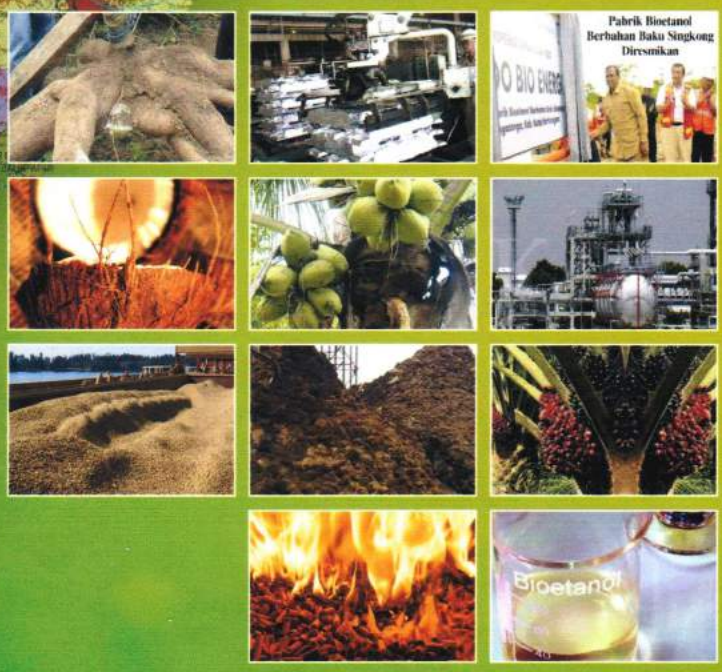
# The Study of Investement Opportunities

## In East Kalimantan Province

**( elephant cassava, waste palm oil & coconut )**




# Final Report

**PEMERINTAH PROVINSI KALIMANTAN TIMUR**

**BADAN PERIJINAN DAN PENANAMAN MODAL DAERAH**

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# Introduction

Assalamu'alaikumWarahmatullahiWabarakatuh

Alhamdulillah, praise to Allah SWT, God The Almighty on the implementation of the preparation of the book "The Study of Investment Opportunities in East Kalimantan Province (Singkong Gajah / Cassava Elephant, Waste Palm Oil and Coconut)".

The purpose and goal is as sufficient information about the potential and investment opportunities in East Kalimantan, especially in commodity Singkong Gajah (cassava elephant) as a raw material of bio-ethanol, waste palm oil as an ingredient of wood pellets and coconut as a source of bio-fuel as well as reference / referral in order to promote the potential and investment opportunities that becomes more targeted, effective, and efficient.

The publication of the Book of "The Study of Investment Opportunities in East Kalimantan Province (Cassava Elephant, Waste Palm Oil and Coconut) 2015" is aimed that it can provide the information about the investment potential of the industry especially to the commodity of Singkong Gajah (cassava elephant) as a bio-ethanol, waste oil as an ingredient of wood pellets and coconut as a source of bio-fuel in East Kalimantan through Investment and Licensing Agency (BPPMD).

We realize though this book has been prepared as well as possible, shortcomings and negligence and error is likely to occur, to the criticisms and suggestions that are build for the improvement of Book Study of Investment Opportunities in East Kalimantan Province (Singkong Gajah / Cassava Elephant, Waste Palm Oil and Coconut) 2015. This will be received with pleasure, I hope this book of Investment Opportunities Study has beneficiary as we would expect.

Wassalamu'alaikumWarahmatullahiWabarakatuh.

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# Table of Content

**Introduction** ..... i
**Table of Content** ..... ii
**List Of Tables** ..... v
**List of Figure** ..... vii

**CHAPTER 1 PRELIMINARY**
1.1 Purpose and Targets ..... 1-3
1.1.1 Purpose ..... 1-3
1.1.2 Targets ..... 1-4
1.2 Scope of Activities ..... 1-4
1.2.1 Scope of Activities ..... 1-4
1.2.2 Range Regional ..... 1-5
1.3 Activities Output ..... 1-6
1.5 Report System ..... 1-6

**CHAPTER 2 LITERARY REVIEW**
2.1 Assessment Regulations ..... 2-1
2.2 Literature ..... 2-9
2.2.1 Development of World Energy ..... 2-9
2.2.2 Indonesia Development Energy ..... 2-11
2.2.3 Development of Biomass Energy of Elephant Cassava into Bioethanol ..... 2-15
2.2.4 Development of Oil Palm Biomass Waste into Wood Pellet ..... 2-19
2.2.5 Development of Biomass EnergyCoconut into Biofuel ..... 2-23

**CHAPTER 3 OVERVIEW AREAS AND INVESTMENT**
3.1. Aspects of Geography and Demographics ..... 3-1
3.1.1 Regional Characteristics ..... 3-1

3.1.2 Potential Development Areas ..... 3-9
3.1.3 Earthquake Prone Region ..... 3-12
3.1.4 Demographics ..... 3-15
3.2. Aspects of Social Welfare ..... 3-17
3.3. Development of East Kalimantan Provincial Investment ..... 3-26
3.4. Potential of Biomass Energy Resource in East Kalimantan Province 3-32
3.5. Potential of Cassava Elephant Being Bio Ethanol in the District Kutai Kartanegara ..... 3-38
3.6. Potential of Waste Palm Oil Being Wood Pellet in the District East Kutai..... 3-42
3.7. Potential Bio Fuel Oil in Being in the District Paser ..... 3-45

**CHAPTER 4 FEASIBILITY ASPECT**

4.1. Singkong Gajah( CAsssava Elephant) Being Bio Ethanol at the District Kutai Kartanegara..... 4-1
4.1.1 Policy and Legal Aspects ..... 4-1
4.1.2 Technical Aspects..... 4-2
4.1.3 Market and Marketing Aspects ..... 4-6
4.1.4 Aspects of Human Resources, Management dan Organization 4-9
4.1.5 Social and Environment Aspects ..... 4-10
4.1.6 Financial Aspects..... 4-10
4.2. Waste Wood Pellet Oil Being in the District East Kutai ..... 4-15
4.2.1 Policy and Legal Aspects..... 4-15
4.2.2 Technical Aspects..... 4-16
4.2.3 Aspects of Market and Marketing ..... 4-23
4.2.4 Aspects of Human Resources, Management dan Organization 4-27
4.2.5 Environmental Social Aspects ..... 4-29
4.2.6 Financial Aspects..... 4-30
4.3. Coconut (inside) Being Bio Fuel in Paser District ..... 4-31
4.3.1 Policy Aspects ..... 4-31
4.3.2 Technical Aspects of Production ..... 4-34
4.3.3 Aspects of Market and Marketing ..... 4-43

4.3.4 Aspects of Human resources, Management dan Organization. 4-45
4.3.5 Environmental Social Aspects ..... 4-53
4.3.6 Financial Aspects..... 4-54

**CHAPTER 5 INVESTMENT PROFILE IN EAST KALIMANTAN**

5.1. Investment Needs ..... 5-1
5.1.1 Investment Needs of Bio Fuel made from Coconut (Inside) ..... 5-1
5.1.2 Investment Needs Bio Ethanol made from Singkong Gajah (Cassava Elephant) ..... 5-5
5.1.3 Investment Needs Wood Pellet made basic Waste Palm Oil ... 5-10
5.2. Investment Feasibility ..... 5-12
5.2.1 General..... 5-12
5.2.2 Investment Feasibility Bio Fuel made basic Coconut (Inside). 5-13
5.2.3 Investment Feasibility Bio Ethanol made basic Singkong Gajah (Cassava Elephant) ..... 5-16
5.2.4 Investment Feasibility Wood Pellet made basic Waste Palm Oil ..... 5-17

**CHAPTER 6 THE DIRECTION OF DEVELOPMENT**

6.1. Development Direction Coconut In Being Biofuel ..... 6-1
6.2. Development Direction Waste Palm Oil Being Wood Pellet..... 6-14
6.3. Development Direction Cassava Elephant Being Bio Ethanol ..... 6-20

**CHAPTER 7 CONCLUSIONS AND SUGGESTION**

7.1. Conclusion ..... 7-1
7.2. Suggestion ..... 7-3

# LIST OF TABLES

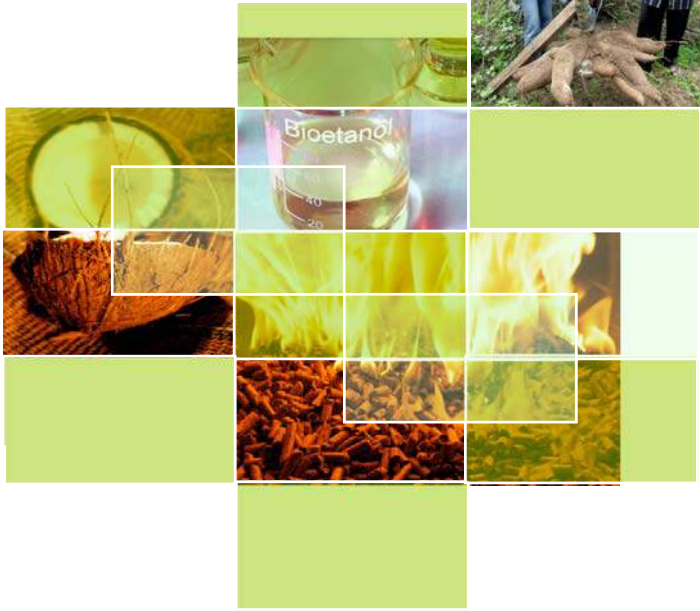
Table 2.1 Eight Differentiator Indicators Between Traditional and Modern Biomass ..... 2-14
Table 2.2 The Indonesia's Position in The Utilization of Biomass WEO. 2013 ..... 2-15
Table 2.3 Waste Product of Palm Oil ..... 2-21
Table 2.4 The Calculation of Palm Oil Waste ..... 2-22
Table 2.5 Biodiesel Specification ..... 2-30
Table 3.1 The Avarage of Temerature, Humidity, Air preasure, Wind Speed, Rainfall, and Solar Radiation Trough Station, 2013 ..... 3-8
Table 3.2 The Number of Disaster Events per District/ City in east Kalimantan Province ..... 3-14
Table 3.3 Population According to District/City in 2011-2013 ..... 3-16
Table 3.4 Land Area and Population Density at District/City in 2013 ..... 3-17
Table 3.5 Comulative PDRB and Economic Growth in The province of east Kalimantan in 2011-2013 ..... 3-21
Table 3.6 The Number and Percentage of Poor ..... 3-26
Table 3.7 Comulative Realized Investement In East Kalimantan ..... 3-26
Table 3.8 Development of The Realization of Forigen Investement By Sector in 2010-2014 at east Kalimantan ..... 3-27
Table 3.9 Development of The Realization of Domestic Investement By Sector in 2010-2014 at east Kalimantan ..... 3-28
Table 3.10 Development Of Foreign Investement Realization in East Kalimantan Province Quarter 2 By Sector, 2015 ..... 3-29
Table 3.11 Development Of Investement Realization in the country East Kalimantan Province Quarter 2 By Sector, 2015 ..... 3-30
Table 3.12 Development Of Foreign Investement Realization East Kalimantan Province Based on The Location of The Quarter 2 By Sector, 2015 ..... 3-31
Table 3.13 Development Of Foreign Investement Realization East Kalimantan Province Based on The Location of The Quarter 2 By Sector, 2015 ..... 3-31
Table 3.14 Cassava Planting area in Dictrict Kutai Kartanegara ..... 3-38
Table 3.15 Cassava Productions in Dictrict Kutai Kartanegara ..... 3-39
Table 3.16 Rekapitulation Area And Large Plantation Private Production Of Annual Crops ..... 3-41
Table 3.17 Rekapitulation Acreage And Production of Perennial Crops Plantation(Pr) ..... 3-42

Table 3.18 Data Area of Coconut Plantations in The District Paser, 2009-2013 ..... 3-45
Table 3.19 Oil Production Data in The Plantations of The People in District Paser, 2009-2013 ..... 3-45
Table 4.1 The Market Segmentation of Bioethanol ..... 4-7
Table 4.2 Bioethanol Elephant Cassava Investement Price List ..... 4-11
Table 4.3 Fixed Price Detailed List For Bioethanol Elephant Cassava ..... 4-12
Table 4.4 Variable Price List For Bioethanol Elephant Cassava ..... 4-13
Table 4.5 Education Level at East Kutai Dictrict ..... 4-28
Table 4.6 The Condition of Production, Productivity and Land Area, Coconut Comodities ..... 4-34
Table 4.7 An Amount and Allocation of Human Source by The Position in Manufacture Plant ..... 4-52
Table 5.1 Parameter Calculation of Biofuel Investement Value ..... 5-2
Table 5.2 Biodiesel Investement Cost And Components ..... 5-4
Table 5.3 Operational Cost and Component of Coconut V#Biodiesel Production (Rp/yr) ..... 5-5
Table 5.4 Investement Cost of Bioetanol Ubi Kayu ..... 5-6
Table 5.5 Fixed Cost Detailed of Bioetanol Ubi Kayu ..... 5-7
Table 5.6 Variable Cost of Bioetanol Ubi Kayu ..... 5-8
Table 5.7 Credits/Loan Installment Payment ..... 5-14
Table 5.8 The Project of Production and Benefit per Year ..... 5-15
Table 5.9 Analitical Result of Investement Criteria on DF 15% ..... 5-16
Table 5.10 Financial Internal Rate of Return(FIRR) Investement of Singkong Gajah Became Bio Etanol ..... 5-17
Table 5.11 Financial Internal Rate of Return(FIRR) Investement of Wood Pellet From Waste Palm Oil Raw Material ..... 5-18
Table 6.1 The Phase of The Minimum Utilization of Biodiesel(100) as A Mixer Fuel ..... 6-3

# List Of Figure


| | | |
|---|---|---|
| Figure 2.1 | The Procecing Of Palm Oil and its Production and Waste Result | 2-21 |
| Figure 2.2 | TKKS Result(Tandan Kosong Kelapa Sawit/ Oil Palm Empty Bunches) | 2-22 |
| Figure 2.3 | Mix Energy Target 2015 | 2-25 |
| Figure 2.4 | Raw Materials For Biofuel | 2-27 |
| Figure 2.5 | Produktion Chains | 2-28 |
| Figure 2.6 | The Diagrams of Biodiesel Production Through Transesterfikation | 2-29 |
| Figure 2.7 | Biodiesel and Solar Non Subsidiez Price Flow Chart | 2-32 |
| Figure 2.8 | Biodiesel Price Flow Chart 2010-2013 | 2-32 |
| Figure 2.9 | The Development of Biodiesel Market and Production | 2-33 |
| Figure 2.10 | World Biodiesel production Share in 2013 | 2-36 |
| Figure 3.1 | The Administration's Map oe East Kalimnatan | 3-4 |
| Figure 3.2 | Topoghrapic's Characteristic of East Kalimantan Based on the Degree of Sloope Steepness | 3-5 |
| Figure 3.3 | Topoghrapic's Characteristic of East Kalimantan Based on Altittude | 3-6 |
| Figure 3.4 | The Hazard Map Of East Kalimantan | 3-15 |
| Figure 3.5 | Structure of GDP Quarter II/2014 By Industry in East Kalimantan Province | 3-18 |
| Figure 3.6 | Distribution Precentage of Regional Gross Domestic Product of Non-Oil Current Price By District(%), 2013 | 3-19 |
| Figure 3.7 | The Avarage Inflation Rate In East Kalimantan province in 2009- FEbruaty 2015 | 3-21 |
| Figure 3.8 | PDRB Per Capita At Current Price Year 2013 | 3-22 |
| Figure 3.9 | Gini Indexs in East Kalimantan province | 3-23 |
| Figure 3.10 | Human Development Index Province of East Kalimantan 2011-2013 | 3-24 |
| Figure 3.11 | Indicator Makro Economi | 3-24 |
| Figure 3.12 | Life Expectancy | 3-25 |
| Figure 3.13 | Closed Carbon Cycle In The Use Of Fuels Derived From Biomass That Berlignoselulosa | 3-33 |

Figure 3.14 Mass Balance in Palm Oil Proccesing Industry (Kismanto, 2006 dimodifikasi : Aminta et al) ..... 3-35
Figure 3.15 Potential Of Cassava In Bendang Raya Village District Tenggarong Kutai Kartanegara ..... 3-39
Figure 3.16 Potential Of Palm Oil in District East Kutai ..... 3-43
Figure 3.17 Potential Of Coconut in The District Pasir Belengkong, Disrtict Paser and Disctrict Darts Paser With District Penajam Paser Utara ..... 3-44
Figure 3.18 Potensial of Coconut in The Village Kampung Lidi Saloloang District Penajam Paser Utara..... 3-44
Figure 4.1 The Process Of Bioethanol Making Bioetanol ..... 4-5
Figure 4.2 The Production Process of Wood Pellet From Palm Oil Waste ..... 4-19
Figure 4.3 Wood Pellet Machine ..... 4-22
Figure 4.4 Marketing Mix Wood Pellet From Palm Oil Waste ..... 4-26
Figure 4.5 Population Percentage Chart By Activities ..... 4-27
Figure 4.6 The Chart of Proccess and System of Biodiesel Production 4-38
Figure 4.7 Biodiesel Production Process Level II ..... 4-40
Figure 4.8 Manufactory Organization Structure ..... 4-47
Figure 5.1 The Alocation Location For The Proccecing of Bioethanol Made From Singkong Gajah at Desa Bendang Raya Kecamatan TEnggarong Kabupaten Kutai Kartanegara ..... 5-8
Figure 6.1 The Scheme of Biofuels Development ..... 6-5
Figure 6.2 The Scheme Direction of Biodiesel Development Coconut Based Commmodity..... 6-13




# CHAPTER 1
# PRELIMINARY

The energy crisis in Indonesia has started to show symptoms. In 2015, Indonesia is expected to get shortage of supply of oil and gas 2.4-2.5 million BOEPD. "If there is no discovery of new reserves of about 11-12 years, Indonesia will run out of oil and gas and will become a net importer.

Based on current conditions, Indonesia still relies on petroleum needs at 54 percent, natural gas at 26 percent, and 14 percent of coal. The Government launched a program of development of bioenergy as a substitute for fossil energy. In addition to overcome the scarcity of energy with alternative energy, it also aims to improve the rural economy.

Bioenergy development in this regard is the development of energy derived from plant-based materials, such as jatropha, palm oil, sugar cane, cassava, corn, and others, as well as biomass. Bioenergy products can be either vegetable solid fuel, liquid bio-fuels, bio fuels, and bio-gas electricity.

The strategic position of East Kalimantan Province which is the central axis of Indonesian sea trade lanes (Makassar Strait and the Sulawesi Sea) has a wealth of natural resources that abound (as a comparative advantage). Powered by situations that are relatively safer areas and the willpower of Regional Government in creating a conducive investment climate (competitive advantage), East Kalimantan becomes one of the potential areas in Indonesia and attractive to invest.

So far, the advantages of the province of East Kalimantan have been able to drive the wheels of government and generate economic growth in most of the

district/ city in East Kalimantan. Nevertheless, the government realizes that the utilization and management of superior potency in East Kalimantan through investments (foreign and domestic) is not optimal.

Promotional activities towards favorite potency owned by East Kalimantan province in order to increase the inflow of investments became one of the concerns of development policy in East Kalimantan province. The efforts were undertaken by the Government through various promotional activities and media usage information.

East Kalimantan has particularly been able to attract foreign direct investment (FDI) and domestic (DCI) in the mining, fishery, agriculture and plantations. The success is inseparable from the support of the government's strategic policy both nationally and regionally, so a conducive investment climate and boost local revenue (PAD) are created.

In order to increase economic growth, the Government of East Kalimantan Province also provides convenience for business licensing and business opportunities to investors in the sector leading commodity. To support that, an exciting investment climate is developed continuously, including through simplification of procedures, capacity building effort, good service smoothness at the center of the region, as well as the facilitating adequate infrastructure and facilities. Especially for the plantation sector in East Kalimantan itself is an area that has appropriate agro-climate for investment development. Several studies on the suitability of land for the development of several commodities indicate that the business and investment opportunities plantation sector is still very promising. Cassava is still a contributor to the plantation sector as bioethanol-producing plants.

The increasing need for fuel oil (BBM) on the entire community, not only causes problems, but also provides new business opportunities for the manufacturers of alternative energy. Various studies began to be developed to obtain a replacement energy source which is relatively cheaper and certainly friendly for the environment such as the elephant cassava bioethanol which is now being developed in various parts of the world as a substitute for fuel oil.

Based on the vision and mission of development in East Kalimantan, the development of natural resources that can be renewed will become the foundation of sustainable economic development in East Kalimantan in the future.

By seeing opportunities bioethanol demand for commodities, wood pellets and biofuels, it is deemed necessary to develop sources of raw materials, such as elephant cassava, oil waste, and coconut. The incoming investment is expected to encourage the cultivation of elephant cassava in order to be able to be implemented more modernly as raw material for bioethanol, and the construction of the processing industry will help to increase the additional value and the level of social welfare of elephant cassava farmers in particular.

As well as wood pellets and biofuels, availability of raw materials is sufficient to be developed. The challenges of global markets and the added value to be gained by the region have consequences to the need to increase competitiveness through the development of superior commodities area. Government support in the form of policies that make it easier for such businesses is an important factor, especially for investors to invest in this commodity.

In order to provide correct and proper information to investors, it is necessary to have investment information that describes the resource and prospective development until the investment market opportunity for the leading commodity in East Kalimantan can be available.

## 1.1 Purposes and Targets

### 1.1.1 Purposes

The purposes of this program are:

1 Identification of foreign/ domestic investment opportunities to elephant cassava commodity, oil waste and coconut in East Kalimantan.

2 Establishment of comprehensive information on the development of commodity production of elephant cassava, oil waste and coconut in East Kalimantan.

3 Identification of downstream industrial investment potential for the commodity elephant cassava as bioethanol element, oil waste as an ingredient of wood pellets and coconut as a source of biofuel.

### 1.1.2 Targets

The targets of this activity are:

1. As the sufficient information material about the potential and investment opportunities in East Kalimantan, especially in elephant cassava commodity as raw material of bioetnaol, oil waste as an ingredient of wood pellets and coconut as a source of biofuel.
2. As a reference/ referral to promote the potential and investment opportunities in order that in planning the implementation of promotion becomes more targeted, effective, and efficient.

## 1.2 Scope of Activities

### 1.2.1 Scope of Activities

These activities are Broadly done using surveys and literature on the elements that are competent. Data and information were analyzed using qualitatively and quantitatively descriptive method using the criteria of feasibility based on financial aspect comprising: NPV (Net Present Value), B/ C ratio, IRR (Internal Rate of Return), and PP (Payback Period).

In accordance with the goals and objectives of the work, the boundaries which are being made to sharpen the study consist of three groups or principal occupation stages as follows:

**1. Identification activities, including:**

1) Identification of commodity potential as well as the needs of facility and infrastructure development and the supporting factors such infrastructure data, marketing network, technology, capital, labor, cultural social and institutional aspects (formal and informal), including policies that have been issued by the Government of East Kalimantan.

2) Identification of the needs of elephant cassava products, oil waste and coconut in East Kalimantan
3) Identification of constraints and problems encountered in the cultivation and processing of elephant cassava, oil waste and coconut in East Kalimantan.
4) Other data that support the development of this commodity in East Kalimantan.
5) Identification of the commodity markets at home and abroad
6) Process of making the preliminary report and discussion of the achieved results.

**2. Data processing activities**

1) Processing of data to determine the feasibility of business
2) Processing of potential data and development areas
3) Processing of marketing data at home and abroad
4) Management of investment potential market data of East Kalimantan
5) The accounting of identification data
6) Preparation of interim final report

**3. Activities of organizing strategies of business development**

1) Bookkeeping of Investment Opportunity Study of East Kalimantan Province (Elephant Cassava, Oil Waste and Coconut)
2) Forming of a work report
3) Preparation of final report
4) Preparation of a summary report

### 1.2.2 Range Regional

The study area of this activity is set by purposive sampling in some districts, namely Kutai Kartaneagara, East Kutai and Paser with consideration that this region is the producer/ commodity manufacturer of elephant cassava, oil palm and coconut in East Kalimantan.

## 1.3 Activity Output

Study books of Investment Opportunities consist of the Elephant Cassava as Bioethanol Materials, Oil Waste as ingredient of Wood Pellet and Coconut as Biofuel ingredient.

## 1.4 Report System

Final Report of Investment Opportunity Study of the Province of East Kalimantan (Elephant Cassava, Oil Waste and Coconut in annual budget of 2015 is presented with systematic as berikut:

**Chapter 1 : Abstract**

This chapter describes the understanding of the activities based on the Terms of Work Reference provided by the Task giver. The description in this chapter will be the direction and also the limit for the Consultant in carrying out the activities. This chapter describes the background of the activities, goals and objectives of the activities, the scope of which is composed of regional scope and scope of activities, outputs and systematic report.

**Chapter 2 : Literature Review**

This chapter outlines the Consultant understanding on Investment Opportunities in East Kalimantan Province (Elephant Cassava, Oil Waste and Coconut) and the concept of program planning which refers to the laws and regulations that relate directly or indirectly to the activities of Investment Opportunities in East Kalimantan Province (Elephant Cassava, Oil Waste and Coconut). In addition, it is also an explanation of non legal studies to support these activities.

**Chapter 3 : General Description and Biomass Investment Profile**

This chapter outlines the general description of East Kalimantan Province, particularly on aspects related directly or indirectly to the Investment Opportunities in East Kalimantan province; those are: the potential of elephant cassava to be bio-ethanol in the Kutai Kartanegara district; potential of oil waste to be wood pellets in the East Kutai district; and the potential of coconut to be bio fuel in the Paser district.

**Chapter 4 : Propriety Aspects**

This chapter explains the feasibility aspect of elephant cassava into ethanol, waste oil into wood pellets and coconut into bio fuel. The aspects covered include aspects of Policy and Legal; Technical Aspects; Aspect of Markets and Marketing; Aspects of Human Resources, Management and Organization; Social Environment; and Financial Aspects.

**Chapter 5 : Profil Investasi**

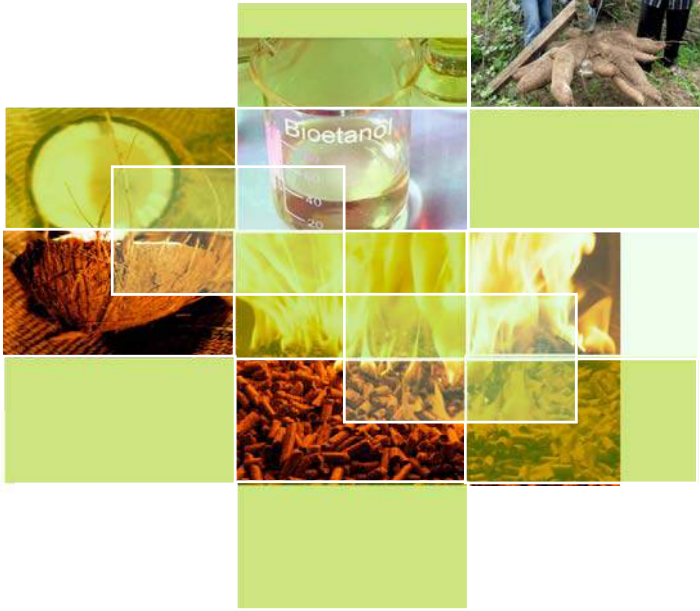
This chapter explains the investment profile of each of the analysis results of the feasibility aspects of elephant cassava into ethanol, waste oil into wood pellets and coconut into bio fuel. In this chapter, the investment needs of brackish each product developed and feasibility of investment primarily in detail the calculation of financial feasibility are also described.

**Chapter 6 : Development Directions**

This chapter explains the direction of the development of the elephant cassava into bio ethanol, waste oil into wood pellets and coconut into biofuel. The directions of this development include the production, marketing, economic aspects, aspects of the investment

**Chapter 7 : Conclusion and Suggestion**

This chapter explains the Conclusion and Suggestion of The Study of Investement Opprotunities In East Kalimantan Province ( Elephant Cassava, Waste Palm Oil and Coconut)




# CHAPTER 2
# LITERARY REVIEW

## 2.1. Assessment Regulations

### 1. Law No. 25 Year 2007 Investment

Public investment should be part of the implementation of the national economy and placed in an effort to boost national economic growth, create jobs, promote sustainable economic development, enhance capacity and national technology, encouraging the economic development of democracy, and the public welfare in an economic system competitive.

The objectives of the investment can only be achieved if the supporting factors that hinder the investment climate can be addressed, inter alia by improving coordination among agencies of the Central Government and the regions, the creation of bureaucracy efficiently, legal certainty in the field of investment, the economic costs are highly competitive, and a conducive business climate in the field of employment and business security. With the improvement of the various factors supporting the realization of the investment is expected to improve significantly.

One of the main problems faced by the investors in starting a business in Indonesia is related to licensing issues. The approval and licensing arrangements which it contains a provision about the one stop service will encourage interest of investors to invest in Indonesia. With this system, it is expected that the integrated service in the center and in the area can create licensing simplification and acceleration of the settlement. Law No. 25 Year 2007 regarding Investment has given space to the Government to adopt policies in order to anticipate the various international agreements that happened and also to encourage international cooperation in order to increase the regional and international market

opportunities for goods and services from Indonesia. Economic development policy in certain regions is a part to attract potential international markets and as an impetus to improve the attractiveness of the growth of a region or a particular economic region that are strategic for the development of national economy. In addition,

Law No. 25/2007 also regulates the right of transfer of assets and the right to transfer and repatriation by taking into account the responsibility of the legal, fiscal obligations and social obligations that must be resolved by investors. The possibility of disputes between investors and the government is also anticipated that Act with the regulation concerning the settlement of disputes. The rights, obligations and responsibilities of investors specifically regulated in order to provide legal certainty, to reinforce the obligation investors against the application of the principles of sound corporate governance, giving respect to the cultural traditions of the community, and implement corporate social responsibility.

Setting responsibilities investor climate needed to encourage healthy competition, increase environmental responsibility and fulfill the rights and obligations of workers, as well as efforts to encourage the observance of investors against the legislation. The world economy is characterized by competition between nations increasingly tight so that the investment policy must be encouraged to create national economic competitiveness in order to encourage integrationIndonesia's economy to the global economy.

The world economy is also characterized by the presence of a block trade, a common market and free trade agreements are based on the synergy of interests between parties or between countries that have an agreement. It was also the case with the involvement of Indonesia in various international cooperation related to investment, whether bilateral, regional and multilateral (World Trade Organization / WTO), give rise to consequences that must be faced and adhered to. As some of Understanding contained in Law No. 25 of 2007 on Investment, several definitions that need to be understood include:

1. Investments are all forms of investing activity by both domestic investors and foreign investors to do business in the territory of the Republic of Indonesia.
2. Domestic investment is investment activity to conduct business in the territory of the Republic of Indonesia by a domestic investor using domestic capital.
3. Foreign investment is investment activity to conduct business in the territory of the Republic of Indonesia, made by a foreign investor, whether using foreign capital and joint venture with a domestic investor.
4. The investor (investor) is an individual or business entity that makes an investment that can be either domestic investors and foreign investors.
5. Capital is an asset in the form of money or other form that is not money that is owned by an investor who has economic value.
6. Foreign capital is capital owned by foreign states, foreign individuals, foreign business entities, foreign legal entities and / or Indonesian legal entity which is partially or wholly owned by foreign parties.
7. Domestic Capitals are capital owned by the Republic of Indonesia, individual Indonesian citizens, or entity in the form of legal entity or non-legal entity.
8. The integrated one-stop service is the implementation of a licensing activities and non licensing activities who received the delegation or the delegation of authority of the agency or agencies that have a licensing authority and non licensing authority the management process starts from the proposal stage to the stage of publication of documents done in one place.
9. Regional autonomy is a right, authority, and duties of the autonomous regions to set up and manage their own affairs and interests of local communities in accordance with the provisions of laws and regulations.

Principles and Objectives of Investment Principles of investment activity in Indonesia is:

1. legal certainty;
2. openness;

3. accountability;
4. equal treatment and did not distinguish the origin of the country;
5. togetherness;
6. The efficiency of justice;
7. sustainable;
8. environmentally sound;
9. The independence; and
10. The balance of progress and national economic unity.

While the aim of the investment, among others, to:

1. increase the growth of the national economy;
2. create jobs;
3. boost sustainable economic development;
4. improve the competitiveness of the national business world;
5. enhance the capacity and capability of national technology;
6. encourage the development of community economy;
7. The process of economic potential into real economic strength by using funds from both domestic and foreign; and
8. improve the welfare of the community.

Basic Investment Policy The government determines basic policy of investment to:

1. encourage the creation of national business climate conducive to investment in order to strengthen the competitiveness of the national economy; and
2. accelerate the increase in capital investment.

In setting the basic policy of the Government:

1. to give the same treatment to domestic investors and foreign investors with regard to national interests;
2. ensure legal certainty, certainty and security attempted to investors since the licensing process until the termination of investment activities in accordance with the provisions of the legislation; and
3. an opportunity for growth and provide protection to micro, small, medium enterprises and cooperatives.

**Energy Development**

In connection with this Act explained that "investor" is an individual or business entity that makes an investment that can be either domestic investors and foreign investors. All business sectors should be sought, including the energy sector. In Article 12 emphasized that all areas of business or type of business open to investment activity, except the areas of business or type of business that is declared closed and opened with requirements.

Government pursuant to Presidential Decree establishes business fields closed to investment, both foreign and domestic, based on criteria of health, morals, culture, environment, defense and national security, and other national interests.

Government establishes opened business field with requirement is based on the criteria of national interest, namely the protection of natural resources, protection, development of micro, small, medium enterprises and cooperatives, supervision of production and distribution, increased technological capacity, participation of domestic capital, as well as cooperation with entity appointed by the government.

**2.Law No. 3 of 2014 regarding Industry**

Industry is one of the pillars of national economic development. To promote and develop the national industry, the government has issued a law on industry. The existence of this law is the duty and responsibility of the government to the industrial development of both national and local levels. The law regulates the terms, provisions on industry.

To advance the national industry the government has given authority to the regions, provinces and districts / cities to organize industry in each region is the regional authority importance because the local government better understand the environmental conditions and can explore more optimal economic potential in supporting national industry.

It also said that local governments participate in the acceleration of the development and distribution of development industry throughout the territory of the Republic of Indonesia through zoning Industry. Industrial zoning is done with

the least attention to: a. spatial plans; b. utilization of the resource potential of the national territory; c. increasing the competitiveness of industry excellence based on the resources of the area; and d. adding value throughout the value chain.

### 3. PP 79 2014 About the National Energy Policy

In Paragraph National Energy Utilization of Resources explained that Article 12

(1) Utilization of Energy Resources nationally implemented by the Government and / or Regional Government refers to the strategy as follows:

a. utilization of Renewable Energy Sources of the type of water flow and waterfall energy, geothermal energy, energy movement and the difference in sea surface temperature, and wind energy is directed to electricity;
b. utilization of Renewable Energy Sources of energy types sunlight is directed to electricity, and non-electrical energy for industrial, household, and transportation;
c. Renewable Energy Sources utilization of this type of biofuel is directed to replace fossil fuels mainly for transport and industry;
d. Renewable Energy Sources utilization of this type of biofuel done while maintaining food security;
e. Renewable Energy utilization of biomass and litter types geared for electricity and transport;
f. the use of petroleum for transportation and commercial that can not be replaced with energy or other energy source;
g. Energy Sources utilization of natural gas for industrial, electricity, household, and transportation, preferred to use the highest added value;
h. Energy Sources utilization of coal for electricity and industry;
i. New Energy Sources utilization of liquid which liquefied coal (liquified coal) and hydrogen for transport;
j. New Energy Sources utilization of solid and gas for electricity;
k. Energy Sources utilization of liquid outside liquified petroleum gas is directed to the transportation sector;

l. Energy Sources utilization and movement of sea surface temperature difference are encouraged to build a pilot as a first step which is connected to the electricity grid;

m. increase the utilization of Renewable Energy Sources sunlight through the use of solar cells in the transportation, industrial and commercial buildings and households; and

n. maximizing the utilization of Renewable Energy Sources and obligations made under terms sunshine all components and sun energy generating system from upstream to downstream produced in the country gradually.

(2) Utilization of Energy Resources of national priority to meet the needs of energy and raw materials.

(3) Priority use of national energy source is based on thorough consideration on capacity, continuity, and the economic and environmental impact.

**4. ESDM No. 4 Year 2012 on Energy Management**

This regulation requires that all user energy sources and users of energy using energy sources is greater than or equal to 6,000 (six thousand) tons of oil equivalent per year are required to conduct Energy Management, while for the user under specified in this rule are called upon to implement energy savings.

Energy management is an integrated activity to control the use / consumption of energy in order to achieve energy utilization effectively and efficiently to produce a maximum results through technical measures in a structured and economical way to minimize the use of energy, including energy for production processes and minimize the consumption of raw materials and supporting materials.

**5. ESDM No. 27 2014 About the Power Purchaseof Biomass Power Plant (PLTBm) and Power Biogas Power Plant (PLTBg) by the State Electricity Company(Persero)**

This regulation is a revision of the previous regulation 4 In 2012, as a form of incentive to encourage investor interest in the development of biomass-based power plants and biogas. Since the issuance of the Regulation of the Minister of

Energy and Mineral Resources 4 In 2012 in February 2012, private investment for electricity supply based on biomass and biogas grid is still low. One reason is the depreciation of the rupiah against the dollar and the rising price of biomass. Besides the provision of electrical energy from PLTBg and PLTBm dominated by the sale of excess electricity scheme (excess power) and not the construction of new power plants are dedicated to the supply of electrical energy (Independent Power Producer-IPP) to the grid. So we need a revision of the Regulation of the Minister of Energy and Mineral Resources No.4 of 2012 to ESDM No. 27 of 2014.

The Minister of Energy and Mineral Resources Regulation 27/2014 in principle to encourage the utilization of biomass and biogas to reduce the use of fossil energy, especially fuel oil (BBM) in the area- areas that have a dependency on fuel and the archipelago which still has a low electrification ratio.

## 6. East Kalimantan Investment Policy

a. Regulation No. 15 Year 2008 on Provincial RPJP
    1. East Kalimantan Year 2005 - 2025 (fulfillment supply
    2. electricity reliably and efficiently, stated in Goal
    3. PJPD.
b. Regulation No. 07 Year 2014 concerning RPJMD East Kalimantan in 2013 - 2018 (East Kalimantan Development Vision "CreatingProsperous East Kalimantan Equitable and Fair Based Agro-industry and Clean Energy ")

    As for the meaning set forth in the Vision East Kalimantan associated with Agroindustrial and Clean Energy, is to make East Kalimantan as energy centers leading in Indonesia which is characterized by the availability of energy needs by making optimal use of the energy resources that are not renewable such as natural gas, coal; the establishment of alternative sources of energy by utilizing renewable energy sources as solar power, wind power and bioenergy as well as the growing awareness of the public to make energy savings.
c. East Kalimantan Governor Regulation No. 22 2014about RUPM East Kalimantan Province in 2014 - 2025. In the field of agro-industries have

been established RUPMP, infrastructure, energy and tourism as a strategic issue that must be considered in the development of the quality and quantity of capital investment. The policy for investment in these areas must be in harmony with sustainable economic development, independent and supports the sovereignty of Indonesia, the implementation should be supported by the development of each sector of both primary, secondary and tertiary. In RUPMP also determined that the direction of the investment policy should be towards the green economy development programs (greeneconomy), in this case the target of economic growth must be consistent with the issues and goals of environmental development, which include climate change, controlling damage to biodiversity and environmental pollution, and the use of renewable energy and oriented on the development of strategic areas of economic development area of productive , efficient and able to compete with network support facilities and infrastructure of transportation, telecommunications, water resources, energy and industrial allotment area. Development of new and renewable energy (EBT) or renewable energy contained in RUPM East Kalimantan Province Phase II (from 2014 to 2019) through the empowerment of Micro, Small, Medium Enterprises and Cooperatives (MSME) and Phase III (2020 to 2025) that large-scale technology-based , innovation and creativity.

## 2.2 Literature

### 2.2.1 Development of World Energy


The development of energy in the world are classified into two groups, namely renewable energy (renewable energy) and renewable energy (non-renewable). Renewable energy can be used constantly and will never run out. An example is solar energy (solar), biomass (biomass), geothermal (geothermal), water (hydroelectric), and wind (wind). Meanwhile, non-renewable

energy is the energy derived from natural resources will be depleted if used continuously. An example is the fossil energy (fossil energy), such as natural gas (natural gas), coal (coal), and oil (petroleum).

From the first, the need for energy in the world is dependent on oil, coal and natural gas. According to the US Energy Information Administration, the amount of fossil energy reserves in the world there are about 5638.9 billion barrels in 2007. Based on the data distribution of the distribution of fossil energy reserves, reserves of petroleum and natural gas in the world there is the Middle East region, such as Saudi Arabia , Iran, Iraq, and Kuwait. However, the Middle East region that dominates ownership of oil reserves and natural gas in the world have not recorded coal reserves. United States, Russia, and China are the countries that have a fantastic record for their wealth of fossil energy sources such as coal.

**World Biomass Energy developments**

In biomass-based energy development both forest and agricultural waste into one of the most important renewable energy source in the world. Of the world's total energy needs, 10.6% of them met through the use of biomass (International Energy Agency, 2006).

Biomass energy has rapidly become an important part of the global renewable energy and has been considered as a contributor to electricity supply in the whole world. According to a UNEP report earlier this year, total renewable power capacity worldwide exceeded 1,470 GW in 2012, up 8.5% from the previous year.

For the supply of renewable energy provides about 1/5 of the energy consumption around the world, ranging from the use of traditional biomass, hydropower, and to the 'new' are renewable energy (mini hydro, modern biomass, wind, solar, geothermal, and biofuels).

Some examples of biomass such as corn, wheat, and cassava. Only withtouch technology, the biological material can be converted into energy fuel. Some recent predictions indicate that biomass energy is likely to make a third of

the world's total energy contribution in 2050. In fact, biofuels only provide about 3% of the world's fuel for transportation.

### 2.2.2 Indonesia Development Energy

The Statistics development of Petroleum in Indonesia, EMR 2011 states Indonesia still has oil reserves of 7.73 billion barrels. Largest oil reserves in Indonesia are in central Sumatra with a value of 3.847 billion barrels. Natural Gas Statistics, EMR 2011, Indonesia has natural gas reserves are quite large, amounting to 152.89 TSCF (Trillion Cubic Feet Square). Coal Statistics, EMR 2011, Indonesia's coal reserves are 103.187 billion tons. The reserves are spread in Borneo (52.32 billion tons) and Sumatra (52.48 billion tons). With a potential source of energy and natural resources, Indonesia is actually able to meet the energy needs of the people of Indonesia, but because its management is not optimal fulfillment of the National done yet able to be fulfilled.

Pusdatin EMR illustrates that Indonesia has the potential of Renewable Energy (EBT) large enough such mini / micro hydro amounted to 450 MW, Biomass 50 GW, solar energy 4.80 kWh / m2 / day, energy wind 3-6 m / sec and 3 GW of nuclear energy. Currently the development of renewable energy refers to Presidential Decree No. 5 of 2006 on National Energy Policy. In the regulation mentioned the contribution of renewable energy in the primary energy mix nationally in 2025 amounted to 17% with the following composition:

1) Biofuels by 5%,
2) Geothermal 5%,
3) Biomass, Nuclear, Water, Solar, and Wind 5%,
4) Coal disbursed by 2%.

For the steps that will be taken by the Government is to add:

1) an installed capacity of Micro Hydro Power Plant into a 2,846 MW by 2025,
2) biomass installed capacity of 180 MW in 2020,
3) the installed capacity of the wind (PLT Bayu) 0.97 GW 2025, GW 2024 to 0.87 solar, nuclear and 4.2 GW by 2024.

The total investment absorbed renewable energy development until 2025 is projected at 13.197 million USD.

## Biomass development in Indonesia


In Indonesia, biomass is the oldest traditional energy sources are generally used to meet energy needs for cooking in rural areas. Some forestry industry and agriculture also uses waste biomass to meet the needs of heat for the production process. Some also produce electricity.

The use of energy from forest biomass in Indonesia is still relatively limited, despite the magnitude of its potential. Forests can provide biomass as a source of second generation biofuel feedstock. Critical forest areas are very spacious that can be used as a source of raw materials by combining lignocellulose raw material supply efforts with the rehabilitation of degraded land. Indonesian forest biodiversity wealth is projected to also produce fruit / seeds, starch and high caloric value timber. The development of bioenergy from forestry thus very broad, ranging from woodpellet, biodiesel / biokerosene / biothanol to biomethanol.

However, existing initiatives are still sporadic and without analysis process Ranta value (value chain analysis) is adequate. It is suspected because of the lack of direction / design-based energy developmentforest biomass nationally. Besides, no steps - a strategic move across sectors to realize the considerable potential.

Efforts are underway to develop the biomass is to encourage the utilization of industrial wastes of agriculture and forestry as an energy source is integrated with the industry, integrating biomass development with economic activities, encourage the manufacturing of energy conversion technologies of biomass and supporting business, and increase research and development utilization of waste including municipal solid waste for energy.

Biomass is energy generated from food industry waste, such as waste palm oil (CPO), waste rice and sugar factory waste. Biomass can also be developed by utilizing waste development of bioethanol (sugar cane and cassava), waste and biooil biodiesel (palm and teak). Biomass development using agricultural waste,

forestry and plantation industry, not food, is an alternative in the development of energy from renewable sources will replace gasoline.

Data from the Directorate General of Renewable Energy and Energy Conservation of the Ministry of Energy and Mineral Resources said in 2013, the potential of biomass in Indonesia stood at 32 654 MW and amounted to 1716.5 MW have been developed (5.26%). The development of bio-energy-based power plants (on-grid) up to the year 2013 reached approximately 90.5 MW, while the development of bioenergy-based power generation (off-grid) of approximately 1,626 MW, of which the power plant based on biomass, biogas and municipal solid waste.

Based power generation biofuels also has potential in areas remote from waste forestry, agricultural waste, the palm oil industry, the paper industry, tapioca industry, and other industries Ministry of Energy, optimistic energy targets national average of 23% of renewable energy ( EBT) and 8.3% originating from bioenergy can be achieved. Ministry of Energy and Mineral Resources was optimistic after the issuance of RegulationEMR Number 27 Year 2014 concerning the Purchase of Electricity from Biomass Power Plant (PLTBm) and Power Generation Biogas (PLTBg) by PT PLN (Persero). Government Policy 27/2014 is a revision of Regulation No. 4 In 2012 as a form of incentive to encourage investor interest in the development of biomass-based power plants and biogas. By government policy 27/2014, investors are increasingly interested because of the economic value of electricity generation rates are adequate.

In the use of biomass, can be divided into two groups: traditional and modern biomass biomass. Perspective traditional biomass refers to the absence of collateral provision back through replanting biomass feedstock crops or agricultural waste utilization. Meanwhile, modern biomass refers to efforts by planting or use of material derived from the cultivation system for agricultural commodities, forestry or municipal waste. So the difference of the two groups is sustainability criteria.

The following definitions will differentiate understanding of traditional biomass and modern biomass, then summarized in Table 2.1. using eight indicators that terminology / terms, purpose of use, efficiency of energy

conversion, conversion technology, treatment, additional products, users and their implications.

1. Traditional Biomass

   Solid Biomass, including firewood collected, charcoal, agricultural and forest residues, and animal dung, which usually produced but is not sustainable and is usually used in rural areas in developing countries by burning polluting and inefficient furnaces , furnace, or open burning as a provider of heat for cooking, comfort, and small-scale agriculture and processing industry (as opposed to modern biomass energy). Called unsustainable traditional biomass because retrieval of raw materials from the field or the location of the source is not offset by replanting.

