VIABILITY
OF AFRICAN PALM OIL AS BIODIESEL

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Abstract
The pressing need, which has been originated by the speculative shortage of polluting gasoline, to find new environmentally friendly alternative fuels has caught the attention of governments, researchers and organizations involved with the topic of biofuels, in which palm oil has become the primary potential source. Such interest has led the palm oil production growth and usage beyond economic expectations in the last decades. The palm oil has been the focus of governments and investors, mainly in warm tropical countries eligible for its proper cultivation, thus creating a sound growing industry based on a latent global need. However, serious questions have arisen as a result of the way palm companies install themselves and operate in the communities. Deforestation, CO_2 emissions due to peat lands burning, forced displacement of native populations, change to monocultures, among other issues, have reached unexpected dimensions in the international level, where the main consumer countries have been subject to pressure from non-governmental organizations (NGO) and human rights organizations to demand compliance of the Roundtable on Sustainable Palm Oil (RSPO) agreed by palm oil industry players. This article incorporates important papers concerning the African palm, especially its use as biofuel as well as the existing problems surrounding it. This paper intends to provide an extensive and objective perspective of the palm oil industry and its potential to become a surrogate of gasoline in the world.

Key words: Palm Oil, Biofuels, New Fuels, African Palm, Business Ethics

Resumen
La necesidad imperante de encontrar nuevas alternativas de combustibles amigables con el medio ambiente, originada en la especulativa escasez de la contaminante gasolina, ha volcado la atención de gobiernos, investigadores y organizaciones en general sobre los biocombustibles, entre los cuales se encuentra, como fuente potencial, la palma africana. Tal interés la ha lleva-

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do a alcanzar crecimientos en su producción y uso fuera de toda expectativa económica en los últimos lustros. La palma africana ha sido el foco de interés principalmente de gobiernos e inversionistas en países tropicales cálidos aptos para su adecuado cultivo, creando por ende una industria sólida creciente, fundamentada en una necesidad mundial latente. No obstante, serios cuestionamientos han surgido como resultado de la forma de instalarse y operar de las mismas en las comunidades. Deforestación, emisión de CO_2 por la quema de bosques, desplazamientos forzados de poblaciones nativas y cambio a monocultivos, entre otras problemáticas, han alcanzado dimensiones inesperadas a nivel internacional, donde los principales países consumidores han sido objeto de presión por parte de ONG y organizaciones de derechos humanos para que exijan el cumplimiento de lo acordado en la *Roundtable on Sustainable Palm Oil* (RSPO) por parte de los países productores y demás agentes de la industria. Este artículo incorpora escritos y ediciones importantes referentes a la palma africana, resaltando especialmente su uso como biocombustible y la problemática existente a su alrededor, buscando dar una perspectiva amplia y objetiva de la industria y sus posibilidades de convertirse en el tiempo en una substituta de la gasolina.

Palabras claves: Aceite de Palma, Biocombustibles, Nuevos Combustibles, Palma Africana, Ética Empresarial

Introduction

Corley and Tinker (2003) stated in their book *The Palm oil* (World Agriculture Series) why the African palm is one of the world's most valuable oil crops by describing the origins and progress of the industry, the basic science underlying the physiology, wider issues such as genetic modification of the crop, the promise of clone propagation, breeding, and the effects of palm oil on human health.

Corley and Tinker (2003) also show why palm oil production had increased by more than 50% in the 1990s –and set to double in the following twenty years from 2003. As regards, the environmental group Greenpeace (2007) estimates that palm oil demand will double from 2000 levels by 2030, and triple by 2050. Therefore, it has never been before so important to understand the history, use, and cultivation of this fascinating crop.

The rapid growth in the use of palm oil biodiesel and its future projections seem to make it a substitute for the polluting –with unknown reservoirs– gasoline; however, does palm oil meet the requirements to becoming the substitute?

Organization of the Petroleum exporting countries -OPEC- (2007) asserts that advances in three –3D– and four dimensional –4D– technology are changing the traditional perception of scarcity, enabling the world to boost oil bases to unthinkable levels. Regarding the development of large amounts of non-conventional oil, this should also allow to lower costs –enhancing the availability of oil supply–, and achieve a support role in the long run that provides stability to gas prices, as palm oil prices continue rising.

