Towards the Development of an ASEAN Framework for Trade Negotiations and Regional Cooperation:

Bio-fuels

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May 28, 2007

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1. INTRODUCTION

Increases in prices of petroleum products and global warming have made the use of bio fuels necessary particularly for Third World countries. Greenhouse gases which cause global warming have been largely caused by excessive pollution brought about largely through the use of fossil fuels. Bio fuels on the other hand do not cause pollution. Proponents of bio fuels claim that bio fuels may even clean up the engines on which these are used.

Unlike fossil fuels, bio fuels can be absorbed by the environment. There is less danger to the environment in cases of oil spills as what had happened recently in Guimaras.

Fossil fuels take millions of years to form. Bio fuels can be derived from plants and is renewable. Many of the plants from which it can be derived are locally available. Many of the plants from which bio fuels may be derived are grown in the Philippines such as coconut from which bio diesel can be obtained and sugar cane from which ethanol which can be blended with gasoline can be extracted.

ASEAN can be a center for production of bio fuels. The Philippines and ASEAN are the major world producers of four plants from which bio fuels may be derived. These are coconut, sugar cane, cassava and palm oil. Many of them are net exporters of these products.

Jatropha or tubang bakod which is found all over the Philippine shows promise as a source of bio diesel. It grows even on marginal soil and is used as a material for hedges. It can also be grown as an intercrop. At present, it is being utilized in India as a source of bio diesel. The Indian Railways, largest land owner in the country, grows jatropha on thousands of acres of land along both sides of the railway tracks. It hopes to cut its fuel bill, by blending jatropha oil with diesel.

This study was prepared with the aim to serve as a guide to policy makers as they negotiate with their ASEAN counterparts. The study was based on interviews with oil industry executives, government officials and experts in the field of bio fuels. Secondary data was obtained through the internet and library research.

Limited time and resources prevented the author from visiting far flung provinces where jatropa plantations were being established.

Biofuels is the answer to dependence of fossil fuels for many countries, including the Philippines. With crisis brewing in the Middle East and oil prices rising up again in the world market, bio fuels will once again be of strategic importance to ASEAN and its major trading partners.

2. HISTORICAL BACKGROUND

Biofuels are any fuel derived from biomass. These are renewable sources of fuel, unlike other natural resources such as petroleum, coal and nuclear fuels. Used as motor fuels, these can be used in compression-ignition and spark ignition engines with no major modifications. Bio fuels are also biodegradable, nontoxic and free of sulfur and aromatics. These are also inexhaustible and can be produced from locally available agricultural resources. Typically, bio fuels are burned to release its stored chemical energy. The carbon from biofuels however is extracted from the atmosphere by growing plants, so burning does not increase the average amount of carbon dioxide.

Bio Fuels are not a new energy source. It was used in Germany and France way back in 1894 by the then developing industry of internal combustion engines. Brazil utilized ethanol as fuel since 1925. Over the years, however, petroleum became difficult to beat, being considered as a limitless and cheaper resource. The difficulty with petroleum, however, was that very few countries were endowed with this resource. Some countries in the Middle East led in the huge concentration of reserve.

Instability of supply always created a series of petroleum crisis. When oil supply is disrupted, it is always accompanied by a rapid increase in oil prices which threaten a country’s economic and national security. Crude oil prices behave like any commodity with wide swings in times of shortage or over supply. Demand is dependent on the nature of society, technical development, economic cycles and political conditions.

Since 1998, global demand for oil rose by two percent every year. The US Energy Information Administration forecasted that worldwide demand for oil would increase to 60 percent by 2020. In 1994, the Wall Street Journal reported that at current rates of production, proven reserves in 2002 40.6 years of consumption, beyond this point, we are looking at unprecedented supply-demand imbalances. Recent events such as the war with Iraq, violence in Nigeria and terrorist attacks have raised doubts about the sufficiency of oil supplies in the near future.

3. TYPES OF BIO FUELS

There are three types of bio fuels, solid, liquid and gaseous.

3.1 Solid Biofuels

Solid bio fuels come from wood, dried compressed peat, straw and other dried plants, animal waste and from crops such as rice, ground nut and cotton.

3.2 Liquid Biofuels

Liquid bio fuels have three sub classes namely bioalcohols, biologically produced oils and oils and gases produced from various sources. This category includes ethanol and methanol. Methanol is also known as methyl alcohol and wood alcohol. It is water soluble and undergoes all of the reactions of primary alcohol.

While ethanol product is of the same carbon structure worldwide, bio diesels differ from one another in carbon hydrogen structure depending on the raw material source. Europe has rapeseed biodiesel, Canada has canola biodiesel; South Africa has jatropa biodiesel and Malaysia has palm biodiesel. The Philippines has CME coco methyl ester or coconut biodiesel. Tests proved that coco bio diesel is the only alternative bio diesel in the world which is closest to the profile of an ideal of diesel in its natural state (with no additives).

3.3 Gaseous Biofuels

The most prominent gaseous biofuels is bio gas from methane. Methane is produced by the natural decay of garbage or agricultural manure and can be collected for use as fuel. Methane may also be collected from animal manure and human waste. Hydrogen, another gaseous bio fuel can be produced by cracking any hydrocarbon fuel in a reformer or by the electrolysis of water.

4. The Oil Industry in the Philippines

4.1 Industry Structure

At present, the Philippines is almost entirely dependent on fossil fuels for its vehicles. Great strides have been made in generating power from non traditional sources such as geothermal energy, hydropower and power has also been generated from wind energy, but bio fuels is something new.

Philippine oil industry has been deregulated since 1998 through Republic Act 8479. It is currently dominated by two major oil refining and marketing companies, Petron and Shell Philippines. Caltex Philippine, a unit of Chevron Texaco of the United States, converted its oil refinery into an import terminal in 2003. The Philippine National Oil Company jointly owns Petron together with Aramco. PNOC and Aramco each have a 40 percent share in Petron while the public hold the balance of 20 percent of the shares. (Department of Energy, 2007)

Petron is the biggest oil company operating a 180,000 bbl/day refinery and over 1,200 gasoline stations all over the country. Shell operates at 110,000 bbl/day refinery and over 800 gasoline stations all over the country. Caltex owns two import oil terminals and operates 850 gasoline stations all over the country.

Caltex was the first to build an oil refinery in the country in 1954. This was followed by Stanvac which built the biggest oil refinery in the country today the Bataan Refining Corporation. In 1973, PNOC acquired ESSO Philippines, Inc., and majority equity interest in the Bataan Refining Corporation (BRC). Shell started operations in July, 1962 and a local player, Filioil started operating in September, 1962. There are currently 3,472 registered gasoline dispensing stations, 182 LPG refilling plants, 28.30 MB storage capacity for oil and 16 MMB storage for import and exports. There is a pipeline transporting oil from refineries in Batangas to Manila. (Department of Energy, 2007)

At present, there are only two new players in the industry actively promoting and distributing bio fuel additives. Flying V sells pre blended bio diesel and bio diesel additives and Seoil, which sells gasoline blended with ethanol. Two manufacturers, Senbel and Chemrez produce l coco methyl ester. Senbel sells additives through deaers and Chemez provides coco methyl ester blended into regular diesel by Flying V.

4.2 Deregulation in the Oil Industry

Republic Act 8479 which deregulated the oil industry promoted a free market atmosphere to the industry. It liberalized the downstream oil industry, established uniform tariff codes on imported crude oil and refined products, promoted fair trade practices encouraged retail competition and encouraged entry of new players in the industry, In a span of eight years, a total of 601 new players entered the market, bringing in total investments of P28.4 billion. These new players already posted a market share of 15.3 by 2005. (Department of Energy, 2007)

4.3 Stockpiling in the Oil Industry

Stockpiling is practiced in developed countries to address supply disruptions. “Strategic stockpiles” act as reserves and are released in periods when supply is disrupted. Generally only crude oil is maintained in strategic stockpiles. Finished products deteriorate faster giving rise to a “commercial stockpile” which has shorter turnover. (Department of Energy, 2006)

A number of issues have to be resolved regarding a stockpile for ASEAN. These are the following;

1. Program Management;
2. Composition of stockpile;
3. Storage method and location;
4. Stockpile ownership
5. Cost of storage facility

There have been calls for an energy stockpile to cushion effects of possible disruptions in oil supply due to political uncertainties in major l sources of oil such as the Middle East. In August, 2006, Philippine Energy Secretary Raphael Lotilla proposed a clearer understanding of policies among ASEAN countries on oil stockpiling to maintain regional oil supply security during the ASEAN +3 meeting which was held in Laos. Participating countries, including the Philippines should be clear on the common purpose of stockpiling. (Department of Energy, 2006)

Stockpiling of oil has been advocated in the past. IN 2004, Japan's Minister of Economy, Trade and industry offered to provide financial assistance to conduct feasibility studies on stockpiling. A similar study was done for the Philippines and Thailand in 2004 and for Vietnam in 2005. A similar study was done for the Philippines by the US Department of Energy in 2004. (Department of Energy, 2006) Please refer to Table 1

Table 1
Petroleum Stockpiling Capacity in the Philippines

Depots	Number	Capacity
Majors	72	6.267
Others	47	2.115
Import/Export Terminals	3	3,011
Subic/ Olongapo	1	2,334
Clark/Pampanga	1	386
SGEI-Tabangao-Batangas	-	290
(Refinery, Crudes & Products)	-	14,477
Petron, LImay, Bataan	-	8,959
Shell Tabangao, Batangas	-	5.518
Total	-	25,869

Source: Department of Energy, Downstream Oil Industry, http://www.doe.gov.ph/down_petro/default.htm

4.4 Relocation of the Pandacan Oil Depot

The relocation of the Pandacan Oil Depot as ordered by the Philippine Supreme Court will have significant effects on the plans to stockpile bio fuels in the Philippines. In a landmark decision the Philippine Supreme Court in March, 2007 decided to order the immediate implementation of the Manila City Ordinance No. 8027 which reclassified the Pandacan Oil Depot from industrial to commercial and directed the owners and operators of businesses disallowed under Section 1 to cease and desist from operating their businesses within six months from the date of effectivity of the ordinance. Among the businesses situated in the area are the so-called “Pandacan Terminals” of the oil companies

Caltex (Philippines), Inc., Petron Corporation and Pilipinas Shell Petroleum Corporation. (Supreme Court, 2007)

The three oil companies operate the depot, which can currently hold about 170 million liters of oil, supplies half of the country's fuel requirements and 90 percent of Metro Manila's.