2. Biomass Modern

   Energy derived from the combustion of solid biomass fuel, liquid, and efficient gas use in households to plant conversion industrial scale for modern applications of heating, electricity generation, combined heat and power, and transportation (as opposed to energy traditional biomass) , Table 2.1

**Table 2.1**
**Eight differentiator indicators betweenTradisional And Modern Biomass**

| No | Indicator | Traditional Biomass | Modern Biomass |
|---|---|---|---|
| 1. | Terminology | No crop replacement significantly in the field through cultivation. | There are a replacement for a biomass through cultivation .Generating electricity , biofuels |
| 2. | The Use | Cooking and room heating/warming | Vihicle, machine, and heating |
| 3. | Conversion Effeciency | Low | High |
| 4. | Conversion Technology | Direct Combustion | Gasification (gasses), pyrolysis, thermolysis, |
| 5. | Treatment | For drying only before the use of biomass. | Drying , manufacture of pellets , roasted ( torrified ) , and others |
| 6. | Additional Products | Only dust | Gass, bio solid, bio fuel |
| 7. | User | Household , poor and emerging/developing countries | Industrial , power generation plants , and settlements , developed countries |
| 8. | Implications | Effect on the addition of gas causing the greenhouse effect through the addition of CO | Considered zero because there is no replacement through cultivation would absorb CO back into the system plants |

*Source: Goldenber and Coelho (2004) dan Gurung and Eun Oh (2013)*

The use of biomass as a modern have become the hallmark of developed countries or countries that realize the utilization of technology conversion other biomass into energy. The trick, they prepared substitutes such biomass through the utilization of the farm system, or using agricultural waste, forestry, and town. The benefit is the result of the conversion of biomass that, by modern society, utilized as a substitute fuel in running equipment and means of transport, or converted directly into electrical energy for household-residential, and industrial.

Where the position of Indonesia in the biomass utilization? The answer given by the data in the report of the International Energy Agency's World Energy Outlook (2013), where the Indonesian population still relies heavily onbiomass for cooking. The Indonesian position brings together India, Pakistan and China still quite traditional biomass user state.

**Table 2.2**
**The Indonesia's Position in the Utilization of BIOMASSA WEO,2013**

| Region | Population relying on traditional use of biomass<br>millions | Percentage of population relying on traditional use of biomass<br>% |
|---|---|---|
| Developing countries | 2,642 | 49.4 |
| Africa | 696 | 67 |
| Sub-Saharan Africa | 695 | 79 |
| *Nigeria* | *122* | *75* |
| *South Africa* | *6* | *13* |
| North Africa | 1 | 1 |
| Developing Asia | 1,869 | 51 |
| *India* | *818* | *66* |
| *Pakistan* | *112* | *63* |
| *Indonesia* | *103* | *42* |
| *China* | *446* | *33* |
| Latin America | 68 | 15 |
| *Brazil* | *12* | *6* |
| Middle East | 9 | 4 |
| World | 2,642 | 38.1 |

*Source: IEA,World Energy Outlook 2013*

## 2.2.3 Development of Biomass Energy Elephant Cassava into Bioethanol

### 1. Production Process

Bioethanol is basically ethanol or alcohol compound obtained through the fermentation of biomass with the help of microorganisms. Bioethanol is obtained

from the fermentation can have the wide range of levels. With levels of 90-94% bioethanol is called bioethanol industry level. If bioethanol yield obtained from 94 to 99.5%, it is called bioethanol neutral level.

Generally this kind of bioethanol used for mixed liquor, and the latter is bioethanol fuel level. Bioethanol content of this very high level, a minimum of 99.5%. National Standardization Council (DSN) has established the Indonesian National Standard (SNI) for bioethanol. Currently there are two types of SNI bioethanol, ie SNI DT 27-0001-2006 for denatured ethanol and SNI-06-3565-1994 for technical alcohol comprising Prima Super Alcohol, Alcohol Prima Iand Alcohol Prima II. Alcohol Prima Super has a maximum level of 96.8% and a minimum of 96.3%, while the first Prima and Prima II minimum of 96.1% and 95.0%. All measured at a temperature of 15oC.

To convert biomass into bioethanol necessary steps as follows (Gan Thay Kong, 2010):

1) The process of hydrolysis of starch to glucose. In this step the starch or carbohydrate destroyed by enzymes or mineral acids into more simple carbohydrates. If the raw materials used fruits contain sugar do not need to be done hydrolysis.
2) The process of fermentation, or the conversion of sugar to ethanol and CO2. The number and levels of ethanol produced is very dependent on this process, therefore this process must be controlled so that bioethanol can be produced in large quantities and high-yield.
3) The distillation process to separate ethanol from water in order to obtain bioethanol with levels of 95-96%. Because the boiling point of water is different with bioethanol, then these two components can be separated by distillation techniques.
4) The process of drying or dehydration to remove residual water in the ethanol bio-ethanol in order to reach the level of more than 99.5% (Fuel Grade Ethanol (FGE). The raw material for bioethanol production (first generation bioethanol) are widely available in Indonesia, among others, cassava or cassava, maize, sweet potatoes, and sugar cane. Everything is a

carbohydrate-rich biomass and crops derived from carbohydrates or starches.

## 2. Product Prices

With regards to the price of bioethanol products, Pertamina bought 1 liter of bioethanol Rp 5.000, - home-scale producers were given mengoplos opportunity alias mix of bioethanol and premium itself to be marketed (legal as reserved). Happily bioethanol for fuel duty free. It is proof that the governmentindeed serious in developing bioethanol as a renewable energy source.

Prawoto research results show, with a mixture of bioethanol fuel consumption more efficient. E20 car alias given a mixture of 20% ethanol, at a speed of 30 km per hour, fuel consumption 20% more efficient than gasoline-fueled cars. If the speed of 80 km per hour, fuel consumption 50% more efficient. Combustion more efficient because of faster burning ethanol instead of pure gasoline. No wonder more and more a mixture of bioethanol, combustion processes increasingly short. The complete combustion because of bioethanol higher octane than gasoline. The octane rating of gasoline just 87-88; Bioethanol 117. When the two materials were mixed, increase the octane rating. Example 3% addition of bioethanol to boost the octane rating of 0.87. Levels of 5% ethanol increases the octane to 94 octane 92, (Sungkono). The higher the octane number, the more resistant to fuel does not burn itself resulting stability of the combustion process to obtain a more stable power. Only 3% bioethanol mix, able to reduce carbon monoxide emissions to only 1.35%. Compare the premium if the vehicle harness, aka the emission of carcinogenic compounds that cause cancer 4,51%. when the ethanol content increased, the emission was getting down. Blue sky program launched by the government is more easily realized. Impact, increasingly healthy society. The current mix of bioethanol in premium to conventional cars maksimal10% or E10. Even in Brazil, conventional cars using E20 bioethanol mix alias 20% without modifying the engine.

Although many privileges, bioethanol business is not without obstacles. One obstacle roadblock that business is the limited supply of raw materials. Currently most manufacturers rely on molasses as raw material. In fact, the sugar

processing waste also needed other industries such as manufacturing soy sauce and flavor. In fact, some of them are exported. Indra Winarno said molasses into black gold lately. Impacts, economic law was talking. So manydemand, the purchase price of raw materials was rising so bioethanol producer margins shrink. Several manufacturers of cassava as an alternative glance. First cassava prices under $ 300 per kg. Now more than USD 400, The price increase was a blessing for the planters. On the other hand complicate the producers.

### 3. Product Markets (request)

Bioethanol is a chemical that has many uses, for example: As an ingredient in cosmetics, as a fuel, as a solvent, as an ingredient of liquor. The use of ethanol reduces emissions of CO gas (environmentally friendly) significantly, Bioethanol can be used directly as a biofuel or blended into premium as an additive with a certain ratio (Gasohol or Gasoline alcohol), when mixed into gasoline, the ethanol could significantly increase the octane number. A mixture of 10% ethanol into gasoline will raise the octane number of premium to the equivalent pertamax (octane number 91), Production of bioethanol relatively low cost therefore bioethanol can be made by anyone, including SMEs and home industry. Technology manufacture of bioethanol relatively low technology so that ordinary people with limited education can make their own ethanol bio-ethanol sources, such as cassava, sugar cane, fruits and corn is cultivated.

As the substitution of premium fuel, bioethanol demand is very high. According Yuttie Nurianti, national gasoline Needs reach 17,5- billion per year, 30% of the total requirement is imported. As mandated in Presidential Regulation No. 5/2006 on national energy policy, the government is targeting to replace the 1.48-billion liters of gasoline with bioethanol due to increasing depletion of oil reserves. That percentage will increase to 10% in 2011-2015, and 15% in 2016-2025. In the first period of 2007-2010 during the 3-year government needed an average of 30.833 million liters of bioethanol per month. Of the total demand was only 137 000 liters of bioethanol per month is metor 0.4%. That means the

government every month supply shortages 30.696 million liters of bioethanol for fuel.

The market is increasingly extensive and improved when the fuel subsidy is revoked. Apart from the business of fuel, bioethanol market opportunity remains large. That's because many industries that require it. For example, industrial seasoning, powder, paint, pharmaceutical, carbonated beverages, cough medicine, toothpaste and mouthwash, perfumes, and cigarettes require it. Even the ink industry also needs bioethanol. The products useful as solvents, vinegar making materials, and acetaldehyde. Ethanol industry needs an average of 140-million liters per year (Agus Purnomo, head of the Association of Ethanol Spiritus and Indonesia).

## 2.2.4 Development of Oil Palm Biomass Waste into wood pellets

### 1. Production Process

Increasing global demand for crude palm oil (crude palm oil) to encourage increased production of palm oil, which have an impact on the increase also oil palm empty fruit bunches (EFB). TKKS which is palm oil industry waste biomass currently not utilized optimally, and only a low energy value fuel only. To change the palm oil waste into bioethanol and chemicals are worth the need to implement the processing of waste biomass of oil palm in an integrated manner.

Oil palm waste is composed of cellulose and hemicellulose components. To treat waste in an integrated palm oil, it is necessary to apply the concept of biorefinery utilizing biomass as a raw material for the production processes of energy sources, chemicals, foodstuffs, and pharmaceuticals. Further outlining the cellulose component of palm oil waste into glucose. Meanwhile, most of the hemicellulose components from palm oil waste will decompose into xylose can be converted into xylitol with some particular types of yeast. Glucose is then fermented decomposition cellulose intobioethanol, while xylitol can be used as a natural alternative to sugar that is low in calories and do not damage teeth.

The series of studies covering the hydrolysis of palm oil waste to ferment xylitol, and the integration of both processes in an integrated system design. With

the integration to both the process, the cellulose content of palm oil waste can be processed into bioethanol. As a first step the study, conducted studies of fundamental characterization of potential microbial beforehand. Potential studied microbes is expected to produce xylitol from xylose by fermentation. In addition, also carried out optimization of microbial fermentation xylitol potential.

**Enzyme and Microbial Characterization**

Potential Characterization of microbial hemicellulase enzyme production is done by using 3 strains of the fungus, the Penicillium sp. ITB CC L96, Trichoderma Viridae QM9419 L67, and L61 CC ITB Aspergillus niger. The study was conducted by varying the time of harvesting the enzyme, the composition of palm oil waste in the media, temperature, pH and cultivation for analyzing the total protein concentration and enzyme activity obtained.

From these studies, Tjandra and his team found that when the highest cellulase enzyme activity within 36 hours obtained from cultivation of the fungus Penicillium sp. Meanwhile, the characterization of microbes producing xylitol potential is based on two criteria, namely growth on xylose substrate and its ability to produce xylitol. Characterization is done by using 3 strains of microbes, Candida utilis ITB CC R23, R85 CC ITB Debaromyces hansenii, and Pichia stipitis ITB CC R89.

The study was conducted by varying the air condition and concentration of xylose. For characterization of microbes, found that in general the three tested microbial strains can grow on xylose substrate, with Candida utilis ITB CC R23 and Debaromyces hansenii ITB CC R85 as microbes with the most potential to be used in the production of xylitol.

**Optimization of Xylitol Fermentation**

To optimize the fermentation of xylitol, an examination of the variable ratio of sugars xylose and glucose in the substrate, the concentration of sugar, aeration conditions and pH. In general, studies conducted have managed to find strains of fungi and operating conditions to produce a hemicellulase enzymes are used to

hydrolyze palm oil waste into xylose. In addition, the study also found that a potential yeast strains to produce xylitol from xylose to the fermentation process.

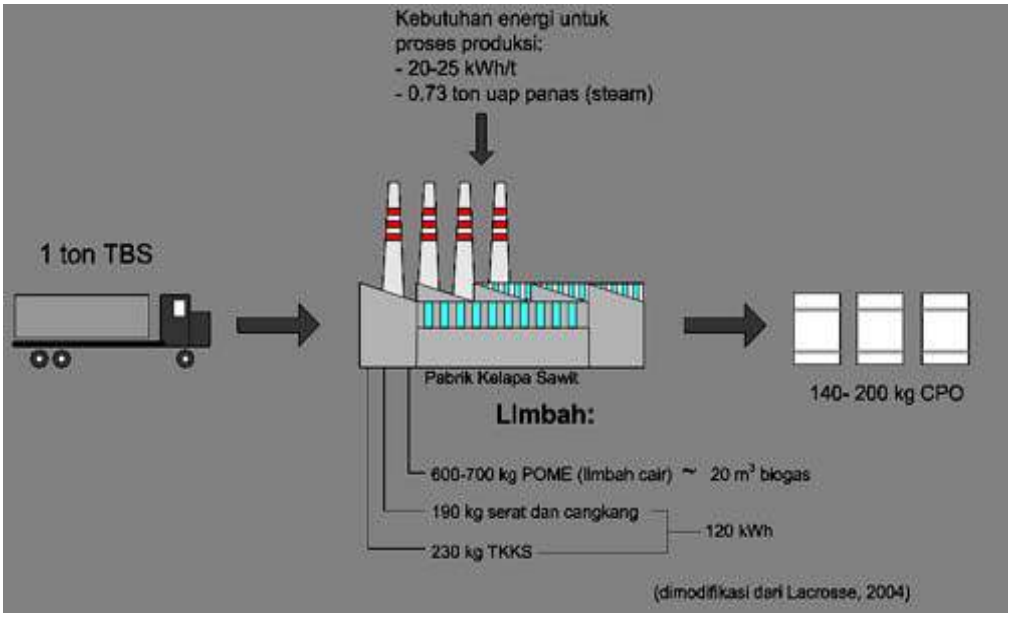
Oil palm trees that produce palm fruit bunches collected in one, therefore, often referred to as TBS (FFB). Oil already in production can generate TBS optimal weighing between 15-30 kg / bunches.

Bunches is then further processed produce palm oil. The main production plant is CPO and palm kernel oil palm. CPO is extracted from the husk taken off, namely between the skin shell. While the flesh will produce palm kernel oil. Palm varieties with thicker skin much sought after, because palm fruit like this that high oil yield. In addition to producing palm oil and palm kernel oil production of palm oil generates solid waste, which can be seen from the table below.

**Table 2.3**
**Waste products of palm oil**

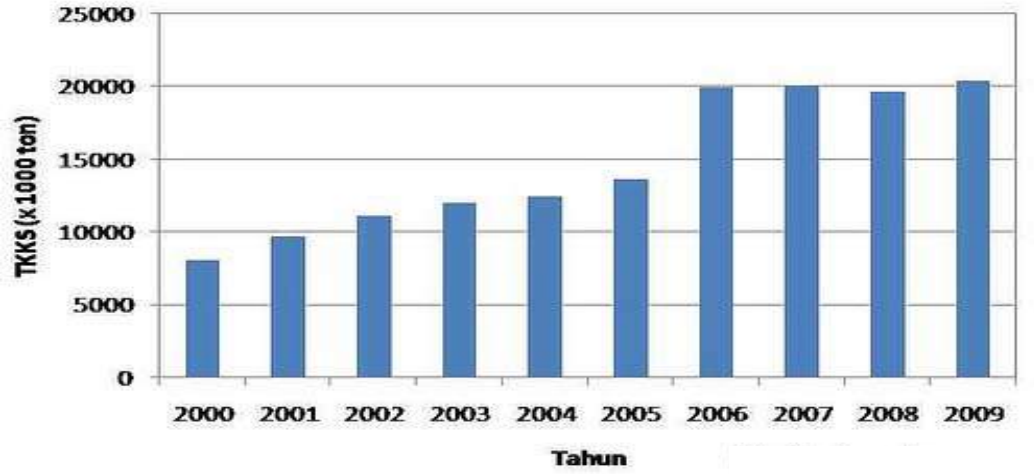
| No | Jenis komoditi | Limbah produksi / pengolahan |
|---|---|---|
| 1 | CPO (*Crude Palm Oil)* | Liquid waste: POME (*Palm Oil Mill Effluent*)<br>Solid waste : midrib and unproductive tree trunks , empty fruit bunches , fiber |
| 2 | Minyak inti sawit (Palm kernel oil) | Palm Shell (Cangkang Sawit) |

**Figure 2.1**
**The processing of palm oil and its production and waste results**



From the picture above it is known that waste oil produce named POME wastewater and solid waste such as palm shells, stem and trunk unproductive, empty fruit bunches and fibers.

**Figure 2.2**
**TKKS Result(Tandan Kosong Kelapa Sawit/Oil palm empty bunches)**




*Source : http://isroi.wordpress.com*

From the above chart it is known that there is a rise in the number TKKS, along with the increase of oil palm plantations.

Of the solid waste will be processed into wood pellets as an alternative fuel is non-oil. Of each tonne of FFB processed can produce 140-200 kg CPO. In addition to processing CPO also produce waste / by-products, among others: effluent (POME = Palm Oil Mill Effluent), palm shells, fiber / fiber, and oil palm empty fruit bunches. Wastewater produced quite a lot, and it ranged between 600-700 kg. Also produced fibers and shells reach 190 kg.

**Table 2.4**
**The Calculation of Palm Oil Waste**

| No | Production of palm oil per 1 ton | Result |
|---|---|---|
| 1 | CPO | 140 – 200 kg |
| 2 | Liquid Waste | 600 – 700 kg |
| 3 | Fiber and Shell | 190 kg |

Another waste in very large amount in addition to the liquid waste are empty oil palm bunches (EFB), which reached 230 kg of every tonne of FFB

processed. So the potential for wood pellets materials in East Kalimantan is: 7600298 kg multiplied by 230 divided by 1000, the figure amounted to 1,748 tons TKKS.

For solid waste marketing potential of oil palm in East Kalimantan Disbun Party explained that the state of Polish investors keen to bring waste oil palm fresh fruit bunches as fuel for electric power in Poland. For the year 2012 palm oil waste products reached 1.7 tons is expected in the next years will increase. East Kalimantan provincial government expects the Polish investors invest their funds in East Kalimantan for power generation. Given the cost of shipping large enough TKKS to Poland, also the advantage of a small East Kalimantan. Currently only one company that processing waste oil into new energy sources, PT Rea East Kalimantan Plantations.

### 2.2.5 Development of Biomass Energy Coconut into Biofuel

**1. Biofuel Production Process is a renewable fuel that is promising.**

Biofuel can be broadly defined as solid, liquid or gas fuel containing or derived from biomass. A narrower definition defines biofuels as a liquid or gas that serves as a transportation fuel derived from biomasssa (Milbrant and Overend, 2008). Meanwhile, according to BNN national team (2013), biofuel or biofuel (BBN) is a renewable fuel (renewable) that can be produced from a variety of plant species. Biofuels or Biofuel (BBN) is the most promising source of energy as fossil fuel substitution. Biofuels are fuels derived from biomass processing results therefore biofuel is often called green energy as well as the origins and emissions that are environmentally friendly and do not cause a significant increase in global warming.

BBN is a bioenergy products that have high development potential due to a liquid so as to facilitate the handling and utilization. BBN contains no petroleum, but it can be mixed with various kinds of petroleum products to produce the fuel mixture. BBN can be used on various types of machines without making major changes. Excess renewable biofuel in addition to also be environmentally friendly, biodegradable, able to eliminate the greenhouse effect and continuity of raw

materials is assured. Bioenergy can be obtained by a fairly simple way is through the cultivation of biofuel crops and raising livestock. In Indonesia there are more than 50 types of plants that can be used as raw material for biofuel.

Biofuels are popular today are biodiesel and bioethanol. Biodiesel is for a diesel engine, derived from the esterification-transesterification or direct transesterification of oils or fatswhile bioethanol as an additive or premium substitution is made of hydrolysis, fermentation and distillation starchy biomass. Technology processing biomass into biodiesel and bioethanol relatively easy (low technology) as well as its production costs are relatively low so that the conversion of biomass into biodiesel and bioethanol can be applied anywhere and by anyone.

BBN is one form of green energy that can be broadly grouped into three, namely:

(1) Biodiesel. Biodiesel is a form of ester of vegetable oil. The raw material can be derived from palm oil, jatropha, soy and coconut. Bio-Diesel will be a substitute for Diesel Fuel (Diesel) which will be used for transport (10%) and Power Plant (50%). In use was blended with petroleum diesel with a certain ratio. B5 is a mixture of 5% biodiesel with 95% petroleum diesel sold commercial by Pertamina under the trade name biodiesel.

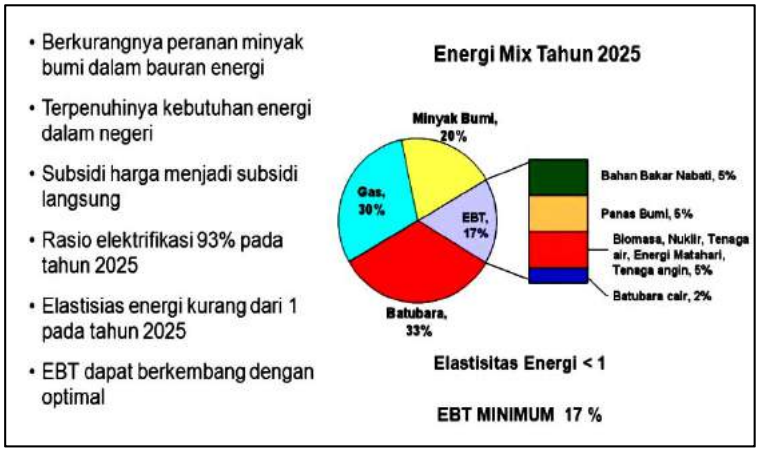
(2) Bioethanol. Bioethanol is anhydrous alcohol derived from fermentation of molasses, cassava, corn or sago. Bioethanol is used to reduce the consumption of premium. E5 is a mixture of 5% bioethanol with 95% premium that has been marketed under the trade name biopremium Pertamina. The use of ethanol up to E15 does not need to make modifications to existing vehicle engines, but for the E100 can only be used for car type FFV (flexible fuel vehicle). Bio-Ethanol is used as a substitute fuel (Gasoline) on transport, with a target of 10%. The raw material is of Sugar cane (Sugar Cane Plant) and Cassava (Cassava).

(3) Pure Plant Ofadditional equipment specifically for fuel of industrial equipment. Use of greater than O15 must add equipment converter. Bio-Oil has 3 derivatives as follows:

a. Bio-Kerosene: Kerosene instead of in the household (10%) with the raw material of oil palm and Jatropha
b. Bio-Oil: instead of Automotive Diesel Oil (ADO) to transport (10%) and Power Plant (10-50%), and the Bio-Oil as a substitute Industrial Diesel Oil (IDO) for Maritime Transport and Railways (10%) , as well as raw materials together with Bio-Kerosene.
c. Bio-Oil: instead of Fuel Oil (Fuel Oil) for the Industry as much as 50%. Her raw material is oil palm and Jatropha.

The National Energy Policy 2006 (KEN 2006) stated in Presidential Decree No. 5 of 2006 states that the goal of long-term renewable energy development is a target mix of hydropower, geothermal, solar, bio and other new energy in 2025 reached a total of more than 17% of the total energy used while the portion of the fuel in the energy mix is targeted only 20%. Target national energy mix is shown in Figure 2.3.

**Figure 2.3**
**Mix Energy Target 2025**




To accomplish the realization of the target of energy mix, national energy policy diantarnya done through: intensification, conservation, diversification and energy indexation. Given that, the development and use of biofuels types of biodiesel as a source of alternative energy has met every item of the policy, namely: intensifying the use of degraded land and unproductive for biofuel raw materials (intensification), save the use of petroleum fuels (conservation), development of fuel non-petroleum vegetable (diversification) and adjustment of

the type of fuel according to the conditions of local regions (indexation). The use of biodiesel as an alternative energy source has many comparative advantages, among others,

(2) the availability of resources,
(3) the availability of technology,
(4) superior quality products,
(5) a positive impact on the macro economy (foreign exchange) and microeconomic like creation of new jobs and
(6) increase in income communities around the location of raw materials (Sudrajat, 2008).

Biodiesel has physical properties similar to diesel, but with some advantages, namely in the form of renewable energy and environmentally friendly. The research proves, a mixture of 30% by volume of biodiesel to diesel generating engine performance is not much different with the use of 100% diesel fuel and the composition does not require any modifications to the vehicle engine. Biodiesel can be used easily as it can be mixed with any composition with diesel oil, so that it can be applied directly to existing diesel engines almost without modification.

Biodiesel can be degraded easily (biodegradable), 10 times no toxic than regular diesel oil, has a cetane numbers were better than regular diesel oil, biodiesel exhaust fumes is not black, it contains no sulfur and aromatic compounds so that the resulting combustion emissions are environmentally friendly. Other advantages do not add to the accumulation of carbon dioxide in the atmosphere thus further reducing the effects of global warming or the many so-called zero CO2emission. Biodiesel is the result of utilization of resources of non-fossil, substitution (1-3%) of biodiesel in diesel will save considerable foreign exchange.

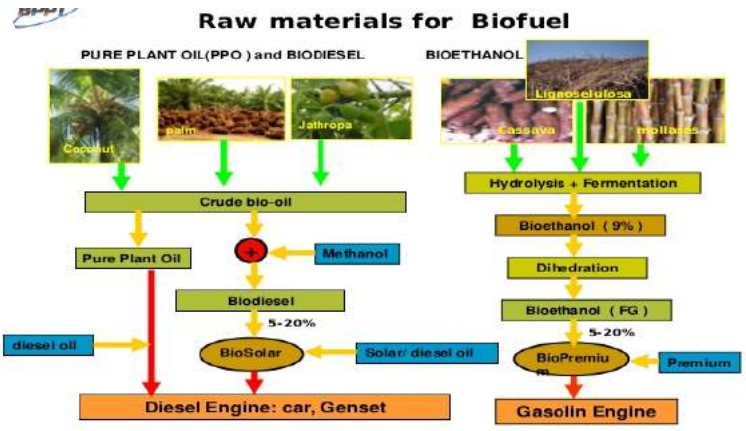
Biodiesel is a renewable fuel that is extremely low berbelerang potentially a booster blending component quality and quantity of diesel oil. The main raw material for biodiesel production include vegetable oils derived or made from plant oil palm, coconut, Distance, etc. Of the three basic ingredients of the oil palm produces the highest vegetable oil, which is 5,950 liters / ha / year, while oil 2,689

liter / ha / year and castor beans 1892 liters / ha / year (Bajoe 2008). Meanwhile, as a supporter or helper ie alcohol (Figure 2.4).

Vegetable oils contain free fatty acid (FFA) is lower than in animal fats, vegetable oils usually besides containing ALB also contains phospholipids. Phospholipids can be removed in degumming process and ALB removed in the refining process. Vegetable oil used to produce biodiesel depends on the type of plant as the raw material used vegetable oils as well as preliminary processing of the raw materials. While alcohol is used as a reagent for vegetable oils is methanol, but can also be used ethanol, isopropanol or butyl, but it should be noted that the water content in alcohol. When the high water content will affect the quality of biodiesel.

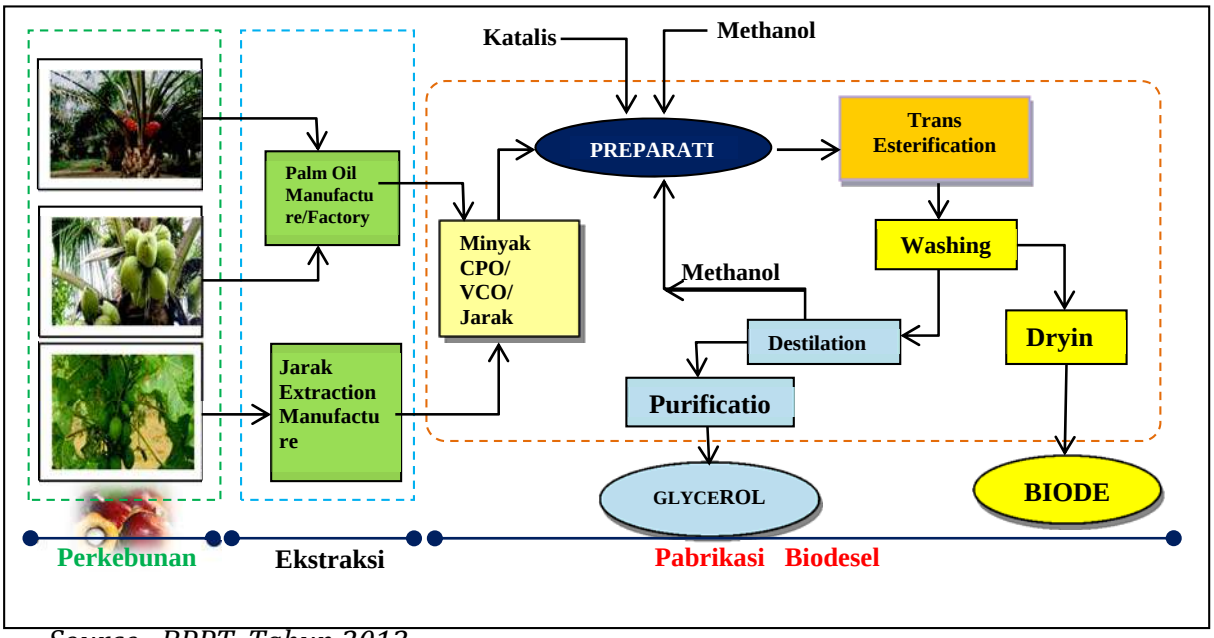
Besides, the biodiesel is also influenced by the high operating temperatures of the production process, the length of time of mixing or blending the speed of alcohol. Happening are needed catalyst. Catalyst also needed to improve the solubility during the reaction. The catalyst used is a strong base is NaOH or KOH or sodium methoxide. Catalysts are generally highly hygroscopic and chemically react to form a solution that would be destroyed by the reactant alcohol. If more water is absorbed by the catalyst, the catalyst performance is not good so poorly biodiesel product. Once the reaction is complete, the catalyst must be neutralized by the addition of a strong mineral acid. Once the biodiesel is washed neutralization process can also be done with the addition of washing water, HCl can also be used for the neutralization of alkaline catalyst, when used acid phosphate fertilizer phosphate will menghasil (K3PO4).

**Figure 2.4**
**Raw Materials for Biofuel**



Biodiesel production process of a plant or vegetable oil is generally made or carried out through a chemical process called transesterification (Figure 2.6). Transesterification is a chemical process that exchange alkoxy group on the ester compound with alcohol. To accelerate this reaction necessary assistance in the form of acid or base catalyst. In the oil-producing plants, pretty much contained fatty acids. Chemically, these fatty acids are glycerides compound. In the transesterification process glycerides compound is broken down into monomers and glycerol ester compound, with the addition of large amounts of alcohol and a catalyst. Ester compounds, at the level (grade) is at the particular biodiesel. In the transesterification process for the production of biodiesel from plants, usually used sulfuric acid (H2SO4) as catalysts for chemical reactions. In addition to the transesterification process, in the production of biodiesel as well as through the following phases: compression plant tissue to produce crude oil; separation (separator) ester and glycerin phases; and purification / washing ester compound to produce grade fuel (biodiesel).

**Figure 2.5 Production Chains**



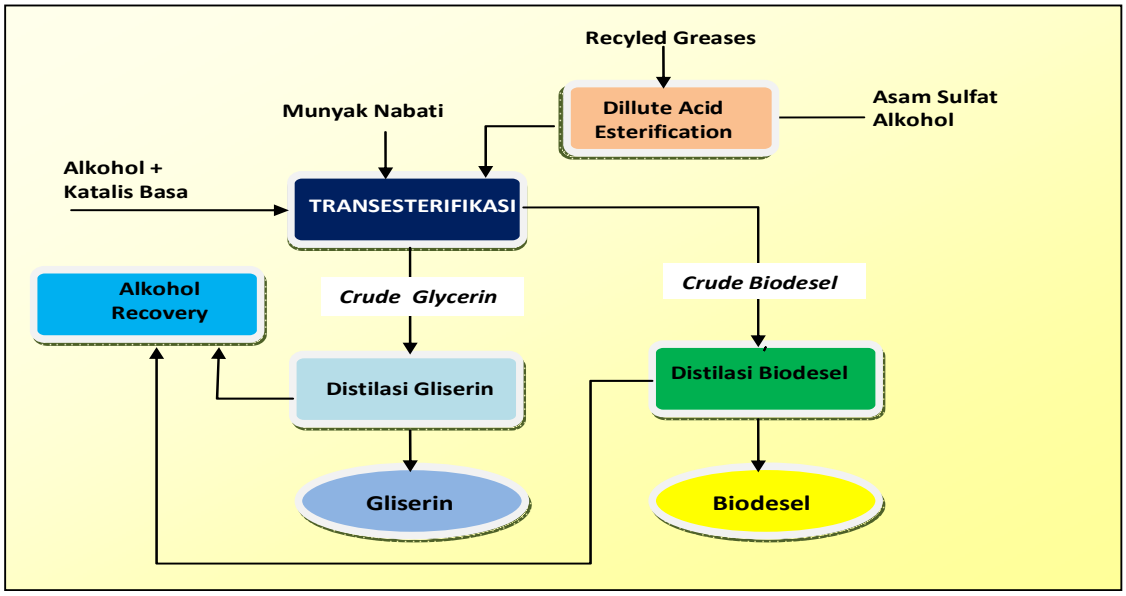

*Source : BPPT, Tahun 2013*

Transesterification process in making biodiesel from vegetable oils (biolipid) as described above, there are generally three kinds of processes, namely:

1. transesterification with Catalyst Bases,
2. transesterification with Catalyst Acid Direct,
3. Conversion oils / fats into fatty acids into biodiesel continued.

Tranesterifikasi biodiesel production process through the catalyst base (Figure 2.6), is a process that most people do because most economically and require low temperature and pressure. Conversion results that can be achieved from this process is that it can reach 98%. Transesterification process using alkaline catalyst is a reaction of trigliserin (fats / oils) with bioalcohol (methanol or ethanol) to form esters and glycerol, an approach that is very important in producing biofuel.

**Figure 2.6 The Diagram of Biodiesel Production through Transesterifikasi**




Biodiesel as diesel motor fuel can be used in a pure state or blended with petroleum diesel with a certain ratio. Specifications biodiesel produced depends on the vegetable oil used as a raw material and operating conditions of the plant as well as modification of the equipment used. Specifications bio-diesel to be mixed or used must comply with established standards, as these standards can ensure that the bio-diesel produced from the reaction of raw material processing vegetable oil is perfect, meaning that free glycerol, catalyst, alcohol and free fatty acids.

Mixing biodiesel with diesel oil is usually given the naming system itself, such as B2, B3 or B5, B20 and B100, which means a mixture of biodiesel and diesel fuel, each containing 2%, 3%, or 5%, 20% and 100% biodiesel. While related to the international standard for biodiesel is ISO 14214, ASTM D 6751 and DIN (standard biodiesel is used in Germany), and is currently in Indonesia has drafted a standard bio-diesel Bio-diesel specification standards RSNI EB 020551. The picture related biodiesel specifications detailed in Table 2.5.

**Table 2.5**
**Biodiesel Specifications**

| No. | Specifications | Measurement | Limit of Max/Min | Method ASTM*) |
|---|---|---|---|---|
| 1 | Burning Point | $^{o}$C | 130 min | D93 |
| 2 | Water & Sedimen | % mm | 0.50 max | D 2709 |
| 3 | Viskositas (40 $^{o}$C | mm$^{o}$/second | 1.9 – 6.0 | D 445 |
| 4 | Abu Sulfat | % mass | 0.020 max | D 874 |
| 5 | Sulfur | | | |
| | a. S 15 Grade | Ppm | 15 max | |
| | b. S 500 Grade | Ppm | 500 max | |
| 6 | Cooper Strip Corrosion | | No.3 max | D 130 |
| 7 | Cetane | | 47 min | D 613 |
| 8 | Carbon Residue | % mass | 0.5 max | D 4530 |
| 9 | pH | Mg KOH/gr | 0.8 max | D 664 |
| 10 | Free Glycerine | % mass | 0.02 max | D 8564 |
| 11 | Total Glycerine | % mass | 0.24 max | D 8564 |
| 12 | Phosphate Content | % mass | 0.001 | D 4951 |
| 13 | Distelation Temp | $^{o}$C | 360 | D1160 |

*Data : *)American Society of Testing and Materials(ASTM)*
*Source : National Biodesel Board*

## 2. Production Price BIOFUEL

Until the end of 2013 the price of biofuels including biodiesel is determined based on the benchmark price of MOPS (Mean of Platts Singapore). The selling price of locally produced biodiesel from palm oil (CPO) is much cheaper compared

to the purchase price of imported diesel. According to the government and the National Energy Board in prediction harg selling biodiesel in the range of 7800 / liter, (Tumiran, the National Energy Board - 23 August 2013). However, at the tender Pertamina in September, 2013, which is implementing a tender for the procurement of 6.6 Million Kilo Liters Biodiesel (domestic consumption for 2 years), Biodiesel purchase price estimated in the range of USD 8400 / liter with a subsidy of Rp 3,000 / liter - already far DEN-than-expected in August which predicted in the range of USD 7800, USD has gone up in 1000 after just a month. (http://margind.com/index.php/ home / detil_berita).

Based on the purchase price of biodiesel (Rp. 8,400 / lit), the condition is of course if no subsidy, the selling price of biodiesel is not competitive with diesel oil. That is the price of biofuels (biofuels) still highercompared to fossil fuel prices. In fact, initially the use of biofuels is expected to become an alternative energy source that is inexpensive and environmentally friendly to replace fossil fuel that is getting more expensive. Another problem, is related to raw materials biodesel that still rely on crude palm oil (CPO) predicted price increase. Where rising CPO prices would directly affect the rising cost of biodiesel production.

In 2013 the average cost of biodiesel production per ton of around $ 130 plus the price of palm olein. Palm olein prices range from US $ 25 to US $ 30 above the price of Crude Palm Oil (CPO). If the current CPO price of about US $ 722 per ton, meaning biodiesel production cost of US $ 870-US $ 880 per ton or above the reference price. These conditions meant that if nutrient CPO biodiesel price increases will lead to increasing of the reference price, and of course, the subsidy will be increased as well, (Cash, 12 September 2013). Based on data from the Ministry of Energy and Mineral Resources 2014 price developments biodiesel and diesel prices / non-subsidized diesel in the period January to September 2013. (Figure 2.7) the price of biodiesel and diesel fuel over a period of quite volatile with the average price of biodiesel condition is higher than diesel fuel, except in January and September the price of non-subsidized biodiesel smaller than diesel oil. While based on the price development of biodiesel 5 (five) years (Figure 2.8), the average price of biodiesel in 2013, which reached US $ .0.80 / liter decrease

compared to the average price of the previous two years. Where in 2012 reached US $ 0924 / liter and in 2011 is US $ .1.049 / liter.

**Figure 2.7**
**Biodesel and Solar Non-Subsidized Price Flow Chart**

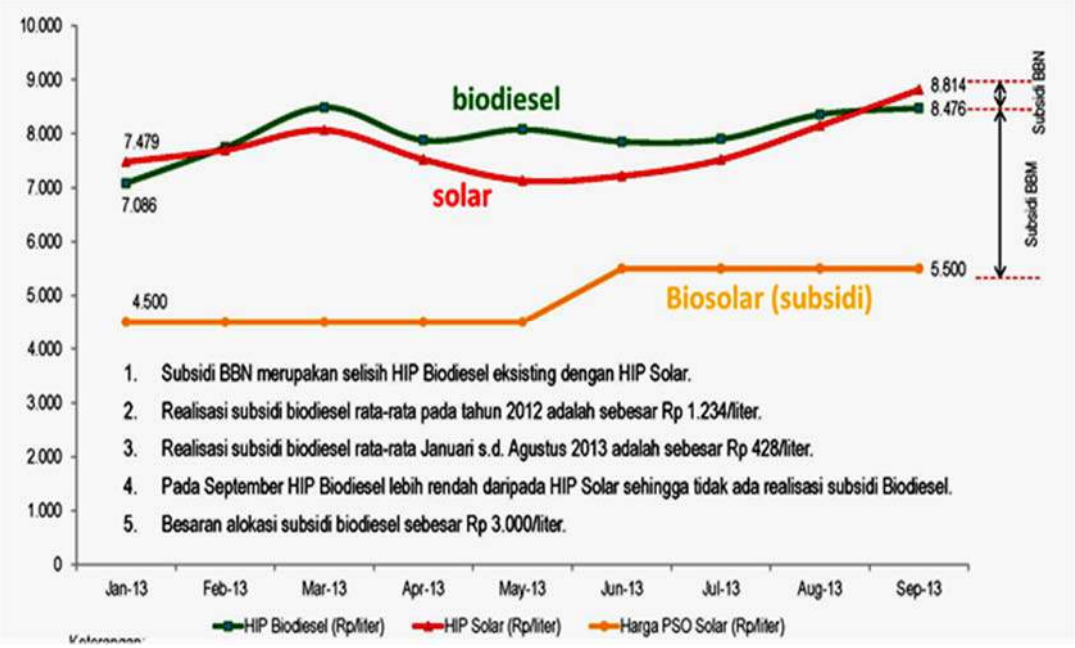
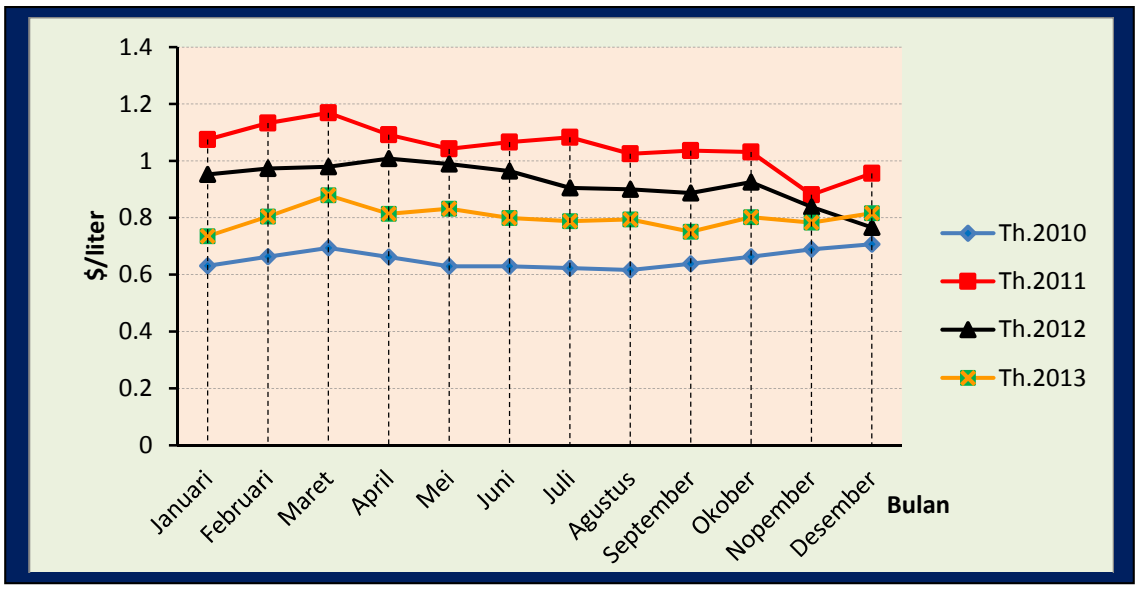



**Figure 2.8**
**Biodesel Price Flow Chart. 2010 - 2013**




*Source: Kilas Balik ESDM 2013 dan rencana BBN 2014*

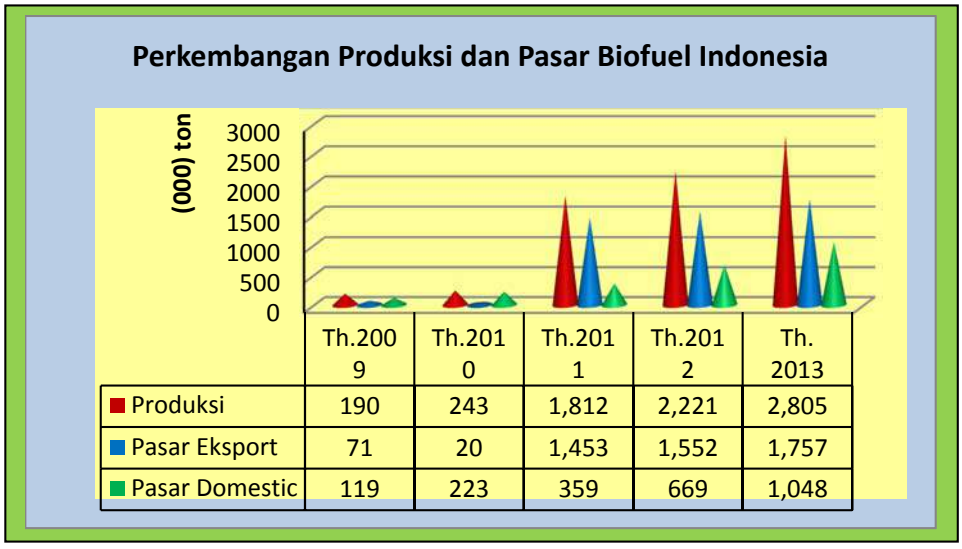
### 3. Product Markets (request)

BBN (Biofuel / Biofuel) began to be marketed commercially in Indonesia since 2006 in the form of bio-diesel, and bio biopremium pertamax. Starting from fuel service stations, gas stations JABODETABEK area, then expanded throughout Java, and in 2012 Pertamina already bio-diesel market is West Kalimantan. While the production and marketing in 2013, namely to the South Kalimantan, East Kalimantan and parts of Sulawesi.

BBN utilization that began in 2006 can not be separated from government policy, namely the issuance of Instruction President No. 1 of 2006. And since 2009, the Government has imposed a policy of mandatory use of biofuels in the transport sector, industry and power generation through the Minister of Energy and Mineral Resources Regulation No. 32 Year 2008 on the Provision, utilization and trade system Biofuels (Biofuel) as a Material Other fuel.

As an illustration (Figure 2.9), the production of biodiesel in the country in 2012 amounted to 2.2 million kiloliters, an increase of almost 104-fold from 2010 which is only about 243 thousand KL. In 2012 the uptake of biofuels by Pertamina only reach 669 000 tonnes (30.12%). Whereas in 2013 increased to 2,805 thousand tons, an increase of approximately 26.3% compared to the year 2012, increased production is followed by increase of export (13.2%) and domestic demand / domestic (56.65%).

**Figure 2.9**
**The Development of Biodiesel Market and Production**




| | Th.2009 | Th.2010 | Th.2011 | Th.2012 | Th.2013 |
|---|---|---|---|---|---|
| Produksi | 190 | 243 | 1,812 | 2,221 | 2,805 |
| Pasar Eksport | 71 | 20 | 1,453 | 1,552 | 1,757 |
| Pasar Domestic | 119 | 223 | 359 | 669 | 1,048 |

*Source : Kementerian ESDM (2014)*

Processed increased production and use of biodiesel, one of which is inseparable from the policy or implementation of the government in implementing BNN utilization by increasing the volume of mixing biodiesel in diesel oil to 7.5% in early 2012 from only 5%. However, if viewed from the installed capacity of the national biodiesel industry reached 5.6 million kL / year, the use of biodiesel in the country is still very small and therefore find a gap export market for biofuels becomes very important. By 2012 Volume production of biofuels from Indonesia's exports reached 1.55 million tons (Figure 2.9), where the majority (90%) are exported to European countries, while to other countries such as the United States just as much as 30,000 tons per year and 2,000 tonnes Korea per year. PT Musim Mas, PT Pelita Agung Agrindustri, PT Wilmar Nabati Indonesia, and PT Wilmar Bioenergy Indonesia control 90 percent of the export market of biofuels from Indonesia to Europe. In Indonesia, the biofuels produced in Sumatra, Kalimantan, North Sulawesi and South Sulawesi.