For his part, Pahl (2008) states that despite palm oil's top ranking in terms of oil yield; it represents only about 10% of total global biodiesel raw material sources.

The issues relating palm oil, forests and sustainability, and the definition of sustainable palm oil crop, have been addressed at the Roundtable on Sustainable Palm Oil (RSPO) meeting (2008), where concerns of climate change, global warming, forced displacement of peasants, and deforestation have been highlighted by members as well as nonmembers of RSPO, as they seek continuous improvement in their processes in order to live up to diverse expectations.[2]

As The House of Commons (2008) reports, the palm oil´s advantages on CO_2 emissions are polarized when we contrast

2 Roundtable on Sustainability of Palm Oil, rspo, 2008, *RT6 Conference Press Release: post RT6 2008*, Bali, Indonesia [rspo´s response to the urgent and pressing global call for sustainably produced palm oil]. The Roundtable on Sustainable Palm Oil (rspo) was established in 2004 with the objective of promoting the growth and use of sustainable palm oil products through credible global standards and the engagement of stakeholders.

that palm biodiesel is more environmentally friendly, but, pollution is far more devastating in the planting process .

Social, cultural, and environmental aspects in this kind of commodities could be neutralized if it was not for the palm oil late appearance, just when Non-Governmental Organizations (NGO) and international agencies on human rights and environmental protection had a more influential role in markets and products, and how these could affect the planet. This did not happen in the case of the petroleum, because of its gained privileged position in the world as an essential commodity that powers the expanding global economy, despite its issues, high cost and pollution. Nevertheless, sustainability evidences that this situation is not going to be repeated with the potential substitutes.

Palm Oil overview

The palm oil is being produced by diverse tropical developing countries, which are seeking for new forms to make their economies grow, decrease unemployment rate, bring current exchange to their homes, and reduce poverty. The following sections show the performance of four of five top world palm oil producers. For further information see table 1 Palm oil statistics, which summarizes world palm oil statistics, top ten producing countries, production, export, import, consumption, and stocks from 2006/2007 - 2009/2010.

Indonesia

The United States Department of Agriculture -USDA- (2007) reported that a significant change in the palm oil industry took place in 2007, when Indonesia surpassed Malaysia and became the world's leader producer, designation that continues due to the country production rate. USDA (2007) also reported that the palm oil production development by the government of Indonesia has been clearly successful in securing edible oil and generating foreign exchange through land concessions to large companies, government plantations, and small holder programs.

USDA apprised that the subsequent rise in palm oil production has also resulted in the loss of tropical rain forests and generated major concerns about the effect of palm oil production on endangered species, therefore on the reduction of biodiversity. Most recently, the government and some palm oil producing companies are negotiating sustainability standards with Europe and The United States, under the auspice of the RSPO.

The Agency France-Presse (2010) published that the destruction of the Southeast Asian Archipelago's dwindling forests is threatening biodiversity and turns out to be the main reason why Indonesia is considered the world´s third biggest greenhouse gas emitter, as scientists confirmed.

Malaysia

Palm oil production is a major pillar of Malaysia´s industrialization, asserts Chandra (2006). The author says that by 1986, when the Industrial Master Plan (IMP) was launched, palm oil had become Malaysia´s leading agricultural commodity and its third-largest exporter. Malaysia now accounts (Chandra, 2006) for about half of the top world´s production of palm oil countries; its plantations, processors, and manufacturers are generally regarded as operating at the industry´s latest technology. Chandra declares that Malaysia evolved from a simple cultivation and crude oil processing country to become the industry´s leading innovator, controlling the industry´s valued-added chain, and becoming the largest exporter and the world second producer.

Basiron (2007) shows how in Oil World´s data, palm oil production in Malaysia increased by over 400% between 1980 and 2005. The World Bank (2010) informs that about 60% of Malaysia´s palm oil production shipments head to China, the European Union, Pakistan, The United States, and India. The World Growth (2009) reported that the industry employed about 570.000 people.

Nonetheless, Hickman (2009) denounces that palm oil plantations are barren places when vast blocks of palms are planted in straight lines, stretching for mile after mile, 90% of the wildlife disappears, adding that they become "biological deserts".