Senator Mar Roxas noted the apprehension of consumers that the relocation costs involved in the transfer of the oil depot will be passed on to them by the country's top three oil companies, namely, Petron Corporation, Pilipinas Shell Petroleum Corporation, and Chevron (formerly Caltex). (Senate of the Philippines, 2007)

4.5 Storage of Bio Fuels

There has been no comprehensive study on the storage of bio fuels. At present, coco methyl ester or bio diesel is the only bio fuel being utilized in the Philippines. There are storage depots of coconut oil, but these are not enough for a stockpile. Coconut oil needs to be stored out of direct sunlight. If exposed to high temperatures, the oil the heat can slow the oil's potential from becoming rancid. In tropical climates the oil is not refrigerated and is stored in liquid form while in colder climates, the oil solidifies. (Encyclopedia of Product Reviews, 2006)

5. BioFuel in the Philippines

5.1 Bio Diesel

Diesel may be mixed with bio fuels to form bio diesel. Between one to twenty percent bio fuels maybe mixed with diesel from fossil fuels to form bio diesel. The most widely used raw material for bio diesel is obtained from coconut. Jatropha has also been found to be a raw material for bio fuels to be mixed with fossil fuels.

5.2 Bio Diesel from Coconut

At present, bio diesel in the Philippines is obtained from coconut oil. This is called the coco methyl ester or coco diesel. This is being produced by two companies, Senbel Fine Chemicals and Chemrez Inc. The bio diesel that they sell is commonly called coco diesel. Senbel sells its bio diesel as a fuel additive and Chemrez sells its bio diesel both as fuel additives and in a pre blended formula through Flying V, one of the independent petroleum dealers.

Chemrez plans to sell 340.91 million new shares at P4.0 per share. The offer is equivalent to 24.4 percent of the firm's outstanding capital after the stock sales.

Proceeds from the offer, roughly to P1.43 billion will be used to retire the firm's obligations, wipe out its bank loans and partially finance its working capital requirements. (Sanchez, 2006)

Coconut oil remains the primary raw material for bio diesel in the Philippines. Indonesia, Philippines and India dominate world coconut production. They jointly account for 73% of world coconut production. The Philippines continues to export coconut products which have low value such as copra and crude coconut oil. Thailand whose land planted to coconut is only 10% the size of land planted to coconut in the Philippines earns more from coconut products because the produce and export higher value processed products made from coconut. Please refer to Table 2 below:

Table 2
Top Ten Producers of Coconut in the World in 2005

Country	**Value (In US$1,000)**	**Volume (MT)**
Indonesia	1,474,172	16,300,000
Philippines	1,311,380	14,500,000
India	859,180	9,500,000
Brazil	274,380	3,033,830
Sri Lanka	176,358	1,950,000
Thailand	135,660	1,500,000
Mexico	86,732	959,000
Vietnam	85,014	940,000
Malaysia	64,212	710,000
Papua New Guinea	58,786	650,000
Production in In $1000 have been calculated based on 1999-2001 international prices.		

Source: Food and Agriculture Organization
http://www.fao.org/es/ess/top/commodity.html?lang=en&item=249&year=2005

Production of coconuts rose modestly compared with other oilseeds due to its being a perennial crop as compared to other oilseeds such as rapeseed whose output can be more flexible depending on the world market.

In the Philippines, hectarage devoted to coconuts as well as production of coconuts increased. As 2004 a total of 3,259 hectares are planted to coconuts compared to 3,217 the previous year. The number of nut bearing trees has likewise increased.

Table 3
Philippine Coconut Situation

Year	Area	Bearing Trees	Nuts Gathered
1990	3,112	302,297	11,941,960
1991	3,093	301,796	11,292,500
1992	3,075	298,705	11,580,400
1993	3,076	294,850	11,669,480
1994	3,083	298,556	11,837,160
1995	3,095	301,310	12,790,840
1996	3,149	304,331	11,936,720
1997	3,134	302,940	13,707,837
1998	3,116	301,077	12,806,429
1999	3,138	299,749	11,589,010
2000	3,144	300,833	12,994,654
2001	3,149	297,439	13,146,052
2002	3,182	312,944	14,068,495
2003	3,217	324,325	14,294,203
2004	3,259	331,466	14,366,164

Source: United Coconut Association, Coconut Statistics

It is estimated that there would always be a supply of coconut oil to convert into coco methyl ester or CME if the bio fuels bill mandating a one percent blend of CME to diesel is implemented. The Philippines exports an estimated one billion liters per year of coconut oil. The projected demand for diesel is 6.6 billion liters per year. When the Bio Fuels Bill is implemented mandating a one percent blend of coco diesel and 99 percent blend petroleum based , diesel is implemented, this would mean only 6.6 million liters of coconut oil would be diverted to production of coco diesel. Please refer to Table 4.

Table 4
Potential Demand and Supply of Bio Diesel

RP Diesel Demand	6.6 billion liters per year
RP Coconut Oil Export	1.0 billion liters
1% Coco bio diesel as diesel blend	6.6 million liters
% of Coconut Oil Exports	6.6%

Source: Asian Institute of Petroleum Studies, as cited by United Coconut Association of the Philippines

Four groups of products dominate the coconut trade in the international market. These are coconut oil, copra meal, dessicated coconut and oleochemicals. Apart from these, there is a wide range of coconut products and by products like coconut shell charcoal, coconut water, coconut milk, coir products, coconut vinegar, coconut sugar, coconut wine and others.

Other plants which will extract bio diesel from coconut are being built. Aurora province ventured into biofuel production through a partnership with the Bureau of Post Harvest Research and Extension (BPRE), the Department of Science and Technology (DOST), the Department of Agriculture (DA), the Philippine Coconut Authority (PCA), the lone district congressional office, the provincial government and the Aurora State College of Technology (ASCOT).

Under the agreement, the provincial government, the congressional district office and the BPRE would provide the funding and manpower requirements for the installation, establishment and maintenance of the coconut biofuel project. The ASCOT would utilize its existing coconut oil mill, facilities and location for the adoption of appropriate technologies for the production of coconut biofuel as well as the sourcing of the raw materials for the project. (Galvez, 2006)

5.3 Jatropha as Another Source of Bio Diesel

The government is looking seriously at jatropha, a plant whose seeds contain 28 percent oil that is almost the same grade as diesel fuel. Jatropha oil can be used as a fuel for cooking, lighting and even as fuel in diesel engines. One major advantage of utilizing jatropha for bio diesel is that it cannot be used as food, unlike coconut. Utilizing coconut as bio diesel will divert part of its production from food uses and increase prices of coconut based food such as cooking oil.

The Philippine National Oil Company Energy Development Corp. (PNOC-EDC) has a jatropha project in Cabangcalan, Negros Occidental in which three varieties of the plant have been grown side-by-side to determine which one to use in Philippine plantations. The government has big plans for jatropha plantations. A Korean firm signed an agreement with PNOC for a 120,000-hectare plantation.

Jatropha is a hardy tropical and subtropical plant with an economic life of 35 years and thrives well in marginal soil, sandy, gravelly, or saline soil and high temperatures don’t bother it. The Tuba-Tuba needs little or no maintenance and grows quickly (the first shoot appears within six days of planting). The "energy" tree’s natural low-maintenance cost, let alone the soaring prices of fossil fuels ensures the viability of its commercial cultivation. Expected yield is 250 kilos per hectare on the first year and 1,000 kilos in the second year and as much as 6,000 kilos by the sixth year onwards when the plantation has fully matured. Five tons of seed can produce two tons of biodiesel, about 2,300 liters. (Paredes 2006)

5.4 Bio Gasoline

Sugar cane and sweet sorghum are two sources of bio gasoline from the Philippines. There are petroleum dealers are currently utilizing ethanol imported from Brazil and Australia. There are plans to extract fuel grade ethanol from sweet sorghum.

5.4.1 Bio Gasoline from Ethanol Derived from Sugar Cane

Seaoil Philippines and Eastern Petroleum are selling gasoline with a ten percent blend of ethanol. Seaoil started selling this blend since 2005. One of the problems cited by its Chief Executive, Glenn Yu is the myth among Filipino motorists that ethanol may harm their engines.

At present there is no fuel grade ethanol produced in the Philippines. Ethanol in the Philippines will be sourced from sugarcane. The British firm, Bronzeoak Ltd, in partnership with the National Development Corporation is building the e San Carlos Bio-Energy Inc. (SCBI) plant. It is an integrated facility that will have a capacity of 100,000 liters of bio-ethanol a day in its distillery plant. It will also have a cane milling plant with a throughput capacity of 1,500 metric tons of cane daily, as well as a co-generation power plant that will produce around nine megawatts of power, of which four megawatts will be sold to the main power grid It will start commercial operations next year.

Through its local unit Bronzeoak Philippines Bronzeoak Ltd. will spend P1.5 billion to construct a dedicated ethanol plant in the southern province Bukidnon. It purchased a 24-hectare lot in the village of Labuagon in Kidawe town, in the southern part of the province, in preparation for the plant's construction. The plant would have a capacity of 150,000 liters a day, bigger than a plant Bronzeoak is building San Carlos City in Negros Occidental. (Ho, 2006)

The Board of Investments recently approved incentives for JG Summit Holdings which is building a distillery to produce fuel grade ethanol in Negros Occidental. It has a projected capacity of 32 million liters per year and is expected to be operational by October, 2009.