In the year 2014, the installed capacity of biodiesel has reached 5.6 million kL / year of 25 biodiesel producers who have had commercial business license BBN. Of 4.5 million kL / year of which was ready for production. Meanwhile, bioethanol production capacity amounted to 416 thousand kL / year from 8 bioethanol producers who have had commercial business license BBN, and which are ready for production to reach 200 thousand Kl / year. While for 2015 the target of biodiesel in transport PSO from 5% to 10%, industry 10% to 20% and electricity from 15% to 30%. In 2014 the substitution target to reach 4 million kl, so in the next year is expected to decline in the import of diesel fuel with foreign exchange savings of 3.1 million dollars.

In the European market, the biofuels market is still wide. Netherlands and Germany is still the main goal. Furthermore there are Belgium, Poland, Portugal, Austria, and France. After France then there are Spanish and English, in addition to Greece, Sweden, Slovenia and Luxembourg. The potential for the European market, the first place is filled Italy. Then there is Turkey which also serves as a liaison Indonesia to the wider European market, in this case the eastern and southern Europe. Eastern Europe potential market for biofuels owned Estonia, the Czech

Republic, Latvia, Lithuania, Romania, Hungary and Bulgaria. For these countries, Indonesia was aiming for increased export of CPO number of 1 million to 1.5 million tons per year.

For the Asian market, the potential market is still occupied by China and India. For China, the need for potentially large biofuel will lead to the aviation industry and manufacturing. For manufacturing, the supply of biodiesel China will meet the demand for premium-class manufacturing industries. Export-oriented manufacturing industries with stringent environmental protection requirements. As for India, with 20 percent biofuel mandatory policy. Not just a mixture of 20 percent, India is also eager to replace 20 percent of the fuel needs with biofuels, either bioethanol or biodiesel.

Other potential Asian markets such as Japan and South Korea, while for the ASEAN countries, particularly Thailand, Vietnam, Singapore, and the Philippines. It is based on the projected growth in the number of vehicles and the rate of fuel demand is increasing, due to land ownership limited sources of biofuel. Especially for Thailand, the biofuels market there has been a mature form, plus the mandatory rules of the country which has risen from 10 percent to 20 percent mix.

## 4. Producing Products (Quote)

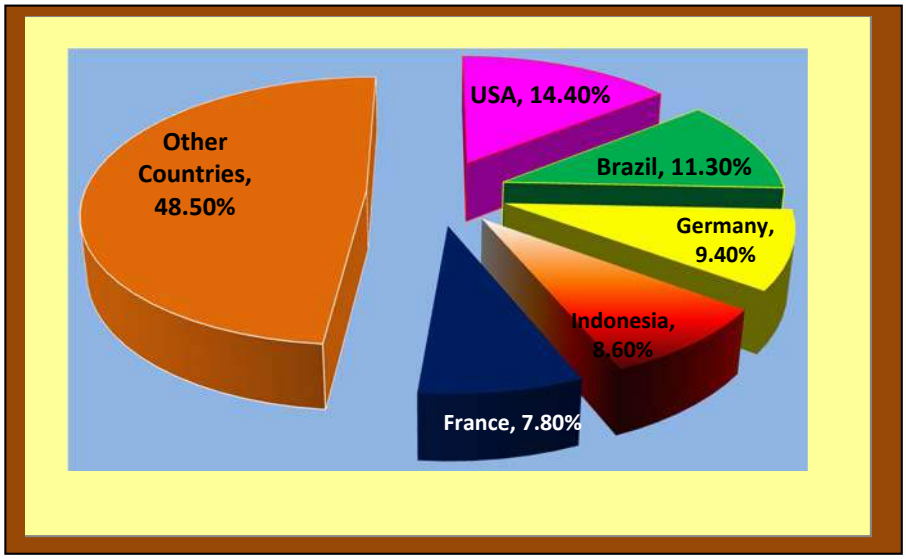
Biofuel Referring to the document "EU Biofuels Annual 2014", it is known that the countries of the largest biodiesel producer in the European Union in 2014 are:

1. Germany (3250 million liters in 2008, 2950 million liters in 2012, and is predicted be 3180 million liters in 2015),
2. Benelux (430 million liters in 2008, 1360 million liters in 2012, and is predicted to be 1990 million liters in 2015)
3. France (2000 million liters in 2008, 1870 million liters in 2012, and is predicted to be 1930 million liters in 2014) ,

According to a survey conducted CDMI, Indonesian biodiesel production in the last five years (2009-2014) continues to increase at an average growth rate of 49.8% per year, from 412.98 thousand tons in 2009 to 2.58 million tons in 2013, in

predicted in 2014 reached 2.64 million tons. Similarly, the exports during the period, in 2009 exports of biodiesel amounted to 309.15 thousand tons with a value of US $ 199.6 million, but in 2013 exports reached 1.69 million tonnes with a value of $ 1.41 billion, in the prediction exports in 2014 reached 1.71 million tonnes with a value of $ 1.90 billion.

**Figure 2.10**
**World Biodiesel Production Share in 2013**




# CHAPTER 3
# REGION AND INVESTMENT OVERVIEW

## 3.1. Aspects of Geography and Demographics

Geography and demography are the two important and fundamental factors that determine the success of the development. Geography will provide an overview of the availability of natural resources, ranging from land, mineral and minerals contained therein, to the physiographic land along with the flora and fauna that are in it. Meanwhile, the demographic picture of the availability of human resources, both in terms of quality and quantity aspects in order to support the implementation of the development.

### 3.1.1. Regional Characteristics

Characteristic explain the vast territory and borders admisnitrasi, geography, topography, geological conditions, hydrological conditions, climatic conditions, and conditions of use of land in East Kalimantan Province.

**1) The extent and limits of the administrative region**

East Kalimantan (Kaltim) has an area of approximately 12,726,752 ha which consists of land covering an area of 12,533,681 hectares of land and 193 071 ha of water area. Marine management (0-4 mile) area of 25 656 km$^2$ (Kaltim in Figures, 2014) is the largest province, with an area reaching 6.56% of the total area of Indonesia. East Kalimantan province is divided into seven (7) districts (Berau, Kutai, East Kutai, Kutai Barat, Paser, Penajam Paser Utara, and the Mahakam Ulu) and three (3) cities (Balikpapan, Bontang and Samarinda). The position of East Kalimantan province lies between 40 24 'North Latitude (LU)

and 20 25' South latitude (LS), 1130 44 'east longitude (BT) and 1 190 000 east longitude (BT). In the administrative borders of East Kalimantan province is as follows:

1. North: Bordering the North Kalimantan Province;
2. West: Bordering the State of Sarawak Malaysia, West Kalimantan, and Central Kalimantan;
3. South: Bordering the South Kalimantan Province;
4. East: Bordering the Makassar Strait and the Sulawesi Sea.

**2) Geographical Conditions**

Geostrategic East Kalimantan Province is one of 13 provinces in Indonesia which has the border areas, namely the State Malaysia. In addition, the position of East Kalimantan is the Indonesian archipelagic sea lanes (ALKI) II of the Celebes Sea to the Indian Ocean through the Strait of Makassar and Lombok Strait is a strategic economic potential. ALKI instrumental in expediting transportation merchant ships across the Indonesian archipelago. The benefits of the availability of the sea lanes for Indonesia is very large, which can increase good trade relations with the countries of Africa, Asia and the Pacific. For Kaltim ALKI II position is very strategic value both in terms of economic and political aspects, there are opportunities of developing large ports and international standards that can foster the development of local and national economies. The province of East Kalimantan very broad cause all the characteristics of the region are in this area, from the border area, inland, remote, mountains, coastal areas and islands. Kaltim region which has 1,185 Km along the coast have coastal areas very broad, Bontang and Balikpapan are two cities located on the coast of East Kalimantan.

**3) Topographic condition**

Based on the steepness of slope and altitude, topographic characteristics Kaltim dominated by lands with slopes of 40% and a height of less than 500 meters above sea level. Such conditions will have a very big influence in order to utilize the land in accordance with spatial plans. Flat land in East Kalimantan are generally only found in coastal areas and watersheds-the

great river, which is about 10.70%. Followed by the degree of slope gently sloping land (2-15%) which covers approximately 16.17%. The rest, hilly land with a slope rate of> 15% and a steeper again with the extent of approximately 73.13% of the area of East Kalimantan (Figure 3.2). Development of food crops is only possible in a flat area (slope 0-2%) to ramps (slope 2-15%). While land with a slope higher level only suitable for annual crops and conservation areas.

**Figure 3.1**
**The Administration's Map of East Kalimantan**

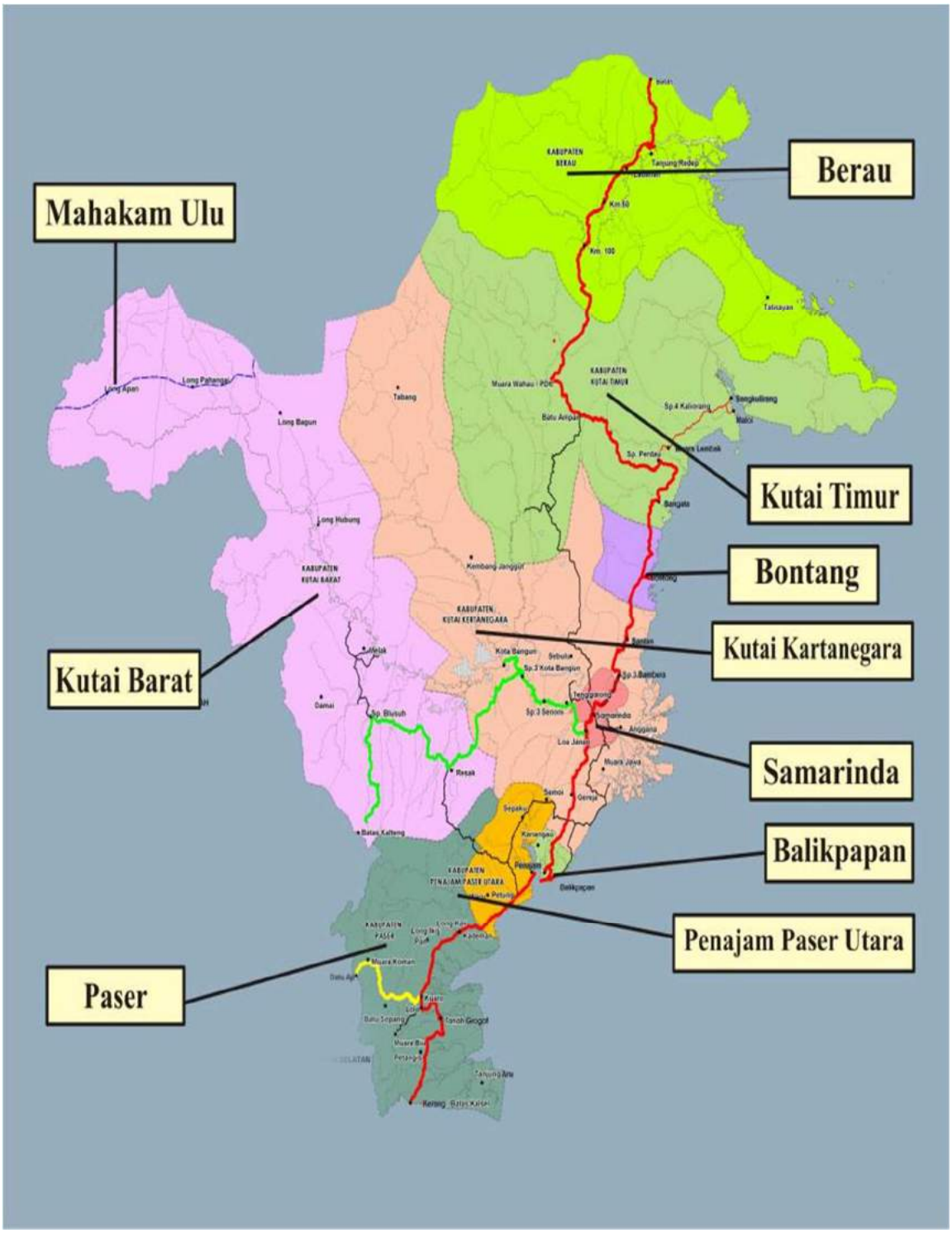
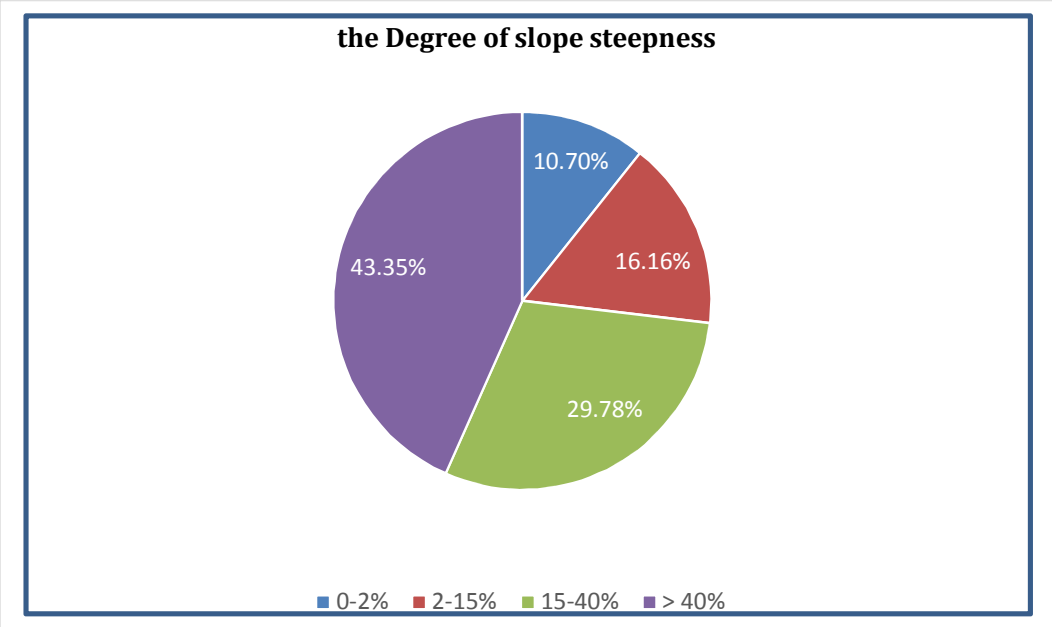
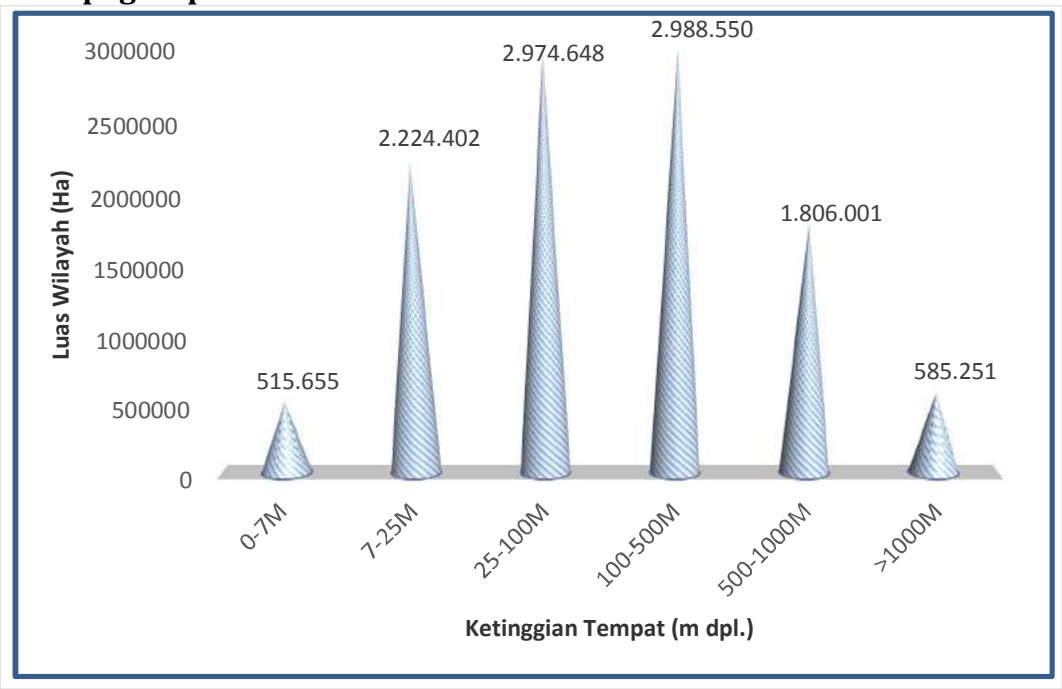


**Figure 3.2**
**Topoghrapic's Characteristic of East Kalimantan Based on the Degree of Slope Steepness**




Based on the altitude above sea level, 51.51% of the land in East Kalimantan has an altitude below 100 meters above sea level. While the land area which lies at an altitude of between 100 and 500 meters above sea level 26.94%. land which lies at an altitude of between 500 and 1,000 meters above sea level 16.28%. The rest, which is located at an altitude above 1,000 m asl covers only approximately 5.28% (Figure 3.2). Based on data from the altitude, it is known that approximately 21.55% of East Kalimantan region including cool temperate areas with altitudes above 500 meters above sea level. The region's relatively lower temperature suitable for the development of horikultura plants, especially vegetables and fruits.

**Figure 3.3**
**Topoghrapic's Characteristic of East Kalimantan Based on Altitude**




**4) Geological Conditions**

The type of soil in East Kalimantan land area is dominated by red-yellow podzolic latosol soil and litosol spread across central and northern part of East Kalimantan. Other types of soil is alluvial, organosol, latosol, podsol, and red-yellow podzolic with low fertility levels.

**5) Based on hydrology**

Hydrology conditions, the condition of East Kalimantan region can be described as follows. Potential water resources from the river is USD 325 380 million $m^3$ per year, and the potential water resources originating from lakes and reservoirs amounted to 42 917 million $m^3$. The direction of flow of the river is the East-West all anchored on the east coast province of East Kalimantan. Number of streams contained in the province of East Kalimantan as many as 157 large and small rivers of which is the Mahakam River has a length of 920 km with an area of River Drainage Region (DPS) 77 913 $km^2$,

Sesayap river with a length of 262 km and 16,140 km $^2$ large DPS. Kelai river with a length of 254 km.Sedang number of lakes there are a total of 18 (eighteen) pieces, with three (3) largest lake is Lake Crossing area of 11,000 hectares, covering an area of 13,000 Ha Semayang Lake and Lake Jempang of 15,000 hectares located in Kutai Kertanegara. Besides its use as a transportation infrastructure and sources of raw water these rivers can also be used as a Power Generation Plant (HEPP) as Kelay river, Sungai Boh, Telen River, and the River Medang.

In accordance with Candy PU No. 11 A / PRT / M / 2006 on the division of the River Region, rivers in East Kalimantan province are grouped into 6 (six) Regional Unit River (SWS), the SWS Sesayap (Cross Country) which consists of rivers Large inter alia River Sembakung, Sesayap, Sebakis and Sebuku; SWS Mahakam (National Strategic) which consists of the Great Rivers among others the Mahakam River, Samboja, Senipah, and Semoi; SWS-Kelay Berau (Cross County) consisting of large rivers include the Yellow River, Bakau, Berau, Pangkung, and River Beaches; SWS Authorship (Cross County) consisting of large rivers include the River Authorship, Sangata, Bengalon, and Santan; SWS Kayan consisting of large rivers, among others, the Kayan River, Bulungan, Selor Bengarak, and Berasan; and SWS Kandilo.

**6) As the climate**

Climate Condition of Indonesia in general, East Kalimantan tropical climates and has two seasons, dry and rainy seasons. The dry season usually occurs in May to October, while the rainy season occurs from November to April. This situation continued every year interspersed with transitional season in certain months. In addition, because of its location on the equator, the climate in East Kalimantan is also influenced by the Monsoon winds, the West Monsoon winds of November to April and East Monsoon winds from May to October. But in recent years, the state of the season in East Kalimantan sometimes erratic.

In the months that was supposed to rain in reality there is no rain at all, or vice versa in the months that should dry it rains with a much longer season.

Temperatures somewhere in the tropics, among others, determined by altitude to sea level. In general, East Kalimantan tropical climates with temperatures in 2013 ranged from 24,6ºC to 32,2ºC (Samarinda Meteorological Station), from 24,7ºC to 31,2ºC (Balikpapan Meteorological Station). The average air temperature is 22,1ºC lowest and highest average was 35.1 ° C (Meteorological Station Cape Redeb). The average minimum and maximum temperatures at the three stations complete weather station can be seen in Table 3.1.

**Table 3.1**
**The Avarage of Temerature, Humidity, Air Preasure, Wind Speed, Rainfall dan Solar Radiation through Station, 2013**

| commentary | Observation stations | | |
|---|---|---|---|
| | Samarinda | Balikpapan | Tanjung Redeb |
| (1) | (2) | (3) | (4) |
| 1. air temperature (°C) | | | |
| - Minimum | 24,6 | 24,7 | 22,1 |
| - Maximum | 32,2 | 31,2 | 35,1 |
| 2. humidity (%) | 83 | 84 | 87 |
| 3. air pressure (mbs) | 1.011,5 | 1.010,5 | 1.012,6 |
| 4. wind velocity (Knot) | 3 | 4 | 4 |
| 5. monthly rainfall (mm) | 237,8 | 242,2 | 245,1 |
| 6. solar radiation (%) | 42 | 47 | 54 |

*source: Kaltim in figures , 2014*

According to each station observers during 2013 were the lowest recorded in Samarinda station (237.8) and the highest recorded in Cape Redeb station (245.1). The highest rainfall during 2013 was recorded at the Meteorological Station Balikpapan by 476.1 mm in May, while the lowest rainfall recorded at the Meteorological Station Balikpapan at 72.2 in September.

Wind state in East Kalimantan in 2013 were monitored at several monitoring stations, shows that wind speeds ranged from 3 knots to 4 knots. Highest wind speed 4 knots occurred in the city of Balikpapan, the

lowest being 2 knots occur in Berau. The state of the wind at several monitoring stations are presented in Table 2.1.

**7) Conditions of Use of Land**

Resources of land in East Kalimantan by the Spatial Plan of East Kalimantan Province Year 2008-2027 19,550,550.99 Ha area, broadly divided into forestry cultivation area (CBC) and non-forestry cultivation region (KBNK) , Forestry cultivation area (CBC) covers an area of 12,920,647.89 ha (66%) which is subdivided into protected forest areas that serve an area of 5,136,913.99 hectares (26,27%) and forest cultivation serves an area of7,783,733, 90 ha (39.56%). While Non Forestry Cultivation Areas (KBNK) covering an area of 6,629,903.10 hectares.

## 3.1.2. Potential Development Areas

Based on the description of the characteristics of the area, identified areas that have the potential to be developed as cultivation areas such as fisheries, agriculture, tourism, industry, mining and others based on the spatial plan.

As a basis for meeting the needs of regional development, spatial planning nationwide have set up the formation of the region to boost the economy at the center of growth is the mainstay Region. Key region is part of a farming region whose development is directed to stimulate economic growth for.

The area and the surrounding region. National Mainstay region associated with the province of East Kalimantan, among others:

a. Cape Redeb Mainstay region and surrounding areas.
b. Mainstay region Sangkulirang - Sengatta - Muara Wahau (SASAMAWA).
c. Mainstay region Bontang - Samarinda - Tenggarong - Balikpapan - Penajam and surrounding areas (BONSAMTEBAJAM) and surrounding areas.
d. Mainstay Sea region Bontang - Tarakan and surrounding areas.

In addition to the development strategy of the Master Plan for the Acceleration and Expansion of Indonesian Economic Development (MP3EI), East Kalimantan to be part of Kalimantan economic corridor as a "Center for production

and processing of mining products and barns national energy". In support of national policy, not only see the economic growth but also the development of the region by supporting functions of the environment in a sustainable manner in the Spatial Plan Province has set provincial strategic areas to see the value of strategic importance within the province as well as the potential and impact on the surrounding area, namely:

1) The region has a strategic value in terms of economic interests that affect the economic growth of the province include:
   1. the industrial area and the port of Maloy in East Kutai Regency;
   2. regional agropolitan area in East Kutai Regency; and
   3. regional mining center region (cluster mining) in East Kutai.
2) area that can accelerate the growth of the province disadvantaged areas are in West Kutai, Nunukan and Malinau.
3) strategic areas from the point of social and cultural interest in the province include:
   1. Corridor Mahakam River to the upstream;
   2. Mulawarman Museum, Museum of Wooden Tenggarong, and Bukit Bangkirai in Kutai regency; and
   3. The village culture Pampang in Samarinda.
4) Regions that have strategic value of the interest of the functions and the carrying capacity of the environment in the province include:
   1. Mahakam Delta region;
   2. Semayang Lake neighborhood, Jempang, Lake Crossing, Lake Siran, and its surroundings;
   3. Balikpapan Gulf region (Sepaku-Penajam-Balikpapan); and
   4. Coastal and Marine areas Derawan Islands.

In support of sustainable environmental carrying capacity, the magnitude of the economic dependence on non-renewable resources to the attention of the Government of East Kalimantan in determining the development strategy. The government recognizes that non-renewable resources will eventually decline and then discharged, so it is necessary to prepare a new locomotive of economic

growth "sustainable". In preparing the locomotive, East Kalimantan provincial government established two major strategies to spur economic growth that is equitable Developing Existing Industries like Oil Refining Industry, Fertilizer Industry, Industrial Gas and Coal Mining. In addition the Local Government also build and develop the agricultural industry with an approach based on economies of scale and industrial clusters. Development of Industry Cluster made by the Government of East Kalimantan in an effort to change the economic structure of production than just an exporter of raw materials, become exporters of finished / processed (final / processed product) that has competitiveness (competitiveness), value added (value added) and capable of providing multiplier effects More significant for the welfare of people (sustainable welfare).

With attention to alignment, alignment, and balance regional growth and development policies, in relation to stimulate economic activity, which in turn helped impact on the development of regional development activities. East Kalimantan provincial government to develop the region as a center of industry cluster approach expected growth as a generator of economic activity around the area with seeing the potential and advantages of each region and taking into account the carrying capacity of a sustainable environment, developed five (5) leading industrial region namely:

1. Industrial Kariangau, Balikpapan City
   Industrial Zone Kariangau (CIC) located in Balikpapan Gulf region with an area of 3540.3 hectares. The industrial area is directed to move in the processing sector of coal, oil and gas, palm oil, rubber, food, fisheries, coffee, furniture, and others.
2. Services Industry and Trade Zone, Samarinda
   Samarinda, the capital of East Kalimantan Province with administrative area of 718 km2 and a population of 727 500 inhabitants (census 2010). The urban area will be directed towards the concept of Green Industrial City which is engaged in the industrial sector and trade services.
3. Based Industrial Area Gas and Condensate, Bontang
   Bontang is one city in East Kalimantan, which is projected to become Industrial Estate with the administrative area of 497 km2 and a population of

143 483 inhabitants (census 2010). Bontang evolved as industrial outlets along with the establishment of two (2) large companies, namely PT. Fertilizer Kaltim and PT. Badak LNG & Co. The industrial area is directed to move in base processing sector Oil, Gas and Condensate.

4. Industrial Area and International Port Maloy, East Kutai Regency

   International Port Industrial Zone and Maloy is located in the East Kutai Regency, District and Sub-District Kaliorang Sangkulirang with an area of 5.305 ha. Based on the Presidential Instruction No. 1 of 2010 and the Master Plan for Extension and Expansion of Indonesian Economic Development (MP3EI), Kipi Maloy directed to a center processing palm oil, oleo-chemical and industrial derivatives. In the early stages, Kipi Maloy will be built with a total area of 1,000 hectares with an investment of 3.7 trillion rupiah (Masterplan, 2012). Kipi Maloy consists of 6 (six) industrial zones, namely: (1) Zone Oleochemical Industry Association; (2) Food-Based Industrial Zone; (3) Biodiesel Industrial Zone; (4) Industrial Zone Care Products; (5) By-Products Industry Zone, and; (6) Other Industrial Zone. Kipi Maloy will be integrated with timbun tank and the International Port of CPO (Crude Palm Oil) which will be operationalized through a piping system. As a strategy to increase the value of the investment, Kipi Maloy has also been proposed to become a Special Economic Zone (SEZ).

5. Derawan Islands Tourism Industrial Area, Berau district

   Derawan Islands Tourism Industry is located in the district of Berau with a total area of 13,500 ha. Derawan Islands group has tourism potential of the underwater world with 4 (four) as the island's main tourist destinations, namely: Derawan, Kakaban, Charitable Island, and the island Maratua. The number of tourists who visit Derawan Islands is increasing every year, where in 2011 there were 1.2785 million tourists, both local and foreign.

### 3.1.3. Earthquake Prone region

A natural occurrence that can not be predicted. And keep in mind also all the plates that cause earthquakes was always on the move. It is not possible

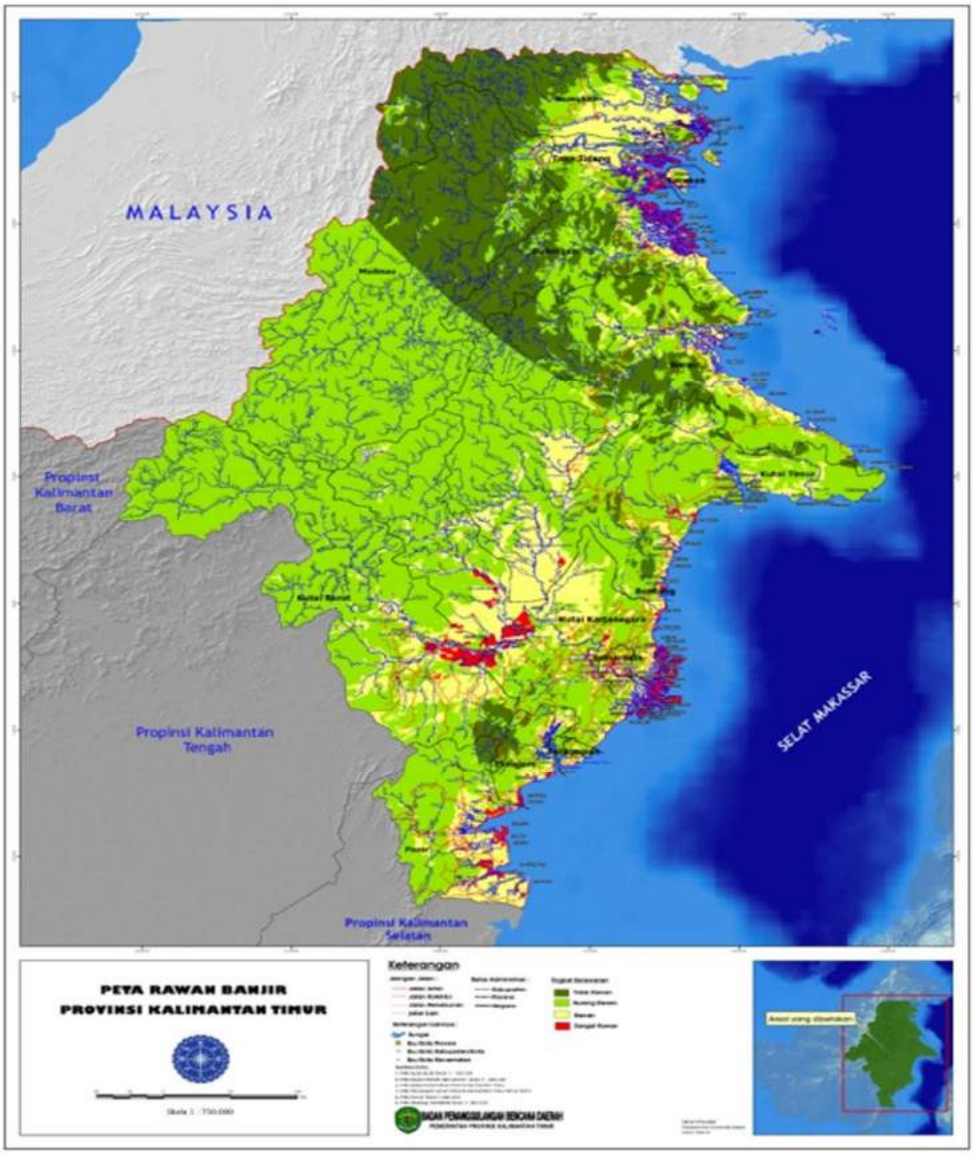
collision of plates that had previously been in the region of Sulawesi shift to inland areas east of Borneo. But when seen from the movement of faults that only about 6cm / year, it is predicted that within a period of hundreds of years new epicenter shifted to the mainland Borneo. Number of catastrophic fires ranks highest after the flood. In 2013 the number of catastrophic fires reached 241, while in 2012 the number decreased to 168 cases. Despite a drastic decline, the incidence of fire as much as 168 times from January to December 2012 is still relatively high (see table 3.2). Number of disaster events per district / city in East Kalimantan province in detail can be seen in the table below.

**Table 3.2**
**The Number of Disaster Events per District/City in East Kalimantan Province**

| District/city | Jenis Bencana | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fire | Landslide | Flood | Hurricane | Tidal wave | Failed technology | conflict | sink | Transportation accidents | | | | Epidemic of a disease | | |
| | | | | | | | | | traffic | air | sea | river | DBD | Chikunguya | |
| Samarinda | 60 | 2 | 1 | | - | - | - | - | - | - | - | - | | | 63 |
| Balikpapan | 77 | 44 | 75 | 3 | - | - | - | 7 | - | | | | | | 206 |
| Kutai Kartanegara | 5 | - | 1 | 1 | - | - | - | - | | | | | | | 7 |
| Kutai Timur | 3 | 1 | 1 | - | - | - | - | - | | 1 | | - | | | 6 |
| Kutai Barat | 1 | - | - | - | - | - | - | - | | | 1 | - | | | 2 |
| Nunukan | 1 | -` | 1 | 1 | - | - | - | - | | | | - | | | 3 |
| Malinau | - | - | - | 1 | - | 1 | - | - | | | | - | | | 2 |
| Bulungan | 2 | - | - | - | - | - | - | - | | | 1 | | | | 3 |
| Tidung Pala | - | - | - | - | - | - | - | - | | | | - | | | - |
| Berau | - | - | 1 | 1 | - | - | - | - | | | | - | | | 2 |
| Tarakan | - | - | - | - | - | - | - | - | | | 1 | - | | | 1 |
| Bontang | - | - | 2 | - | - | - | - | - | | | | - | | | 2 |
| Paser | 19 | - | 1 | - | - | - | 1 | 2 | | | | - | | | 23 |
| Penajam Paser Utara | - | - | - | - | - | - | - | - | | | | - | | | - |
| **Total** | **168** | **47** | **83** | **7** | **0** | **1** | **1** | **9** | **-** | **1** | **3** | **-** | | | **320** |

*Source: Badan Penanggulangan Bencana Daerah (2013)*

**Figure 3.4**
**The Hazard Map of East Kalimantan Province**




## 3.1.4. Demographics

Demographic conditions explain about population structure and population growth in East Kalimantan Province

**1) Population structure**

Population East Kalimantan from year to year has increased significantly. It can be seen from the results Projected Population in 2011, 2012 and 2013. The results of Population Projection The population in 2011 was 3,131,964 inhabitants, rising to 3,216,101 inhabitants

in 2012, and increased again to 3,300,517 inhabitants in 2013. It means that in that period the population of East Kalimantan has increased by about 168 553 inhabitants for two years. From 2011 to 2012 increased 84 137 inhabitants, and increased again by 84 416 inhabitants from 2012 to 2013. Overview of data can be seen from the following table:

**Table 3.3**
**Population According to District/City in 2011-2013**

| District/city | 2011 | 2012 | 2013 |
|---|---|---|---|
| 1. Paser | 237.783 | 244.111 | 249.991 |
| 2. Kutai Barat | 142.016 | 143.101 | 144.018 |
| 3. Kutai Kartanegara | 648.215 | 665.489 | 683.131 |
| 4. Kutai Timur | 269.375 | 281.594 | 294.216 |
| 5. Berau | 185.986 | 191.576 | 197.388 |
| 6. Panajam Paser Utara | 145.978 | 148.034 | 150.205 |
| 7. Balikpapan | 572.184 | 583.272 | 594.322 |
| 8. Samarinda | 756.697 | 781.313 | 805.688 |
| 9. Bontang | 148.411 | 152.089 | 155.880 |
| 10. Mahakam Ulu | 25.319 | 25.522 | 25.678 |
| **Jumlah** | **3.131.964** | **3.216.101** | **3.300.517** |

*Source: Kaltim in figures 2014*

## 2) Population growth

East Kalimantan Population growth from year to year has increased significantly. It can be seen from the number of population in 2011, 2012 and 2013. The population in 2011 was 3,131,964 inhabitants, increasing to 3,216,101 inhabitants in 2012 and increased again to 3,300,517 in 2013. It means that in that period the population East Kalimantan has increased by almost 100 thousand lives annually. In the period 2012-2013 the population growth in East Kalimantan of 2.62 percent. Regency / City that experienced the highest growth in East Kutai is 4.47 percent, while the other district / city growth ranged from 0.63 to 3.03 percent.

East Kalimantan pattern of population distribution by area so lame, thus causing differences in population density striking between regions, especially between districts with the city. District with an area of 98.85 percent of the East Kalimantan region inhabited by approximately 52.86 percent of the total population of East Kalimantan. While the rest, ie 47.14 per cent settled in an area of only 1.15. As a result, the density of population in the district is only about 1-47 people / $km^2$, while the population density in the city of Balikpapan as much as 1058.87 inhabitants / $km^2$, Samarinda 1122.39 inhabitants / $km^2$, and Bontang 809.51 inhabitants / $km^2$. East Kalimantan while the population density is 25.93 inhabitants / $km^2$.

**Table 3.4**
**Land Area and Population Density at the Districts/Cities in 2013**

| Kabupaten/Kota | Luas Wilayah Daratan | | Kepadatan Penduduk Per $Km^2$ |
|---|---|---|---|
| | $Km^2$ | % | |
| 1. Paser | 11.192,93 | 8,79 | 22,30 |
| 2. Kutai Barat | 15.630,60 | 12,28 | 9,21 |
| 3. Kutai Kartanegara | 26.348,95 | 20,70 | 25,93 |
| 4. Kutai Timur | 31.896,49 | 25,06 | 9,22 |
| 5. Berau | 22.200,33 | 17,44 | 8,89 |
| 6. Panajam Paser Utara | 3.211,55 | 2,52 | 46,77 |
| 7. Balikpapan | 561,28 | 0,44 | 1.058,87 |
| 8. Samarinda | 717,83 | 0,56 | 1.122,39 |
| 9. Bontang | 192,56 | 0,15 | 809,51 |
| 10. Mahakam Ulu | 15.315,00 | 12,03 | 1,68 |
| **Jumlah** | **127.267,52** | **100,00** | **25,93** |

*Source: Kaltim in figures 2014*

## 3.2 Aspects of Social Welfare

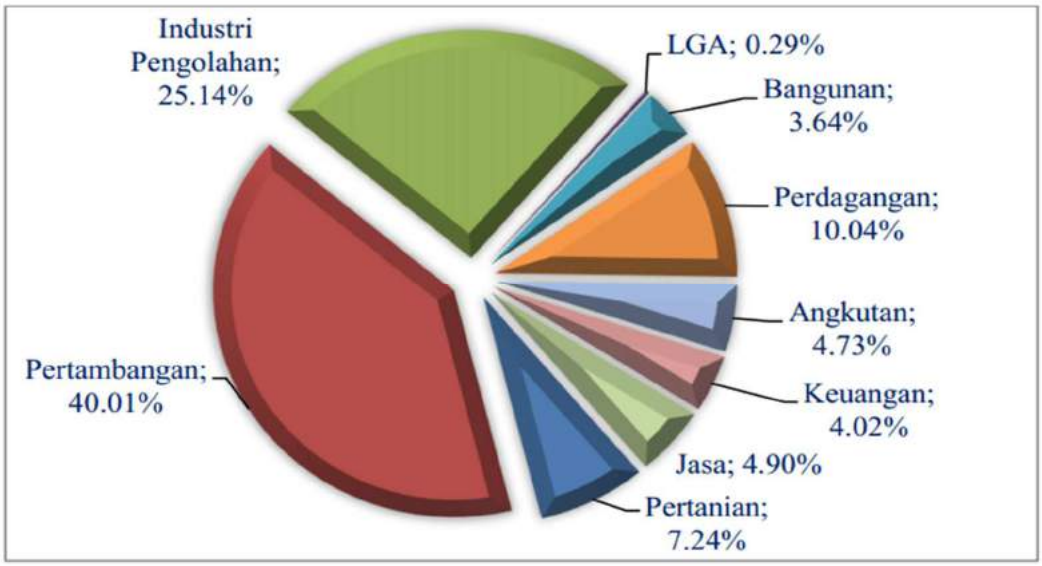
In the aspect of welfare provides a description and the results of the analysis of the condition of public welfare, including welfare and economic equality, social welfare and cultural arts and sports.

**1. Focus welfare and Economic Equity**

The indicators commonly used to determine the rate of economic growth of a region is to look at the Gross Regional Domestic Product (GDP) of the area, both with oil and gas (oil) and without gas. Percentage Value GDP Upper Constant

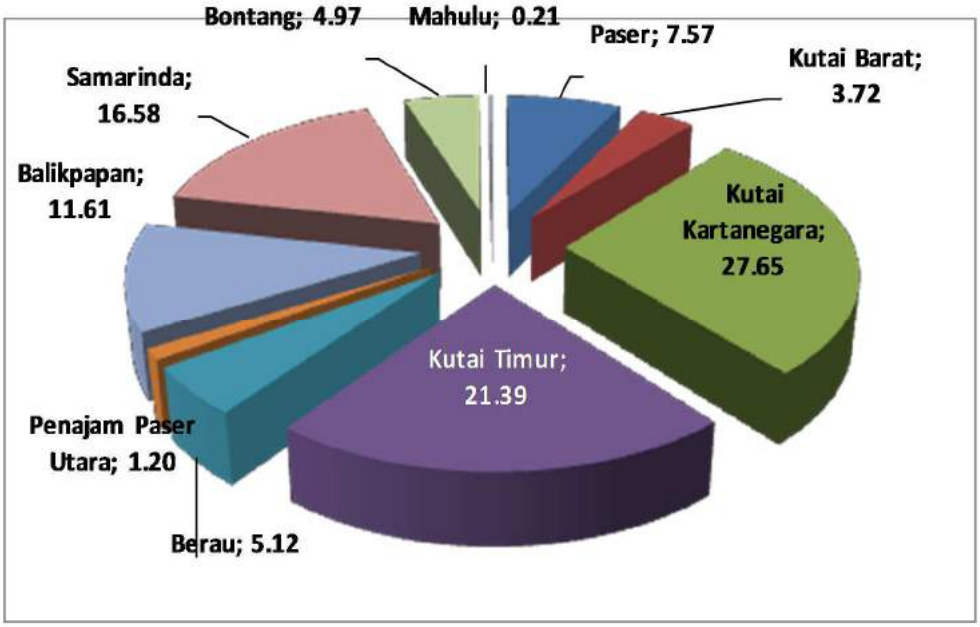
Price of East Kalimantan Province in 2012 was still dominated by mining and quarrying by 48% and the agricultural sector still contributes very low at only 5%, the percentage of value GDP Over Current Prices Constant East Kalimantan Province in 2012 was still dominated mining and quarrying by 48% and the agricultural sector still contributes very low at only 5%, whereas the agricultural sector is capable of providing extensive benefits to the community and more environmentally friendly.

**Figure 3.5**
**Structure of GDP Quarter II/2014 By Industry in East Kalimantan Province**




The percentage of GDP Value Over Current Price of East Kalimantan Province in 2012 was still dominated by mining and quarrying sector amounted to 47.44% and the agricultural sector still contributes very low at only 6.16%, the expected future development of East Kalimantan Province began to reduce dependence on mining and quarrying and began to move into the agricultural sector which is able to be enjoyed by society at large.

**Figure 3.6**
**Distribution percentage of regional gross domestic product of non – oil current prices by district (%), 2013**




*Source: Kaltim in figures 2014*

- **Economic Growth**

  During the last decade, the rate of economic growth in East Kalimantan always experienced positive growth despite fluctuations in each year. In 2013 the rate of economic growth in East Kalimantan recorded 1.59% slower than it was in 2012, which grew 3.98%. This weak growth performance is heavily influenced by the oil and gas commodities both oil and gas mining and processing industries LNG and Refining Petroleum, also influenced by the weakening of the weakening performance of coal caused coal prices. This is illustrated by the rate of economic growth without oil and without coal. If no oil and gas, economic growth reached 5.17 Kaltim turns persenpada 2013. Furthermore, if oil and coal issued Kaltim economic growth is much greater, ie 7.47 per cent in 2013.

  The study results further, the respective growth each component / economic sector in East Kalimantan in 2013 turned out to be seven economic sectors experienced positive growth except in the mining and quarrying sector and the manufacturing sector.

In 2013 this sector and the mining and quarrying sector processing industry as one of the sectors that contribute substantially in the economic movement in East Kalimantan, a correction of each of negative 0.23% and negative 3.93%. From mining and quarrying sector, subsector which fell was the oil and gas sub-sector which amounted to a negative 5.73%, while the oil and gas and mining subsector without extracting each subsector grew by 1.93% and 14.39%. While the manufacturing sector, subsector which fell negative for the oil and gas industry.

Judging from the outcomes (growth rate) of each component in the year 2013, the financial sector, rental services and business services is the sector with the highest growth compared to other sectors in the amount of 12.93%. This condition is supported by significant growth in the banking subsector amounted to 25.26%. The next highest growth sector, namely the construction sector amounted to 10.13%. This is certainly due to the jealous development undertaken in East Kalimantan, be it roads, other public facilities such as terminals, airports, docks or offices, shops and housing development undertaken by the developer. Followed by the services sector at 8.25%. Then the next sector that is experiencing high growth is the transportation and communication sector amounted to 7.56%, which was donated by the growth of the transport and communications subsector respectively by 6.67% and 11.84%, of course, could mean that the population East Kalimantan is high enough mobility to use transport services and high usage of telecommunication services.

Trade, hotels and restaurants followed the services sector which grew by 5.93% due to growth of 7.14% subsector restaurant, hotel subsector amounted to 5.71% and wholesale and retail trade sub-sector alone grew by 5,83 %.Then the electricity, gas and water supply grew by 4.47% due to growth in electricity subsector subsector amounted to 4.09% and by 7.16% clean water.

While the agriculture sector achieved growth of 4.67% was slightly higher than the previous year in the amount of 4.24%. Growth in the agricultural sector caused by the growth of plantation crops subsector amounted to 8.82%,

the growth of the fisheries sub-sector amounted to 7.19, the growth of the livestock sector and the results of 4.23%, the growth of food crops subsector by 1.94%. 7.26%, while the non-oil industry is able to grow 6.54%.

