CZECH UNIVERSITY OF LIFE SCIENCES

PRAGUE

INSTITUTE OF TROPICS AND SUBTROPICS

DIPLOMA THESIS

Contract farming in the Indonesian palm oil value chain: Potential for economic and environmental benefits

Libuše Valešová

Vladimír Verner

Prague, 2012

Declaration

I hereby declare that I have written presented master thesis “Contract farming in the Indonesian palm oil value chain: Potential for economic and environmental benefits” by myself with help of the literature listed in references.

Prague 6—Suchdol, 19 April 2012

.....

Libuše Valešová

Acknowledgement

I would like to express my sincere gratitude to my supervisor Vladimír Verner, Ph.D. for the continuous motivation and support of my MSc. study. His guidance from the initial to the final level enabled me to develop a thorough understanding of the subject.

Besides my supervisor, I would also like to thank David Herák, Ph.D. (associated professor at the Faculty of Engineering, CULS Prague) for providing me with the details on issues in the Indonesian Palm Oil industry.

I am also indebted to many of my friends and classmates for not only cheering me up throughout my writing but also providing some valid arguments about the issue. My special thanks belong namely to Bc. Filip Mukoko as he had made available his support in a number of ways, taking an important part especially in the final proofreading.

Last but not the least; it is an honor for me to thank my parents, Ing. Libuše Valešová and Ing. Petr Valeš, and also my brother, Petr Valeš along with his family all for supporting me not only in the studies but throughout my entire life.

Abstract

Vegetable oil has become the world's currently most rapidly expanding product, palm oil specifically making up by far the largest part of any non-animal originated oil production. Palm oil is known to have both, food and technical uses, including serving as a renewable energy, particularly due to the sharp increase of world's demand for ethanol and biodiesel derived from sugars, grains, vegetables and other crops, becoming the centre of attention in the agricultural trade. With the current increase rate, world's annual production of biodiesel by 2020 will have risen up to 144 percent of that in 2009. Based on this likely prediction, a massive increase in demand for palm oil could be expected; Indonesia in particular being one of the countries most affected by this evolvement. Though there are many countries around the globe involved in the palm oil production, only a mere few are considered net exporters of the commodity. Difficult to imagine, Indonesia and Malaysia together make up a dominating 86 percent of the entire world's palm oil production. Needless to establish, the two countries hold an eminent position in trade with palm oil products. Given the growth in production and the paralleled employment opportunity Indonesia has experienced over the past decades, palm oil as Indonesia's currently second most successful agricultural product is already estimated to have shifted over 6 million lives upside of the poverty line. Unfortunately, besides economic and social development, the industry has contributed to a line of ecological problems such as deforestation, habitat destruction, biodiversity decline, water, soil and air pollution and chemical contamination. Large part of the Indonesian arable land is dedicated to oil palm production, and is made up of oversized plantations owned by private companies (about 50 percent) and small-holders (44 percent). It is low living standard of these small-holders that makes for one of the crucial factors causing economic, environmental and social problems. In this regard, contract farming seems to be suitable a tool for a massive reduction of the negative aspects of palm oil cultivation.

Key words:

Palm oil; palm oil industry; value chain; contract farming; farmers; environment; deforestation; shifting cultivation; land-use changes; Indonesia

Table of Contents

List of Abbreviations

ADB	: Asian Development Bank
CDC	: Commonwealth Development Corporation
CSPI	: Centre of Science in Public Interest
EBTP	: European Biofuels Technology Platform
ECD	: State Environmental Conservation Department
FAOSTAT	: Food and Agriculture Organization of United Nations Statistics
FAPRI	: Food and Agriculture Policy Research Institute
GAPKI	: The Indonesian Palm Oil Association
GDP	: Gross Domestic Product
IEA	: International Energy Agency
IFAD	: International Fund for Agriculture and Development
IIED	: International Institution of Environment and Development
IMF	: International Monetary Fund
NERC	: Natural Environment Research Council
MPOC	: Malaysian Palm Oil Conservation
OECD	: Organization for Economic Co-operation and Development
OPEC	: Organization of the Petroleum Exporting Countries
RSPO	: Roundtable Sustainable Palm oil
UN DATA	: United Nations Statistical Databases
USAID	: United States Agency for International Development
USD	: United States Dollar
WB	: World Bank
WEC	: World Energy Council
WRI	: World Resources Institute
WWF	: World Wildlife Fund

List of Tables

List of Figures

1.INTRODUCTION

The demand for palm oil has been increasing for last decades due to the versatility of its use; food, non-food production and biofuel production. The strong development of oil palm industries in many tropical countries has been motivated by its high positional productivity. The palm oil can generate significant economic and social development in South-East Asia. Indonesia, which is classified as a lower middle income country, belongs to the most important world's palm oil producers with its more than 21.5 million tonnes produced in 2010. Despite of the important economic benefits, the Indonesian palm oil production is the focus of many debates on ecological issues. It strongly contributes to the number of environmental problems such as deforestation, soil and air pollution, habitat destruction and many others. These issues could be overcome or at least diminished significantly by applying contract farming. This governance mechanism for transactions in agrifood chains refers to the production and supply of produce under advanced contracts. Since there currently seems to be missing any clear guideline defining the rules of a palm oil production and this particular area, it can be assumed that contract farming would at least partially systemize this production. The increased governability will in essence allow for further molding of the currently destructive approach to producing palm oil.

The literature review consists of five parts. The first chapter informs about the development of palm oil production in South-East Asia and about both, traditional and non-traditional uses of palm oil, including biodiesel production. The next part of review describes the increasing demand for palm oil and the expansion of trade with vegetable oils in general. Many figures were used to bring about a better understanding of the economic side of palm oil production. Some of the economic benefits of the industry to Indonesia are introduced in the third part of this review. The second to last chapter deals with the number of ecological problems connected to palm oil plantation development; foremostly, deforestation, water and air pollution, soil erosion and habitat destruction for various species of fauna and flora. The last part introduces smallholders as important actors in the palm oil value chain and

explains the main differences between the independent and the supported smallholders. Also examined are challenges for these smallholders, some of which are access to biofuel markets, information and technology network, and many more. Following are my thesis, dealing with the model of contract farming, introducing it, and discussing its´ pros and cons. Contract farming, however, is in essence presented here as a partial solution to the diverse issues of palm oil production.

2. LITERATURE REVIEW

2.1. Palm oil

Palm oil is recently considered as one of the most valuable products that can be obtained from oil palm (*Elaeis guineensis)* originated in the tropical rain forest region of West Africa. Palm oil is obtained from the flesh of the fruit which makes the extraction easier, compared to other oils obtained from seeds. Processing oil palm fruits for oil has a long history in Africa and it has been practiced there for thousands of years. Some palm fruits were taken to the Americas and to the Far East during 14th to 17th centuries. The palm oil is rich in carotenoids from which it has its deep red colour and it is high in saturated fatty acids, about 50 percent and 80 percent. Because of its economic importance the oil pal is grown as a plantation crop in tropical climates within 10 of the equator and with high rainfall[1].

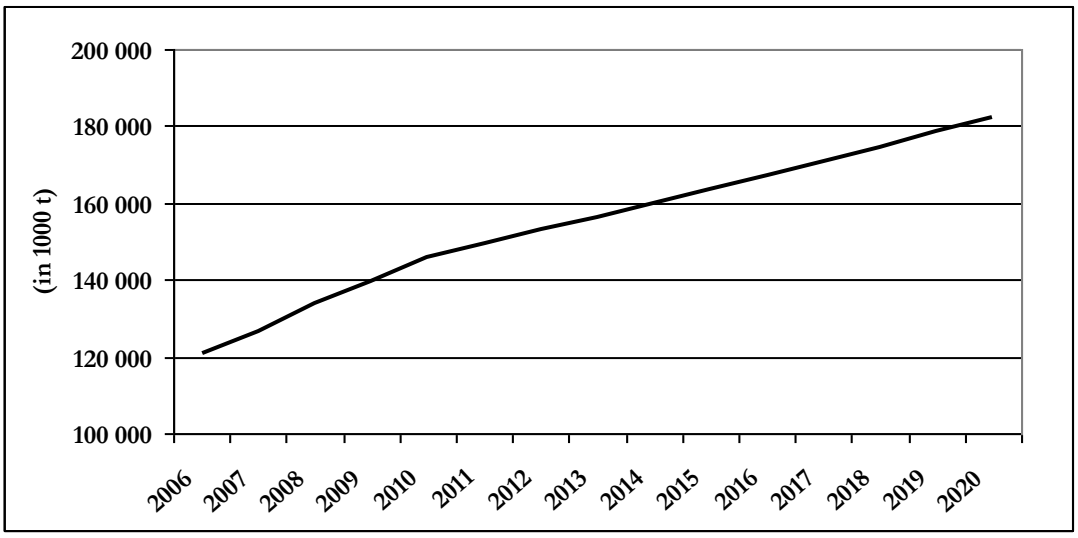


Figure 1
Expected consumption of vegetable oils to 2020
Source: OECD (2012)

[1] Minimal annual precipitation should not drop bellow 1,600 mm

Vegetable oils become to the world's most rapidly expanding crops and especially palm oil is produced more than any other vegetable oil. Palm oil has become global agricultural commodity (Corley and Tanker, 2003; FAO, 2002).

Oil palm is a monoecious crop and each tree produces bunches weighing between 10 and 25 kilograms with 1000 to 3000 fruitlets per bunch. The fruitlet is dark purple and the colour turns to orange red when ripe. Each palm oil fruit consist of a hard kernel (seed) held in a shell (endokarp) which is surrounded by mesocarp. Oil palm tree, which grows up to sixty feet, starts bearing fruits after 30 months of field planting and is productive for the next 20 to 30 years. According to Malaysian Palm Oil Wildlife Conservation Fund "*the oil palm is the most efficient oil-bearing crop in the world, requiring only 0.26 hectares of land to produce one tonne of oil while soybean, sunflower and rapeseed require 2.22, 2 and 1.52 hectares, respectively, to produce the same.*" Another explanation expressing the economic uniqueness of palm oil is that average yield per year of palm oil is 3,68 tonnes per hectare while soybean is 10 times less productive than palm oil, as it is well seen in Figure 3. In addition, palm oil generates nearly 10 times the energy it consumes, compared to a ratio of 3 for ripe oilseed and 2, 5 for soybeans.(MPOC, 2006; World Growth, 2009).

Figure 2
Oil palm fruit bunches (left) and oil palm fruit cut in half, close-up (right)
Source: Roundtable on Sustainable Palm Oil (2010)

2.1.1. Development of palm oil plantation in South-East Asia

The first plantation in Asia was established on Sumatra in 1911 using Deli palms that were found to be more productive in terms of fruit bunches and content of oil compared to African palms. By 1917 the first plantation was founded in Malaysia. The Sumatran industry has developed rapidly with 31,600 ha in mid-1920s while Malaysia had 3350 ha and before World War II, the areas were 92,000 and 20,000 ha. Moreover, in the case of Sumatra, an area exceeded 110,000 ha in 1940, but following World War II caused that Sumatran plantations were only slowly brought back into good condition, and planting process was very slow. The planted area had risen by only 15% and yields per hectare were low by 1956.

In 1960s the Indonesian tree crop area was organised into estate groups under public ownership. At the beginning of 1970s, 36,000 ha were held by private companies and seven groups held 90,000 ha in Sumatra. Lately, there were strong capital investments by the World Bank and the Asian Development Bank into the large estates group and by 1985 the planted area expanded to 500,000 ha. In 1980s the planted area rose five-fold in 11 years, and almost doubled by 1996, including moving into new areas such as Sulawesi and Kalimantan. (ADB, 2010).

Additionally, there were 165 palm oil mills working in Indonesia in 1997 and the consumption of palm oil reached 60 percent of oil production during the same year. In 1996 the Indonesian 50 percent of planted area was private estates, 33 percent on smallholdings and 17 percent in public ownership – from total 2, 3 million hectare of plantings (Corley and Tanker, 2003; MPOC, 2006).

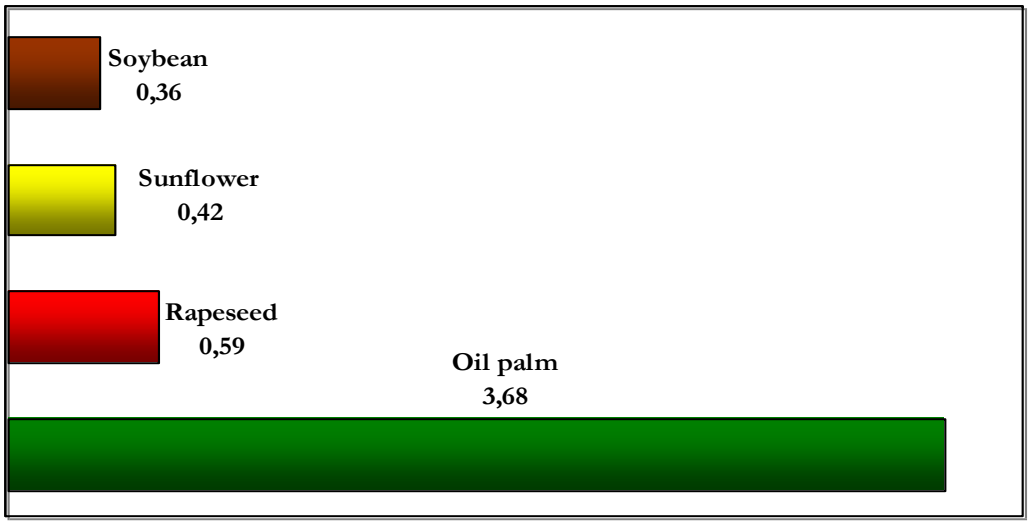


Figure 3
Average yield of major oil crops per year (tonnes of oil per hectare)
Source: Oil World (2010)

2.1.2. Traditional uses of palm oil

There are two oils which we can extract from the oil palm fruit – palm oil from the fleshy mesocarp and palm kernel oil from the seed of kernel. Traditional use of oil palm includes production of soap, margarine and cooking fat. There are both technical uses and food product uses. Palm oil is used primarily in food product; cooking oil, margarines, cocoa butter substitute, milk fat replacer and palm kernel oil is mostly used in the oleo chemical industry form making detergent, soap, toiletries and cosmetics. The oils of lower quality are used for non-edible purposes, such as resins, candles, glycerol or cosmetics. Because of the great increase in its quality and availability palm oil is now used largely for food production. It is suited to many food purposes, especially cooking fats and deep-frying oil, bakery products, crisps, potato, snacks and ice-creams. The manipulated palm oil may become available in time and it is still more flexible for foodstuff use. In addition, palm oil is more competitive with other edible oils. In addition, scientists have found palm oil to be one of the richest of Vitamin E and it is now sold as a dietary supplement. The significant advantage is that every part of the palm oil fruit can be utilised. The shell is used to produce activated

charcoal and in many industrial burners. Palm kernel residue is used in animal feed and the fronds have been used to make fibre boards for furniture (Corley and Tanker, 2003; RSPO, 2008).

PALM OIL	**Fruit**	**Crude palm oil**	Food (frying oil, margarine, cocoa butter substitute)
			Oleochemical (stearine, soap, detergent, lubricant, biodiesel)
		Fibre	Particle board, pulp, paper
		Sludge	Feedstuff, soap, fertilisers
	Nut	**Kernel**	Frying oil, salad oil, olechochemical
		Palm cake	Feedstuff, fertiliser
		Shell	Carbon briquette, activated carbon, particle board
		Empty bunch	Pulp, paper, particle board, fertiliser, energy
	Trunk		Furniture, particle board, feedstuff, starch, energy

Table 1
Uses of palm oil in food and manufacturing industry
Source: Douglas et al. (2010)

In addition, palm oil is cholesterol-free and has semi solid characteristics at room temperature with origin meeting point between 33 C to 39 C. Palm oil has a balanced ratio of saturated and unsaturated fatty acids which results in an edible oil suitable for use in many food applications. It contains 45 percent palmitic acid, 40 percent oleic acid, 10 percent linoleic acid and 5 percent stearic acid (MPOC, 2006).