5.4.2 Bio Gasoline from Sweet Sorghum

There are plans to extract bio gasoline from sweet sorghum. A team of investors together with government authorities led by Presidential Assistant for Northern Luzon Enrie Mendoza is mapping out the establishment of the country's first sweet sorghum ethanol plant which may even turn out to become the country's first ethanol plant. Sweet sorghum has a lower ethanol production cost of P13.11 per liter against sugarcane's R14.98 per liter. Unlike sugarcane, which is a one-year crop, sweet sorghum can be harvested two to three times a year.

Water requirement may be one-fourth less with only 8,000 cubic meters over two crops compared to 36,000 cubic meters for sugarcane. Sweet sorghum ethanol productivity is at 3,200 liters per year at 80 metric tons per hectare millable stalk over two crops at 40 liters ethanol yield. (Sun Star, 2006)

5.5 Flexible Fuel Vehicles Manufactured in the Philippines

Ford Motors Group is concentrating on the promotion of its biofuel vehicles to gain acceptance in the Asian region. Ford Philippines demonstrated its commitment by investing P1.1 billion to set up an engine plant within its Santa Rosa, Laguna manufacturing facility. This is the first in ASEAN and makes the Philippines the ASEAN Center for Excellence in flex fuel vehicle (FFV) technology. As of late 2006, Ford is the only car manufacturer in the country offering flex fuel vehicles in the form of Ford Focus 1.8L and 2.0L which are sold in the Philippines and in ASEAN markets. (Magkilat, 2006)

5.6 Exports of Coco Diesel

Bio fuels commonly known as coco methyl ester has been exported from the Philippines since. 1995. Before the increased interest in bio diesel, coconut methyl ester existed as an intermediate oleochemical product which was further processed into coconut fatty alcohol or fatty acids for use as material for surface active agents. (UCAP 2005) CME exports started with a volume of 5,545,064 kgs and FOB value of P4,440,000. The value of coco diesel exports has decreased to 1,403,837 kilograms with a value of P1,166,895. Only two companies, Senbel and Chemrez are presently exporting coco diesel. Please refer to Table 5:

Table 5
Exports of Coco Methyl Ester from the Philippines

Year	Volume (MT)	Value (Int US$1000)
2005	1,403,837	1,166,895
2004	826,555	878,119
2003	755,013	874,295
2002	732,868	442,490
2001	1,274,355	712,283
2000	1,182,253	979,890
1999	1,361,108	1,324.707
1998	1,161,792	928,775
1997	3,374,400	3,279,133
1996	4,106,541	4,173,093
1995	5,645,064	4,440,010

Source: Department of Trade and Industry, Republic of the Philippines

When the Philippines started exporting coco diesel in 1995, ninety-nine percent of its exports went to Japan. In recent years, however, Germany started to buy bigger quantities of coco diesel. Please refer to Exhibit 1.

5.7 Local Market for Coco Diesel

Coco diesel is presently being sold in the local market. Senbel sells its coco diesel with the brand name Estrol through a network of dealers. It does not have a tie up with a petroleum company. It also sells 2T coco oil which is specially designed for tricycles.

Chemrez sells its coco diesel with the brand name “Bio Aktiv” and “Envirotek” through service stations of Flying V, an independent petroleum dealer, Shell and Petron. Chemrez sells coco diesel in 200 ml and 1 liter plastic containers through Flying V service stations and through dealers. It also sells pre blended mixture of coco diesel and petroleum derived diesel. Among the three oil companies selling bio diesel additives in their outlets, Flying V has the most extensive network of service stations selling the product. Forty of the 126 service stations of Flying V in Ilocos and Metro Manila sell bio diesel blended with diesel. These blends have a composition of one percent coco diesel and ninety percent fossil fuel diesel.

The government became a market for bio diesel was developed when it was ordered that government offices had to utilize a one percent blend of coco bio diesel in their land vehicles. President Gloria Macapagal Arroyo issued Memorandum Circular No. 55 on February 9, 2004 which required the use of 1% CME-diesel blend in the diesel requirements of all diesel-fed land vehicles of the government. Please refer to Exhibit 1.

During an interview with executives of Chemrez and Senbel, it was learned that prices of bio diesel were higher in the Japanese export market than in the local market. Some of the bio fuel dealers of Senbel ran out of stocks of coco diesel.

5.8 Local Prices of Bio Fuels

Prices of coco diesel are higher than the prices of petroleum based diesel. At Flying V where coco diesel is pre blended with petrol based diesel, it costs P38.80 per liter compared with P30.08 per liter of pure petroleum based diesel as of October, 2006. Please refer to Table 6 at the next page for a comparison of the prices.

Table 6
Local Prices of Bio Diesel Additives

	Senbel	Flying V
1 liter	P 86.60	P 130.00
20 liters (in carbuoys)	67.20	
200 liters (in drums)	62.62	

6. Manufacture of Bio Fuels

Bio fuels can be used as a pure fuel or blended with petroleum in any percentage. B20 (a blend of 20 volume of bio diesel with 80 percent b volume of petroleum diesel) demonstrated significant environmental benefits with a minimum increase in cost for fleet operations and other consumers. (TWG, Ethanol Program Consultative Committee, 2006)

6.1 Process of Deriving Coco Diesel from Coconut Oil

In the petroleum industry, the ideal diesel is referred to as 10% n paraffin, straight carbon chain known as “alkane”, a saturated carbon chain. Saturated carbon means that it is not prone to oxidation and bacterial growth. Saturated carbon has excellent anti corrosion properties and is resistant to polymerization or gumming. An ideal diesel requires little or no anti oxidant additive had has excellent combustion characteristics.

The ideal petroleum diesel, is however unattainable because commercial diesel fuel contains a blend of components like “cracked” diesel which have lower oxidation characteristics. Typical blend elements are oleins, iso-paraffins, and aromatics. These make the fuel a bit difficult to burn. It is also prone to oxidation, bacterial growth, corrosion, polymerization and gumming, clogging the fuel line. This is the reason why additives are mixed with diesel fuel formulations, to make a distinction between competing brands of diesel fuels and make this more effective.

Coco diesel is sourced from coconut oil by removing glycerine. The process of separation of glycerine from fatty acid is known as esterication. Methanol is reacted with coconut oil with the aid of a catalyst. Glycerine is then drawn out of the mixture, leaving just the fatty substance known as methyl ester. Coconut methyl ester is a diesel like derivative of coconut oil after its glycerine content has been separated. (Diaz and Galindo, 2006)

6.2 Advantages of Coco Diesel

The medium carbon fatty acid (MCPA) of coconut has excellent solvency solubility. This makes it ideal for Third World countries where there are many old diesel engines in use. Heavy carbon soot deposits or partially clogged fuel nozzles will be cleansed and declogged.

The high level of saturation in coconut oil (91%) consisting of "easy to burn" medium saturated carbon chains gives the following benefits:

1. oxidation stability making coconut methyl esters not prone to bacterial growth, corrosion and polymerization (an issue with other bio fuels)
2. high octane number which enhances combustion and acceleration response
3. lower emissions for cleaner air

7. Cross Country Comparisons of Bio Fuel Programs

7.1 Pioneers in Bio Fuels

Brazil and the United States spearheaded the setting up of a national ethanol program. The two countries set the regulatory and trade framework conducive to the growth of the ethanol fuel industry. Ethanol is produced from molasses and sugar cane juice.

7.1.1 Brazil

Brazil is considered as the world's leader in production and consumption of ethanol. It produced 14.4 billion liters or 11.52 million tons of sugarcane for ethanol in 2004. it exported 2.3 billion liters of ethanol to India, United States and the Caribbean. Out of the projected 41.3 billon liters of ethanol to be produced, 67% is projected to be consumed by Brazil. Brazil uses ethanol as an octane enhancer in gasoline in the form of 22 percent any hydrous ethanol.

Brazil started using ethanol with substantial official support in 1975 as a reaction to the oil crisis of 1973. During its initial stages of production, it produced ethanol at a high cost. Competitive prices were secured only during upset conditions in the world's petroleum supply.

The government gave all out support for production of ethanol. These incentives ranged from guaranteed purchase of ethanol by the state owned PETROBAS, guaranteed prices for ethanol, control of ethanol distribution by a state owned company and giving incentives for construction of distilleries including credit guarantees and low interest loans to reach the needed capacity.

The Brazilian government started a bio diesel program in the city of Curitiba in Parana State. The production of biodiesel from low-quality coffee, from the oils extracted from urban runoff, or from cattle fat is a pioneering initiative in Brazil, where efforts are under way to diversity the raw materials used as clean fuels, the consumption of which is on the rise. (Osava 2006) Under the Brazilian system for the voluntary addition of two percent biofuel to petroleum diesel (B-2), the demand currently stands at about 800 million litres annually. This mixture will be obligatory beginning in 2008, and the proportion will rise to five percent in 2013, driving up total biodiesel consumption to an estimated 2.5 billion litres a year.

Coffee beans of lower quality, which represent about 20 percent of the national coffee harvest, are emerging as an alternative raw material for biodiesel.

There was a crisis in the ethanol program in the 1980's to the 1990's. The crisis was caused by the lower prices of oil, recovery of sugar prices and the decline in interest in specialized ethanol cars running with hydrous alcohol and the emergence of any hydrous ethanol as against hydrous ethanol.

The period between 1997 and 1999 saw the liberalization of Brazil's Proalcol Program. The liberalization involved the end of the monopoly of state owned oil company, liberalization of ethanol prices, reduction of subsidies, restriction of State intervention in ethanol-gasoline blending provisions and minor tax reduction for fuel ethanol.

