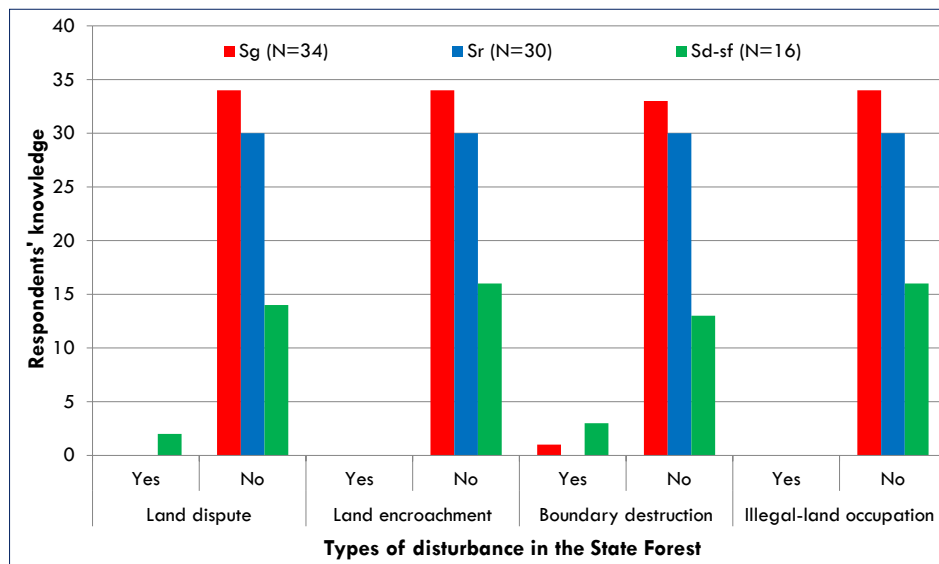


Figure 3.24. Respondents' knowledge on the disturbances in the State Forest

More evidences on the acknowledgement of forest boundary existence are forest disturbances, such as illegal felling (illegal logging), massive illegal felling, grazing, forest fire, and illegal trimming. Figure 3.25. shows that the first three disturbances were less-witnessed by the respondents, while forest fire and illegal trimming were higher. Forest fires were usually occurred in the dry season; where Kuningan District is usually suffer from drought. Illegal trimming were usually done for obtaining firewood. Although the landowner (or *Perhutani*) knows there have been illegal trimming practices in their forests, as long as illegal trimming is not affecting the trees, e.g. the trees died because of illegal trimming or even worst (illegal felling); illegal trimming was usually forgiven, because it is for livelihood of the people surrounding the forest.

After knowing the forest boundary as indicator that the respondents have confident feeling in the rights to manage the forest, the type of forest management activities were asked. It is revealed in the result (Figure 3.26) that respondents from villages that engaged in PHBM program and manage a portion of forest allocated to them (Sg, Sr, and Sd-sf Villages) were mostly managing their forests by conducting forest patrol, participating in the nursery, planting, and weeding-trimming. Only limited respondents involved in the pruning and felling trees. This was because pruning and felling were activities organized by *Perhutani* and only representative of LMDH involved as witness for logged-timber quantity.

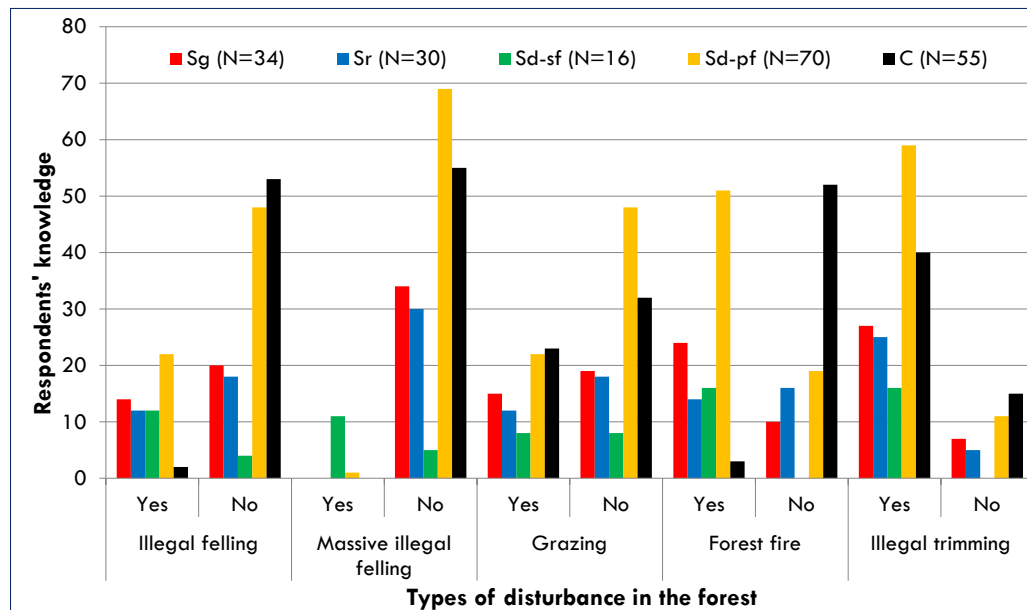


Figure 3.25. Respondents' knowledge on the disturbances in the forest (SF & PF)

