Economic Analysis of Oil Palm Plantation and Oil Palm Productivity in Effect on Per Capita Income in Indonesia

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List of Acronyms

BPS RI	Badan Pusat Republik Indonesia (Statistic Indonesia)
CPO	Crude Palm Oil
FAO	Food and Agriculture Organization
FAOSTAT	Food and Agriculture Organization Statistic
FEM	Fixed Effect
GDP	Gross National Product
GNP	Gross National Product
KEMENTAN	Kementerian Pertanian Republik Indonesia (Ministry of Agriculture Indonesia)
LSDV	Lease Square Dummy Variable
OLS	Ordinary Lease Square
REM	Random Effect Model
USD	United State Dollar ($)
VIF	Variance Inflation Factor

Abstract

Oil palm plantation was becoming the mainstay of agricultural commodities in Indonesia since last three decades. Indonesia as an equatorial country with 147 million hectares of forest area has a great potential in the development of oil palm plantations as a weapon in increasing per capita income especially in rural areas. However, it cannot be denied that expansions of oil palm plantations bring negative effects, especially in relation with environmental issues and conservation of biodiversity.

This study conducted in order to understand the effects of oil palm plantation and oil palm productivity on per capita income in the region and national level in Indonesia. This study uses panel data at provincial level which consists of 23 provinces in Indonesia in the vulnerable period of 9 years from 2003 to 2011 in annually data. The region level is divided in 5 based on the similarity of provincial location in same island in Indonesia.

The results showed that oil palm plantation did not significant in effect the per capita income in Indonesia. In region level, oil palm plantations gave significant effect on per capita income in the opposite relationship and this effect was represented by all across regions. Oil palm productivity is significant in effected on per capita income at national level with positive relationship. However, oil palm productivity did not give significant effect in representation across regions in Indonesia. According to these results, this study concludes that expansion of oil palm plantations do not significant in increasing per capita income. Increasing of oil palm productivity becomes more reasonable way in increasing per capita income in Indonesia.

Relevance to Development Studies

Indonesia has a huge opportunity to develop oil palm plantations as a tool to increasing per capita income. Expansion of oil palm plantation in forest areas was continuously happening. Despite being an opportunity, this expansion also bring negative effects especially on the environment and biodiversity.

The purpose of this study is to understand the effects of oil palm plantation and oil palm productivity to per capita income in Indonesia. This analysis will contribute to the Indonesian government as a consideration in agricultural and forest management especially in land use.

Keywords

Oil palm plantation, oil palm productivity, per capita income, poverty, Indonesia

Chapter 1
Introduction

1.1 Background of the Study

Oil palm plantation has become a major agriculture commodity in equatorial countries, especially in Southeast Asia. This sector has significantly contributed to the economic not only creating jobs in rural areas but also increasing income of farmers and rural people. Investment in oil palm plantation has also accelerated development of rural population. Development of infrastructures supporting in oil palm plantation like road, electricity, water, housing and others can speed of rural development. On the other hand, expansion of oil palm plantation also raises the problem of environment. Conversion of forest to oil palm plantation becomes crucial issue in producer countries today.

Oil palm plantations became the most dominant commodities in the agricultural sector in Southeast Asia especially Indonesia and Malaysia in last 4 decades. Increase on demand followed an increase in the world market price for crude palm oil as a raw material for industry. Oil palm became a major agriculture product. Although there was fluctuating in prices in 1998 and 2008, Cif-Rotterdam[1] noted the price of palm oil is likely to rise. In 1998 the lowest price is 234 USD per tonne and increased to 1.249 USD per tonne in 2006. Even in 2011 it decreased to 1000 USD per tonne, the price of crude palm oil tend to increase (Robinow R.M. 2013). Recorded by Koh and Wilcove (2009:3-4) contribution of palm oil production in Malaysia and Indonesia in 2004 is 6.3 million USD and 4.1 million USD. This value is equivalent to 5.6% and 1.7% of the GDP of each country in the same year. Statistics Indonesia (2013) also recorded that the contribution of plantation sector in Indonesia rose sharply from 0.4% of GDP in 2004 increased to 5.08% in 2012 and mainly product is oil palm.

Triggered by an increasing price of CPO since the last three decades, expansion of oil palm plantation has been inevitable. Indonesia and Malaysia are the world's largest producers of palm oil. These two countries are supplying more than 80% of the world palm oil. With more than 6 billion hectares of oil palm plantation in 2004, Indonesia and Malaysia became producer countries that dominate the world market of CPO. They were sifting dominance of Nigeria after more than five decades (Koh and Wilcove 2007:993-994). Oil palm plantation expansion is on a massive scale both in Indonesia and Malaysia since the

[1] CIF Rotterdam is the price list of CPO that published by REA company base in UK. This website is updating the list of CPO price where is become a base price for some small seller or broker of PO in Indonesia and Malaysia to offer the price to their costumer.

last three decades. Indonesia had only 1 million hectares of oil palm plantation area in 1995 and increased more than five-fold to 5.4 million hectares in 2012. At the same period production of palm oil increased 5-fold from 2.4 million tons in 1995 increased to 14.5 million tons in 2012 (Statistics Indonesia. 2013).

Oil palm plantation not only gives significant contribution on agricultural sector but also becomes an effective weapon in reducing poverty by stimulating and accelerating development in rural areas. Many evidences can be delivered that oil palm plantation gives positive effects on increasing income in rural areas. Providing permanent employment in oil palm plantation and industrial activities can stimulate economic activities and reduce poverty in rural area. Palm plantations also provide opportunities for local farmers and residents to get a larger fixed income. Development of oil seed processing industry that is integrated with plantation areas makes job opportunities for the local community (Chomitz and Buys 2007:27-30). Success story of Malaysian Government in resettlement of rural landless programme to expansion oil palm plantation in smallholder became the key role of poverty reduction in rural area. The poverty in the rural areas declined to 10 % only in seven years from 21.8% in 1990 decreased in to 11.8% in 1997. (Simeh et al. 1970:6, Brockington et al. 2008). Malaysia's oil palm plantations also provide more than half a million of direct employment in rural areas (Koh and Wilcove 2007:994).

Developing oil palm plantations gives opportunities of investment in rural areas. Establishing large plantation by companies will push of investments in rural areas. It will have an impact on giving a boost to the economy and infrastructure development in rural areas. Providing road, electricity, water, housing, school, medical facilities, transportation and communication by palm plantation companies can support the government in accelerating the development of the rural areas (Koh and Wilcove 2007:993). Easy access to transportation, education, markets, and health has an impact on economic activity in the village and will reduce poverty naturally.

On the other side, the dilemma of expansion oil palm plantation happens when it is correlated with environment issue. The International Tropical Timber Organization (2006, p. 46) in (Chomitz and Buys 2007:57) described the dilemma facing sustainable forest management: in alternative land uses, usually involve a much more intensive use of the land and more profitable. In Sumatra, for instance, management for non-timber forest products employs 0.3 people a hectare per year and returns a net present value of just 5 USD per hectare, while oil palm cultivation employs 108 people per hectare per year and returns 114 USD per hectare.

Oil palm plantations contribute significantly to the economy, but it is also has a negative effect on the environmental and biodiversity conservation. The expansion of oil palm plantation has been possible by converting natural forests, especially in forest concessions. Study in tropical countries stated the development of the agricultural sector forced an increase in the needs of agricultural

land by natural forest conversion (Barbier and Burgess 2001:429). FAO[2] also noted that Indonesia and Malaysia during the period 1990-2005 expanded its oil palm plantation from 56% and 55-59% with the conversion of natural forests. Many other reports published related to the conflict of oil palm plantation in terms of natural and biodiversity conservation.

Indonesia as the biggest producer of CPO gets many benefits from establishing oil palm plantation, but as a country with fast forest degradation, it has a problem. Indonesia is a tropical developing country with majority of its population living in rural areas. To reduce poverty, developing the agriculture sector is mandatory. On the other hand, Indonesia with more than 147 million hectares of natural forest is becoming the important country in conservation of natural and biodiversity in the world. Oil palm plantation is mono-crop plantation that the make limited species can life rather than natural forest. Land forest clearing by burning had performed in the conversion and it is not only destroyed the environment but also eliminated and fragmented biodiversity (Fitzherbert et al. 2008:539-543).

Indonesia has a big opportunity to develop oil palm plantation in order to reduce the poverty and increase development in rural area. Nevertheless, in exploiting this opportunity it should take into account the environment issue. Therefore, study to understanding the effect of expansion oil palm plantation and oil palm productivity in Indonesia is become mandatory. This study is important to answer the question that it is true or not developing oil palm plantations and increasing oil palm productivity can give positive impact in reduce the poverty in rural areas by increase the per capita income.

1.2 The Research Objective and Questions

This study is conducted to determine the economic impact of development oil palm plantations in Indonesia (23 provinces). The economic influence is focus on per capita income at national and region levels. To achieve the objectives of this study, the research question will focus: Does establishing oil palm plantation and increasing of oil palm productivity have significant effect on per capita income in Indonesia and this effect can mediated in different across regions in Indonesia?

[2] The data refer to FAO Statistic (FAOSTAT) website available online on 23 July 2013 at http://faostat3.fao.org/home/index.html

1.3 Hypothesis

The hypothesis is the establishment of oil palm plantation and increase of oil palm productivity would give a positive effect on per capita income in Indonesia and this effect also can mediated by all different across region in Indonesia.

1.4 Limitation Research

The limitation of this research related to the data being used. This research fully uses secondary panel data provided by the institutions related to the research. Study using panel data usually need long period time to obtain satisfactory results. Because of the limitation of the availability of data sources, this research uses only nine years annually data form 2003 to 2011. Some data are also not fully complete especially data from West Papua province as the new provinces in Indonesia. The missing data in West Papua are data of oil palm plantation and oil palm productivity in 2003 as priority variables and also data of four controls variables (population, illiteracy rate, number of poor people, and open unemployment rate) from 2003 to 2005.

1.5 Organization of Research Paper

This research paper is divided into five chapters. Chapter 1 is introduction which covers of background, research question, objective research, hypothesis and organization of research paper. Chapter 2 contains of literature review which explains theoretical framework and empirical evidence from previous research. Chapter 3 consists of data and methodology. Chapter 4 discuss result and main analysis of this paper. Chapter 5 is conclusion.

Chapter 2
Theoretical and Analysis Framework

This chapter explains the general theory of oil palm plantation in term of economic development and poverty alleviation. The explanation started by discussing oil palm plantation in agricultural development. Moreover, the description goes further by explaining the effect of oil palm plantation on per capita income and poverty alleviation. This chapter also discuss about oil palm plantation in relationship with environment issue. Based on the location of research, this chapter also explains about oil palm plantation in Indonesia. At last, the chapter summarizes the empirical evidences of the previous studies related to the topic.

2.1 Agricultural Development and Oil Palm Plantation

Economic development is identic with economic growth. Even growth is not always sufficient but necessary for development. Economic growth becomes the main goal of development especially for poor or developing countries where agriculture becomes main sector of development. According to Wayne E. Nafziger (2006) was explained that developing the country is developing the output. When the output of production is increase, the GPD will also increase and automatically the per capita income increase.

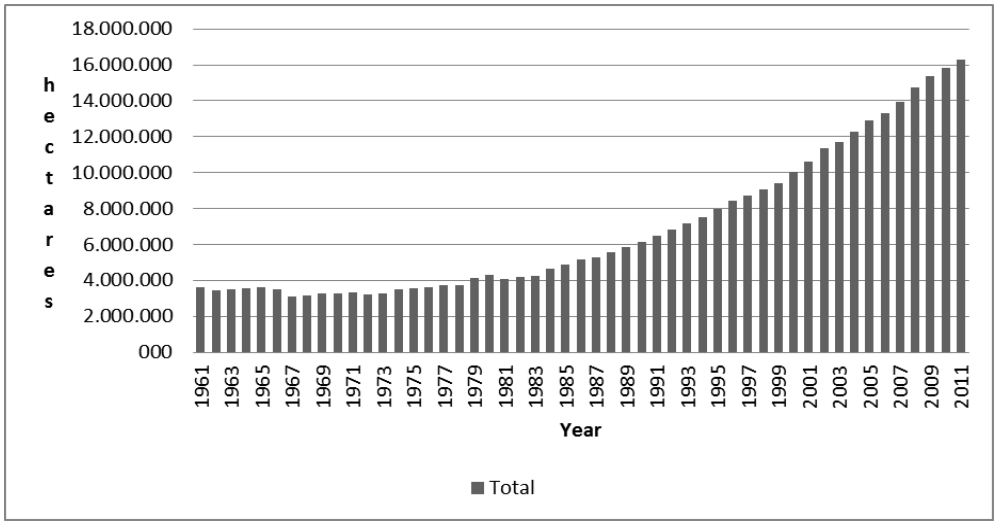
Agricultural sector becomes a crucial sector where the human capital and technology have not been able to be main factors of development. Agriculture is one of the major activities in poor and developing countries. Both food and non-food crops play a vital rules in economic development. Not only needs to meet the basic of domestic consumption, agriculture products also become main export products. Evidence from Indonesia and Malaysia, palm oil as an agricultural product becomes main export non-oil and gas product. In some developing countries, contribution of agricultural sector to GDP is roughly 15 – 30 %. Economists believe in development process, improving of productivity in agricultural sector is important in successful of economic development. To take-off, revolutionary changing in agricultural productivity is important (Rostow 1990:19-20)

Agricultural development in developing countries is become an effective weapon to reduce poverty and sift to industrialization when majority poor people are farmers and live in rural areas. Development in the rural areas has many different understanding. Some economists believe that development on rural area is expansion of capitalist in term of introducing productivity, production, specialization, technological advance and market in rural. Some others

consider that development is policy. Interventions project to change the socio economic and human capital to be better. Learning from Britain Industrial Revolution where positive links between developments in agriculture sector to move to industrialization have. Increase in agriculture productivity will possible to change activity of population in the industrial sectors. Increase in agriculture productivity per labour will shape labour supply to industrial sector. Availability and surplus of agricultural raw materials triggered industrial activities. Increase in productivity of agriculture will lead to increase income and will make demand of industrial products increase. Increase in income also lead to increase in domestic saving that can impulse investment in industrial sector (Matsuyama 1992:329-331).