2.1.3. The use of palm oil as biofuel and biodiesel

Biofuels, which are derived from biological materials, present an alternative solution for the world; they are renewable, relatively cheap to operate and their greatest appeal lies in potential to reduce greenhouse gas emissions.[2] This could help countries meet their commitments under the Kyoto Protocol.[3] Simply, biofuels offer opportunities to pursue environment and development goals both globally and domestically. However, non renewable resources can produce a lot of energy in a short time and they are still cheaper in total than the alternatives. But it is clear that the supply of fossil fuels is finite and that one day they will probably run out. Moreover burning of fossil fuels releases additional carbon dioxide into the atmosphere which causes the global warming (Scragg, 2009).

Depleting non-renewable natural resources such as mineral petroleum has increased the need of renewable sources in the coming era and at the same time to protect the environment from emissions. In the last few years, demand for ethanol and biodiesel derived from sugar, grains, vegetable oils and other crops has increased sharply and the trade in agricultural commodities has moved to the centre of attention. Biofuels can be produced from a large number of agricultural commodities. Soybean oil is of primary interest as biodiesel source in the United States and European countries are concerned with rapeseed oil, while countries with tropical climate prefer palm oil or coconut oil (Knothe et al., 2002; Fei and Teong, 2008).

There is the group of first generation biofuels including roots, grains, tubers and vegetable oils as feedstock. Nowadays, global biofuel consumption is dominated by ethanol derived from sugar and other maize crops. The palm oil starts to be used as an ingredient in biodiesel and as a fuel to be burnt in power stations to produce electricity. This is a fresh market for palm oil which causes the huge increase global

[2] Henry Ford originally designed the Ford Model T (1903 – 1926) to run completely on ethanol.

[3] The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change (UNFCCC) aiming in reduction of greenhouse gas emissions, especially carbon dioxide, methane and nitrous oxide.

demand for this commodity. By 2020 global production of biodiesel is expected to grow (Figure 16) and the major reason is because that many countries now have targets for converting to biomass-based fuels, including China, the EU, USA and Malaysia. This fact is going to cause a massive increase in demand of palm oil. As RSPO introduced in their report from January 2012, Indonesia has plans for 4 million hectares dedicated purely to biofuel production by 2015. The increasing demand for vegetable oil for biodiesel has had a strong influence on the strengthening of prices. However, palm oil has remained the lowest priced vegetable oil. Commercial production of biodiesel from palm oil is about to start in a number of countries in Asia where it will be sold on the domestic markets as competitor to conventional fossil diesel (RSPO, 2010 and Thoenes, 2006; Vermulen and Goad, 2006).

Alternative diesel fuels are technically competitive and offer advantages compared to conventional diesel fuel. Biodiesel is a renewable and domestic resource and reduces most emissions. However, there are still several problems including combustion, economics, some emissions, lube oil, low-temperature properties and contamination. Economic reasons have been one of the main problems in the use of biodiesel because it is more expensive than petroleum-based diesel fuel. For example, in the United States, a gallon of soybean oil costs two to three times as much as a gallon of classic diesel fuel (Knothe et al., 2002). On the other hand, the greenhouse gas emissions of palm oil have been estimated at 835 kg carbon equivalent. Rapeseed emissions were estimated at 1,562 kg and soybean at 1,387 kg (World Growth, 2011).

According to study by Fei and Teong (2008), palm oil, as the cheapest edible oil, has the economical potential to become the source of fatty acid methyl ester (FAME). FAME which is derived from various renewable oil sources has had the potentional to substitute petroleum-derived diesel oil. Moreover, the usage of fatty acid methyl ester has the benefits of lower aromatic content, lower sulphur content, higher heat content, renewability, biodegradability and other benefits. Rapeseed and soybean are the common feedstock for fatty acid methyl ester production in Europe and USA while Asian countries are exploring crude palm kernel oil and crude coconut oil as FAME feedstock. But, the study on converting palm oil to FAME is still very limited and being explored only in Asian countries – due to its availability. The commercial

production of biodiesel is via homogeneous transesterification which has a lot of limitations and compared to petroleum-derived diesel it has strong economical disadvantages, for example high costs (Fei and Teong, 2008).

As Darnoko and Cheryan (2000) pointed out in their paper "*biodiesel is produced by transesterification of large, branched triglycerides into smaller, straight-chain molecules of methyl esters, using alkali or acid as catalyst. There are three stepwise reactions with intermediate formation of diglycerides and monoglycerides resulting in the production of 3 mol of methyl esters and 1 mol of glycerol.*"

2.2. Trade with palm oil

Since 18th century palm oil has been exported from West Africa, mainly for industrial uses. Later, at the beginning of 20th century refinery techniques were improved and developed which supported palm oil to be used in food applications. According to Berger (2005), substantial availability of food grade palm oil had to await developments after the WWII. After 1950 the development of snack food manufacture on industrial scale opened up uses of palm oil because of its good ability to withstand the high temperatures.

Many countries plant and produce palm oil to satisfy their own consumption. Indonesia and Malaysia are unique because their production of palm oil is meant for export. The production of palm oil is very viable for these countries; palm oil has become a favourite cash crop to substitute traditional crops such as rubber. There are many countries involved in the palm oil production but only a few are net exporters of the commodity. The net exporting countries include countries where palm oil grows well to make it viable to produce the oil for export – only Indonesia and Malaysia. To secure their palm oil supplies most major buyers of palm oil products use the NIOP or FOSFA contracts. Palm oil prices are created in the terminal markets such as New York, Rotterdam and Kuala Lumpur. There is a network of dealers and brokers who are involved in facilitating trade in palm oil products. Moreover, some multinational buyer founded their trading offices in the producing countries and sellers participate in responding to tenders. It means that palm oil has been exported

through many channels to suit consumer needs. The developed countries of the European Economic Community (EEC), the United States and Japan used to be the major importers of palm oil. According to FAOSTAT, in 2009 Japan moved to 13th position in world's import of palm oil and United States to 8th position, as it is well seen in Figure 4**.** Many developing countries were able to import processed palm oil for direct consumption with minimal refining which helped to expand the palm oil market in these countries. The developing countries became the major consumers of palm oil accounting for 75 percent of the import trade by the end of the 1980s. According to Basiron, (2005) "*Many countries are facing chronic shortages of oils and fats due to shortfall in the domestic production in the face of increasing population and income. For these countries, the relative availability of palm oil provides a convenient source of supply."* (Basiron, 2005; Faostat 2010).

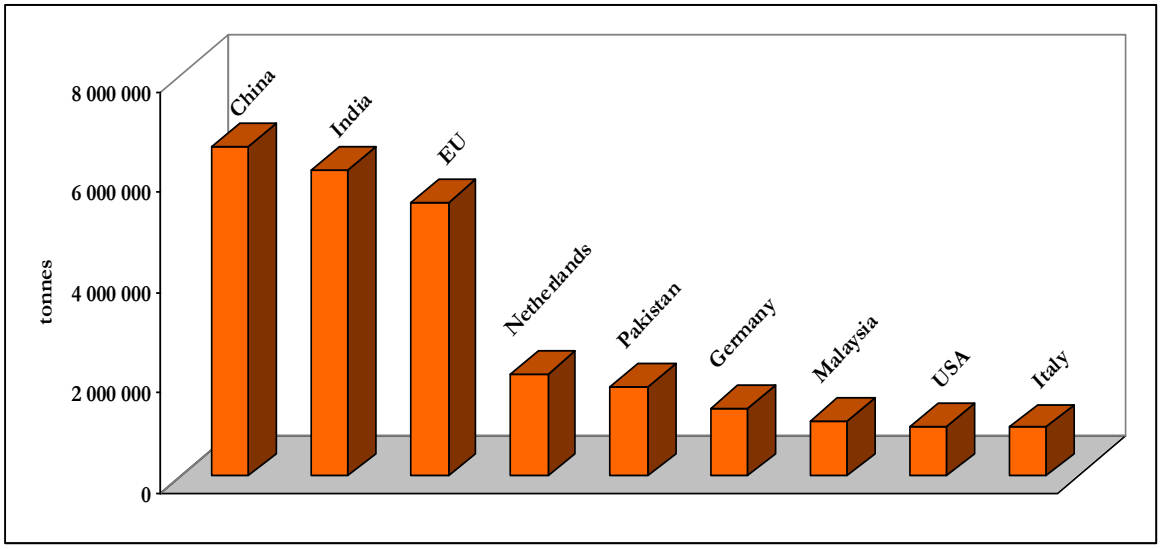


Figure 4
Top importers of palm oil in 2009
Source: Faostat (2012)

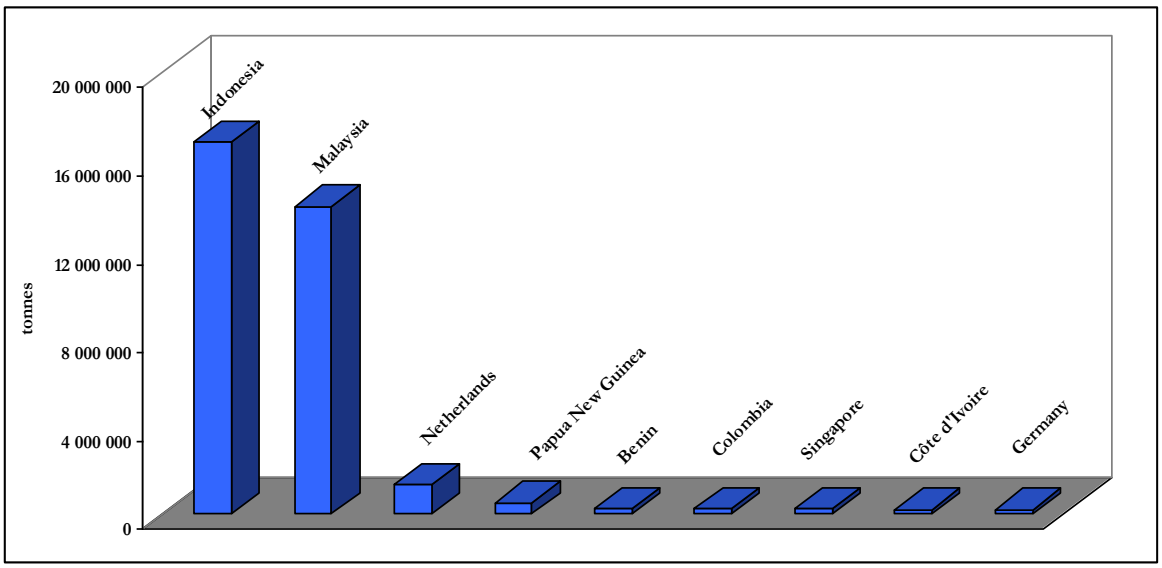


Figure 5
Top exporters of palm oil in 2009
Source: Faostat (2012)

2.2.1. Demand for palm oil

Demand for the palm oil increased in recent years as many economies are shifting away from the use of trans-fats. The world consumed approximately 6,5 kilograms of palm oil per capita annually in 2009 and by 2020, global consumption of palm oil is expected to almost 60 million tonnes. In 2010 palm oil accounted for 30 percent of the global production of edible vegetable oils. The general advantage of palm oil is its low cost and ability to substitute the unhealthy trans-fats. Moreover it is the most cost competitive vegetable oil for production of biodiesel (World Growth, 2011 and RSPO, 2010).

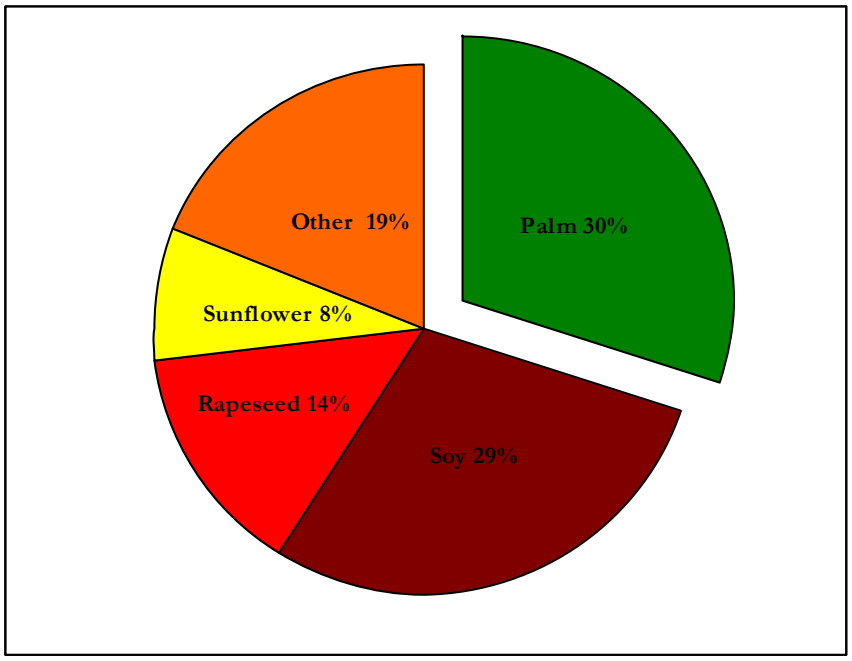


Figure 6
World's most produced vegetable oils
Source: Oil World (2010)

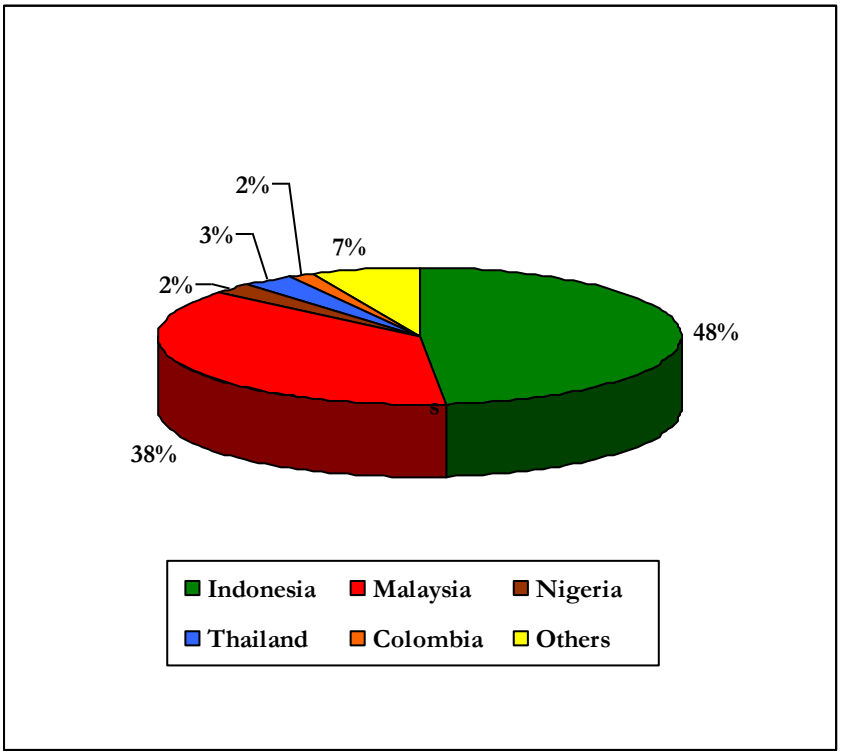


Figure 7
The major producers of palm oil in 2010
Source: Faostat (2012)

