

Palm Oil Opportunity & Projections



Opportunity

Commercial Palm Oil Plantations offer an unequalled investment opportunity in Latin America, primarily because of the vast amount of suitable land well situated within the highly desired Palm Oil 'LATITUDE BELT' (15° North to 15° South of the Equator).

Investment Strategy

The Nicaragua Oil Palm investment platform is geared towards Private Equity Funds, Pension Funds and High Net-Worth Individuals seeking long-term, consistent returns based on our low risk to reward operating plan, in the emerging markets of the Caribbean, Central America and South America. Black Lion International's close relationship with the government, and the original developers of the oil palm plantation, allows us to maintain local cooperation and greatly minimize risk throughout the life of the project.

About Oil Palm

The Oil Palm (*Eleais guineensis*), native to West Africa, one of 17 **oils and fats** traded globally, is found in ONE in TEN food products. The oil palm fruit produces two oils; **crude palm oil (CPO) from the fibrous mesocarp** and **crude palm kernel oil (CKO) from the kernals**. Although both oils originate from the same fruit, palm oil is chemically and nutritionally different from palm kernel oil. It is one of the only two mesocarp oils available commercially, the other being olive oil.



Palm oil, being a vegetable oil, is cholesterol-free. Having a naturally semi solid characteristic at room temperature, with a specific origin melting point between **90°F to 102° (F 33°C to 39°C)**, it does not require hydrogenation for use as a food ingredient. CPO is deep orange red in color due to the high content of natural carotenes.

Palm oil is a rich source of **Carotenoids** and **Vitamin E** (tocopherols & tocotrienols) which confers natural stability against oxidative deterioration. Fractionation separates oil into liquid and solid fractions. Palm oil can be fractionated into liquid (olein) and solid (stearin) components.

http://www.mpoc.org.my/The_Oil.aspx

Palm oil is used primarily in food products: cooking oil, shortening, margarine, milk fat replacer and cocoa butter substitute. Palm kernel oil is mostly used in the oleochemical industry for the production of soap, detergent, toiletries and cosmetics. World production of palm oil is **53.67 million metric tons** (Palm Oil Research 2014). Malaysia and Indonesia account for 86%-91% of global production as of 2015, each holding 42%-46% market share. Palm oil producing countries include *Malaysia, Indonesia, Thailand, Papua New Guinea, Ivory Coast, Nigeria, India, Colombia, Ecuador and Brazil*.

The Plantation



Oil Palm (*Elaeis guineensis*) is a tropical tree crop which is mainly grown for its industrial production of vegetative oil. It is a typical estate crop, grown and harvested over large uniform areas **3,000 to 5,000 hectares** (*2.47 acres per hectare*) around a central oil mill to allow for rapid industrial handling after harvesting.

Oil palm is a typical crop of the rainy tropical lowlands, it thrives best in lowlands below 300 - 400m altitude.

Under a favorable microclimate it can also occur at much higher altitudes up to 1,000 to 1,300m elevation. The tree requires a deep soil, a relatively stable high temperature and continuous moisture throughout the year. Oil palm Oil Palms require 2,000 mm (78 inches) of rain per year and temperature ranges of **84°F - 92°F (29°C - 33°C) max** and **70°F -75F° (22°C - 24°C) min** and Five hours per day bright sunshine. Dry periods of more than 2-3 months do not specifically damage vegetative growth, but affect seriously the production and quality of the fruit bunches. Oil palm yield is not only determined by vegetative growth and production, but also by the way and pests and diseases can be controlled or eradicated.

Soils: Soil fertility is less important than physical soil properties. Best-suited soils are moist, well-drained, deep, loamy alluvial soils, rich in organic matter with good water permeability. At least one-meter depth of soil is required. Avoid highly alkaline, highly saline, waterlogged and coastal sandy soils.

The oil palm is thought to have evolved in swampy, wet levees, a well drained alluvial soil as found in coastal areas of Southeast Asia is probably most suited. However, a wide range of soils derived from igneous and sedimentary rocks, peat, and volcanic ash (which are of lower nutrient status) are commonly planted to oil palm in Southeast Asia. Some soils are not appropriate for oil palm plantations. For example, coastal wetlands with soils containing large amounts of sulphur and iron sulphide often develop into what are known as acid sulphate soils when they are drained for planting.

Preparation

Several measures to prevent soil degradation and conserve soil fertility are: contour terracing along steep slopes, silt pits help reduce slope length while trapping soil and plant nutrients, pruned fronds placed along the slope minimize soil erosion and fertilizer loss. Hilly forests with steep slopes are usually left untouched. Depending on soil makeup, additional fertilizer is needed to balance pH.