Development of traded agriculture products becomes a sure-fire strategy to increase farmer's income and productivity. Palm oil was becoming the main crop product and the most massive expand equatorial crop since last five decades in equatorial countries. Increase of global oil palm plantation more than 4 times since 5 decades. FAO[3] (2013) reported in 1961 global oil palm plantations roughly 3.7 million hectares had settled in 33 countries, it had increased intensely became 16.3 million hectares in 2011 established in 43 countries (figure 1). Southeast Asia became the biggest region that was doing expansion of oil palm plantation. More than 15.4 million hectares of oil palm plantation were settled until 2011 and this region contributed more than 90% of global production. Today Indonesia and Malaysia becomes the biggest producer of oil palm and supplied more than 80% of global demands.

Figure 1. The world oil palm plantation from 1961 – 2011 (hectares)

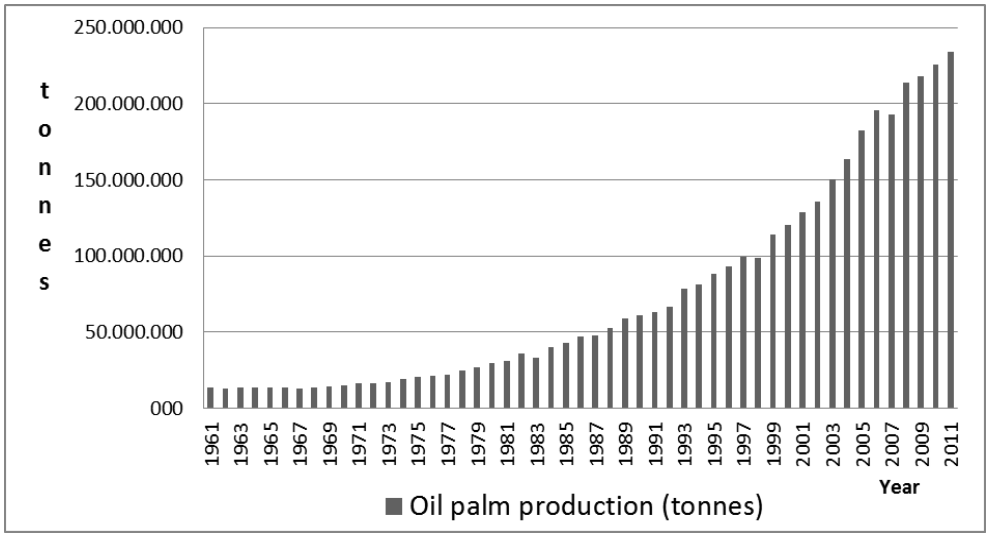


Source: FAO 2013

[3] The data provided by FOA and available access on FAOSTAT website in 27 July 2013 at http://faostat3.fao.org/home/index.html#DOWNLOAD

Palm oil becomes the mainstay agricultural products due to raising the world oil prices. Increase in vegetable oil consumption for both domestic and export cause an increase in oil palm prices continuously. Increase on global palm oil production did not make a price of that product decrease. Even though the production has been increasing more than 15 times since 5 last decades, FAO[4] noted the global price of oil palm also had been increasing. In 1961, global production of palm oil is only 13.7 million tonnes, but in 2011 the production became 233.9 million tonnes (figure 2). The prince has increased annually from 540 USD per tonne in 1961 became more than 1040 USD per tonnes in 2010.

Figure 2. Global oil palm production from 1961 – 2011 (tonnes)

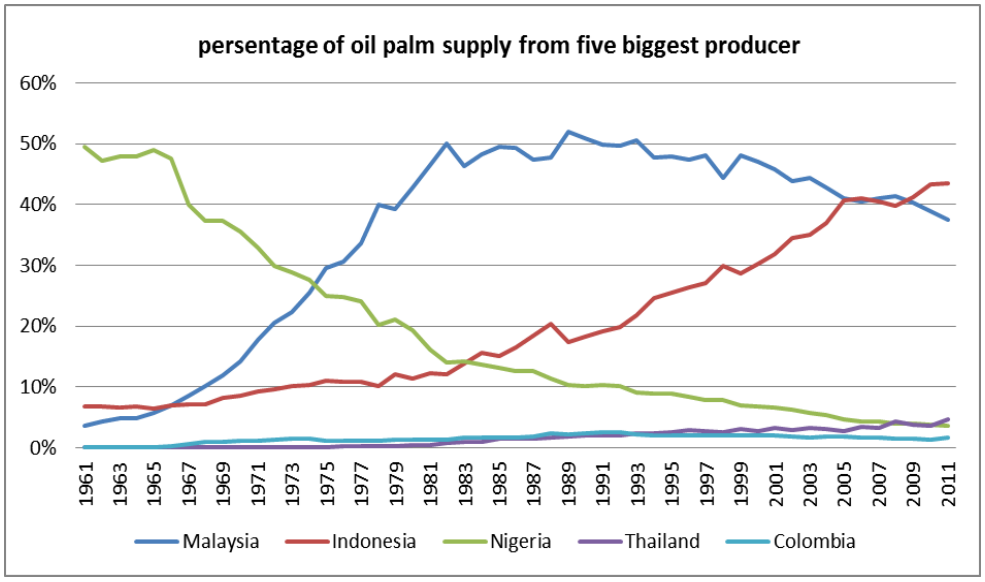


Source: FAO 2013

Palm oil (*Elaeis guineensis)* is originally from West Africa. Since Industrial Revolution in Europe in nineteenth century and legal slave trade were ended, Nigeria became the leader of palm oil producer country for more than one and a half centuries. Nigeria produced more than 50% global demands of oil palm. In early nineteenth century, oil palm plantation was introduced to Indonesia and Malaysia by European colonizer. Oil palm plantations in these countries had been established by private companies' especially European companies. Research and development were also conducted to create new varieties with have high productivities. The result of establishing and developing palm oil in Indonesia and Malaysia were palpable since 1975 when Malaysia can exceed the Nigeria's oil palm production (figure 3).

[4] The data provided by FOA and available access on FAOSTAT website in 27 July 2013 at http://faostat3.fao.org/home/index.html#DOWNLOAD

Figure 3. Five biggest producer of palm oil (supply global in %)



Source: FAO 2013

FAO[5] noted since the middle of nineteenth century, production of oil palm plantation in Malaysia and Indonesia had been increasing. Malaysia became the biggest producer in more than three decades from 1975 to 2009 and supplied more 40% of global oil palm demand. Indonesia as the third of the biggest producer country was exceeding Nigeria in 1985 and became the second of the biggest producer. Indonesia supplied more than 15% of global demands. Domination of Nigeria was sifted by Malaysia and Indonesia in 1973 when the massif expansion and investment on oil palm plantations had been doing by those countries. Indonesia with 5 main islands (Sumatera, Java, Kalimantan, Sulawesi and Papua) has been doing expansion of oil palm plantation especially in former forest concession area. Since early twenty century when Indonesia entered the decentralization era, expansion of oil palm plantation could not being dammed. Indonesia became the biggest oil palm producer sifted Malaysia in 2009. Indonesia supplied more than 40% of global oil palm demand.

The other producer countries did not really significant in increase of production. Thailand even start in the same time in establishing oil palm plantation, there are not significant in influence the global demands. Since 1965, Thailand was supplying no more than 5% in global market. Colombia also remains constant on production. Columbia was supplying no more than 3% of palm oil demand since 1968.

[5] The data provided by FOA and available access on FAOSTAT website in 27 July 2013 at http://faostat3.fao.org/home/index.html#DOWNLOAD

2.2 Oil Palm Plantation and Poverty Alleviation

Many economists believe economic growth is the key to reduce poverty especially in poor and developing countries. Increase growth will lead to increase in income per capita of the poor people. The problem is how people become poor. Hagenaars and De Vos (1988:212) were explained that poor people's are people who live in under standard of living. They lack of food, powerless, voicelessness, dependency, shame, and humiliation. They are also lack in access to basic infrastructure – roads (particularly in rural areas), transportation, electricity and clean water. Poor people also have low level education even only on basic education. They also do not have health care access. The poor rarely speak of income, but focus instead on managing assets – physical, human, social, and environmental – as a way to cope with their vulnerability. In many areas, this vulnerability has a gender dimension (Nafziger 2006).

Development is not only in term of infrastructures but also in increase on productivity of resources, land, capital and technology. It is also about distribution on income of poor people in rural. Agriculture sector provide employment more than 60% of labour force in developing countries. Poor and developing countries have low productivity on agriculture. Conventional farmer typically produces less economic product like staple crops and commonly only for cover their daily needs. They do not have access on technology, market, capital specialization and landless. Access on technology and capital are only benefited by large farmers. It is difficult to envisage that reducing poor people in developing countries without increasing productivity in agricultural sector. Increase in agriculture production will lead to increase per capita income of farmers and reduce additional cost for basic need. This condition is in absolutely reducing the poverty where majority poor people live in rural areas (Gollin 2010:3834-3835)

Commercializing farming by introducing and developing of traded crops in rural areas become the sharp strategy in development rural areas. Specialization of crop production using advance technology will increase productivity and create specific market in national and international scale. Producing traded crops can attract investors to invest in rural areas. Wayne Nafziger (2006) was explained, since 1990's where globalization and commercialization era began, Multinational Corporations were investing and transferring technology, developing product collaboration with local researcher, training producers, introducing contract farming, and providing financial assistance for farmers and agribusiness people in poor and developing countries.

Growth is become main focus on poverty reduction because poverty is absolute concept at any point time. Poverty is a measurement of the percentage of people (head count) live in below standard of living. By obtaining of cost a standard of living, poverty can be measure. While, inequality is a relative concept where it is possible for no one to be poor but they may not equal. Ine-

quality can appears in the different rich communities, otherwise is not exist in the poor groups when they are all poor. This is the reasons why poor and developing countries do not really focus on inequality but more concern on poverty reduction[6]. The equality of income distribution is not natural thing. Many factors can influences. According to Adelman and Robinson (1989:960-961) were explained that to reduce inequality especially in developing countries need three steps i.e. increasing in agriculture productivity in smallholder, redistribution of land or agrarian reform and open non agriculture employment in rural area. Intervention of the government became the key to conduct those steps.

Developing oil palm plantations in developing country like Malaysia became the success story of development agriculture in rural areas. Oil palm plantations are not only giving permanent income to peasants but also provide employments in rural areas and create new economic activities. Providing road, transportation, telecommunication, health service, water, housing, and other infrastructures by investors will change the economy in rural area and in naturally the poverty and poor people will be decrease. According to Wayan R. Susilo (2004:110) was noted that in Kampar and Musi Banyuasin Province of Riau, more than 63% or around 5 million to 11 million rupiahs incomes and assets of household contributed by oil palm plantation. Number of poor people in oil palm communities is also no more than 10%. In term of income distribution, there are also indicated a high equality of income where the Gini coefficient in oil palm areas is relatively small, around 0.36.

2.3 Oil Palm Plantation and Environment Issue

Develop oil palm plantations can drive development of rural areas. However, establishing oil palm plantations bring many controversies related to environment issues. Expansion of oil palm plantations are causes of natural resource degradation through deforestation, forest fire, biodiversity degradation, and other social issues.

Natural resources and lands as factor production function in economic growth in fact are fixed. Consequently, utilizing lands and natural resources in production function will reduce and degrade the resources itself. Lands and natural resources cannot be produce and refilled. Lands are immobile however it can be renewable. While the natural resources are mobile but cannot be renewable. Kahn (1995) in Nafziger (2006) was described the environmental resources as resources provided by nature that are inseparable. An ecosystem, an ozone layer, or the lower atmosphere cannot be allocated unit by unit (as you would allocate oil or copper) or consumed directly. Therefore people consume the ser-

[6] This concept is explained by Rolph Van der Hoeven in Devinition of Poverty and Inequality's in ISS The Hague, 2013.

vices provided by these resources. Implication on property rights for natural resources and environment goods are related to how utilize the resources in term of market and price of that goods dependence to the importance in production (Romer 2006:37).

Expansion of oil palm plantation in natural forests has been happening because of natural forest cannot gives more benefits in directly especially for rural people compared to the oil palm plantation. Several forestry policies and programs conducted by government did not give significant effects on increase income of farmers. According to Lorenzo Pelegrini (2010) based on research was conducted in Bolivia, Nicaragua and Honduras, he explained that there are many challenges in development social forestry. Corruption, mismanagement and long bureaucracy became the main problems in develop community base forest management in order to reduce poverty in rural areas. Inconsistencies of government policies and lack of law enforcement in forest management became the contribution of forest in poverty alleviation did not significant. Expansion of oil palm plantations has been doing by equatorial countries in Southeast Asia especially Indonesia and Malaysia. Hwanho Kim at al. (2013:3) was explained that even though oil palm can growing on marginal and degraded area, the potential of profit from this business made many investors and companies build oil palm plantation in natural forest.