Thailand

Pleanjai and Gheewala (2009) state that in order to reduce the dependence on imports and to improve energy security of the country, biodiesel for transportation has to be promoted by the Thai government as an option of development. Also, the authors said that the government of Thailand has planned to increase the national renewable energy share from 0,5% in 2002 to 8% by the year 2011; and explained how palm oil has been considered as a prospective feedstock for biodiesel production, due to the fact that it has the highest yield among country´s oil yielding plants.

Despite good intentions, Yangdee (2007) says that the government support has not been enough for the industry given the country´s competitiveness disadvantage before Malaysia, with much lower prices, higher yields, and exports to Thailand.

Colombia

As part of the government´s plans to promote the oleaginous crop, Fedepalma explains that during the 1980´s the number of hectares of palm oil in Colombia tripled, converting the crop in the country´s most important raw material in the oil seeds and oils and fats production chain, as a result, becoming the world fifth producer and the leading producer in Latin America. Nevertheless, several NGOS have denounced the violation of human rights in the lands where palm oil companies have been installed. Mingorance, in his study for the United Nations (2006), reported how threats, murders, or massacres have become the cause of region´s inhabitant displacement in order to seize the potential planting land.

Comparison of production cost of major vegetable oils

Comparative data show palm oil advantages in oil yield, land productivity, CO_2 footprint, production costs, global biofuel production, and global use of oil and fats.

Palm oil, soybean, rapeseed and sunflower seeds are the four primary sources of vegetable oil (Oil World, 2008) that satisfy 111.4 million tons, or 81,4% of the world´s demand. Palm oil currently holds a share of 31%, followed by soybean (28%), rapeseed (14%), and sunflower oil (8%) (Oil World, 2008). The palm oil is a perennial crop, while soybean and rapeseed are annual. The palm oil has the best land productivity and highest yield of oil per hectare of all oil crops (Corley & Tinker, 2003). It produces 3.68 tons/ha/year (Oil World, 2008), compared to rapeseed (0,59), sunflower seed (0,42) and soybean (0,36). This works ten times more oil per hectare than soybean, six times more than rapeseed and almost nine times more than sunflower seed (MPOC). Obire (2009) shows that a palm oil plantation can produce more than 6000 liters/ha of biodiesel compared to about 500 liters/ha of soybean and 1 000-1 500 liters/ha of other arable oilseeds (Basiron *et al.*, 2009).

Higher land productivity of the palm oil means that it requires less land to produce the same amount of oil than other major oil crops. The current combined reduction of 111.4 million tons of palm, soybean, rapeseed, and sunflower oil is obtained from a total area of 177 million ha (Oil World, 2008). Palm oil uses the smallest acreage (11,6 million ha), followed by sunflower (26 million ha), rapeseed (33 million ha), and soybean (106 million ha).

Palm oil is a highly energy efficient crop compared to other biomass such as soybean or rapeseed (Basiron *et al.*, 2009). Based on current industry practices for palm oil production in Malaysia, using palm oil for biofuel applications renders an average net CO_2 reduction of approximately 60% (Basiron *et al.*, 2009). That is, the CO_2 emissions incurred in the palm oil supply chain are only around 40% of the CO_2 emissions generated by fossil fuels (Basiron *et al.*, 2009).

Depending on production techniques, palm oil can reach even higher Greenhouse Gases (GHG) savings of 80% to 90%, which could be compared with second generation biofuels. Further improvements in yield and waste management could move this figure beyond 90% in the future, taking into account the palm oil carbon requisitioning (Basiron *et al.,* 2009).

Palm oil's success as a global commodity lies in its flexibility, fecundity, and competitive production costs (Basiron *et al.*, 2009).

The current use of biofuels constitutes only a minor fraction of global transport fuel consumption (Basiron *et al.,* 2009). In 2007, global biofuel production amounted to 62 billion litres or the equivalent of 36 million tons of oil. This was about 1,8% of total global transport fuel consumption in energy terms (Basiron *et al.*, 2009). Palm oil contributes to a small portion of the biofuel supply. According to the Organization for Economic Cooperation and Development –OECD- (2007), the palm oil mainly supplied by Indonesia and Malaysia constitutes only 1,2% of the world's biofuel production (Basiron *et al.*, 2009). Biofuels account for 5% of global demand for oils and fats (Basiron *et al.*, 2009). The largest proportion of oils and fats is used for food (79%) whereas animal feed and oleo chemicals have got a proportion of 6% and 10% respectively (Basiron *et al.*, 2009).

