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Biodiesel Production: Focus on Palm Oil and Jatropha

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Market Report	Yr Ago	4 Wks Ago	6/13/08
Livestock and Products, Weekly Average			
Nebraska Slaughter Steers, 35-65% Choice, Live Weight	$89.00	$93.47	$92.98
Nebraska Feeder Steers, Med. & Large Frame, 550-600 lb	119.75	131.73	130.25
Nebraska Feeder Steers, Med. & Large Frame 750-800 lb	105.10	110.31	110.50
Choice Boxed Beef, 600-750 lb. Carcass	147.63	156.66	157.03
Western Corn Belt Base Hog Price Carcass, Negotiated	72.58	79.05	69.35
Feeder Pigs, National Direct 50 lbs, FOB	53.35	40.26	40.97
Pork Carcass Cutout, 185 lb. Carcass, 51-52% Lean	76.36	81.66	75.00
Slaughter Lambs, Ch. & Pr., Heavy, Wooled, South Dakota, Direct	101.50	*	116.25
National Carcass Lamb Cutout, FOB	256.32	254.62	267.48
Crops, Daily Spot Prices			
Wheat, No. 1, H.W. Imperial, bu	5.51	7.71	8.54
Corn, No. 2, Yellow Omaha, bu	4.17	5.53	7.00
Soybeans, No. 1, Yellow Omaha, bu	7.84	12.94	14.55
Grain Sorghum, No. 2, Yellow Dorchester, cwt	6.95	9.37	11.77
Oats, No. 2, Heavy Minneapolis, MN , bu	3.01	3.96	4.18
Hay			
Alfalfa, Large Square Bales, Good to Premium, RFV 160-185 Northeast Nebraska, ton	136.00	*	195.00
Alfalfa, Large Rounds, Good Platte Valley, ton	92.50	77.50	77.50
Grass Hay, Large Rounds, Premium Nebraska, ton	*	85.00	*

* No market.

Given high gasoline prices and the negative environmental effects of burning fossil fuels, there is increased interest in alternative energy sources, including biofuels. Brazil and the United States have been leading the way with ethanol production derived from sugar cane and corn. Recently, there has been increased interest in another biofuel, biodiesel, particularly in Europe (the leading producer). Biodiesel, a non-petroleum-based diesel fuel, can be produced from the transesterification of vegetable oils or animal fats. In the United States, most biodiesel is made from rapeseed (canola) or soybeans. But elsewhere, there are other biodiesel feedstocks such as palm oil and jatropha that have great potential as renewable fuels. This paper takes an in-depth look at the potential of these two crops for the production of biodiesel.

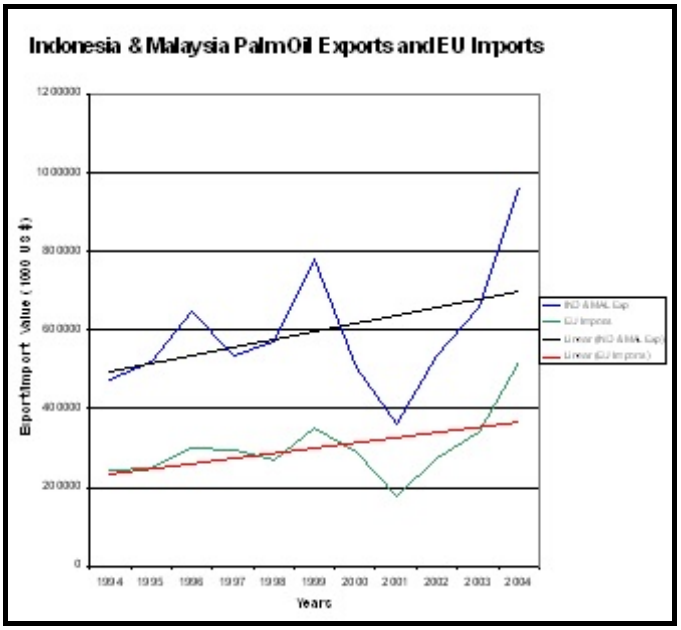
Oil palm (*Elaeis guineensis)* is a perennial crop that originated in West Africa, probably in Sierra Leone and Guinea. The crop spread to other parts of Africa and then to Asia, notably Malaysia and Indonesia. Today, Malaysia and Indonesia are the leading producers and exporters of oil palm products. In 2007, Malaysia exported almost 14 million metric tons of palm oil, while Indonesia exported about 13 million metric tons in the same year.[1]