**Table 3.5**
**Cumulative PDRB and economic growth in the province of east kalimantan year 2011 – 2013**

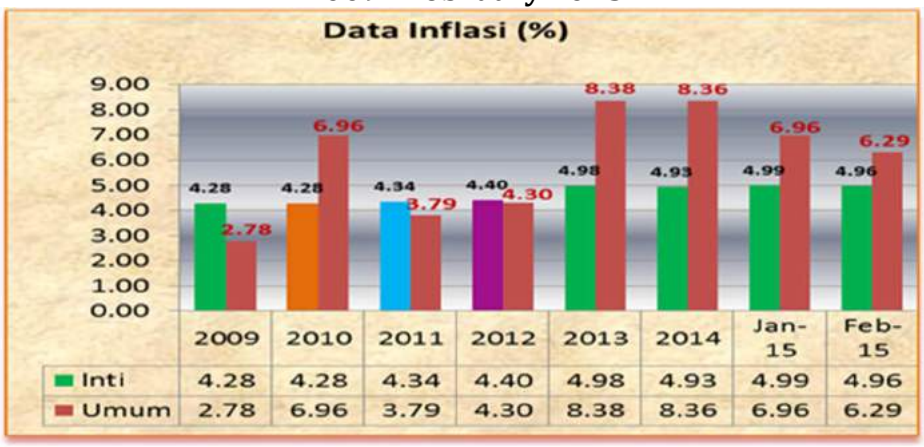
| No. | PDRB | Atas Dasar Harga Berlaku (Triliun Rp.) | | | Atas Dasar Harga Konstan (Triliun Rp.) | | | Laju Pertumbuhan (%) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 2011 | 2012 | 2013 | 2011 | 2012 | 2013 | 2011 | 2012 | 2013 |
| 1. | Dengan Migas | 391,8 | 419,5 | 425,4 | 115,5 | 120,1 | 122 | 4,09 | 3,98 | 1,59 |
| 2. | Tanpa Migas | 242,4 | 272,8 | 283,5 | 75,1 | 83,5 | 87,9 | 12,06 | 11,21 | 5,17 |
| 3. | Tanpa Migas + Batubara | 122,8 | 145,4 | 164,6 | 44,3 | 48,8 | 52,4 | 8,77 | 10,14 | 7,47 |

*Source: Kaltim in figures, 2014*

- **Inflation**

In economic development, price stability is very important factor to be observed and considered very influential because of price fluctuations on the value of goods and services produced, as well as the impact on purchasing power. Inflation is one of the measuring devices to see the stability of prices of goods and services in general. The average inflation rate in East Kalimantan Province in 2009 - February 2015 are presented in the following table:

**Figure 3.7**
**The average inflation rate in East Kalimantan Province in 2009 - February 2015**

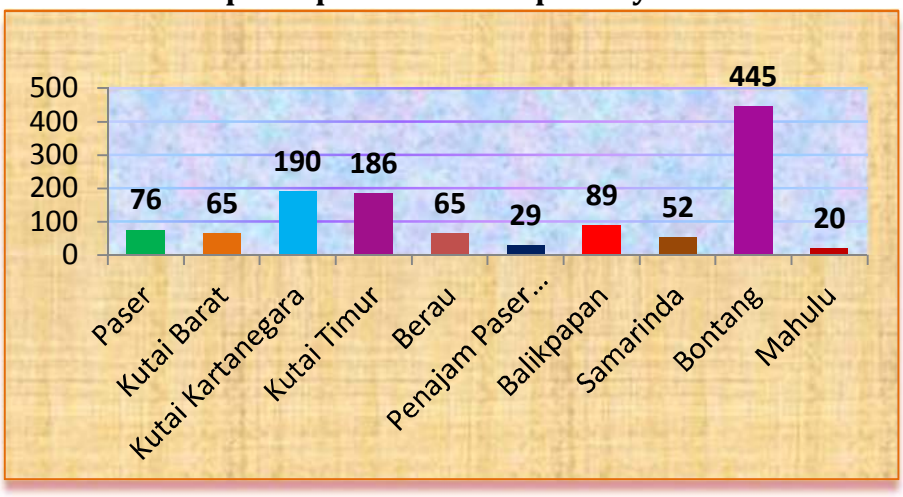



*Source : Kaltim in figures, 2015*

- **GDP per capita**

  GDP and inflation above can describe the condition of East Kalimantan's economy in general, but has not been able to provide information about the welfare of the community. To find out how the influence of GDP on social welfare, can be seen in general is based on income per capita that is GDP or regional revenue divided by the number of mid-year population. Although perhaps this measure has its weaknesses, but at least can give you an idea development at the macro level of the welfare society.

**Figure 3.8**
**PDRB per capita at current prices year 2013**



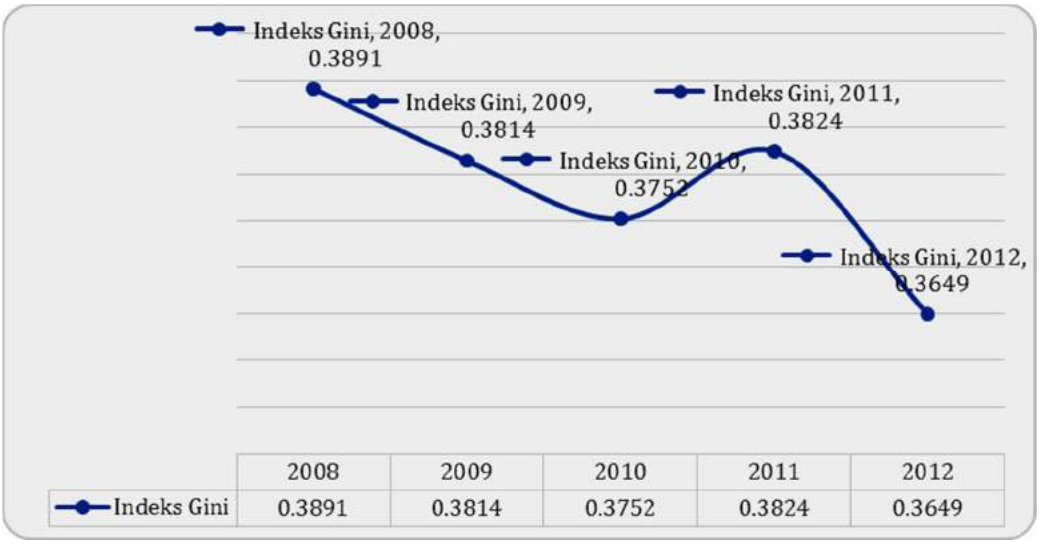

*Source: Kaltim in figures 2014*

- **Gini index**

  Development is done in a region not always be enjoyed equally by the whole society. Increased development is not always accompanied by an increase in income of the population evenly. Several factors are a source of income differentials among others is an opportunity, education and various other capital. One measure that can be used to see the resident income gap is the Gini ratio. The higher the ratio the more unequal the income of the population. At 0, development of the Gini index in the period 2008-2012 fluctuated but experienced a downward trend from 0.3891 in 2008 fell to 0.3649. Although the Gini index has not been near-perfect East Kalimantan (0) but the

downward trend shown in the period 2008 to 2012 showed that the income gap in East Kalimantan increased equity.

**Figure 3.9**
**Gini index East Kalimantan Province**

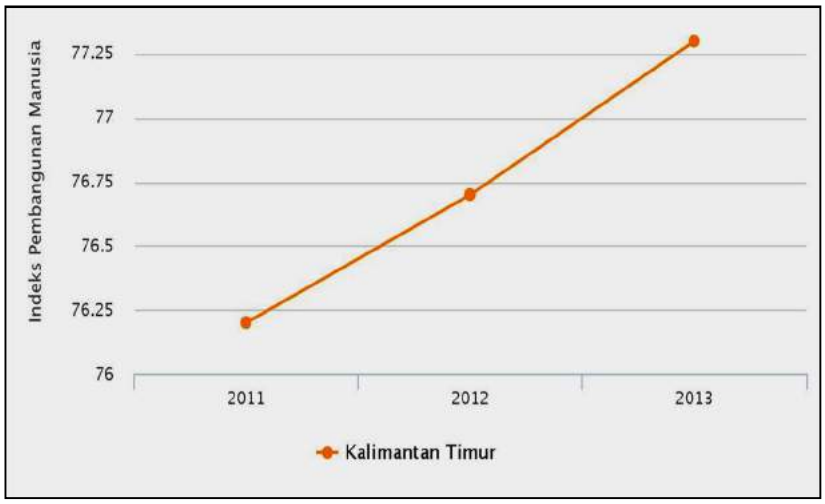



## 2. Focus On Public Welfare

Focus on the achievement of social welfare outlining the Human Development Index (HDI), viewed from the aspect of education, health, and economy.  HDI Human development is development that aims to expand opportunities so that people can live well. The objectives will be achieved when every person to obtain the widest possible opportunities for a healthy and long life, for educated and skilled and have the income necessary to live. To see the successful development of the human need for shooting the result of human development has been dilakukan.Pengukuran success rate of human development is done by using the HDI. Human development index or the Human Development Index (HDI) which was introduced by the United Nations Development programes (UNDP) since 1990 is to measure the success or performance of a country in the field of human development. With the HDI we can perform benchmarking analysis of the achievement of human development between regions. HDI itself is built through a three-dimensional approach to basic

includes life expectancy, education and income levels (decent living standards). In the period from 2011 to 2013, the IPM in East Kalimantan experienced an increasing trend in the amount of 76.22% in 2011 rose to 77.30 in 2013.

**Figure 3.10**
**Human development index province of east kalimantan**
**Year 2011 s.d 2013**

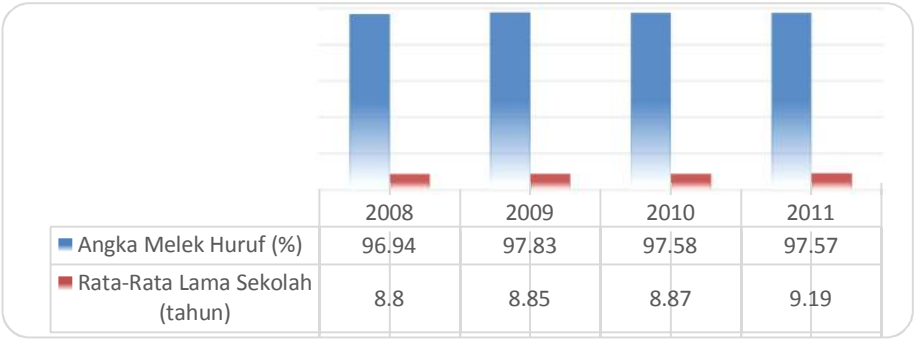



*Source : Kaltim in figures 2014*

- **Education**

  Education is a key factor enhancing the quality of human resources and social welfare. The higher education community, the quality of human resources in East Kalimantan, the better. Macro indicators used in determining the success of education is literacy rate and average length of school.

**Figure 3.11**
**Indikator Makro Ekonomi**



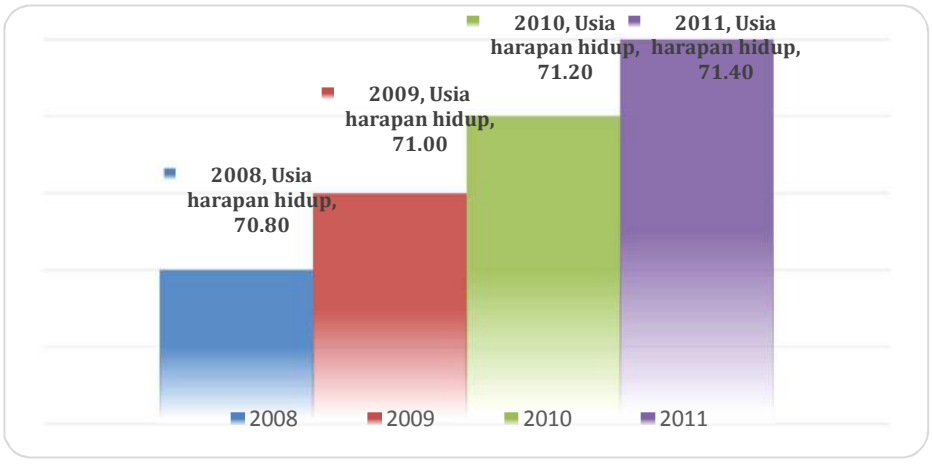
| | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|
| Angka Melek Huruf (%) | 96.94 | 97.83 | 97.58 | 97.57 |
| Rata-Rata Lama Sekolah (tahun) | 8.8 | 8.85 | 8.87 | 9.19 |

*Source: Kaltim in figures*
**) Data Prov.Kaltim including Kaltara*

- **Health**

  In the health sector, macro indicators used is life expectancy. Life expectancy figures condition of East Kalimantan Province of 71.20 years in 2008 and increased to 71.40 in 2011.

**Figure 3.12**
**Life expectancy**




*Source : Kaltim in figures 2014*

- **Poverty**

  The number of poor people in East Kalimantan in the range of 2009 to 2012 have an upward trend in the amount of 245 050 inhabitants in 2009, 285,000 inhabitants in 2010, and reached 247 100 inhabitants in 2012. The population is also associated with poor population ratio, because the level related to the age of a person's productivity and affect the level of poverty. In 2009 through 2012 can be concluded that local governments successfully reduce poverty. It was marked by the realization ratio of the poor who always declines in the amount of 8.00% in 2010, 6.63% in 2011 and 6.38% in 2012.

**Table 3.6**
**The number and percentage of poor**

| Year | The number Of poor (000) | The percentage Of Poor % |
|---|---|---|
| *2009* | 245.050 | 7,86 |
| 2010 | 285.400 | 8,00 |
| 2011 | 247.100 | 6,63 |
| 2012 | 246.100 | 6,38 |

*Source : Kaltim in figures 2014*

## 3.3 Development of East Kalimantan Provincial Investment

In order to accelerate the economic development necessary to increase investment to making the economic potential into real economic strength by using originating capital, both domestic and abroad. BPMPTSP East Kalimantan Province is a technical institute which is supporting element and provincial governments have a duty to implement government administration in the field of promotion and investment. Investment performance achievements of East Kalimantan Province was getting better from year to year as shown in the table below, in addition it is also affected by the increase of licensing services. One is the presence of One Stop Services (OSS).

**Table 3.7**
**Comulative realized investment east Kalimantan**

| Year | Investment (triliyun Rp) | | | employment (people) | | |
|---|---|---|---|---|---|---|
| | PMA | PMDN | Total | Ind. | foreig | Total |
| 2010 | 8.986.386.444.282 | 7.881.289.778.898 | 16.867.676.223.180 | 21.131 | - | 21.131 |
| 2011 | 2.132.547.245.000 | 16.196.330.386.462 | 28.328.877.631.462 | 21.228 | 38 | 21.266 |
| 2012 | 22.769.100.000.000 | 7.709.270.000.000 | 30.478.370.000.000 | 85.819 | 512 | 86.331 |
| 2013 | 13.299.926.400.000 | 18.411.377.300.000 | 31.711.303.700.000 | 106.998 | 567 | 107.565 |
| 2014 | 24.889.715.171.600 | 12.983.049.700.000 | 37.872.764.871.600 | 36.560 | 151 | 36.711 |
| Rata-rata | 16.415.535.052.176 | 12.636.263.433.072 | 29.051.798.485.248 | 54.347 | 254 | 54.601 |

*Source : BPMPTSP'2015*

In cumulative investment realization Kaltim from 2010 to 2014 continued to increase despite the realization of both domestic and foreign investments experienced fluctuating. The average total realization of domestic and foreign

investment over the last 5 years is Rp. 29.051 billion with employment of 54 347 people of Indonesian workers and 254 foreign workers. While the average realization of foreign investment Rp. Rp 16.415 trillion and domestic investment. 12.636 trillion. For PMA, the realization of the highest investments in 2014 reached Rp. 24.889 trillion, while the highest domestic capital investment realization in 2013 of Rp. 18.411 trillion.

Employment, labor both Indonesian and foreign workers from 2010 to 2013 continues to increase, but in 2015 has decreased. And the employment of the most high occurred in 2013 as many as 107 565 people.

**Table 3.8**
**Development of the realization of foreign investment by sector year 2010 –2014 di east Kalimantan**

| No | SEKTOR USAHA | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|
| I. | SEKTOR PRIMER | | | | | |
| 1 | Tan. Pangan & Perkebunan | 189.129.602 | 319.738.812 | 1.659.052.400 | 406.404.800 | 470.026.400 |
| 2 | Peternakan | - | - | - | - | - |
| 3 | Kehutanan | - | - | - | - | 6.050.000 |
| 4 | Perikanan | - | - | 400.000 | - | - |
| 5 | Pertambangan | 486.545.913 | 59.156.180 | 285.079.200 | 824.313.750 | 1.142.308.900 |
| II. | SEKTOR SEKUNDER | | | | | |
| 1 | Industri Makanan | - | - | 483.570.800 | 14.006.110 | 103.197.300 |
| 2 | Industri Tekstil | - | - | - | - | - |
| 3 | Industri Barang dari Kulit & Alas Kaki | - | - | - | - | - |
| 4 | Industri Kayu | - | - | - | - | 8.055.000 |
| 5 | Industri Kertas & Pencetakan | - | - | - | - | - |
| 6 | Industri Kimia Dasar, Barang Kimia & Farmasi | 183.135.822 | 264.402.340 | 8.771.900 | 21.826.100 | 52.386.300 |
| 7 | Industri Karet & Plastik | - | 500.000 | 31.626.100 | 146.350 | 2.389.200 |
| 8 | Industri Mineral Non Logam | - | - | - | 18.160 | 1.455.300 |
| 9 | Industri Logam, Mesin & Elektronik | - | - | 2.229.700 | - | - |
| 10 | Industri Instrumen Kedokteran, Presisi, Optik dan Jam | - | - | - | - | - |
| 11 | Industri Kendaraan Bermotor & Alat Transportasi Lain | - | - | - | 400.000 | - |
| 12 | Industri Lainnya | - | 2.085.000 | 1.318.000 | 2.200 | 200.000 |
| III. | SEKTOR TERSIER | | | | | |
| 1 | Listrik, Gas dan Air | 121.219 | 510.000.000 | 8.526.300 | 5.808.600 | - |
| 2 | Konstruksi | 175.000 | - | - | - | - |
| 3 | Perdagangan & Reparasi | 13.964.757 | 9.022.130 | 42.686.300 | 8.349.180 | 39.065.050 |
| 4 | Hotel & Restoran | - | 250.000 | 1.130.900 | 212.900 | - |
| 5 | Transportasi, Gudang & Komunikasi | 39.773.553 | 55.123.800 | 5.058.400 | 50.998.080 | 194.632.200 |
| 6 | Perumahan, Kawasan Industri & Perkantoran | - | 65.000 | - | 672.490 | 687.100 |
| 7 | Jasa Lainnya | 75.864.272 | 127.717.543 | 450.000 | 52.250.280 | 125.212.351 |
| TOTAL | | $ 988.710.138 | $ 1.348.060.805 | $ 2.529.900.000 | $ 1.385.409.000 | $ 2.145.665.101 |

*Sourc e: BPMPTSP'2015*

In 2014 from the table above, realization of foreign investment per sector, it appears that the dominant sectors are in the primary sector the mining sector with a value of US $ 1.142 billion, crops and plantations of US $ 470 million. Other sectors are also contributing is enough food industry sector amounted to US $ 103 million and basic chemical industry, chemical and pharmaceutical goods worth US $ 52.386 million. The cumulative number of realization of foreign investment in 2014 (US $ 2.145 billion) is increased compared to the year 2013 (US $ 1.385 billion).

**Table 3.9**
**development of the realization of domestic investment by sector year 2010 –2014 di Kalimantan Timur**

| No | SEKTOR USAHA | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|
| I. | SEKTOR PRIMER | | | | | |
| 1 | Tan. Pangan & Perkebunan | 2.889.931.158.529 | 3.139.709.265.213 | 793.339.800.000 | 1.138.136.700.000 | 3.793.223.400.000 |
| 2 | Peternakan | - | - | - | - | - |
| 3 | Kehutanan | - | - | - | - | - |
| 4 | Perikanan | - | - | - | - | - |
| 5 | Pertambangan | 517.124.372.256 | 774.839.275.348 | 5.679.718.400.000 | 8.596.100.000 | 328.865.500.000 |
| II. | SEKTOR SEKUNDER | | | | | |
| 1 | Industri Makanan | - | 300.966.568.960 | 561.222.500.000 | 4.346.900.000 | 73.074.100.000 |
| 2 | Industri Tekstil | - | - | - | - | - |
| 3 | Industri Barang dari Kulit & Alas Kaki | - | - | - | - | - |
| 4 | Industri Kayu | 451.278.815.131 | 2.700.000.000 | - | 197.684.900.000 | 487.151.600.000 |
| 5 | Industri Kertas & Pencetakan | - | 74.119.469.720 | - | 10.000.000 | - |
| 6 | Industri Kimia Dasar, Barang Kimia & Farmasi | 474.004.592.496 | 7.000.316.405.221 | 674.445.300.000 | 1.824.619.000.000 | 3.155.561.900.000 |
| 7 | Industri Karet & Plastik | - | - | - | - | - |
| 8 | Industri Mineral Non Logam | - | - | - | - | 175.300.000 |
| 9 | Industri Logam, Mesin & Elektronik | - | - | - | - | - |
| 10 | Industri Instrumen Kedokteran, Presisi, Optik dan Jam | - | - | - | - | - |
| 11 | Industri Kendaraan Bermotor & Alat Transportasi Lain | - | - | - | - | - |
| 12 | Industri Lainnya | - | - | - | - | - |
| III. | SEKTOR TERSIER | | | | | |
| 1 | Listrik, Gas dan Air | 4.145.641.035 | 570.192.890.000 | - | 1.283.401.400.000 | 2.474.559.400.000 |
| 2 | Konstruksi | - | - | - | - | - |
| 3 | Perdagangan & Reparasi | - | - | 80.000.000 | 1.147.080.400.000 | - |
| 4 | Hotel & Restoran | 234.759.791.624 | - | - | - | - |
| 5 | Transportasi, Gudang & Komunikasi | 1.399.320.000.000 | - | 464.000.000 | 60.861.300.000 | 1.916.276.500.000 |
| 6 | Perumahan, Kawasan Industri & Perkantoran | - | - | - | - | - |
| 7 | Jasa Lainnya | 1.910.725.407.827 | 4.333.486.512.000 | - | 12.746.640.600.000 | 754.162.000.000 |
| TOTAL | | Rp 7.881.289.778.898 | Rp16.196.330.386.462 | Rp 7.709.270.000.000 | Rp18.411.377.300.000 | Rp12.983.049.700.000 |

*Source : BPMPTSP' 2015*

In 2014 from the table above, the realization of domestic investment per sector, it appears that the dominant sectors are in the primary sector food crops and plantation sector with a value of Rp. 3.793 trillion. In the secondary sector is

dominated by the basic chemical industry, chemical and pharmaceutical goods Rp. 3,155 trillion. While in the tertiary sector dominated on electricity, gas and water Rp. 2.474 trillion and transport, storage and communication Rp. 1.916 trillion. The cumulative number of domestic investment realization in 2014 (Rp. 12.983 billion) is decreased compared to the year 2013 (Rp. 18.411 billion).

The realization of foreign investment by sector in Q2 2015 amounted to US $ 675 million with a number of projects as much as 62 and can absorb the local workforce 10 339 people, while 69 foreign workers. For the moment the sector is dominated primary sector that is still mining of US $ 514.61 million and crops and plantations US $ 82.94 million, followed by the secondary sector and the tertiary sector. When compared with the second quarter of the plan, the realization of the second quarter has exceeded the target. Plan for the second quarter amounted to US $ 427.65 million with the number of projects 6 and workers absorbed 469 people (TKI) and 3 (TKA). More detail can be seen in the table below.

**Table 3.10**
**development of foreign investment realization East Kalimantan Province quarter 2 by sector year 2015**

| No | SEKTOR USAHA | TAHUN 2015 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | RENCANA TRIWULAN II | | | | REALISASI TRIWULAN II | | | |
| | | PRO | INVESTASI (US$.) | TENAGA KERJA | | PRO | INVESTASI (US$.) | TENAGA KERJA | |
| | | | | TKI | TKA | | | TKI | TKA |
| I. | SEKTOR PRIMER | | | | | | | | |
| 1 | Tan. Pangan & Perkebunan | - | - | - | - | 7 | 82.946.400 | 3.163 | 19 |
| 2 | Peternakan | - | - | - | - | - | - | - | - |
| 3 | Kehutanan | - | - | - | - | - | - | - | - |
| 4 | Perikanan | - | - | - | - | - | - | - | - |
| 5 | Pertambangan | 2 | 7.450.000 | 95 | - | 28 | 514.617.900 | 330 | 34 |
| II. | SEKTOR SEKUNDER | | - | | | | | | |
| 1 | Industri Makanan | - | - | - | - | 3 | - | 53 | - |
| 2 | Industri Tekstil | - | - | - | - | - | - | - | - |
| 3 | Industri Barang dari Kulit & Alas Kaki | - | - | - | - | - | - | - | - |
| 4 | Industri Kayu | - | - | - | - | - | - | - | - |
| 5 | Industri Kertas & Pencetakan | - | - | - | - | - | - | - | - |
| 6 | Industri Kimia Dasar, Barang Kimia & Farmasi | 1 | 267.500.000 | 300 | 1 | 2 | 15.106.000 | 56 | - |
| 7 | Industri Karet, Barang dari Karet dan Plastik | - | - | - | - | 2 | - | 28 | - |
| 8 | Industri Mineral Non Logam | - | - | - | - | - | - | - | - |
| 9 | Industri Logam Dasar, Barang Logam, Mesin & Elektronik | - | - | - | - | - | - | - | - |
| 10 | Industri Instrumen Kedokteran, Presisi, Optik dan Jam | - | - | - | - | - | - | - | - |
| 11 | Industri Kendaraan Bermotor & Alat Transportasi Lain | - | - | - | - | - | - | - | - |
| 12 | Industri Lainnya | - | - | - | - | - | - | - | - |
| III. | SEKTOR TERSIER | | - | | | | | | |
| 1 | Listrik, Gas dan Air | - | - | - | - | 2 | 23.826.400 | 6.420 | 1 |
| 2 | Konstruksi | - | - | - | - | - | - | - | - |
| 3 | Perdagangan & Reparasi | 2 | 2.047.600 | 24 | 2 | 9 | 2.714.500 | 224 | 11 |
| 4 | Hotel & Restoran | - | - | - | - | 2 | - | - | - |
| 5 | Transportasi, Gudang & Komunikasi | - | - | - | - | 4 | 29.871.900 | 55 | 4 |
| 6 | Perumahan, Kawasan Industri & Perkantoran | 1 | 150.655.300 | 50 | - | 3 | 6.321.400 | 10 | - |
| 7 | Jasa Lainnya | - | - | - | - | - | - | - | - |
| | TOTAL | 6 | $ 427.652.900 | 469 | 3 | 62 | $ 675.404.500 | 10.339 | 69 |
| * Sumber : BPPMD Provinsi Kalimantan Timur, IPMK 10 Kab/Kota dan BKPM Jakarta | | | | | | | | | |
| * Kurs Dollar Tahun 2015 : 1 US$ = Rp 12.500,- | | | | | | | | | |

*Source : BPMPTSP'2015*

The realization of domestic investment by sector in Q2 2015 amounted to Rp. 4.382 trillion, the number of projects as much as 33 and can absorb the local labor force 7919 people, while the foreign workers 17 people. In contrast to the realization of foreign investment, which dominate the sector in the realization of domestic investment is the secondary sector that is the basic chemical industry, chemical and pharmaceutical goods Rp. 2.747 trillion and Rp food industry. 788 billion. Followed by the tertiary sector of hotels and restaurants Rp. 300 billion and the transport, storage and communication Rp. 144.78 billion. Then the primary sectors namely mining Rp. 194.63 billion and Rp food crops and plantations. 119.63 billion. Similarly, the realization of foreign investment, domestic investment realization is greater than the second quarter's plan,

The realization of the second quarter has exceeded the target. Plan for the second quarter amounted to Rp. 1.918 billion with 15 projects and a number of workers absorbed 4199 people (TKI) and TKA 0. For more details can be seen in the table below.

**Table 3.11**
**Development of investment realization in the country east Kalimantan province quarter 2 by sector year 2015**

| No | SEKTOR USAHA | TAHUN 2015 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | RENCANA TRIWULAN II | | | | REALISASI TRIWULAN II | | | |
| | | PRO | INVESTASI (Rp.) | TENAGA KERJA | | PRO | INVESTASI (Rp.) | TENAGA KERJA | |
| | | | | TKI | TKA | | | TKI | TKA |
| I. | SEKTOR PRIMER | | | | | | | | |
| 1 | Tan. Pangan & Perkebunan | 4 | 1.162.710.100.000 | 3.661 | - | 4 | 119.634.500.000 | 1.505 | - |
| 2 | Peternakan | - | - | - | - | - | - | - | - |
| 3 | Kehutanan | - | - | - | - | 1 | - | 1.784 | 11 |
| 4 | Perikanan | - | - | - | - | - | - | - | - |
| 5 | Pertambangan | 4 | 403.204.700.000 | 180 | - | 2 | 194.630.700.000 | 151 | 3 |
| II. | SEKTOR SEKUNDER | | - | | | | | | |
| 1 | Industri Makanan | 2 | 317.583.500.000 | 295 | - | 8 | 788.358.600.000 | 3.420 | - |
| 2 | Industri Tekstil | - | - | - | - | - | - | - | - |
| 3 | Industri Barang dari Kulit & Alas Kaki | - | - | - | - | - | - | - | - |
| 4 | Industri Kayu | - | - | - | - | 2 | 2.114.400.000 | 310 | - |
| 5 | Industri Kertas & Pencetakan | - | - | - | - | - | - | - | - |
| 6 | Industri Kimia Dasar, Barang Kimia & Farmasi | 1 | 1.275.000.000 | 11 | - | 7 | 2.747.381.000.000 | 192 | - |
| 7 | Industri Karet & Plastik | - | - | - | - | - | - | - | - |
| 8 | Industri Mineral Non Logam | - | - | - | - | 1 | 74.869.300.000 | 100 | - |
| 9 | Industri Logam Dasar, Barang Logam, Mesin & Elektronik | - | - | - | - | - | - | - | - |
| 10 | Industri Instrumen Kedokteran, Presisi, Optik dan Jam | - | - | - | - | - | - | - | - |
| 11 | Industri Kendaraan Bermotor & Alat Transportasi Lain | - | - | - | - | - | - | - | - |
| 12 | Industri Lainnya | - | - | - | - | - | - | - | - |
| III. | SEKTOR TERSIER | | - | | | | | | |
| 1 | Listrik, Gas dan Air | - | - | - | - | 1 | 2.039.900.000 | 50 | - |
| 2 | Konstruksi | - | - | - | - | 1 | 6.848.800.000 | 392 | 3 |
| 3 | Perdagangan & Reparasi | 3 | 19.500.000.000 | 39 | - | 2 | 1.500.000.000 | 15 | - |
| 4 | Hotel & Restoran | - | - | - | - | 2 | 300.801.300.000 | - | - |
| 5 | Transportasi, Gudang & Komunikasi | 1 | 14.100.000.000 | 13 | - | 1 | 144.780.200.000 | - | - |
| 6 | Perumahan, Kawasan Industri & Perkantoran | - | - | - | - | 1 | - | - | - |
| 7 | Jasa Lainnya | - | - | - | - | - | - | - | - |
| TOTAL | | 15 | Rp 1.918.373.300.000 | 4.199 | - | 33 | Rp 4.382.958.700.000 | 7.919 | 17 |

* Sumber : BPPMD Provinsi Kalimantan Timur, IPMK 14 Kab/Kota dan BKPM Jakarta

*Source : BPMPTSP' 2015*

In view of realization of foreign investment Kaltim Q2 2015 based on its location, the city most investment realization is the city of Balikpapan (US $ 491.28 million) followed by Samarinda (US $ 45.99 million) and Kutai regency (US $ 29.01 million) followed by city / other districts. City / County that can absorb the local workforce is the most widely Kutai regency as many as 7084 people. As for the realization of domestic investment Kaltim second quarter of 2015, the city most investment realization is Bontang (Rp. 2.733 trillion), Kutai Barat (Rp. 608 billion), Samarinda (Rp. 454.54 billion) and City / other districts. And the city / county that can absorb the local workforce is at most West Kutai many as 3,390 people.

**Table 3.12**
**Development of foreign investment realization east Kalimantan province based on the location of the quarter 2 year 2015**

| No | KABUPATEN / KOTA | TAHUN 2015 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | RENCANA TRIWULAN II | | | | REALISASI TRIWULAN II | | | |
| | | PRO | INVESTASI (US$.) | TENAGA KERJA | | PRO | INVESTASI (US$.) | TENAGA KERJA | |
| | | | | TKI | TKA | | | TKI | TKA |
| 1 | SAMARINDA | 1 | 1.047.600 | 13 | 2 | 5 | 45.990.600 | 208 | 4 |
| 2 | BALIKPAPAN | 2 | 151.655.300 | 61 | - | 13 | 491.285.000 | 113 | 3 |
| 3 | KUTAI KARTANEGARA | 1 | 1.200.000 | 10 | - | 11 | 29.016.500 | 7.084 | 5 |
| 4 | BONTANG | 1 | 267.500.000 | 300 | 1 | 2 | 4.879.500 | 9 | - |
| 5 | KUTAI TIMUR | 1 | 6.250.000 | 85 | - | 11 | 2.032.200 | 264 | 8 |
| 6 | PENAJAM PASER UTARA | - | - | - | - | 1 | - | 4 | 2 |
| 7 | PASER | - | - | - | - | 1 | - | - | - |
| 8 | KUTAI BARAT | - | - | - | - | 13 | 98.556.600 | 2.543 | 40 |
| 9 | BERAU | - | - | - | - | 5 | 3.644.100 | 114 | 7 |
| 10 | MAHULU | - | - | - | - | - | - | - | - |
| TOTAL | | 6 | $ 427.652.900 | 469 | 3 | 62 | $ 675.404.500 | 10.339 | 69 |

*Source : BPMPTSP' 2015*

**Table 3.13**
**Development of foreign investment realization east Kalimantan province based on the location of the quarter 2 year 2015**

| No | KABUPATEN / KOTA | TAHUN 2015 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | RENCANA TRIWULAN II | | | | REALISASI TRIWULAN II | | | |
| | | PRO | INVESTASI (Rp.) | TENAGA KERJA | | PRO | INVESTASI (Rp.) | TENAGA KERJA | |
| | | | | TKI | TKA | | | TKI | TKA |
| 1 | SAMARINDA | 2 | 3.000.000.000,00 | 24 | - | 4 | 454.544.700.000 | 627 | 3 |
| 2 | BALIKPAPAN | 1 | 16.500.000.000,00 | 15 | - | 4 | 1.500.000.000 | 15 | - |
| 3 | KUTAI KARTANEGARA | 4 | 403.204.700.000,00 | 180 | - | 6 | 210.687.400.000 | 277 | 3 |
| 4 | BONTANG | 1 | 1.275.000.000,00 | 11 | - | 4 | 2.733.564.500.000 | 178 | - |
| 5 | KUTAI TIMUR | 3 | 577.286.300.000,00 | 2.008 | - | 4 | 280.412.800.000 | 748 | - |
| 6 | PENAJAM PASER UTARA | 1 | 14.100.000.000,00 | 13 | - | 2 | - | 1.859 | 11 |
| 7 | PASER | - | - | - | - | 4 | 93.890.700.000 | 825 | - |
| 8 | KUTAI BARAT | - | - | - | - | 5 | 608.358.600.000 | 3.390 | - |
| 9 | BERAU | 3 | 903.007.300.000,00 | 1.948 | - | - | - | - | - |
| 10 | MAHULU | - | - | - | - | - | - | - | - |
| TOTAL | | 15 | Rp 1.918.373.300.000 | 4.199 | - | 33 | Rp 4.382.958.700.000 | 7.919 | 17 |

*Source: BPMPTSP' 2015*

## 3.4 Potential of Biomass Energy Resources in East Kalimantan Province

Indonesia is one of the few countries in the world are known to have forest areas is still relatively high, in addition to Brazil and Zaire. Indonesia exact geographical location being on the equator, make this country as one of the owners of humid tropical forests are still owned by the world today. Indonesia moist tropical forest areas known to store a variety of biological richness (biodiversity). WWF Indonesia even reported that forests in Indonesia, especially those in East Kalimantan (Kayan Mentarang, Malinau) has about 15,000 species of plants on each kilimoter square of the region, and the value of this diversity is the highest, when compared to any region in advance This earth (Pio, 2008).

Not only that, the jungle in Borneo is also known to store a wealth of diverse species of endemic plants. Recorded 6,000 plant species are classified into this classification, including 155 types of dipterocarp are economically and ecologically have a very important role for the community in this region. Unfortunately, the potential for high diversity is not yet fully perceived benefits, given that most of the biological wealth of the unknown and the unknown function and its use, both economically and ecologically to support the lives of human beings who live in a sustainable manner.

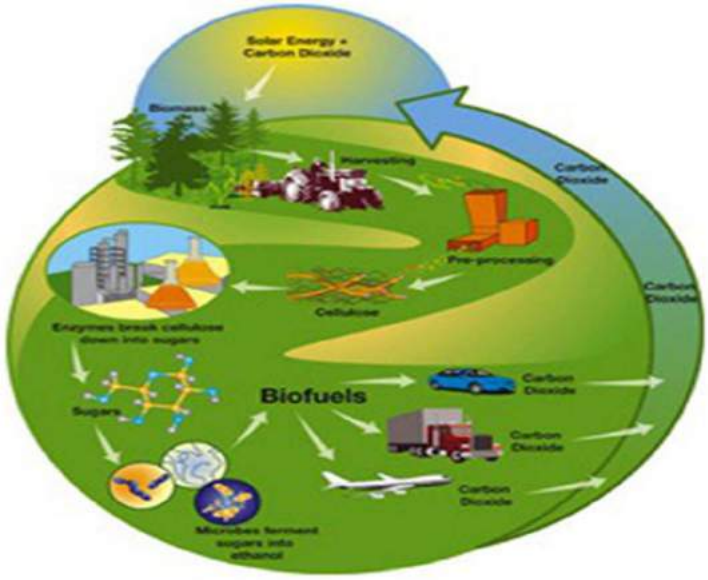
Ignorance of the nature and function of the main factor and the cause of ketidakbermanfaatannya potential of forests and biomass sources are rich in this lignocellulose. Currently, forests are not only built to produce wood carpentry in order to meet the needs of construction, the furniture as well as the raw material of pulp and paper alone. Since the last few years, developed also thought and technology utilization of forest biomass potentials are large and rich in lignocellulose this (lignocellulosic biomass) as a raw material to produce fuel, energy and renewable chemicals (Watanabe, 2007).

Lignosellulosa is a term generally used to describe the main constituent components of a plant, either in the form of timber (wood), as well as non-tree (non-woody) such as grass, hay and so forth. These components can generally be found from the roots, stems and leaves of plants. As seen in Figure 3.13, chemically

berlignosellulosa biomass will be composed of 3 the main components, namely cellulose (38-50%), lignin (15-30%) and hemicellulose (23-32%) (Sierra et al., 2007).

Today, the use of forest biomass that is rich in lignocellulose as penghara (feedstock) in producing environmentally friendly fuels (bioethanol) to be very important and interesting to do mainly based on three main advantages it has. First, biomass berlignoselulosa is a source of raw materials that are renewable (renewable resources), so it can be developed in a sustainable manner in the future. Secondly, the type of fuel that originates in biomass virtually no carbon dioxide emissions (CO2), hence a very positive impact on the environment.

**Figure 3.13**
**Closed carbon cycle in the use of fuels derived from biomass that berlignoselulosa**




Third, biomass fuels have a very favorable economic potential and significant, especially if associated with the phenomenon of declining production and increasing fossil fuel prices in the future (Cadenas and Cabezudo, 1998; Demirbas, 2007). Moreover, forest biomass, waste wood industry and agriculture are rich in lignocellulose is not a food, so its utilization as fuel and energy will not disrupt the availability of stocks of food that we had (non edible biomass).

Especially with regard to bioethanol, the Indonesian government has drawn up a road map roadmap development or production of renewable fuels. In the roadmap, the government plans to produce bioethanol using berlignosellulosa

biomass materials sourced from forests, waste wood industry and agriculture to replace the use of foodstuffs, as it exists today (planned for 2016-2025).

Responding to the plan and as a first step in order to create and fill the bioethanol industry development roadmap Indonesia independent, since two years ago we have conducted a series of studies that we focus on identifying and selecting the appropriateness of use of some types of plants, particularly wood-tropical timber has the potential to be converted into bioethanol. Identification and selection phases we have done by analyzing the chemical content of the wood and the potential for reduced sugar held (after the process of hydraulic enzymatically) by the biomass of the tropical forest berlignoselulosa. As this study we are doing as part of the adaptation to the rapidly evolving technological advances, especially in the process of making bioethanol.

Results of the research we have done shows that some kind of tropical timber which is known as a pioneer species of secondary forest, fast growing and can adapt to environmental soil nutrient-poor and have so far not been used and the economic value is very low as arranging, breadfruit , bungur and sengon proved to have a very high level of fitness, and has great potential to be developed as raw material for bio-ethanol in the future (lignocellulosic biomass). Positive assessment would suitability of the use of the wood as raw material for bioethanol is characterized by its reduced potential sugar content are classified as very high, where wood applicability (Artocarpus elasticus) reached 73.59%, sengon (Paraserianthes falcataria) 70.25%, bungur (Lagerstromia speciosa) 69.06% and breadfruit (Artocarpus altilis) 67.84% (w / w). As far as we know, this study is the first findings that show the potential for a very high sugar terreduksi of wood pioneer tropical areas, especially of pioneer species that grows and many have encountered in Southeast Asia.

Not only that, forests and plantations in Indonesia is also the raw material reserves tremendous energy for Indonesia. Biodiesel and energy pellets can also be developed to exploit the potential of this great biomass. Nowadays, almost every area of the district and the city, especially those in Sumatra and Kalimantan is the center or base of the development of plantations and palm oil processing industry in this country.

Nationally, oil palm is one of Indonesia in achieving commodity exchange. For 20 years (1985-2005) recorded the bulge area of oil palm plantations as much as 837%, this is evidenced by the contribution of palm oil to the national export as much as 6%, this is also the number one commodity of Indonesian products outside the oil and gas sector. However, the positive impact of the development of the palm oil industry also produces adverse effects to the environment if the waste generated is not managed properly.

If we examine the processing of fresh fruit bunches (FFB) into palm oil (CPO), then approximately 45% of the inputs of fresh fruit are processed will eventually turn into solid waste in the form of shell / shell (shell), fiber (fiber) and palm empty fruit bunches (EFB) (Fig. 6). Half of the amount of solid waste is a palm empty fruit bunches. A very large number, when considering the amount of fresh oil palm fruit that is processed continues to increase over time, as well as the capacity of its palm oil processing industry.

**Figure 3.14**
***Mass Balance* in palm oil processing industry**
**(Kismanto, 2006 dimodifikasi: Aminta *et al*)**

For example, East Kalimantan Province, currently operates several oil palm plantation companies with the realization of growing areas that have reached 714,000 ha and with an annual production rate of crude palm oil (CPO) of 2.5 million tons (annual production of fresh fruit ± 12.5 million tonnes). A large amount of production is supported by the presence of 18 palm oil mills are scattered in most regions of the province (Anonymous, 2010). If it is assumed that 20% of waste will be generated bunches of processing each ton of fresh palm fruits, then at least there are currently about 2.5 million waste of potential, which is ready to be used into products of high economic value, one of which is bio-pellets ( pellet energy).

So far the utilization of solid waste palm oil to produce a new energy limited as solid fuels in boilers (boilers), especially for solid waste in the form of shell / shell and fibers. Especially for waste oil palm empty fruit bunches, as the use of solid fuel boilers has constrained / inhibitors, namely the high content of water (moisture) 60% and pollution generated. However, with the technology development process that has been done, we were able to significantly improve the quality and calorific value of the product bio-pellet / pellet energy produced. So far, the results we were able to change the solid waste of oil palm empty fruit bunches into alternative energy products with the average calorific value or heat of ± 5,000 kCal / kg. Not only that, the results of this study also is the first findings were reported that waste oil palm empty fruit bunches can be processed into an energy source that is capable of having a calorific value / heat relatively high, reaching up to the value of 5,354 kcal / kg, equivalent to 22.4 MJ / kg.

Pellet product is potentially vast energy to be developed. Industrial development opportunities and bio-pellet production is highly dependent on the level of demand for these products in the market of energy, whether it is of domestic origin (domestic), as well as from abroad. Calorific value possessed by bio-pellets made from waste oil palm empty fruit bunches today, ie> 5,000 kCal / kg, in fact, is far above the requirements of the Low Rank Coal (LRC) or low calorie coal desired by the State Electricity Company (PLN) to be used as fuel for power plants (power plant) national, in order to support the provision of national power (the value of heat / heat 3,900 ~ 4,700 kCal / kg).

PLN needs the LRC will be loaded and delivered in a variety of occasions and reports in some national media. Citing reports from Media Indonesia at the end of 2009, `PT PLN (Persero) tender the procurement of low calorie coal (low rank coal -LRC) to meet the plant's needs 3.26 million tons per tahun`. That means, bio-waste pellets palm empty bunches are very likely to be developed in order to meet national energy needs from year to year tends to increase.

Therefore, East Kalimantan and some other provinces that became the center of plantation and palm oil processing likely to be center development of bio-pellet industry / energy pellets made from solid waste palm oil, given the extensive plantations and palm oil production level that has been held today. Not only that, oil palm plantation development program of 1 million hectares was initiated by the local government will also be synergized with the development of bio-pellet industry in order to realize the capability and independence of the region in producing energy from renewable sources it has today.

In addition to having the domestic market, renewable energy products such as bio-pellets from solid waste palm oil is also a great opportunity to be exported abroad. The current trend of world demand for energy pelleted product very well and continues to increase from year to year. Reported by Swaan and Melin (2008) and Ekstrom (2009), each year the countries of Europe and America need about 14 ~ 15 million tons of pellet energy product, both made of wood, agricultural waste and others. Generally energy pellets used as fuel for heating purposes in the winter. However, this time the need for energy pellets tend to increase, along with expanding use as a fuel substitute substitution of coal for the needs of the industries in these countries.

Armed with various explanations have been given, we sincerely hope we can follow up explanation and the results of this research into an opportunity to investment in order to maximize the use of natural resources we have, providing energy and fuel enough for the community, especially for those who stay rural areas, forests and plantations are so far relatively untouched by a sufficient supply of energy and fuel, as we who live the urban region. Moreover, through this effort we can actually play an active role in maintaining the environment, save it from global warming is happening through a real effort in the form of the use of

environmentally friendly energy, renewable and derived from renewable biomass that we have a lot of this.