Palm oil and more significant issues

Social issues

The palm oil production has become a source of economic growth and job creation for the producing countries (Roberts, June 2010). Small farmers mostly located in poor areas benefit substantially from the crop, in Indonesia (1.500.000) and Malaysia (500.000) which correspond to 35% to 40% of producers respectively (RSPO); in African countries, 90% (United Nations), and in Colombia about 20% (Fedepalma).

The United Nations Development Programme (2008) explains that when the production of palm oil is done by small farmers, it becomes significantly more sustainable because the crop offers opportunities to improve their income, thus improving their quality of life.

Webster (2003) stated that problems arise when the palm oil becomes a monoculture for the regions, impacting negatively the locals who are often dependable on natural forests for their subsistence. He discovered that local people employed by the plantations are offered low wages. Pollution in drinking water sources caused by companies and their use of chemicals becomes another issue that Webster (2003) encountered, as a result, water is lethal for human consumption, children particularly.

Vermeulen and Goad (2006) listed issues on employment such as new local jobs – but low wages–, dangerous work, large number of immigrant workers –especially in Southeast Asia– that causes further social tension, and, the use of piecerate labor contractors, avoiding statutory employee benefits. Vermeulen and Goad also listed concern over companies and governments accountability, for instance issues of government patronage and concession allocations.

One of the main social issues denounced Vermeulen and Goad is the displacement of communities to clear large plantation areas, which often present inadequate resettlement provision, or even, forcing peasants and native inhabitants to leave their lands under death threats, thus violating their human rights. Besides Vermeulen and Goad stated that land tenure –long term, large land areas– often overlap community rights and claims, causing protracted disputes.

Mingorance's study (2006) about HREV-CBC, shows that Colombia's Palm industry is small compared to Indonesia's and Malaysia's, and that it has been blighted by the seizure of hundreds of thousands of acres from small Afro-Colombian farmers by paramilitary forces in the remote state of Chocó in the late 1990s and other regions. The author also mentions that palm oil producers moved into the areas soon after, and it was not until January 2008 that an investigation started relating 23 companies accused of having links with paramilitaries. Nine companies have since, reports Mingorance, been ordered to return land to farmers they forced to displace and investigations on alleged homicides and land seizures continue. Few cases of displacement have been denounced in the last decade by the *Corte Interamericana de Derechos Humanos* (Interamerican Court of Human Rights), *Consultoría para los Derechos Humanos y el Desplazamiento* (Human Rights and Displacement Consulting Agency), The United Nations Country Team in Colombia, ONG Human Rights Everywhere, among other organizations concerned in the communities affected by palm oil crops.

Economic issues

Many governments of producing countries have adopted palm oil as a strategy to pursue economic growth, foreign exchange earnings, employment creation, and poverty reduction (Roberts, 2010). From the developed nations' viewpoint, the commodity is the way to reduce CO_2 emissions through the usage of environmentally-friendly biofuel, seeking to cease their contribution to global warming (UNEP, 2007). Government policies worldwide have decreed the use of biodiesel in public transport under combinations such as B5 (5% biodiesel and 95% petroleum diesel), B7, and the projection to increasing them up to B20 by 2020, are ensuring the exponential growth of the market, making the industry one of the most attractive for the coming years (Alain Vertes, Nasib Qureshi & H. Yukawa 2010).

Palm oil contributes about 5-6% to the Malaysian GDP (MPOB & MPOC, 2010) and provides employment for 1,4 million workers (direct employment of 570.000) (Roberts, 2010). It triggers downstream activities and brings in revenue for national development and stability, with USD 18 billion foreign exchange earnings in 2008 (MPOB & MPOC, 2010). Palm oil cultivation has become a means to overcome rural poverty (MPOB & MPOC, 2010), the establishment of land schemes, for example, reported FELCRA, has resettled landless farmers who mainly grow palm oil (Vermeulen & Goad, 2006).

For its part, the Colombian government has seen the palm oil industry as a source of economic growth, sustainable development through job creation, increase foreign exchange through product exports, and replacement of illicit crops in the country (CENIPALMA, 2009).