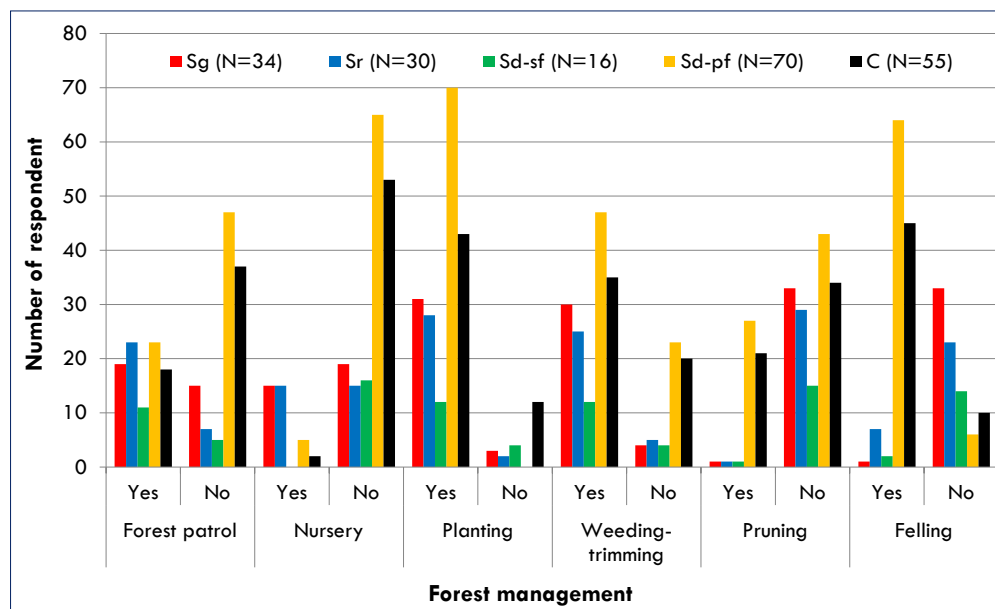


Figure 3.26. Respondents' activities in forest management (SF & PF)

On the contrary to the respondents from PHBM villages, respondents from non-PHBM villages (Sd-pf & C Villages) were less in doing the forest patrol and nursery, but more in weeding-trimming and felling. They already felt secure that the trees they planted in their owned-lands were safe, so that forest patrol was not considered as crucial. Meanwhile, most of the respondents bought seedling from seedling seller, so they did not make their own nursery. Weeding-trimming and pruning were usually conducted to get firewood. Felling was done only to selected trees based on the necessity and usually they were involved in the felling of their own trees. It is important to recall about the reasons of planting trees (as already explained in Section 3.2.4), that "economy" reason is at the second rank and "scarcity" reason is at fifth rank. Respondents plant trees for economic reasons, such as to have income from selling timber, to have energy from the firewood collection, and saving for the future needs. Respondents also plant trees because of less input for the tree management, such as lack of labor and tree need less management. Intensive care is only needed for the first few months after the seedling/tree is planted, to avoid drought and pest.

As results of these forest management activities, planting rates increased, incidences of illegal felling decreased, and most or all forest land encroachments were halted. Meyfroidt and Lambin (2008) had a similar finding in Vietnam, when farmers were given access to forest land for household purposes, the policy led to an increase in forest coverage.

### 3.3. Underlying causes of forest transition in Kuningan

Based on data and explanation in Sections 3.1 and 3.2, there has been a forest transition in Kuningan District. The year 1999 is the turning point from deforestation and reforestation. Several factors that influenced forest transition in Kuningan District are:

- a) Paradigm shift in forest management, from the so-called “scientific-forestry” to the “community based forest management” (literary translated as managing forest resources with community from *Pengelolaan Sumberdaya Hutan Berbasis Masyarakat/PHBM*). This management has increased the sense of belonging of local people over forest, because of the benefit sharing system. Besides, farmers have been having secure feeling in the long-term farming, because of acknowledgement of rights by the government and acknowledged State Forest boundary by the people;
- b) Kuningan people, especially those who reside in villages/rural areas, are still rely on wood as main source of energy (firewood), so that they are planting trees in their owned-lands. Besides, for most of the people in Kuningan, trees are seen saving for future needs;
- c) Log scarcity has made the timber price risen and stimulated farmers to plant trees. Accessibility problem to distribute timber from villages to the market was overcome, because good road infrastructure in Kuningan District already available;
- d) Part-time farming has been conducted by people who are engaging non-agricultural activities as their main occupation. Planting trees is considered the perfect choice based on their time and labor availability;
- e) In some location with dry-environment condition, planting trees is the best choice for the farmers instead of planting horticulture; and
- f) Mainstreaming of planting trees into the Kuningan District government.



#### **IV. CONCLUSION**

Theory of forest transition first developed through observation of data on the processes of deforestation and reforestation at State/National level (e.g. Scotland, France). Based on this theory, precondition for forest transition are: (a) concentration of agricultural land on better soil quality, resulted forest growth on abandon poor land (Mather & Needle 1998); (b) rural exodus due to agricultural land decrease and more land released for growing forest (Mather, Fairbairn and Needle, 1999; Mather 2004), (c) small holder agricultural intensification and emerging market for agricultural input and output (Meyfroidt & Lambin 2008), (d) Log scarcity/timber shortage that creates market incentive to plant trees (Mather 2004). Some countries in Asia are already experiencing forest transition, such as China, Korea, and Japan. For Indonesia, at the national level, basic assumptions for the occurrence of forest transition are not yet fulfilled, because of the diversity in the biophysical, social, culture, policy, and infrastructure between islands throughout the country. However, observation to the smaller scale or sub-national level showed that forest transition is already happened in several provinces and districts. Case study in Kuningan District is one of the proofs of forest transition in Indonesia.

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