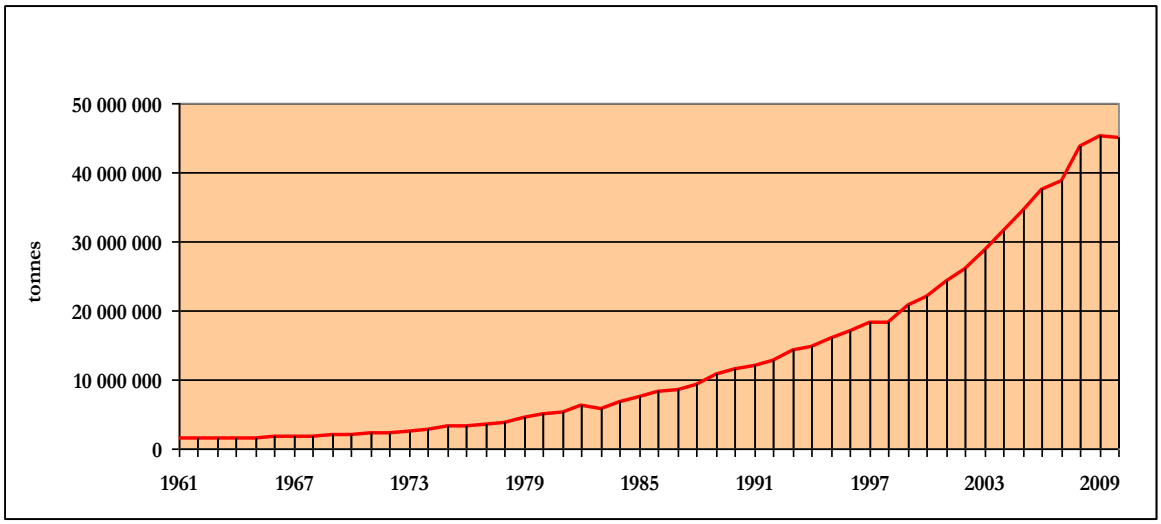


Figure 8
World's palm oil production between 1961 – 2010
Source: Faostat (2012)

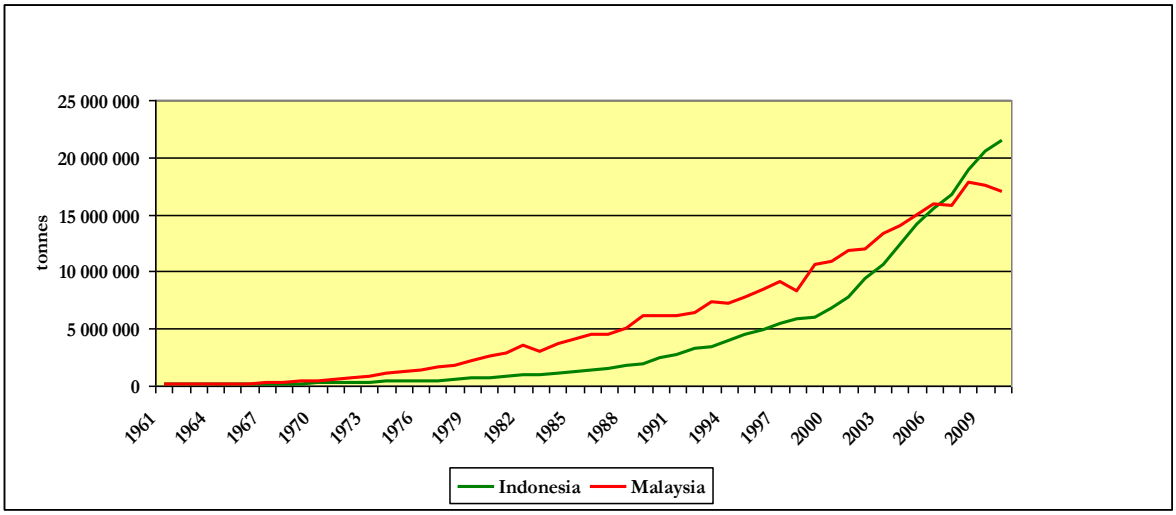


Figure 9
Indonesian and Malaysian production of palm oil between 1960 – 2010
Source: Faostat (2012)

The strong development of oil palm industries in many tropical countries has been motivated by its high positional productivity. The oil palm oil is a highly productive crop with an output-to-input energy ratio of 9:1 compared to 3:1 to other oilseed crops. Moreover oil palm cultivation uses less land to supply oils and fats for both food and non-food production, including biofuels (Basiron, 2007; FAO, 2002).

Modern palm oil industry lends itself to estates because of its positive response to bush and weed control, the need to process soon after harvesting and regular employment of labour force. One of the other reasons that palm oil is favoured plant is because of the regularity of income (Baumann, 2000).

Giving the growing interest for vegetable oils, demand pushes the world palm oil price up by about 10 percent in 2009/2010. According to FAPRI (2010), *"over the remaining projection period, the palm oil price keep increasing along with the other vegetable oil prices and reaches 957 USD per mt by 2019/ 2020."* In the face of price increases for vegetable oils, palm oil remains the most traded oil and the lowest-cost. The major producers are Indonesia and Malaysia, together accounting for about 85% of total world palm oil production[4] (Faostat, 2012). The major importers are China, European Union and India. The leading consumer is China and palm oil used for food consumption accounts for 56% of China's total palm oil domestic demand in 2010 (FAPRI Agricultural Outlook, 2010).

Indonesia surpassed Malaysia as the world's leader of palm oil production in 2006/ 2007 (viz. Figure 9)

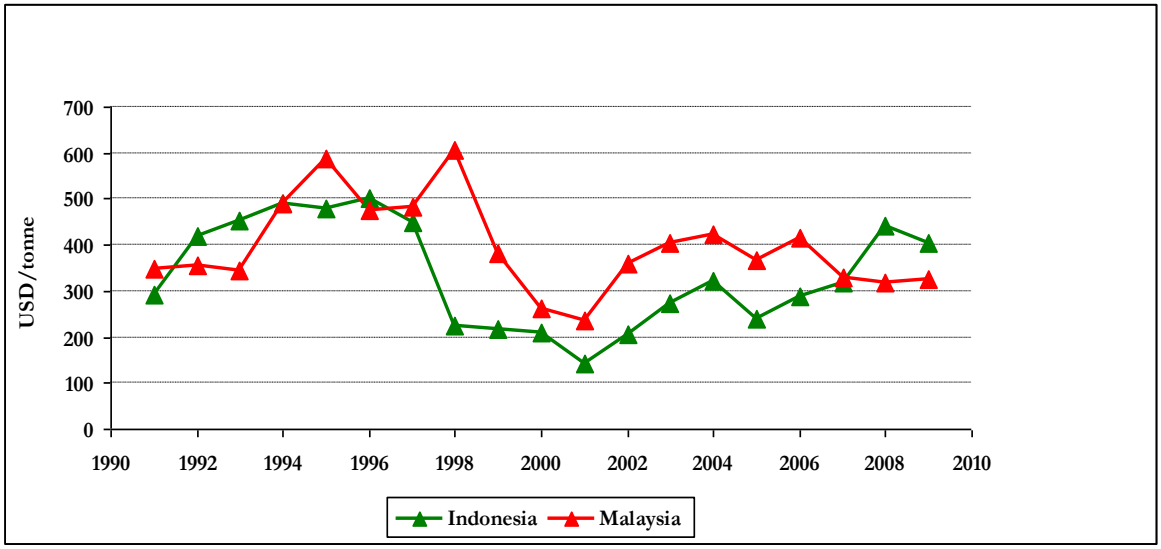


Figure 10
Indonesian and Malaysian prices of palm oil between 1991 – 2009
Source: Faostat (2012)

2. 3. Economic benefits of palm oil production for Indonesia

The palm oil production has experienced rapid growth in recent decades and has the potential to generate significant economic and social development in Indonesia. After rice paddy, palm oil is Indonesia's second most successful agricultural product and the largest agricultural export. As Goenadi (2008) says: *„economically, socially, environmentally, and perhaps politically the country has been affected by the unbelievable booming of this so called liquid gold commodity".*

Indonesia's GDP was estimated at USD 760,558 billion in 2010, classifying it as a lower middle income country (World Bank, 2010) and its population is expected to continue to grow at an annual growth rate of 0.57 percent to over 271 million by 2030 (UN DATA, 2010). The overall poverty in Indonesia has fallen from 17 percent in 2004 to 13.3 percent in 2010. However, this population of 13 percent lives above the national poverty line and approximately 53 percent of the population live in rural areas where the poverty is concentrated (ADB, 2010).

According to World Growth (2009), the palm oil has been an outstanding source of poverty reduction through downstream processing and farm cultivation. The Indonesian and Malaysian governments invested into biodiesel processing capacity by allocating 6 million tonnes of palm oil to the industry each year.[5] The majority of palm oil in Indonesia is placed in Sumatra Island with 80 percent of total palm oil production. In certain areas, palm oil is the dominant crop and it the largest contributor to economic development (World Growth, 2011). The palm industry provides employment for a significant number of people in developing countries. Goenadi estimates that employment connected with palm oil industry in Indonesia could reach over 6 million lives and help them to go out of poverty (Goenadi, 2008).

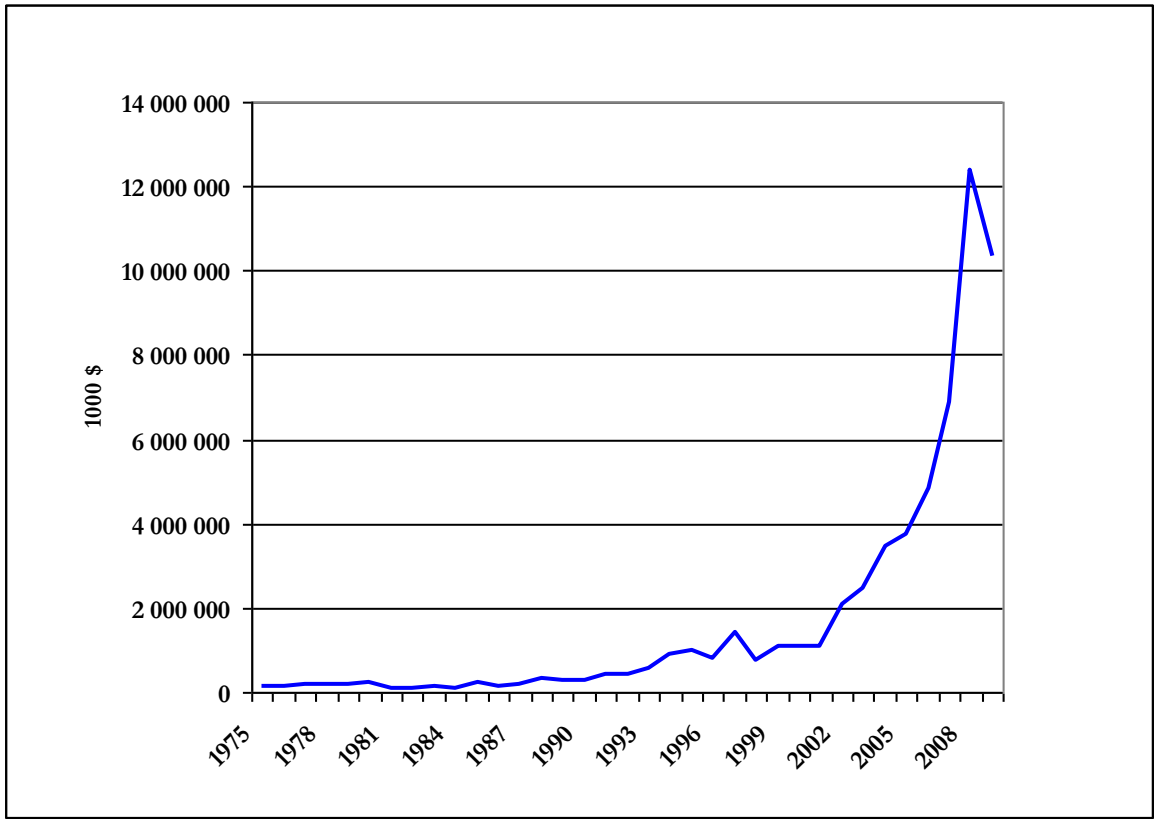


Figure 11
Export value of Indonesian palm oil between 1961 - 2009 (in 1000 $)
Source: Faostat (2012)

[5] The oil refiner in Finland (Neste Oil) built the world's largest biodiesel plant in Singapore.

2.4. Impacts on environment

Nowadays palm oil production in Indonesia and Malaysia is in the focus of the debates on many ecological issues such as carbon dioxide and other greenhouse gas emissions together with debate on deforestation and use of peat land. The oil palm has been strongly contributing a host of ecological problems, including deforestation, habitat destruction, endangered wildlife species, water, soil and air pollution and chemical contamination (CSPI, 2005).

ECD (2000) identifies the key environmental impacts of palm oil plantation:

• Ecological impacts due habitat destruction for species of fauna and flora

The palm oil plantations contribute both to land and aquatic based habitat destruction. Palm oil production inevitably leads to clearing of affected area which results in loss of natural habitats causing the significant ecological imbalances. These imbalances can create difficult conditions for survival of wildlife, especially small animals which are very sensitive to environmental changes. The monkeys, wild boar, rodents and porcupine are affected the most and the birds at minimal level because they can easily relocate and set up their new resident. The affected animals have to move to the nearby areas to find their new homes which means destruction of breeding sites of mammals. The clearing of forests negatively influence also aquatic life in terms of water flow, sediment delivery to streams, poor water retention and surface erosion which worse water quality (ECD, 2000).

• Air pollution

Oil palms produce high amount of volatile organic compounds which react with nitrogen oxides and form ozone. This causes breathing problems and damages plants. The measurement done by Lancaster University (2009) confirmed that the conversion of forested area into palm oil plantation increases volatile organic compounds and nitrogen oxides. They also point out that palm oil produce these compounds as a defence against environmental stress. The emissions in an area dominated by palm oil plantations may cause significant rising of ozone concentrations to level which is dangerous to human health (NERC, 2009).

• Water pollution due to usage of agro-chemicals

The usage of agro-chemicals such as pests control and fertilisers for palm oil plantations worse the water quality. The main elements of fertilisers, Nitrogen, Potassium, Phosphorus and Magnesium, have significant impact on water quality. On the other hand, impacts from usage of pesticides in palm oil plantations are minimal (ECD, 2000).

• Soil erosion due to land clearing having impacts to water

Palm oil belongs to major crops that cause soil erosion besides coffee, cotton, cassava, corn, rice, sorghum, tobacco, tea and wheat. It is generally assumed that level of soil erosion tend to increase when natural forest is changed to tree crop plantations. When natural vegetation is cleared, the exposed topsoil is often washed away by rain or blown away by wind. In the case of mature palm oil plantations, the soil erosion losses depend on slope of site and soil management practices. The disturbance of the tree canopy and litter layer results in increased rates of erosion and increased exposure of the soil surface (Hartemink, 2006; WWF, 2010).

2.4.1. Deforestation

The oil palms are often grown on newly cleared rainforest or peat land forests rather than on degraded land. The Indonesian's area planted with palm oil has grown over 30-fold since 1970s and covered 12.000 square miles. The monoculture replaced the high amount of species, trees, vines, mosses, shrubs and other plants, most animals cannot live there anymore. Its effect is a "biological desert" (CSPI, 2005).

A Google search (March 9, 2012) for "palm oil" and "deforestation" gave 1,510,000 references and views while "palm oil" and "biodiversity loss" yielded 119,000 which is more than 12 times less number [6] Most of the problems related to the debates over the impacts on environment and palm oil industry deals with deforestation. This topic is polarized with the pro-conservationists who consider the palm oil production as

[6] According to discussion paper about key sustainability in palm oil sector by Cheby Hai Teo the Google search in April 2010 gave 106,600 references in the first case and 23,700 hits in the second.

the major cause of deforestation and other environmental and social problems and pro-development side which considers the palm oil as crop that feeds the world (Teoh, 2010).

The area covered by forests in Indonesia has decreased by an alarming 19.7 percent over the past 20 years. The forest area, that in 1990 had disposed of 119 millions hectares of, had in 2009 just 95 millions hectares as it is well seen in Figure 12**.** Sodhi (2004) observed that Southeast Asia has the largest rate of deforestation of any major tropical area and estimates that Southeast Asia region could lose up to 42 percent of its biodiversity and three quarters of its original forests by 2100.