Economic issues emerge when smallholders are being left behind the industry. Vermeulen and Goad (2006) asserted that smallholders' ownership status is affected by disagreements and uncertainty over land tenure, which is widespread and can be violent. Besides, Vermeulen and Goad say that smallholders typically cannot meet basic conditions of collateral minimum loan size to secure bank financing; moreover, early palm oil developments often deprive smallholders of sufficient land and time to feed their own households.

Taking into account the current importance of biofuel as a commodity, it is not in position to dictate, demand or cause large price movements for related vegetable oils. The biofuel hype has, however, caused vegetable oils to be associated with fossil fuel price. In fact, CPO futures were highly correlated with NYMEX crude oil futures (Basiron *et al.*, 2009). For a while, palm oil price tracked NYMEX crude oil movements.

However, since the end of October 2008, palm oil price has been disassociated from developments in crude mineral oil prices (Basiron *et al*., 2009).

Wall (2010) shows how the awareness increase and importance attached to environmental issues such as global warming and more environment-friendly fuels are being developed as alternatives to fossil fuel. The author enunciates the advantages of palm oil biodiesel over petroleum: no modification of the engines is required; and it gives good engine performance, cleaner exhaust emission and comparative less fuel consumption.

Environmental aspects

Palm oil´s competitive edge extends well beyond pricing advantages alone. In a world with soaring mineral oil prices, crude palm oil (CPO) is increasingly being targeted as an alternative energy source (Oxford Business Group, 2007). Biofuel use is on the rise, high demand has kept prices buoyant, besides has the advantage of being more environmentally friendly than fossil fuel, in part due to the offsetting factor of being originated from trees which helps to reduce the buildup of carbon dioxide in the atmosphere (Oxford Business Group, 2007).

The European Union (EU) has set out rules, including the Biofuels Directive of 2005, stipulating targets for biofuel use in EU countries (Oxford Business Group, 2007). So far, most members have failed them, in part because EU farmers cannot produce enough rapeseed oil, which have led to imports of substitutions, such as palm oil from other countries, including Indonesia (Oxford Business Group, 2007). The EU wants to see biofuel use increase dramatically, and a report released in 2006 set a target for 25% of fuel consumption throughout the EU to be biofuel by 2025 (Oxford Business Group, 2007).

Biodiesel is nontoxic, biodegradable, and excels because reduces the emission of harmful pollutants (mainly particles) from diesel engines (80% less CO_2 emissions, 100% less sulfur dioxide) (OECD, 2001). Controversially, the exceptional attributes of palm biodiesel in their fuel efficiency does not come from its ultimate created use. However, problems arise in preparing land for planting seeds at the start of its agro-industrial cycle.

Palm oil production is one of the most contentious environmental issues in the world at present (Cushion *et al*., 2009). In the major producing countries of palm oil –Indonesia, Malaysia, Thailand, and in Colombia according to Fedepalma it has been 10%–, tropical forests are cut down in order for palm oil plantations to be put in their place, endangering species, causing habitat loss, accelerating global warming, increasing greenhouse gas emissions, and causing substantial and often irreversible damaged to the natural environment –greenhouse effect– (Chiew & Too, 2009). Research from The World Wildlife Fund (WWF) shows that, together with illegal logging, forest conversion to palm oil is now the major threat to tropical rainforests.

Despite this discouraging outlook, a report by The United Nations Environment Programme (2007) says that a positive contribution to greenhouse gas emissions can arise if the palm oil is grown on abandoned or degraded land.

Besides, RSPO certificates that environment-friendly palm oil crops were created under the scheme policy of sustainability. This certification is a seal of approval that states that the palm oil used in the product is indeed produced and that its volumes are traceable. Producers are certified through strict verification of the production process by accredited certifying agencies, and may be withdrawn at any time on infringement of the rules and standards.

Government issues

Palm oil has been seen by corporations and government development agencies as a source to alleviate poverty (Roberts, 2010). Its versatility and low cost have guaranteed its role as a hidden ingredient in products ranging from lipsticks to margarine, in the manufacturing of products ranging from shoes to plastics, and, nowadays, as a biodiesel (Obire *et al*., 2010).