In some cases, overlap of oil palm plantations with natural forest was happened massively. Converting natural forest for plantation also gave extra profit for companies by cutting and selling of wood without reforestation. Since 60's Indonesia was becoming a country with the biggest deforestation ever. More than 1.6 million hectare per year had been converting. FAO[7] was noted the increase of oil palm plantations in last 5 decades is more than four times. Oil palm plantation in Indonesia only less than 3.7 million hectare in 1961 and it was became more than 15 million hectares in 2011. Indonesia contributes more than 5.5 million hectares. According to Casson (2000) in Sheil (2009:23) had explained that Indonesian Ministry of Forestry was indicated roughly 70% or 2.5 million hectares of oil palm plantation was established in state forest located in Sumatera and Kalimantan. Malaysia with two main islands, Serawak and Sabah, was becoming oil palm as the main product of agricultural sector. Oil palm plantation was increased more than 2 million hectares only on 15 years. In 1990 the total oil palm plantation in Malaysia was only 1.8 million hectares and in 2005 became 4.2 million hectares. More than 1.1 million hectares of forest converted to oil palm plantation (Fitzherbert et al. 2008:539).

Clearing forest area by fire in establishing oil palm plantation is one activity that causes damage to the habitat. In directly, burning forest gives impacts on human life, health, biodiversity extinct and effect on global warming. Burning

[7] The data provided by FOA and available access on FAOSTAT website in 27 July 2013 at http://faostat3.fao.org/home/index.html#DOWNLOAD

forest in preparing of land plantation is still doing because this way is most easily and cheaply in Indonesia. Usually smallholders open the forest by cutting and burning in small area. However, this technique also used by companies with has huge concession of forest. Sulaiman and Saleh (2007) in Sheil (2009:21) were recorded in 2007 in Kalimantan has 5108 fire "hotspots" and in Sumatera reported 366 fire only in one month. To minimize of fire forest issues in 1990's, Malaysia's Government made policy to prohibit the burning in land clearing lands activities. This policy effective in reduced fire forest in Malaysia. However it is different with Indonesia where many palm oil plantations just being established in Indonesia.

Establishment of palm oil plantations in natural forest is effects on biodegradation. Not only produce timber, natural forest is a habitat of biodiversity which has rich of flora and fauna. Conversion of natural forest to become oil palm plantation like what happening in Indonesia and Malaysia were made the decimation of biodiversity. Establishing oil palm plantations in industrial scales (4000 – 20.000 hectares) are not only will fragmented of habitat but also will create new different habitat that can sift biodiversity. Oil palm plantation is monoculture crop. There will not be sufficient for many biodiversity to survive and live in. Chemical fertilizer using in cultivation of oil palm is also being hindered even killing some biodiversity. Oil palm plantations also have less complexity than natural forest. There are monoculture, lower canopy, has rotation system and high human intervention. Some published studies noted only 13 species usually live in oil plantation (Fitzherbert et al. 2008:539-542).

Social issues in oil palm plantation are complex and not only about local and smallholder tenure conflict, most of them it has becoming national and international issues. Overlapping claim of land ownership by community, state, local people and companies have been occurring in developing oil palm plantation in many countries. In Indonesia, conflict of tenure happened because the government cannot accommodate public interest especially rights of indigenous people and local communities. This condition is became a trigger of tenure conflicts. On the other hand, this condition also made the companies prefer established oil palm plantation in forest area because easier and more save in ownership (Fitzherbert et al. 2008:544).

2.4 Oil Palm Plantation in Indonesia

Indonesia is a tropical and developing country where more than 60 % of population are living in rural areas. The agriculture sector played an important role in economic development where majority population are farmers. In addition to the primary bumper of the national economy, agricultural sector also become important in increase the national income and alleviating of poverty. Palm oil is the biggest Indonesia's agriculture product contributes on GPD. As a major product of agriculture sector, oil palm plantation provides mass em-

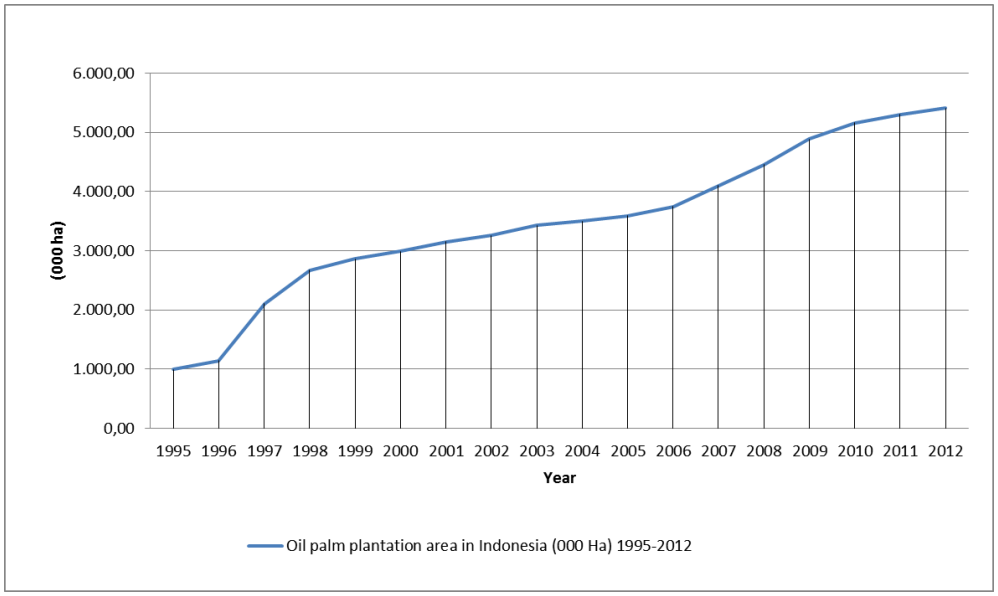
ployment and produces raw material of industry for export and domestic consumption.

Palm oil has long history in Indonesia. Introduced by the Netherlands Indies Government at the beginning of the 18th century, palm oil did not originally from Indonesia. This crop is originally from Africa. In 1842, this plant was bough to Indonesia. Planted in Kebun Raya Bogor and Deli North Sumatera this plant was used as roadside ornamental plants. Industrial revolution in the middle of 19th century in Europe was made demand of palm oil increased. These conditions gave the idea of developing oil palm plantation in Indonesia. First oil palm plantation was opened by Maskapai Oliepalmen Cultuur and Maskapai Huilleries de Sumatera in North Sumatera in 1911. After three decades, expansion of oil palm plantation in Indonesia rose sharply from 2.7 thousand hectares of plantations in 1915 were became roughly 100 thousand hectares with 66 plantations in 1939. In the end of World War II when Indonesia was colonizing by Japan, oil palm plantation is in the bleak condition. There did not any export activity, many oil palm plantations had converted to become food crops and the oil palm factories were closed. After the end of colonization era, oil palm plantations were taken over by Indonesian Government in 1957 based on the Decision Letter of the Indonesia Minister of Agriculture No. 229/UM/1957. Indonesian oil palm plantations have been growing since the Suharto became president in 70's. The annual rate of oil palm plantation growth from 1979 was noted 150 thousand hectares. Today's Indonesia has more than 6 million hectares oil palm plantations and become the biggest producer of palm oil (Agro Lestari. 2009:4-8).

Oil palm plantations in Indonesia were increasing significantly since last 3 decades. According to Statistic Indonesia[8] was noted form 1 million hectares of area in 1995, oil palm plantation had been increasing 4-fold to became more than 5.4 million hectares in 2012 (figure 4). Expansion triggered by increase of world palm oil price and the reality that sustainable forest management were conducted by concessionaire companies did not running well in Indonesia. Long-time of capital revenue and high cost forest investment were became reasons. On the other hand, oil palm plantation offers more profitable investment with fast capital revenue. It became reasons why conversion of conversion forest to oil palm plantations has been happening in Indonesia.

[8] The data provided by Statistics Indonesia (BPS RI) available access on 25 June 2013 in official website http://www.bps.go.id/eng/index.php

Figure 4. Indonesia oil palm plantation 1995 – 2012 (000 ha)



Source: Statistic Indonesia (BPS RI) 2013

At the same period, production of palm oil in Indonesian has been increased 5-fold from 2.4 million tons in 1995 increased to 14.5 million tons in 2012 (figure 5) and since 2011 Indonesia was becoming the biggest producer CPO in the global market (Statistics Indonesia. 2013).

Figure 5. Indonesia oil palm production 1995 – 2012 (tonnes)

Source: Statistic Indonesia (BPS RI) 2013

Although some areas complete by converting forests, oil palm plantations considered to be more advantageous in terms of economic development and employment. Statistic Indonesia[9] noted the contribution of plantation sector rose sharply from 0.4% of GDP in 2004 had increased to 5.08% in 2012. Oil palm industry which setup integrated with plantations provided more than 2 million jobs for rural people. In Kampar and Musi Banyuasin, the proportions of poor people in oil palm community less than 5% and 10%. While the oil palm plantation was giving income 5 million rupiah per month per hectare. Income from oil palm plantation became the driving force of the economy of rural communities and effective in reduce poverty (Susila 2004:113). The Indonesian Government's nucleus estate program in oil palm plantation has increased the standard living of farmers. It can be perceived even though the program is done by involving private parties. This program also reduced the economic gap between rural and urban areas (Zen et al. 2006:7-8).

Stability and tend to increase of CPO price makes oil palm plantation the most favourite of agriculture crop in Indonesia especially in main islands out site of Java. FAO[10] was noted since 1998 the annual rate price of CPO in Indonesia has been increase. Price of CPO in 1998 only 224 USD per tonne and it was increased continuously until 2007 became 320 USD per tonne. Increase in CPO price is not only gives positive effect on income of farmers but it is also gives negative impact. In 1999 demands of CPO from India and China were increased. That made the price and the volume export of CPO was increased. It was made the domestic price of cooking oil was also increased. To reduce the price and insufficient domestic demand of cooking oil, Indonesia's Government was increased the export taxes of CPO. When the global financial crisis hated in 2009, the market price of palm oil stable because the biggest consumer of CPO, China and India, were spared from the crisis. On the other hand, increase of world oil price also became a reason why CPO or biofuel price tend to increase (Sheil et al. 2009:19).

2.5 Empirical Evidence

Many researches have been conducted on the influence of oil palm plantation on economic development and poverty reduction. In Indonesia, several studies on oil palm plantation in relationship with economic development particularly in effect on per capita income were conducted by local-level researches. According to Zen, Barlow and Gondowarsito (2006:16-17) were explained that

[9] The data provided by Statistics Indonesia (BPS RI) available access on 25 June 2013 in official website http://www.bps.go.id/eng/index.php

[10] The data provided by FOA and available access on FAOSTAT website in 25 June 2013 at http://faostat3.fao.org/home/index.html#DOWNLOAD

the Indonesian government has success of nucleus estate program by establishing oil palm as motor of socio-economic improvement. This program was giving benefits in increase on standard of living and distribution of welfare on smallholders. Collaborating with private sectors, this program was encouraging the smallholders in manage the oil palm plantation using advance technology and commercial market system to influence socio economic objectives.

Local studies were recorded in Riau, West Sumatra, South Sumatra, North Sumatra and West Kalimantan oil palm plantations suggests that contributed significantly on economic growth at the regional level. It was also provided positive influences on income farmers and rural economic activities. According to Susila (2004:109) studied in Musi Banyuasin and Kampar regencies in Riau province, noted that contribution of palm oil in the household is around 63% to 74% from total assets. This contribution is equivalent to 59.49 million rupiahs to 63.10 million rupiahs per household. This can be seen that the oil palm plantation was giving an important contribution in increase income and reduce poverty in rural areas.

According to Schrier et al (2013:54) had explained that oil palm plantation contributed 0.85% of Indonesia GDP in 2007. It increased more than a half million smallholders of oil palm plantation with the average income seven times higher than the subsistence farmers. Rist et al (2010) in Schrier et al (2013:54) also examined the oil palm plantation on smallholder income at four provinces in Indonesia (Central Sumatera, West Kalimantan, East Kalimantan, and Central Kalimantan) and they got result that smallholders got significant benefit from the oil palm plantation. Local government, smallholder and palm oil companies played significant contribution in recognize profits not only in sortterm but also for long-term and in the uncertain condition.

Malaysia's oil palm plantation industry has been emerging more than 50 years and was becoming the main family tourism in agricultural activities. With intervention and assistance from the government, oil palm plantations in Malaysia contribute in increase of farmer's income in a sustainable way especially for smallholders. This make an income of farmers in Malaysia has been rising (Basiron 2007:295). Started from 1970 when the Malaysian government began the program of poverty alleviation in rural areas, the percentage of poverty among oil palm smallholders indicated 30.3 %. Only in one decade, with massive expansion of new oil palm plantation for smallholders, poverty in oil palm smallholders decreased became 8.2 % in 1980. Then, poverty is no longer there since 1984 (Simeh et al. 1970:6).

Although establishment of oil palm plantation gives positive effect in increase income of farmers, but it is also bring negative impacts on the environment. Based on research conducted by Ben Phalan (2009:S28) in Asia, he explained that biofuel gave opportunities in increase income, employment and poverty reduction in rural areas. However, government should played important rule to ensure land and labour right to rural people. Biofuel also gave benefit in reduc-

ing carbon emission. The negative impacts of biofuel are degradation of environment caused by expansion of oil palm plantation. It was happening on biodiversity, natural forests, wetlands and grasslands. Political will and strong government institution to enforcing the rules become mandatory to avoid environmental damages. Expansion of oil palm plantation has the biggest contribution on deforestation in Southeast Asia. I caused fragmentation of habitat, pollution and biodiversity lose because oil palm plantation did not appropriate for biodiversity. Avoiding of forest conversion should be taken by controlling of land use and forest protection to reduce those impacts (Fitzherbert et al. 2008:539-542).