More than 84 percent of Indonesia's national greenhouse gas emissions increased from deforestation and land use change. From 2000 to 2005 deforestation averaged 0.71 million hectares per year and Indonesia became the second-most deforesting country, after Brazil and accounts for 27 percent of greenhouse gas emissions from land use and forestry (WRI, 2010).

Palm oil industry has been still expanding across the tropic areas, despite strong efforts of environmentalists to make people aware of its ecological damage. According to Wilcove and Pin Koh (2009), there is no single approach for dealing with the oil-palm crisis in Southeast Asia. The mixture of incentives, disincentives and regulations must be implemented at all sectors of the palm oil industry to protect rapidly disappearing forests in region.

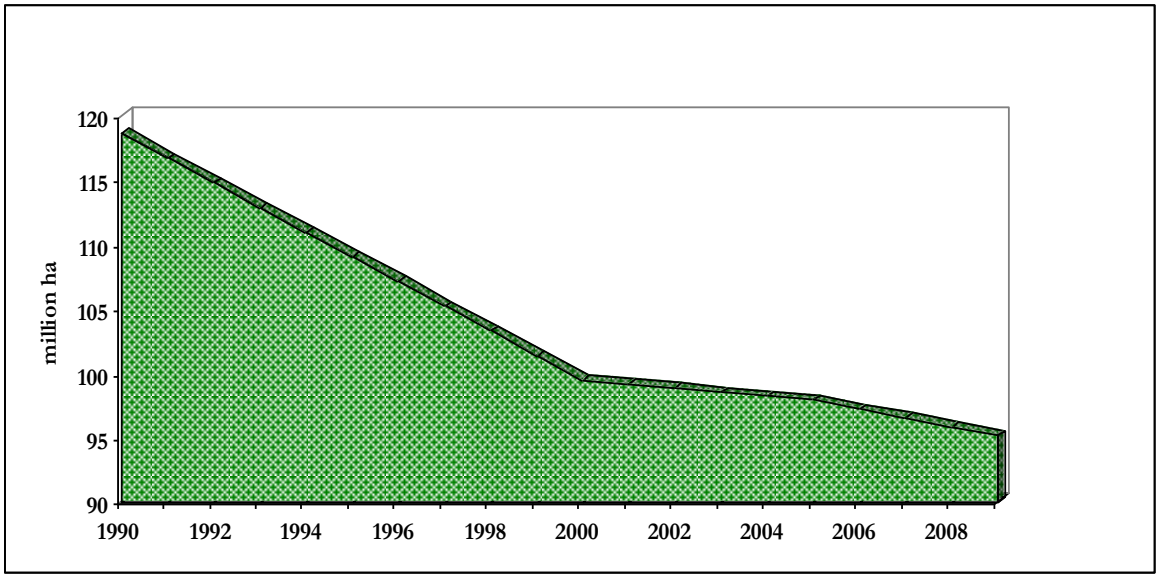


Figure 12
Forest land in Indonesia between 1990 – 2009
Source: Faostat (2012)

As Wangari Maathai, the Kenyan Nobel Prize Winter, says the main cause of deforestation is poverty. About 60 to 70 percent of forest is cleared by the poor people to secure fuel wood or to make space for housing (World Growth, 2011).

Under a deal signed between the Norwegian Government and Indonesian Government, the Indonesia engaged to two-year moratorium on new concession to clear natural forests and peat land to reduce greenhouse gases. Norway agreed to invest one billion USD in Indonesian conservation projects. According to World Growth (2011), *"after year period, the Indonesian government announced it would double palm oil production to 40 million tonnes by 2020."*

2.5. Palm oil Smallholders

Oil palm is big business. In Indonesia, private companies own half of the plantations and they are often part of large conglomerates. 44 percent of cultivated area belongs to smallholders, as it is seen in Table 3.[7] RSPO and most sources define the oil palm smallholders as farmers controlling 50 hectares or less of cultivated land.[8] According to discussion paper by Teoh (2010), three million smallholders are involved in the oil palm sector.

Smallholders and other local involvements in palm oil are not always voluntary which is important to remember. Sometimes local people may not choose when expansion of palm oil is so strong and presents the single way by government and the international donor community how to increase farmers´ income and feed their families. Small farms are mostly family-run, maybe market or subsistence-oriented. They can work manually or with machinery, use few or many external inputs. Large farms are market-oriented, can by family-run and use few or many labourers. Both of them can use the land extensively or intensively as well as they can use manual or machinery methods (Vermeulen and Goad, 2006; Vermeulen and Cotula, 2010).

Converting smallholder agriculture into a dynamic sector helps to efficiency of rural economy as a source of demand for growth in other sectors. The contractual arrangements may include a lot of actors, and they are often embrace multiparty arrangements with private plantations and local or transnational agribusinesses and with such organizations as the World Bank, CDC or USAID (Little and Watts 1994).

Smallholders are also holders of customary rights and perhaps also labourers on nearby plantations. There are several main structures of the relationship between

[7] In West African countries smallholders produce up to 90 percent of the annual harvest because they produce mainly for domestic and regional markets.

[8] In Malaysia the term „smallholder“ is more specific; Malaysian smallholder controls less than 40.46 hectares of cultivated land.

smallholders and the plantation companies; independent and supported smallholders:

• Independent smallholders are farmers who are free to sell to any mill which can result in pursuing higher prices. On the other hand, their market access is not assured. They cultivate palm oil without the direct support of the private sector or government. Unfortunately, the independent smallholders are mostly less productive; studies indentified that these farmers use own low-quality seedlings, harvest unripe fresh fruit bunches or maintain the old oil palms too long. If independent smallholders are able to invest to facilities, they have potential to get a great share of the value chain of palm oil.

• Supported smallholders have access to some degree of direct support of private sector or government but their productivity is often lower than that of plantation estates. The support can be provided by technical assistance, access to credit – pesticides and fertilisers on a loan basis. These growers are not free to sell to any mill as independent smallholders but they are generally tied to specific mills. The milling companies have favoured supported smallholders because their productivity comes close to productivity of large-scale plantations. There are written or verbal contracts between the smallholders and private companies or government including terms for calculating the mill price and guarantees of sales. This schema can be found in most of the major palm oil producer countries; Indonesia, Malaysia, Nigeria, Colombia and others. Nucleus-plasma (PIR), which is typical example of supported smallholder scheme in Indonesia, was supported by World Bank. As Vermeulen and Goad explain *"it is a grower schema in which plantation companies would develop palm oil plots for smallholders in a plasma area around their own plantation nucleus."* Nucleus-plasma schema resulted in nearly 900,000 hectares of palm oil smallholdings (Vermeulen and Goad, 2006; WBG, 2011).

	Advantages	Disadvantages
Independent smallholders	• low cost of inputs • free to sell any mill • able to pursue higher prices • able to shift labor between palm oil and other crops • involvement of family labor in production	• their market access is not assured • less productive • limited access to technology and credit • mills can consider them unreliable
Supported smallholders	• access to some degree of support - credit, technical assistance • they are preferred by mills • access to new technologies • market is assured	• farmers´ decision-making is limited • they are tied to specific mills • lower production than that of plantation estates • dependence on one crop • less flexibility in labor allocation and land use

Table 2
Summary of relative advantages and disadvantages of independent and supported smallholders
Source: Vermeulen and Goad (2006) and WBG (2011)

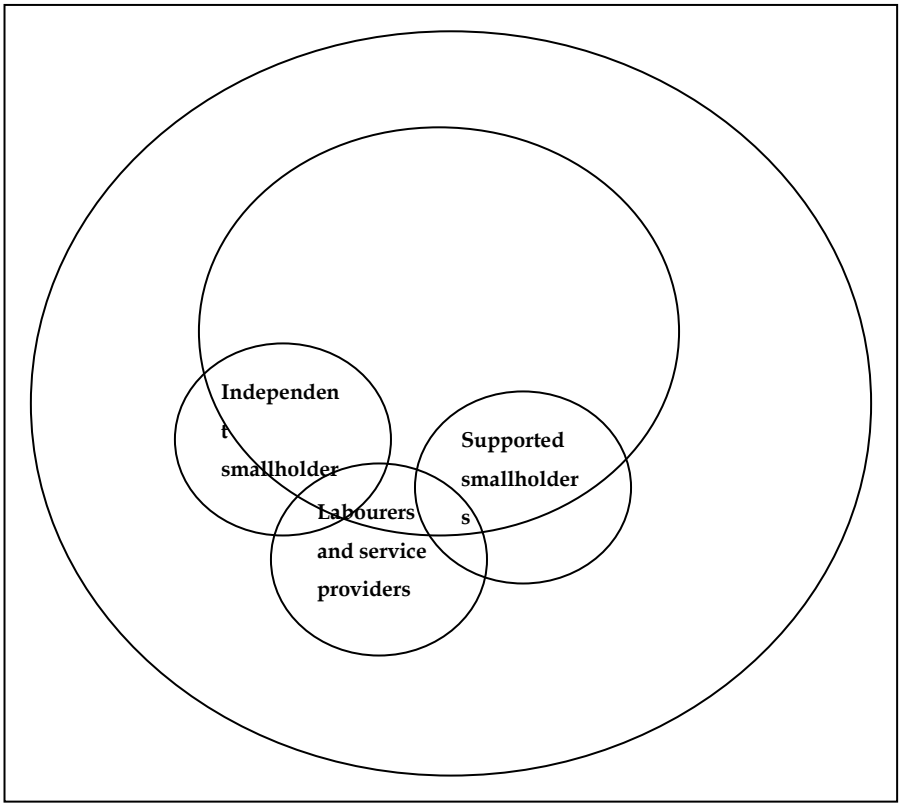


Figure 13
Venn diagram of local stakeholder groups in palm oil production areas
Source: Vermeulen and Goad (2006)

One of the factors which determine the profitability of palm oil is productivity and efficiency of smallholder's palm oil land. There are some reasons why their productivity can be unsatisfactory:

- problem with pest and pruning management and insufficient weed control
- the use of uncertified seed which results in production of unproductive trees
- inappropriate use of fertilizers because of lack of information and capital
- wrong distances between trees which results in poor yields (Papenfus, 2000).

As Vermeulen and Goad (2006) point out that, there are numerous problems and constraints that smallholders face while striving to maximize their potential of palm oil production.

• Ownership: There are often disagreements over land tenure. Responses to this problem are companies and government agencies which improve fairness and transparency.

• Access to information: the access to good technical, market and policy may sometime became a major difficulty therefore there are NGOs and international agencies which provide information services to farmers.

• Securing capital: interest-free loans for specified inputs could cover smallholder's expenses.

• Food security versus cash crops: Some flexible labour schemes for smallholders and labourers dealing with allocating of farmers´ time were introduced because some early palm oil developments deprived smallholders of sufficient time and land to feed their families.

• Market risk: Independent smallholders have to face risk from crop price fluctuations therefore national or internationally-indexed pricing standards and emergence of smaller-scale independent mills were formed (Papenfus, 2000; Vermeulen and Goad, 2006).

Country	Percentage of Area under Smallholders	Percentage of Production under Smallholders
Indonesia	44%	33%
Malaysia	41%	/
Nigeria	/	80%
Thailand	76%	/
Papua New Guinea	42%	35%

Table 3
Smallholder production in major producer countries
Source: Teoh (2010) and Vermeulen and Goad (2006)

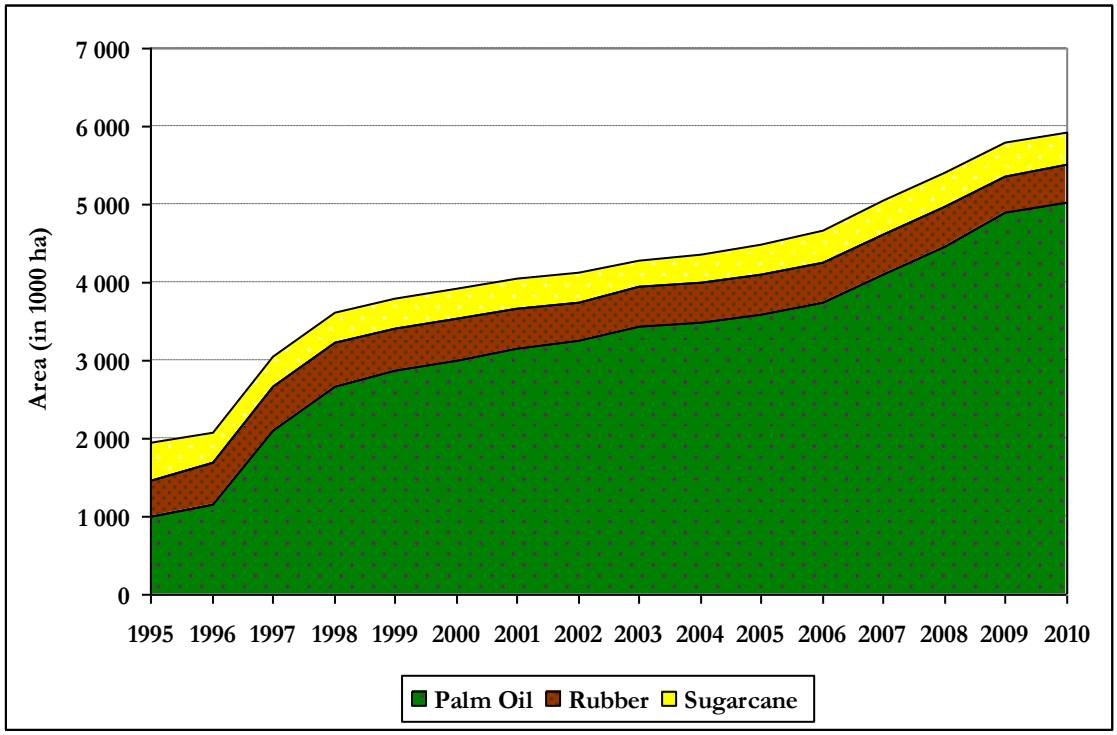


Figure 14
Estates Area by Crops in Indonesia between 1995 – 2010
Source: Badan Pusat Statistik (2012)

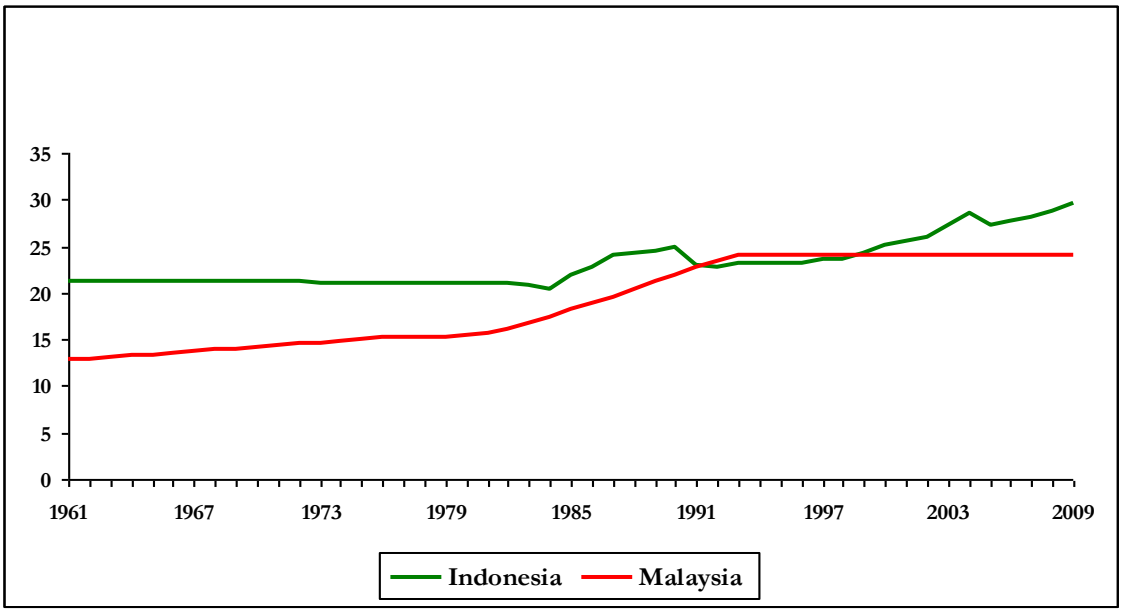


Figure 15
Agricultural land of total land in Indonesia and Malaysia
Source: World Bank (2012)

Oil palm production on Indonesian estates is usually organized on traditional basis. The president-commissioner, reporting to a board of part-time commissioners, is a head of big local and foreign concerns. There is a president-director who operates with a board of people holding important positions in the organization and daily management which is undertaken to him. The administration includes heads of departments, consultants, specialist visiting agents and technical staff. Individual production units are controlled by a manager or assistant who depends on size and regional operations are organized in subsidiary groupings, each supervised by a local manager. The organization of small-holdings is completely different to that of estates. Although plasma smallholdings[9] are developed in the estate structure therefore the plasma are planted by contractors. The separate plasma parcels are allocated to settlers who can hire others and operate them personally. But management remains under the nucleus estate (Barlow, Zen and Gondowarsito, 2003).