7.1.2 United States

In the early 1990's the Clean Air Act was passed mandating the use of cleaner burning fuels by requiring oxygen level in gasoline of 2.7% by weight in the dirtiest US cities and a 2.0% level in cities with severe ozone problem in order to reduce ground level ozone formation. The Energy Policy Act of 1992 established a goal of replacing 10 percent of motor fuels with non petroleum alternatives by 2000, increasing to 30 percent by 2010. By 1995, 10 percent of Federal vehicles were to be using alternative fuels to set an example. There is a strong lobby from the petroleum industry, but despite this, use of bio fuels increased. (Canadian Renewable Fuels Association, 2006)

United States was the second largest producer after Brazil of ethanol in 2004. It r produced 10.9 billion liters or 8.7 million tons of ethanol of which 97% was fuel ethanol. It produces its ethanol mainly from corn.

During the farm crisis of the early 80's policymakers at the state and federal levels increased tax and production incentives. Income tax credits were given to users as well as producers. Incentives were given to auto manufacturers for producing alternative fuel vehicles. Loans, loan guarantees and grants were given to assist farmers in value added agricultural enterprises including bio fuels.

Soybeans are the leading feedstock for bio diesel in the United States. It is the world's biggest producer of soybeans. The production of biodiesel in the U.S. tripled in 2005 to 75 million gallons from 25 million gallons in 2004. This was spurred on in large part by the Blenders Credit provision in the Energy Bill. A number of public transit fleets have been using biodiesel. Tests indicate production costs for biodiesel are 2.5 times that of petroleum diesel.

A number of public transit fleets started using bio diesel produced from soybeans. An increasing number of school districts also used these for their school buses.

7.2 Asia

Several countries in Asia which have little or no petroleum resources at all have begun bio fuel programs. These are India, Sri Lanka and Japan.

7.2.1 India

Beginning October of 2006, the Indian government plans to make it mandatory for all oil and petroleum companies to blend five per cent ethanol with their products. This will be doubled to 10 per cent by October 2007. .Petroleum Minister Murli Deora directed petroleum marketing firms, Indian Oil Corporation, Hindustan Petroleum and Bharat Petroleum to start acquiring ethanol and begin the blending process by October. Private refiners are expected to follow.

Ethanol has become popular in India, with sugar producers finding it a lucrative alternative. There are about 125 ethanol producers in the country, with a total capacity of 1.25 billion liters of ethanol. Most of them are concentrated in sugar cane growing states like Maharashtra and Uttar Pradesh, but many of them also operate in states like Tamil Nadu, Andhra Pradesh, Karnataka and Gujarat.

Brazilian firmsare tying up with Gill & Co, plan to set up 15 ethanol plants in India over the next two years. Kantilal Shah, managing director, Gill & Co, points out that the Brazilian technology is suitable not just for sugar but even for wheat corn and other agricultural produce.

The Indian government identified jatropha as a source of bio diesel and identified 100 million acres of land for growing jatropha. Jatropha does not require much water, and can be raised in arid, semi-desert areas as well. Experts estimate that the bio-diesel produced from jatropha raised on 100 million acres of land can easily save 20 per cent of diesel consumption in India.

Indian Railways, largest land owner in the country, grows jatropha on thousands of acres of land along both sides of the railway tracks. It hopes to cut its fuel bill, by blending jatropha oil with diesel.

Reliance Industries Ltd, plans to invest $500 million in a bio-diesel refinery near Jamnagar in Gujarat. It also acquired 200 acres of land for growing jatropha.

British Petroleum is investing about $10 million in a bio-diesel facility in India, and plans to grow jatropha in over 8,000 hectares of wasteland. Daimler Chrysler India has completed road trials for its Mecedes Benz, using bio-diesel.
(Kuma, 2006)

7.2.2 Sri Lanka

In a bid to find a solution to the mounting global oil prices Sri Lanka is to manufacture diesel using coconut oil by the end of 2005. This breakthrough product Coconut Diesel is branded as Coco Diesel. The manufacturing would be undertaken by the British Ceylon Company Limited (BCC) which is Sri Lanka's first coconut oil and by product manufacturing company in a joint venture with a Malaysian company.

7.2.3 Japan

Japan is a big prospective market for bio fuels. Due to the fact that Japan imports 60 percent of its food will make it difficult for her produce bio fuels. It has to substitute its dependence on foreign oil producers with dependence on grain producers. In the interest of meeting the Kyoto Protocol commitment to reduce emissions by 6% from the 1990 levels, it has to import ethanol for use in bio fuels. The Government of Japan supports up to three percent ethanol blend. Production is severely limited by Japan’s shrinking agricultural production. (Fukuda, Kingsbury and Obara 2006).

7.3 Europe

Among European countries, Austria and France started their own bio fuel programs. They derive their bio fuels from rapeseed which is grown in their country.

7.3.1 Austria

Austria utilizes rapeseed as feedstock for bio diesel. Rapeseed oil as used as fuels for tractors and as lubricating oils. The Austrian government gives direct subsidies for rapeseed oil. Austrian rapeseed producers are given US$675 per acre as subsidy and growers of other crops which may be utilized as bio fuels receive $225 per acre. Rapeseed methyl ester which will be used for agriculture is tax free.

Bio-energie GmBH which is a combination and interests from private industry and from agricultural cooperatives has a 10,000 Metric ton per year capacity plant in operation at Asheaeh.

7.3.2 France

Bio fuels in France are derived from rapeseed. French rapeseed growers signed an agreement with Elf and Total (the French state owned petroleum companies). The agreement states the amount of rapeseed that the oil companies will buy to incorporate into mineral diesel. The resulting bio fuel blend is five to fifty percent bio diesel. Elf plans to start distribution in 90 filling stations in three French departments.

Robbe in Compiegne operates a 20,000 metric ton per year rapeseed methyl ester plant. There are plans for more plants. The French government expects to get five percent of the diesel market for rapeseed oil methyl ester or 800,000 metric tons of biodiesel annually. (Leysen, 2006)

7.4 ASEAN Biofuel Users

Other than the Philippines, there are countries in ASEAN which have active bio fuel programs. Indonesia which has fossil fuel resources started developing a bio fuel industry. Malaysia and Indonesia utilize palm oil and coconut for their bio fuel industry and Thailand utilizes sugarcane. Among ASEAN countries, Thailand was the first to set up a national bio fuels program.

7.4.1 Indonesia

The Indonesian government plans to invest $1.1 billion to develop eight bio-fuel factories and several jatropha and palm oil plantations, as part of a larger initiative to expand the bio-fuel industry. The proposed factories will produce annually a total of around 36,000 metric tons of bio-fuel derived from jatropha and palm oil, the newspaper reported, citing Industry Minister Fahmi Idris. The project has dual goals of supplying a growing demand for bio-fuel in Indonesia. (Investment Report, 2006)

Although rich in fossil fuels, Indonesia does not have an endless supply with 23 to 25 years of oil, 60 years of gas and 150 years of coal. Jakarta plans to make at least five million hectares of forest lands available for palm oil, jathropa, sugar cane and cassava plantations in a bid to create three million jobs. (Galvez, 2006)

7.4.2 Malaysia

Malaysia recently inaugurated its Carotino palm bio-diesel plant in Pasir Gudang in August, 2006. The Nexsol (M) Sdn Bhd’s bio-diesel plant was also recently inaugurated and the Tanjung Langsat Industrial Complex was declared as a biodiesel park. The world's largest producer of palm oil by far is Malaysia with 48% of world production and Indonesia is the second largest producer with 36% of world production. Together they account for 84% of world production. Malaysian production in 2002/3 rose by 6% to 12.520 million metric tons from 11.856 million in 2001/2. Indonesian production in 2002/3 rose by 8% to 9.480 million metric tons from 8.790 million in 2001/2. (Palm Oil, Commodity Research Bureau, 2006)

7.4.3 Thailand

Gasohol project started in Thailand since 1985 by His Majesty The King Bhumibol to solve problems related to oil supply scarcity and falling crop prices. Now gasohol is promoted by government to Thai people in the point of view to reduction of emitted gas from vehicles that cause air pollution. The government through Ministry of Energy continues to campaign the use of more and more gasohol by offer gasohol price at 1.50 baht/liter lower than gasoline.

Thais see the need for alternative products from sugarcane because of the perennially low prices of sugar in the old market where a big volume of Thai sugar production is sold.

Through the initiative of the Thai Sugar Board, the Thai Ethanol Committee was organized to create alternative products from sugar cane. This committee is composed of representatives from the following:

1. Ministry of Energy
2. Ministry of Industry
3. Ministry of Finance
4. Ministry of Agriculture
5. Ministry of Interior
6. Defense Department
7. Department of Excise Tax
8. Secretary General of the Cane and Sugar Board
9. National Economic and Social Development Board

Incentives have been granted for production of ethanol in Thailand. These range from reduction of value added taxes. Exemption from income tax, investment incentives and exemption from contributions to the fuel stabilization fund.

As of 2003, two distilleries are producing the supply requirement for a ten percent gasohol blend with ethanol. One is using tapioca and the other molasses as feed stocks. Two companies, PTT and Bangchak, distributed gasoline blended with gasoline.

Thailand was the first country to launch bio-diesel as a national program on July 10, 2001. In 2006, several bio-diesel plants are operating in Thailand using the excess palm oil/palm stearin and in some cases, waste vegetable oil as raw materials. About 15 petrol stations are now distributing B5 (5% bio-diesel with 95% diesel) in Chiangmai and Bangkok (SIRIMANE, 2006).

8. ASEAN as a Center for Bio Fuels Production in Asia

ASEAN countries rank among the top twenty world producers of the following feedstocks used in bio fuel production:

1. Coconut
2. Sugar Cane
3. Cassava
4. Palm Oil

8.1 Coconut

Six ASEAN countries are among he top twenty producers of coconut in the world. These are Indonesia, Philippines, Thailand, Vietnam, and Malaysia. based on its order of importance, most of the coconut in these countries is used as food, particularly as cooking oil. Please refer to Table 8.

The coconut palm (*Cocos nucifera, L.*) has multifarious uses. It is often described as a tree of life and is one of the most important crops in the tropics. It is also considered as one of the world's most beautiful trees. All parts of the coconut can be manufactured into commercial products. The coconut provides food, shelter and fuel especially in countries in Asia and the Pacific where it is abundantly grown.