## 3.5 Potential of Cassava Elephant Being Bio Ethanol in the District Kutai Kartanegara

Based on the location of the aquatic mammal distribution of cassava production, cassava production in East Kalimantan is concentrated in three districts / cities, namely Kutai, Kutai Barat and Balikpapan. The level of productivity of cassava in Kalimantan around 19.7 tonnes / ha. This condition indicates that the productivity of cassava Kaltim still below the national productivity (22.4 tons / ha). Therefore, the increase cassava productivity through increased production of technical application through the use of high yielding varieties (such as cassava elephants that have a comparative advantage) is a potential to increase cassava production in East Kalimantan

**Table 3.14**
**Cassava planting area in district Kutai Kartanegara**

| KECAMATAN | Luas Tanam (Ha) | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 jan-juli |
| | | | | | | |
| 1 SEMBOJA | 100 | 30 | 45 | 50 | 20 | 20 |
| 2 MUARA JAWA | 48 | 44 | 33 | 122 | 15 | 6 |
| 3 SANGA-SANGA | 44 | 38 | 43 | 32 | 24 | 6 |
| 4 LOA JANAN | 10 | 13 | 11 | 23 | 23 | 9 |
| 5 LOA KULU | 15 | 6 | 9 | 12 | 30 | 3 |
| 6 MUARA MUNTAI | 276 | 186 | 147 | 107 | 91 | 31 |
| 7 MUARA WIS | 6 | 7 | 2 | 10 | 13 | 7 |
| 8 KOTA BANGUN | 64 | 126 | 122 | 174 | 203 | 108 |
| 9 TENGGARONG | 66 | 38 | 35 | 47 | 50 | 51 |
| 10 SEBULU | 147 | 133 | 90 | 103 | 98 | 72 |
| 11 TGR SEBERANG | 109 | 56 | 35 | 41 | 29 | 18 |
| 12 ANGGANA | 131 | 83 | 87 | 20 | 114 | 14 |
| 13 MUARA BADAK | 25 | 12 | 24 | 21 | 28 | 13 |
| 14 MARANG KAYU | 67 | 120 | 152 | 55 | 19 | 59 |
| 15 MUARA KAMAN | 50 | 50 | 36 | 135 | 73 | 41 |
| 16 KENOHAN | 110 | 111 | 53 | 47 | 21 | 14 |
| 17 KEMBANG JANGGUT | 32 | 102 | 76 | 123 | 132 | 36 |
| 18 TABANG | 156 | 71 | 39 | 111 | 69 | 22 |
| **JUMLAH** | **1,456** | **1,226** | **1,039** | **1,233** | **1,052** | **530** |

*Source: estate agency district Kutai Kartanegara' 2015*

**Table 3.15**
**Cassava production in the district kutai kartanegara**

| KECAMATAN | PRODUKSI (Ton) | | | | |
|---|---|---|---|---|---|
| | 2010 | 2011 | 2012 | 2013 | 2014 |
| | | | | | |
| 1 SEMBOJA | 1,139 | 1,348 | 267 | 1,229 | 842 |
| 2 MUARA JAWA | 634 | 763 | 587 | 1,462 | 1,019 |
| 3 SANGA-SANGA | 756 | 525 | 670 | 518 | 423 |
| 4 LOA JANAN | 364 | 128 | 249 | 306 | 537 |
| 5 LOA KULU | 225 | 73 | 119 | 232 | 410 |
| 6 MUARA MUNTAI | 2,733 | 2,145 | 2,422 | 1,477 | 2,050 |
| 7 MUARA WIS | 110 | 97 | 32 | 147 | 241 |
| 8 KOTA BANGUN | 785 | 1,510 | 1,921 | 3,207 | 3,670 |
| 9 TENGGARONG | 891 | 542 | 328 | 862 | 941 |
| 10 SEBULU | 2,088 | 1,908 | 1,103 | 1,600 | 2,449 |
| 11 TGR SEBERANG | 1,346 | 909 | 616 | 781 | 730 |
| 12 ANGGANA | 2,245 | 1,427 | 1,374 | 454 | 2,259 |
| 13 MUARA BADAK | 298 | 134 | 222 | 475 | 555 |
| 14 MARANG KAYU | 826 | 1,589 | 1,989 | 1,559 | 253 |
| 15 MUARA KAMAN | 949 | 443 | 624 | 1,991 | 2,017 |
| 16 KENOHAN | 1,333 | 1,488 | 815 | 770 | 632 |
| 17 KEMBANG JANGGUT | 348 | 1,395 | 1,228 | 2,196 | 2,916 |
| 18 TABANG | 2,667 | 1,193 | 730 | 1,761 | 1,316 |
| **JUMLAH** | **19,737** | **17,614** | **15,296** | **21,027** | **23,260** |

*Source: estate agency district Kutai Kartanegara' 2015*

**Figure 3.15**
**Potential of cassava elephant in Bendang Raya village districts Tenggarong Kutai Kartanegara**

## 3.6 Potential of Waste Oil Being Wood Pellet in the District East Kutai

East Kutai is one of the areas in East Kalimantan province. The location is bordered by the East Kutai Regency of Berau Kabuapten in the north, in the west bordering the Malinau District, in the south bounded by Dan Bontang and Kutai regency in the east bordering the Makassar Strait. The total area of East Kutai. 35 747.50 km2, which is composed of 18 districts.

One ingredient manufacture of wood pellets is the result of processing solid waste palm oil into CPO. East Kutai Regency is one of the areas of East Kalimantan province has vast oil palm plantations, as well as other areas in East Kalimantan and is the flagship product in East Kalimantan and Kalimantan in general.

From year to year, oil palm plantations is increasing, in line with the governor in an attempt to launch the program "one million hectares of palm oil" so that the area of the plant will increase from year to year. However, in 2015 a decline. At 3:16 table shows that palm oil production reached 4,446,370.51 tons of plant area of 318,025.81 ha in 2014, while in 2015 decreased 318,025.81 ha with production 2,565,898.75 tons due to the mutation of People Plasma PBS.

Just an example for East Kutai any information obtained through the Department of Estates, in the near future it will issue 101 company business license (IUP) for the palm oil sector with a total area of 700 thousand hectares.

## Table 3.16
## Recapitulation area and large plantation private production of annual crops

| No | Komoditi | Luas Areal (Ha) | | | | Produksi (Ton/Ha) Semester II | Produktivitas Rata-Rata (Kg/Ha) Semester II | Wujud Produksi TBS CPO | Jumlah Tenaga Kerja Perkebunan |
|---|---|---|---|---|---|---|---|---|---|
| | | TBM | TM | TR/TTM | Jumlah Akhir Semester II | | | | |
| 1 | Sengata Utara | - | - | - | - | - | - | - | - |
| 2 | Sengata Selatan | - | - | - | - | - | - | - | - |
| 3 | Teluk Pandan | - | - | - | - | - | - | - | - |
| 4 | Rantau Pulung | 6.257,11 | 2.284,72 | - | 8541,83 | 8.894,22 | 3.892,91 | TBS | 1.239 |
| 5 | Bengalon | 16.238,01 | 24.859,45 | - | 41097,46 | 172.209,98 | 6.927,34 | TBS | 4.973 |
| 6 | Kaliorang | 1.126,64 | 7.622,06 | - | 8748,7 | 9.435,76 | 1.237,95 | TBS | 962 |
| 7 | Kaubun | 6.979,23 | 9.824,81 | - | 16804,04 | 103.719,49 | 10.556,89 | TBS | 2.045 |
| 8 | Karangan | 15.704,97 | 18.914,16 | - | 34619,13 | 192.404,36 | 10.172,50 | TBS | 3.531 |
| 9 | Sangkulirang | 11.010,52 | 11.865,45 | - | 22875,97 | 129.627,04 | 10.924,75 | TBS | 2.292 |
| 10 | Sandaran | 25.968,59 | 9.558,91 | - | 35527,5 | 93.921,50 | 9.825,54 | TBS | 3.979 |
| 11 | Batu Ampar | 629,52 | 2.074,64 | - | 2704,16 | 302,25 | 145,69 | TBS | 392 |
| 12 | Telen | 8.147,16 | 21.704,68 | - | 29851,84 | 685.426,94 | 31.579,68 | TBS | 3.254 |
| 13 | Muara Wahau | 4.772,52 | 45.063,18 | - | 49835,7 | 771.757,30 | 17.126,12 | TBS | 5.658 |
| 14 | Kongbeng | 7.835,49 | 12.555,49 | - | 20390,98 | 224.869,73 | 17.910,07 | TBS | 2.671 |
| 15 | Muara Bengkal | 4.517,00 | 6.639,00 | - | 11156 | 78.872,82 | 11.880,23 | TBS | 1.339 |
| 16 | Muara Ancalong | 13.992,23 | 10.468,00 | - | 24460,23 | 58.356,33 | 5.574,73 | TBS | 3.596 |
| 17 | Long Mesangat | 1.720,94 | 3.649,00 | - | 5369,94 | 24.655,87 | 6.756,88 | TBS | 913 |
| 18 | Busang | 4.647,48 | 1.394,85 | - | 6042,33 | 11.445,16 | 8.205,29 | TBS | 955 |
| | Tahun 20015 | 129.547,41 | 188.478,40 | - | 318.025,81 | 2.565.898,75 | 10.181,10 | TBS | 37.799 |
| | Tahun 20014 | 129.547,41 | 188.478,40 | - | 318.025,81 | 4.446.370,51 | 23.590,88 | TBS | 37.798 |
| | Tahun 20013 | 154.953,29 | 128.423,87 | - | 283.377,16 | 2.767.524,51 | 21.549,92 | TBS | 36.688 |
| | Tahun 20012 | 133.324,53 | 108.482,24 | - | 241.806,77 | 2.259.363,38 | 20.827,03 | TBS | 36.261 |
| | Tahun 20011 | 137.962,44 | 83.483,73 | - | 221.446,17 | 1.703.631,07 | 20.406,74 | TBS | 35.431 |

*Source : estate agency district east kutai ' 2015*

**Table 3.17**
**Recapitulation acreage and production of perennial crops plantation (Pr)**

| No | Komoditi | Luas Areal (Ha) TBM | TM | TR/TTM | Jumlah Akhir Semester II | Produksi (Ton/Ha) Semester II | Produktivitas Rata-Rata (Kg/Ha) Semester II | Wujud Produksi TBS CPO | Jumlah Tenaga Kerja Perkebunan |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Sengata Utara | 71,00 | 63,00 | - | 134,00 | 582,92 | 9.252,62 | TBS | 67,00 |
| 2 | Sengata Selatan | 381,30 | 107,00 | 70,00 | 558,30 | 1.000,17 | 9.347,34 | TBS | 357,00 |
| 3 | Teluk Pandan | 814,50 | 195,00 | - | 1.009,50 | 1.845,95 | 9.466,38 | TBS | 603,00 |
| 4 | Rantau Pulung | 1.572,75 | 1.504,50 | 240,25 | 3.317,50 | 12.811,00 | 8.515,12 | TBS | 1.974,00 |
| 5 | Bengalon | 6.249,65 | 3.885,37 | 504,00 | 10.639,02 | 33.635,89 | 8.657,06 | TBS | 4.097,00 |
| 6 | Kaliorang | 1.376,03 | 1.446,56 | 39,50 | 2.862,09 | 12.100,66 | 8.365,12 | TBS | 1.288,00 |
| 7 | Kaubun | 2.455,76 | 4.818,12 | - | 7.273,88 | 41.105,17 | 8.531,37 | TBS | 3.096,00 |
| 8 | Karangan | 3.967,77 | 4.121,28 | - | 8.089,05 | 32.104,51 | 7.789,94 | TBS | 2.871,00 |
| 9 | Sangkulirang | 1.892,13 | 2.313,03 | - | 4.205,16 | 16.538,77 | 7.150,26 | TBS | 1.597,00 |
| 10 | Sandaran | 5.727,04 | 77,55 | - | 5.804,59 | 436,88 | 5.633,53 | TBS | 1.053,00 |
| 11 | Batu Ampar | 181,66 | 520,93 | - | 702,59 | 1.557,14 | 2.989,14 | TBS | 163,00 |
| 12 | Telen | 3.642,14 | 3.872,20 | - | 7.514,34 | 29.983,27 | 7.743,21 | TBS | 2.545,00 |
| 13 | Muara Wahau | 6.759,08 | 7.156,51 | 57,00 | 13.972,59 | 50.078,84 | 6.997,66 | TBS | 4.371,00 |
| 14 | Kongbeng | 3.736,21 | 8.641,40 | - | 12.377,61 | 92.450,69 | 10.698,58 | TBS | 4.113,00 |
| 15 | Muara Bengkal | 1.525,76 | 1.650,50 | - | 3.176,26 | 9.986,09 | 6.050,34 | TBS | 913,00 |
| 16 | Muara Ancalong | 1.204,20 | 2.613,30 | - | 3.817,50 | 5.322,00 | 2.036,51 | TBS | 1.393,00 |
| 17 | Long Mesangat | 1.106,33 | 502,00 | - | 1.608,33 | 3.535,82 | 7.043,47 | TBS | 725,00 |
| 18 | Busang | 1.110,66 | 268,68 | - | 1.379,34 | 1.449,73 | - | TBS | 407,00 |
| | Tahun 20015 | 43.773,97 | 43.756,93 | 910,75 | 88.441,65 | 346.525,50 | 7.427,51 | TBS | 31.633,00 |
| | Tahun 20014 | 44.071,02 | 41.078,38 | 911,00 | 86.060,40 | 756.603,04 | 18.418,52 | TBS | 31.633,00 |
| | Tahun 20013 | 41.562,08 | 33.706,64 | 873,65 | 76.142,37 | 634.882,51 | 18.835,53 | TBS | 30.775,00 |
| | Tahun 20012 | 47.827,53 | 17.156,37 | 834,15 | 65.818,05 | 276.541,00 | 16.118,85 | TBS | 25.176,00 |
| | Tahun 20011 | 43.091,95 | 10.157,94 | 758,00 | 54.007,89 | 185.968,12 | 18.307,66 | TBS | 24.535,00 |

*Source : estate agency district east kutai ' 2015*

As well as Big Private Plantation (PBS), Smallholder also experienced a decline in production in 2015 than in 2014. The number of palm oil production reached 756,603.04 tons of plant area 86060.40 ha in 2014, whereas in 2015 experienced decrease 346,525.50 tons of planting area 88441.65 ha. In fact, since 2011 until 2014 continued the amount of production. For workers absorbed in 2011 as many as 24 535 people continues to increase in 2012 (25 176 people), in 2013 (30 775 people) and 2014 (31 633 people).

Judging from the above table can be seen that the area of oil palm cultivation folk (PR) from year to year, oil palm plantations is increasing due to the transmigration of the People Plasma PBS.

**Figure 3.16**
**Potential of palm oil in the district east kutai**

## 3.7 Potential Bio Fuel Oil In Being in the District Paser

Paser, East Kalimantan Province is a region located at the South, precisely in the position 0045'18,37 "- 2027'20,82" south latitude and 115036'14,5 "- 166057'35,03" East Longitude. Paser boundaries include the northern border with West Kutai and Kutai, East borders with Penajam Paser Utara and Makassar Strait, south by New City District, South Kalimantan, and the west bordering Tabalong South Kalimantan Province. Wide Paser Regency is an area of 11603.94 km2. This widely distributed to 10 (ten) districts with 144 villages / wards. Districts that have a fairly extensive area is the District Long time with an area of 2385.39 km2 and the narrowest is Tanah Grogot with an area of 335.58 km2.

Oil plants in the traditional commodity Paser, grows well in all the places sought by the public as well as cultivated plants perkarangan in fairly broad expanse. District of potentially produce coconut, among others: the District Land Grogot, Sand Belengkong and Long Kali.

**Figure 3.17**
**Potential of coconut in the sand in the district Pasir Belengkong district Paser and district darts Paser with district Penajam Paser Utara**


In addition to meeting the needs of local, coconut plantations in Paser largely traded between regions. Each result plantation commodities already has its own marketing channels. To coconuts are mostly sold to Balikpapan. 3:18 and 3:19 in the table below represents the acreage and production data coconut in Paser.

**Figure 3.18**
**Potential of coconut in the village Kampung Lidi Saloloang district Penajam Paser Utara**

## Table 3.18
## Data area of coconut plantations in the district Paser
## Year 2009 - 2013

| No. | Kecamatan | Luas Areal (Ha) | | | | |
|---|---|---|---|---|---|---|
| | | 2009 | 2010 | 2011 | 2012 | 2013 |
| 1 | Long Kali | 1,614.00 | 1432.00 | 1358.00 | 1170.50 | 970.00 |
| 2 | Long Ikis | 146.95 | 144.20 | 80.00 | 80.00 | 80.00 |
| 3 | Kuaro | 298.73 | 296.00 | 296.00 | 296.00 | 260.00 |
| 4 | Batu Sopang | 65.00 | 70.35 | 70.35 | 65.00 | 65.00 |
| 5 | Muara Samu | 57.40 | 57.40 | 52.00 | 52.00 | 52.00 |
| 6 | Muara Komam | 122.00 | 108.00 | 89.00 | 69.00 | 49.00 |
| 7 | Pasir Belengkong | 441.69 | 441.69 | 441.69 | 444.00 | 403.00 |
| 8 | Batu Engau | 423.75 | 423.75 | 379.00 | 379.00 | 379.00 |
| 9 | Tanjung Harapan | 304.00 | 304.00 | 304.00 | 304.00 | 290.00 |
| 10 | Tanah Grogot | 855.00 | 856.00 | 856.00 | 866.00 | 806.00 |
| | **Jumlah** | **4,328.52** | **4,133.39** | **3,926.04** | **3,725.50** | **3,354.00** |

*Source : estate agency district Paser 2014*

## Table 3.19
## Oil production data in the plantations of the people in district Paser
## Year 2009 – 2013

| No. | Kecamatan | Produksi ( Kg ) | | | | |
|---|---|---|---|---|---|---|
| | | 2009 | 2010 | 2011 | 2012 | 2013 |
| 1 | Long Kali | 1,385,844.46 | 3,037,800.00 | 2,469,212.00 | 1,942,000.00 | 1,822,000.00 |
| 2 | Long Ikis | 83,326.94 | 185,950.00 | 102,655.00 | 100,300.00 | 100,000.00 |
| 3 | Kuaro | 258,231.60 | 463,500.00 | 597,820.00 | 546,400.00 | 509,263.00 |
| 4 | Batu Sopang | 43,033.58 | 97,250.00 | 98,502.00 | 204,702.00 | 197,000.00 |
| 5 | Muara Samu | 36,944.40 | 70,165.00 | 84,135.00 | 82,000.00 | 59,500.00 |
| 6 | Muara Komam | 5,306,876.40 | 194,545.00 | 162,393.00 | 324,786.00 | 122,000.00 |
| 7 | Pasir Belengkong | 1,043,744.79 | 798,509.00 | 796,624.00 | 714,805.00 | 619,200.00 |
| 8 | Batu Engau | 339,066.20 | 756,725.00 | 700,720.50 | 683,040.00 | 675,000.00 |
| 9 | Tanjung Harapan | 223,881.75 | 543,800.00 | 533,883.50 | 526,360.00 | 498,400.00 |
| 10 | Tanah Grogot | 765,688.00 | 1,555,688.00 | 1,544,125.00 | 1,522,925.00 | 1,452,410.00 |
| | **Jumlah** | **9,486,638.11** | **7,703,932.00** | **7,090,070.00** | **6,647,318.00** | **6,054,773.00** |

*Source : estate agency district Paser 2014*


# CHAPTER 4
# FEASIBILITY ASPECTS

## 4.1 Singkong Gajah (Cassava Elephant) Being Bio Ethanol at the District Kutai Kartanegara

### 4.1.1. Policy And Legal Aspects

In accordance with the Regulation of the President of the Republic of Indonesia No. 5 2006 on National Energy Policy to develop alternative energy sources as a substitute fuel and Presidential Instruction No. 1 dated at January 25, 2006 on the Provision and Use of Biofuels (Biofuel) as a liquid fuel (tentang Penyediaan dan Pemanfaatan Bahan Bakar Nabati (Biofuel) sebagai bahan bakar cair), Bioethanol is the most appropriate choice as the fuel of the future. Besides cultivated from agricultural commodities that can be renewable, bioethanol can be done on a scale of SMEs to the village level. In addition, the government is serious to develop biofuels by issuing Presidential Instruction No. 1 2006 June 25, 206 on the supply of biofuels (Biofuel) as a fuel source.

The development of the leading sectors in the province of East Kalimantan to anticipate the exhaustion of oil and gas and mining resources that are unrenewable through the development of the agricultural sector that are more renewable and as part of an effort to improve national food security and territory as well as for the purpose of developing East Kalimantan province, through the development of strategies:

1. Developing the potential in each region to develop and encourage the development of leading commodity sectors and activities of agriculture, plantation, fishery and livestock to better contribute to the economic growth of the region.

2. Making a part in reducing the gap region by developing the agricultural potential area of agriculture, plantation and fisheries, which generally are rural areas, rural areas and regions lagging behind.
3. Develop disadvantaged areas and / or inland in an attempt to reduce the gap region of east-west by encouraging new growth centers with the support of the agricultural sector basis.
4. Develop and enhance linkage with the primary sectors of agriculture-based industrial sector supporters by building industrial zones and related infrastructure.

### 4.1.2. Technical Aspects

Technical aspects of the business is beneficial to find out the information regarding bioethanol production resources, production facilities as well as the phase-tahapproduksi bioethanol. It plays an important role in the success of the business kegiatanatau bioethanol.

**1. Resource Production**

Production resources in bioethanol includes business location, availability of raw materials and labor. Kabupaten Kutai (District of Kota Bangun) is a location in developing bioethanol's singkong gajah (cassava elephant) based industry . This location was chosen because it has a relatively complete infrastructure and sources of raw materials which are relatively available with quite large and extensive development potential. Cassava used are specific types of cassava, the production singkong gajah (cassava elephant) that weighs each of which are very large (30-40 kg) despite the relative starch content is not too big, which is about 20-30 percent.

Here are some advantages of Singkong Gajah (Cassava Elephant):

a. The potential for large bulbs

Elephant cassava production capability is high, to achieve results 10 kg to the top of each tree is very easily achieved. So potentially become the leading commodity to be developed further. Even with good treatment, cassava is easy to reach the target of at least 20 kg per tree. With a spacing of 1 × 1.5 m with the number of trees 7000 trees, then in 1 hectare can be achieved 100

tons or more. With low purchase price of cassava in the land of Rp 600 per kg it will get at least Rp 84 million. But it all depends on soil conditions and treatments. But, do not heroics, say out the results of only an average of 10 kg per tree with a spacing of 1x1m for 1 hectare will remain acquired 100 tons.

b. Rapid growth and adaptive

Singkong Gajah (Cassava Elephant) adaptable in various types of locations, in a dry location Singkong Gajah (Cassava Elephant) can still give a high yield of origin planted at the beginning of the rainy season. For location rather damp better planted at the end of the rainy season.

c. Good taste

Tastes good and can be used as raw material for culinary snacks, such as chips and other.

d. Tuber growth evenly

e. Relatively high starch content

Relatively high starch content, cassava yield elephant if made tapioca able to provide the range of 20-30 percent starch content.

f. Cassava leaves tastes good

g. Big and tall stems

So, cassava is very likely to be developed into a number of raw materials several products, from fresh food products made from raw cassava, tapioca were not to consider the matter of taste singkongnya.Dalam efforts bioethanol supply of raw materials, especially the effort to note is the increase in production and productivity of cassava input the proper cultivation technology. Low productivity is caused by the use of old varieties and production is still sideline.

Increased production of cassava plants can be done in the plantation concession or exploitation on a large scale to meet the needs of raw materials for bioethanol in the direction of development in marginal lands. The main problem in the production of cassava is still low crop productivity.

Increased production of cassava plants can be done in the plantation concession or exploitation on a large scale to meet the needs of raw materials for bioethanol in the direction of development in marginal lands. The main problem in the production of cassava is still low crop productivity.

For data production, harvested area and productivity of cassava commodities in general (all types) detailed in Table below. In 2013 Cassava in Kaltim relative spreading scattered throughout the County / City of East Kalimantan Province, with a total production of 55 552 tonnes and a land area of about 2809 hectares.

Based on the distribution of cassava production sites, Kaltim cassava production is concentrated in three districts / cities, namely Kutai, Kutai Barat and Balikpapan. The level of productivity of cassava in Kalimantan around 19.7 tonnes / ha. This condition indicates that the productivity of cassava Kaltim still below the national productivity (22.4 tons / ha). Therefore, the increase cassava productivity through increased technical penerapaan production through the use of high yielding varieties (such as Singkong Gajah (Cassava Elephant)s that have a comparative advantage) is a potential to increase cassava production in East Kalimantan.

## 2. Production Facilities

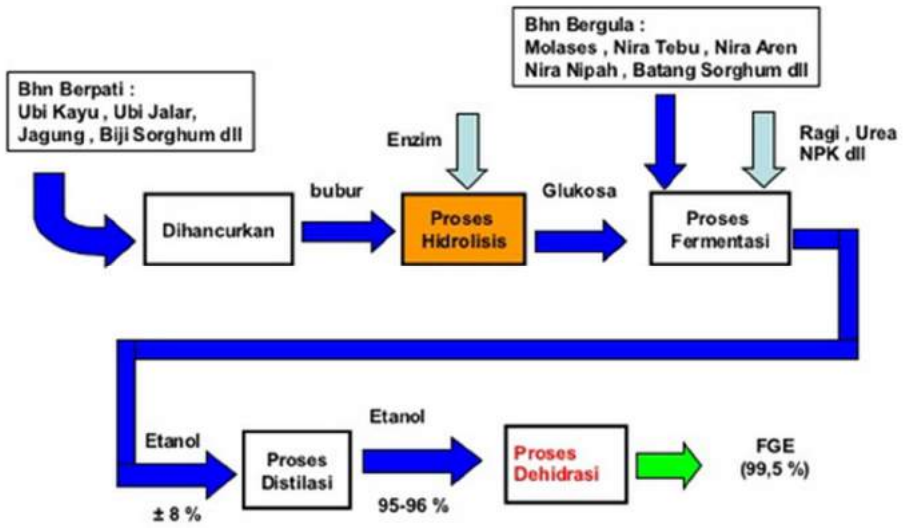
Production is the main activity in this effort. Good production activities should be supported by avalable facilities which makes the production activities can proceed smoothly. Machines or tools used in the production of bio-ethanol industry resulted from the purchase or cooperation with the workshop.

Machines used to produce bioethanol made from cassava are cassava peeling machine, the machine grated cassava, wood pengukusubi engine, heat exchangers, tank fermentation, distillation tank and boiler.

## 3. Production Techniques

Production engineering is the process or the stages of the production of bioethanol. The picture of the bioethanol production flowcharts can be seen below.

**Figure 4.1**
**The Process of Bioethanol Making**




The stages of bioethanol production from Singkong Gajah (Cassava Elephant) is as follows:

1) The Singkong Gajah (Cassava Elephant) peeling machine peeled cassava and cleaned of dirt.
2) Singkong Gajah (Cassava Elephant) that have been peeled and shredded with cassava grater machines elephant. This is done to minimize the size of the elephant cassava.
3) Results of grated Singkong Gajah (Cassava Elephant) cooked up into a slurry and then added the enzyme α-amylase. The cooking process lasts up to suhu1100C so annoying dead bacteria. The addition of α-amylase enzyme aiming to break the chain of cassava starch in the slurry so that the slurry does not clot.
4) Once the temperature reaches 1100C the temperature was lowered to 500C and then added the enzyme β-amylase (glucoamylase) and then allowed to stand for three hours while stirring continuously. This process is called saccharification, which change starch into sugar.

5) After the saccharification process is complete, the temperature is lowered back to 350C and added yeast, urea and NPK. This process lasts for 72jam (three days).
6) The result of the fermentation process is then carried out a process of distillation (separation of ethanol and water).

### 4.1.3. Market and Marketing Aspects

**1. Market Segment**

Bioethanol is environmentally friendly chemicals (green chemicals, biodegradable, environmentally friendly emissions) because it is made from natural materials and non edible.Hasil yangedible combustion of bioethanol produces CO2yang can be utilized by plants so bioethanol fuel is very promising as the future.

In addition to bioethanol used as fuel in a number of activities, among others:

a. Cosmetics industry
b. The pharmaceutical industry and health
c. Households and SMEs (as fuel for the generator)
d. Agriculture
e. Research laboratory
f. Raw materials such as fine chemicals and biodietilasetat bioeter

Given the extensive benefits and the bioethanol market potential to be developed both large and SME industrial scale and home industries.

**Table 4.1. The Market Segmentation of Bioethanol**

| GRADE BIO ETANOL | MANFAAT | PEMAKAI |
|---|---|---|
| Kadar 20 % | Digunakan untuk saos rokok dan campuran minuman juga parfum dan deodorasi | Pabrik rokok, makanan dan minuman, Home industri, pembersih lantai dan parfum |
| Kadar 20% - 60% | Subtitusi minyak tanah 1 liter untuk digunakan 3 jam | Masyarakat dan rumah tangga |
| Kadar 70% - 80% | • Sterilisasi di Rumah Sakit dan Balai Pengobatan<br>• Reparasi Elektro<br>• Bahan baku obat | • Para Medis<br>• Pabrik obat Farmasi dan jamu |
| Kadar 90% ke atas | • Perdagangan umum di toko-toko kimia / PBF<br>• Perdagangan Ekspor | • Masyarakat luas<br>• Luar Negeri |
| Kadar 99% ke atas | Campuran bensin E-10 | Transportasi dan masyarakat umum |

## 2. Product Price

Relating to the price of bioethanol products, Pertamina bought 1 liter of bioethanol Rp 5.000, - home-scale producers were given the opportunity mengoplos alias mix of bioethanol and premium itself to be marketed (legal as reserved). Encouraging bioethanol for fuel excise free. That is evidence that the government is serious about developing bioethanol as a renewable energy source.

The results showed, with a mixture of bioethanol fuel consumption more efficient. E20 car alias given a mixture of 20% ethanol, at a speed of 30 km per hour, fuel consumption 20% more efficient than gasoline-fueled cars. If the speed of 80 km per hour, fuel consumption 50% more efficient. Combustion will be more efficient because of faster burning ethanol instead of pure gasoline. The more a mix of bioethanol, combustion processes increasingly short. That's

because the complete combustion of bioethanol higher octane than gasoline. The octane rating of gasoline just 87-88; Bioethanol 117. When the two materials were mixed, increase the octane rating. Example 3% addition of bioethanol to boost the octane rating of 0.87. Levels of 5% ethanol increases the octane to 94 octane 92, (Sungkono). The higher the octane number, the more resistant to fuel does not burn itself resulting stability of the combustion process to obtain a more stable power. Only 3% bioethanol mix, able to reduce carbon monoxide emissions to only 1.35%. Compare if the vehicle utilizing premium, emissions of cancer-causing carcinogenic compounds alias was 4.51% when the ethanol content increased, the emission was getting down.

Blue sky program launched by the government is more easily realized. Impact, increasingly healthy society. The current mix of bioethanol in premium to conventional cars maksimal10% or E10. Even in Brazil, conventional cars using E20 bioethanol mix alias 20% without modifying the engine.

Although many privileges, bioethanol business is not without obstacles. One obstacle roadblock that business is the limited supply of raw materials. Today most manufacturers rely on molasses as raw material. In fact, the sugar processing waste also needed other industries such as manufacturing soy sauce and flavor. In fact, some of them are exported. Indra Winarno said molasses into black gold lately. Impacts, economic law was talking. So much demand, the purchase price of raw materials was rising so bioethanol producer margins shrink. Several manufacturers of cassava as an alternative glance. First cassava prices under $ 300 per kg. Now more than USD 400, The price increase was a blessing for parapekebun. On the other hand complicate the producers.

### 3. Distribution Channels

Bioethanol is a chemical that has many uses, for example: As an ingredient in cosmetics, as a fuel, as a solvent, as an ingredient of liquor. The use of ethanol reduces emissions of CO gas (environmentally friendly) significantly, Bioethanol can be used directly as a biofuel or blended into premium as an additive with a certain ratio (Gasohol or Gasoline alcohol), when mixed into gasoline, the ethanol could significantly increase the octane number. A mixture of 10%

ethanol into gasoline will raise the octane number of premium to the equivalent pertamax (octane number 91), Production of bioethanol relatively low cost therefore bioethanol can be made by anyone, including SMEs and home industry. Relatively low-tech bioethanol production technology so that ordinary people with limited education can make their own ethanol bio-ethanol sources, such as cassava, sugar cane, fruits and corn is cultivated.

As the substitution of premium fuel, bioethanol demand is very high. According Yuttie Nurianti, national gasoline demand reached 17,5- billion per year, 30% of the total requirement is imported. As mandated by Presidential Decree No.5 / 2006 on national energy policy, the government is targeting to replace the 1.48-billion literbensin with bioethanol due to increasing depletion of oil reserves. That percentage will increase to 10% in 2011-2015, and 15% in 2016-2025. In the first period of 2007-2010 during the 3-year government needed an average of 30.833 million liters of bioethanol per month. Of the total demand was only 137 000 liters of bioethanol every month met or 0.4%. That means the government every month supply shortages 30.696 million liters of bioethanol for fuel.

The market is increasingly extensive and improved when the fuel subsidy is revoked. Apart from the business of fuel, bioethanol market opportunity remains large. That's because many industries that require it. For example, industrial seasoning, powder, paint, pharmaceutical, carbonated beverages, cough medicine, toothpaste and mouthwash, perfumes, and cigarettes require it. Even the ink industry also needs bioethanol. The products useful as solvents, vinegar making materials, and acetaldehyde. Ethanol industry needs an average of 140-million liters per year (Agus Purnomo, head of the Association of Ethanol Spiritus and Indonesia).

### 4.1.4. Aspects of Human Resources, Management and Organization

Bioethanol is an industry-led entity olehseorang director. Director akanmenerima responsibility of three parts, namely the financial, operational part teknikdan section. The financial section in charge of the administration of the company, especially in terms laporankeuangan company. Part techniques duty in

the production of agricultural equipment, especially equipment or machinery production of bioethanol as well as taking care of the intensive cultivation of cassava. Oversees the operational section operasionalproduksi activities fertilizer and bioethanol. Engineering parts and operations led by satuorang.

Operational activities of bioethanol use experts and implementing labor. Implementing labor will be divided into two kelompokkerja, namely shift shift I and II. Shift I started working from 08.00 sampaidengan at 20.00 pm while the second shift starts working from 20.00 to 08.00 pm WIBsampai.

Experts in charge of monitoring the kegiatanoperasional in order to run smoothly. Pelaksanamerupakan labor workforce conducting operations. In addition, labor implementers must perform recording to the treatment produksi.Misalnya take records when adding the enzyme α-amylase.

### 4.1.5. Social and Environmental Aspects

The social aspect is an aspect that supports the course of a proyek. It's concerned with the effects arising from the business. Support from the surrounding environment is needed to create a safe business environment. Every effort is being run is certainly not positive impacts that arise but also negative impacts. The negative impact that would arise from the bioethanol business is sound pollution (noise) generated from pulping machines cassava and cassava grater machines. This noise only occurs in a business environment bioethanol only if the distance between the place of business of bioethanol to population centers far enough.

### 4.1.6. Financial aspect

Analysis of financial feasibility of bioethanol business is done with the aim of projecting the budget will estimate revenue and expenditure in the future every year. It is used as a source of information on the feasibility of the business to be run.

If the business is financially feasible then it could be one of the factors supporting the development of the bioethanol business.

## 1. Investment Cost

The investment costs are costs incurred in the early life of the project as a whole. Investment goods will be consumable if the economic life of such goods have been exhausted. Investment activities may also be carried out again if the economic life of certain items has been depleted. This is known as reinvestment. The total investment cost incurred for the business of cassava bioethanol Elephant is $ 1.7075 billion. Details of the investment costs can be seen in the table below.

**Table 4.2.**
**Bioethanol Singkong Gajah Investmnent Price List**

| No | Items | Unit | Volume | Price Unit (Rp) | Amount (Rp) |
|---|---|---|---|---|---|
| 1 | Building | m2 | 600 | 1.000.000 | 600.000.000 |
| 2 | Cassava Peeling Machine | pieces | 1 | 35.000.000 | 35.000.000 |
| 3 | Cassava Grater Machine | pieces | 1 | 35.000.000 | 35.000.000 |
| 4 | Cassava Cooking machine | pieces | 1 | 200.000.000 | 200.000.000 |
| 5 | Heat exchanger | pieces | 1 | 250.000.000 | 250.000.000 |
| 6 | Fermentation Tank | pieces | 3 | 150.000.000 | 450.000.000 |
| 7 | Destillation Tank | pieces | 1 | 500.000.000 | 500.000.000 |
| 8 | Boiler | buah | 1 | 450.000.000 | 450.000.000 |
| 9 | Electricy Installation | paket | 1 | 10.000.000 | 10.000.000 |
| 10 | Well | buah | 1 | 5.000.000 | 5.000.000 |
| 11 | Boot / Shoes | pasang | 8 | 50.000 | 400.000 |
| 12 | Plastics Can | buah | 20 | 100.000 | 2.000.000 |
| 13 | Knifes | buah | 5 | 25.000 | 125.000 |
| | **Total** | | | | **2.537.525.000** |

*Source : Analysis Result 2015*

Based on the table above. It can be seen that the cost is the biggest investment distillation equipment, which amounted to Rp 500,000,000. The distillation apparatus is obtained by means of assembling itself so that the device is expected to have a better quality when compared with buying. This tool serves to separate the bioethanol produced with other fluids, especially water.

Reinvestment activities started in each year for boots and container plastic (to keep cassava after peeled and cleaning. Cassavan paring machine, cassava grater machines and apparatus fermentation experiencing changes every three years. The knife or cleaver will be reinvested in activities every two year.

## 2. Operating Costs

Operational costs are all costs related to operational activities (production) of cassava elephant bioethanol effort. These costs are divided into two, namely fixed costs and variable costs.

### a. Fixed cost

Fixed costs are costs that has remained in the range of certain activities in the business volume of cassava bioethanol elephant. In this case the classified nature of fixed costs is labor experts, executive manpower, maintenance costs, telephone costs and land and building tax (PBB). The amount of fixed costs incurred for the business elephant cassava bioethanol each year is $ 361 million. Details of the business fixed costs cassava bioethanol elephants can be seen in the following table.

**Table 4.3.**
**Fixed Price Detailed List for Bioethanol singkong gajah**

| No | Items | Fixed Price (Rp/year) |
|---|---|---|
| 1 | Rent (for a place) (1.000 $m^2$) | 10.000.000 |
| 2 | Expertizes | 50.000.000 |
| 3 | Operators | 150.000.000 |
| 4 | Maintanance | 90.000.000 |
| 5 | Telephone | 60.000.000 |
| 6 | Tax | 1.000.000 |
| | **Total** | **361.000.000** |

*Source : Result Analysis 2015*

Based on the table above. it is known that the largest expenditures for biayatetap labor contained in the implementing of Rp. 150,000,000. These costs will be incurred each year. Maintenance costs are costs incurred to finance the engine maintenance activity - production machine so that the expected performance of the production machine can run well. Call charges represent costs incurred to help smooth the production activities. For example, to order raw materials or to follow up orders. The UN is a payment of a fixed fee that is the lowest amount, ie $ 1,000,000 per year.

### b. Variable costs

Variable costs are those costs incurred where a large tersebutsangat cost depends on the number of products produced. In this study the major variable

cost depending on the amount of ethanol that will be produced. Variable costs incurred to cassava bioethanol business is USD 882 064 880 elephants. Details of cassava bioethanol business variable costs gajahdapat seen in the following table.

**Table 4.4.**
**Variable Price List fot Bioethanol singkong gajah**

| No | Uraian | Total Biaya Variabel (Rp/thn) |
|---|---|---|
| **1** | Singkong Gajah | 709.800.000 |
| **2** | Enzim α –amilase | 1.597.050 |
| **3** | Enzim β –amilase | 958.230 |
| **4** | Yeast | 59.150 |
| **5** | Urea | 2.306.850 |
| **6** | NPK | 4.968.600 |
| **7** | Electricity cost | 60.000.000 |
| **8** | Coal | 34.125.000 |
| **9** | Jerigen/Can | 68.250.000 |
| | **Total** | **882.064.880** |

*Source : analysis Result 2015*

**1) Cassava**

Singkong Gajah (Cassava Elephant) is the main raw material for bioethanol production Singkong Gajah (Cassava Elephant). Expenditure to purchase Singkong Gajah (Cassava Elephant) is the biggest cost. Singkong Gajah (Cassava Elephant) needs to produce bioethanol of 2000 liters per day is 13,000 kg or 13 tonnes of cassava Singkong Gajah (Cassava Elephant) elephant (conversion of 6.5 kg of Singkong Gajah (Cassava Elephant)s will produce one liter of bioethanol). Singkong Gajah (Cassava Elephant) when research is Rp 600 per kg so that the costs to be incurred every year for the purchase of cassava is 13,000 kg x Rp 600 / kg x 91 times production = Rp 709.8 million.

**2) The enzyme α-amylase and β-amylase enzyme**

A-amylase enzyme is an enzyme that plays a role when solving the existing starch chains in solution elephant cassava so that the solution does not become lumpy. B-amylase enzyme is an enzyme that plays a role in glucose pembentikan process or saccharification. The existence of these enzymes is

very important because without these enzymes, the elephant cassava bioethanol production process can not take place.

The need for enzymes α-amylase and β-amylase enzyme to produce 2,000 liters of bioethanol per production cycle is 0.39 liters and 0.234 liters. So the costs to be incurred for the purchase of α-amylase enzyme for one year was 0.39 liters x Rp 45,000 / liter x 91 times = USD 1.59705 million. Costs to be incurred for the purchase of β-amylase enzyme for one year is 0.234 liters x Rp 45,000 / liter x 91 times = USD 958 230.

**3) Yeast, Urea and NPK**

Yeast, urea and NPK are ingredients added during the fermentation process. It aims to be the fermentation process can run secaraoptimum. The material needs are respectively 0.26 kg of yeast; 16.9 kg of urea; and 3.64 kg of NPK. The material price is Rp 2,500 / kg for yeast, Rp 1,500 / kg of urea and Rp 15,000 / kg for NPK. Costs incurred for the purchase of the yeast during the year was 0.26 kg x Rp 2.500 / kg x 91 times = USD 59 150. Costs incurred for the purchase of urea during the year was 16.9 kg x Rp 1,500 / kg x 91 times = USD 2.30685 million. Costs incurred for the purchase of NPK during the year was 3.64 kg x Rp 15.000 / kg x 91 times = USD 4.9686 million.

**4) Cost of Electricity, Coal and Jerigen**

Electricity efforts on cassava bioethanol elephants used to run mesinsdan lighting. The cost of electricity is estimated to reach Rp 5,000,000 per bulansehingga in one year to the expenses of electricity is Rp 60,000,000.

Coal in this study is used to power the boiler (heater). In one day, will need as much as 250 kg of coal so that within one year of purchase cost of coal is 250 kg x Rp 1,500 / kg x 91 times = Rp 34.125 million. Jerrycans used is a capacity of 200 liters, so for one-time production requires 10 pieces jerrycans. So, in one year the cost incurred for the purchase of 10 pieces x jerrycan is 91 times the production / year x Rp 75.000 = USD 68.25 million

## 4.2. Waste Wood Pellet Oil Being in the district East Kutai

### 4.2.1. Policy And Legal Aspects

In the Policy and Legal aspects, analyzes the policies of the local government to support the establishment of industrial wood pellets made from waste oil. As one alternative fuel sources of the future Government of East Kalimantan to support the development of waste oil as wood pellets. Policies that support the development outlined in the form of legislation which, among other things:

1. Regulation No. 15 Year 2008 on Regional Long Term Development Plan of East Kalimantan Province Year 2005-2025 (Fulfillment of electric power supply of reliable and efficient, contained in the Target PJPD)
2. Regulation No. 4 Year 2009 on Medium Term Development Plan of East Kalimantan Province Year 2009-2013 (East Kalimantan Make For Leading Energy Center in Indonesia)
3. East Kalimantan Governor Regulation No. 54 Year 2012 on Regional Action Plan for Greenhouse Gas Emission Reduction on Energy, Industry and Transport in 2010-2020 (conversion of fuel / fossil energy to renewable energy and energy conservation)
4. East Kalimantan Governor Instruction No. 03 Year 2012 on Implementation of Energy Saving, Water and Paper on Government Agencies, enterprises, public enterprises, and private
5. East Kalimantan Governor Decree No. 671.12 / K.196.12 / 2010 on the Establishment of the Coordination Team and the Technical Committee of Action and Alternative Energy Utilization (New Energy and Renewable Energy)

The existence of local regulations, especially from the East Kalimantan provincial government, strongly support the Government of East Kutai Regency to develop the production of wood pellets from waste oil. Local regulations is a legal umbrella for East Kutai Regency to make bylaws that support the development of the production of wood pellets.

With reference to the local regulations Provincial Government of East Kalimantan on alternative fuels, Parties Kutai regency over 101 Plantation Office

has issued the company business license (IUP) for the palm oil sector with a total area of 700 thousand hectares. From 101 IUP issued over 700 thousand hectares of land pants, as many as 87 companies are active IUP holder with an area of 287 thousand hectares planted with oil palm, while the other companies there has been no activity.

Not easy to realize the target of 500 thousand haktare, because to build 287 hectares of plantation land in East Kutai took 12 years ie from 2000 to 2012 today. East Kutai target is 500 thousand hectares of oil palm plantations of total sat million haktare palm plantation launched by the Provincial Government of East Kalimantan, and can only be realized within five years.

Is expected to realize 500 thousand hectares of oil palm plantations, it takes at least 5 years again.Many company / investor who has a business license that has not been able to realize the current plantations as constrained boundaries of the village.

It is the duty of the government to resolve these obstacles so that investors are able to work and people can also increase their income and improve their welfare.

Of the 101 permits that have been issued with a land area of about 700 thousand hectares not all be planted with oil palm, because most is an area with a rock, as well as residential areas and so forth. With an area of 359 ha in 2013 and then will be expanded with an additional 700 ha, of course, will increase the potential production of fresh fruit bunches. This will increase the amount of wood pellets.

### 4.2.2. Technical Aspects

In analyzing the technical aspects of the sides related to technical matters. The sides, among other production processes, locations, buildings and industrial facilities.

**A. Production Process**

To be able to produce wood pellets required stages as follows.

1. Preparation of Material The default

   Wood pellet production process begins with the selection of raw materials by using wood waste, especially waste oil palm empty fruit bunches. This raw

material has a lignin content is high as gluten natural wood one waste empty fruit bunches of oil palm can produce quick energy and quality and does not contain a lot of sugars and gum because it will affect the molding machine wood pellet which resulted in sticky on the printing process and the process of incomplete combustion.

2. Cutting / Minced

Raw materials from waste oil palm empty fruit bunches then cut and chopped inserted into a tool called cipper which will result in the form of splinters of wood. Chipper is used for the initial phase for the destruction of the rough with a chip size of about 1-3 cm.

3. Drying Machine / Rotary Dryer

The crushed wood chips are then put into a dryer or a rotary dryer. Drying machine aims to compact biomass densification tau efficient and highly dependent on the particle size of the raw material, as well as the water content in the raw material. Dryer or dryer is used to adjust the water content to the desired level. If cipper the water level ranged from 20% to 25% wood chips can directly go to the grinding machines or Grinding expected water levels could reach 7% to 10% to produce wood pellets.

4. The mill machinery / Grinding

Grinding is the process of reducing the particle size of the material becomes rough shape finer sizes to enhance the mixing process proceeds mixing evenly and avoid segregation of particles of material. The goal namely increasing the pelleting efficiency and pellet quality due to the percentage of starch can be reduced and reduce reworking of the pelleting process due to the many who return to the flour pellet system. Cipper milled and floured wooden back to check the moisture content in accordance the procedure 10% to 12%. Cipper that has become powder were then transferred to the place of storage container for conditioning can be printed directly sawdust into wood pellets and melt the lignin content as a natural substance wood adhesives.

5. Cooling / Cooling

Furthermore, wood pellets, which have been printed are removed and cooled as the temperature is still hot so that the finished wood pellets do not disintegrate, fragile or broken.

6. Filtered / Sieving

Aiming for the separation process is mechanically based on differences in particle size of dust and powders to be sucked by the engine blower steam, hot steam will be discharged from the engine blower steam while dust and pollen from the process of cooling and sieving will be fed back into the large tube specifically to fit temperature and pressure are then processed into wood pellets back.

7. Wood Pellet

Wood pellets have become then packed and carried out quality control to maintain the quality of the resulting pellet.

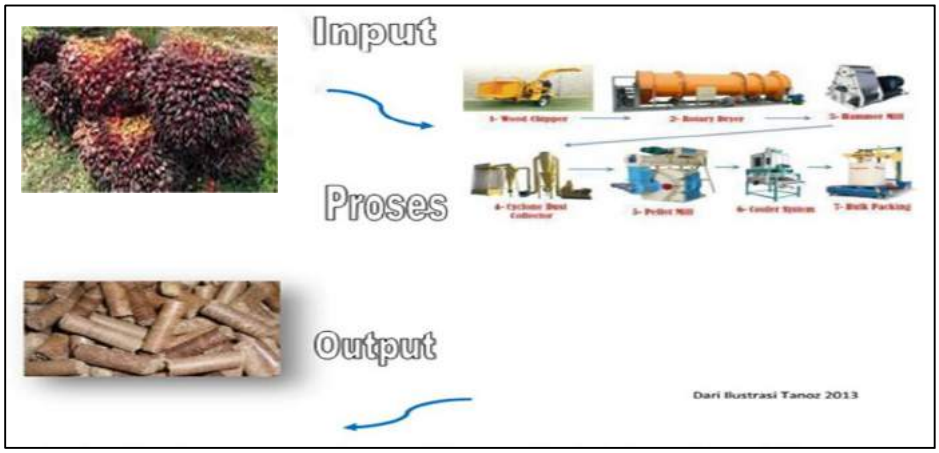
To build wood pellet processing plant-based waste oil required three components, namely input, process and output. Component inputs are raw materials in the form of solid waste consisting of oil palm shells. For the palm shells in East Kutai in 2013 based on the data of the Department of Plantation East Kutai of 3,402,408 tons. This is an input to the production process. For process components consist of equipment and machinery production. For machinery can be obtained from the provider of wood pellet machine with different brands and production capacity and the price per unit. For the component output is the result of the processing of waste oil into wood pellets. Based on a rough calculation of the figure / 1000 x 190 kg, so the result 646 380 tonnes of waste oil. For many years into the future the amount of waste oil will rise in line with the policy of the East Kutai Regency seeks to expand oil palm plantations.