Leguminous cover crops fix nitrogen in the soil, recycled organic matter improves soil structure, keeps out weeds, reduces soil compaction and erosion, and promotes rainfall acceptance. Emphasis of proper drainage and water management in coastal plantings prevents over-draining and deterioration of acid sulphate and peat soils. Source: Malaysian Palm Oil Council <http://www.mpoc.org.my/default.aspx>

Nursery

12 months from seedling to transplanting into the field. The planting arrangement provides 148-156 trees/ha in a closely packed arrangement and standard pitch is 9m center to center.

Harvesting/Collection



In about 24-30 months, the oil palm yields fruit in compact "fresh fruit bunches" (FFB) weighing 10-25 kg with 1000-3000 fruitlets per bunch. Ripe bunches are manually cut using chisel or sickle. These are then collected manually with wheelbarrow or mechanically using tractor-mounted grabber. The tree will continue to be productive for **25-30 years**, ensuring a consistent supply of oils.

Extraction

The yield of oil depends on the **oil weight** to **bunch weight** ratio which normally ranges between 19% and 26%, depending on genotype and harvesting standards. In addition, palm kernels constitute about 5% of bunch weight and contain about 50% oil (2.5%) of bunch weight. Fresh Fruit Bunches (20-25kg) once harvested must be treated in an oil mill within 24 hours of harvest to maintain freshness and quality. FFB are steamed under high pressure to sterilize, loosen and soften before being stripped from the stalks and mechanically pressed to extract oil. No solvents are used.

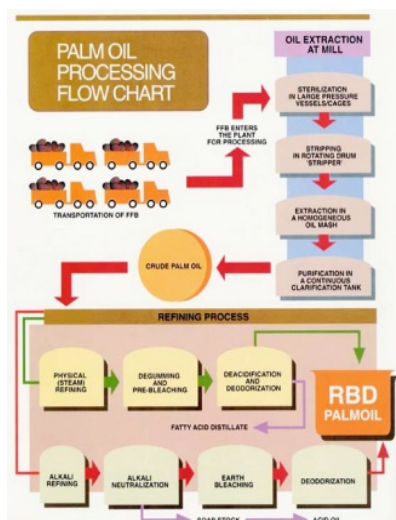
Refining

Extracted oil is called **Crude Palm Oil (CPO)** and is sent to a refinery to remove impurities, colors and odors. Refining also separates solid (stearin) and liquid (olein) fractions for a wide range of uses.

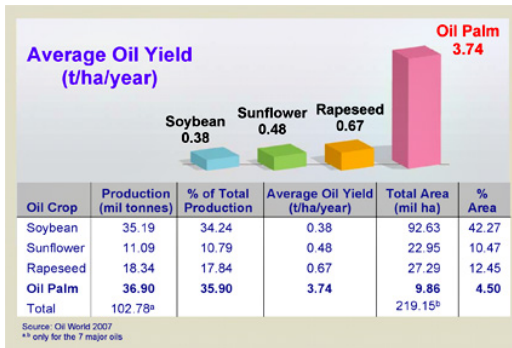
Sustainability: High Positive Energy Balance

Oil palm produces **6 to 9 tons/ha/year**, of Crude Palm Oil, up to 10X more oil per unit area than soybean, rape or sunflower. Oil palm (*palm and palm kernel*) produces **55.9%** of the world's oils and fats **on less than 5% of the total area under oil crops**. An energy balance study shows oil palm requires about 19.2 GJ (*gigajoules*) of energy per hectare per year, which produces 182.1 GJ of energy per hectare per year through its many products. The input-output energy ratio is 9.5 for oil palm, 2.5 for soybean and 3.0 for oilseed rape.

(<http://www.mpoc.org.my/default.aspx>)



Efficient Land Use



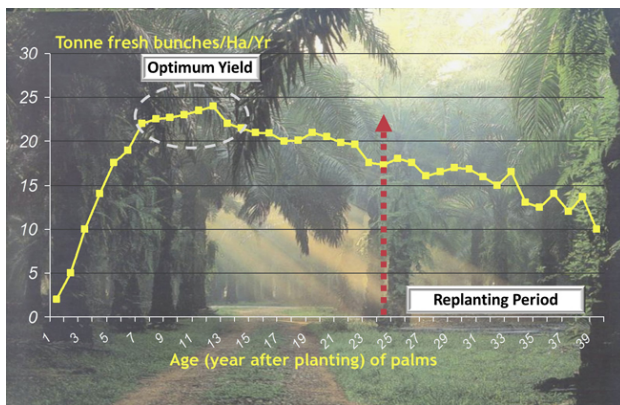
A mature oil palm produces clusters of fruit of around **fifteen times a year**. This high productivity has now resulted in the oil palm becoming the most successful of all oil plants providing the highest yield of oil per hectare per year compared to other oil-bearing crops. A hectare of oil palm yields **TEN** times more oil than other major oil crops. With proper management practices an average as high as **7-9 tons of CPO per hectare** is attainable - making Oil Palm the most efficient crop in the world. In addition to the 7-9 tons of CPO, one ton of **palm kernel oil, CKO**, is common. The oil palm requires

approximately 0.26 hectare of land to produce ONE ton of crude palm oil.