2.5.1. Challenges for palm oil smallholders

Vermeulend and Goad (2006) present six key topics which can became a great opportunities for palm oil smallholders and way how to increase their income and improve sustainable palm oil production.

► Biofuel markets

The global production and consumption of biodiesel have been still increasing; in 2009 world produced 17,179 millions of litres of biodiesel and by 2020 its production is expected to grow to 41 917 millions of litres. With the current increase rate the production of biodiesel in 2020 will have risen up to 144 percent of the world annual production in 2009 (OECD, 2009). This prediction could lead to a massive increase in demand for palm oil, especially in Indonesia. The expand of biofuel markets would certainly result in increasing of price of palm oil which could be a good opportunity not just for smallholders but for producers of palm oil in general. RSPO introduced in

[9] Ownership of land limited to 2 -3 ha per household

their report from January 2012 that Indonesia has plans for 4 million hectares dedicated purely to biofuel production by 2015.

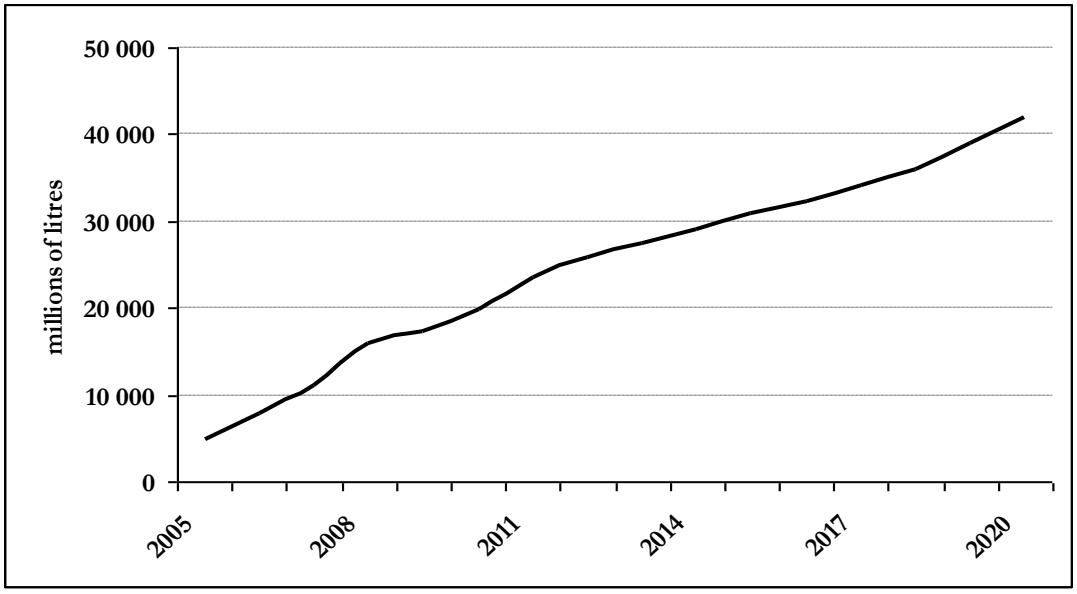


Figure 16
Expected production of biodiesel by 2020
Source: OECD (2012)

► Information and technology networks

Good access to technology, planting stock, technical advice, training and better loan terms for smallholders are the most cost-effective interventions available to large-scale companies and governments. The other important topic is the availability of reliable information. There is guidance for smallholders but it is not widely available.

► Organizations and associations

The existence of local and national organizations and alliances present a great advance for palm oil smallholders. They enable farmers the access to information, allow labour specialisation and help them to organize marketing and increase their incomes (Vermeulen and Goad, 2006).

GAPKI is the Indonesian Palm Oil Producers Association which settles in Jakarta, Java and was founded in Medan, North Sumatra in 1981. It helps to improve plantation management including sustainable oil palm plantations and supports the Indonesian government in establishing regulation on the environment. The organization also distributes information on environment protection (RSPO; 2010 GAPKI, 2010).

► Initiatives of consumers

From consumer's view there is just little demand for environmentally friendly palm oil products. The palm oil is not under consumers´ pressure as soy because genetically modified cultivars are not yet used in commercial production. However, the organizations deal with these issues and try to increase consumers´ awareness of sustainable palm oil products. In 2010 Greenpeace accused Nestlé Company from using palm oil, which is not sustainable, in their Kit Kat product certified as Fair Trade (Greenpeace, 2011; Vermeulen and Goad, 2006).

► Incentives of public policy

To help in development of palm oil industry, support smallholders productivity without creating strong incentives within the broader market and sustainability of palm oil, various steps are have been taken to develop through government policies. This support includes intergovernmental forest finance agreements, bilateral working with the Indonesian government, project with RSPO and with Chinese Chamber of Commerce and sustainability criteria for biofuels (Eppel, 2010 and Vermeulen and Goad, 2006).

► The Roundtable on Sustainable Palm Oil

RSPO is a non-profit organization set up in 2004 with the aim promoting development and use of sustainable palm oil products and implementing of global standards for sustainable palm oil production. These standards have been considered the world's strictest standards for sustainable agriculture production. Since 2008 the Certified Sustainable Palm Oil has been available. The organization unites all stakeholders of the palm oil industry – producers, traders or processors, consumers, manufactures, banks and investors, retailers and NGOs (RSPO, 2010).

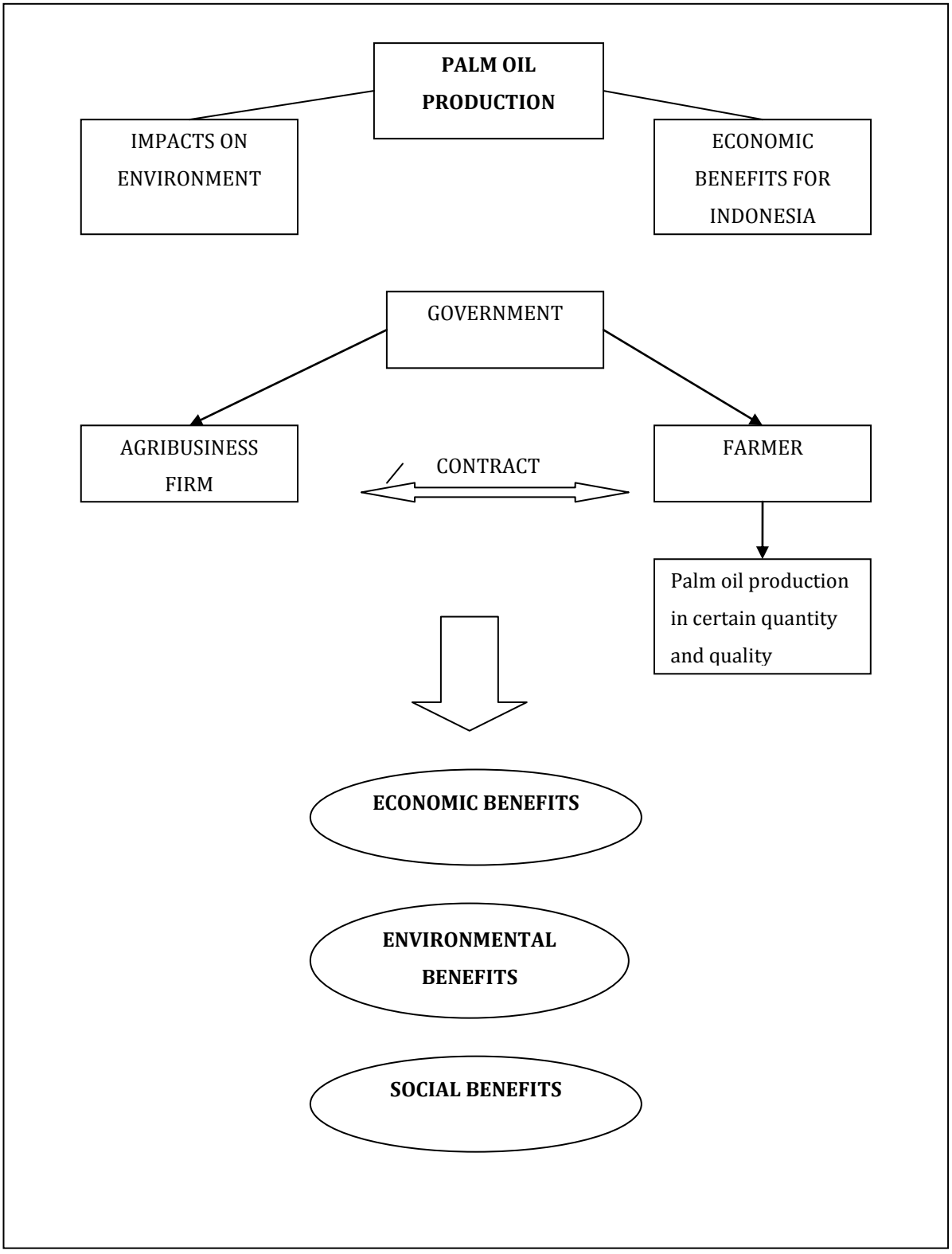
3. OBJECTIVE OF THE THESIS

The main objective of the thesis is to understand and analyze present situation of the whole palm oil value chain as well as land-use changes and particularly to identify the potential positive role of contract farming in poverty alleviation and environmental conservation.

Generally, the major purpose of this thesis is to determine whether contract farming may play a role in improving welfare and increasing of incomes of Indonesian smallholders and to identify opportunities for Indonesian smallholder farmers to participate in contract farming. The model may facilitate farmer access into beneficial contractual relationships and there is potential for expanding contract farming scheme among small farmers. In addition, the model of contract farming may be the way how to make the palm oil production environmentally sustainable and economically viable.

4. MATERIALS AND METHODS

4.1. Conceptual Framework



4.2. Study area description

Indonesia belongs to the largest archipelagic state in the world consisted of 17,508 islands located between two continents; Asia and Australia. The World bank (2012) classified Indonesia as lower middle income country with total population exceeeding 240 millions, which can be divided into two major groups: Malay ethnicity in the western region and Papuans originating from the Melanesian Islands. There are also specific ethnic groups such as the Javanese, the Sundanese and the Batak ethnicity. Indonesia presents the largest Moslem country in the world with its 85,2 percent of Moslem population (Embassy of Indonesia, 2012; The World Bank, 2012).

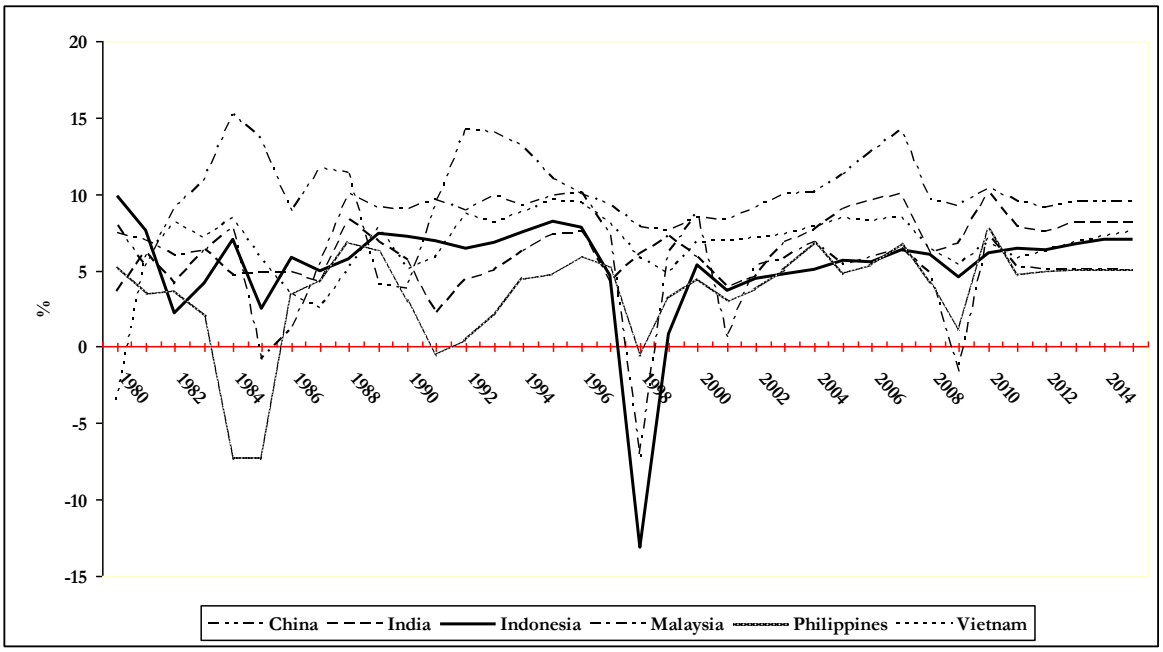


Figure 17
Annual GDP growth in selected Asian countries
Source: IMF (2012)

Agricultural is a central pillar of the Indonesian economy creating 15 percent of GDP. In 2009 the employment in agriculture was 40 percent of total employment. The country is ideal for growing a variety of crops both for export and domestic consumption. Indonesia is the world's producer of palm oil with its 21,5 million

tones of produced palm oil in 2010. Palm oil is the dominant crop as well as cocoa, rubber and coffee that are the most exported.. The Indonesian GDP reached 706,558,240,892 USD in 2010 (Faostat, 2012 and World Bank, 2012).