Settlement and expansion of oil palm plantations not only give negative effects on biodiversity and environment but also on human and livelihood. Lucy Rist (2010:1019-1022) was explained the crucial negative effect on livelihood is conflict and right abused between oil palm companies and small holders. Lack of transparency, benefit sharing, absence of free between small farmer communities and oil palm companies become main causes of conflicts. It is important to avoided the conflict by clarification of land right and contract of agreement between small farmers and companies. Government intervention also needed to promote small holders to develop agribusiness and reduce dependence on companies.

Chapter 3
Data and Methodology

This chapter describes the data and methodology used to conduct the research. The purposes of this research are to examine the effect of oil palm plantation and oil palm productivity on per capita income in region and province level in Indonesia. To explain those effects required methodology and data that can be explicitly described. The data obtained from the official institutions that have the authorization in publication of such data. To analyse the research purposes in accurate and accountable, the methodology refers to the previous studies and academic literatures that can justify the study.

3.1 Data

This study fully uses the secondary panel data set at the provincial level in Indonesia. The data consist of 23 provinces (21 provinces which have oil palm plantation and 2 provinces where do not have oil palm plantation as control data) annually data from 2003-2011. The data obtained from government documents, national survey data, electronic journals, books and other publication sources relevant to this research.

This study uses regional per capita income as a dependent variable where the data provided by Statistic Indonesia[11]. Therefore, independent variables divided into two groups. First is priority variables consist of oil palm plantation and regional oil palm productivity in provincial level. This data provide by Indonesia Ministry of Agriculture (KEMENTAN RI)[12]. In Indonesia, there are only 21 provinces that have oil palm plantation and this study conduct with those provinces. Control data used in this research with included of two other provinces with do not have oil palm plantation. Second is control variables consist of three variables that have correlation in explain the dependent variable. The three control variables that use in this study are the number of poor people, population and illiteracy rate where all of those data are in province level and obtained from Statistics Indonesia[13]. Complementary data also use to support this study taken form the Indonesian government, the relevant international publications such as the FAO, World Bank and some credible websites.

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[11] The data provided by Statistic Indonesia (BPS RI) published on Statistical Yearbook of Indonesia 2003 to 20011.
[12] The data provided by Ministry of Agriculture Indonesia (KEMENTAN RI) available access on June 2013 at http://pusdatin.setjen.deptan.go.id/
[13] The data provided by Statistic Indonesia published on Statistical Yearbook of Indonesia 2003 to 20011 and also on website: www.bps.go.id

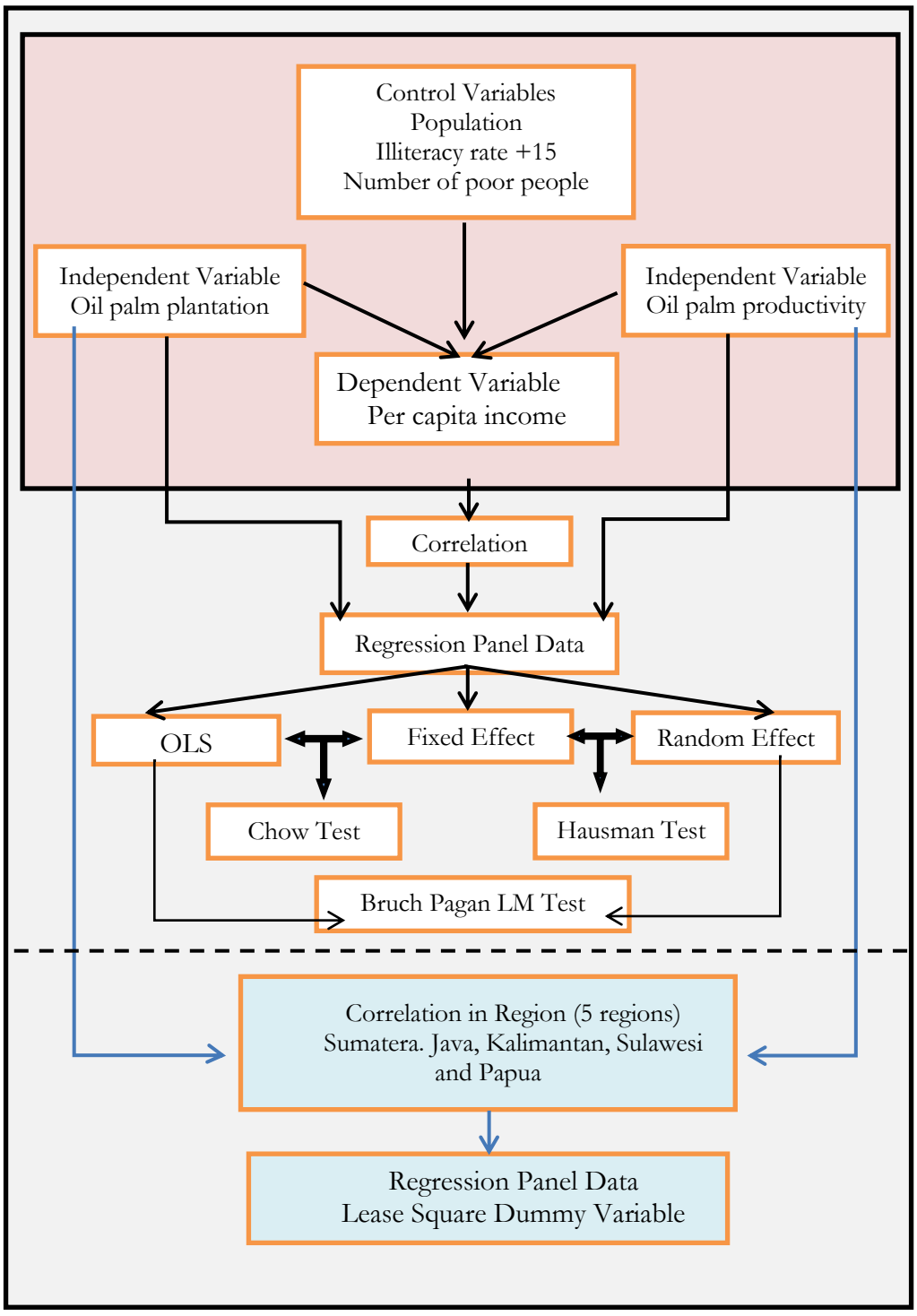
3.2 Methodology

Per capita income is a measure of the wealth of the population a nation. It is also measure a standard of living in some country. The main factors contribute to capita income are human capital, resources capital and skill or technology. Resources endowment per head and technological introduction have significant factor on income distribution (Krueger 1968:641-642). From that reason, this research use oil palm plantation as parameter of land utilization and oil palm productivity as parameter of technology endowment to analyse effects on per capita income. The control variables that use also refer to those main factors. Variable of population and number of poor people refer to the human capital. While the illiteracy rate represent the skill or technology factor.

Use the panel data set in the research gives several benefits in achieving the goals. Panel data set is a combination of cross section data and time series data. This is the data with multiple of several variables at different time. Hsiao (2003) and Klevmarken (1989) in Baltagi (2005:4-7) had explained that using panel data will give several benefit; first, it can control an individual heterogeneity to avoid the bias result where it is not controlled in time series and cross section data. Second, a panel data will gives more informative data, more variability, more efficiency, more degree of freedom and less collinearity among of variables. Third, panel data gives better result in identify and measure effects that are not detectable in pure cross-section or time series data. Four, panel data can use to test more complicated behavioural model with biases resulting from aggregation individuals may be reduced or eliminated. Using specific regression approaches in panel data, this research can knows relationships between variables the value levels of the relationship between variables. It is also can determine effects of the relationship where the control variables including in the model.

There are three approaches can use to conduct the regression analysis using panel data set; OLS, REM, and FEM methods. In addition, this research conducted also to look the priority variables in effects on capita income arbitrated in all across regions in Indonesia. To determine those effects, this study use dummy variables to differentiate each province in five regions. While the regression method that use is LSDV method. The methodology of regression models that will conduct in this research can be seen in figure 6.

Figure 6.The Research Methodology



3.2.1 Measurement of Per-Capita Income Effected by Oil Palm Plantation and Oil Palm Productivity

Measurement of the economic performance in some country is considered to measurement of GDP. According to Mankiw (2012:16) had explained that there are two ways in understanding of GDP; First is the GDP as a total expenditure of goods and services. Second is the GPD as a total of per capita income in some country. Per capita income or income per person a mean income of one citizen. That accounted by taking all of sources of income or GPD divided by total population in a country, region or city. This value also became an indicator of prosperity or wealth of some country. It can be said that increase in per capita income will lead to increase the welfare of poor people or standard of living. It also include a changing of education level, output distribution and economic structure.

Increase in per capita income or GDP becomes indicator of increase of total production function. The starting point to analyse the growth is by understanding of The Solow model. Robert Solow (1920s) was analysed the growth as a production function and he focus on four variables; labour (L), capital (K), and knowledge or "effectiveness of labour" (A) where this three variables become the explanatory variables of output or income (Y). Where t denotes as time, The Solow model of production function is (Romer 2006:9):

$$Y(t) = F(K(t), A(t)\, L(t)) \qquad (1)$$

Used Cobb-Douglas production function model, Solow differentiated sources of growth as:

$$Y = T\, K^{a} L^{\beta} \qquad (2)$$

The exponent α is the responsiveness of output respect to the capital and exponent β is elasticity of output respect to labour (Nafziger 2006).

In Solow growth model, there is absence of natural resources and lands as one of factors of growth. When natural resources and lands included in the analysis of output, the production function become (Romer 2006:38):

$$Y(t) = K(t)^{a}\, R(t)^{\beta}\, T(t)^{\gamma}\, [A(t)L(t)]^{1-a-\beta-\gamma} \qquad (3)$$

Where R is resources and T is lands that used in production. Natural resources and lands are fixed. It is imply that resources endowment will decline when use

in the production, but there are technological progress that has no limitation to increase the production from the resources and lands (World Bank. 2013).

Therefore, natural resources and lands are crucial factors in economic growth actually for poor and developing countries since capital and technology do not develop well. Agriculture sector is an important sector in developing countries where usually population in majority are famers and live in rural areas. Increasing productivity of land by establishing valuable and tradable crops becomes a significant factor in increasing per capita income. Therefore, Indonesia as a developing country made palm oil as the main product of agricultural sector to increase per capita income and develop rural areas.

This study uses oil palm plantation and oil palm productivity as priority variables in effect on per capita income. Meanwhile, as control variables, this study use number of poor people, population and illiteracy rate that are representation of capital, labour and knowledge factors as described in the Solow model.

1. Base on The Solow model of production function, to determine the effect of oil palm plantation to per capita income, the analysis model that used is:

$$Y_{it} = \alpha + \beta_1 Pop_{it} + \beta_2 Ir_{it} + \beta_3 PP_{it} + \beta_4 OP_{it} + \varepsilon_{it} \quad (4)$$

Since the unit value of dependent and independent variables are different, to avoid multicollienarity and outlier, the data variables transformed in to natural logarithms value and the model is becomes:

$$ln\, Y_{it} = \alpha + \beta_1 \ln. Pop_{it} + \beta_2 Ir_{it} + \beta_3 \ln. PP_{it} + \beta_4 \ln. OP_{it} + \varepsilon_{it} \quad (5)$$

2. To determine the effect of oil palm productivity to per capita income, the equation model that used is :

$$ln\, Y_{it} = \alpha + \beta_1 \ln. Pop_{it} + \beta_2 Ir_{it} + \beta_3 \ln. PP_{it} + \beta_4 \ln. Pt_{it} + \varepsilon_{it} \quad (6)$$

Where:

Y	*Regional per capita income (province level)*
Pop	*Number of population (people)*
Ir	*Illiteracy Rate + 15 (%)*
PP	*Number of poor people (province level)*
OP	*Oil palm plantation (hectare)*
Pt	*Oil palm productivity (kg/ha)*
Ln	*Data in logarithm natural unit*
i	*Province; i = 1,2,3,4*
t	*Time; t = 2003,…., 2011*
a	*intercept*

ε_{it} *error component at time of t for unit cross section of i*
$\beta_1 - \beta_4$ *coefficient of independent variables*

This study is conducted using panel data set. As explained above, regression analysis using panel data set has three approaches; OLS method, FEM and REM. According to Jeffrey M. Wooldridge (1980:35), OLS is a simplest method in analysing panel data set. This method is a linear regression method that uses to estimate the indefinite parameters by minimizing the sum of squared vertical distance and responses predicted the linear approximation. This method is combine cross section and time series data to being regarded as single observation. With same treatment in each observation, this method treats the individual specific effect is identic without looking cross section and time series. That is why this method called a naïve method. Using OLS method in the panel data will be difficult to estimate the actual circumstances because it cannot represent the difference of each individual which may arise by different of cross section and time series. Despite using OLS method will increase significance of each variable and the value of R-squared will be lower.

According to Gujarati (2003: 639-651) was explained that FEM method is the method observed quantities in terms of priority variables that were treated as if the quantities were non-random. Variables that were not included in the model can give possibility of inconstant intercept or change in each individual observation and time series. The differences of individual and time series in FEM approach represented in the intercept. REM approach is a regression method that used in the panel data or classified when one assume the data being analysed consists of a hierarchy of different populations whose were different relate to that hierarchy. In this method, the differences of individual and time series were represented on the error.

Referring to Hun Myoung Park (2005:4), was explained that the main different of FEM and REM in the rule of dummy variables. If dummies were measured as a part of the error, it was REM. In this method, estimated variance components for groups (or times) and error, assuming the same intercept and slopes. The difference among groups (or time periods) lying in their variance of the error term, not in their intercepts. In FEM, dummies were considered as an intercept. A fixed group effect model examining group differences in intercepts, assuming the same slopes and constant variance across entities or subjects. Since a group (individual specific) effect time invariant and considered a part of the intercept, it allowed to be correlated to other regressors.