Higher yielding strains of palm oil come from the **Tenera** variety (a cross between the **dura** and **pisifera**) which produces 25% more oil than others; Malaysian palm oil is this variety.

Start-up costs: Land preparation, clearing, installing irrigation systems and seedling planting, start-up costs range from **\$500 to \$3,000** plus per hectare. According to IOPRI (Oil Palm Research Institute) via the World Agroforestry Center (ICRAF), the cost of replanting ONE hectare is **\$2,250**.

Crop Yield



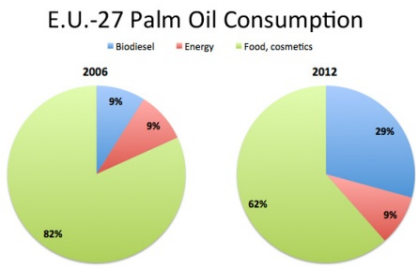
Oil palms begin producing after 24-30 months (special seed cultivation has reduced this to 18 months) but the industry standard is 30 months until first harvest. During the first 4-8 years of production, yield is a fraction of a mature plant and after four years averages yields of **3.3–3.69 CPO** tons/ha/year. Efficient plantations yield rises to peak production of **7-9 CPO** tons/ha/year after year 8.

The harvesting rounds are organized throughout the year so the same palm is visited every 2 weeks, during which workers will harvest any ripe bunch using a chisel on a short pole or sickle on a longer pole for taller palms. A typical 3,000-hectare plantation would employ a manager (usually a university graduate), three assistant managers and nine field staff. Manual workers are employed to carry out weeding, fertilizing and harvesting.

The Palm Oil Advantage in Biofuel & Biomass



The high prices of petroleum have stimulated the rapid development of the biofuel industry in the European Union, United States and to some extent in Malaysia. Biofuel offers strategic advantages for different sectors and stakeholders.



Oil Palm generates huge quantity of biomass including oil palm trunks, oil palm fronds, empty fruit bunches (EFB), shells and fibers as waste from palm oil fruit harvest and oil extraction processing. At present there is a continuously increasing interest in the utilization of oil palm biomass as a source of clean energy. One of the major interests is hydrogen from oil palm biomass. Hydrogen from biomass is a clean and efficient energy source and is expected to take a significant role in future energy demand due to the raw material availability.

Operations & Management

No Burning of Existing Palms, replanting traditionally involved burning the felled palms at the end of their 25-30 year productive cycle. Now trees are mechanically felled, then windrowed, shredded and decompose on site, recycling 90-100 tons of organic matter per hectare.

Natural Green Fertilizers



Biomass like pruned fronds, empty fruit bunches (EFB) and old palm stems are an excellent source of fertilizer, high in potassium, nitrate, magnesium, phosphate and other soil nutrients. Water used in processing palm fruits - palm oil mill effluent (POME) - is biologically treated and returned to the land for its fertilizer and moisture benefits. The soil filters the organic matter and nutrients, returning clean water to the ground. POME, combined with EFB, produces compost. Used in sufficient amounts, it replaces 66% of chemical fertilizers otherwise required.

Eco-system maintenance in the tropics is highly dynamic. Herbicide spraying is confined to a small circle at the base of the palm and in strips along rows or harvesting paths. This covers ~25% of the planted area. If sheep, cattle, goats or deer are reared, weeds are 'cleared' naturally. Integrated pest management including barn owls, snakes, predatory insects, parasitoids and entomo-fungi are preferred over chemical pesticides to optimize yields. Dealing with disease is crucial, as stem rot can destroy over 50% of an oil palm stand through severe infestation. Eco-friendly steps include deboling and shredding of oil palm debris during replanting, timely removal of infected palms and inoculation of seedlings with fungi.

Economic Summary

Demand for Crude Palm Oil continues to increase year after year. The price of palm oil tripled between 2005 and 2014 and it continues to increase. The current market price for Crude Palm Oil is \$686 (April 2016) with potential yields of 9 tons per hectare. Industry operational costs run between 25 and 30% of gross revenues. Using the higher end of the cost spectrum and the current market price, once stabilized a 3500 hectare plantation should generate an annual net operating profit of \$15,126,300.