Indonesia is the world's leading producer of coconut. The 1999 total area coconut plantation in Indonesia was 3.712 million hectares. The industry is dominated by smallholders coconut plantations (96,6%) and large estate companies (3.4%). Coconut plantation spreads all over Indonesia, in 1999 from the total area of 3,712 thousand ha, there one 1,222 thousand ha (32.9%) in Sumatera, 903 thousand ha (24.3%) in Java, 305 thousand ha (8.2%) in Bali, NTB, NTT, 277 thousand ha (7.5%) in Kalimantan, 716 thousand ha (19.3%) in Sulawesi, and 289 thousand ha (7.8%) in Maluku and Irian Jaya.

Indonesia exports coconut products to USA, Netherlands, United Kingdom, Germany, France, Spain, Italy, Belgium, Ireland, Singapore, Malaysia, Bangladesh, India, Sri Lanka, China, Taiwan, South Korea, Thailand, and other countries. The industry which use coconut products are cooking oil, refined coconut oil, desiccated oil, food, beverages, and other industries. Only around 45% is processed for coconut oil, 45% fresh consumption, and 10% are for the others. The lack of coconut oil is substituted by palm oil.

The Philippines is second to Indonesia as the world's top producer of coconut products. The Philippines, however is the top exporter of coconut products, about 64% of the world's copra & coconut oil comes from the Philippines. 25% of the country's 12 million hectares of agricultural land is planted with coconuts. There are 3.5 million coconut farmers and about 25 million people who benefit from the coconut industry (directly & indirectly) and not surprisingly, coconut product exports is one of the top 5 dollar earners for the county (U.S. $760 M p.a.). The coconut industry contributes about 1.14% of the Gross National product (GNP). ((Philippine Herbal Medicine Site, 2007)

Thailand is the third largest producer of coconut in ASEAN and ranked as the sixth largest producer of coconuts in the world. Most of the coconut areas in Thailand are found in the peninsular provinces and in the shores of the Gulf of Thailand. Coconut farms in Thailand are primarily smallholder type with a mean farm size of 2.4 hectares, 80% or more of the holdings being less than 2 hectares. Please refer to Table 7.ring the period 1970-1992, the coconut area ranged between 320,000 and 412,000 hectares and is expected to remain stable up to year 2000. The country estimates the present age structure of coconut palms at 60% of the population between 15 and 40 years old, 10% immature or non-bearing and the remaining 30% mainly senile palms. Typhoons also hit the prime coconut producing areas in Southern Thailand and cause massive felling of trees. Some of the country's coconut area is also converted into the production of other more profitable crops or into housing development projects. (Food and Agriculture Organization Resource Directory, 2006)

Vietnam is the fourth largest producer of coconut in ASEAN and ranked as the eighth largest producer of coconuts in the world. The coconut industry in Vietnam contributes to the economic welfare of 10 million Vietnamese. It provides direct employment to some one million people. In 1957, the country had 31,540 hectares planted to coconut which increased to 40,800 hectares in the early 60's. Due to war damage, coconut area decreased to about 35,000 hectares in the early and mid 1970's. The area under coconut henceforth increased reaching a peak of 350,000 hectares in 1990 and drastically declined to some 186,000 hectares in 1995. The decline in area was due to the shift in land use from coconuts to fruit trees. Coconut cultivation has been steadily declining in Malaysia in recent years, resulting in a down trending outlook for copra.

Domestic coconut oil output amounted to 36,000 metric tons (MT) in 2003 mainly for the export market, reckons the U.S. agricultural attache here. Coconut oil accounts for only about 1% of total domestic oil consumption. Malaysia imported 135,000 MT of crude oil from Indonesia and the Philippines in 2003. Exports of refined coconut oil reached about 166,000 MT with major markets being Sri Lanka, China and Singapore

Of the total area under coconut, 73% is located in the 9 provinces of the Mekong delta. As a matter of national land policy, private coconut holdings in Vietnam are limited to 0.5 hectares or less, with 60% smallholders, 30% cooperatives and 10% state farms. Since nearly 65% of the area under coconut has been planted after 1983, the majority of the palms are relatively young; senile palms are estimated to be about 10%.

Vietnam's coconuts once chopped down or abandoned due to e a shortage of outlets for such products in the Mekong delta region and Vietnam's central provinces, are being revived through the high profits brought about by the export of coconut products.

Vietnam now expects to become one of four leading coconut exporters in the world, aside from the Philippines, Indonesia and Sri Lanka, with its products available in 46 countries and territories. A rise in the price of raw coconut due to exports to China and Thailand and the resultant nut shortage threatens to put domestic processors out of business. *(Thanhmien News, 2006)

Products made from coconuts for export now more varied compared to several years ago, when only unprocessed fresh and desiccated coconuts were exported to China. Besides copra for the food processing industry, farmers use coconut covers, shells and juice for producing coir fiber, an activated carbon and jelly that bring high profits. (Asia Times, 2004)

Malaysia is the fifth largest producer of coconut in ASEAN and ranked as the ninth largest producer of coconuts in the world. Coconut ranks fifth in Malaysia's agriculture in terms of cultivated area with oil palm and rubber occupying the greater portion. The coconut industry, however, still plays an important role in the country's economy providing livelihood to some 100,000 farm families or almost 10% of the nation's farming community.

In terms of area planted, the highest level was attained in 1982 at 363,000 hectares. Since 1986 at 330,000 hectares, the area planted to coconut was observed to be at a generally decreasing trend reaching to 315,000 hectares level in 1992 and down to 290,000 hectares in 1995.

Coconut in Malaysia is generally a smallholder's crop with 91% under smallholder cultivation and 9% under estate management. Of the total area planted to coconut, 63% is located in Peninsular, Malaysia, 19% in Sabah and 18% in Sarawak. With increasing labor shortage, decreasing productivity of palms and massive conversion of coconut lands to oil palm plantation and other more profitable crops, a continuous decline in coconut area at a rate of 2.5-3.5% per year to some 285,000 hectares towards year 2000 is projected. It was estimated that about 32% of the total plantings are now well over 60 years old. Malaysia is a net crude coconut oil importer. It imported 135,000 MT of crude oil from Indonesia and the Philippines in 2003. Exports of refined coconut oil reached about 166,000 MT with major markets being Sri Lanka, China and Singapore. (STAT Communications Ltd., 2004)

Table 7
Top 20 Coconut Producers in the World

Rank	Country	Production (Int $1000)	Foot Note	Production (MT)	Foot note
1	Indonesia	1,474,172	C	16,300,000	F
2	Philippines	1,311,380	C	14,500,000	F
3	India	859,180	C	9,500,000	F
4	Brazil	274,380	C	3,033,830	
5	Sri Lanka	176,358	C	1,950,000	F
6	Thailand	135,660	C	1,500,000	F
7	Mexico	86,732	C	959,000	F
8	Viet Nam	85,014	C	940,000	F
9	Malaysia	64,212	C	710,000	F
10	Papua New Guinea	58,786	C	650,000	F
11	Tanzania, United Rep of	33,463	C	370,000	F
12	Myanmar	31,654	C	350,000	F
13	Vanuatu	28,489	C	315,000	F
14	Ghana	28,489	C	315,000	F
15	China	22,610	C	297,500	F
16	Solomon Islands	24,961	C	276,000	*
17	Mozambique	23,967	C	265,000	F
18	Côte d'Ivoire	21,706	C	240,000	F
19	Dominican Republic	16,279	C	180,000	F
20	Jamaica	15,375	C	170,000	

No symbol = ***official figure*** *** =** ***Unofficial figure***
F = ***FAO estimate*** **C =** ***Calculated figure***

Production in Int $1000 have been calculated based on 1999-2001 international prices

Source: Food and Agriculture Organization Major Food and Agricultural Commodities Producers., http://www.fao.org/es/ess/top/commodity.html?lang=en&item=125&year=2005

8.2 Sugar Cane

Four ASEAN countries, Thailand, Philippines, Indonesia and Vietnam are among the top twenty producers of sugar cane in the world. Only two of them, Thailand and the Philippines have been net sugar exporters in recent years. Vietnam, however, has a rapidly expanding area devoted to production of sugar cane. Indonesia also has an established sugar industry and refining capacities which may be expanded. Please refer to Table 8.

Among ASEAN countries, Thailand is the biggest sugar producer. It ranks the fourth largest producer of sugar in the world and is a net exporter of sugar. During the first half of the nineties, sugar exports averaged 3.1 million tons per year, nearly double the level of exports during the first half of the eighties. This upward trend in exports has been spurred by growing regional markets, higher domestic production, low internal consumption relative to total production, and favorable export policies.

Due to freight cost advantages and reliable services, sugar has become increasingly important in growing Asian regional trade. According to trade sources, sugar moves from Thailand to the major regional buyers China, Japan, the Republic of Korea, and Malaysia, with a freight advantages over Western Hemisphere sugar making. (FAO, 1997)

According to international sugar production cost analysts, Thailand ranks among the world's lowest cost producers. Efforts to expand cane production to match milling capacity should enhance this status. In the long run Thailand's future as a very low-cost producer is not certain in view of sharply increasing land costs reflecting rapid industrialization and rising labor costs.

The Philippines is the ninth largest sugar producer in the world and the second biggest producer in ASEAN after Thailand. Sugar cane as a commercial crop started in the Philippines in the 18th century. By the 19th century the crop became a major commodity for export. By the 20th century, the growing needs of America for sugar fuelled a major expansion of the crop. This, together with new technology in sugar milling and the provision of adequate financing, created what is now known as the Philippine sugar industry.

Negros Occidental is the “Sugar Capital of the Philippines.” It accounted for 43% of total sugar produced in the Philippines in 2003. This is explained by factors such as soil suitability, complemented by regular monsoon rains. The other top producing provinces during the period were Bukidnon, which producred 13 %, Negros Oriental, 8%, Batangas, 7% and Tarlac which produced 4% during the same period. (Department of Agriculture, 2004)

The industry’s performance has been marked by production fluctuations. The country was a net importer from 1999 to 2002 and was a net exporter in 2003.