To select the preeminent method to use in this research, the several tests will be conducted. There are three types of test that use to select the preeminent approach. The tests are Chow Test, Hausman test and Breusch-Pagan Lagrangian Multiplier test. Chow Test or called F-statistic test is a test use to select between OLS and FEM method. This test conducted to determine whether the independent variables have different impacts on different subgroups of the

population in the observation. Breusch-Pagan Lagrangian Multiplier test is the test to see heteroscedasticity in a linear model weather the estimated variants of the residuals from a regression is dependent on the value of independent variables. The aim of this test is to choose the appropriate method between OLS and REM method. This test is designed to test random effects. The null hypothesis of the one-way random group effect model is that individual-specific or time-series error variances are zero. If the null hypothesis is not rejected, the OLS method is appropriate (Park 2005:82). Hausman test is the basic consideration test in selecting between FEM and REM approach. This test is preferred under the null hypothesis due to higher efficiency; while under the alternative FEM is at least consistent and thus preferred (Greene 2003:285).

3.2.2 Measurement of Per Capita Income Effected by Oil Palm Plantation and Oil Palm Productivity in Region Level

LSDV approach used in this study to determine the effect of per capita income facilitated in region level. Gujarati (2003) explained that in FEM although the intercept in across individuals may differ, each individual intercept does not vary over time, it is time invariant. Dummy variables use in this technique to allow intercept to vary between groups (regions) and to get differentia; intercept dummies. This technique is called LSDV method. This method using dummy variables to estimates the fixed effect. LSDV approach can explain the intercept between groups in the models. However using LSDV method should be careful to avoid the disadvantages of this approach. Furthermore Gujarati (2003:646) was noted that; first, degree of freedom problem will happen when using too much dummy variables in the model. Second, multicollinearity also can happen when there were too many variables in the model. Third, LSDV method sometimes cannot identify the impact of time invariant variables. Last, multi interpretation of error term can happen when the assumption of error wrong.

To determine the effect oil palm plantation to per capita income and mediate in region level, the data will separate into five regions as explained earlier. Since we have five regions as dummy variables, the dummy variables that use in the equation are only four dummy variables. One dummy region (region Papua) omitted to avoid the situation that in perfect multicollinearity or it called dummy-variables trap (Gujarati 2003:642). To avoid the dummy variable trap, LSDV method has three different approaches with respect to model estimation and interpretation of dummy variable parameters. Those approaches are producing different dummy parameter estimates, but their results are equivalent. First approach is by eliminated one dummy variable to avoid perfect multicollinearity, and this study will conduct with this approach. Second is by running all dummies and in turn, suppresses the intercept and set to zero. Last is in-

cludes the intercept and all dummies, and then impose a restriction that the sum of parameters of all dummies is zero (Park 2005:5).

Since this study use LSDV method with the first approach, to determine the effect of oil palm plantation to per capita income facilitated in region level, the equation dummy model that used is;

$$\ln. Y_{it} = \alpha + \beta_1 \ln. Pop_{it} + \beta_2 Ir_{it} + \beta_3 \ln. PP_{it} + \beta_4 \ln. OP_{it} + \gamma_1 D_1 + \gamma_2 D_2 + \gamma_3 D_3 + \gamma_4 D_4 + \varepsilon_{it} \quad (7)$$

To determine the effect of oil palm productivity to per capita income facilitated in region level, the equation dummy model that use is:

$$\ln. Y_{it} = \alpha + \beta_1 \ln. Pop_{it} + \beta_2 Ir_{it} + \beta_3 \ln. PP_{it} + \beta_4 \ln. Pt_{it} + \gamma_1 D_1 + \gamma_2 D_2 + \gamma_3 D_3 + \gamma_4 D_4 + \varepsilon_{it} \quad (8)$$

Where :

Y	*Regional per capita income (province level)*
Pop	*Number of population (people)*
Ir	*Illiteracy Rate + 15 (%)*
PP	*Number of poor people (province level)*
OP	*Oil palm plantation (hectare)*
Pt	*Oil palm productivity (kg/ha)*
D_1	*dummy region Java*
D_2	*dummy region Kalimantan*
D_3	*dummy region Sulawesi*
D_4	*dummy region Papua*
$\gamma_1 - \gamma_4$	*coefficient of dummy variables*
ln	*Data in natural logarithm unit*
i	*Province; i = 1,2,3,4*
t	*Time; t = 2003,…., 2011*
a	*intercept*
ε_{it}	*error component at time of t for unit cross section of i*
β_1 - β_4	*coefficient of independent variables*

3.3 Research Variable

According to the equations that use in this study, per capita income as indicator of growth becomes a dependent variable. Since the research conducted to find the oil palm plantation and the palm oil productivity effect on per capita income, those variables become priority variables. Oil palm plantation represents to the lands accumulation of oil palm plantation in each province in Indonesia. Expansion of plantation is a main factor in increasing oil palm production. When production increase, the GDP will also increase and it will lead to increase per capita income. Therefore, this variable should have a positive correlation with per capita income. This is the reason that the hypothesis of this study expects that oil palm plantation has positive effect on per capita income. This expectation also addressed to the oil palm productivity. Oil palm productivity is the average of oil palm production on kilogram in a hectare of oil palm plantation. Increase in the productivity will also lead to increase the total production in the same area.

While the control variables that used in this study are related to The Solow model of production function. Representation of three factors in the Solow model, the control variables that used are the number of poor people, population, and illiteracy rate where all variables in unit of provincial level. The variables that would be used in this research summarized in table 1.

Number of poor people becomes an indicator of economic growth of some country. This is the reason why poverty alleviation becomes a major purpose for developing countries. World Bank[14] explained that poverty is a deprivation of well-being including inability to require the basic needs and services necessary. Poor people were people who live in below the standard of living. United Nation[15] was defined that poor people as people who live in economic inability to fulfil food and non-food as basic needs which are measured by minimum consumption. Poor people were not having basic capacity to participate effectively in society, powerless and lack of basic human needs. In opposite direction, the number of poor people should be decrease when the per capita income increase, because when income increase, the standard of living will also increase. Nevertheless the distribution of income also became the key on this relationship. Although per capita income increase if distribution of income not equally, it not guaranty that the number of poor people will be decreased. It depend on how big of inequality on income distribution. The data of num-

[14] This definition is derived from the publication of World Bank in website; http://search.worldbank.org/all?qterm=definition+of+poverty&title=&filetype=

[15] This definition is derived from the publication of United Nation with publication title is Poverty Reduction in website www.undp.org.

ber of poor people that uses in this study is obtained from Statistic Indonesia[16]. Measuring the number of poor people, Statistic Indonesia uses a basic need approach where poor person is a person who has basic expenditure per month below the poverty line. (Statistics Indonesia. 2013).

Some economists believe that high population will decrease per capita income. Nevertheless, there are little empirical evidences for especially developed countries that the higher population will lead to decline the per capita income. Gary S Becker at al. (1999:149) were explained the population can effect on per capita income in two directions, it can be positive direction or otherwise, depend on the productivity. Increase population can lead to decrease productivity because of traditional diminishing return in utilizing of natural resources and lands. On the other hand, it can created specialization and increased investment in technology and sciences. When encouragement of human and sciences are stronger than the diminishing return of natural resources, the per capita income will has same direction in relationship with population. Base on explanation above, this study uses population as a control variable on per capita income analysis with double directions expectation. Population can give positive effect on per capita income because it can lead to increase productivity, but it is also can be in opposite.

The Solow production function model noted human capital is the one the factor in increasing production. Therefore, education is important for development to mature of human capability. With high human capability it will increase the productivity per worker. Many evidences stated that education level has positive effect on increase per capita income. According to Philip Stevens and Martin Weale (2004:164) were explained that the education will effect on economic growth in two aspects. First, education is needed to benefit from scientific and technological advanced. With advance on sciences and technology, the standard of living will increase because efficiency will also increase. Evidences from developed countries became justification that education level give positive correlation with per capita income. Second, education levels will effect on income individual levels. Studies were explained that income individual really depends on the level of education. Schultz (1961) in David and McClelland (1966:257) calculated the education expenditure budget in United Status has increased more than 100 times from 1900 to 1956 and at the same times the per capita income also increase many times, that because the increasing of skills of labour force.

Measurement in the education level, World Bank uses the literacy rate as the indicator of education level. Literacy rate is a percentage of population age 15 and above who can and understand read and write in their daily life and also able to make simple calculations of arithmetic (World Bank. 2013). In this

[16] The data of number of poor people obtained from Statistic Indonesia on Statistically Yearbook of Indonesia since 2003-2009.

study, the education factor that used is illiteracy rate + 15 or the rate of population age 15 and above who cannot and do not understand read, write and cannot be able to make simple arithmetic calculation in their daily life. Therefore, in expectation illiteracy rate as a control variable will has correlation with per capita income in opposite direction.

Table 2. Summary of Research Variables

Variable	Variable name	Expected Sign	Source
Dependent variable (province level)			
	Per capita income *(ln Y)*		Statistical Yearbook of Indonesia 2003-2011.
Independent variable (province level)			
Priority Variable	Oil palm plantation *(ln OP)*	Positive	Ministry of Agriculture Indonesia 2003-2011.
	Oil palm productivity *(ln Pt)*	Positive	Ministry of Agriculture Indonesia 2003-2011.
Control Variable	Illiteracy rate +15 *(Ir)*	Negative	Statistical Yearbook of Indonesia 2003-2011.
	Population *(ln Pop)*	Positive / negative	Statistical Yearbook of Indonesia 2003-2011.
	Number of poor people *(ln PP)*	Negative	Statistical Yearbook of Indonesia 2003-2011.

Chapter 4
Result and Analysis

This chapter discuss the regression results of oil palm plantation and oil palm productivity in effect on per capita income as an indicator of poverty alleviation in in Indonesia. Before start to analyse the regressions, this chapter presents the resume of data research. Next, this chapter will explain and discuss the regression-based analysis to know the effects of oil palm plantation and oil palm productivity on per capita income. The regression results will present on three regression methods i.e. OLS, FEM, and REM. To select the best model that used to conduct this study, the several tests conducted as explained in chapter 3. To understand the effects of explanatory variables to per capita income facilitated in region level, this chapter also will present the regression result of LSDV method with 4 dummies region.

4.1 Resume Data Research

The data that use in this study is an annually panel data set at provincial level from 2003-2011. Indonesia has more than 6 million hectares of oil palm plantation spreads in 21 provinces from total 33 provinces. These plantations establish in five main islands. To achieve the goals, this study uses the data of oil palm plantation and productivity as priority variables from those 21 provinces. Control data use to analyse the oil palm plantation in general in Indonesia by including two provinces which do not have oil palm plantation. The control variables that use in this study are population, number of poor people and illiteracy rate +15 at province level. As explained before, to avoid multicolinearity and outlier in regression estimation, some data transformed into natural logarithm. The resume of all data that use in this study presented in table 2.

Table 3. Statistic Data Research

Variable (province level)	Mean	Std. Dev.	Min	Max	Obser
Per Capita Income (Rp/th)	8739843	6079809	3291217	33400000	204
Oil Palm Plantation (ha)	302796.9	399957.3	0	2031817	206
Oil Palm Productivity (kg/ha)	3042.402	654.6639	1397	4597	188
Illiteracy Rate (%)	7.2	6.01	0.7	35.92	204
Population (people)	7285326	10200000	668000	43100000	204
Number of poor people (people)	1084026	1582470	72060	7578400	204
ln_Per Capita Income	15.84	0.47	15.01	17.32	204
ln_Oil Palm Plantation	10.79	3.66	0	14.52	206
ln_Oil Palm Productivity	7.99	0.234	7.24	8.43	188
ln_Population	15.22	0.99	13.41	17.58	204
ln_Number of poor people	13.28	1.04	11.19	15.84	204
Region	5	Provinces			
Region 1	Sumatera	Aceh. North Sumatera. Riau. Jambi. South Sumatera. Bengkulu. Lampung. Kepulauan Bangka Belitung			
Region 2	Java	West Java. Banten. East Java			
Region 3	Kalimantan	West Kalimantan. Central Kalimantan. South Kalimantan. East Kalimantan			
Region 4	Sulawesi	North Sulawesi. Central Sulawesi. South Sulawesi. South East Sulawesi.			
Region 5	Papua	Papua and West Papua			
Number of Province	23	2 provinces as data controls (East Java and North Sulawesi)			
Year	9	(2003 -2011)			

Source: own computation based on provincial data statistics of Indonesia from 2003-2011

4.2 Per Capita Income Analysis

Analysis of per capita income conducted in two models according to the priority variables being influenced. As explained in chapter 3 that first model is analysis of oil palm plantation in effect on per capita income. Second is analysis of oil palm productivity in effect on per capita income.

4.2.1 Analysis of Oil Palm Plantation in Effect on Per Capita Income

The regression results of oil palm plantation in effect on per capita income using three approaches can be seen in table 3.

Table 4. Regression result of oil palm plantation in effect on per capita income.