Wood or biomass pellet mill has a vital role in the production of wood or biomass pellets. Target production with standard and stable quality can only be achieved if the wood or biomass pellet mill working optimally. The use of high quality machines is one means that the production process is running optimally. Some criteria to assist in the selection of machines to mill wood or other biomass pelletantara:

1) It has been proven and tested, in quality and quantity.

2) Ease of operation and maintenance.
3) Ease of start up until steady production.
4) Durable and stubborn, so it is rare problem and effective for a time to the means of production in the long term.
5) Meet the rule of 3 "x 3" ie, the machines have been used in three different places with the operating time of more than 3 years.
6) reliable after-sales services such as the ease of obtaining spare parts and auxiliary materials other processes as well as a quick solution if at any time there are problems in plant operations. Even had there was also a factory of wood or biomass pellets that is connected to the Internet and can report a variety of problems that occur in the plant very quickly so they can take action quickly as well.
7) Safety Aspects of good and the impact of environmental pollution to a minimum. Indeed, getting a provider factory machines wood or biomass pellets that meet the above requirements is not easy especially in Indonesia in particular, wood or biomass pellet industry is nothing new. Prospective producers of wood or biomass pellets to be quite keen attention to this, especially just lured cheap price, without further thought to the long-term orientation.
8) Given that the calorie content of wood pellets is high enough waste oil ranged between 7200 up to 7600 calories / kg higher compared to coal which ranges from 6500 up to 6800 cal / kg. waste ash instead of B3 waste.

**Figure 4.2**
**The Production Process of Wood Pellet from Palm Oil Waste**



## B. Construction Site Industrial Waste Oil Being Wood Pellet

Feasibility aspect plant construction site shows the appropriateness of the location of the plant so that efficient and effective manner. Useful aspect is expected that the establishment of the factory can produce optimal results, while effective it is expected that the establishment of the factory location terseut and minimize expenses.

Some of the factors that affect the feasibility of the location of the establishment of industrial wood pellets:

1. Means and transport infrastructure

   Roads for both land and river, according to the characteristics of the island of Borneo great river, the road is good. With good road conditions would facilitate the transport of raw materials, the results of wood pellets, as well as other support such as fuel etc.

   The transport services to support the activities of business activities such as road and land transportation services is to use the main access to reach the East Kutai Regency of trans Kaltim through a gate Balikpapan in East Kalimantan, Samarinda, Bontang towards Sangatta. The length of roads in the East Kutai Regency in 2012 reached 1105.76 km to the type of road surface asphalt 186 km, 727 km of gravel and soil 180.76 km in good condition along 315.00 km, 383.00 km throughout the state were lightly damaged condition 217.00 km and 167.76 km were severely damaged. Ground transportation can be taken 4 hours of Samarinda, Balikpapan 8 hours on, 2 hours from Bontang.

   Seaports as marine transportation infrastructure is currently only to serve the KPC, while the port of Maloy prepared to accommodate the activities of agro-Maloy region and the surrounding area (hinterland). While port activities that serve the public, ie river ports that are in the river Sangatta in Sangatta City and Port Kenyamukan located in District North Sangatta.

2. Means of electricity

   The existence of the means of power is needed to limah oil production process. In the East Kutai contained electric company that can supply electricity to be used for the propulsion machinery production.

The number of users of electricity each year has increased, for the year 2012 the number of customers and electricity produced by the state electricity company MISIP for Sangatta region as much as 13 378 units with a total installed power 74791.140 Volt Ampere.

3. Clean water

The need for water is indispensable for the processing of waste oil into wood pellets. For the water supplay can be obtained from local taps. Besides the water source can be obtained from the groundwater around the plant. To groundwater is used to facilitate the production process, while the fresh water used for consumption.

Increased production capacity resulting from the previous year of 5,458,248.80 $m^3$ be 5,938,384 $m^3$ while the amount of water delivered also increased from 5,048,011.4 $m^3$ in 2011 to 5,725,044 $m^3$ in 2012, while the production capacity in 2011 amounted to 295 liters / sec and in 2012 to 325 liters / sec. That is because the increase in the number of drinking water from 9580 subscribers in 2011 to 11 661 customers in 2012. While the rate of leakage has increased from 33.71 percent to 34.15 percent.

4. Means telecommunications

To means of communication with outsiders for mobile operators is critical. The means of communication is used to communicate with external parties such as the provider of raw material suppliers, buyers etc.

Mobile operators, internet providers and other information and communication services in the form of electronic media and print media is available at the East Kutai district with good skills and communicative as supporting factors are important and strategic activities, investment activities. There are 18 Cellular operator company, Provider of Internet and other information and communication services that exist today in East Kutai.

5. Banking and Insurance

To endorse the smoothness of the company's financial transactions with outsiders, the banking facilities is needed. Memperlacar banking facilities used for financial transactions. In the East Kutai there are 7 banks, both commercial banks and rural banks.

Here is a list of banks that open branches in Sangatta, namely:

a. BRI Branch Sangatta

b. BPD Kaltim Branch Sangatta

c. BNI 46 Branch Sangatta

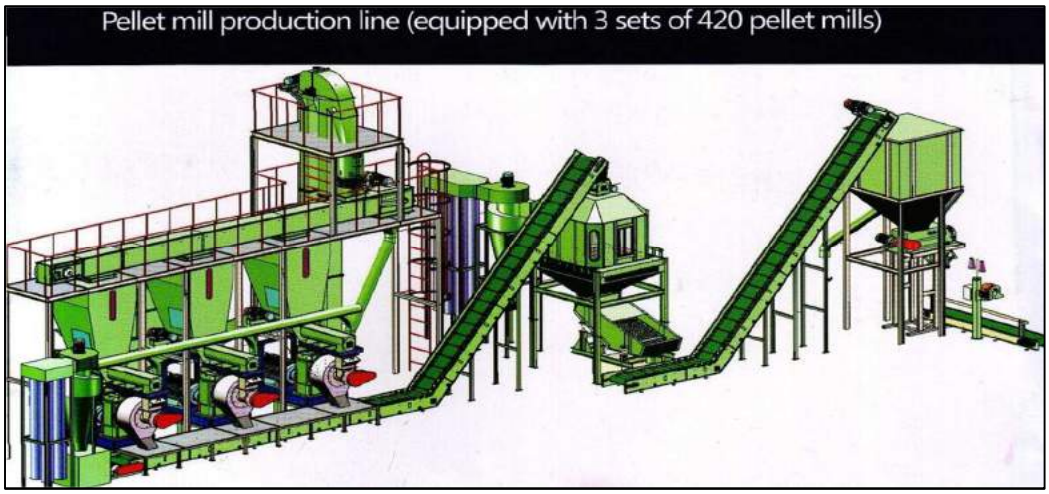
d. Bank Mandiri Branch Sangatta

e. Bank Danamon Sangatta Office, since January 12, 2007

f. BPR Artha Dana Branch Sangatta

g. Mini Bank Branch Sangatta

**Figure 4.3**
**Wood Pellet Machine**




Potential locations for the construction of wood pellet industry will be more efficient and effective when approached palm oil mills. With wood pellets with a nearby processing plant CPO, would minimize the cost of transporting waste oil to wood pellet mill site. The raw material will be immediately processed into wood pellets. This of course will save the cost of transporting materials kosongsawit bunches. Ituakan in addition to saving the time required for material mengrim empty oil palm fruit bunches.

## C. Building Facilities and Infrastructure in Location

Building facilities and infrastructure representatifakan determine the target production of wood pellets.

Building standards that have been established will ensure smooth production processes and also the safety factor of the production process and the

security of human resources beneath. The building must be robust, easy maintenance and easy to get replacement material in case of damage / worn / brittle.

Critical infrastructure is available means of transport both land and water, for the transport of production of wood pellets to the outside. Given in East Kalimantan to transport water into one of the main tarnsportasi given that there are several large and long rivers. In addition, the existence of a port in East Kalimantan extremely helpful to distribute the wood pellets both inter-island and overseas.

### 4.2.3. Aspects of Market and Marketing

**A. Waste Oil Price WOOD PELLET**

Currently, the price of wood pellets are cheaper than the price of LPG. The price of wood pellets range from Rp 2,000 / kg while the price of LPG range Rp.6.300, - / kg. This is certainly advantageous and saves users wood pellets.

**B. Promotion / Communications WOOD PELLET Waste Oil**

For sale will be easier because of the cheaper prices, more secure, practical, high-power fuel and the ashes were little. The most important is safer because it does not cause an explosion that endanger people and the environment.

Promotion can be done through the mass media and visual media. For television media more effectively than other media, because it can reach a wide area to look more lively and interesting. For other media can be done by holding the exhibition accompanied by a demo on certain events. Can also be done with the campaign through certain groups such as recitals, Posyandu, etc.

**C. Distribution Channels WOOD PELLET Waste Oil**

Distribution channels are very important so that a product can be passed from one hand to another. For wood pellets smooth distribution channels depending on the infrastructure and means of transportation. For the distribution of wood pellets can be made through distributors or sales agents. From the distributor or sales agent can be distributed again to the store, shop or kiosk. For subsequent sale to consumers.

For easier distribution of wood pellets compared to LPG, since siapapaun can sell wood pellets. Can be sold through shops, kiosks and stalls, and does not require substantial capital investment.

**D. Market Segment WOOD PELLET Waste Oil**

Segment of the market for wood pellet industry is an industry and households. The price of wood pellets are cheaper than the price of LPG. As a price comparison of 3 kg LPG is currently less than USD 20,000, - so the per-kg +/- Rp 6,300, - while the price of wood pellets of +/- Rp 2.000, -. Surely a cheaper price, especially for household consumption and the industry generally.

Realising wood pellets as a source of household energy may be easier in the process of adoption and adaptation. As is known, the people of Indonesia have long been familiar with the use of firewood for cooking. Many of the traditional public opinion that cooking with firewood in addition to saving and available in the environment, it also gives a distinctive flavor in cooking. Despite the negative effects such as smoke billowed, but this will not be found in the ash of wood pellets as a low level if converted with the right technology.

According to the Center for Forestry Research (2007), private consumption of firewood and carpentry ranged from 0.36 to 4.89 m3 / capita / year. The pattern of demand for firewood by households affected by the price of firewood, income, occupation of household head and family size. Besides the increase in fuel prices also contributed to the increasing demand for firewood.

Wood pellets are one of the alternative energy potential, especially in the industrial sector of both medium and large, because of industrial fuel subsidy level is generally already eliminated. In comparison with the LPG gas calorific value of approximately 11,000 kcal / kg, while wood pellets or pellet fuel has a calorific value of 4,000 kcal / kg, meaning that one kg of LPG equivalent to three kilograms of wood pellets. Non-subsidized LPG gas packing 12 kg currently costs around Rp 12,000, - / kg, while the wood pellet price / kg is around one-sixth or Rp 2,000 / kg. It is thus menghematsekitar 80% when the switch fuels to these types of fuel. It is certainly a very interesting addition to wood pellet fuel also renewable fuels and environmentally friendly. When compared to coal with a high ash content, the

shape is not uniform, high water levels and higher sulfur content, causing serious handling pollution problems, then obviously clearly superior wood pellets. Unlike the case with a number of countries, in particular Indonesia is also no policy to use wood pellets.

If the industry had previously been using a fuel such as firewood or coal, the conversion to wood pellets easier than when previously using fuel gas (LPG) or oil. Wood pellet as fuel requires the furnace or the combustion unit (combustor) specifically so that the combustion process can be optimized with high efficiency or the loss of heat to the environment is very small. The combustion unit also will determine how effective the use of wood pellets for the substitution of fossil fuels such as fuel oil (BBM) and fuel gas (LPG). There are several units burning wood pellets commonly used by the industry, particularly medium-large industrial scale namely, the type stoker grate combustor and combustor.

## E. WOOD PELLET Marketing Strategy Waste Oil

For analysis of the feasibility of marketing strategies will be used analysis of marketing is marketing elements:

1. Price / price

   For the price of wood pellets Rp 2.000, - kg while the price of LPG 3 kg of Rp 6.300, -. With the cheaper price of wood pellets have better prospects. For that also the safety factor is more secure when compared with the use of gas stoves are more vulnerable to blast.

2. Products

   For wood pellets is a simple product in storage when compared to LPG. Wood pellets can be stored without using special containers, the origin kept from moisture.

   Biomass pellet fuel is generally a superior when compared to the raw material (eg sawdust). Pellets are denser and has a great energy, easy to handle, does not need a large storage space, have properties that are environmentally friendly, so that makes it very attractive for use. Wood pellets with wood biomass feedstock has a number of advantages over agroindustrial waste biomass.

Woody biomass has 3 basic components and the amount of material that is very little. The three main components are natural organic polymer structure, namely: cellulose, and lignin hemiselulose. The most important component for pemelletan process is lignin, because lignin as a natural glue that makes the particles into pellets woody stronger. Wood raw materials can be divided into two major groups, namely: softwood and hardwood. Another distinguishing factor between calorific value, ash content and lignin content. The best results for the production of pellets derived from the raw material log.

3. Place

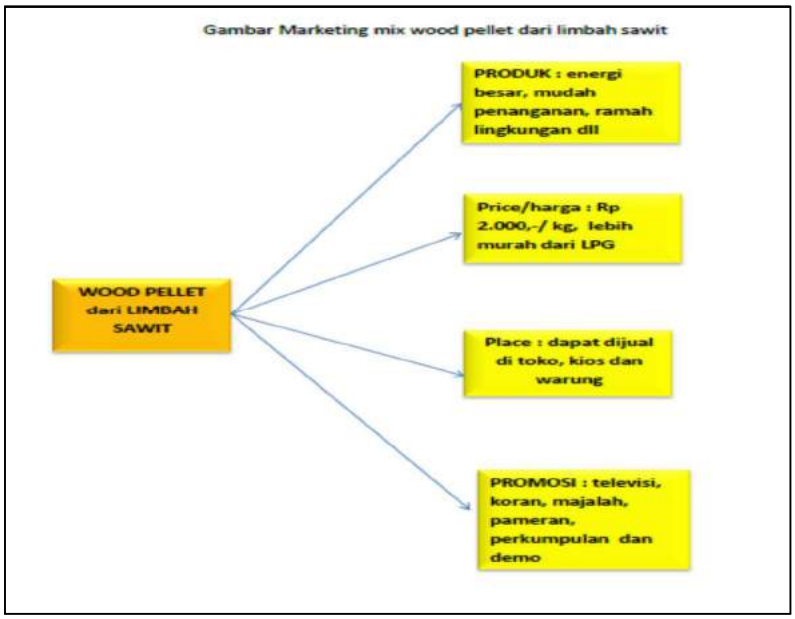
For placement, wood pellets can be distributed through shops and kiosks or stalls because it is simple and non-flammable.

Pellets are denser and has a great energy, easy to handle, does not need a large storage space, have properties that are environmentally friendly, so that makes it very attractive for use. Wood pellets with wood biomass feedstock has a number of advantages over agroindustrial waste biomass.

4. Promotion

Promotion for wood pellets can be made through the mass media (newspapers and magazines) and electronic media (radio and television). Can also be done by selling directly to consumers or through exhibition or demonstration.

**Figure 4.4**
**Marketing Mix Wood Pellet from Palm Oil Waste**



### 4.2.4. Aspects of Human Resources, Management and Organization

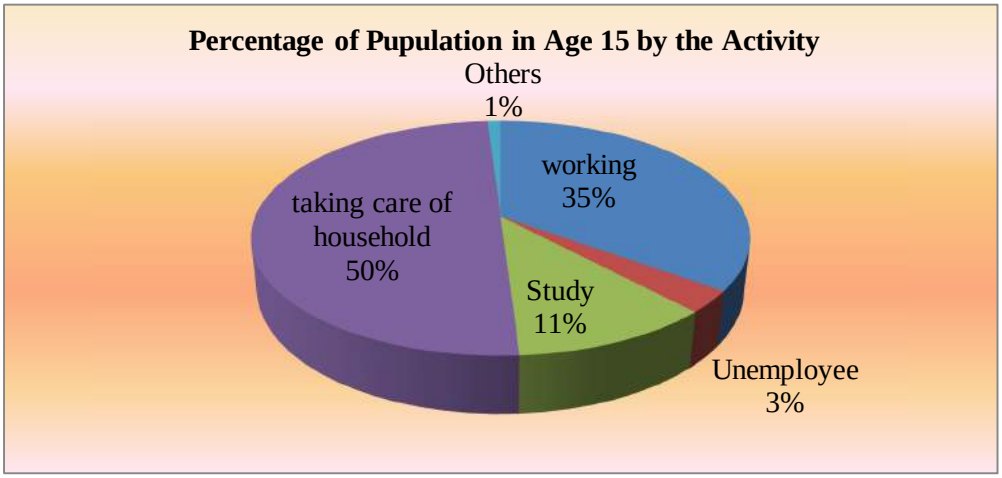
### A. Human Resources (quality and quantity of human resources, capacity and qualifications, etc.)

For wood pellet plant needed human resources with certain specifications. Experts with the necessary background knowledge will facilitate the achievement of the target company. To the board of directors and commissioners of the experience factor will determine the direction and goals TSB industry.

For HR needs woopellet industrial waste oil can be made through the local workforce (East Kutai Regency) or outside (East Kalimantan province on Borneo island or region).

During the period 2011-2012, the labor force in East Kutai decreased by 3,351 people from 128 874 125 523 orang.TPAK be Kab. East Kutai in 2012 amounted to 65.64 percent, decreased by 4.81 percent compared with the condition in 2011.

**Figure 4.5**
**Population Percentage Chart by Activities**




*Source : East Kutai district in figures, 2013*

From the table above it is known that the level of pengangguran in 2012 at 3% of the total population of East Kutai.

The number of schools by type of education in East Kutai District in 2012 as follows:

**Table 4.5.**
**Education Level at East Kutai District**

| No | Jenis Jenjang Pendidikan | Jumlah |
|---|---|---|
| 1 | kindergarden | 129 |
| 2 | Extraordinary School | 1 |
| 3 | Elementary School | 173 |
| 4 | Junior High School | 74 |
| 5 | Senior High School | 22 |
| 6 | Vocational School | 20 |
| 7 | University/High School | 3 |

*Source : East Kutai district in figures, 2013*

From the table above it is known that the number of schools to 20 schools vocational category, employment of vocational level needed for staff and operators of industrial sectors. While the number of universities there are three universities tinggi.Tenaga of college degree required for the position of manager and above.

It is known that job seekers SLA levels up to the area of East Kutai in 2013 amounted to 4,355 persons. This is an opportunity for industrial wood pellets to obtain employment.

It is known that the East Kutai Regency unemployment rate decreased from 2011 to 2013. It is expected that with the development of wood pellet industry can make a significant contribution to the reduction of unemployment in East Kutai.

Assuming that HR needs in the industry for the processing of wood pellets requires a workforce with the specifications of graduates of vocational schools and colleges, the human resource needs can be met from the labor of the East Kutai district.

Opportunities to recruit from East Kutai still open. Total number of job seekers to the area of East Kutai by 4834. Meanwhile, the number of unemployed amounted to 6.09%. By recruiting labor from East Kutai will help tackle unemployment.

To the ranks of managers and experts, especially from the technical background is needed. Because for the purposes of industrial development is closely related to technical matters. For remunisasi for human resources problems adapted to the applicable rules.

### B. Management and Organization

For the analysis and development management plan, that company should have a plan of short-term, medium-length danjangka. For the development of the company made adjustments to the production of palm oil, because the industry is dependent on the quantity of palm oil yields.

To structure the company can be divided into:

1. The Board of the board: the board of directors and commissioners, who will supervise the managers
2. Production Manager, Marketing Manager, Mamanejen Human Resources and General Manager Finance and Akuntasni and Purchasing Manager will supervise the staff and oprator
3. Staff consists of Staff and Production Operator.

For a job description can be described as follows:

1. To the ranks of the board, which is composed of directors and administrators in charge of running the company and commissioners oversee the directors of the controlling company.
2. For mananjer ranks assigned to coordinate and supervise the staff and operators in performing their duties.
3. To the staff and produkasi operators in charge of running the job specified by the company.

### 4.2.5.Environmental Social Aspect

This analysis was to see how far the establishment of this industry towards social change as a result of the establishment of the processing industry of wood pellets made from waste oil. It is hoped with the establishment of this industry will not adversely affect the social environment around industrial TSB.

The impact caused by the industrial establishment TSB is the emergence of social envy, and is the most important. This happens when the majority of human resources recruitment is outside the industritersebut. To anticipate that management must pay attention to the workforce from the surrounding environment.

Another effect is a bad habit that brought labor from outside the area industritersebut, which can cause disease community. Community disease that arises is the habit of drinking, gambling etc.

To anticipate this, the company must cooperate with relevant parties such as local communities and local agencies and security apparatus.

Analysis to see the effect of the establishment of the industry on the environment around the industry. The impact that can be caused is environmental pollution. Pollution include: Air pollution from smoke machines, soil and water pollution due to discharge residual processing, tersedotnya groundwater by the industry that result in reduced availability of water for the people around.

To minimize such problems the company must make to provide smoke filter, providing WWTP Waste Water Treatment Plant, providing clean water for the surrounding population when the dry season.

### 4.2.6. Financial Aspect

Financial Feasibility analysis is needed to see if the investment plan a development of commodity processing quite well financially. The measures being taken is the value of BCR (Benefit Cost Ratio), FIRR (Financial Internal Rate of Return), NPV (Net Present Value) and Payback Period.BCR is the number of appeals between the benefits (benefits) and expenses (cost), of course, figures appeal better is if the value is more than 1 (one) is the state which illustrates that the benefits provided are greater than the costs of issuance.

While the FIRR is a value of interest (rate) that makes the net present value of benefits and costs to be the same or also the difference becomes zero. If the value of FIRR is higher than the rate means an investment opportunity can be considered quite favorable compared with the storage of the money that generates interest.

NPV (net present value) taking into account the time value of the money. For the discount rate is set and is used to assess all costs and revenues in the future into the present value. By adding up all the costs and revenues have been adjusted in value, then the NPV. If the NPV is positive or more than zero, the

project is financially viable, otherwise if the NPV is negative or less than zero, the project is not feasible.

The Payback Period is the period of the years required for the return of an investment.

For the sake of financial analysis, the factors that constitute revenue receipts for the building is very important to be taken into account.

In the calculation of income in this case derived from the sale of commodity wood pellets. Prices were imposed following the prevailing market conditions.

It is assumed that the rate increase occurs every year with consideration adjustments to inflation and improving the quality of the commodity.

As for the cost factor, there are three components of the costs to be taken into account in the analysis, the investment cost of land acquisition, construction of the port and its facilities as well, the cost of maintenance. Maintenance costs are accounted for 3% of the construction costs. Maintenance costs will increase for inflation at 7% per year. Operating expenses include personnel costs, material costs and general administrative expenses (including taxes and insurance) are assumed to be paid by the local government.

## 4.3 Head In Being Biofuel in Paser

### 4.3.1. Policy Aspects

Biofuel or biofuel (BNN) is one source of renewable energy that has great potential to be developed in Indonesia. One type of biofuel that can be developed in Indonesia, namely biodiesel. Biodiesel is an alternative fuel derived from triglycerides. Triglycerides are the main constituent of vegetable oils and animal fats, so it can be said that biodiesel can be made from vegetable oil sources. This vegetable oil sources can include palm oil, coconut oil, jatropha seed oil, etc.

Regulation of bio-fuels (bio fuel) is set in the Minister of Energy and Mineral Resources No: 32 of 2008, concerning Supply, Utilization and trade system Biofuel (BioFuel) As Fuel another, dated 26 September 2008. In these regulations include otherwise THAT entities that carry out business activities Commercial Biofuel (BioFuel) as an alternative fuel is required to have business licenses

Biofuel (BioFuel) as an alternative fuel of Ministers (Chapter IV Article 13 Peremen EMR No. 32 of 2008).

To get a business license is required Data Administrative and Technical Data. Administrative data required are:

1. The deed of establishment of business enterprises with the scope of the energy sector and the changes that have been approved by the competent authority.
2. Biodata Enterprises (Company Profile)
3. Taxpayer Identification Number (TIN)
4. Letter of Company Registration (TDP)
5. Domicile Enterprises.
6. Letter written on the stamp on the ability comply with applicable laws and regulations.
7. A statement written on the stamp on the willingness of site inspections carried out by the Directorate General.

Technical Data needed:

1. Source of acquisition of raw materials / ingredients Biofuels (biofuels) as other fuels are cultivated.
2. Data standards and quality (specifications) Biofuel (BioFuel) as an alternative fuel that will diniagakan.
3. The name and trademark materials Biofuels (BioFuel) as Fuel another for retail.
4. Information feasibility.
5. Letters written statement on stamp duty regarding the provision of alternative fuel capability (BioFuel)
6. A statement written above stamp on the ability to meet safety and occupational health and environmental management.

Giving authority Biofuel Permit (BioFuel) based on capacity provision (Volume Production Tons Annually):

1. Production capacity is over 10,000 tons / year by the Minister.

2. Production Capacity between from 5000 to 10,000 tons / year by the Governor.
3. Production capacity is under 5,000 tons / year by Regent / Mayor.

In addition to aspects of business licenses, to members and increased stimulation of development of biofuels the government of Indonesia government issued a policy through the Minister of Energy and Mineral Resources Regulation No.25 of 2013 as a refinement of Number 32 Year 2008 concerning Supply, Utilization and trade system Fuel Commerce as other fuels. This regulation establishes the obligation of the use of biofuels, including biodiesel gradually until 2025 in the fields of transport, industry and power plants. In the policy stated in the 2016-2020 phasing minimum obligation utilization of biodiesel (B100) as a mixture of fuels for the transport sector, industrial and commercial, namely respectively 20%, while for electricity that is 30%.

In industry, one of the implementation of the national industrial policy to support the acceleration of the increase and expansion of the use of biofuels such as by release of PP No.14 of 2015 on National Industrial Development Master Plan. In the PP stated biodiesel and bioethanol industry is one of the priority industridalam national industrial development.

Based on the policy of renewable energy development, the development of biofuels (Biofuel) in particular biodiesel is a good strategic step in supporting the development of renewable energy and the development of plant-based processing industry (including agricultural commodities in the broad sense).

In East Kalimantan, the development of biofuels (Biofuel) commodity-based Oil, other than in line with the policy of renewable energy development is also a business unit of processing of biofuels is expected to encourage the achievement of development goals term medium in improving the growth of a green economy, especially the increasing contribution of the sector agriculture in the broad sense and utilization of renewable energy. In terms of the development and expansion of the industrial estate, the investment development of biofuels is expected to accelerate the development of strategic areas of East Kalimantan province,

especially in encouraging the acceleration of the industrial area of agriculture (Regulation No. 07 Year 2014 and Pergub 30 2015).

### 4.3.2. Technical Aspects of Production

#### A. Potential Production as Raw Materials

In accordance with the technical production of biofuel processing industry commodity-based oil, the main production facilities are needed in the production of biofuels based on coconut is the main raw material, namely coconut or copra. According to statistics of the East Kalimantan provincial agricultural commodities (Table 2.4-1), production of coconut (copra) in 2014 reached 11 424 tons. Total oil production in 2014 decreased compared to the production in the last four years has decreased.

The decline in production due to declining productivity. Therefore, in an effort to increase oil production in East Kalimantan in addition to the development of the land area, increasing productivity through the application of technical culture production technology is one step stratgis in increasing oil production and availability of biofuel feedstock. This condition is seen, in addition to the relative extent still immature (2,348 ha) is also of the potential for increased productivity, which in 2012 pproduktivitas oil is able to reach 667 kg / ha and the average productivity of coconut National is 700-1050 kg / ha.

**Table 4.6. The Condition of Production, Productivity and Land Area, Coconut Commodities**

| No | District / Town | Land Area ( Ha ) | | | Amount | Production*) | Productivity |
|---|---|---|---|---|---|---|---|
| | | TBM | TM | TT/TR | ( Ha ) | (Ton) | ( Kg/Ha ) |
| 1 | Kutai Kartanegara | 452 | 8,122 | 2,770 | 11,344 | 5,565 | 685 |
| 2 | Kutai Timur | 192 | 919 | 77 | 1,188 | 495 | 539 |
| 3 | Kutai Barat | 142 | 465 | 431 | 1,038 | 101 | 217 |
| 4 | Mahakam Hulu | 14 | 86 | 120 | 220 | 36 | 419 |
| 5 | Penajam P.U | 739 | 4,230 | - | 4,969 | 2,571 | 608 |
| 6 | Paser | 96 | 2,588 | 228 | 2,912 | 1,405 | 543 |
| 7 | Berau | 420 | 2,672 | 85 | 3,177 | 826 | 309 |
| 8 | Samarinda | 141 | 600 | 13 | 754 | 230 | 383 |
| 9 | Balikpapan | 148 | 553 | 343 | 1,044 | 184 | 333 |
| 10 | Bontang | 4 | 24 | - | 28 | 11 | 458 |
| | **JUMLAH 2014** | **2,348** | **20,259** | **4,067** | **26,674** | **11,424** | **564** |
| | **2013** | 2,788 | 20,282 | 4,202 | 27,272 | 13,266 | 654 |

| No | District / Town | Land Area ( Ha ) | | | Amount | Production*) | Productivity |
|---|---|---|---|---|---|---|---|
| | | TBM | TM | TT/TR | ( Ha ) | (Ton) | ( Kg/Ha ) |
| | **2012** | 2,416 | 21,477 | 4,148 | 28,041 | 14,335 | 667 |
| | **2011** | 2,306 | 21,620 | 3,080 | 27,006 | 14,110 | 653 |
| | **2010** | 2,310 | 21,804 | 3,007 | 27,121 | 12,720 | 583 |

*Note : *) Kopra/copra*
*Source : estate agencies east Kalimantan (2015)*

Based on data from the table above, indicates that coconut / copra production as a source of raw materials seen from spreading concentrated in three districts namely Kutai, Paser and Penajam PU. In general, the allocation of oil production is to memuhi food consumption needs and the needs of industrial raw materials such as industrial processing of coconut oil or copra oil.

When food consumption in an effort to meet the nutritional needs and expectations of calories as food (national consumption of oil per capita pert year ie 6.1 point), then the oil needs to meet people's consumption is about 20.4434 million grains Kaltim (East Kalimantan total population is 3.3514 million life time item 6.1). If the coconut production in East Kalimantan in the form of copra maximum of 14 355 tonnes (production in 2012) is equivalent to 71 775 thousand fruit or coconuts per year (conversion of coconuts into copra 0.225%), meaning that approximately 28% of total coconut production Kaltim allocated to meet the needs of food consumption and 72% are potential raw materials for the processing industry needs.

In proportion to the allocation of the use of coconut production, assumed potential oil production as the raw material processing industry is allocated for Biofuel industry, the potential availability of raw materials for the production of biofuel per year in Kaltim around 51.33146 million pieces of coconut or copra equivalent to 10,266,292 kilograms, or about 6,100 - 6,400 tons of copra oil (1 kg of copra oil produces 0.6 kg of coconut / copra). If it is assumed conversion factor of vegetable oils (coconut oil) into biodiesel, a maximum of 0.96%, the production capacity of biodiesel made from palm per year in Kaltim about 6,000 tons / year.

## B. Production Process Technology

### 1. Process Description

The design of the biodiesel plant of coconut oil (coconut oil) is divided into two processes, namely making process (exploration) coconut oil (coconout oil), and the process of making ethyl ester as biodiesel. For palm oil making process conducted thermal mechanical extraction process, whereas to produce ethyl ester as biodiesel is done by transesterification.

### a. Coconut Oil Production Process

The process of making the kind of palm fruit oil that is chosen is the coconut palm-aged and elderly aged 11-12 months. Initial stage is in the process of destruction of coconut meat and coconut milk srewpress resulting residue. Screw Press at this refined palm pressed with a pressure of 200 Mpa so that the coconut milk in a depressed out and collected in the tank, the pulp out through the other side and collected on the tank, coconut milk from ending up in the dregs of ± 5% of total coconut milk. Coconut milk produced is itself a kind of oil in water emulsion (M / A), where that act as the dispersion medium is water and the dispersed phase is oil. Oil globules in milk are surrounded by thin layers of protein and fosfolida. Protein coating envelops the droplets of oil dispersed in water. To be able to produce oil then a layer of protein that needs to be broken so that the drops of oil will merge into oil. Producing coconut oil through the coconut is coconut milk emulsion system solution through protein denaturation. This can be done by chemical, mechanical, thermal, biological / enzymatic. Techniques used in this process is making coconut oil is commonly referred to as thermal heating techniques. Raw material input into srew press to be taken santannya (coconut milk).

Coconut milk is heated in a stirred tank continuously (rendering) for 3 hours. Furthermore, the water will evaporate until exhausted. This mechanism aims at solving the coconut milk through destruction (denaturation of proteins) so that the only remaining coconut oil and dregs (blondo). The next process is blondo is separated from the oil, blondo squeezed in a press filter to remove residual oil.

In the Filter Press is a mixture of oil and blondo carbohydrates were separated with the aid of filtration, separation of the two fractions in the filter press planned

to produce 99% oil and 1% of oil entrained in blondo. Blondo retained in screening will form a layer cake.

The quality of oil produced by the heating stage shows that the water content of the oil is relatively small (0.08 to 0.12%), free fatty acid content is very low (0.02-0.05%), a colorless oil and fragrant. Oil quality can be categorized as natural oil or oil clear and ready for use in the next process as the main raw material in the manufacturing process of biodiesel (Sutarmi, 2005).

**b. The production process of biodiesel**

Biodiesel is made through a chemical process called transesterification where glycerin is separated from vegetable oils. This process produces two products, namely methyl esters (biodiesel) / mono-alkyl esters and glycerine which is a by-product. The main raw material for the manufacture of biodiesel in this study are vegetable oils such as coconut oil (Coconut Oil). In general, vegetable oils including coconut oil contains triglycerides, free fatty acids (FFA) and the contaminants which depends on pre-treatment of the raw material. Meanwhile, as the supporting materials, namely alcohol. In the process of making biodiesel a catalyst for the esterification process, the catalyst is needed because alcohol is soluble in oil. Vegetable oil besides containing ALB also contains phospholipids, phospholipids can be removed in degumming process and ALB removed in the refining process.

In the process traseterifikasi alcohol used as a reagent for palm oil is methanol, but can also be used ethanol, isopropanol or butyl, but it should be noted that the water content in alcohol. When the high water content will affect the results of low quality biodiesel, because the content of soap, ALB and high trigeserida. Besides, the biodiesel is also influenced by the high operating temperatures of the production process, the length of time of mixing or blending the speed of alcohol. In this process other than the required alcohol katalisastor also needed. Catalyst needed to increase solubility during the reaction, generally the catalyst used is a strong base is NaOH or KOH or sodium methoxide.

The catalyst will be chosen depending on the used vegetable oil, when used crude oil with FFA content of less than 2%, in addition to soap and glycerine are

formed. Catalysts are generally highly hygroscopic and chemically react to form a solution that would be destroyed by the reactant alcohol. If more water is absorbed by the catalyst, the catalyst performance is not good so poorly biodiesel product. Once the reaction is complete, the catalyst must be neutralized by the addition of a strong mineral acid. Once the biodiesel is washed neutralization process can also be done with the addition of washing water, HCl can also be used for the neutralization of alkaline catalyst, when used acid phosphate fertilizer phosphate will menghasil (K3PO4).

Transesterification process which is common to make biodiesel from vegetable oils (biolipid) there are three kinds: (1) transesterification with Catalyst Bases, (2) transesterification with Catalyst Acid Direct and (3) Conversion of oils / fats into fatty acids continued into biodiesel. But in general, in the manufacture of biodiesel transesterification method using alkaline catalyst (Figure 4.6) because of an economical process and only requires a low temperature and pressure, the conversion results that can be achieved from this process is that it can reach 98%. Transesterification process is the reaction of trigliserin (fats / oils) with bioalcohol (methanol or ethanol) to form esters and glycerol. Process flow biodiesel production (transesterification) other than as depicted in Figure 4.6, is simply described also in the image below.

**Figure 4.6**
**The Chart of Process and System of Biodiesel Production**

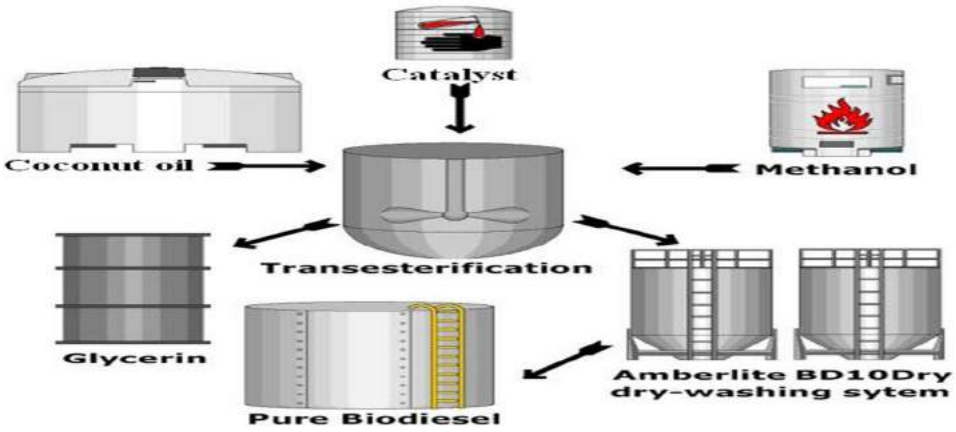



Figure (a)

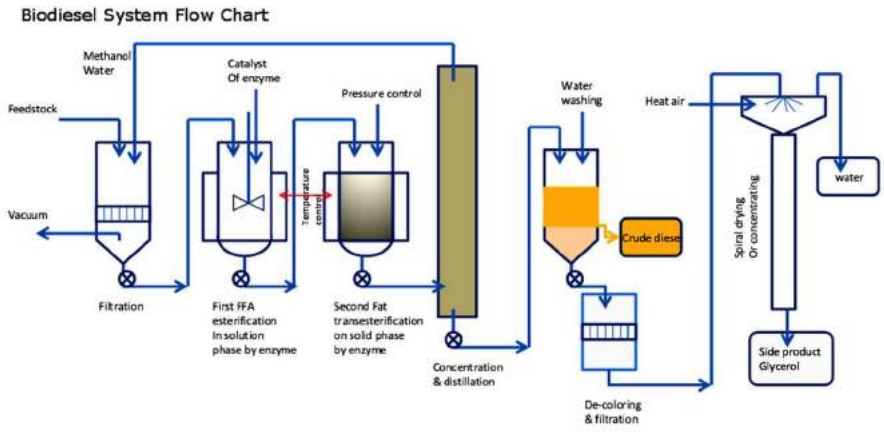



Figure (b)

In the technological process of biodiesel (transesterification) of vegetable oils are best used are vegetable oils with a free fatty acid (FFA) was low (<1%), when more especially if> 5%, it is necessary pretreatment due to result in a lower performance efficiency , This is because the standard of world trade ALB levels permitted up to 5%. Thus for vegetable oils with high levels of ALB> 1-5%, needs to be done deasidifikasi by reaction with glycerol methanolyisis or rough.

Simply put transesterification reaction can be drawn as follows: 100 lbs Vegetable Oil + 10 lbs Methanol - "100 lbs Biodiesel + 10 lbs glycerol R1, R2, and R3 are alkyl esters. During the esterification process, trigliserin reacted with an alcohol with a catalyst alkaline strong ( NaOH, KOH or sodium silicate). The amount of catalyst used in this titration process is quite decisive in producing biodiesel. Empirically, 6,25gr / l NaOH is adequate concentration. The reaction between biolipid and alcohol is a reversible reaction (reversible) so Alcohol should be given the excess to drive the reaction to the right and get a perfect conversion.

In the biodiesel production process, in addition to free fatty acid content should be less than 1%, also requires that the particle size of the free fatty acid (FFA) must be <5 micrometers. When this condition is not met, the necessary process as berikiut:

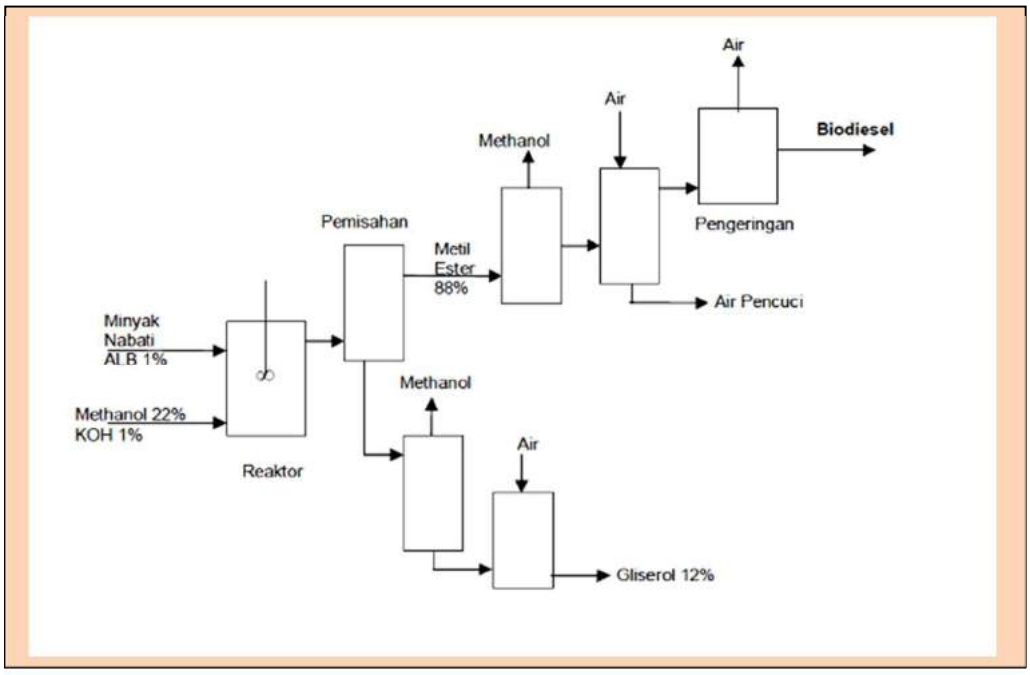
1. Filtration to 5 micrometers,
2. Washing with water,
3. decantation,

4. Heating oil,
5. The second decantation

When the vegetable oil water content is high enough, then after the second decantation drying besides that note is oil soluble in alcohol. Briefly stages of the production process (Figure 4.7) is as follows:

1. If the content of free fatty acids and the water is too high, it will result in the formation of soap (saponification) and cause problems in the separation of the glycerol later. Therefore, it is necessary to pre-treatment of raw materials and refined degumming process is carried out
2. The catalyst is dissolved in methanol by using a mixer or agitator standards.
3. A mixture of methanol and catalyst are put into a closed reactor and then add the vegetable oil. The system must be completely closed to avoid evaporation of methanol.

**Figure 4.7**
**Biodesel Production Process Level II**




4. The reaction is maintained at a temperature above the boiling point of alcohol (about 700C) in order to accelerate the reaction although some systems recommend the room temperature. Reaction time is 1-8 hours. Administration of excess methanol required to ensure a perfect conversion.

5. Although the density is higher than the biodiesel glycerol to glycerol pulled downward by gravity, centrifugal tools are needed to accelerate the separation of the two compounds. After the separation of the glycerol and biodiesel, excess methanol is taken by evaporation or distillation.
6. byproduct glycerol and soap still contains catalyst subsequently neutralized with a solution of sulfuric acid.
7. Once the biodiesel is separated from the glycerol was further purified again with warm water to get rid of traces of catalyst or soaps. Then dried and sent to storage tanks of biodiesel.

If vegetable oils contain free fatty acids ≤ 5%, then the esterification process to remove the Free Fatty Acid (FFA) is as follows:

1. Process deguming, which is the process of removing gum contained in vegetable oils containing FFA ≤ 5% by adding a solution of 85% H3PO4.
2. Filtering: to filter bentonite and gum adsorbed on the bentonite along with other impurities that doperoleh vegetable oil with FFA content of <5% and phosphorus levels <20 ppm.
3. Deodorization, FFA removal processes that cause the smell (odor) in the vegetable oil by steam stripping process vacuum system in order to obtain vegetable oil with FFA content of <0.5 w / o.
4. Reaction, namely oil and reacting methanol with NaOH catalyst to produce methyl ester / biodiesel and glycerin.
5. Washing, namely biodiesel washing process to be free of the remaining methanol, glycerol, and the catalyst NaOH. The process is in the form of mixing and settling. The result obtained in the form of biodiesel upper phase which is ready for the drying process and lower phase in the form of methanol solution that is ready for the distillation process.
6. Drying, drying biodiesel with Vakuum system to remove the water contained in biodiesel until its water content to <0.04 w / o.
7. Filtering, filtering biodiesel with a fine filter to obtain the levels of dirt <0.01 w/o.

8. Distillation, purification of methanol solution of 60% residual reaction and washing into products such as methanol above 95% and below results in the form of crude glycerine.

**c. Location Development**

In line with the development of strategic areas of East Kalimantan province, one of the alternative locations, namely in the development of biofuels and Penajam Paser Paser Utara (PPU). It is based because the district is developing a strategic area of East Kalimantan Province for the development of the industrial area of agriculture. With the development of biofuel investment is expected to accelerate the development of agriculture in the industrial area of Paser and PPU.

Associated with the location of the development of biofuel plants, consideration of aspects such as markets, raw materials, energy sumbr, transfortasi, labor and the other is the approach commonly used to determine the location of the plant. According Zulian Yamit (2002), in the development of processing industry products outside of the city-based raw materials verisable, where the cost of transporting raw materials is greater than the cost of transportation of the final product, the considerations of the plant, close to the raw materials to be very important in reducing (minimize) the cost of transportation of raw materials. Under these conditions, the determination of the location of the development of biofuels in addition to policy considerations regional development of strategic industries (industrial area of agriculture) of East Kalimantan Province judgment or approach raw material becomes very important, because the raw materials (palm fruit), in addition to mememiliki weights heavy enough by one unit also requires transfortasi costs (transport costs) are quite high.

Based on consideration of industrial estate development policy and raw materials, the location of the development of biofuels in the agricultural industry which is located on the border between Paser and PPU is a strategic choice, especially in efforts to optimize the availability of materials, particularly of the quantity of raw materials and minimization of transportation costs.

### d. Infrastructure

Carrying capacity of the infrastructure is very important in supporting the development of processing industries including biofuels industry. Industrial infrastructure consists of electric energy, water, infrastructure transportations, airports and ports and telecommunications.

For road infrastructure, road length in Kabuaten PPU yaiu 1028 km majority (85.7%) is the district with the type of road is about 60% gravel road, 19.5% asphalt roads and the rest of the dirt road, while the condition of the majority (> 80%) in good and fair condition.

For the conditions of Paser, in the year 2013 a long way in Paser is about 1579.5 km, mostly (44%) is the county 17% of provincial roads, 14% of national roads and the remaining 24% of village roads, the road condition around 27% kondisnya broken and damaged. For electrical energy is still supplied by PT PLN with less production of about 99.2 kwh to the power use of about 75.63 million kwh. To port in Paser there is one port.

## 4.3.3. Aspects of Market and Marketing

On the demand side, biofuel or biofuel especially for this type of biodiesel as an alternative energy source or a mixture of diesel oil (ADO) connection or a negative correlation with the conditions of diesel oil price developments. That is the increase or decrease in the price of diesel fuel will result on the decrease and increase in demand for biodiesel.

The potential use of bio-diesel as an alternative fuel or diesel oil mixture can be described as a share of the utilization of bio-diesel to the use of diesel fuel in the transport sector. Bio-diesel exploiting opportunities to use diesel oil or ADO (Automotive Diesel Oil) in the transport sector starting from 2017 to 2025 increased steadily from 2 percent to reach 57 percent of the total use of diesel oil in the sector. Bio-diesel usage share is equivalent to 0.50 per cent to almost 10 per cent of total energy needs in the transport sector in 2017 up to 2025.