Palm Oil Fruit (Palm Kernel)

On average, it takes the oil palm plant about five years from the time it is planted to its first harvest. After the first harvest, yearly harvests can be made for as long as ten years or more. Modern oil palm hybrids often reach maturity in as little as three years. Traditionally, oil palm products have been used as vegetable oils and in such industrial products as soap. The Palmolive Company named its soap for the palm and olive oils used in its original recipe. Palm Oil is very rich in carotene and is a good source of vitamins A and E. Carotene accounts for the red color observed in the fruit as shown in the picture above. [2]

Over the last five years there has been an increase in the use of palm oil compared to other oil seeds as feedstock in the production of biodiesel.[3] The comparatively high conversion ratio associated with palm oil lowers the cost of producing biodiesel. A single hectare of palm oil yields about 6,000 liters of oil, compared to 446 liters for soybeans and 172 liters for corn.[4] The cost of producing one ton of rapeseed biodiesel in the European Union is about 500 to 600 euros, while palm-oil based biodiesel costs far less at 150 to 200 euros. [5]

In terms of trade, there has been an increase in the volume of palm oil imported by all European countries, and the quantity exported by leading exporting countries (Malaysia and Indonesia). These trends are shown in the graph below. The growth in supply is likely to continue because of the potential for increased production in tropical developing countries and the continued expansion of demand for biodiesel in Europe. A recent study found that Malaysia, Thailand, Colombia, Uruguay and Ghana are the developing nations most likely to attract biodiesel investment.[6] This conclusion was based on the potential for production increases in those countries and their political stability, characteristics that are most likely to attract foreign investment.



Some environmentalists, however, worry about the rapid rate of deforestation in developing countries associated with large scale cultivation of oil palm. From 1990 to 2005, 55–59 percent of oil palm expansion in Malaysia, and at least 56 percent of Indonesian expansion occurred at the expense of primary forests.[7] Deforestation has continued to increase over the last three years.

As with palm oil, the use of jatropha as feedstock in the production of biodiesel has also been on the increase. Jatropha belongs to a large family, Euphorbiaceous, and the *Jatropha* genus includes about 175 different plants.[8] *Jatropha curcas* (the plant used in the production of biodiesel) is a perennial and poisonous shrub that begins producing nuts about three years after planting.[9] The nuts produce oil that can be used to make high-quality biodiesel. A native of the Caribbean, jatropha can be grown in many tropical and subtropical areas, including India, Africa and North America. As with oil palm products, there is great scope for increased production of jatropha, but this plant has the added advantage that it can thrive in more arid areas such as the African Sahel. It requires only ten inches of rain per year in its first years of growth. [0][1] In addition, jatropha can be inter-cropped with food crops such as maize. Unlike many other oil crops used in the production of biodiesel, jatropha is inedible so its use in biodiesel production does not mean that human food is being diverted to fuel production. Because of its ability to thrive in arid regions, there is less risk of deforestation associated with its cultivation. This also reduces the tendency for competition with food crops for arable land. It could be argued that, in addition to its value as a source of oil for biodiesel production, cultivation of this crop is beneficial because of its ability to restore soils, combat desertification and provide fertilizer for crops.


Jatropha curcas Nuts

Trade figures on import and export levels have not yet been precisely documented in the literature. Some studies however suggest that there has been increased investment in the cultivation of jatropha in India, Africa, Asia and some parts of the Americas. Several European countries (Belgium, Germany, and the UK) are currently developing technologies based on biodiesel from jatropha. This has served to increase the impetus for these countries to invest in the cultivation of jatropha in tropical developing countries. [1][1]

Despite these advantages, some researchers argue that caution must be exercised in increasing the cultivation of jatropha. Some have suggested that the poisonous nature of the crop might reduce the value of arable land in growing food crops in the future. It is not clear that large scale cultivation of the crop is warranted, particularly on arable land. More research needs to be carried out on cultivation of the crop and its use in producing biodiesel.

Palm oil is already being widely used in the production of biodiesel, and jatropha may have great potential as a non-food feedstock for biodiesel. It should also be noted that these two crops could play a significant role in the agricultural development of low-income countries. Because the agricultural sectors in many of these countries contribute very significantly to employment and GDP, additional income sources are of great benefit for both agricultural and overall economic growth and development. The fact that biodiesel made from these plants appears to be less damaging to the environment than petroleum-based fuels is an added benefit.

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