Dependent Variable : ln_per capita income			
Variable	**OLS**	**Fixed Effect**	**Random Effect**
	(a)	(b)	(c)
ln_Oil Palm Plantation	-0.0084113	0.0068386	-0.0144273
	0.0093664	*0.0398853*	*0.023286*
Illiteracy Rate (%)	-0.0047368	-0.0439121***	-0.0367704***
	0.0066394	*0.0102152*	*0.0091681*
ln_Population	0.2938214***	0.0201197	0.2788977***
	0.087285	*0.1972316*	*0.1002954*
ln_Number of poor people	-0.2530496***	-0.3886505***	-0.322486***
	0.0845449	*0.1038329*	*0.0831257*
Constant	14.851***	20.93507***	16.30309***
	0.5787938	*3.373638*	*1.46576*
Number of observation	204	204	204
Prob > F / Prob > chi2	0.0005	0.0000	0.0000
R-squared	0.0954	0.291	0.282
*Legend : * p<0.1; ** p<0.5: ***p<0.01*			

Source: own computation based on provincial data statistics of Indonesia from 2003-2011

Analyse regression results in statistic usually begin by looking at the goodness of the model that use. Indicators of goodness a model viewed from p-value or "Prob > F / Prob > chi2" value and R-squared value. P-value is the value that indicates in global the significance of explanatory variables in effect on the dependent variable in the model. Since p-value is less than 0.1 means that a model is fit. In other words all independent variables that uses in the model can significant in explain the dependent variable of the model. From three methods that used, indicate that all p-value are significant. Therefore, since the three methods are fit, selection of the best approach should be done using several tests as explained in chapter 3.

The other indicator of goodness a model in statistic is R-squared value. Determinant of coefficients on linear regression model is often defined as how large

the ability of all independent variables can explain the variance of the dependent variable. Coefficient of determinant is calculated by squaring the correlation coefficient (R). Means the R-squared is value the ability of independent variables in explaining the variance of an independent variable. This value actually explains how many percentages of all independent variables in the equation can explain and describe dependent variable in the model. For example if value of R-squared is 67% it is mean that there are 33% (100%-67%) variance of dependent variables explained by other factors. From interpretation above, it can say that the value R-squared is in between 0 to 1(Park 2005:8). Nonetheless, when the value of R-squared is 1 the equation is doubtful because it means there are 100% variables can explain equation without error or perfect collinearity without error.

Base on table 3 can be seen that R-squared value of FEM method is the highest with value = 0.291 point. It is means independent variables that use in this equation can explain 29.1 % of dependent variable using FEM method. Therefore R-squared value in REM method is quite similar with FEM method. Different with the two methods, OLS method only has value of R-squared is 0.0954 point. R-squared value in OLS approach is becomes smallest because as explained in chapter 3, using OLS method in panel data cannot estimate the differences of each individual which may arise by different of cross section and time series. R-squared value can be raised by adding more independent variables. Therefore adding explanatory variables without have strong arguments will increase bias in the model. It is not allowed to add new variables without knowing the basics theory of relationships with dependent variable.

Before analyse each variables in each methods, statistic test needed to know the multicollinearity in the models. Multicollinearity occurred when two or more variables in the model are correlated and provide redundant information about the response. To avoid multicollinearity in the model, "Corr and VIF" test should be conducted on OLS method. Gudjarati (2003:362) was explained that two things related to "Corr and VIF" test; first, when VIF values are above 10, is indicates a strong multicollinearity between independent variables; second, for correlation index (corr), the result of correlation above 0.8 or 80% suggested a strong relationship between independent variables or muticollinearity. Base on the result of "Corr and VIF" test in appendix 2, it can be seen that all independent variables in the model do not have VIF values more than 10 point and "corr" values bellow than 80%. This result indicates that all explanatory variables in the model do not correlated each other and the model do not has molticollinearity problem accounted using OLS method. To ovoid outlier in the model also conducted robust test to meke the model in robust condition. The result of robust test in this model can be seen in appendix 2.

Since the three methods give appropriate results by giving significant of p-value, several test should be conducted to select the best method. As described in chapter 3, there are three kinds of test should be conducted; Chow test,

Haueman test and Breusch Pagan LM test. Chow Test or called the F-statistic test is a test conducted to determine whether the independent variables have different impacts on different subgroups of the population in the observation. Base on the Chow test result in appendix 2, since the value Prob > F=0.0005 the null hypothesis was rejected, means all fixed effects are zero and thus prefer the FEM method over the OLS method.

Breusch and Pagan Lagrangian Multiplier test conducted to select best method between OLS method and REM method for some linear regression model using panel data. According to the result of this test in appendix 2, the p-value = 0.0000 is significant at 1% significance level. Since the p-value is significant, the null hypothesis is rejected and REM is selected.

Hausman test tests the null hypothesis that the coefficients estimated by the efficient REM estimator are the same as the ones estimated by the consistent FEM estimator. If the p-value more than 0.05, then it is safe to use REM. Otherwise, when p-value is statistically significant, FEM method should be selected. Base on the Hausman test result in appendix 2, the p-value = 0.093 is not significant in 5% significance level. Since the p-value is not significant, null hypothesis is not rejected. Therefore, REM would be more appropriate.

Analysis of each explanatory variable conducted to understanding the effect to dependent variables. While the t-test is a test to indicates significance effect of each independent variable to dependent variable in the model. According to t-test results in table 3, explanatory variables in three methods give different results on effects of per capita income. As can be seen in table 3 that oil palm plantation as a priority variable does not give significant effect on per capita income in all three methods. This result is answer the research question in this study where the oil palm plantation is actually does not have effect on per capita income in Indonesia. However, this result gives different expectation to the hypothesis of this study. The hypothesis in this study expects that oil palm plantation will give positive effect on per capita income in Indonesia.

Whereas, three control variables that use also give different results on the three methods. As can be seen in column (a) (b) and (c), variable of population has significant result in effect on per capita income at 1% significance level were accounted by OLS and REM methods. While this variable does not significant in FEM method. This variable also has positive sign of coefficient that means this variable has in line direction in effect on per capita income. This result is also in accordance with the expectation. As described in chapter 3 that increase of population will lead to increase the per capita income when encouragement of people and application of technology more productive than the diminishing return of utilizing natural resources (Becker et al. 1999:149).

Illiteracy rate as an indicator of education standard expects give negative effect on per capita income because education level will effects on individual income and will gives benefit on technological advanced (Stevens and Weale 2004:164). Base on table 3 the illiteracy rate is significant in effects on per capita income

in REM and FEM methods at 1% significance level. Illiteracy rate did not significant in OLS method. Coefficients of illiteracy rate are similar in all methods with negative sign. These results are in line with expectation where illiteracy rate should be in opposite direction in relationship with per capita income.

Based on the explanation above can be concluded that the REM method is the most appropriate approach to explain the model. Using this method, explanatory variables that use in the model can explain 28.2% of dependent variable. Refer to the result on REM method in column (c) can explain that the results is different with the hypothesis of this study, Oil palm plantation in Indonesia does not give significant effect on per capita income. Although oil palm plantation establish in 21 provinces and become a major traded agriculture product, actually oil pam plantations cannot give significant effect in increasing per capita income. Expansion of oil palm plantations in expected can contribute positively on increase per capita income especially in rural areas cannot be approved. While, all control variables that used in this model deliver results that correspond to the expectations.

4.2.2 Analysis of Oil Palm Productivity in Effect on Per Capita Income

According to the regression result of oil palm productivity in effect on per capita income using three approaches in table 4, all three approaches that use in the model are in goodness or fit condition. All p-value are statistically significant at 1 % significance level. From R-squared value can indicate that the OLS method has R-squared value 0.1073 which is the lowest value. The reasons of OLS method always has lowest R-squared value is already explain in above. While, with the value 0.4042, R-squared value of FEM approach is the highest. This value indicates that all independent variables use in this model can explain 40.42 % of the dependent variable in FEM method. Since this study is a social economics study, this result is quite good. R-squared in REM method is lower than FEM method but it is quite similar.

The number of observations in this model is 186 observations. This is different with the number of observation in oil palm plantation (204 observations) because in this model, the data control from two provinces excluded from the observations. When the control data are included it will make confusion on interpretation of that data. The productivity of oil palm in control data will be in zero point and it is impossible to use. It will sift the standard deviation of this variable and miss interpretation.

Based on results of the statistic test conducted on this model, multicollinearity did not occur in this model. As can be seen in appendix 3, the results of "VIF and corr" test indicate the each VIF value from five independent variables is less than 10 point. While all the values of "coor" test on each independent var-

iable in this model is also less than 0.8 point. Those results are indicated that there are no multicollinearity and no strong correlation in each independent variable at the model. To avoid the outlier in this model, the robust test also conducted. As can be seen in appendix 3, from the result of robust test indicated that the model is already robust

Table 5. Regression result of the oil palm productivity effect on per capita income

Dependent Variable : ln_per capita income			
Variable	**OLS**	**Fixed Effect**	**Random Effect**
	(a)	(b)	(c)
ln_Oil Palm Productivity	-0.2230156	0.1452529 ***	0.127901***
	0.1594525	*0.0455059*	*0.0455432*
Illiteracy Rate (%)	-0.0109812	-0.023336 ***	-0.0236749***
	0.0071743	*0.007199*	*0 .006855*
ln_population	0.2273111**	-0.1047481	0.1122838
	0.0883106	*0.1220655*	*0.0857879*
ln_Number of poor people	-0.2483538***	-0.4289265***	-0.3393415***
	0.0843272	*0.0704959*	*0.0597457*
Constant	17.14787***	22.06596 ***	17.74134 ***
	1.527601	*2.256047*	*1.437162*
Number of observation	186	186	186
Prob > F / Prob > chi2	0.0004	0.0000	0.0000
R-squared	0.1073	0.4042	0.3908
*Legend : * p<0.1; ** p<0.5: ***p<0.01*			

Source: own computation based on provincial data statistics of Indonesia from 2003-2011

Based on the Chow test result in appendix 3 can be explain that since p-value = 0.0000 is statistically significant, the null hypothesis is rejected and FEM method is selected. Referring to the result of Breusch Pagan Lagrangian Multiplier test as a test to select better method between OLS method and REM method is also explain that the value of Prob> chi2 = 0.0000 is statistically significant. Therefore the null hypothesis is rejected and the REM method is more appropriate than OLS method to explain the model. Hausman test conducted to select the best method in between REM method and FEM method, From the Housman test result in appendix 3 can be explain since the p-value or Prob >chi2 = 0.0977 it is not statistically significant at 5 % significance lev-

el. From that, null hypothesis is not rejected and the REM model is selected. From the results of three tests above, can be conclude that the REM method is the most appropriate approach to explain the effect of oil palm productivity in effect on per capita income.

Therefore, the aim of the regression is to understanding the effect of oil palm productivity to per capita income. As can be seen in the table 4, oil palm productivity as priority variable gives different results in effect on per capita income using three approaches. Oil palm productivity is statistically significant in effect on per capita income at 1% significance level using FEM and REM methods. However it is not statistically significant in OLS method. Positive sign of coefficient value oil palm productivity in FEM and REM methods indicate that this variable has in line relationship with per capita income as dependent variable. This result is also similar with the hypothesis of this study where productivity of oil palm plantation will give positive effect on per capita income in Indonesia. Per capita income will increase when the productivity of oil palm is increase.

While three control variables that use in this model also give different effect in different approach. Since the best approach in explain the model is REM method, explanation of control variables only focus on this approach. Based on results in table 4 column (c), variables of illiteracy rate and number of poor people are statistically significant in effect on per capita income at 1% significance level. Therefore, variable of population is not statistically significant in effect per capita income.

Illiteracy rate variable with negative sign of coefficient indicate that this variable has negative correlation in effect on per capita income. This result is in line with the expectation of the study. Illiteracy rate is a variable that represents the level of education in some country or city. Education level has positive correlation with the individual income and in technological advanced. Education level also effect on productivity per worker. Higher education level is higher productivity (2004:164). Therefore, when illiteracy rate decrease it is means that the level of education is increase.

Therefore, variable number of poor people is statistically significant in effect on per capita income using the REM approach. The coefficient of those variables is also in line with the expectation of the study with coefficient variables is in negative sign. As explained above that number of poor people has opposite correlation with the per capita income. When the number of poor people decreases income per capita will increases because the standard of living is increase when income increases.

Although population variable is not statistically significant in effect on per capita income, the sign of coefficient this variable is positive. Means this variable has in line relationship to per capita income. This result is in line with the expectation of this study because population can has double direction in correlation to per capita income.

According to results of several tests and explanation above, it can be assumed that to understand the effect of oil palm productivity in per capita income using panel data analysis, the best approach that used is REM method. Using this method, explanatory variables that use in this model can explain the dependent variable 39.08%. Oil palm productivity as a priority variable is statistically significant in effect on per capita income in Indonesia in positive relationship with coefficient value 0.1278901. It is means that if the average of oil palm productivity in Indonesia is 1% increase, it will constitute 0.127901 % of per capita income.

4.3 Per Capita Income Analysis in Region Level

LSDV method used to analyse fixed effect of the explanatory variables to per capita income facilitated by the different across regions in Indonesia. This analysis conducted based on two models depend on the priority variables. First is the analysis of oil palm plantation in effect on per capita income in region level. Second is analysis of oil palm productivity in effect on per capita income in region level.

4.3.1 Analysis of Oil Palm Plantation in Effect on Per Capita Income in Region Level

Base on table 5, the p-value indicate that the equation model using LSDV method in general is statistically significant at 1% significance level. All explanatory variables used in the model can significant in explain the dependent variable. The value of R-squared = 0.3993 is quite appropriate to explain the model since this study is social economic study.

Therefore, all the explanatory variables were used in the model are statistically significant in effect on per capita income at 1% significance level. However, coefficient of oil palm plantation is in negative sign. It is means that the relationship of this variable is in opposite direction with the dependent variable. An increase in oil palm plantation will lead to decrease of per capita income. This relationship is not in line with expectation in the hypothesis of this study.

While three control variables give appropriate results in term of correlation to the dependent variable. Coefficient values of illiteracy rate and number of poor people variables are in negative sign. The relationship of those variables to the per capita income is in opposite direction. These results are in line with the expectation. When illiteracy rate or number of poor people is increase, it will lead to decrease the per capita income and vice versa.