While climatic factors do play an important role, it is felt that the major cause has been due to fragmentation of farms to smaller production units which are highly dependent on yearly price fluctuations and do not have the financial resources. Moreover, the lack of capability to restore full production in many areas and the inability to improve productivity have been attributed to a lack of research, development, and extension

The sugar industry through a consortium of sugar millers and National Sugar Refining Company (NASUREFCO) founded the Philippine Sugar Research Institute Foundation, Inc. (Philsurin). Initial funds from them came to P9.76 million eventually regularly augmented from a P2 levy per bag of sugar produced. Philsurin analyzed the causes of low productivity. These were the limited use of high-yielding varieties, pests and diseases, low ratooning due to RSD (ratoon stunting disease), improper fertilization, harvesting immature canes and delay between cutting and milling. There were more than enough tasks to undertake for these problems.

Philsurin cooperated with UPLB and other entities, including foreign sugar research and development groups. It has developed high-yielding varieties and massively distributed them. It has come up with biotechnology that will soon replace chemical fertilizers that are expensive and cause unwanted side effects. It took over the Victorias Milling Corp.'s sugar-breeding station and turned a l2-hectare area into a state-of-the-art experiment station with cutting edge equipment, nurseries, greenhouses and micropropagation facilities which, with its investment in scientific personnel, started to make waves in the development of new varieties of cane, new ways of enhancing their growth with selection of which to distribute. The new varieties have high sugar content, high tonnage and resistant to disease.

Indonesia is the 11th largest sugar producer in the world in 2005 and the third largest producer of sugar in ASEAN after the Philippines. It's sugar industry dates back to the seventeenth century. Indonesia harvests about 400 000 hectares of cane for centrifugal sugar, of which almost three-quarters is on Java. The remainder comes from Sumatra, Kalimantan and Sulawesi islands. Since 1967, Indonesia reverted to a net importer position. The national sugar policy seeks to encourage the intensification of production, the rehabilitation of factories in Java and establishment of new factories outside Java to meet growing domestic requirements due to steady population growth, rising incomes and the growth of the food and beverage industries.

A major challenge facing the Indonesian sugar industry is the extent to which domestic production can be expanded. Despite dynamic growth in output between the early-eighties and the early-nineties, in more recent years production of sugar appears to have stabilized reflecting the emergence of constraints at both the agricultural and industry level. This resulted in substantial increases in net import requirements.

Competition for land, particularly irrigated areas, from other crops and livestock production and increasing urbanization in densely populated Java, resulted in a shift in the cultivation of sugarcane to non-irrigated areas and to poorer lands. Unless yields can be sufficiently increased to enhance the economic viability of crop, possibilities for growth will continue to be dampened.

Vietnam is the fourth biggest producer of sugar cane in ASEAN after the Philippines and the sixteenth largest sugar producer of the world in 2005 base don figures from FAO. . The sugar industry of the Socialist Republic of Viet Nam is currently in transformation as growth in sugar consumption outpaced domestic production. The shortfall is met by increased imports. The Government is implementing a series of projects to attain self-sufficiency and achieve a net exporter status. In its development plan, the Government is taking into consideration all stages in the production process; from growing the cane to processing the sugar. Key elements of the plan include: expansion in area planted to sugarcane to increase potential production capabilities, introduction of methods to improve current yields and of new higher yielding varieties, and a major investment initiative to expand the capacity of the domestic processing sector. The Government has set targets of 12.7 million tons of sugarcane production and 1.0 to 1.2 million tons of sugar production by the year 2000.

Viet Nam’s domestic sugar industry is primarily based on sugarcane. The regions in the south account for 80 percent of the nation’s cane production. Cane is generally grown in the drier regions of the Mekong Delta area in the south without irrigation, and of the Red River Delta area in the north. The area planted to sugarcane gradually expanded in recent years, from 140 000 hectares in the early nineties, to around 225 000 hectares in 1995.

The recent expansion in cane production areas may partially reflect the fact that sugarcane is becoming more competitive with other crops. In the southern province of Long An, the area planted to sugarcane expanded to over 11 000 hectares in recent years, in direct competition with rice, groundnuts, and pineapples. And in the north-central province of Thanh Hoa, increases in sugarcane areas were taken from land formerly used for pineapples and coffee.

Table 8
Top 20 Sugar Cane Producers in the World

Rank	Country	Production (Int $1000)	Foot note	Production (MT)	Foot note
1	Brazil	8,725,914	C	420,121,000	
2	India	4,825,286	C	232,*320,000	
3	China	1,819,452	C	88,730,000	
4	Thailand	1,029,610	C	49,572,000	
5	Pakistan	981,260	C	47,244,100	
6	Mexico	937,277	C	45,126,500	F
7	Colombia	827,669	C	39,849,240	
8	Australia	794,369	C	38,246,000	*
9	Philippines	643,870	C	31,000,000	F
10	United States of America	535,948	C	25,803,960	
11	Indonesia	529,635	C	25,500,000	*
12	South Africa	451,230	C	21,725,100	
13	Argentina	400,861	C	19,300,000	F
14	Guatemala	373,860	C	18,000,000	F
15	Egypt	339,278	C	16,335,000	F
16	Viet Nam	311,550	C	15,000,000	F
17	Cuba	259,625	C	12,500,000	F
18	Venezuela,Bolivar Rep of	182,776	C	8,800,000	F
19	Peru	147,467	C	7,100,000	F
20	Iran, Islamic Rep of	135,005	C	6,500,000	F
	No symbol = official figure F = FAO estimate		*** = Unofficial figure C = Calculated figure**		
Production in Int $1000 have been calculated based on 1999-2001 international prices					

Source: Food and Agriculture Organization Major Food and Agricultural Commodities Producers
http://www.fao.org/es/ess/top/commodity.html?lang=en&item=125&year=2005

8.3 Palm Oil

Three ASEAN countries are among the top ten producers of palm oil in the world. These are Malaysia which is the biggest palm oil producer as of 2003, followed by Indonesia and Thailand which ranked second and fourth in world oil production. Only Malaysia and Indonesia are net exporters of the product. Please refer to Table 9.

Malaysia currently accounts for 51 % of world palm oil production and 62% of world exports, and therefore also for 8% and 22% of the world's total production and exports of oils and fats. As the biggest producer and exporter of palm oil and palm oil products, Malaysia has an important role to play in fulfilling the growing global need for oils and fats in general. Its palm oil output is exported to the European community, China and the United States, India and Egypt. (Malaysian Palm Oil Council, 2006)

Palm trees were first introduced to Malaya in early 1870's as ornamental plants. In 1917 the first commercial planting took place in Tennamaran Estate in Selangor, laying the foundations for the vast oil palm plantations and palm oil industry in Malaysia. Cultivation of oil palm rapidly increased in the sixties under the government's agricultural diversification program which was to reduce the country's economic dependence on rubber and tin. Later in the 1960s, the government introduced land settlement schemes for planting oil palm as a means to eradicate poverty for the landless farmers and smallholders. The oil palm plantations in Malaysia are largely based on the estate management system and small holders scheme. (Malaysian Palm Oil Council 2003)

Indonesia is the world's second largest producer of palm oil. Palm trees were brought to Bogor, West Java as ornamental plants in 1848. Palm oil plantations started in Sumatra in 1911 and spread out to other Indonesian islands. In 1974, when prices of palm oil in the international market was high, the government started the Nucleus Estate Scheme wherein state owned plantation companies provided seedlings, technical assistance and financing to small farmers who were given access to oil mills. At present, oil palm plantations are no longer confined to northern Sumatra but have expanded to Kalimantan, Sulawesi and Irian Jaya. (Bangun, 2006).

Indonesia developed its downstream palm oil industry. Downstream products could be classified as edible and non edible. Non edible products are soap and oleochemicals while edible products are cooking oil, fats for bakery and margarine. Palm oil is the raw material used for cooking oil in Indonesia. At present, Indonesia exports palm oil to India, Netherlands, Malaysia, the United Kingdom, Pakistan and Bangladesh. (Bangun, 2006)

Thailand is the third biggest producer of palm oil in ASEAN and the fourth largest producer of palm oil in the world based on figures from the **:** Federacion Nacional de Cultivadores de Palma (Colombia) Please refer to Table 9. In the Asia-Pacific region Thailand is currently the third biggest palm oil producers, but is still way behind leading producers Malaysia and Indonesia in terms of output. In the course of the past ten years, the country has managed to more than double annual production to around 6 million tons, representing an annual growth rate of 9.5 per cent which has largely been bought about by rubber plant farmers in the south of the country switching over to palm oil production.

Despite being one of the top palm oil producers in the world, Thailand is still a net importing country of palm oil. In the course of the past ten years, the country has managed to more than double annual production to around six million tons, representing an annual growth rate of 9.5 per cent which has largely been bought about by rubber plant farmers in the south of the country switching over to palm oil production. (AP. Foodtechnology Com, 2004)

The Thai government may allow imports of palm oil to produce bio-diesel due to a shortage of palm oil in Thailand, said Energy Minister Piyasvasti Amranand. Local production of palm oil for use in the manufacturing of the alternative fuel may be insufficient this year, he said, so the Energy Ministry may ask the Commerce Ministry to allow palm oil imports to refine into bio-diesel. (AP. Foodtechnology Com, 2004)

Table 9
World Production of Palm Oil
(In thousand tons)

Country	**2003**
Malaysia	1.642
Indonesia	1.064
Nigeria	203
Thailand	59
Colombia	50
Papua New Guinea	30
Ivory Coast	23
Costa Rica	12
Others	230
Total Production	3.314

Source: Federacion Nacional de Cultivadores de Palma (Colombia)
http://www.fedepalma.org/index.shtm

8.4 Cassava

Four ASEAN countries, Indonesia, Thailand and the Philippines ranks among the twenty largest producers of cassava in the world in 2005 based on figures from the Food and Agriculture Organization. All of these countries exported cassava in the past. Some of the key characteristics of the crop are its efficiency in producing carbohydrate, its tolerance to drought and to impoverished soils, even though it thrives on fertile, sandy-clay soils, and its high flexibility with respect to the timing of planting and harvesting. For these reasons, cassava plays an essential role for food security, especially in those regions prone to drought and with poor soils. It is the world's fourth most important staple after rice, wheat and maize and is an important component in the diet of over one billion people.(Food and Agriculture Organization, 1998) Please refer to Table 10.