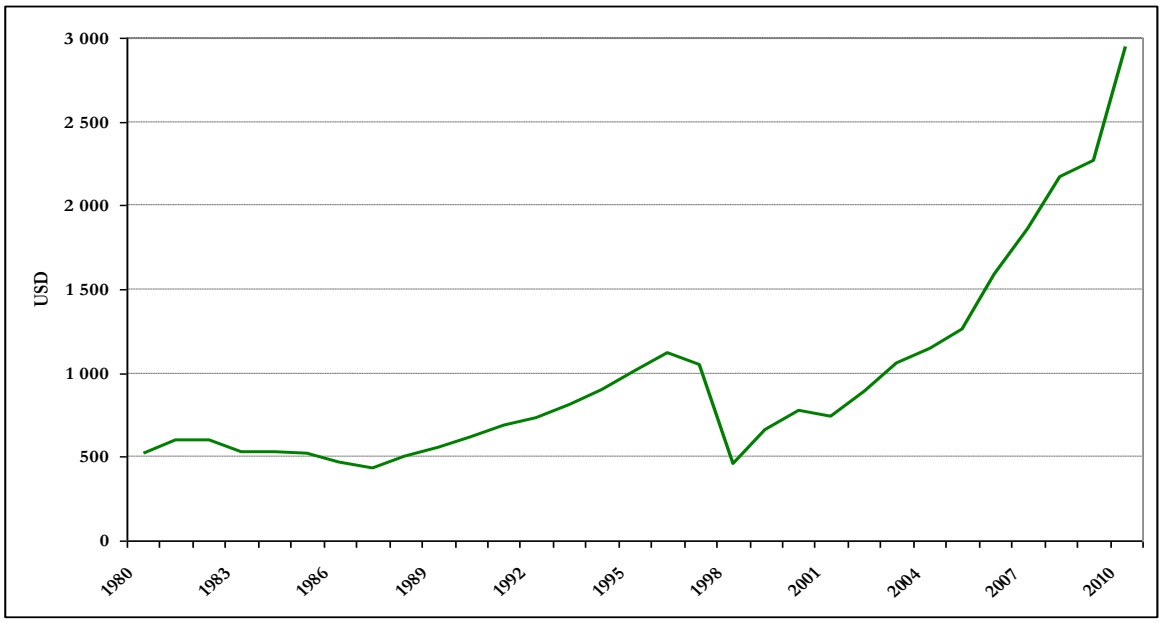


Figure 18
Indonesian GDP per capita between 1980 – 2010
Source: World Bank (2012)

4.3. Data collection

Data were collected from December 2011 to April 2012. They were gathered from scientific articles, reviews, symposiums of several agricultural organizations such as FAO or IFAD or OECD, books and other literature focused on the given topics. Faostat, the WBG, IMF or OECD serve as another important source of information, providing data necessary for the creation of tables and figures, both indicating the rate of evolution and the collateral impacts effecting not only Indonesia but the world as a whole.

Significant part of the articles and reviews used were obtained through the search engines of Google and Web of Science; inputs were many keywords, and their

combinations. Some of which are the following: Indonesia, palm oil, production, industry, crops, biodiesel, processing, environmental impacts, Indonesian smallholders, contract farming, functional contract farming, environmental impacts, and deforestation. Faostat had provided for data about the historical price and production evolution, import and export of palm oil. Data collected from the WBG provided necessary information about the Indonesia such as GDP, population as well as about the Indonesian agriculture production. Another important source for creating figures was OECD, especially for information about expected consumption or production of vegetable oils and biofuel in future. Most of the tables were based on knowledge gained from scientific articles and reviews or books listed in references.

5. RESULTS AND DISCUSSION

5.1. The potential role of agribusiness

Global demand for agricultural commodities and increasing technological capacity for higher yields make agriculture an attractive investment option. Especially for rural people, this fact creates a great opportunity to improve their living standards and increase their incomes. On the other hand, there are risk of losing land and mainly very serious environmental problems. Rural areas are often of poor governance and weak institutions which do not enable expansion of sustainable palm oil plantations. In this condition of unclear laws and chaos between central and regional governments it is difficult to find suitable investment climate. Sponsors can bring to the rural areas a lot of benefits such as capital, technology, infrastructure, market access or knowledge but local people can lose access to the resources on which they depend on such as land, water or wood. However, agribusiness can influence their suppliers to change their processes and be more sustainable through contract farming arrangements. These arrangements may also involve horizontal integration. Agribusiness do not provide just direct inputs but also support integration of various activities of smallhoders their community. There are two main models of agriculture production; spot markets and vertical integration. Spot markets means that commodities are bought on the open market and vertical integration that company controls the various stages of the value chain. The major role in business decisions about the degree of vertical integrating plays the distribution of risk (Jurgens et al., 2010 and Simmons, 2002; Vermeulen and Cotula, 2010).

Degree of vertical integration				
spot market		chain coordination		vertical integration
open market	purchase agreement	contract farming	management contracts	fully incorporated land and production
Types of business model				

Table 4
Business models at increasing levels of vertical integration
Source: Vermeulen and Cotula (2010)

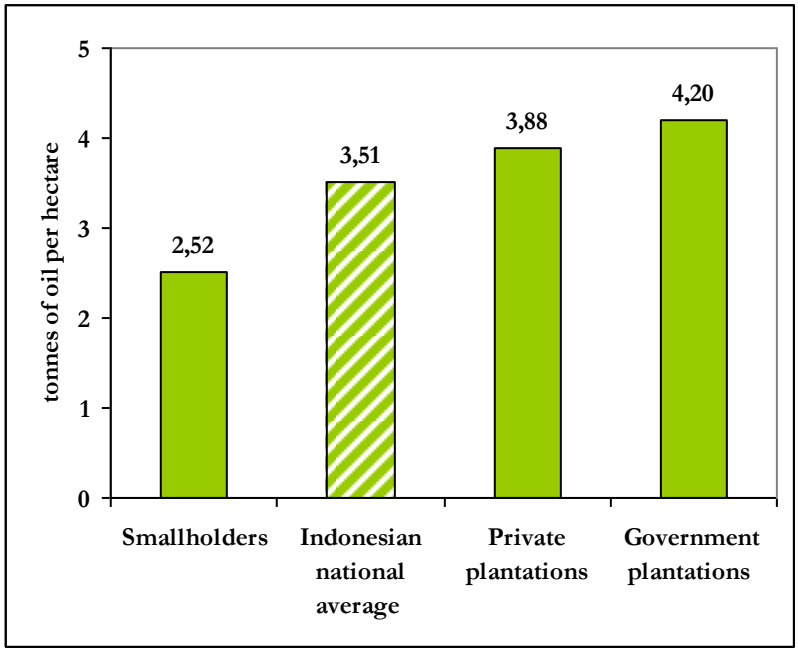


Figure 19
Palm oil productivity in Indonesia
Source: World Bank (2010)

5.2. Model of contract farming

In rural areas, markets are often poorly serviced and farmers cannot use the significant advantage of market access. Smallholders´ costs are very high because of market imperfections and it can be very difficult to get to market of technology

information. Contract farming can be potentially a way of overcoming of these problems. This business model has been applied in many developing countries and it may also provide significant benefits for Indonesian smallholders. The diversification in agriculture is focused on stabilization of employment and incomes in the farming sector. Contract farming pursues to achieve this diversification through lowering costs of production and promoting high value crops with better extension and raising returns by higher prices for the produce. The scheme refers to the production and supply of produce under advance contracts. This model is suitable for highly perishable and labor-intensive crops. Its essence is the commitment to provide a commodity of a time, price and quantity required by sponsor. On the other hand, the sponsor provides access to such critical inputs as fertilizer, hybrid seeds, insecticides, technical extension services institutional credit and access to profitable market which otherwise would be closed to the small farmers (Little and Watts; 1994; Singh, 2007).

The spread of contract farming varies in the world. According to World Investment report 2009 issued by UNCTAD, contract farming accounts for 100 percent of cotton in Mozambique, 75 percent of poultry production in Brazil, 90 percent of cotton, 50 percent of tea and 40 percent of rice in Vietnam, and 60 percent of tea and sugar in Kenya . Contracting is basically a way of allocating risk between farmer and sponsor; at first the risk of production and after the risk of market failure. The allocation of risk can vary widely; some contracts specify prices; in others agree to trade a certain volume of production (Baumann, 2000, UNCTAD, 2009).

Referring to the reviews of Little and Watts (1994) as well as Glower and Ghee, the most contract farming projects increase smallholders' incomes and contribute to their welfare, at least in the short term. However, as Baumann (2000) points out, there are many projects which fail after a season. The risk of contract farming has to be evaluated from a long-term perspective. The smallholders are often sheltered from risk at the beginning and get large salaries. After few years the sponsors may be unable to sustain these and can lower smallholders´ incomes.

The following SWOT analysis identifies the strong and weak sides of contract farming in relationship to palm oil production:

Strengths	Weaknesses
• favorable political acceptability • access to credit • access to critical inputs for domestic entrepreneurship • availability of technical and marketing advice, experience and agriculture extension • structural adjustment • tested production procedures • controlled palm oil production	• absence of legal framework • adverse environment • palm oil farmers´ unwillingness to adapt to new conditions • absence of basic equipment, technology and inputs needed for palm oil production • illiteracy of farmers preventing their proper understanding of sponsor's terms and conditions
Opportunities	**Threats**
• social development and poverty alleviation • development of public services (public transport, schools, hospitals) • reduction of environmental degradation • reduction of deforestation and soil erosion • changes in palm oil production procedures resulting in sustainable palm oil production and certifying of seeds • limitations of shifting cultivation	• production or market failure • selling out of contract • corruption • lack of transparency in the price determination mechanism • manipulation of quotas and production specification

Table 5
SWOT analysis of contract farming
Source: Based on da Silva (2005) and Simmons (2002)

5.2.1. Palm oil farmers constraints and risks

Sometimes palm oil farmers face to serious problems that may negatively affect their production in terms of quality, quantity or lack of experience. If farmer uses low-quality equipment, seeds and fertilizers, he can face problems not just with the quality of production but also with observing the terms. Smallholders who decide to enter into contractual relationship may also worry about the higher risk associated

with a business cooperation. Another major limitation is also the unavailability of new markets, thanks to which a farmer could achieve higher profits from palm oil production. All these problems and limitations can be solved by model of contract farming, as it is well seen in Table 6.

Palm oil smallholders´ constraints and risks	**Contract farming solution**
Poor-quality seeds and fertilizers	*Under the contract, the sponsor provide inputs, fertilizers or equipment to insure quality production of palm oil.*
Obsolete equipment	
Access to reliable information	*Technical and management advices are provided by sponsor to maximize productivity and avoid production or market failure.*
Access to market	*The sponsor enables farmers the access to new markets and channels which would otherwise be inaccessible for small farmers.*
Low productivity and quality from smallholders	*To improve quality of palm oil production the firm ensure trainings on technical or management skills.*
Fear from market or production failure	*The risk of market or production failure is allocated between both partners of contractual relationship. The sponsor provides farmers technical and management advice to reduce the potential risk of failure.*
Adverse environmental impacts	*The sponsor's supervision makes the palm oil production sustainable. The contract defines the way of production process which is not harmful to environment. The firm can also influence the palm oil production and implement the certifying seeds.*
High level of risk	*The risk is allocated (price and yield of palm oil) between smallholders and firm.*
Absence of legal framework and law	*The government should ensure legal framework and institutional mechanism to protect both parties of the contract.*

Table 6
Overview of palm oil smallholders´constraints and their solution from the side of CF
Source: Based on Sartorius and Kirsten (2006) and Patrick (2004)

5.2.2. Benefits of contracting to smallholders

Contract farming brings benefits and positive evaluations both for smallholders and sponsors. The decision to enter a contract can improve farmers´ welfare in terms of reducing risks, increasing of income or even gaining social prestige.

Many small palm oil farmers have minimal access to credit or they have no access to credit at all. If smallholders have possibility to get to credit, it is always under disadvantageous conditions such as high interest rates leading to high cost production. Farmers can also try to search credit from micro-lenders or agricultural banks but transaction costs are high. Contract farming offer possibility to provide smallholders credit from the sponsor if the firm is large and well established. The other problem is that palm oil smallholders have limited possibilities for managing risk. Under contract, smallholders´ risk is mitigated because the risk is allocated between both farmers and sponsors. Contracted farmers may also have access to markets which would otherwise be inaccessible for them. The sponsor has market knowledge, experience, information links and finance to sustain international trade relationships. From the smallholders´ view these opportunities are missing and these new linkages enable to expand farmers´ palm oil production in advantageous conditions. Most governments in developing countries provide agriculture extension services, especially about traditional crops in certain country. Unfortunately the government's information resources are limited. The smallholders under contract can get reliable information or technical and management advice the firm which is both technically and business well experienced (Simmons, 2002; da Silva 2005).

The Table 7 summarizes the major benefits associated with contract farming. This model brings many advantages for both actors of contractual relationship as well as to surroundings, farmers´ families and other rural people which is described in social benefits. The smallhoders and sponsors benefit from economic advantages introduced in the table and environmental benefits help to reduction of serious ecological issues, such as deforestation, biodiversity degradation or soil erosion.

ECONOMIC BENEFITS
• *improved access to markets* • *access to credit* • *assured prices* • *provided inputs (seeds, fertilizers etc.)* • *reduction of risk from market and production failure* • *availability of technical, marketing and extension advice*
ENVIRONMENTAL BENEFITS
• *limitations of shifting cultivation under the terms of the contract* • *reduction of deforestatin and soil erosion due to eco friendly measures introduces by agribussiness* • *sustainable palm oil production which does not cotribute to ecological problems + certified seeds* • *reduction of envrionmental degradation through consultation between farmers, management and extension stuff*
SOCIAL BENEFITS
• *farmers´higher incomes leading to ability to feed their families* • *improved access to food due to assured prices from palm oil production* • *higher amount of crops for subsistence* • *reduction of illiteracy due to higher incomes* •*development of public services (public transport, infrastructure, schools, hospitals)* • *general development of family and rural area*

Table 7
Summary of benefits resulting from contract farming in palm oil production
Source: Based on FAO (2002); Baumann (2000)

5.2.3. Contract farming and poverty reduction

Contract farming has been applied in developing countries for long time but its importance as a tool contributing to poverty alleviation has been reviewed in recent years. Obsolete equipment, poor-quality seeds and fertilizers, the unavailability of new markets and farmers' lack of experience may negatively affect the quality and quantity of their production. These factors have a negative impact on the

smallholder's income. Contract farming, where the sponsor can help farmers to overcome these constraints, becomes an opportunity for increasing of farmers' profitability and reduction of rural poverty. Table 20 identifies the major benefits resulting from contract farming and leading to poverty reduction.

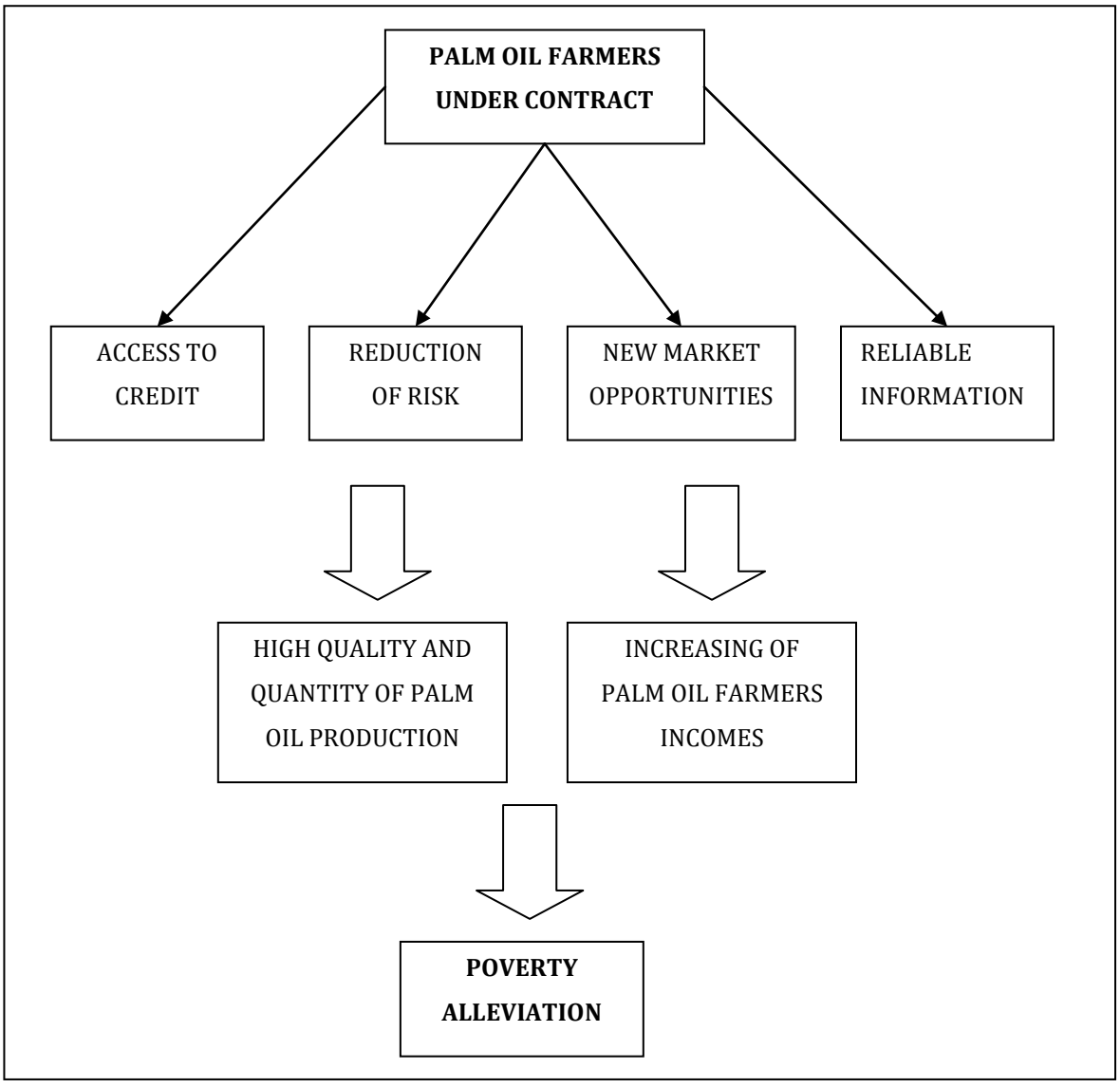


Figure 20
The major advances for palm oil farmers entering contract farming
Source: Based on Simmons (2002)

5.2.4. The contract farming and role of government in palm oil production

The major players of contract farming are two; sponsor and smallholder. However, there is the government which plays an important role in this arrangement as well. Political framework including institutional mechanism and laws of contract for local groups are necessary for making contract farming. The need to balance relationship between the parties and the reduction of transaction costs are the important steps for successful contracting. Mentioned areas create advantages and disadvantages for contracting parties including taxes, property rights, commercial licensing, and land tenure and labor relations.