Table 6. Regression result of oil palm plantation effect on per capita income using dummy regions

Dependent Variable : ln_per capita income		
Variable	Coefficient	Standard Error
ln_Oil Palm Plantation	-0.0389371***	*0.0103065*
Illiteracy Rate (%)	-0.029245***	*0.0067828*
ln_Population	0.3804013***	*0.0972375*
ln_Number of poor people	-0.2384521***	*0.083918*
Dummy Region		
Region Sumatera	-0.9773089***	*0 .172655*
Region Java	-1.279465***	*0.2175617*
Region Kalimantan	-0.6255454***	*0.1830194*
Region Sulawesi	-1.22976***	*0.1491439*
Constant	14.78436***	*0.6462878*
Number of observation	204	
Prob > F / Prob > chi2	0.0000	
R-squared	0.3993	
*Legend : * p<0.1; ** p<0.5: ***p<0.01*		

Source: own computation based on provincial data statistics of Indonesia from 2003-2011

Variable of population has positive correlation with per capita income since the coefficient of this variable is in positive sign. This result is also in line with the expectation. Per capita income is also increase when population is increase and vice versa. In Solow model explained that increase of population effected to economic growth in three ways. First, population growth will lead to increase the number of worker, total of output and capital will also growing. Therefore the output and capital per worker are constant. Second, increase in population will reduce the capital and output per worker. This is why when some countries have high growth of population; they will have lower of per capita income. Last is determining by the consumption level of capital per worker (Mankiw 2012:201-202).

LSDV method uses to understand the fixed effect of all explanatory variables to per capita income mediated by the differences across region. This model estimates the pure effect explanatory variables to per capita income due to by adding the variable dummies region. Base on result in table 5, it can be seen that all dummy variables give significant effects at 1 % significance level. This result is indicates that the effects of all explanatory variables to per capita income in this model can be mediated by all across regions in Indonesia.

Since the Papua region was excluded from the dummies variable in this model, all dummies region that use in this variable referring to the Papua region in term of effect on per capita income. Base on table 5, four coefficient variables

of dummy region have negative sign. It can be said that all regions have less per capita income than Papua region. Java region has lowest per capita income rather than other regions since the coefficient dummy variable in this region is smallest than others. Papua region consist of two provinces with smallest number of population, since the issue of disintegration in 1998, the Indonesian government was giving most budged to reduce inequality and prevent that issue. Therefore, per capita income in Papua is highest than other regions.

4.3.2 Analysis of Oil Palm Productivity in Effect on Per Capita Income in Region Level

The regression result of oil palm productivity in effect on per capita income using LSDV method can be seen in table 6.

Table 7. Regression result of effect oil palm productivity on per capita income

Dependent Variable : ln_per capita income		
Variable	Coefficient	Standard Error
ln_Oil Palm Productivity	0. 0231883	*0.1340546*
Illiteracy Rate (%)	-0.0368086***	*0.0073573*
ln_Population	0.4261874***	*0.0983999*
ln_Number of poor people	-0.3024665***	*0.0858218*
Dummy Region		
Region Sumatera	-1.24247***	*0.182705*
Region Java	-1.540267***	*0.2379321*
Region Kalimantan	-0.9107211***	*0.1933123*
Region Sulawesi	-1.312476***	*0.1489241*
Constant	14.54808 ***	*1.312882*
Number of observation	186	
Prob > F / Prob > chi2	0.0000	
R-squared	0.4371	
*Legend : * p<0.1; ** p<0.5: ***p<0.01*		

Source: own computation based on provincial data statistics of Indonesia from 2003-2011

The p-value in table 6 is show that in overall the equation model is statistically significant at 1% significance level where all of explanatory variables explain significantly the dependent variable. Therefore the value of R-squared 0.4371 indicates that all explanatory variables in the equation are 43.71% explain the dependent variable. Since this study is social economic study, this result is quite good in explaining the per capita income as a dependent variable using dummy variables.

Therefore, all explanatory variables used in the model are statistically significant at 1% significance level in effect on per capita income except oil palm productivity variable. Oil palm plantation as a priority variable is not statistically significant at three significance levels (1%, 5% and 10%) in effect on per capita income. This result is answers the research question in different expectation hypothesis. Hypothesis in this study expects that the oil palm productivity will gives positive effect on per capita income mediated by all across regions in Indonesia. However the result is not in line with the hypothesis. Oil palm productivity improvement can gives positive effect on per capita income in province level. Previous study was noted in provinces of Central Sumatera, West Kalimantan, East Kalimantan and Central Kalimantan oil palm plantation were contributed significant benefits in increase farmer's income (Schrier-Uijl et al. 2013:54-56). However, oil palm plantation is not being a flagship product of one or part of a region in Indonesia. Consequently, oil palm productivity does not significant influence of per capita income in region level in Indonesia.

Base on sign of coefficient three control variables were used in the model, those variables have relationship to the dependent variable in line with the expectation of hypothesis in this study. Illiteracy rate and number of employment variables have in opposite relationship with per capita income since the coefficient of these variables are in negative sign. While population variable in this model also gives similar result with the previous model. This variable has in line correlation with the per capita income.

While the dummy variables give same result where all dummies region are statistically significant at 1 % significance level in effect on per capita income. These results indicate that all regions in Indonesia have significant effect in mediated the effects of the explanatory variables to per capita income. Three variables were used significantly effect on per capita income and mediated in all regions of Indonesia. The effect of oil palm productivity as a priority variable also facilitated in all across region but this variable does not significant in effect on per capita income at region level in Indonesia.

As explained above, this model also excluded Papua region as a dummy variable. Since Papua region was omitted, the effects of all independent variable to per capita income in all dummies region will refer to Papua region. Base on result of coefficient dummies region in table 6, all coefficients are negative and Java region has the smallest value. It means that in term of effect all independent variables that used in the model; Papua region has highest per capita income and next sequence regions are Kalimantan, Sumatra, Sulawesi and Java.

Chapter 5
Conclusion

Since last four decades, palm oil was becoming a major agriculture traded product in Southeast Asia especially in Indonesia and Malaysia. Increase in demand followed by an increase on price of CPO in last three decades made expansion of oil palm plantation was being inevitable in these countries. Shift the dominance of Nigeria in 2004, Indonesia and Malaysia with more than 6 million hectares of oil palm plantation were becoming the largest CPO producing countries in the world. More than 80% of world CPO's demand was being supplied by Indonesia and Malaysia (Koh and Wilcove 2007:993-994).

Development of oil palm plantation becomes an effective strategy in reducing poverty and accelerating growth in rural areas. Establishment oil palm plantations do not only create new jobs but also accelerate infrastructures development in rural areas. Establishment of oil palm industries and other infrastructures by oil palm companies will give positive impacts on economic activities and standard of living in rural areas(Chomitz and Buys 2007:27-30).

Nevertheless, development of oil palm plantation also has negative effects especially on environmental and biodiversity degradation, forest fire and social issues. There is no doubt that the expansion of oil palm plantations are done by converting of forest area. FAO[17] noted since 60's Indonesia was becoming a country with the biggest deforestation in the world. More than 1.6 million hectares natural forest degraded and converted every year. Establishment of oil palm plantations are not sufficient for biodiversity because it will change the habitat and not much of creatures can live in there. Burning of forest in preparing oil palm plantation was becoming an international issue in Indonesia. Conflicts of tenure were happening in claiming of land ownership since the government absence in accommodate the public interest (Fitzherbert et al. 2008).

Indonesia as a developing country with more than 147 million hectares of forest areas has a huge potential for developing oil palm plantations as a weapon of poverty alleviation in rural areas. Development oil palm plantation is expected to increase per capita income in Indonesia.

The objective of this study is to examine effects of oil palm plantation and oil palm productivity on per capita income in national and region level in Indonesia. According to previous studies conducted by Schrier (2013) and Susila (2004) were explained that in provinces of Central Sumatera, West Kalimantan, East Kalimantan, Central Kalimantan and Riau establishment of oil palm plan-

[17] The data provided by FOA and available access on FAOSTAT website in 27 July 2013 at http://faostat3.fao.org/home/index.html#DOWNLOAD

tation gave positive effects on per capita income of farmers. This study conducted to understand these effects at national level.

In order to analyse the relationship between oil palm plantation and oil palm productivity with per capita income, this study referring to the Solow production function model. The production function uses to analyse the growth with focus on four variables; labour, income and capital become the variables of output or income. In this study, output is representing by per capita income. Therefore, explanatory variables consist of priority variables and control variables. The priority variables in this study are oil palm plantation and oil palm productivity. Therefore population, number of poor people and illiteracy rate become control variables.

This study uses the panel data at provincial level with consist of 23 provinces in Indonesia with the period time from 2003 to 2011 in annually data. Actually Indonesia has 33 provinces but only 21 provinces which have oil palm plantation. Two other provinces as control data in measurement of oil palm plantation effect on per capita income.

The results of this study indicate that oil palm plantations in general did not give significant effect on per capita income in Indonesia. Nevertheless, in the region level showed that the oil palm plantation gives negative effect on per capita income in Indonesia and this effect was mediated by all across regions. While the oil palm productivity gives positive effect on per capita income in Indonesia. Increase in 1 % of average oil palm productivity will lead to increase 0.128 % of per capita income in Indonesia calculated using REM method with R-squared value 39.08%. Nonetheless in region level, oil palm productivity did not significant in effect on per capita income and this effect was mediated by all across regions in Indonesia.

Whereas, the three control variables that used in this study gave appropriate contributions to per capita income. Although they did not always give significant effect on several results, control variables that used mostly contributed significant effects on per capita income. Relationship between control variables and per capita income are in line with expectations and theories that underlying this study.

Finally, expansion of oil palm plantations in fact did not give significant effect on per capita income in Indonesia. Although Indonesia has potential for do that. Environmental issues and natural degradations due to oil palm expansions also made real considerations where Indonesia was becoming an important country in conservation of biodiversity in the world. Increase the productivity of oil palm becomes more effective approach in increases per capita income and reduces poverty in Indonesia especially in rural areas rather than enlargement of oil palm plantations.

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Appendices

Appendix 1. Summary Data Research

Grouping Data Reseach

Province	Code Province	Region
Aceh	1	Sumatera
North Sumatera	2	Sumatera
West Sumatera	3	Sumatera
Riau	4	Sumatera
Jambi	5	Sumatera
South Sumatera	6	Sumatera
Bengkulu	7	Sumatera
Lampung	8	Sumatera
Kepulauan Bangka Belitung	9	Sumatera
West Java	10	Jawa
Banten	11	Jawa
West Kalimantan	12	Kalimantan
Central Kalimantan	13	Kalimantan
South Kalimantan	14	Kalimantan
East Kalimantan	15	Kalimantan
Central Sulawesi	16	Sulawesi
South Sulawesi	17	Sulawesi
South East Sulawesi	18	Sulawesi
West Sulawesi	19	Sulawesi
West Papua	20	Papua
Papua	21	Papua

Summary Data Research

Variable	Obs	Mean	Std. Dev.	Min	Max
codeprovince	207	12	6.64933	1	23
year	207	2007	2.588248	2003	2011
region	207	2.478261	1.413616	1	5
areapo	206	302796.9	399957.3	0	2031817
productivi~o	188	3042.402	654.6639	1397	4597
population	204	7285326	1.02e+07	668000	4.31e+07
percapitai~e	204	8739843	6079809	3291217	3.34e+07
numberofpo~e	204	1084026	1582470	72060	7578400
openunempl~r	204	8.366569	3.221092	2.37	18.91
illiteracy~e	204	7.200539	6.0055	.7	35.92
ln_areapo	206	10.78666	3.657887	0	14.52444
ln_populat~n	204	15.22325	.9909682	13.41204	17.57796
ln_percapi~e	204	15.83986	.4867268	15.00677	17.32461
ln_numbero~e	204	13.27454	1.037726	11.18525	15.84081

Appendix 2. Regression Result of Oil Palm Plantation in Effect on Per Capita Income

OLS model

```
. reg  ln_percapitaincome ln_areapo  illiteracyrate  ln_numberofpoorpeople ln_popula
> tion
```

Source	SS	df	MS		
Model	4.58940604	4	1.14735151	Number of obs	= 204
Residual	43.5018913	199	.218602469	F(4, 199)	= 5.25
				Prob > F	= 0.0005
Total	48.0912974	203	.236902943	R-squared	= 0.0954
				Adj R-squared	= 0.0772
				Root MSE	= .46755

ln_percapi~e	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ln_areapo	-.0084113	.0093664	-0.90	0.370	-.0268815	.0100589
illiteracy~e	-.0047368	.0066394	-0.71	0.476	-.0178294	.0083558
ln_numbero~e	-.2530496	.0845449	-2.99	0.003	-.4197685	-.0863308
ln_populat~n	.2938214	.087285	3.37	0.001	.1216991	.4659437
_cons	14.851	.5787938	25.66	0.000	13.70964	15.99235

Multicollineraity test

```
. vif
```

Variable	VIF	1/VIF
ln_numbero~e	7.15	0.139900
ln_populat~n	6.95	0.143933
illiteracy~e	1.48	0.677336
ln_areapo	1.10	0.909503
Mean VIF	4.17	

```
. corr ln_percapitaincome  ln_areapo illiteracyrate ln_numberof      >
poorpeople ln_population
(obs=204)
```

	ln_per~e	ln_are~o	illite~e	ln_num~e	ln_pop~n
ln_percapi~e	1.0000				
ln_areapo	-0.0570	1.0000			
illiteracy~e	-0.1897	-0.1548	1.0000		
ln_numbero~e	0.0006	-0.2700	0.1957	1.0000	
ln_populat~n	0.1355	-0.2477	-0.0594	0.5933	1.0000