Indonesia is the biggest producer of cassava in ASEAN and the third largest producer of cassava in the world. It has a long history of utilizing cassava as a staple food, especially where soil and climate conditions do not permit growing of rice, or in years of rice shortfalls. Nonetheless, cassava's role as food security crop is declining, with new interest in further diversification of products and markets. Cassava in Indonesia has traditionally been planted in association with other crops by small farmers, mainly for their own consumption. Cassava cultivation used to be concentrated in Java, but as pressure on land and other resources intensified, it has been spread to the other islands, especially Lampung. (Food and Agriculture Organization, 1998)

The major consumers of cassava in Indonesia are the rural poor. . Roots are also converted into small chips, flour and “sago”, a type of wet starch that is roasted. Cassava roots are eaten boiled or steamed and processed into dried chips, known as “gaplek”, and starch. Gaplek is used for human consumption in a large variety of traditional dishes and, in times of rice scarcity, it substitutes for rice in rural diets.

Most of the production is used internally, although there are significant exports of dry chips for animal feed and of starch. Indonesia is historically Asia's major producer, although overtaken by Thailand in the 1970s and 1980s. There is interest in expanding demand in the processed food industry, and for flour as a wheat substitute.

Thailand is the second largest producer of cassava in ASEAN and the fourth largest producer of cassava in the world. Thailand claims to have an 88 percent market share of the world cassava market. Cassava exports of Thailand declined as a result of the reduced import demand the EU whose past import had been more than 50 percent of the world import. The Common Agricultural Policy of the EU decreased its feedgrain prices in a major effort to provide incentive to increase use of the domestic grains instead of cassava pellets. At the same time, Thailand exercises voluntary restraint of limiting the annual pellet export to 5.5 million tons on the average under the agreement that EU provides assistance for cassava replacement cropping in the bilateral attempt to reduce the cassava planting. (Kajonwan 2003)

Other markets, the People's Republic of China (PRC), Japan and Indonesia formerly did not consume much of the products but the, PRC in particular, increased their demand after 1999. These caused a major upward shift in the world export. It is notable that the PRC increased its demand for cassava products to compensate the needs for animal feeds in its livestock industry. . (Kajonwan 2003)

Thai cassava exports include pellets, chips, flour and sago. As the major export item, pellets had 80-90% share of the total export and EU had been importing from Thailand 60-70% of its total cassava imports. Cassava flour is the second export item following the pellets. Its share ranges from 8-30 percent of the total export. Flour export value continues to show a rising trend of 10 percent with the share of 18 percent in 1992 which increased to 62 percent in 2000. The foreign demand for Thai cassava flour has been expanding and its main importers have been Japan, South Korea and Taiwan. Competition is stiff with substitutable potato flour and corn flour from sources in Europe.

Vietnam is the third larges producer of cassava in ASEAN and the 13th largest producer of cassava in the world based on statistics from the Food and Agriculture Organization. It is the fourth largest producer of cassava in ASEAN. In North Vietnam, cassava is grown for food and animal feed by small farmer households. In South Vietnam cassava has become a cash crop and as raw material for cassava processing factories, which have a total annual processing capacity of one million tons of fresh roots. The main constraints in cassava production in Vietnam are fluctuating prices and marketing problems and slow adoption of new varieties and improved technologies in remote areas. Low soil fertility in cassava growing areas is an important problem, as is the lack of processing facilities. (Bien, Kim et. al 2007)

Cassava research in Vietnam has made remarkable progress since 1988 when Vietnam began its cooperation with the International Center for Tropical Agriculture (CIAT) and the Asian Cassava Research Network. Further progress was achieved when Vietnam established its Cassava Research and Extension Network, in close cooperation with starch processing factories Ne and high yield cassava varieties and more sustainable production practices have increased the economic effectiveness of cassava production, especially in the Southeastern region. In order to transfer new technologies Farmer Participatory Research was conducted in mountainous and hilly areas of North Vietnam. (Bien, Kim et. al 2007)

Table 10
World Production of Cassava, 2005

Rank	Country	Production (Int $1000)	Foot note	Production (MT)	Foot note
1	Nigeria	2,751,179	C	38,179,000	F
2	Brazil	1,920,017	C	26,644,700	
3	Indonesia	1,402,244	C	19,459,400	
4	Thailand	1,220,552	C	16,938,000	
5	Congo, Dem Republic of	1,079,060	C	14,974,470	
6	Ghana	701,779	C	9,738,812	F
7	Angola	620,163	C	8,606,210	
8	Tanzania, United Rep of	504,420	C	7,000,000	F
9	India	482,802	C	6,700,000	F
10	Mozambique	443,169	C	6,150,000	F
11	Viet Nam	410,742	C	5,700,000	F
12	Uganda	396,330	C	5,500,000	F
13	Paraguay	353,822	C	4,910,110	F
14	China	302,652	C	4,215,700	F
15	Benin	223,386	C	3,100,000	F
16	Malawi	187,356	C	2,600,000	F
17	Madagascar	157,914	C	2,191,420	F
18	Colombia	153,139	C	2,125,163	
19	Philippines	117,458	C	1,630,000	F
20	Côte d'Ivoire	108,090	C	1,500,000	F
	No symbol = official figure *** = Unofficial figure**		**F = FAO estimate** **C = Calculated figure**		
Production in Int $1000 have been calculated based on 1999-2001 international prices					

Source: Food and Agriculture Organization Major Food and Agricultural Commodities Producers
http://www.fao.org/es/ess/top/commodity.html?lang=en&item=125&year=2005

9. Other Possible Sources of Bio Diesel in ASEAN

As mentioned earlier, jatropha has been identified as another source of bio diesel in the Philippines and in other Asian countries. Jatropha is found in all places in the Philippines. It grows even in marginal soils. It can be used as an intercrop to coconut, another source of bio diesel. SAMASA Foundation is currently promoting it as an alterative source or another source of bio diesel.

Jatropha has different names in different c places--tuba-tuba, tubang-bakod, sambo, and agumbao apparently proves that, by whatever name, the previously ignored plant sprouting practically all over the country has become a celebrity plant these days.At present, jatropha is used as hedge or fencing material in rural areas of the Philippines. It can be grown together with other crops.

Jatropha is a perennial shrub-tree resistant to drought, typhoon, and flood, jatropha grows fast on marginal or poor soil conditions with little or no maintenance at all. It starts to bear fruits after two years but economic yield starts on the 4th year. This plant can live up to fifty years. Local jatropha species bear fruits 3-4 times a year. Seeds for planting can be gathered when the fruits are already yellow to dark brown. Seeds that are ready for oil extraction are black and dry.

A hectare grown to jatropha could yield 3.5 to 5 tons of seeds. Initial studies revealed that with 3-4 kilos of jatropha seeds, oil yield would be about one liter of crude or unprocessed oil that can be used directly to run low-rpm diesel engines like hand tractors, water pumps, and threshers. (Department of Science and Technology, 2007)

The Department of Science and Technology's Industrial Technology Development Institute initially tested five kilograms of jatropha last March, which confirmed the seeds' 28.60% oil content. This jatropha oil can be used as additive to diesel. Tuba-tuba has been grown because of folk belief that it's smell turns snakes away. This idea made the shrub-tree a primary fencing material in rural areas.

9.1 Promotion of Jatropha Cultivation in the Philippines

The Philippine National Oil Co. board approved a budget of more than a billion pesos for its alternative fuel arm PNOC Alternative Fuels Corp.'s (PNOC-AFC), a chunk of which would be used to fund investments in jatropa plantations. Under PNOC-AFC's approved budget for 2007 worth P1.257 billion, about P679.96 million has been earmarked for investments; P411.36 million has been allocated for operating expenses; and P165.67million has been earmarked for other capital expenditures.

“The budget of PNOC-AFC for 2007 covers the financing requirement for the development and establishment of the jatropha mega-nurseries. We are upbeat about jatropha and we aim to become the most prominent alternative fuels-producing company,” Peter Anthony Abaya, PNOC-AFC president, said. (Añonuevo, 2007)

PNOC-AFC is looking to establish its own nurseries for jatropha, a biodiesel source, utilizing an aggregate area of 1,000 hectares in various areas in Mindanao this year. Likewise, another 500 hectares will be established at Fort Magsaysay, Nueva Ecija, in coordination with the Philippine Army. (Añonuevo, 2007)

“The mega-nurseries will serve not only as sources of seedlings for the commercial plantations but will also be used for research and development including propagation methods, provenance testing, intercropping and effective management practices. Locally sourced jatropha planting materials will be used in the mega-nurseries,” he added. (Añonuevo, 2007)

Much earlier, PhilForest, a subsidiary of the Natural Resources Development Corp. under the Department of Environment and Natural Resources, was created in compliance with President Macapagal-Arroyo’s instruction in October 2004 to step up reforestation.

It’s been given the responsibility to undertake the agro-reforestation projects of the NRDC, the primary corporate arm of the DENR. PhilForest’s tuba-tuba cultivation projects will cover public idle lands, such as mountain sides and denuded forests. “This is to ensure that tuba-tuba cultivation does not encroach into farmlands already devoted to food and other commercial crops,” Lozada said.PhilForest records show that 2 million hectares of public land will be available for planting tuba-tuba.