The Indonesian Government should work in two levels in the field of contract farming, macro and micro. Providing extension services, training, arbitrating disputes are reforms which facilitate contract farming on micro level. Especially training such as accounting or cash management would help to reduce misunderstandings in contracts between farmers and sponsors. Macro efforts are focused on improving the commercial environment leading to reducing costs of contracting. Ownership rules, exchange rates, taxes and food security belong to the macro policies influencing contract farming. Stable exchange rate is very important for international contracting because earned revenues can be in one currency while costs can be incurred in another. Control over food priced and self-sufficiency are two instruments achieving food security in developing countries. Since smallholders may benefit from subsided farm inputs there is no conflict between contract farming and security policies (Patrick, 2004; da Silva, 2005).

5.3. Recommendation

The Indonesian government and non-governmental institution should consider contract farming as a way to support the economic and social development of rural community as well as mitigate negative environmental impacts of palm oil production. Because of these significant benefits, the contract farming should be strongly promoted by the institutions. One of the most important pre-condition of successful and functional contract farming is the availability of financing and

investments, e.g. public transport, roads, schools or extension services. Palm oil smallholders must have at first land, credit facilities, inputs and technology available to be successful actor of contractual relationship. The Table 8 provides an overview of the major recommended investments and investment related facilities required in contract farming. The Indonesian government and non-governmental institutions should also provide special training for palm oil farmers such as accounting or management to defend misunderstandings between the farmers and firms. One of the other requirements is that farmers should be willing to adapt to conditions required from sponsors. On the other hand, the firms should provide simple and understandable terms and conditions of contract for palm oil farmers which is very important for low intellectual standards areas.

Palm oil farmers	Private sector	Institutions (governmental and/ or non-governmental)
Land tenure	Land/plantation	Land provision, property rights to farmers
Credit facilities	Credit to farmers	Credit facilities/ micro-credit schemes
Inputs (oil palm seeds, fertilisers..)	Inputs to farmers (oil palm seeds, fertilisers..)	Public utilities and services; public transport, roads, telephones, electricity supply, water supply, hospitals, schools
Collecting, packaging facilities, transportation	Processing, distribution, export facilities	Climate favourable for investment (legal system, tariffs and tax systems, reliable market structure)
Technology, mechanization services	Technology, mechanization services to farmers	Extension services (education communation, technology)

Table 8
Recommended investments to successful contract farming in palm oil production
Source: Based on Eaton and Shepherd (2001)

Many case studies confirm that contract farming can be an effective mechanism to increasing of farmers´ incomes and reduction of rural poverty. Unfortunately, there are not many studies dedicated to contract farming in palm oil production. Table 9

presents contract farming practiced in various developing countries and on different types of production.

Subregion	Country	Production	Results	Source
South-East Asia	Thailand	Rice	*Contracted rice farmers are more profitable than non-contracted farmers, their profit increased more than 30 percent*	Setboonsarng et al. (2006)
South-East Asia	Malaysia	Poultry	*Poultry contracting scheme put considerable money back into rural sector and provided new market opportuinites for Malaysian smallholders*	Saminathan (2008)
South-East Asia	Bali	Seed Rice	*Smallholders who participated in the contract did not receive significant financial benefits from their participation. The seed rice contract had a relatively small effect on use of non-farm or female labour*	Patrick (2004)
South-East Asia	Lombok	Soybean, Corn, Rice	*There is a significant increase in household gross margins through participating in contract and there are no direct affect on use of family labour or off-farm work by family members*	Patrick (2004)
South Asia	India	Milk, Spinach, Broilers	*The study case confirmed a striking difference in the profits of contract and non-contract farmer, particulary in milk and spinach production. In the case of milk, the difference is more than double an 79 percent in spinach.*	Birthal (2009)
South Asia	India	Milk	*Contracted farmers received 70 percent higher profit over non-contracted farmers*	Birthal and Jha et al. (2006)
South Asia	India	Potato	*Smallholders under contract benefit from 143 percent higher profit compared to other smallholders*	Kumar (2006)

Table 9
Evaluation of contract farming applied in various developing countries
Source: listed in the Table

5.3.1. Proposed model of contract farming in the Indonesian palm oil production

Contract farming has become a common practice used not only in Asia but also in many other developing countries. Based on my study of the application in countries with similar conditions, I have put together the following proposal of a functioning model for North Sumatra.

Green Agro-Processing Company Ltd. (GAPC) is a private Dutch company founded in 1995. It deals especially with food production and it has leader position in Dutch market in production of margarines, milk fat replacer and cocoa butter substitute which are used in biscuits production. 60 percent of the company's products are consumed domestically and the rest is traded to some European markets; German, Belgium and Luxemburg.

GAPC has been using the palm oil in their food processing since 1998 because of its significant advantages; ability to be solid in room temperature, health benefits and first of all because of its cost-efficiency. In 1997 GAPC established contract with Indonesian middle-man about palm oil supplies including transport to Netherlands. One year later this contract was terminated because of cost-inefficiency of the deal.

The company is certified as eco-friendly Company by Dutch government and GAPC is aware of serious environmental problems connected with palm oil production in Indonesia. That is the main reason why the GAPC decided to implement contract farming scheme as business model in 1998. The contracts were signed with twenty-three market-oriented smallholders located in North Sumatra.

Under the scheme, farmers received inputs including fertilizers, seeds and technical training advice and stable price from GAPC. Sumatran farmer's price risk was significantly reduced because contract farming agreement did not determine purchase price through reference to market prices but to a fix amount. Contract farming proved attractive to local smallholders due to the increase of incomes and

training and new market opportunities. On the other hand, the company appreciated higher production reliability, less risk and cost-efficiency.

Palm oil production started to be supervised in contracted areas and production became sustainable due to ecological efforts by GAPC. In addition, because the cooperation with small farmers on sustainable palm oil production is politically well accepted, the GAPC received subsidies from Dutch Ministry of Agriculture and organizations dealing with sustainable agriculture production. GAPC´s products, marked as eco-friendly products by Chamber of Agriculture, reached better ranking in consumers food charts which positively influenced company's profit.

Critical data:
Population density: 96 people per sq km
Size of investment and landholding: unknown
Date of establishment: 1995

5.3.2. Success Factors

GAPC is seen as the successful company with leading position on Dutch agrifood market. The company received support from government and they are now active in asking for grant, borrowing capital and they have positive feedback from the local government. Currently, the company plan to expand their production of margarines, milk fat replacer and cocoa butter substitute to other European markets.

The reason for success as follows:

• The palm oil is unique product which can be used both for food and non food production including production of biofuels.
• Palm oil is easy to plant with high profit in compare to other vegetable oils.
• The local government plays an important role in dealing with conflict between GAPC and contracted farmers.
• The company committed to long-term investment and good finance source to widening of palm oil sector

• The terms and conditions of contract are simple which is very important for low intellectual standards areas.

• Palm oil farmers are willing to adapt to conditions required by the firm

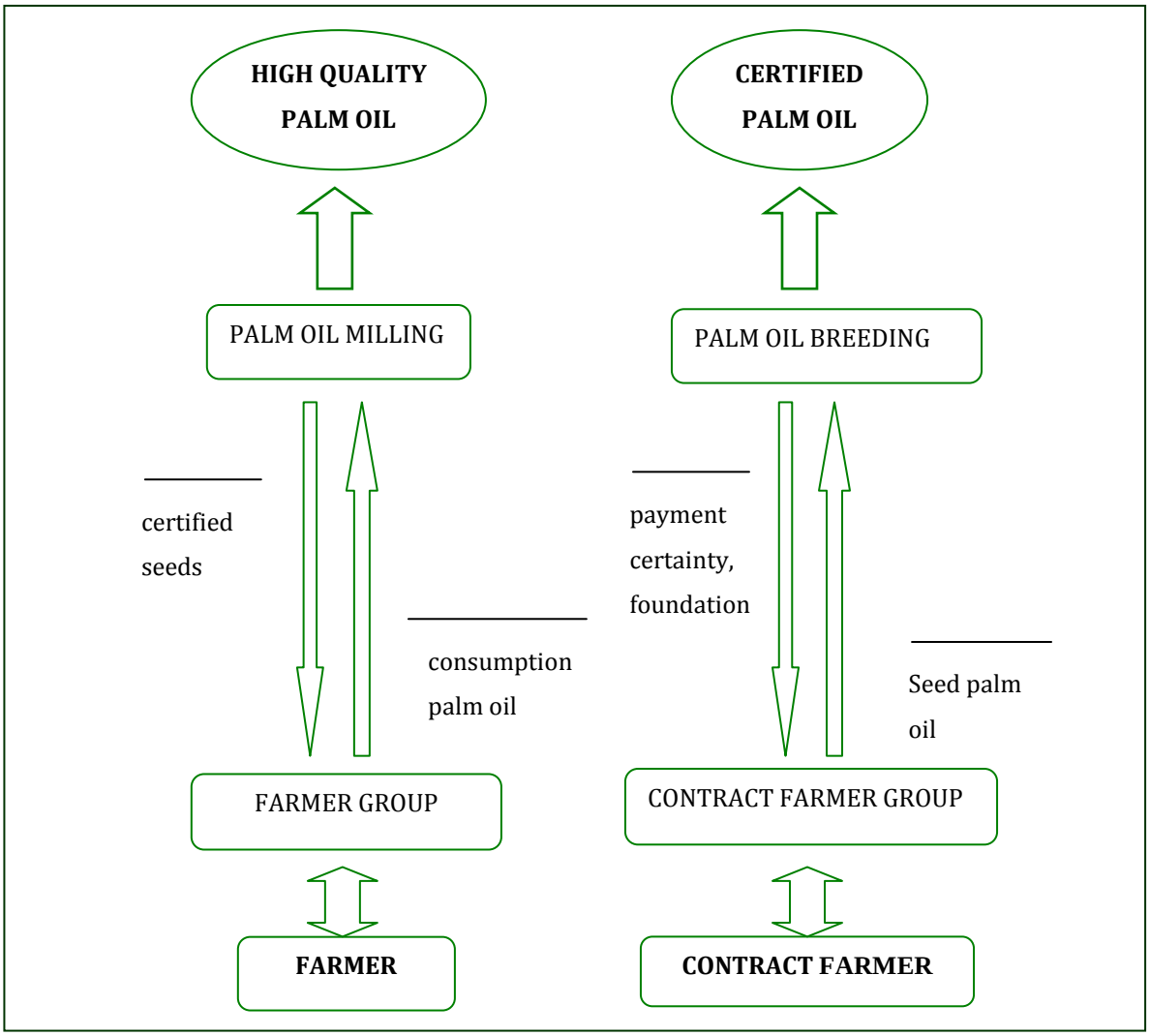


Figure 21
Contract farming system in palm oil production
Source: Based on Patrick (2004)

6. CONCLUSION

The main purpose of the thesis was to identify the current situation in the palm oil value chain, the land-use changes palm oil production accounts for, and further to present contract farming in Indonesia as a model producing significant economic, environmental and social benefits.

The thesis highlights the strong potential uses of contract farming in the Indonesian palm oil production in the following context:

1. Development tool resulting in poverty alleviation
2. Improvement of social conditions in the rural areas
3. Reduction of negative impacts of palm oil production on the environment

Contract farming provides palm oil small-holders an access to more stable and profitable business relationships. Entering into a contract clearly yields higher value and improves the farmers´ welfare; it increases their income and reduces the potential risks associated with raising a crop. The decreasing uncertainties improve their level of social prestige, and serve as a certain source of self-satisfaction. Furthermore, contract farming clearly facilitates farmers of the palm oil industry an access to new markets through their sponsor's knowledge, information links and the funding necessary to maintain an international trade relationship. Small-holders under contract also have the opportunity of obtaining a loan on preferential conditions, given that their sponsor is large and well established. The consequently higher capital levels provide access to such critical inputs as fertilizers, hybrid seeds, insecticides or technical extensions. An equal amount of value added comes to the small-holders with the access to reliable information or even management and technical advice provided by the large, established and most importantly experienced agribusiness firms. Contract farming is the most persuasive and in substance the safest of available answers to the existing market imperfections of the Indonesian

palm oil value chain; poorly serviced markets, their unavailability and an overall destructive inflexibility.

It is, however, important to keep the light focused not only on the potential economic benefits of contract farming to a single country. No less of attention deserve the serious environmental issues such as deforestation, uncontrolled elemental pollution and other aspects affecting Indonesia as much as humanity as a whole. We are confronted with a global scale issue, an urgent need for the definition of rules for the Indonesian palm oil production, contract farming provably stands in position of the fittest solution.

REFERENCES

Asian Development Bank: Fighting Poverty in Asia and the Pacific. [online]. [cit. 2012-01-24]. Accessible at: http://beta.B.org/main

Badan Pusat Statistik (2012). Statistics Indonesia. [online]. [cit. 2012-03-11]. Accessible at: http://www.bps.go.id/

BARLOW, Colin; GONDOWARSITO, Ria (2003) *The Indonesian Oil Palm Industry*. [online]. The Official Portal of Malaysian Palm Oil Board. it.

BASIRON, Yusof (2007). Palm Oil Production Through Sustaiable Plantations. *European Journal of Lipid Science and Technology*: *Special Issue: Palm oil*.

BASIRON, Yusof. *Palm Oil*, (2005). Bailey´s Industrial Oil and Fat Products, Sixth Edition, Six Volume Set.

BAUMANN, Pari (2000). *Equity and Efficiency in Contract Farming Schemes*: *The Experience of Agricultural tree Crops* [online]. London: Overseas Development Institute.

BERGER, Kurt G. (2005), *The Use Of Palm Oil In Frying*. Malaysian Palm oil Promotion Council.

BIRTHAL, P.S., JHA, M. et al. (2006) *Equitable intensification on smallholder market-oriented dairy production in India through contract farming*. Annex I of the IFPRI-FAO Final Report.

BP Statistical Review June 2011. (2011) Energy Academy and Centre for Economic Reform and Transformation, Heriot-Watt University.

BROWN, Ellie; JACOBSON F. Michael (2005). *Cruel Oil: How Palm Oil Harms Health, Rainforest and Wildlife.* Washington D.C.: Center for Science in the Public Interest.