Development agencies (World bank), international financial institutions (International Monetary fund), and governments (including the United Kingdom), at the behest of big business, have promoted commodity trades like that of palm oil as a model for development (Webster, 2003). This has resulted in an extensive expansion of palm oil plantations (Webster, 2003).

Many of the companies involved in this trade argue that palm oil is needed for the development of regions, because it brings money to poor rural areas (Webster, 2003). Since its introduction in the nineteenth century by colonial Europeans, palm oil has played an increasingly important role in the economies of Malaysia and Indonesia, and has been strongly promoted by governments and international institutions as a route to prosperity for tropical countries (Webster, 2003).

As regards, Proexport (2008) published that national governments are promoting palm oil crops as part of a policy to promote growth on strategic sectors, creating incentives and

tax exemptions for the production and commercialization of biodiesel for use in diesel engines, opening potential markets through laws that require the use of biodiesel in the domestic industry with blends of 2%, 5%, and 7%, and up to 20% (B20), which later are expected to increase up to 20 to 25% (WB). In addition, countries have numerous Research and Development (R&D) centers, combining efforts from the public, private, and academic sectors (Proexport, 2008).

In that matter, Starbuck and Harper (2009) said that by devoting a proportion of agricultural production to energy crop and biofuel production we are competing with food production and causing the price of food to rise. Starbuck and Harper explained while rich Western consumers are cushioned from this price increase by their affluent lifestyles and high wages, the hardest impact could be reflected on the poorest, whose prices of basic food commodities increasing by only a small margin can mean life or death to those living on less than a dollar a day.

Besides, Starbuck and Harper (2009) recalled that for some this is an oversimplification and, that we need to view the world food situation in the context of the ever-growing demand for animal feeding food and the satisfaction of the growing demand for meat and food from countries like China and India, which are also driving the surge of prices of arable crops. Furthermore, the rising price of crude oil is impacting both the cost of production of food and the transportation costs (Starbuck & Harper, 2009).

Final comments

The search for new environmental-friendly biodegradable fuel alternatives, the global growth of population, and food demand –especially from emerging economies– seems to favor the future development of palm oil in the world. Not to mention its recognition as a pillar for the economy of developing countries where tropical climate allows the crop, as a driver for reducing poverty and hunger through new agricultural jobs.

Production and mass use of biofuels have several aims, and are based on the need to ensure the countries energy supplies and reduce their dependence on fossil fuels in addition to social, environmental and economic factors that can achieve benefits such as permanent employment generation, strengthening the agricultural sector and regional economies, agro-industrial development, improving the quality of the air we breathe, and illicit crop substitution, among other. These issues concern the world, as part of the international environmental and energy policies, included in the agendas of developed countries and the various conventions and agreements –human rights and environment protection organizations– which currently exist worldwide.

Promotion and support of governments, committed in developing their economies, the groups of interest in the industry market –communities, researchers, investors, suppliers, and buyers– vow to make the palm oil industry viable and sustainable in the future. Remarkable features show reasons why producing countries governments encourage palm oil biodiesel production, use of research and development, clean technology, and biotech, directing the industry to a stable and secure route. Yet its production costs, high yield per hectare than other oil crops, and low market prices, make it attainable for buyers seeking to reduce costs with alternative products of equal or better quality than the traditionally used fuels. Technical advantages permit safe storage and transport due to its high flash point, excellent lubricity, and relatively simple production tech, which does not require major changes in conventional engines.

Outrightly, biodiesel blends established by governments in the world convert vegetable diesel as a mandatory commodity, creating a growing potential market, from B5-B10 to B20-B25 targets for 2020 to 2025, where palm oil plays a leading role for its characteristics, and technical and productive yields. Low CO_2 emissions (80% less CO_2 emissions, 100% less sulfur dioxide) compared to petro oil. Such reduction of harmful pollutants (mainly particles) is how environmental-

ists are expecting to substitute the pollutant petro oil. Hither the Hubbert Peak Theory, or *peak oil*, that posits future petroleum stocks, will eventually peak, and thereupon decline in a similar rate to the rate of increase before the peak as these reserves are exhausted.