Based on the differences in the social, economic and regional potential in the supply of raw materials, each region has a different economic feasibility of the use of bio-diesel. Borneo is thought to be the first region as a location for

utilization of bio-diesel in 2017, followed by Papua or Irian Jaya, which started using Bio-diesel by 2022 about 0.35 million tonnes or 0.31 million kiloliters of bio-diesel. By 2025, the needs of Biodiesel in Indonesia is expected to reach a total of 7 million tons, or 6 million kiloliters of bio-diesel.

Most of Bio-diesel in Indonesia in 2025 is used to meet the needs of Bio-diesel in Papua, which is more than 4.13 million tonnes or 3.59 million kiloliters of bio-diesel, while the rest to meet the needs of Biodiesel in Borneo. The magnitude of the needs of Bio-diesel in Kalimantan and Papua are expected because of the potential for land development as a growing medium raw materials, especially oil palm in both regions.

Based on data from Revenue Kaltim, the development of industry and transport sufficient to make Kaltim in East Kalimantan is the largest province in fuel consumption in Indonesia. In the Year 2012 in the form of diesel fuel consumption reached 4.1 billion liters, of which about 3.89 billion liters of an industrial consumption (diesel engine) and 238 million liters are subsidized fuel quota. As for the year 2013, based on data from Pertamina, in the period January-March 2013. East Kalimantan diesel consumption reached 3.7 million kiloliters, or 105.2% of the quota.

When referring to the Minister of Energy and Mineral Resources Regulation No.25 of 2013, which stated that the use of biodiesel as a mixture of at least oil in 2016 which is 20% of the total demand / use of oil (diesel) then apabia assumed it applies also for fuel consumption (quotas Fuel subsi) in East Kalimantan, East Kalimantan, the potential for biodiesel requirement for 2016 of around 0.7 million liters whereas when referring to the consumption of industrial diesel Kaltim in 2012, the potential need for Kaltim biodiesel is around 0.78 billion liters (3.89 billion liters x 20%). Assuming ESDM No.25 of 2013, and the development of industrial and transportation equipment continues to increase and the production of palm oil for biodiesel raw materials is constant, then the development of biofuel types of coconut-based biodiesel as a biofuel product diversification of the vegetable raw materials is a strategic step in the development of biofuels , This is because the demand or need for good biodiesel to meet domestic demand and exports as a mixture of oil will increase.

From the supply side biodiesel, by 2012 the largest biodiesel supply in Indonesia such as PT Eterindo, PT Wilmart, PT.Sumi Asih PT Platinum, PT. NBF and PT. Nularborsampai the number of products to 16,000 tons per year with the potential of products per year 3.95 million tons per year.

### 4.3.4. Aspects of Human Resources, Management and Organization

Human resources are and have a central role in the development of an organization, therefore the quality and capacity of resources within an organization will greatly affect the optimization of achievement and success of the organization. As mentioned that the main objective of human resource management is to increase the contribution to the organization and management of resources in order to achieve organizational productivity (Notoatmodjo, 2003). In addition to the aspect of human resources, another vital aspect is the aspect of management and organization. This is because of the efforts that will be or are being piloted may be a failure if the management and the organization is not going well. Management process itself also has rules that a business can run more easily. And rules (rule) itself can be clearly illustrated through the following management functions:

1. Planning (Planning)

   Planning is process to determine where and how a business will be executed or initiated to achieve a goal that has been set.

2. Organizing (Organizing)

   Organizing is a process for classifying activities in certain units so clear and organized in accordance with the responsibilities and authority of the unit holders.

3. Implementation (Actuating)

   Execution is the process where all the planned has been started by the whole unit. Like a manager who put all his subordinates to begin the work in accordance with the duties which have been assigned to him.

4. Control (Controlling)

Supervision is a process to measure, assess and evaluate the results of the work in keeping with the original plan and corrects various aberrations during the process of working implements selected.

In the development of biofuels, the need for human resources, as well as aspects of management and organization of course very course will depend on the scale of business and the business or the type of material and the orientation of product development. According to Ilyas (2011) specification needs of human resources required will depend on the business management and corporate organizations. In general, management and organization of the company consists ari top managers, middle managers and low managers who all certainly requires a different skill human resources between levels of management. One size or quality and skill and human resource capacity that samapai is still valid and used by the company is the standard of education.

The highest education level of human resources is an undergraduate (S1, S2 and S3). In Borneo number of graduates in 2014 are 4993 people consisting of 4,414 graduates and the remaining graduates S1 S2 and S3. Therefore, when linked to the condition of the old school, where in 2013 the average length of school in East Kalimantan is 9:39 year, gives an indication that most of the education of human resources who entered the labor force in East Kalimantan tendency graduated junior high. This indicates that for the availability of resources to occupy low potential managers in East Kalimantan. Therefore, the increase in non-formal education based on specific expertise is a strategic step in the effort to improve the quality and capacity of human resources. This is because the organizational approach used by a company in general-functional line organization

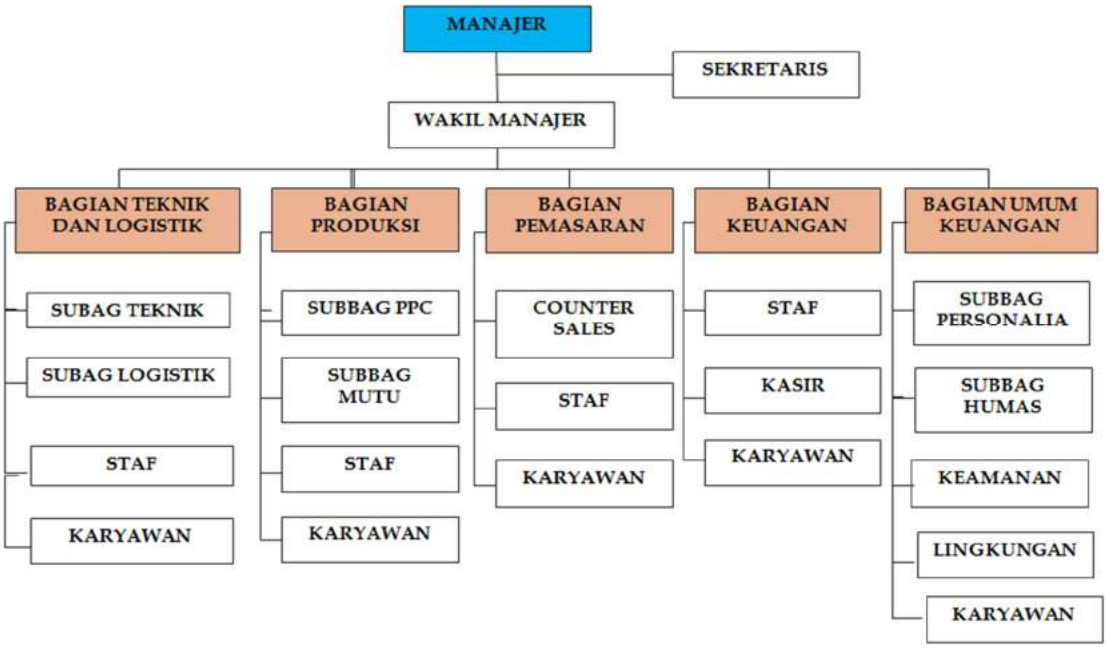
The organization is a group of people who are working to achieve the same tujuanyang and among those given the distribution of tasks for the achievement of these objectives. The organizational structure is a schematic illustration of the relationship and cooperation between the functions, the parts that move the organization to achieve the goal.

Company consisting of several parts of different activities must be coordinated in such a way so as to achieve the targets and goals of the company. In terms of the organization of the different parts required an organizational structure that can unite the resources in an orderly way. Good organizational structure is an organizational structure that is flexible in the sense of living, evolving, moving in accordance with the conditions being faced by the company.

The organizational structure of a company plays an important role in determining and expedite the wheels companies. The distribution of duties, powers and responsibilities as well as the harmonious relationship of the parts with other parts that can be described within an organizational structure. It is expected the presence of a clear direction and coordination to achieve the objectives of the company and each employee can see precisely where the command came and to whom should be accounted for the results of his work.

To achieve the goals and objectives that have been set, the organizational structure used in Production Plant in East Kalimantan is a mixture of relationships that form a line and functional relationships. In carrying out its organizational structure is no clear division of tasks between the management, staff and implementers and in making decisions more easily achieved. For factory development stage Plant Organizational Structure can be seen in the figure below:

**Figure 4.8**
**Manufactory Organization Structure**



## Duties and Responsibilities

Company organization is a container companies that utilize its resources. These containers set of activities that need to be carried out in accordance with the responsibilities and authority. In running an organization required personnel who occupy certain positions in the organization, where each personnel are given duties and responsibilities in accordance with the position. In performing its duties, each position are given an overview and limit the duties and responsibilities of each organizational structure.

The division of tasks and responsibilities of each position in the organization structure of the plant including the following:

1. Managers
   a) Leading and coordinating Head of the company's employees in advance,
   b) Plan strategy of the company, led the activities of purchasing, marketing, administration, and pengkoordiniran these tasks,
   c) To approve the company's overall work plan,
   d) Make decisions in determining the cost and wages of workers.

2. Deputy Manager
   a) Assist the manager held a planning towards the achievement of corporate objectives at the Department of Logistics, Engineering, Quality Control, Product Development Design and Production,
   b) Assist the manager to remove and replace each of the head, staff, officers and employees,
   c) Assist manager to oversee the implementation of the work plan / operating companies,
   d) Membantumanajeruntukmemintadanmenilaipertanggungjawaban each Head of Section on duties charged,
   e) Responsible for the development and progress of the company,
   f) Responsible to the manager.

3. Head of Engineering Logistik
   a) Make a reservation scheduling of raw materials,

b) Determine the amount of raw materials ordered,

c) Responsible to the manager,

d) Take into account and plan for the needs of spare parts (spare parts) for machinery and equipment production,

e) Responsible for the maintenance and repair of machinery and equipment for production activities,

f) Establish a schedule maintenance (maintenance) machinery and equipment production,

g) Responsible to the Manager.

4. Head of Production

a) Checking and supervising the condition of the materials before processing, during the production process to the finished product in order didapatkanproduk that meet the standards,

b) Monitor and supervise the activities of the laboratory and is responsible for the development and survival of laboratory activities,

c) Create reports the results of the examination and testing of raw materials such as levels of protein, fat, water and dust and also the finished product periodically,

d) Develop and enhance the appearance of the products by improving designs and colors to suit the tastes of consumers,

e) To diversifikassi product,

f) Plan and organize the activities of production companies in order to conform to the specifications and quality standards are given,

g) Monitor and evaluate production activities to determine deficiencies and deviations,

h) Responsible for the execution of production activities in accordance with production schedules,

i) Served in controlling excess production processes.

5. Head of Marketing
   a) Analyze market activities in order to obtain the level of consumer demand and the level of competition as well as developing the marketing of the results of market research that has been set,
   b) Determine the policy plans and working with distributors in determining marketing strategies that include the number and type of products to be marketed, do the pricing, distribution and promotion,
   c) Determine a marketing budget plan.

6. Head of Finance
   a) Setting up and managing sumberkeuangan effectively,
   b) Managing finance company to ensure provosi for funds for the needs of long-term and short-term economic,
   c) Maintaining a good working relationship with the bank or other agencies dealing with the financial aspects of the company,
   d) To formulate and evaluate the implementation of financial plans and budgets, reporting, corporate accounting, fund processing and assessment, as well as taxes and insurance,
   e) Setting up a data application for credit needs,
   f) Requiring accountability on part of cash and bookkeeping tasks are delegated and supervise the implementation of treasury and accounting work.

7. Head of General
   a) Implement the company's policy in the field of public and personnel,
   b) Selecting and placing the employee in accordance with the capabilities and needs of the company,
   c) Represents the company in dealing with labor issues.

8. Head of Section Logistics
   a) receipt, storage and release of goods in the warehouse,
   b) Conduct planning purchase orders goods that are known by the Manager of Logistics and Purchasing,
   c) Responsible for the security of goods in the warehouse,

d) Perform reception, storage and release of goods in the warehouse,

e) Make a purchase order planning goods known by the Chief,

f) Responsible for the security of goods in the warehouse,

g) Responsible directly to kapala Parts Logistics and Engineering.

9. Head of Sub Division of Engineering

a) Coordinate and schedule the execution of the maintenance of production machines and other facilities,

b) Responsible for the maintenance of machinery and other faslitas,

c) Conduct the planning and implementation of activities to maintain the vehicle tools,

d) Responsible for sorting, appointment, transfer and dismissal of employees on its part,

e) Plan of the care and maintenance of large-scale power generation and power house companies,

f) Checking and supervising the procurement of electricity for the smooth running of all activities of the company,

g) Conducting repair facilities of the company.

**Labor and Working Hours**

For the management and operation of production plant (Coconuts biodiesel) in East Kalimantan, it takes manpower, labor either directly or indirectly. Direct labor is labor that works on operating biodiesel production process in the factory, while the indirect labor are workers who work outside the production process.

In accordance with the organizational structure and implementation of plant development, manpower needs and the allocation of labor in the production detailed in the table below:

**Table 4.7.**
**An Amount and Allocation of Human Source by the Position in Manufacture Plant**

| No | Position | Amount (people) | Note |
|---|---|---|---|
| 1 | Manager | 1 | |
| 2 | Vice Manager | 1 | |
| 3 | Secretary | 1 | |
| 4 | Logistic and Technique dept | | |
| | ▪ Head of Dept | 1 | |
| | ▪ Staff | 2 | |
| | ▪ Technicians and Employeer | 4 | |
| 5 | Production dept | | |
| | ▪ Ka. Bag | 1 | |
| | ▪ Ka Subbag PPC | 1 | |
| | ▪ Ka Subbag Mutu | 1 | |
| | ▪ Staf | 2 | |
| | ▪ Employeer | 6 | |
| 6 | Marketing Dept | | |
| | ▪ Ka. Bag | 1 | |
| | ▪ Counter Sales | 1 | |
| | ▪ Staff | 2 | |
| | ▪ Employeer | 4 | |
| 7 | Financial Dept | | |
| | ▪ Ka Bag | 1 | |
| | ▪ Kasir/Cashier | 1 | |
| | ▪ Staff | 2 | |
| 8 | Bagian Umum | | |
| | ▪ Ka Bag | 1 | |
| | ▪ Ka Sub Bag Personalia/ HRD | 1 | |
| | ▪ Ka Sub Bag Humas/ PR | 1 | |
| | ▪ Security | 4 | |
| | ▪ Environtment | 2 | |
| | ▪ Employeer | 4 | |
| **Amount** | | **46** | |

**Work Hours and Wage System**

Appropriate and referring to the labor laws, working hours for all workers or employees are the same, both employees of the office, production and guards / security consisting of a single work shift. The details of working hours is generally used by a company and can also be used on plant development biodeselkelapa are as follows:

**1. Monday s / d Friday**

- At 8:00 to 12:00 pm: Work Active
- At 12:00 to 13:00 pm: Break
- At 13:00 to 16:00 pm: Work Active
- At 16:00 to 18:00 pm: Overtime Hours

**2. Saturday**

- At 8:00 to 12:00 pm: Work Active
- At 12:00 to 13:00 pm: Break
- At 13:00 to 14:00 pm: Work Active

For labor wage system, wage system applied to the palm biodiesel plants, in addition to need to refer to the rules and regulations prevailing wage system, and jugasistem and policies perusahaan.Secara general wage system consists of three types:

**1. Monthly Wages**

Monthly wages given to office employees and security officers / guards. In this case the wages are paid every end of the month.

**2. Daily Wages Fixed and Variable / Remove**

Daily wages granted to employees where wages are paid on a daily basis during working hours and work actively berakhir.Jenis activities and policies tailored to the needs of the plant.

### 4.3.5. Social Aspects Environment

Coconut biodiesel plant construction should not to carry due to damage to the environment, in fact a lot more attention in the establishment of the industry now is the benefits of their products. Little attention to environmental problems, so that the industry will lead to the establishment of environmental pollution by industrial waste disposal results are sometimes overlooked.

Hence the need for careful planning on any industrial development to be taken into account before any effect of the activity of the industrial development of the wider environment that. In taking the decision the establishment of an industry, in addition to the benefits to be obtained should also be carefully considered environmental sustainability. Here are some perinsip that need to be considered in the development of the coconut biodiesel plant to the surrounding environment:

1. Evaluation of socio-economic and ecological effects of both general and specific.
2. Research and monitoring of the environment is good for jangkapendek and long term.

3. Survey on the effects on the environment that may arise.
4. Based on the guidelines made the formulation of the criteria ecological cost analysis, project benefits, project design and project management form.
5. When the locals were forced to get a negative influence on the development of this industrial project, then create alternative development or find a way to compensate the loss entirely.

### 4.3.6. Financial aspects or Finance

Financial or financial aspect is the estuary of all aspects of financial reasons are the implications of all aspects of feasibility should be taken into account. Various matters relating to finance are discussed ranging from the initial planning, the preparation period, the implementation of plant construction and operation period when the business is running. In general, the financial study visits of the period consisted of Preparation Period also called investment period and the period of operation. Financial implications preparation period will terkaver in need of investment funds, whereas the operating life are reflected in the income projections, projected balance sheet, cash flow projections and the projected ability to pay off loans and returns.

Analysis of financial feasibility aspect is the basis for determining the financial resources required for certain activities and profit levels can be expected. Approaches and measures of financial analysis in business development including:

1. Determination of the financial requirement / total cost of the funds required for the operation.
2. Determination of the financial resources available and the costs, yaituberupa search for the source of funds and the cost of capital.
3. Determination of cash flow (Cah-in and cash out) per unit of time and analysis of profit and loss
4. Determination of criteria invetasi in an effort to evaluate the feasibility of business development based on investment criteria

Financial feasibility analysis is basically an activity to analyze or assess the extent of the benefits to be gained from business development activities to be carried out. So the results of this analysis are used for the decision whether to

accept or reject the idea of business development. Understanding feasible in question, is a business that was developed to provide benefits (benefit) from the financial side in terms of financial or benefits.

In general, the financial aspects in the development of biofuel production investments palm in East Kalimantan include pre-production costs, investment (investment costs and operating costs / working capital), financing, projected cash flow and profit and loss.

**a. Pre-operating costs**

In building a business unit of biofuel processing industry begins with the manufacture of various studies on the product, market and other aspects are considered to take a decision. Has consequences for purposes of the costs to be incurred are termed pre-operating costs. These costs had to be incurred before the decision was taken to carry out projects that are classified as sunk costs or investments whose value is fixed and has not been issued all the rest. These costs are incurred both these efforts be executed or canceled.

In a feasibility analysis, Sun costs not included in the calculation of NPV because the cost is beyond calculation feasibility study. The amount of pre-production costs are generally projected 2-5% of the investment cost.

**b. Investment Needs Plan**

Biofuel development plan investment needs are taken into account at the beginning of the coconut business plan covers the entire expenditure for the development of plant biofuel (biodiesel). The expenditure in grouped as follows:

1. The cost of the construction of the Physical (Fixed Assets)

   In accordance with the coconut-based biodiesel production process, physical development costs are costs incurred for the provision of facilities and infrastructure throughout the production development needs biodsel which includes the purchase of land, construction of buildings, purchase of equipment and machinery, office equipment, furniture and vehicles.

2. Working Capital

The definition of working capital is the entire cost required for the production of biodiesel company operating daily in making the product. The cost of working capital in the production of biodiesel consisting of cost of goods tangible and intangible, the cost of tangible items include charges for the needs of the purchase of raw materials (copra), supporting materials others (alcohol, sodium hydroxide, sulfuric acid, etc.), water, fuel, electricity, labor costs, and the cost of other goods, while the intangible costs including credit installments and interest, the interest of capital, maintenance costs, depreciation costs, etc.

**c. Source of funds**

Sources of funds for business spending could derive its own capital and bank loans.

1. Capital Sendiri.Yang own capital is capital is owned by its shareholders, which is stated in the certificate of incorporation. Generally, the amount of funds specified in the deed is still far from enough to anticipate the needs of the overall investment funds. In the development of biodiesel production amount of capital itself assumed 40% of the total cost or the cost of investment and working capital.
2. Loans or capital gains Luar.Guna lkerja mode needs and purchase of fixed assets needed loans from banks or other financial institutions. Provisions amount of the loan, withdrawal period, installments, interest rate, maturity and repayment of other administrative costs included in kontrakkredit agreement concluded between the company and the bank. The amount of capital beyond the assumed 60% of the capital investment or working capital.

**d. Projection of Cash Flow (Cash Flow)**

Cash flow projections are useful for preparation of balance sheet projections. Cash flow is a note on the reception or benefits (cash inflows) and expenditure (cash outflow) of cash in one period. While the difference between the two (incoming and outgoing) are called net cash flow or profits. In the development of biodiesel production its main revenue stream copra oil and

biodiesel and glycerol. While current expenditures are all expenditures are reckoned during the period or economic life of the project / projected lifespan biodiesel development efforts.

**e. Projection Profit - Loss**

The projection of income is a picture of some of the business operating profit in each particular year period. To make projections of income must be calculated first projection of the value of sales or revenues or in terms of project management is Benefit (B), the cost of production and operating costs (Cost / C). Operating costs are the costs incurred for the production of biodiesel operations, office costs and product marketing. Costs of production and operation for a short period can also be grouped into variable costs and fixed costs. Income projections in the level of certain diccounto become very important in the analysis of the feasibility / investment criteria (NPV, Net B / C, or the IRR and Payback Period).


# CHAPTER 5
# INVESTMENT PROFILE AT EAST KALIMANTAN

## 5.1 Investment Needs

### 5.1.1. Investment needs of Biofuel Made from Coconut

**1. Design of Investment Development of Biofuel**

As described previously, the pattern of development of the coconut biofuel investment is assumed biofuel products produced, namely biodiesel by-products, namely glycerol. In the development of the coconut biofuel is another main product produced is copra oil (coconut oil). This development pattern implies also that the raw material (vegetable oil such as coconut oil precedence of the products of own production) with the potential availability of raw materials (copra production potential of East Kalimantan as an industrial raw material approximately 10.4 thousand tons, or the equivalent of about 5-600 tons of oil copra per year). Other considerations related to the design pattern of biofuel development in East Kalimantan, this is the problem of raw material prices biodiesel (vegetable oil such as coconut oil). Where based on the results of the study are known at this time raw material prices (the price of copra oil is Rp.12-14 thousand) more expensive than the price of biodiesel subsidies (Rp.8400 / lit).

Furthermore, the design of the technology associated with biodiesel production process as described previously, biodiesel production process technology used is the chemical process of transesterification method kalatis bases. This means that in addition to produce biodiesel using alcohol also using alkali catalyst such as NaOH alkaline, and other chemicals.

## 2. Assumptions and Parameter Calculation of Investment

In calculating the investment requirement Biofuel coconut assumptions and parameters calculation becomes very important in the effort to calculate the feasibility of the investment required. Some of the assumptions and parameters of calculation in determining the value of investments biofuels (biodiesel) palm in East Kalimantan detailed in the table below:

**Table 5.1.**
**Parameter Calculation of Biofuel Investment Value**

| No | Investment Assumption | Unit | Volume/value |
|---|---|---|---|
| 1 | The Projection of Analysis Period | Year | -10 (economical age ) |
| 2 | Manufacture and office land | $M^2$ | 5000 |
| 3 | Manufactur and Office building, other facilitations | $M^2$ | 2000 |
| 4 | Copra and Biodiesel Machine and Oil Equipment:<br>1. mesin screw oil press<br>2. Reactor tank<br>3. Separator<br>4. Heator<br>5. Flash Drum<br>6. Kondensor<br>7. Cooler<br>8. Washing Tank<br>9. Dekanter<br>10. Evaporator<br>11. Dekanter<br>12. Biodiesel Tank<br>13. Catalis Pump<br>14. Mixer Pump<br>15. Reactor and Sparator Pump<br>16. Washing Pump<br>17. Gliserol Tank<br>18. etc | Unit | **High quality low price Biodiesel mac hine**<br>**US $100000-500000** / *Set ( FOB Price)*<br>**1 Set** *(Min. Order)*<br>Grade: B100<br>Application: Vehicles<br>Standard: 5T/D Biodiesel Equipment<br>Place of Origin: CN;HEN<br>Brand Name: Zhongzhiyuan |
| 4 | Transport<br>4 wheels<br>2 wheels | <br>Unit<br>Unit | <br>3<br>6 |
| 5 | Materials for work<br>- Raw Materials (Copra)<br>- Methanol<br>- Katalis (Alkohol)<br>- H2SO4<br>- Etc | <br>Ton /yr<br>Lit<br>Lit<br>Lit | <br>10.000<br>%/bhn Baku<br>%/Bhn Baku<br>%/Bhn Baku |
| 6 | Human Resources | people/mnth | |
| | Manager | | 1 |
| | Vice Manager | | 1 |

| No | Investment Assumption | Unit | Volume/value |
|---|---|---|---|
| | Secretary | | 1 |
| | Head/Chief | | 9 |
| | Staff | | 10 |
| | Employeer | | 24 |
| 7 | Water and Electricity | Lit Kwh | |
| 8 | Machine and Building maintanance | Rp/mnt/yr | s |
| 9 | Work's day per month | day | 25 |
| 10 | Work's day per year | day | 300 |
| 11 | Month per year | month | 12 |
| 12 | Production Capacity | Kg/day | 6000 kg |
| 13 | Oil Production | Kg/day | 3000 kg |
| 14 | Biodiesel Production | Kg/day | 3000 kg |
| 15 | The yield of copra to oil | % | 60 |
| 16 | The yield of oil to biodesel | % | 96 |

*Source: Calculation Result of 2015*

## 3. Investment and Operational Costs

Components of investment costs and operational costs of investment development of biofuels (biodiesel) is determined by the production capacity or the number of products produced. As explained in economic studies revealed that the product cost is a function of a product. The investment costs are incurred prior to the operations of the production process. The investment costs incurred depends period of production processes, but in general the period of the investment costs incurred at the beginning before the production process and the amount of the value of spending a period of time dependent on the projected economic life. The cost of investment in the development of biodiesel production of coconut types of investment costs allocated to the provision of land, buildings, machinery and equipment, as well as a means of transportations and others. Picture related to the projected amount of investment costs biodiesel in East Kalimantan detailed in Table 5.2.

**Table 5.2.**
**Biodiesel Investment Cost and Components**

| No | Investments | Value (Rp) |
|---|---|---|
| 1 | Land | 2,500,000,000 |
| 2 | Building | 5,000,000,000 |
| 3 | Biodesel equipments and machine | 5,200,000,000 |
| 4 | Machines and production equipment of Copra | 3.900.000.000 |
| 5 | Factory Installation | 3,640,000,000 |
| 6 | Other Installation | 500,000,000 |
| 7 | Transportation | 1,280,000,000 |
| | **Amount** | **23.730,000,000** |

*Sourcer: Calculation Result of 2015*

Based on the investment component, the proportion of the amount of the investment cost for the development of palm biodiesel production is an investment buildings and machinery-equipment production reached more than Rp. 10 billion. The amount of the investment costs for equipment and production machinery used in the production process of biodiesel is assumed to imported products. The condition makes the price of equipment and or biodiesel engines rely heavily on the dollar. In this study assumed dollar exchange rate of Rp. 13,000 / $ 1. Likewise other investments, the amount of investment in umumnnya proportional to the time change (Time Value of Money). Where for example, the price of land will be growing with time, so are the costs for the building investments.

For component and operating costs, the amount of operating costs will be largely determined by production capacity. That is the high and low operating costs or working capital is determined by the large capacity of the products produced. The main component of operating costs in the development of the production of biofuels (biodiesel) is the cost of materials production facilities khususunya raw material and operating costs of labor. Komponenen type and amount of oil biodiesel development Operational costs detailed in Table 5.3.

**Table 5.3.**
**Operational Cost and Componen of Coconut Biodiesel Production (Rp/yr)**

| No. | Items | Value (Rp) |
|---|---|---|
| 1 | Raw Materials (Copra) | 35,000,000,000 |
| 2 | Methanol | 3,450,000,000 |
| 3 | NaOH | 1,344,000,000 |
| 4 | H2SO4 | 1,140,000,000 |
| 5 | Another materials | 700,000,000 |
| 6 | Water and Electricity | 520,000,000 |
| 7 | Human Resources | 1,794,000,000 |
| 8 | Office equipment | 50,000,000 |
| 9 | Office Administrations | 179,400,000 |
| 10 | Fuel | 928,000,000 |
| 11 | Credits | 4,124,724,000 |
| 12 | Capital Interest | 6,187,086,000 |
| 13 | Pbuilding Maintanance | 100.000.000 |
| 14 | Machine and Equipment maintanance | 260.000.000 |
| 13 | Others | 350,000,000 |
| | Total | **55,327,210,000** |

*Source: Calculation Result of 2015*

Based on data from the table above, shows that the component of operating costs biodiesel production development in East Kalimantan with a capacity of raw material per year 10,000 tons of copra, the largest proportion of operating costs (64.6%) is for the supply of raw materials, namely Rp. 35 billion (10.000ton x @ Rp.3500, -). This condition indicates that the availability of palm biodiesel production development cost per year for the supply of raw material becomes very important and greatly affect the operation of biodiesel production. In other words, the availability of operational costs for raw materials and other materials will greatly determine the effectiveness and productivity of palm biodiesel production process.

### 5.1.2. Investment needs Bio Cassava Ethanol Made Basic Elephant

Bioethanol is basically ethanol or alcohol compound obtained through the fermentation of biomass with the help of microorganisms. Bioethanol is obtained from the fermentation can have a wide variety of levels. With levels of 90-94% bioethanol is called bioethanol industry level. If bioethanol yield obtained from 94 to 99.5%, it is called bioethanol neutral level. Generally this kind of bioethanol

used for mixed liquor, and the latter is bioethanol fuel level. Bioethanol content of this very high level, a minimum of 99.5%. National Standardization Council (DSN) has established the Indonesian National Standard (SNI) for bioethanol. Currently there are two types of SNI bioethanol, ie SNI DT 27-0001-2006 for denatured ethanol and SNI-06-3565-1994 for technical alcohol comprising Prima Super Alcohol, Alcohol Alcohol Prima Prima I and II. Alcohol Prima Super has a maximum level of 96.8% and a minimum of 96.3%, while the first Prima and Prima II minimum of 96.1% and 95.0%. All were measured at temperatures of 15oC.

### 1. Investment Cost

The investment costs are costs incurred in the early life of the project as a whole. Goods - consumable goods will invest if the economic life of such goods have been exhausted. Investment activities may also be carried out again if the economic life of certain items has been depleted. This is known as reinvestment. The total investment cost incurred for the business of cassava bioethanol is $ 2.537525 billion. Details of the investment costs can be seen in Table.5.4

**Table 5.4.**
**Investment Cost of Bioetanol Ubi Kayu**

| No | Items | Unit | Vol. | Price per Unit (Rp) | Amount (Rp) |
|---|---|---|---|---|---|
| 1 | Buildings | $m^2$ | 600 | 1.000.000 | 600.000.000 |
| 2 | Cassava Pealing Machines | buah | 1 | 35.000.000 | 35.000.000 |
| 3 | Cassava Grater Machines | buah | 1 | 35.000.000 | 35.000.000 |
| 4 | Cassava Cooking Machines | buah | 1 | 200.000.000 | 200.000.000 |
| 5 | Heat exchanger | buah | 1 | 250.000.000 | 250.000.000 |
| 6 | Fermentation Tank | buah | 3 | 150.000.000 | 450.000.000 |
| 7 | Destillation Taank | buah | 1 | 500.000.000 | 500.000.000 |
| 8 | Boiler | buah | 1 | 450.000.000 | 450.000.000 |
| 9 | Electricity Installation | paket | 1 | 10.000.000 | 10.000.000 |
| 10 | Well | buah | 1 | 5.000.000 | 5.000.000 |
| 11 | Boots/Shoes | pasang | 8 | 50.000 | 400.000 |
| 12 | Plastics Can | buah | 20 | 100.000 | 2.000.000 |
| 13 | Knives | buah | 5 | 25.000 | 125.000 |
| | **Total Investments** | | | | **2.537.525.000** |

*Source: Calculation Result of 2015*

Based on the table above it can be seen that the cost is the biggest investment distillation equipment, which amounted to Rp 500,000,000. The distillation apparatus is obtained by means of assembling itself so that the device is expected to have a better quality when compared with buying. This tool serves to separate the bioethanol produced with other fluids, especially water. Reinvestment activities started in each year for boots and plastic containers (to keep cassava after peeled and cleaned). Pulping machines cassava, cassava grater machines and apparatus fermentation experiencing changes every three years. Knife or cleaver will be reinvested in activities every two years.

## 2. Operating Costs

Operational costs are all costs related to operational activities (production) of cassava bioethanol business. These costs are divided into two, namely fixed costs and variable costs.

### 1) Fixed Costs

Fixed costs are costs that has remained in the range of certain activities in the business volume of cassava bioethanol. In this case belonging to the fixed costs are labor experts, executive manpower, maintenance costs, telephone costs and land and building tax (PBB). The amount of fixed costs incurred for the business of cassava bioethanol each year is $ 361 million. Details of fixed costs cassava bioethanol effort can be seen in the following table.

**Table 5.5.**
**Fixed Cost Detailed of Bioetanol Ubi Kayu**

| No | Uraian | Biya tetap (Rp/Tahun) |
|---|---|---|
| **1** | Rent for the land (1.000 $m^2$) | 10.000.000 |
| **2** | Expertizes | 50.000.000 |
| **3** | Operators | 150.000.000 |
| **4** | Maintanances Cost | 90.000.000 |
| **5** | Telephone | 60.000.000 |
| **6** | Tax | 1.000.000 |
| | **Total** | **361.000.000** |

*Source: Calculation Result of 2015*

Based on Table 5.5 above, it is known that the expenditure for the largest fixed costs of labor contained in the executive, namely Rp. 150,000,000. These costs will be incurred each year. Maintenance costs are costs incurred to finance

the maintenance of production machinery so that the expected performance of the production machine can run well. Call charges represent costs incurred to help smooth the production activities. For example, to order raw materials or to follow up orders. The UN is a payment of a fixed fee that is the lowest amount, ie $ 1,000,000 per year.

**Figure 5.1**
**The Allocation Location for the Processing of Bioethanol made from Singkong Gajah at Desa Bendang Raya Kecamatan Tenggarong Kabupaten Kutai Kartanegara**

**2) Variable Costs**

Variable costs are those costs incurred where the costs are very dependent on the amount of product produced. In this study the major variable cost depends on the amount of ethanol that will be produced. Variable costs incurred to cassava bioethanol business is USD 882 064 880. Details of the variable cost of cassava bioethanol effort can be seen in the following table.

**Table 5.6.**
**Variable Cost of Bioetanol Ubi Kayu**

| No | Uraian | Total Biaya Variabel (Rp/thn) |
|---|---|---|
| 1 | Ubi kayu/Cassava | 709.800.000 |
| 2 | Enzim α –amilase | 1.597.050 |
| 3 | Enzim β –amilase | 958.230 |
| 4 | Ragi/Yeast | 59.150 |
| 5 | Urea | 2.306.850 |
| 6 | NPK | 4.968.600 |
| 7 | Electricity Cost | 60.000.000 |
| 8 | Batu bara/ Coal | 34.125.000 |
| 9 | Jerigen/Plastic can | 68.250.000 |
| | **total** | **882.64.880** |

*Source: Calculation Result of 2015*

**a) Cassava**

Cassava is the main raw material for bioethanol production cassava. Expenditure to purchase cassava is the biggest cost. The need cassava to produce ethanol of 2000 liters per day is 13,000 kg of cassava or 13 tonnes of cassava (conversion of 6.5 kg of cassava will produce one liter of bioethanol). Prices of cassava when research is Rp 600 per kg so that the costs to be incurred every year for the purchase of cassava is 13,000 kg x Rp 600 / kg x 91 times production = Rp 709.8 million.

**b) The enzyme α-amylase and β-amylase enzyme**

A-amylase enzyme is an enzyme that plays a role when solving the existing starch chains in solution cassava so that the solution does not become lumpy. B-amylase enzyme is an enzyme that plays a role in glucose pembentikan process or saccharification. The existence of these enzymes is very important because without these enzymes, the cassava bioethanol production process cannot take place.

The need for enzymes α-amylase and β-amylase enzyme to produce 2,000 liters of bioethanol per production cycle is 0.39 liters and 0.234 liters. So the costs to be incurred for the purchase of α-amylase enzyme for one year was 0.39 liters x Rp 45,000 / liter x 91 times = USD 1.59705 million. Costs to be incurred for the purchase of β-amylase enzyme for one year is 0.234 liters x Rp 45,000 / liter x 91 times = USD 958 230.

**c) Yeast, Urea and NPK**

Yeast, urea and NPK are ingredients added during the fermentation process. It aims to be the fermentation process can be run at its optimum. The material needs are respectively 0.26 kg of yeast; 16.9 kg of urea; and 3.64 kg of NPK. The material price is Rp 2,500 / kg for yeast, Rp 1,500 / kg of urea and Rp 15,000 / kg for NPK. Costs incurred for the purchase of the yeast during the year was 0.26 kg x Rp 2.500 / kg x 91 times = USD 59 150. Costs incurred for the purchase of urea during the year was 16.9 kg x Rp 1,500 / kg x 91 times = USD 2.30685 million. Costs incurred for the purchase of NPK during the year was 3.64 kg x Rp 15.000 / kg x 91 times = USD 4.9686 million.

**d) Cost of Electricity, Coal and Jerrycans**

Electricity efforts on cassava bioethanol used to run engines and lighting. The cost of electricity is estimated to reach Rp. 5,000,000 per month so that in one year to the expenses of electricity is Rp 60,000,000.

Coal in this study is used to power the boiler (heater). In one day, will need as much as 250 kg of coal so that within one year of purchase cost of coal is 250 kg x Rp 1,500 / kg x 91 times = Rp. 34.125 million.

Jerrycans used is a capacity of 200 liters, so for one-time production requires 10 pieces jerrycans. So, in one year the cost incurred for the purchase of 10 pieces x jerrycan is 91 times the production / year x Rp 75,000 = Rp 68.25 million.

### 5.1.3. Investment needs Wood Pellet Made Basic Waste Oil Palm

The community is now faced with a difficult condition to meet the daily energy needs, but especially to acquire LPG and kerosene price is always increasing (expensive). Indonesia is a country blessed with abundant resources in the world, one of which biomass. Biomass is a renewable energy source derived from agricultural and plantation sectors, including oil palm plantations.

Meanwhile, the development of the palm oil industry has negative impacts that must be taken seriously, especially the problem of waste management. Most waste from the processing of oil palm empty fruit bunches namely (empty fruit bunch), which generate as much as 22% of the total FFB per ton. First oil palm empty fruit bunches burned using the incinerator, then the ashes as fertilizer. However, the rules of Good Agricultural Practices, now banned operated incinerator. One way that can be done to reduce solid waste palm oil is to utilize the oil waste into alternative fuels such as biomass pellets. The advantages of wood pellets is a combustion process that is capable of producing calorific value of 5,354 kcal / kg higher than the low-calorie coal or low rank coal (LRC) which is 4,700 kcal / kg.

This study is important, because the developing process of handling waste oil in the form of shells and empty fruit bunches of oil palm through the creation biopellet international standards the Swedish Standard (SS 187 120), NORM M 7135, and the Standard of Austrian Pellets Association (PVA), this is done for

products generated more competitive in terms of quality and price. Wood Pellet presence is expected to provide solutions to the government and society at large to cope with expensive and limited fuel for energy diversity, and participate in preserving the environment. This study thus be interesting to be realized.

For the calculation of investment needs Wood pellets made from palm oil, can be seen in the calculation below:

WOOD PELLET
Pabrik pengolahan wood pellet limbah kelapa sawit kapasita 800 kg/hari

| | | |
|---|---|---|
| A. Investasi | | |
| 1. Tanah | Rp | 500.000.000 |
| 2. Bangunan | Rp | 400.000.000 |
| 3. Pondasi dan kontruiksi platform | Rp | 50.000.000 |
| 4. Pembelian mesin dan peralatan | Rp | 81.316.000 |
| Total Investasi | | 1.031.316.000 |

B. Biaya produksi
I. Modal kerja

| Uraian | Kebutuhan | Satuan | Harga satuan | Jumlah |
|---|---|---|---|---|
| 1. TBS | 800 | kg | 1.100 | 264.000.000 |
| 2. Solar | 100 | L | 6.800 | 204.000.000 |
| 3. Gaji karyawan | 5 | HOK | 50.000 | 75.000.000 |
| 5. Administrasi kantor | | | | 50.000.000 |
| | | | | 593.000.000 |

| | |
|---|---|
| II. Penyusutan | |
| 1.Bangunan (10 tahun) | 40.000.000 |
| 2. Alat dan Mesin (5 tahun) | 16.263.200 |
| 3. Biaya perawatan mesin | 2.439.480 |
| | 58.702.680 |
| Total Biaya Produksi | 651.702.680 |

Overall investment needs for the industrial manufacture of wood pellets made from palm affluent needed investment costs of approximately USD 1,683,018,680 for waste oil plant capacity of 800 kg per day.

## 5.2 Investment Feasibility

### 5.2.1. General

Investment feasibility study processing of plantation commodities in the top three, focused on:

1. Checking the financial feasibility and economic viability of investment in the processing of palm plantations, palm oil and cassava waste elephant as an alternative investment option.
2. Identify and assess the basic assumptions used in the analysis of feasibility.
3. Evaluate the basis of the decision-making process and private investors to invest.
4. Compare it with the decision process based on the consideration of social, economic and environmental, that taking into account the (internalize) all costs related to the investment.

The study was primarily based on literature review and analysis of secondary data from various publications and the results of scientific research about the business and investment processing of plantation. In addition, it also conducted field research and interviews with various sources on the conversion of natural forests for oil palm development. Presentation of this technical report begins with the presentation method and approach of the study, the exposure data, the exposure of the basic assumptions used, then continued with the presentation of the results of the investment feasibility analysis, discussion and debate, and ends with a conclusion.

Investment feasibility analysis is done through the following approaches:

1. Identify a variety of factors and variables (variables) were the main influence on investment. Based on published data and the development of the movement (trend) the value of a variable conducted an examination of values and range of acceptable values. For example, the level of production of fresh fruit bunches (FFB) in various classes (levels of farm production: low, medium, and high), a wide range of input values to be paid for the investment of plant, plant maintenance, harvesting and processing of TBS, the price of production, variety external impact (negative) on the environment, alternative sources of income.

2. Develop calculations in a spreadsheet (Excel spreadsheet using) such as to allow to adjust flexibly variables. All the calculation of the variable costs and benefits of the project carried out in units per unit (per hectare). It is intended to be able to allow comparison between categories of benefits and costs. Furthermore, the calculation of the value of the indicator variable comparison, for example, net present value (NPV, net present value).
3. Mengdentifikasi case of 'basic' ('base' case) which describe the condition (situation) on average plantation processing investment projects.
4. Perform analysis of flexibility and analysis of the principal return (break-even analysis) to see where the investment decision is changed from "yes" to "no"

Financial analysis aimed to assess whether a particular activity undertaken financially feasible, or can provide financial benefits for companies that aim to maximize profits. In taking a decision based on assessment of the feasibility of an activity, it is important to take into account all relevant costs and benefits and / or actually happening as a result of the implementation of activities.

Financial feasibility of an activity shown by the NPV (net present value), B / C ratio (Benefit-Cost Ratio), or IRR (Internal Rate of Return). NPV, B / C ratio and IRR actually relate to each other. An activity is said to be financially viable (profitable for the company) if the NPV is positive. If a positive NPV means that the value of B / C ratio is greater than one, and the value of IRR is greater than the discount interest rate (discount rate) used in the calculation of NPV. So, one of these values can be used to decide whether an activity will be profitable (feasible) or financially.

In this study, financial feasibility indicated by the value of NPV. If the overall benefits generated during the period of the life of activity greater than the overall cost of the investment, the value of a positive NPV. That is, the activity is financially feasible because it can provide financial benefits for investors.

### 5.2.2. Investment Feasibility Biofuel Made Basic Coconut

In an attempt availability of operational cost is very large, certainly within the limitations of working capital the role of bank credit to be important, although

the use of working capital sourced, either partly or entirely of outside capital (capital loans) makes operating capital becomes greater because there is an additional burden costs in the form of fees for the principal and interest installments. Based on data from Table 5.3 Components and Operational Costs The amount of biodiesel production Oil (USD / year), the amount of the cost of loan installments and interest installment reaches more than Rp.9 billion. The magnitude of this is assuming the amount of working capital and capital investment of 60% is derived from banking loans with longer credit period of 10 years at an interest rate of 15% / year. For the amount of principal per year for 10 years is the same, while the amount of the interest installment will fall in line with increasing years.

Each based on the assumption of working capital and capital investment, 60% came from the capital loans, the amount of credit is for working capital of Rp. 26.85324 billion, - and investment capital Rp. 10.572 billion, -. If the loan period and repayment over 10 years, the amount of principal and interest installment loans (15%), as detailed in Table 5.7.

**Table 5.7.**
**Credits/Loan Installment Payment**

| Year | Main Payment | Interest Payment | Total |
|---|---|---|---|
| 1 | 3,742,524,000 | 5,613,786,000 | 9,356,310,000 |
| 2 | 3,742,524,000 | 5,052,407,400 | 8,794,931,400 |
| 3 | 3,742,524,000 | 4,491,028,800 | 8,233,552,800 |
| 4 | 3,742,524,000 | 3,929,650,200 | 7,672,174,200 |
| 5 | 3,742,524,000 | 3,368,271,600 | 7,110,795,600 |
| 6 | 3,742,524,000 | 2,806,893,000 | 6,549,417,000 |
| 7 | 3,742,524,000 | 2,245,514,400 | 5,988,038,400 |
| 8 | 3,742,524,000 | 1,684,135,800 | 5,426,659,800 |
| 9 | 3,742,524,000 | 1,122,757,200 | 4,865,281,200 |
| 10 | 3,742,524,000 | 561,378,600 | 4,303,902,600 |

*Source: Calculation Result of 2015*

Production and Reception

As the design or pattern of development of the production process of biodiesel, the main product of the production of investment development production process

biodel is biodiesel oil and copra (coconut oil) with a capacity of each product is 50% (3000 tons / year), while byproducts accounted for them cake and glycerin. Assuming the conversion of raw material copra (10,000 tons) to 6,000 kilograms of coconut oil or copra oil (60%) and 40% coconut pulp. For copra oil, 50% for raw materials biodiesel with biodiesel conversion 0.96 and 0.1 Glycerin. Assuming the plant is operating at optimal capacity and the prevailing price for palm oil is Rp.14.000 / kg, biodiesel Rp.8400 / liter, Glyserin Rp.15000 / liter and coconut pulp Rp.1500 / kg. Based on that projection products and the value of products produced per year of palm biodiesel production process development is as detailed in Table 5.8 below.

**Table 5.8.**
**The Projection of Production and Benefit per Year**

| No | Products | Unit | Volume | price (@Rp) | Value (Rp) |
|---|---|---|---|---|---|
| 1 | Coconut Oil | Kg | 3,000,000 | 12,000 | 36,000,000,000 |
| 2 | Coconut Waste | Kg | 4,000,000 | 1,500 | 6,000,000,000 |
| 3 | Biodesel | Liter | 3,000,000 | 8,400 | 25,200,000,000 |
| 4 | Glycerol | Liter | 300,000 | 15,000 | 4,500,000,000 |
| | Jumlah | | | | 71,700,000,000 |

*Source: Calculation Result of 2015*

**Cash flow projections and Investment Feasibility**

To assess the feasibility of palm biodiesel production development investment, made through investment criteria approach berdsarkan amount of Net Present Value (NPV), Net Benefit / Cost, Internal Rate Ratio (IRR), payback period (PBP). Investment development of biofuels (biodiesel) declared eligible to be developed if the scale of value NPV> 0, Net B / C> 1, and the amount of the value of IRR> OCC (bank lending). Berdsarkan projected cash flow and profit and loss account in the discount rate (Discount Factor) 15% unknown amount of the value of investment criteria, as detailed in Table 5.9

**Table 5.9.**
**Analytical Result of Investment Criteria on DF 15%**

| No | Kriteria Investasi | Besaran Nilai |
|---|---|---|
| 1 | NPV | Rp. 40.043 billions |
| 2 | Net B/C | 1.54 |
| 3 | IRR | 19.05 |
| 4 | Payback Period | Year 4 + 2 months |

*Source: Calculation Result of 2015*

Based on Table 5.9, note the development of biofuels (biodiesel) at the level of the discount factor of 15% the amount of the NPV (Net Present Value)> 0, then the amount of the value of Net B / C> 1 and the magnitude of the value of IRR> OCC equivalent to the lending bank (16 %). Based on the criteria for investment or feasibility analysis can be stated that the development of the production of biofuels (biodiesel) deserves to be implemented or developed because it gives the amount of the invested amount value financially lucrative benefits.