Robust test

```
. reg ln_percapitaincome ln_areapo  illiteracyrate ln_population ln_numberofpo
> orpeople,ro

Linear regression                               Number of obs =     204
                                                F(  4,   199) =    5.18
                                                Prob > F      =  0.0005
                                                R-squared     =  0.0954
                                                Root MSE      =  .46755
```

ln_percapi~e	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
ln_areapo	-.0084113	.0085771	-0.98	0.328	-.0253249	.0085023
illiteracy~e	-.0047368	.0062527	-0.76	0.450	-.0170668	.0075932
ln_populat~n	.2938214	.0817274	3.60	0.000	.1326585	.4549843
ln_numbero~e	-.2530496	.0734417	-3.45	0.001	-.3978735	-.1082257
_cons	14.851	.5135634	28.92	0.000	13.83827	15.86372

Fixed effect model

```
. xtreg  ln_percapitaincome ln_areapo  illiteracyrate  ln_numberofpoorpeople ln_popu
> lation,fe

Fixed-effects (within) regression               Number of obs      =       204
Group variable: codeprovince                    Number of groups   =        23

R-sq:  within  = 0.2910                         Obs per group: min =         6
       between = 0.0061                                        avg =       8.9
       overall = 0.0097                                        max =         9

                                                F(4,177)           =     18.16
corr(u_i, Xb)  = -0.7109                        Prob > F           =    0.0000
```

ln_percapi~e	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ln_areapo	.0068386	.0398853	0.17	0.864	-.0718734	.0855506
illiteracy~e	-.0439121	.0102152	-4.30	0.000	-.0640714	-.0237529
ln_numbero~e	-.3886505	.1038329	-3.74	0.000	-.5935602	-.1837408
ln_populat~n	.0201197	.1972316	0.10	0.919	-.3691084	.4093479
_cons	20.93507	3.373638	6.21	0.000	14.27734	27.5928
sigma_u	.66962543					
sigma_e	.14471385					
rho	.95537972	(fraction of variance due to u_i)				

F test that all u_i=0: F(22, 177) = 86.37 Prob > F = 0.0000

Random effects model

```
. xtreg  ln_percapitaincome ln_areapo  illiteracyrate  ln_numberofpoorpeople ln_popu
> lation

Random-effects GLS regression                   Number of obs      =       204
Group variable: codeprovince                    Number of groups   =        23

R-sq:  within  = 0.2820                         Obs per group: min =         6
       between = 0.0496                                        avg =       8.9
       overall = 0.0643                                        max =         9

Random effects u_i ~ Gaussian                   Wald chi2(4)       =     65.44
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000

------------------------------------------------------------------------------
ln_percapi~e |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   ln_areapo |  -.0144273    .023296    -0.62   0.536    -.0600867    .0312321
illiteracy~e |  -.0367704   .0091681    -4.01   0.000    -.0547395   -.0188013
ln_numbero~e |   -.322486   .0831257    -3.88   0.000    -.4854095   -.1595626
ln_populat~n |   .2788977   .1002954     2.78   0.005     .0823224    .4754731
       _cons |   16.30309    1.46576    11.12   0.000     13.43025    19.17592
-------------+----------------------------------------------------------------
     sigma_u |  .49489935
     sigma_e |  .14471385
         rho |  .92123106   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Chow Test

```
. testparm  ln_percapitaincome ln_areapo  illiteracyrate  ln_numberofpoorpeople ln_p
> opulation

 ( 1)  ln_areapo = 0
 ( 2)  illiteracyrate = 0
 ( 3)  ln_numberofpoorpeople = 0
 ( 4)  ln_population = 0

       F(  4,   199) =    5.25
            Prob > F =    0.0005
```

Hausman Test

```
. hausman fe re

                 ---- Coefficients ----
                 (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
                  fe           re          Difference          S.E.
-------------------------------------------------------------------------------
   ln_areapo |   .0068386   -.0144273       .0212659        .0323749
illiteracy~e |  -.0439121   -.0367704      -.0071417        .0045051
ln_numbero~e |  -.3886505    -.322486      -.0661645        .0622204
ln_populat~n |   .0201197    .2788977       -.258778        .1698268
-------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =          7.96
                Prob>chi2 =        0.0930
```

Breusch and Pagan Lagrangian Multiplier Test

```
. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        ln_percapitaincome[codeprovince,t] = Xb + u[codeprovince] + e[codeprovince,t
> ]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                 ---------+-----------------------------
                ln_perc~e |    .2369029       .4867268
                        e |    .0209421       .1447138
                        u |    .2449254       .4948994

        Test:   Var(u) = 0
                                  chi2(1) =   625.97
                               Prob > chi2 =     0.0000

.
```

Appendix 3. Regression Result of Oil Palm Productivity in Effect 0n Per Capita Income

OLS model

```
. reg ln_percapitaincome ln_productivitypo  illiteracyrate ln_population ln_nu
> mberofpoorpeople,ro

Linear regression                                      Number of obs =     186
                                                       F(  4,   181) =    4.47
                                                       Prob > F      =  0.0018
                                                       R-squared     =  0.1073
                                                       Root MSE      =  .46119
```

ln_percapi~e	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
ln_produ~ypo	-.2230156	.166844	-1.34	0.183	-.552225	.1061938
illiteracy~e	-.0109812	.0079722	-1.38	0.170	-.0267115	.0047491
ln_populat~n	.2273111	.0771469	2.95	0.004	.0750881	.379534
ln_numbero~e	-.2483538	.0711824	-3.49	0.001	-.3888078	-.1078998
_cons	17.509	1.580147	11.08	0.000	14.39112	20.62688

Milticolinearity Test

```
. vif
```

Variable	VIF	1/VIF
ln_populat~n	5.54	0.180388
ln_numbero~e	5.19	0.192779
illiteracy~e	1.60	0.625218
ln_produ~ypo	1.15	0.867633
Mean VIF	3.37	

```
. corr ln_percapitaincome ln_productivitypo  illiteracyrate ln_population ln_n
> umberofpoorpeople
(obs=186)
```

	ln_per~e	ln_p~ypo	illite~e	ln_pop~n	ln_num~e
ln_percapi~e	1.0000				
ln_produ~ypo	-0.0393	1.0000			
illiteracy~e	-0.2256	-0.3144	1.0000		
ln_populat~n	0.0608	-0.0893	-0.2274	1.0000	
ln_numbero~e	-0.0988	-0.1304	0.0552	0.6600	1.0000

Robust Test

```
. reg ln_percapitaincome ln_productivitypo  illiteracyrate ln_population ln_nu
> mberofpoorpeople,ro

Linear regression                                     Number of obs =     186
                                                      F(  4,   181) =    4.47
                                                      Prob > F      =  0.0018
                                                      R-squared     =  0.1073
                                                      Root MSE      =  .46119
```

ln_percapi~e	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
ln_produ~ypo	-.2230156	.166844	-1.34	0.183	-.552225	.1061938
illiteracy~e	-.0109812	.0079722	-1.38	0.170	-.0267115	.0047491
ln_populat~n	.2273111	.0771469	2.95	0.004	.0750881	.379534
ln_numbero~e	-.2483538	.0711824	-3.49	0.001	-.3888078	-.1078998
_cons	17.509	1.580147	11.08	0.000	14.39112	20.62688

Random Effect

```
. xtreg ln_percapitaincome ln_productivitypo  illiteracyrate ln_population ln_
> numberofpoorpeople,

Random-effects GLS regression                 Number of obs      =       186
Group variable: codeprovince                  Number of groups   =        21

R-sq:  within  = 0.3908                       Obs per group: min =         6
       between = 0.0412                                      avg =       8.9
       overall = 0.0512                                      max =         9

Random effects u_i ~ Gaussian                 Wald chi2(4)       =    100.34
corr(u_i, X)       = 0 (assumed)              Prob > chi2        =    0.0000
```

ln_percapi~e	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ln_produ~ypo	.127901	.0455432	2.81	0.005	.038638	.2171639
illiteracy~e	-.0236749	.006855	-3.45	0.001	-.0371105	-.0102394
ln_populat~n	.1122838	.0857879	1.31	0.191	-.0558574	.280425
ln_numbero~e	-.3393415	.0597457	-5.68	0.000	-.456441	-.2222421
_cons	17.74134	1.437162	12.34	0.000	14.92456	20.55813
sigma_u	.49545303					
sigma_e	.09745972					
rho	.96274731	(fraction of variance due to u_i)				

Fixed Effect

```
Fixed-effects (within) regression             Number of obs      =       186
Group variable: codeprovince                  Number of groups   =        21

R-sq:  within  = 0.4042                       Obs per group: min =         6
       between = 0.0135                                      avg =       8.9
       overall = 0.0157                                      max =         9

                                              F(4,161)           =     27.31
corr(u_i, Xb)  = -0.6867                      Prob > F           =    0.0000
```

ln_percapi~e	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ln_produ~ypo	.1452529	.0455059	3.19	0.002	.0553875	.2351184
illiteracy~e	-.023336	.007199	-3.24	0.001	-.0375527	-.0091194
ln_populat~n	-.1047481	.1220655	-0.86	0.392	-.3458039	.1363077
ln_numbero~e	-.4289265	.0704959	-6.08	0.000	-.5681423	-.2897106
_cons	22.06596	2.256047	9.78	0.000	17.6107	26.52122
sigma_u	.65608106					
sigma_e	.09745972					
rho	.97840983	(fraction of variance due to u_i)				

F test that all u_i=0: F(20, 161) = 194.60 Prob > F = 0.0000

Chow Test

```
. testparm ln_percapitaincome ln_productivitypo  illiteracyrate ln_population
> ln_numberofpoorpeople

 ( 1)  ln_productivitypo = 0
 ( 2)  illiteracyrate = 0
 ( 3)  ln_population = 0
 ( 4)  ln_numberofpoorpeople = 0

           chi2(  4) =  100.34
         Prob > chi2 =    0.0000
```

Hausman Test

```
. hausman fe re
```

	——— Coefficients ———			
	(b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
ln_produ~ypo	.1452529	.127901	.017352	.
illiteracy~e	-.023336	-.0236749	.0003389	.0021988
ln_populat~n	-.1047481	.1122838	-.2170319	.0868355
ln_numbero~e	-.4289265	-.3393415	-.0895849	.0374182

```
                b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                        =          7.84
              Prob>chi2 =      0.0977
              (V_b-V_B is not positive definite)
```

Breusch and Pagan Lagrangian Multiplier Test

```
. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        ln_percapitaincome[codeprovince,t] = Xb + u[codeprovince] + e[codeprov
> ince,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+-----------------------------
                ln_perc~e |     .233097       .4828012
                        e |    .0094984       .0974597
                        u |    .2454737        .495453

        Test:   Var(u) = 0
                            chi2(1) =   632.73
                          Prob > chi2 =     0.0000
```

Appendix 4. Regression Result of Effect on Per Capita Income Using Dummy Region

Oil Palm Plantation in Effect on Per Capita Income Using Dummy Region

```
. reg  ln_percapitaincome ln_areapo  illiteracyrate  ln_numberofpoorpeople ln_popula
> tion dummyreg1 dummyreg2 dummyreg3 dummyreg4
```

Source	SS	df	MS		
Model	19.1988882	8	2.39986103	Number of obs	= 204
Residual	28.8924091	195	.148166201	F(8, 195)	= 16.20
				Prob > F	= 0.0000
Total	48.0912974	203	.236902943	R-squared	= 0.3992
				Adj R-squared	= 0.3746
				Root MSE	= .38492

ln_percapi~e	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ln_areapo	-.0389371	.0103065	-3.78	0.000	-.0592636	-.0186106
illiteracy~e	-.029245	.0067828	-4.31	0.000	-.042622	-.0158679
ln_numbero~e	-.2384521	.083918	-2.84	0.005	-.4039555	-.0729488
ln_populat~n	.3804013	.0972375	3.91	0.000	.1886291	.5721736
dummyreg1	-.9773089	.172655	-5.66	0.000	-1.31782	-.6367979
dummyreg2	-1.279465	.2175617	-5.88	0.000	-1.708541	-.8503892
dummyreg3	-.6255454	.1830194	-3.42	0.001	-.986497	-.2645937
dummyreg4	-1.22976	.1491439	-8.25	0.000	-1.523902	-.9356174
_cons	14.78436	.6462878	22.88	0.000	13.50975	16.05898

```
.
```

Oil Palm Productivity in Effect on Per Capita Income Using Dummy Region

```
. reg ln_percapitaincome ln_productivitypo  illiteracyrate ln_population ln_nu
> mberofpoorpeople dummyreg1 dummyreg2 dummyreg3 dummyreg4
```

Source	SS	df	MS		
Model	18.8511744	8	2.35639681	Number of obs	= 186
Residual	24.2717651	177	.137128616	F(8, 177)	= 17.18
				Prob > F	= 0.0000
Total	43.1229395	185	.23309697	R-squared	= 0.4371
				Adj R-squared	= 0.4117
				Root MSE	= .37031

ln_percapi~e	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ln_produ~ypo	.0231883	.1340546	0.17	0.863	-.2413627	.2877393
illiteracy~e	-.0368086	.0073573	-5.00	0.000	-.0513279	-.0222892
ln_populat~n	.4261874	.0983999	4.33	0.000	.2319994	.6203755
ln_numbero~e	-.3024665	.0858218	-3.52	0.001	-.4718322	-.1331008
dummyreg1	-1.24247	.182705	-6.80	0.000	-1.60303	-.8819091
dummyreg2	-1.540267	.2379321	-6.47	0.000	-2.009816	-1.070719
dummyreg3	-.9107211	.1933123	-4.71	0.000	-1.292215	-.5292275
dummyreg4	-1.312476	.1489241	-8.81	0.000	-1.606371	-1.01858
_cons	14.54808	1.312882	11.08	0.000	11.95716	17.13899