Yet, palm oil producers and agents of interest have still to deal harder to overcome issues, such as uncertainty surrounding the predictions of the timing of the oil global peak. After speculations on oil reserves scarcity, in which many peak oil promoters proposed many different dates, some of them passed already. For instance, the peak of oil discoveries was in 1965, and oil production per year has surpassed oil discoveries every year since 1980, as OPEC confirmed. OPEC (2007) stated that technological breakthroughs in areas such as subsurface imaging, 3D –three dimensional– and 4D –four dimensional– drilling and offshore production has had a dramatic effect on upstream activity, leading to large discoveries, particularly in deep water. OPEC (2007) also suggested a simplistic calculation in this order with conventional and new nonconventional reserves: recoverable crude oil reserves will last around 80 years, at present production rates.

The above, added to unique chain supply value surrounding the use of oil will not make it easy for any commodity to become the near oil substitute. Along with straight vegetable oil and biodiesel, other energy sources that could play an important role in the future are hydrogen economy, solar energy, ethanol fuel, nuclear power –actually being reviewed after the 2011 tsunami that laid the crisis of Japanese nuclear plants-, and lithium economy, among other.

Besides restrictions in its technical performance: cold start problems, higher copper strip corrosion, and pumping difficulty due to the higher viscosity (Demirbas & Gupta, 2010), palm oil does not meet all the requirements for being whole environmental friendly, since emissions of nitrogen oxides (precursor of ozone) have increased. A research (House of Commons, 2007-2008) demonstrated that the draining of tropical peat lands and the clearance of tropical rainforest are a major source of greenhouse emissions. Peat lands cover just over 3% of the world´s land area; yet, they are the largest terrestrial store of biomass carbon. As regards, 7,6% is found in Southeast Asia, which stores 42 billion tons of carbon. A recent study showed that 27% of palm oil plantations in Indonesia are planted on drained peat lands (House of Commons, 2007-2008). When peat lands are drained, cleared and burned for agriculture or energy crop production, there are two sources of emissions: one from peat oxidation, the second from fire (House of Commons, 2007-2008). Together, these emissions from Southeast Asia´s peat lands, which cover just 0,2% of the world´s land surface, are responsible for the release of two billion tons of CO_2 to the atmosphere each year (equivalent to 8% of annual global emissions) (House of Commons, 2007-2008).

Palm oil is associated in several producing countries with the displacement of forest natives and peasants from their land (FOE). Friends of the Earth (FOE) affirm that serious imbalance of power exists between these communities, who have no formal rights to their traditional land. Palm oil replaces these diverse, mixed farming systems with export-oriented monocultures. Farmers on small-scale farms become workers on large-scale plantations, with less control over their lives and in many cases with an income lower than they had, dependent on the fluctuations of the international market.

On September 9, 2009, the World Bank agreed to suspend the International Finance Corporation (IFC) funding for the palm sector, pending the development of safeguards to ensure that lending does not cause social environmental harm. It had suspended investments in palm oil businesses until after a review of its practices in the sector. This was the results of NGO´s pressure on human rights.

Aligned with these claims, the Roundtable on Sustainability of Palm oil (RSPO) is issuing RSPO certificates under the scheme policy of sustainability, which are not mandatory in the market trade yet, but the very few companies that are certificated have risen the price in 35% more than regular supply, as Forest Footprint Disclosure reports (2010), only 4% of global supply is currently certified.

Regarding petroleum, with palm oil controversy is more valid than ever; though, the search for renewable energy is on the agendas of the major world agents, seeking for cheaper, more reliable and higher performance feed stocks to meet global demand, with unstoppable population growth, where need does not give pause. Timing is calling for maintaining a balanced position in search of commonwealth in a chaotic and complex world, proposing decisive action towards mutual convenience.

Several researchers agree that, given the need and role of palm oil in the world economy, especially its convenience in the economy of developing nations, the agents that make up the group interest of the industry should seek common grounds for addressing the future of the use of palm biodiesel assertively. Based on restrictions, a new market for eco-friendly certified biofuels may be created, working towards a

framework on sustainable production of energy crops.

Favouring palm oil, The American Center for Continuing Professional Education –ACCPE- (Webster *et al.*, 2003) believes that the UK government can make a huge contribution by helping to find creative solutions that will help business continue to prosper, but not at the expense of the environment or the communities in other parts of the world. The Indonesian Institute for Energy Economics, IIEE (Kusdiana, 2009), accepts that subsidy is sometimes needed to support the development of biofuels, although it should not distract the effort on efficient uses of this type of fuels. IIEE (Kusdiana, 2009) also highlights the importance of R&D, and, on land conflict, asserts that the issue can be solved by the governments´ legal certainty.