CORLEY, R.H.V. a P.B.H. TINKER (2003). *The Oil Palm*. Blackwell Science Ltd., a Blackwell Publishing Company Editorial Offices, Oxford. (2003).

DARNOKO, D.; CHERYAN, M. (2000). *Kinetics of Palm Oil Transesterification in a Batch Reaktor*. University of Illinois, Department of Food Science and Human Nutrition, Agricultural Bioprocess Laboratory, Illinois.

DOUGLAS, Sheil et al. (2009) *The Impacts and Opportunities of Oil Palm in Southeast Asia*. Center for International Forestry Research [online]. [cit. 2012-03-11]. Accessible at: http://www.scribd.com/doc/77660459/30/Smallholder-palm-oil-production

EATON, Charles; SHEPHERD, Andrew W. (2001). *Contract Farming: Parthership for Growth*. FAO Agriculture Services Bulletin 145.

ECD (2000). Environmental Impact Assessment (EIA) Guidelines Oil Palm Plantation Development. State Environmental Conservation Department, Sabah. Malaysia.

EPPEL, Sara (2011). *Government's Role in Support Sustainable Palm Oil*. Department for Environment. Food and Rural Affairs.

Embassy of Indonesia, Prague (2010). Indonesia at a Glance. [online]. [cit. 2012-04-10]. Accessible at: http://www.indonesia.cz/indonesia-at-a-glance/

European Biofuels Technology Platform (2010). Biofuel Production. [online]. [cit. 2012-04-11]. Accessible at: http://www.biofuelstp.eu/fuelproduction.html

FAO (2002), *Small-scale Palm Oil Processing in Africa.* Agricultural Services Bulletin, no. 148.

FAOSTAT: Food and Agricultural Organization. [online]. [cit. 2012-01-24]. Accessible at: http://faostat.fao.org/default.aspx

FAPRI (2010). Agricultural Outlook. *World Oilseeds and Products*.

FEI, Yee Kian and TEONG, Lee Keat (2008), *Palm Oil as Feedstock for Biodiesel Production via Heterogeneous Transesterification: Optimization Study*.

GLOVER, David and GHEE, Lim Teck (1992). *Contract Farming in Southeast Asia: Three Country Studies.* Institut Pengajian Tinggi/Institute for Advanced Studies. Kuala Lumpur.

GOENADI, Didiek Hadjar (2008). *Perspective on Indonesian Palm Oil Production*. International Food and Agriculture Trade Policy Council.

Greenpeace (2010). Nestlé doesn't deserve a break. [online]. [cit. 2012-03-25]. Accessible at: http://www.greenpeace.org/international/en/news/features/Nestle-needs-to-give-rainfores/

HARTEMINK, Alfred E. (2006). *Soil Erosion: Perennial Crop Plantations*. World Soil Information. Wageningen.

International Institute for Environment and Development. [online]. [cit. 2012-01-25]. Accessible at: http://www.iied.org/

International Monetary Fund (2012). Data and Statistics. [online]. [cit. 2012-0-13]. Accessible at: http://www.imf.org/external/data.htm

JURGENS, Emile et al. (2010). *Environmental, Economic and Social Impact of Oil Palm in Indonesia: A Synthesis of Opportunities and Challenges.* Indonesia Oil Palm Synthesis - Discussion Paper.

KNOTHE, Gerhard et al. (2002), *The Use of Vegetable Oils and Their Derivatives as Alternative Diesel Fuels*. Oil Chemical Research. National Center for Agricultural Utilization Research. U.S. Department of Agriculture. Peoria.

KUMAR, P. (2006). *Contract Farming Through Agribusiness and state corporation*. Economic and Political Weekly, Vol. 41 (52).

LITTLE D., Peter and WATTS J., Michael (1994). The University of Wisconsin Press. *Living Under Contract*: *contract farming and agrarian transformation in sub-Saharan Africa*. London: The Board of Regents of the University of Wisconsin System.

Malaysian Palm Oil Conservation, *Palm Oil Plantation*. [online]. [cit. 2012-01-25]. Accessible at: http://www.mpoc.org.my/Overview.aspx

Mongabay.com (2008). Activism: rural communities in the Philippines oppose mining, palm oil. [online]. [cit. 2012-04-11]. Accessible at: http://blog.mongabay.com/2010/12/15/activism-rural-communities-in-the-philippines-oppose-mining-palm-oil/

Natural Environment Research Council (2009). Palm oil plantations can cause air pollution. [online]. [cit. 2012-01-25]. Accessible at: http://planetearth.nerc.ac.uk/news/story.aspx?id=561

OECD.Stat Extracts. (2010) [online]. [cit. 2012-03-11]. Accessible at: http://stats.oecd.org/Index.aspx

Oil World (2010). Oil World Annual 2010 Report. The Independent Forecasting Service for Oilseeds, Oils and Meals.

PAPENFUS, Michael M. (2000) *Investing in Oil Palm: An Analysis of Independent Smallholder Oil Palm Adoption in Sumatra, Indonesia*. Southeast Asia Policy Research Working Paper, No. 15.

PATRICK, Ian (2004). *Contract Farming in Indonesia: Smallholders and Agribusiness Working Together*. Australian Centre for International Agricultural Research. Canberra.

RSPO, About Palm Oil (2008). Factsheet. Roundtable Sustainable Palm Oil.

RSPO, The RSPO New Planting Procedure: ensuring responsible expansion by palm oil producers (2012). Information sheet.

RSPO (2010). [online]. [cit. 2012-03-11]. Accessible at: http://www.rspo.org/

SAMINATHAN, Sugumar (2008). *Sustainable Contract Farming for Increased Competitiveness: Case Study on Poultry Sector in Sarawak Malaysia*. National Productivity Corporation.

SANTORIUS, Kurt; KIRSTEN, Johann (2006). *Contracts and Contract Farming as Potential Mechanism to Improve Market Access for Black Farmers in South Africa*. University of the Witwatersrand and University of Pretoria.

SCRAGG, Alan (2009). *Biofuels, production, application and development* [online]. Cambridge: Cambridge University Press. Cambridge.

SETBOONSARNG, Sununtar et al. (2006). *Contract Farming and Poverty Reduction: The Case of Organic Rice Contract Farming in Thailand.* ADB Institute Discussion Paper No. 49.

da SILVA (2005). *The Growing Role of Contract Farming in Agri-Food Systems Development: Drivers, Theory and Practice*. Agricultural Management, Marketing and Finance Service. FAO. Rome.

SIMMONS, Phil (2002). *Overview of Smallhoder Contract Farming in Developing Countries.* University of New England, Australia.

SINGH, Sukhpal (2001). *Contract Farming for Agricultural Development and Diversification in Punjab: Problems and Prospects*. Indian Institute of Management, Ahmedabad.

SODHI, S. Navjot et al. (2004). *Southeast Asian biodiversity*: *an impending disaster* [online]. Elsevier. [cit. 2012-01-25]. Review. Trends in Ecology and Evolution. Vol. 19 No. 12.

TEOH, Cheby Hai (2010). *Key Sustainability Issues in the Palm Oil Sector.* A Discussion Paper for Multi-Stakeholders Consultations (commissioned by the World Bank Group).

THOENES, P. (2006). *Biofuels and Commodity Markets – Palm Oil Focus.* FAO, Commodities and Trade Division.

UNDATA: A world of information. [online]. [cit. 2012-01-24]. Accessible at: http://data.un.org/

VERMULEN, Sonja; GOAD, Nathalie (2006). *Towards Better Practice in Smallholder Palm Oil Production.* International Institute for Environment and Development.

VERMULEN, Sonja; COTULA, Lorenzo (2010). *Making the most of Agricultural Investment: A Survey of Business models that provide opportunities for smallholders.* FAO and International Institute for Environment and Development.

WILCOVE S., David; Lian PIN KOH (2010) . *Addressing the threats to biodiversity from oil-palm agriculture.* Biodiversity and Conservation.

World Bank. (2010) Data. [online]. [cit. 2012-04-12]. Accessible at: http://data.worldbank.org/

World Bank (2011), *Improving the Livelihoods of Palm Oil Smallholders: the Role of the Private Sector*. International Finance Corporation.

World Growth (2011). *The Economic Benefit of Palm Oil to Indonesia*. Palm oil Green Development Campaign.

World Growth (2009), *Facts on Palm Oil*, Palm oil Green Development Campaign.

World Resources Institute (2010). Forest Cover Loss in Indonesia, 2000-2005. [online]. [cit. 2012-03-09]. Accessible at: http://www.wri.org/map/forest-cover-loss-indonesia-2000-2005-starting-point-norwegian-billion-reduce-deforestation

World Wildlife Fund (2011). Farming: Soil erosin and degradation. [online]. [cit. 2012-03-09]. Accessible at: http://wwf.panda.org/what_we_do/footprint/agriculture/impacts/soil_erosion/

ANNEX

Annex 1: Tables and Figures

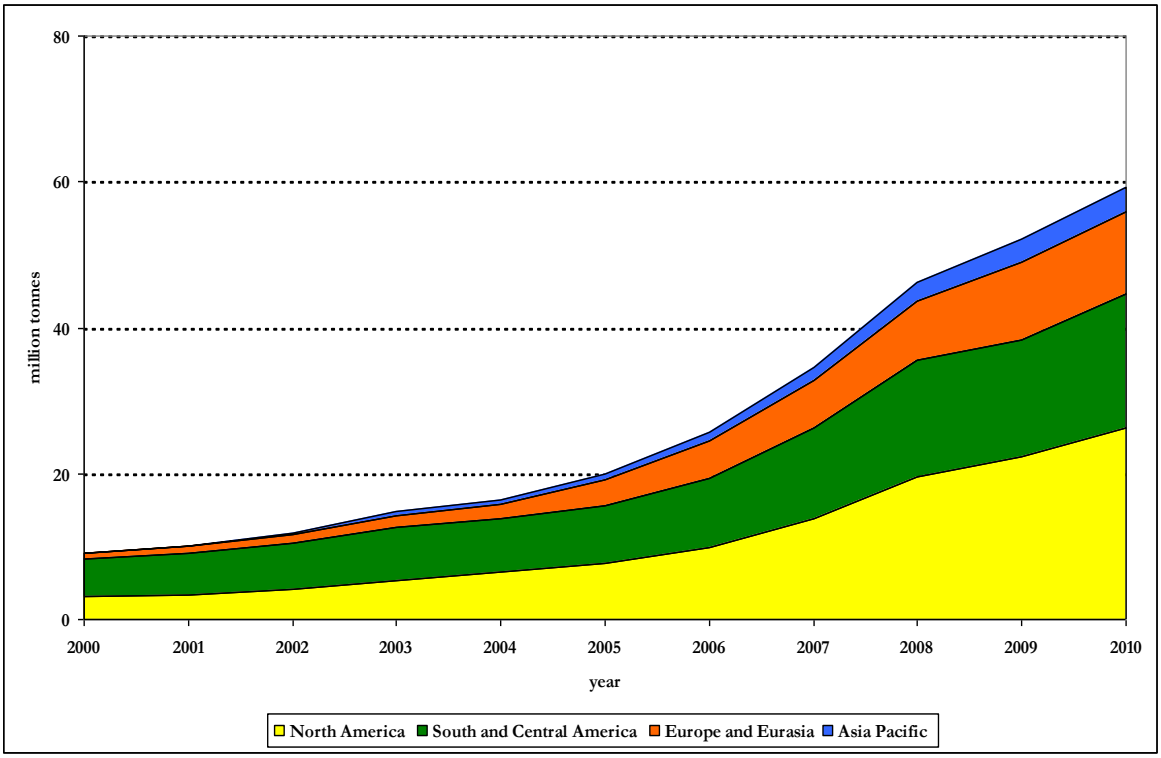


Figure 1
World biofuel production between 2000 - 2010
Source: BP Statisticical Review of World Energy (2011)

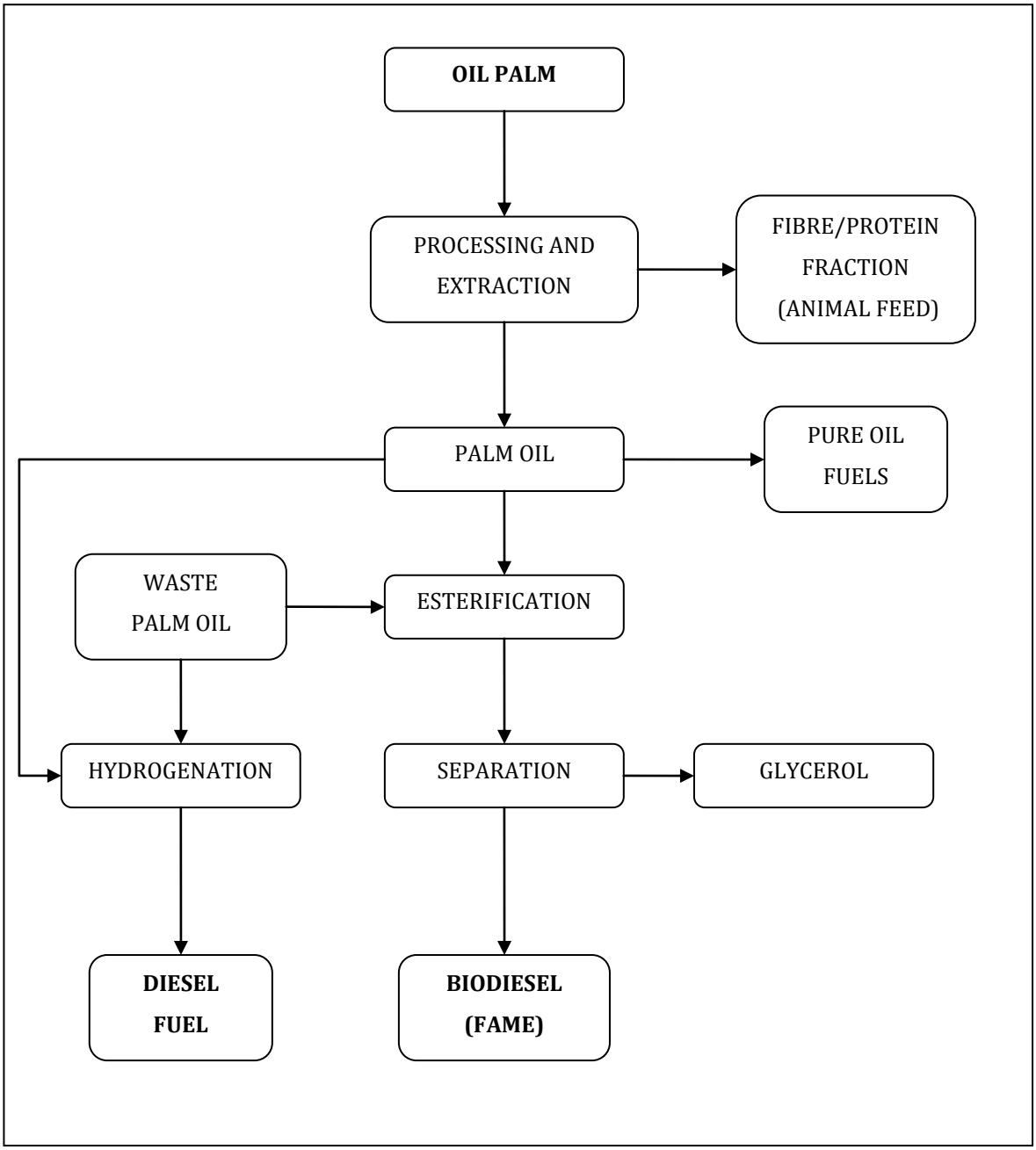


Figure 1
The production of biofuels from palm oil
Source: EBTP (2010)

Annex 2: Photos

Photo 1
Worker on palm oil plantation
Source: RSPO (2010)

Photo 2
Palm oil fruit cut in half
Source: Environmental News and Information – Mongabay.com (2008)