### 5.2.3. Investment Feasibility Bio Cassava Ethanol Made Basic Elephant

The assumptions used in calculating the investment feasibility of Bio Ethanol made from cassava elephant is as follows:

1. The investment value is Rp. 2.537525 billion, -
2. Operation and Maintenance Costs per year Rp. 1243064880
3. Age is 10 years technical activities
4. Production of processing result is 2,000 liters / day
5. The inflation rate of 7%
6. The interest rate of 15%
7. Assumption of products sold were sold at the beginning of the year 60%
8. The price of bio ethanol Rp. 4,200, -
9. The price increase of 10% per year.

Based on the above assumptions result of investment feasibility like the following table:

**Table 5.10.**
**Financial Internal Rate of Return (FIRR)**
**Investment of Singkong Gajah Became Bio Etanol**

Dalam Ribuan Rupiah

| PERIODE | Biaya Investasi | Biaya O & M | Total Biaya | Tambahan Pendapatan | Tambahan Pendapatan Bersih | Analisa Sensitifitas | |
|---|---|---|---|---|---|---|---|
| | | | | | | Biaya Naik 10% | Pendapatan Turun 10% |
| 2,015 | | | 0 | | 0 | 0 | 0 |
| 2,016 | 2,537,525 | 1,243,065 | 3,780,590 | 0 | (3,780,590) | (4,158,649) | (3,780,590) |
| 2,017 | | 1,330,079 | 1,330,079 | 1,323,000 | (7,079) | (140,087) | (139,379) |
| 2,018 | | 1,423,185 | 1,423,185 | 1,944,810 | 521,625 | 379,307 | 327,144 |
| 2,019 | | 1,522,808 | 1,522,808 | 2,917,215 | 1,394,407 | 1,242,126 | 1,102,686 |
| 2,020 | | 1,629,404 | 1,629,404 | 3,063,076 | 1,433,671 | 1,270,731 | 1,127,364 |
| 2,021 | | 1,743,463 | 1,743,463 | 3,216,230 | 1,472,767 | 1,298,420 | 1,151,144 |
| 2,022 | | 1,865,505 | 1,865,505 | 3,377,041 | 1,511,536 | 1,324,985 | 1,173,832 |
| 2,023 | | 1,996,091 | 1,996,091 | 3,545,893 | 1,549,803 | 1,350,193 | 1,195,213 |
| 2,024 | | 2,135,817 | 2,135,817 | 3,723,188 | 1,587,371 | 1,373,789 | 1,215,052 |
| 2,025 | | 2,285,324 | 2,285,324 | 3,909,347 | 1,624,023 | 1,395,491 | 1,233,088 |
| 2,026 | | 2,445,297 | 2,445,297 | 4,104,814 | 1,659,518 | 1,414,988 | 1,249,036 |
| FIRR | 2,537,525 | | | | 23.1% | 17.2% | 16.5% |
| NPV | | | | | 1,287,963 | 356,228 | 227,432 |

| REKAPITULASI ANALISIS FIRR : | | | REKAPITULASI ANALISIS NPV : | | |
|---|---|---|---|---|---|
| 1. Kasus dasar | 23.1% | ***Layak*** | 1. Kasus dasar | 1,287,963 | ***Layak*** |
| 2. Biaya Naik 10% | 17.2% | ***Layak*** | 2. Biaya Naik 10% | 356,228 | ***Layak*** |
| 3. Pendapatan Turun 10% | 16.5% | ***Layak*** | 3. Pendapatan Turun 10% | 227,432 | ***Layak*** |

*Source: Calculation Result of 2015*

Based on the calculation of financial analysis, the discount interest rate (discount rate) of 15%, elephant cassava processing projects into Bio Ethanol give NPV value of Rp. 1.28 Billion (and IRR of 23.1%). Thus, the processing of elephant cassava into Bio Ethanol financially very feasible and profitable.

### 5.2.4. Investment Feasibility Wood Pellet Made Basic Waste Oil Palm

The assumptions used in calculating the investment feasibility Wood pellets made from waste oil is as follows:

1. The investment value is Rp. 1.031316 billion, -
2. Operation and Maintenance Costs per year Rp. 651 702 680, -
3. Age is 10 years technical activities
4. Production of processing result is 800 kg / day
5. The inflation rate of 7%

6. The interest rate of 15%

7. Assumption of products sold were sold at the beginning of the year 100%

8. The price of wood pellets Rp. 2.900, - / kg

9. The price increase of 5% per year

Based on the above assumptions result of investment feasibility like the following table:

**Table 5.11.**
**Financial Internal Rate of Return (FIRR)**
**Investment of Wood Pellet from Waste Palm Oil Raw Material**

Dalam Ribuan Rupiah

| PERIODE | Biaya Investasi | Biaya O & M | Total Biaya | Tambahan Pendapatan | Tambahan Pendapatan Bersih | Analisa Sensitifitas | |
|---|---|---|---|---|---|---|---|
| | | | | | | Biaya Naik 10% | Pendapatan Turun 10% |
| 2.015 | | | 0 | | 0 | 0 | 0 |
| 2.016 | 1.031.316 | | 1.031.316 | 0 | (1.031.316) | (1.134.448) | (1.031.316) |
| 2.017 | | 697.322 | 697.322 | 765.600 | 68.278 | (1.454) | (8.282) |
| 2.018 | | 746.134 | 746.134 | 842.160 | 96.026 | 21.412 | 11.810 |
| 2.019 | | 798.364 | 798.364 | 926.376 | 128.012 | 48.176 | 35.375 |
| 2.020 | | 798.364 | 798.364 | 1.019.014 | 220.650 | 140.813 | 118.748 |
| 2.021 | | 798.364 | 798.364 | 1.120.915 | 322.551 | 242.715 | 210.460 |
| 2.022 | | 798.364 | 798.364 | 1.233.006 | 434.643 | 354.806 | 311.342 |
| 2.023 | | 798.364 | 798.364 | 1.356.307 | 557.943 | 478.107 | 422.313 |
| 2.024 | | 798.364 | 798.364 | 1.491.938 | 693.574 | 613.738 | 544.380 |
| 2.025 | | 798.364 | 798.364 | 1.641.132 | 842.768 | 762.931 | 678.655 |
| 2.026 | | 798.364 | 798.364 | 1.805.245 | 1.006.881 | 927.045 | 826.356 |
| FIRR | 1.031.316 | | | | 23,3% | 16,2% | 15,5% |
| NPV | | | | | 441.740 | 70.415 | 26.241 |

| REKAPITULASI ANALISIS FIRR : | | | REKAPITULASI ANALISIS NPV : | | |
|---|---|---|---|---|---|
| 1. Kasus dasar | 23,3% | ***Layak*** | 1. Kasus dasar | 441.740 | ***Layak*** |
| 2. Biaya Naik 10% | 16,2% | ***Layak*** | 2. Biaya Naik 10% | 70.415 | ***Layak*** |
| 3. Pendapatan Turun 10% | 15,5% | ***Layak*** | 3. Pendapatan Turun 10% | 26.241 | ***Layak*** |

*Source: Calculation Result of 2015*

Based on the calculation of financial analysis, the discount interest rate (discount rate) of 15%, processing projects waste palm oil into wood Pellet give NPV value of Rp. 441 million (and IRR of 23.3%). Thus, the processing of waste palm oil into wood Pellet financially very feasible and profitable.


# CHAPTER 6
# DEVELOPMENT DIRECTION

## 6.1 Development Direction of Coconut In Being Biofuel

### A. Policy Direction and Goals

One of the Government's efforts in the Economic Policy Package to improve the current account deficit and the exchange rate against foreign currencies is to reduce imports of fuel oil (BBM) imports by increasing the utilization of Biofuel (BBN) as a fuel mixture.

Among the many alternative renewable energy sources, biofuels or Biofuel (BBN) is the most promising source of energy as fossil fuel substitution. Biofuels are fuels derived from biomass processing results therefore biofuel is often called green energy as well as the origins and emissions that are environmentally friendly and do not cause a significant increase in global warming. Bio Fuel contains no petroleum, but it can be mixed with various kinds of petroleum products to produce the fuel mixture. Biofuel can be used on various types of machines without making major changes, besides biofuels environmentally friendly as it can decompose in nature (Biodegradable), as well as non-toxic and contains no sulfur and aromatics. Biofuels (biofuels) as other fuels are fuels derived from plant materials and or produced from other organic materials that ditataniagakan as other fuels.

Biofuels (Biofuel) are popular today are biodiesel and bioethanol. Biodiesel is for a diesel engine, derived from the esterification-transesterification or direct transesterification of oils or fats while bioethanol as an additive or premium substitution is made of hydrolysis, fermentation and distillation starchy biomass. Technology processing biomass into biodiesel and bioethanol relatively easy (low

technology) as well as its production costs are relatively low so that the conversion of biomass into biodiesel and bioethanol can be applied anywhere and by anyone. As a country that never felt the great energy crisis and realize the adverse effects of fossil fuel emissions, Indonesia has taken concrete steps in the form of policies and concrete actions on the ground, although for the last step still has many obstacles.

According to the National Energy blueprint, by 2025 the role of green energy (solar energy, wind, water, etc.) will be increased to 4.4% to as much as 1,335% biofuel portion. The need for biofuels that this will be a very big challenge for government, community, energy users and other stakeholders, particularly from the agricultural sector, namely that they would not only produce food ingredients, but also have to produce energy and regulates niaganya. For the community portion of the increase in the use of biofuels should be accompanied by the increased awareness of the importance and the role of biofuels, which is a fossil fuel substitution of environmentally friendly low-staged high employment and renewable.

Based on the conditions and the potential of biofuels, the expected conditions of the development of biofuels such as: (1) The availability of raw materials as required biofuels (biodiesel, bioethanol, biogas) for both short term, medium and long term. (2) The achievement of national energy independence and the achievement of the energy mix as expected, (3) Increasing employment and reduced unemployment, especially for rural communities, (4) An increase in farmers' income, (5) The occurrence of self-sufficiency in energy will reduce dependence on energy from BBM, (6) The achievement of the price of biofuels in accordance with economic price that is profitable for farmers, producers, but not burdensome to consumers. In line with that policy biofuel development is the integrated use of resources (on-farm and off-farm), energy independence based on local resources and based on science and technology

Government policies implemented in the Regulation of the Minister of Energy and Mineral Resources No.25 of 2103, of which stated that in order to increase the utilization of biofuels (biofuels) as other fuels in the context of national energy security, Enterprise Business Permit Commercial Fuel Oil, Fuel

Direct Users Oil and Electricity Supply license holder who is still using fuel oil are required to use biofuel as other fuel gradually.

To accelerate the development and utilization of biodiesel by increasing the target mandatory use of biodiesel in all sectors (transport and non PSO PSO, industrial, commercial, and power plant) through changes to the Minister of Energy and Mineral Resources Regulation 32/2008. The target of phasing obligations related mandatory minimum use of biodiesel as a fuel mixture detailed in Table 6.1.

By 2015 the target of biodiesel in transport PSO from 5% to 10%, industry 10% to 20% and electricity from 15% to 30%. In 2014 the substitution target to reach 4 million kl, so in the next year is expected to decline in the import of diesel fuel with foreign exchange savings of 3.1 million dollars. B100 biodiesel in the biodiesel percentage of 2% (700 thousand k) in 2012, is expected to reach 31% (15 million kl) in 2025 and 33% (27.4 million kl) in the year 2035 with an increase rate of the average 6% per year.

**Table 6.1.**
**The Phase of the Minimum Utilization of Biodiesel (100) as A Mixer Fuel**

| No | Sector | Sept 2013 | Januari 2014 | Januari 2015 | Januari 2016-2020 | Januari 2025 | Notes |
|---|---|---|---|---|---|---|---|
| 1 | House Hold | - | - | - | - | | Not especified |
| 2 | Transportation PSO | 10 % | 10 % | 10 % | 20 % | 25 % | Through the amount of needs |
| 3 | Transportation Non PSO | 3 % | 10 % | 10 % | 20 % | 25 % | Through the amount of needs l |
| 4 | Commercial and Industry | 5 % | 10 % | 10 % | 20 % | 25 % | Through the amount of needs |
| 5 | Power Plants (Electricity) | 7.5 % | 20 % | 25 % | 30 % | 30 % | Through the amount of needs |

*Source : Permen ESDM No.25 Tahun 2013*

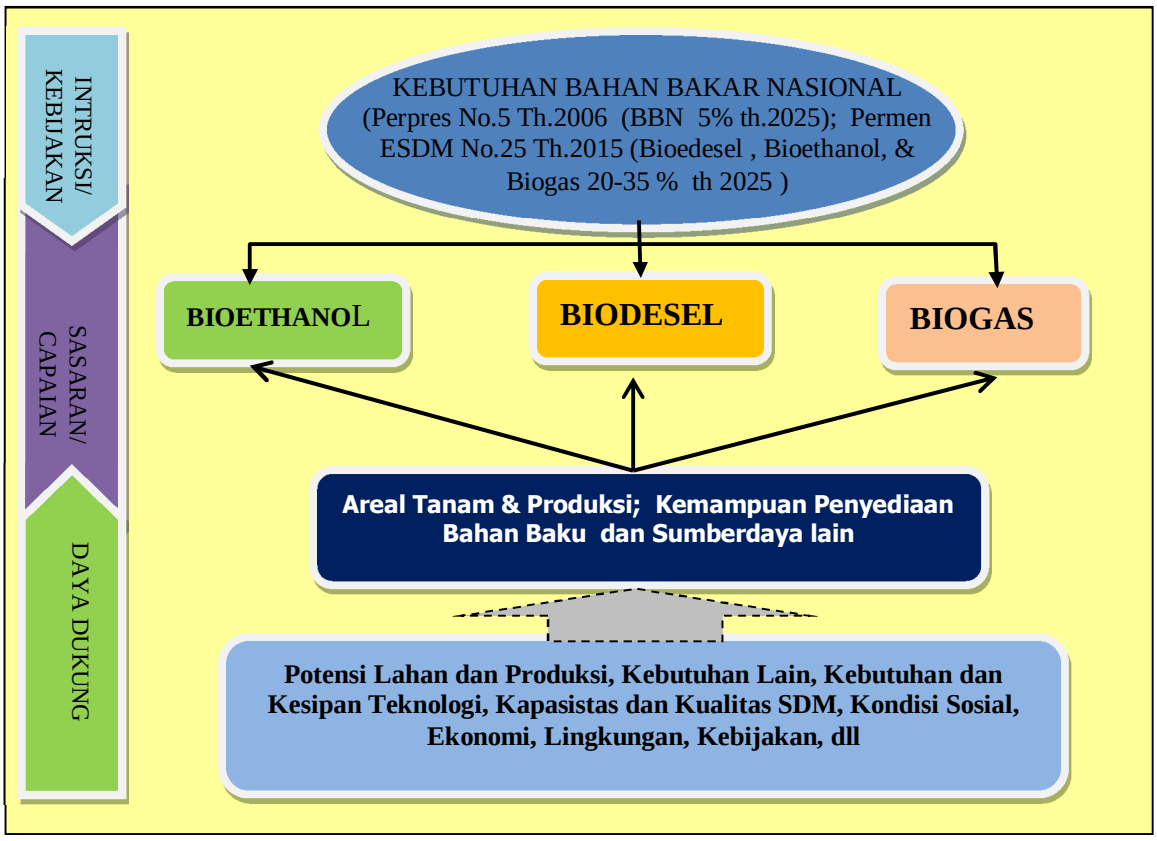
Based on the targets mandatory use of biodiesel in various sectors, of course, although it is intended mainly for the reduction of the current account deficit through a reduction in imports of diesel, this policy is also a positive influence on new and renewable energy sector (EBT), in particular biodiesel

industry. These policies and a momentum to accelerate the development of biodiesel sector, in the homeland. An increase in the portion of biodiesel in diesel from 10% to 20% will directly impact on the increase in demand for the commodity in the domestic market so that it will boost the production of biodiesel homeland.

As it is known that Indonesia has a huge potential in the sector of biofuels, especially biodiesel, which is derived from a variety of vegetable oils that are scattered throughout the archipelago. Vegetable oil as the main source of biodiesel can be met by various types of plants, such as soybeans, canola, palm kernel, coconut, jatropha, sunflower, cotton seed, corn and hundreds of other oil-producing plants. There are at least 40 types of vegetable oils as a potential raw material diesel in Indonesia, such as palm oil, jatropha oil, palm oil, soybean oil, and oil cured.

Based on the resource potential territorial, then the optimization efforts achievement of mandatory targets the use of biodiesel, policy development biodiesel directed at resource use integrated (on farm-off farm), as well as energy independence based on local resources and based Science and Technology (Science and Technology) to be very important. For that of course the development of biodiesel in a region need to be adapted to the production potential of land and raw material resources as well as other needs, technological readiness, capacity and quality of human resources, and other aspects such as economic, social, environmental, and other policies. Based on policy direction and objectives as well as the potential development of biofuels, in the pattern of development of biofuels (biofeul) is depicted in Figure 6.1.

**Figure 6.1**
**The Scheme of Biofuels Development**




## B. Structure of Production

### 1. Product Description

Bio Fuel is the fuel that is renewable (renewable) produced from various raw materials of plant materials (biomass), or byproducts of the agro-industry, or also a product of reprocessing of various wastes such as used cooking oil, wood waste, agricultural waste and etc. Bio Fuel contains no petroleum, but it can be mixed with various kinds of petroleum products to produce the fuel mixture. Biofuel can be used on various types of machines without making major changes, besides biofuels environmentally friendly as it can decompose in nature (Biodegradable), as well as non-toxic and contains no sulfur and aromatics.

Biodiesel is a diesel motor fuel in the form of an alkyl ester / alkyl fatty acids (usually a methyl ester) which is made from vegetable oils through a process of trans or esterification. Biodiesel can be produced from 100% biodiesel (B100)

or mixed with diesel fuel derived from petroleum. Biodiesel can be mixed with diesel fuel and lubricating better power with solar and better lubricating power. In addition it has a sulfur content is almost nil. Types of biodiesel is determined by the content of biodiesel in the fuel. As the substitution of petroleum fuels, biodiesel has several advantages, especially Cetane number is higher, lower emission levels, its high flash point and excellent lubricating ability.

Cetane number indicates the size of the delay / delay time burning fuel (fuel ignition), where the figure higher cetane number indicates a shorter time between the entry of fuel (fuel injection) and combustion (fuel ignition). Higher cetane number is identical to easily start the engine in cold conditions and engine speed more smoothly.

For pure biodiesel (B100) its CO2 emissions could be reduced by up to 73%, methane emissions can be reduced up to 51%, hydocarbon unburned can be reduced by 67%, emissions of carbon monoxide down 48% and sulfur oxide can be reduced up to 100% and a decrease in waste and other potential environmental pollutants than petroleum diesel.

Flash point is the point of burning diesel fuel after reaching a certain pressure in the engine that burned, biodiesel has a higher burning point than petroleum diesel so it is relatively more secure, because it is not flammable due to a lower pressure.

Ability lubrication / lubricity of diesel fuel is very important, because it influences the ability of the machine to the long-term, particularly in maintaining the function of fuel injection equipment bajar / fuel injection components.

Biodiesel has better lubricating power because it is based on 2006 EPA specifications higher sulfur content will reduce the lubricity of diesel fuel. Behind the advantages that biodiesel has the disadvantage that its energy content is still below petroleum diesel, because of the nature of the ester contains different with petroleum diesel.

**2. Potential Production as Raw Materials**

Bakubiodiesel production potential as the material, especially the coconut (coconut) in the form of coconut oil (copra oil) in Indonesia spread almost all

over the archipelago. Palm in Indonesia consists of hybrid coconut and coconut in the (local) with the sheer number of production in the year 2013 around 3:07 million tons (96.6% coconut products inside) and a land area of about 3.65 million hectares, most of which is largely smallholder plantations (PR 98.76% ), Plantation Great State (PBN) 0.012% and Big Private Plantation (PBS 1:13%). Production in 2013 decreased when compared to 2009, which reached 3:26 million tons, in addition to this decrease occurred due to the decrease in the level of productivity of land area as well. Plantation area in 2009 is 3.79 ha JTA. While coconut productivity in 2009 and 2013, respectively 1,175 kg / ha and 1,135 kg / ha.

Coconut production centers in Indonesia over the past five years (2009-2013) spread in some provinces, among others, Riau, East Java, North Sulawesi, North Maluku, Central Sulawesi, Central Java, Jambi and West Java, with the largest contribution of Riua ( 13:14%), while the contribution of other provinces sentar <10%.

For the conditions of East Kalimantan, in 2014 oil production is 11 424 tons, decreased approximately 13.8% compared to production in 2013 is 13:26 ton. Decrease in production in 2014 due to declining land productivity decline in crop yield and coconut. Coconut production in East Kalimantan most (83.52%) is concentrated in three districts (Kutai, Penajam PU and Paser), (Plantation Office of East Kalimantan Province, 2015).

Based on the conditions of potential oil production as raw material for biodiesel then the optimization efforts the development of biodiesel in Kaltim course development planted area coupled with an increase in the application of technical technology commodity production geared towards increased production and productivity as well as support for policy and development cooperation network marketing in the supply of raw materials coconut becomes very important.

### 3. Production Process Technology

In the aspect of the production process as described in the previous chapter, the production of biodiesel from plants commonly implemented is through a process called transesterification. Transesterification is a chemical process that

exchange alkoxy group on the ester compound with alcohol. To accelerate this reaction necessary assistance in the form of acid or base catalyst.

In the oil-producing plants, pretty much contained fatty acids. Chemically, these fatty acids are glycerides compound. In the transesterification process glycerides compound is broken down into monomers and glycerol ester compound, with the addition of large amounts of alcohol and a catalyst. Ester compounds, at the level (grade) is at the particular biodiesel. In the transesterification process for the production of biodiesel from plants, usually used sulfuric acid (H2SO4) as catalysts for chemical reactions. In addition to the transesterification process, in the production of biodiesel as well as through the following phases: compression plant tissues (eg seed) produce crude oil; separation (separator) ester and glycerin phases; and purification / washing ester compound to produce grade fuel (biodiesel).

Technologically process biodiesel, biodiesel technology in general is relatively simple and generally been controlled and or available. It dibutikan with has been the development of several biodiesel processing plant in Indonesia. For example PT Eterindo Wahanatama Tbk, which since 2005 Eterindo build biofuel made from palm oil industry at its plant in Gresik, East Java, then PT Melindo highway, PT Wimar Group, and PT Sumi Asih. This condition menjukkan that in terms of process technology has developed.

## C. Aspects of Economic and Investment

As the production process technology, biodiesel, or methyl ester derived from methanolisis process oils / fats, using trans-esterification reaction or esterification with alkaline or acidic catalyst and methanol. Results washing and drying produce biodiesel whom used. Of 1 kilogram of raw material to produce at least 1 liter of biodiesel. Medium distillation wastes produce glycerol and methanol can be reused. Although only about 10 percent, glycerol into byproducts that also have economic value.

Techno economic basis, the use of 10% biodiesel in diesel mix, targeted to that of diesel fuel can be saved at 1.3 million kiloliters, an increase of 250% of the initial target. In 2014 targeted types of diesel fuel can be saved by 4.4 million

kiloliters, so in the next year there is a decrease of diesel fuel imports at 5.7 million kiloliters. It means the same as foreign exchange savings of US $ 4,096 million (Ministry of Energy, 2015).

Based on production economics, cost biodieselakan development is strongly influenced by the price development of raw materials and production capacity. This is because in the production process, raw material costs are a major cost component in the development of biodiesel production, while other materials such as other alkhol and the proportion is relatively small compared to the cost of raw materials. According to the results of the study Darnako et.al, the cost of processing bio-diesel with a capacity of 6,000 - 60,000 tons / year ranged from Rp.700 - 1000 / kg, so the cost of biodiesel (USD / kg) was determined in raw material prices. If it is assumed bakubiodiesel materials used are copra with the price Rp.3500 / kg da other materials Rp.1000 / kg, the production cost of biodiesel around Rp.4.800, - 5.500, - / kg. In terms of investment needs, to a capacity of 6000 - 60,000 tons / year required an investment of about Rp.90 - 400 billion.

**D. Market Opportunities**

Assuming an integrated biodiesel development (the development of raw materials and the development of biodiesel) biodiesel market opportunities in general, there are three categories, namely the use of the biodiesel market in the company's internal, domestic market and export markets.

- Consumption internalyaitu biodiesel consumption to biodiesel needs its own factory. Consumption of biodiesel to meet the internal demand will continue to grow in line with the development of plants producing biodiesel feedstocks that use Desel machines, such as palm oil mills, oil mills, and other oleokimical factory.
- Consumption of domestic market, assuming that about 5% of energy needs derived from biodiesel, then the open market opportunities for the medium term is approximately 1.3 million kiloliters per year until 2025,
- The export market. Quantitative export market opportunities fairly open market opportunity for the developed countries that have been diversifying

energy to take advantage of biofuel, yet has the raw materials to the conditions as competitive as raw material for biodiesel in Indonesia. United States with the raw material of corn and soybeans, has not been able to compete with alternative sources of energy based on the resulting Brazilian sugar cane and palm oil based. With a production cost of about US $ 0.6 / liter, will obviously not be able to compete with Brazil or biodiesel products are priced substantially less than US $ 0.5 / liter. The same is true for European countries that the cost of production and the capacity of biofuels in produsi will not be able to compete, especially for the long term.

**E. Biodiesel Development Policy**

Judging from the direction of development of renewable energy, development and construction of biodiesel is an important strategic step and become. There are several reasons why we need the development of biodiesel in the country diantranya are as follows:

*First,* the downstream development of agricultural products, with downstream can obtain greater value added and diversified products that will enhance the growth and stability of the farming agribusiness system.

*Second,* the development of biodiesel will create business opportunities and more employment in the country.

*Third,* it is possible to substitute imported diesel fuel with energy raw materials originating from within the country. This will increase national energy security.

*Fourth,* the development of biodiesel will increase the development of on-farm (commodities as raw material for biodiesel), which in turn impact on the socio-economic development area that is a multiplier effect.

*Fifth,* increase the consumption of commodities, especially commodities as bakubiodiesel material resources in the country, and

*Sixth,* reducing dependence on imported diesel fuel. Imports of diesel fuel Indonsia which is about 35 million liters per year worth about US $ 35 billion. It is one cause of the current account deficit (NTB), Indonesia which has lasted 27

months. If there is no significant effort, the NTB deficit will continue and as a result, among others, the weakening rupiah would be difficult to avoid.

Direction of the development of biodiesel in the country which is mandatory from the government sought increased the percentage of utilization of biodiesel in diesel from 5% to 10% and sterusnya. Indeed, in many countries the development of biodiesel in the early stages are always driven by the government through mandatory policies. If the government wants to increase the percentage of biodiesel utilization from 10% to 20% for transport and 30% for electricity generation in January 2016, it still needed the support of some government policies (or the Regional Center), among which:

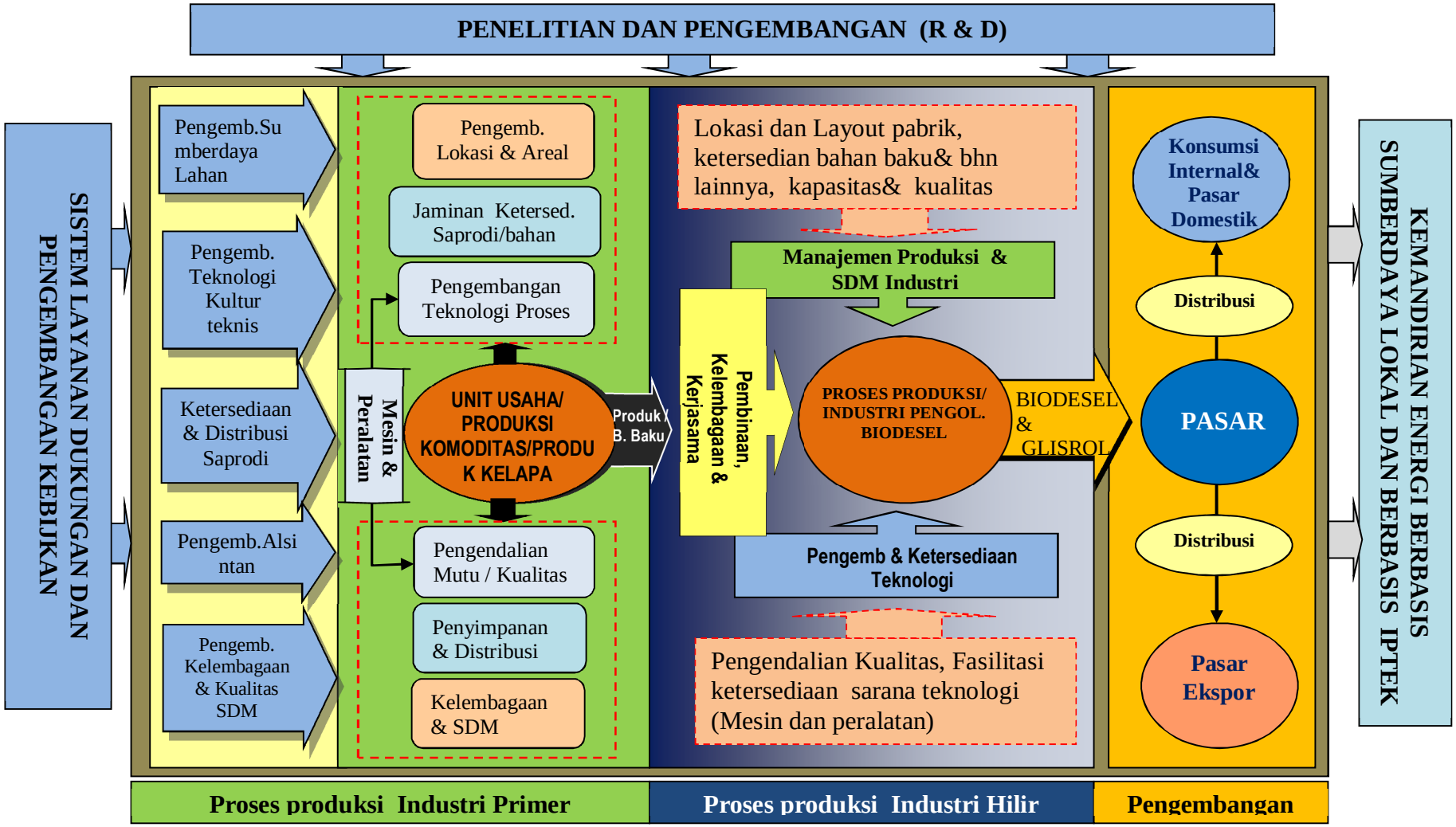
1) The price policy. The pricing policy applied by the government should be such that all businesses involved, especially providers of copra and coconut oil, biodiesel manufacturers, and consumers get the price of mutual benefit, both in the short and long term. If one or more of the stakeholders was harmed, then the biodiesel producers could not flourish, it will even lead to bankruptcy. Job pricing is not an easy job. In addition to paying attention to market forces, but the elements of justice must also be taken into account and over the long-term interests and the general public must also be considered. Therefore, in this pricing policy should also pay attention to a kind of policy mix between pricing policies, fiscal policies such as subsidies and taxes, as well as monetary policies such as interest rate loans for investments and operational biodiesel production.
2) Automotive technology must quickly adjust to the higher percentage of biodiesel utilization. The government should advocate even require that the domestic automotive manufacturers to develop engine technology that is flexible so that they can use biodiesel blends with various levels even up to 100%.
3) Development of sustainable practices. Together with the on-farm level were charged with sustainable practices, either through ISPO and RSPO, the government should also require the production of biodiesel as well. Production of biodiesel must use certified sustainable raw materials. That way, if the

biodiesel industry in the country would export particularly to the developed countries do not receive tariff and nontariff barriers.

4) Policies related to the distribution and pricing of biofuels, including biodiesel. This is because in addition to already enactment of policy-setting use of biodiesel, biodiesel commercialization readiness ends are the distribution and selling prices. This is one of them especially the production cost of biodiesel is not competitive with fossil diesel oil production. One form of policy that is associated with such price incentives and a reduction or exemption of import costs biodiesel processing machines.
5) The policy related to the supply of materials bakubiodiesel assuredness. To optimize the development of biodiesel, both of capacity and sustainability requires assuredness availability poduksi as raw material for biodiesel. This is very important because the raw materials (coconut) in addition to biodiesel remedy is needed also for other purposes, either as an ingredient or raw material consumption of food and oil commodity-based industries.
6) relating to the coordination of policy and technical guidance, especially in the implementation of technical policy of each stakeholder associated with the development of bioenergy biofuel (Biofule).
7) Legislation concerning the facilitation of production facilities and infrastructure and technology development
8) Policies related to the development of cooperation in the financing and development of the domestic and export markets.

Based on policy direction and objectives of the development of biofuels and biodiesel production structure and other aspects, towards the development of commodity-based biodiesel / oil products can be described schematically as described in Figure 6.2

**Figure 6.1.**
**The Scheme Direction of Biodiesel Development Coconut Based Commodity**



## 6.2 Development Direction Waste Oil Being Wood Pellet

### A. Investment Strategy

Amid pessimism Indonesian nation against nation superiority in the face of other nations, Indonesia appears to have excellent potential to be proud of in terms of plantations such as oil palm. This potential can be huge opportunities for trade and investment, both domestic investors and international investors. However, this has a great potential threat and a problem that must be solved together.

**1. Potential of Oil Palm**

Currently, Indonesia is a producer of crude palm oil (crude palm oil, CPO) in the world. In 2012, the plantation area is estimated at 9 million hectares, with a production of 24 million tonnes of palm oil per year, with a composition of 5 million tonnes consumed in the country, while the remaining 80% in exports.

The palm oil industry developed very inappropriate because it creates about 4 million jobs (pro-job), as well as to support local development and poverty alleviation, especially in rural areas outside Java (propoor). In addition, the majority of oil palm plantations are planted in forest areas left-over / former HPH (pro-environment), seta export value of palm oil and palm oil products contribute significantly to export earnings, which is about USD 20 billion (about 10% of the total export earnings ), the second largest after oil and gas (pro-growth).

CPO is used as raw material for the food industry by 80-85% and non-food industry by 15-20%. The growth of domestic consumption of palm oil is about 5.5% / year.

The palm oil industry has good prospects as competitive as the vegetable oil industry. Oil is one of the sources of the most competitive in the world for biofuels, and technical applications and the most important is as a food source.

The development of oil palm products derived from primary products, namely palm oil and palm kernel oil, and by-products from waste. Some of

the products resulting from the development of palm oil include cooking oil, oleochemical products such as fatty acids, fatty alcohols, glycerine, metallic soap, stearic acid, methyl ester, and stearin. The development of basic oleochemical industry stimulates the growth of consumer goods industries such as detergents, soaps and cosmetics.

While the products resulting from the utilization of waste which are organic fertilizers, compost and potassium and fiber derived from oil palm empty bunches, activated charcoal from coconut fruit, paper pulp derived from the stems and bunches of palm, furniture and particle board from the trunk, and animal feed of the stem and midrib, and organic fertilizer from wastewater from palm oil production process.

It is estimated that by 2030 it will take more production of food to feed the world's growing population. Based on conservative calculations, the year that the world will consume 48 million MT over the oil for food use, requiring an increase of 30 million MT to be met in 20 years. Indonesia should be able to play a major role in capturing these opportunities.

The main policy of the Indonesian government in developing oil palm is developing downstream industries. This policy is done by developing industrial clusters in Special Economic Zones (SEZs) which is regulated by Law No. 39 of 2009 on Special Economic Zones (SEZ), which is currently focused on KEK Sei-North Mangke, Maloy-East Kalimantan and Riau Dumai.

The policy is set lower tariffs on processed products from palm oil, crude palm oil and its derivatives. It aims to increase the added value and competitiveness of the downstream oil industry in the country. Based on this, reception duties on CPO and its derivatives is expected to decrease.

Oil palm agribusiness development strategy including the integration of vertical and horizontal oil palm plantations in order to increase community food security, the development of palm oil processing enterprises in rural areas, implementing technological and institutional innovations in the context of resource utilization plantations, and market development. In the implementation, development of oil palm agribusiness through the expansion and rejuvenation of implementing a development nucleus with institutional

strengthening through the provision of opportunity for farmers as shareholders of the company. Ownership of these shares is done through the purchase of shares from the installment sales discounts outcome or result of the outsourcing of funds by farmers' organizations.

**2. Main Threat**

At the time of this high-potential area for oil palm development has limited availability, and the area is still available and likely to be developed is potentially medium - low. Areal potentially low - medium has a limiting factor for the development of oil palm include:

a) factor is the number of months of dry climate that ranges from 2-3 months / years that illustrates the distribution of rainfall in a year that is not evenly distributed.

b) The topography of hilly-mountainous areas with a slope of 25% - 40% (an area with a slope of 40% is not recommended for the development of oil palm plantations).

c) the effective depth of shallow soil, especially in areas with types of soils with high rocks and poor drainage conditions.

d) peatlands.

e) Poor drainage on tidal plains, alluvium plains, and peatlands.

f) The potential for acid sulphate soils in the area of tidal plains.

**B. Development Plan**

**1. Regulatory Support and problems**

Currently the prevalent laws and policies are not in harmony and not in sync. Disharmonis regulation (plantation, forestry, environmental, spatial, regional autonomy) produce overlapping authority that the government is difficult to perform protection, planning, management, monitoring, enforcement and recovery.

Although palm oil and oil palm waste has great potential to be developed, but there are some issues that need to be aware of the following aspects.

a) Ideology

The potential for lucrative palm oil can encourage entrepreneurs to conduct large-scale exploitation of land and existing resources. Capitalism and the free market into the options for profit, ignoring the larger interests such as the protection of workers, preservation of forests, etc.

To overcome this, then there needs to be awareness of the entrepreneurs that earth, water, and natural resources that exist in fact belong to the nation of Indonesia, and should be utilized as much as possible for the prosperity of the nation of Indonesia. To that end, the company had to undertake a program of corporate social responsibilities to the community around the company as a form of social responsibility.

b) Politics

Currently, the fiscal policy (taxes and levies) and licensing of investment for the development of oil palm agribusiness still vary according to the official policy exists. The condition is more severe in the area, because of the fiscal policy and licensing as a means that can be traded at a fantastic price in order to support the provision of funds for the officials who will advance in local elections. This eventually lead to high economic cost.

To overcome this problem, it is necessary to brint blue palm development so that there is a definite policy in the development of oil palm.

c) Economy

From the economic aspect, some of the issues that should be of concern is the government's policy-setting CPO export duty be progressive; land ownership by foreign oil; decline in palm oil prices and rising production costs; and the income gap between smallholders to oil palm plantations.

To overcome this problem, the government should change any policies that do not support the export of palm oil in Indonesia. Especially for industries located in SEZs can be facilitated by the SEZ incentives include: tax incentives and income tax revenue for the shipment of goods in SEZs; land tax for a certain period and the facilitation of land acquisition procedures; additional exemption of value added tax, excise and luxury goods; tariff reduction; local tax incentives and facilitation permit

acquisition. The government also needs to change the investment climate so as not to harm the national interest. In addition, the need to increase the productivity of existing land and increase knowledge of oil palm farmers to reduce the income gap between smallholders to oil palm plantations.

In an effort plantation revitalization, the government needs to provide ease in matters relating to: (1) investment and financing, such as the provision of investment loans and interest subsidy by the government for rejuvenation, rehabilitation and expansion of oil palm plantations, (2) land management and governance space, such as the establishment and utilization of productive land for oil palm plantations in the border region of Borneo, (3) management of the environment and natural resources, such as the development and management of natural resources participatory, (4) infrastructure development, (5) human resource development and empowerment farmer, (6) the provision of incentives, funding for research and technology development, (7) formulation of trade policy that promotes the interests of the nation, (8) the promotion and marketing of products, and (9) the provision of tax incentives and levies.

d) Social Cultural

The existing problems of socio-cultural aspects is the magnitude of the rate of Indonesian forest deforstasi largely due to the expansion of oil palm plantations; the rise of oil palm seeds false; conversion of peatland into oil palm land that contributes to a very wide emissions of greenhouse gases and contributing to seasonal air quality problems; destruction of biodiversity, corruption in licensing; and not in harmony and synchronization of existing laws and policies.

To speak against this, there needs to be reform of the policy, especially with the evaluation of the existing licensing procedures, audit and legal liability for environmental audits, as well as law enforcement.

In addition, the need to approach the industrialized countries to support the achievement of their emission reduction commitments to earn 'carbon

credits' (Certified Emissions Reductions or CERs) through assistance to developing countries in achieving sustainable development; support the REDD + program; application of the Environmental Impact Assessment (EIA) and the organizational principles of sustainable palm oil (Roundtable of Sustainable Palm oil- RSPO) strictly; as well as increased coordination between the relevant stakeholders.

e) Defense and Security

The land conflict is a major problem in the palm oil sector. In Indonesia, Sawit Watch has documented more than 500 land disputes while WALHI recorded 200 cases of conflict in West Kalimantan. To overcome this it needs a persuasive approach to the land owner, the recognition of customary rights protected by the Constitution, reform land permit system, law enforcement, and the implementation of corporate social responsibilities to the community. It should be understood that the roots of conflict, often because of the people's welfare.

## C. Plan for Development of Wood Pellet

In general, the enormous potential of biomass energy development in Indonesia, then in the process of development need to consider the following matters:

1. A competitive market needs to be created so that the source of biomass energy has the space to grow and be accepted by society
2. The development of biomass energy sources must be integrated with the relevant policies of the energy sector, the environment, agriculture and forestry, resulting in incentives that stimulate the growth of all sectors are integrated.
3. The policy should be made to stimulate long-term investment
4. Development of energy from biomass conversion technologies need to be supported by an effective, efficient, and environmentally friendly.
5. Development of massive gasification stove needs to be done to increase public acceptance of biomass energy sources in the domestic sphere.

To that end, the development of biomass energy from sustainable economically, environmentally and socially, should also pay attention to the following criteria:

1. Biomass used must come from renewable sources managed by sustainable management.
2. The costs of the process should be kept low to ensure economic efficiency.
3. The other input materials used in the chain conversion technology derived from non-renewable sources must be kept low to reduce the level of emissions and to continue to use the best conversion technology.
4. The design of the development of bioenergy should be beneficial to the development of society at large.

## 6.3 Development Direction Elephant Being Bio Cassava Ethanol

Elephant cassava or cassava is a specific commodity found in East Kalimantan, cassava-based products have hamipr elephant together with other cassava, among others, can be used as food, animal feed, energy, organic plastics, parmasi, paper, other industries. In the development of cassava-based bioethanol energy elephants, then the direction of its development, among others:

1. The comprehensive government support to the development of cassava elephants, including upstream subsystem development (agro-input), subsystem cultivation, post-harvest and processing subsystems derived products, as well as the sub-subsystem marketing.
2. Encouraging Economic Transformation of the first sector-based economy that can not be updated to the economic sectors that can be updated through the development of agro-industry sectors, industries and sectors of the creative economy. This transformation efforts carried out by the concept of the green economy or green growth
3. Development of industrial zones with industrial cluster approach to renewable energy products.

4. Necessary support the accelerated development of infrastructure on road infrastructure, ports, airports which approach to connectivity - intra modes so as to reduce the cost transfortasi which is still a burden to encourage the competitiveness of the local economy.
5. Completion of licensing issues need to be reformed through One Stop Services (OSS) faster, clear targets and transparent time.
6. Development of land through intensification and extension of agriculture
7. The development of cropping systems by implementing an elephant cassava intercropping systems with other agricultural commodities
8. Encourage the development of cassava seedlings elephants more
9. Develop a more intensive counseling system
10. Encouraging growth and berkembanganya elephant cassava-based downstream industries, including developing bio-ethanol industry
11. Promote the establishment of subsidies both upstream and downstream, through a competitive pricing policy and market cassava bioethanaol more certain.


# CHAPTER 7
# CONCLUSION AND SUGGESTION

## 7.1. Conclusion

The conclusion of this study are as follows:

**1. Coconut Become Biofuel**

a. Components of investment costs and operational costs of investment development of biofuels (biodiesel) is determined by the production capacity or the number of products produced. Magnitude of Investment Costs Bio diesel is Rp.23.730,000,000. While the magnitude of the Operational Costs of coconut biodiesel production is Rp. 55,327,210,000.

b. The development of biodiesel made from oil, a component of operating costs with the development of biodiesel production capacity of raw material per year 10,000 tons of copra. The proportion of operating costs (64.6%) is for the supply of raw materials Rp. 35 billion (10,000 tons x @ Rp.3500).

c. Development of biofuels (biodiesel) at the level of the discount scale Faktor15% NPV value is Rp. 40.043 billion; the amount of the value of Net B / C> is 1.54; 19.05 IRR is equivalent to the lending bank (16%). Based on the criteria for investment or feasibility analysis can be stated that the development of the production of biofuels (biodiesel) deserves to be implemented or developed because it gives the amount of the invested amount value financially lucrative benefits.

**2. Singkong gajah (elephant cassava) Being Bioethanol**

a. The total investment cost incurred for the business of cassava bioethanol is $ 2.537525 billion. It is known that the cost is the biggest investment distillation equipment, which amounted to Rp 500,000,000. The distillation apparatus is obtained by means of assembling itself so that the device is expected to have a better quality when compared with buying.
b. Variable costs depend on the amount of ethanol that will be produced. The need cassava to produce ethanol of 2000 liters per day is 13,000 kg of cassava or 13 tonnes of cassava (conversion of 6.5 kg of cassava will produce one liter of bioethanol). Prices of cassava when research is Rp 600 per kg so that the costs to be incurred every year for the purchase of cassava is 13,000 kg x Rp 600 / kg x 91 times production = Rp 709.8 million.
c. Based on the calculation of financial analysis, premises ntingkat discount rate (discount rate) of 15%, cassava processing projects elephant into Bio Ethanol give sebesarRp NPV value. 1.28 Billion (and IRR of 23.1%). Thus, the processing of cassava into Bio Ethanol elephant financially very feasible and profitable.

**3. Waste Oil Being Wood Pellet**

a. For the manufacture of wood pellet industry, the overall investment requirements needed raw material waste oil investment cost of approximately Rp 1,683,018,680 for waste oil plant capacity of 800 kg per day. With details of the total investment must be spent Rp 1.031316 billion and production costs Rp 651 702 680.
b. Based on the calculation of financial analysis, the discount interest rate (discount rate) of 15%, oil waste treatment project into Wood Pellet give sebesarRp NPV value. 441 Million (and IRR sebesar23,3%). Thus, the processing of waste oil into a Wood Pellet financially very feasible and profitable.

## 7.2. Suggestion

1. For the development of the production of biodiesel made from oil, the raw material menjadihal very important and greatly affect the operation of biodiesel production. In other words, the availability of operational costs for raw materials and other materials will greatly determine the effectiveness and productivity of palm biodiesel production process.
2. According to the results of the survey area, the approach taken by the availability of raw materials. So the establishment of raw material coconut biodiesel plant located in the border district and Penajam Paser Paser Utara (PPU), which has significant potential as a producer of coconut.
3. Development of waste oil into wood pellets have to consider the availability of raw material every day. As it is known that at the moment the processing plant to process waste oil directly, because the economy is quite favorable.
4. Similarly the development of biofuels from coconut , wood pellets from waste oil. Development of Bio ethanol from singkong gajah (elephant cassava) must consider the raw material. The Government together with the farmers should be consistent in promoting the planting of singkong gajah (elephant cassava).