Hence, palm oil is challenging the world ethics as no few times science and technological breakthroughs have. The question is what will prevail in this case: governments blindly supporting a look-like harmful industry? Businessmen taking advantage fiercely of one more business, no matter what and how? NGO´s shouting out human rights violations to be heard by multinational organizations? Ignored peasants and communities, as it was not new in the world? Or, are we about to witness that the theories of sustainability can be implemented as a fact within the development of the palm oil industry?

In a nutshell, it is essential to note that of the total world production of palm oil, only 10% is intended for use as biodiesel (e.g., only approximately 3% of imported palm oil is used for biodiesel production in Europe, according to the House of Commons First Report (2007-2008) . Furthermore, if we took the total production of palm oil, it would reach only about 10% of the total world production of petroleum. This in addition to the significant aspects surrounding the palm oil industry makes us aware about how tough and demanding will be to becoming the substitute of petroleum throughout time.

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APPENDIX 1 – Palm Oil Statistics

Table 1. Palm oil statistics.

TOP 10 COUNTRIES: WORLD PRODUCTION IN %					
Ranking	Country	%	Ranking	Country	%
1	Malaysia	47	6	Cote D´Ivoire	1
2	Indonesia	39	7	Ecuador	1
3	Thailand	3	8	Cameroon	1
4	Nigeria	2	9	Congo	1
5	Colombia	2	10	Ghana	1

WORLD EXPORT (000 METRIC TONS)				
Country	2006/2007	2007/2008	2008/2009	2009/2010
World	29 638	32 850	35 480	36 350
Indonesia	12 465	14 100	16 110	16 840
Malaysia	13 768	15 041	15 990	16 180
png	406	385	451	422
Colombia	214	225	214	316
Ecuador	180	178	173	189
Thailand	327	399	123	160

WORLD PRODUCTION (000 METRIC TONS)				
Country	2006/2007	2007/2008	2008/2009	2009/2010
World	37 591	42 666	44 262	47 154
Indonesia	16 730	18 880	20 450	22 090
Malaysia	15 294	17 567	17 259	18 200
Thailand	989	1 273	1 310	1 420
Nigeria	752	812	853	880
Colombia	830	779	758	773
Ecuador	409	417	431	466

WORLD IMPORT (000 METRIC TONS)				
Country	2006/2007	2007/2008	2008/2009	2009/2010
World	29 366	32 730	35 773	36 280
China	5 543	5 559	6 297	6 200
India	3 664	5 019	6 875	6 550
EU-27	4 634	5 012	5 790	6 150
Pakistan	1 743	1 769	1 800	1 840
U.S.A.	692	955	1.036	985
Egypt	716	508	770	660
Bangladesh	871	855	832	850
Iran	419	589	571	610
Japan	516	551	531	550

WORLD CONSUMPTION (000 METRIC TONS)				
Country	2006/2007	2007/2008	2008/2009	2009/2010
World	37 256	41 325	44 700	47 260
India	3 698	4 882	6 565	6 800
China	5 461	5 660	5 917	6 348
EU-27	4 478	4 806	5 592	6 000
Indonesia	3 920	4 362	4 846	5 230
Malaysia	2 132	2 449	2 474	2 540
Pakistan	1 638	1 734	1 792	1 800
Nigeria	1 042	1 219	1 265	1 301
Thailand	700	941	1.161	1.280
U.S.A	635	935	917	936
Colombia	467	457	580	748
Egypt	598	486	550	569
Japan	509	550	536	545
Russian Fed.	527	690	485	520
Turkey	401	443	388	440

STOCKS (000 METRIC TONS)				
Country	2006/2007	2007/2008	2008/2009	2009/2010
World	5 812	7 060	6 876	6 700
Indonesia	1 780	2 230	1 760	1 820
Malaysia	1 461	1 951	1 579	1 750
India	350	540	920	740
China	472	370	750	600

Source: Oil World, Hamburg, Germany and US Department of Agriculture Development Prospects Group, The World Bank Prepared December 30, 2009