Unlike other source of bio fuels, jatropha is not edible. Its utilization as a bio fuel will not compete with traditional bio fuels feedstock such as coconut, sugar, palm oil and cassava. It can be grown in marginal areas and may be planted as secondary crops in a way that it will not decrease harvest of traditional food crops. These may also be grown hedges in existing farms. This will prevent it from competing with food crops.

10. Possible Market for Carbon Credits

The Carbon Credit market is another market which can be explored by bio fuel processors. .Carbon credits provide a way to reduce greenhouse gas emissions by giving them a monetary value. A credit gives the owner the right to emit one ton of carbon dioxide. International treaties such as the Kyoto Protocol set quotas on the amount of greenhouse gases countries can produce. Countries, in turn, set quotas on the emissions of businesses. Businesses that are over their quotas must buy carbon credits for their excess emissions, while businesses that are below their quotas can sell their remaining credits. By allowing credits to be bought and sold, a business for which reducing its emissions would be expensive or prohibitive can pay another business to make the reduction for it. This minimizes the quota's impact on the business, while still reaching the quota.(Wikipedia, Carbon Credit 2006)

Credits can be exchanged between businesses or bought and sold in international markets at the prevailing market price. There are currently two exchanges for carbon credits: the Chicago Climate Exchange and the European Climate Exchange.

Processors and users of bio fuels may calculate the amount of carbon dioxide that they save from being emitted into the atmosphere. They can in turn sell these as carbon credits.

11. Recommendations

11.1 ASEAN Private Sector Support Framework

1. Initiate Industry Academe Partnership in Research and Advocacy About Bio Fuels

   The private sector may initiate partnership between corporations manufacturing or blending bio fuels with petroleum fuels and the academe. Faculty and students may conduct research to improve bio fuels and discover other sources of bio fuels. This will allow industry to assist the academe in their research.

   Tapping the academe to conduct research studies will also mean savings for industry since the academe has the equipment and trained research personnel needed for testing bio fuels.

2. Initiate an inventory of academe and industry based research institutes which focus research on crops which may be converted into bio fuels

   The private sector should initiate a network among research institutions in ASEAN which focus their research on coconut, sugar, palm oil an cassava, the major sources of bio fuels in the region. These institutes can concentrate on problems common to the industry in the ASEAN region to increase productivity and ensure a sustainable source of bio fuel feestock.

3. Initiate cross country collaboration in bio fuels research and development of bio fuels by universities and research institutes within ASEAN

   The private sector may sponsor cross country collaboration among universities in bio fuel development to hasten development of bio fuel sources. This may include visits by faculty to countries where there is ongoing research and development for bio fuels.

4. Encourage petroleum companies to assist or be partners of manufacturers of bio fuels.

   The private sector may encourage petroleum companies to assist manufacturers of bio fuels. They may also assist farmers who cultivate crops which may be utilized as bio fuels. This can be done by matching petroleum companies which need bio fuels with manufacturers of bio fuels.

5. Include small farmers in programs to encourage cultivation and processing of bio fuels.

   Small farmers, who comprise the majority of the rural population particularly in less developed ASEAN countries such as the Philippines and Indonesia should be given credit and technical assistance to participate the bio fuels development programs. This will enable them to increase their incomes and this will help upgrade the local economy

   Technical as well as credit assistance should be given to small scale processing of bio fuels which could be utilized to power farm implements should be encouraged to further upgrade the local economy. .

11.2 Regulatory Framework

1. Common Standards for Bio Fuels in ASEAN, Japan, China and South Korea

   ASEAN countries with a potential to produce bio fuels such as the Philippines, Malaysia and Indonesia should negotiate with Japan, China and South Korea for a common standard on bio fuels which will be acceptable to them. This will facilitate the entry of ASEAN bio fuels to their markets. The fact that Japan imports 60 percent of its food and has limited arable land will make it difficult for her produce bio fuels.

2. Negotiate for preferential tariff on bio fuels

   a. ASEAN as a body should negotiate for a preferential tariff on bio fuels particularly with Japan which has very limited sources of bio fuels at present and has to meet its obligations to the Kyoto Protocol.
   b. ASEAN as a body should negotiate with South Korea for lower or no tariff on raw intermediate materials for bio fuels to be exported to South Korea to increase markets for newly developed sources for bio fuels such as jatropha which is now being introduced in Indonesia and the Philippines.

3. Bio Fuels Should be Utilized by Governments in ASEAN for its operations

   In order to develop an expanded market for bio fuels, ASEAN governments should follow the example of the Philippines by requiring government vehicles to utilize fuels containing a certain percentage of bio fuels for its vehicles

4. Bio Fuels Should Form Part of the Energy Stockpile or Reserves of ASEAN Countries

   In order to help ASEAN countries, such as Indonesia, Malaysia and the Philippines with potentials for manufacturing bio fuels develop their bio fuel resources and reduce greenhouse gases in ASEAN, ASEAN member countries should agree to have a specific percentage of their oil reserves devoted to bio fuels from other ASEAN countries.

5. Provide Tax Incentives to ASEAN businesses which are able to sell carbon credits by utilizing bio fuels.

   Tax incentives may be given to ASEAN businesses which are able to sell carbon credits to companies in industrialized countries by reducing the amount of carbon dioxide emitted into the atmosphere through its operation by utilizing bio fuels. This will further encourage industries to shift to bio fuels despite initial fuel conversion costs..

11.3 Investment Incentives for Bio Fuels

1. ASEAN countries should give investment incentives to investors in the bio fuels technology.
2. ASEAN countries should provide investment incentives to businesses which will establish stockpiles of bio fuels.
3. ASEAN providers of bio fuels should negotiate with China, Japan and South Korea to provide for investment incentives to importers and users of bio fuels in their respective countries.

11.4 An integrated Approach to Planning for Oil Depots and Pipelines

1. There should be an integrated, long range plan regarding the plans for oil depots. With the impending closure of the Pandacan Oil Depot, there should be an integrated plan where to locate new oil terminals and how to maximize usage or existing terminals taking into consideration the safety of nearby residents.
2. Strategic areas for storage of bio fuels should be identified. The following should be taken into consideration:

    a. ease of transport to oil company depots where the bio fuels will be mixed with fossil fuels;
    b. security of the nearby residential areas

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Exhibit 1

MALACANANG PALACE

MANILA

BY THE PRESIDENT OF THE PHILIPPINES

MEMORANDUM CIRCULAR NO. 55

DIRECTING ALL DEPARTMENTS, BUREAUS, OFFICES AND INSTRUMENTALITIES OF THE GOVERNMENT, INCLUDING GOVERNMENT-OWNED AND CONTROLLED CORPORATIONS TO INCORPORATE THE USE OF ONE PERCENT (1%) BY VOLUME COCONUT METHYL ESTER IN THEIR DIESEL REQUIREMENTS

WHEREAS, under Section 2(a) of R.A. No. 7638, known as the "Department of Energy Act of 1992", it is declared the policy of the State to ensure a continuous, adequate and economic supply of energy with the end in view of ultimately achieving self-reliance in the country's energy requirements through the integrated and intensive exploration, production, management and development of the country's indigenous energy resources, without sacrificing ecological concerns;

WHEREAS, under Sections 2 and 4(a) of R.A. No. 8749, known as "The Philippine Clean Air Act (PCAA) of 1999", it is declared the policy of the State to protect and advance the right of the people to a balanced and healthful ecology in accord with the rhythm and harmony of nature and recognize the citizens' right to breath clean air;

WHEREAS, the government is a major user of motor vehicles operating on diesel fuel;

WHEREAS, the Coconut Methyl Ester (CME) blended with petroleum diesel fuel can reduce harmful emissions such as carbon particulates and greenhouse gases thereby improving air quality and at the same time improving the performance of the engines;

WHEREAS, the use of CME in the petroleum industry will create a new and significant application for coconut oil and reinvigorate the Philippine coconut industry through the creation of a new domestic market and increased productivity, thereby improving the lives of coconut farmers.

NOW, THEREFORE, I, GLORIA MACAPAGAL-ARROYO, President of the Republic of the Philippines, by virtue of the powers vested in me by law, do hereby order:

SECTION 1. All departments, bureaus, offices and instrumentalities of the Government, including government-owned and controlled corporations, are hereby directed to use one percent (1%) CME by volume as a blend in petroleum diesel fuel.

SEC. 2. The Department of Energy (DOE) shall be the lead implementing agency for the CME-Diesel Program. The DOE shall coordinate with various government agencies and private entities involved in CME activities and shall prepare a strategic plan outlining national goals in the development and expanded utilization of CME and provide policy direction for the effective implementation and monitoring of the program.

SEC. 3. The Philippine Coconut Authority (PCA) is hereby directed to include in its national program for the coconut industry the development of the supply chain for CME, and in consultation/coordination with the other government agencies and the private sector, shall formulate a program to encourage investment and technology for the production of CME to meet the needs of the domestic market.

SEC. 4. The DOE, in coordination, with the concerned government agencies shall formulate and issue the necessary implementing rules and regulations within thirty (30) days after the effectivity of this Circular.

SEC. 5. All departments, bureaus, offices and instrumentalities of the Government, including government-owned and controlled corporations, are hereby directed to provide the necessary resources which will be utilized to implement the CME program subject to existing auditing and accounting rules and regulations.

SEC. 6. All orders, issuances, rules and regulations or parts thereof, which are inconsistent with this Circular are hereby repealed or modified accordingly.

SEC. 7. If for any reason or reasons, any part of this circular is declared unconstitutional or invalid, the validity of the other provisions shall not be affected by such declaration.

SEC. 8. This Memorandum Circular shall take effect fifteen (15) days after its publication in at least two (2) newspapers of general circulation.

DONE in the City of Manila, this 9th day of February, in the year of Our Lord, Two Thousand and Four.

(Sgd.) **GLORIA MACAPAGAL-ARROYO**

By the President:

(Sgd.)**ALBERTO G. ROMULO**

Executive Secretary