BIODIESEL

WHAT IS IT?

Biodiesel is a liquid fuel which can be made from any vegetable oil

It can be used in exactly the same way as conventional “diesel” obtained from crude oil

The two can be mixed together

So we can grow our own fuel!

Yes. Biodiesel can be made from any plant which contains oil.

Common examples include maize, oats, cotton, hemp, soya, coffee, many types of nuts, euphorbia, mustard, sesame, rice, sunflower, cacao, rape, olives, castor, avocado, coconut, oil palm, algae…

It can even be made from waste cooking oil from kitchens

Quantity varies, quality is the same

The amount of oil in each crop varies considerably, so potential outputs per hectare range from very little up to several thousand litres.

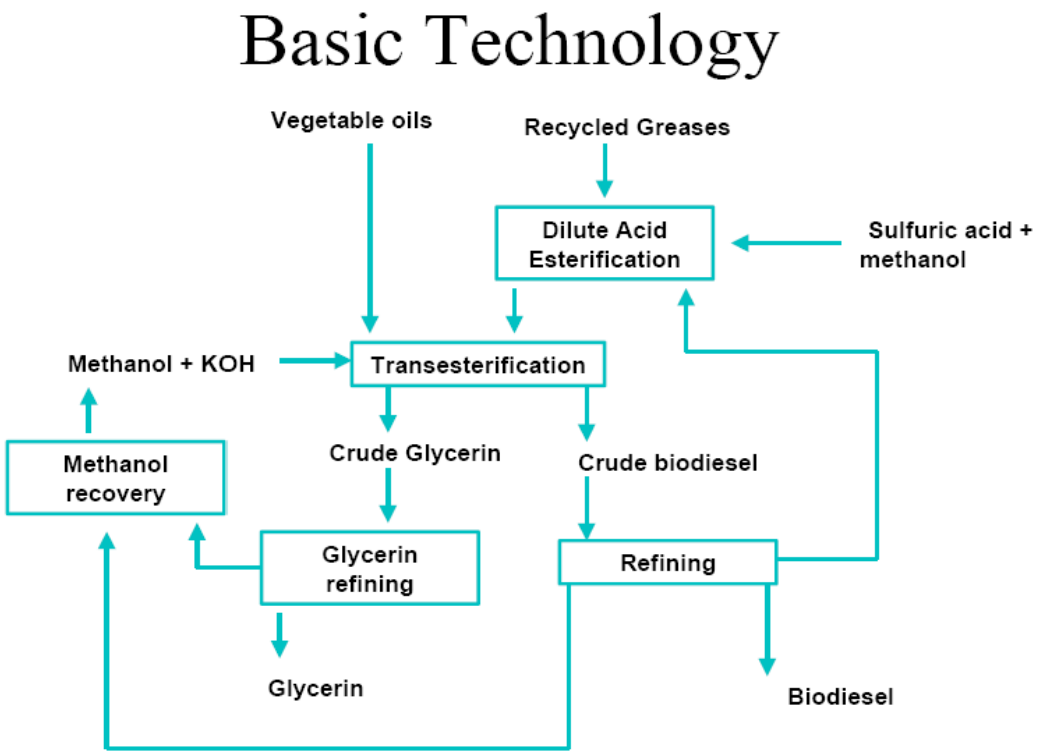
But whatever source of vegetable oil is used, the properties of refined biodiesel are always the same

Comparative crop values

under ideal growing conditions

Crop	Litres per hectare
Maize	172
Cashew nut	176
Oats	217
Cotton	325
Hemp	363
Soybean	446
Coffee	459
Linseed (flax)	478
Hazelnuts	482
Euphorbia	524
Pumpkin seed	534
Corriander	536
Mustard seed	572
Sesame	696
Rice	828
Tung oil tree	940
Sunflowers	952
Cacao (cocoa)	1026
Peanuts	1059
Rapeseed	1190
Olives	1212
Castor beans	1413
Pecan nuts	1791
Jatropha	1892
Macadamia nuts	2246
Brazil nuts	2392
Avocado	2638
Coconut	2689
Oil palm	5950
Algae	95000

How biodiesel is made



The technical know-how

Vegetable oils have been extracted and used in their natural form for many centuries.

In 1923 we discovered how to refine vegetable oils into a much more effective liquid fuel (cleaner burn, more concentrated energy)

So we've known how to make biodiesel for the past 89 years!

Why have we waited so long?

There are both economic and technical reasons

Even now, it is cheaper (much cheaper) to drill and refine crude oil than to grow, harvest and process oil from crops.

Also, the quantities of fuel we consume are enormous, and our agricultural capacity has been busy enough growing food!

Can biofuels replace fossil fuels?

In terms of technical chemistry, Yes.
In terms of practical useage, No.
There are both economic and physical limits.

The first problem is the sheer quantity of fuel that is consumed by transport systems.
Even today, with a very small number of vehicles in world terms, Kenya's road transport consumes 8 million litres of fuel…per day!

A perspective on cost

Even with world prices at an all time high, fuels from crude oil are still the cheapest

(most of what you pay at the pump is tax)

The common vegetable oils cost between more than twice as much, and up to ten times more

(even though they are tax free)

Biodiesel is renewable, but it is not free

The cost of biofuel is the value of the crop in its most viable market, the cost of transport to the refinery, the cost of refining and the cost of transport to distribution points.

That is is very much higher than the cost of products derived from crude oil (LPG, petrol, kerosene, diesel, fuel oil etc)

But the price gap is closing…

A perspective on quantity

Kenya's road transport system consumes

3 billion litres of liquid fuels per year. That is likely to double in the next 20 years.

To produce that quantity of biodiesel from, say, maize, would require 40 million hectares of the very best arable land

Okay, so why bother with biodiesel?

There are several reasons, but the main one is that we are using up all the deposits of crude oil, and eventually there will be none left!

Also, crude oil is a vast underground store of carbon, and when we burn it as fuel we release that "extra" carbon into the atmosphere. Excessive carbon dioxide can cause a greenhouse effect on climates.

One litre of fuel generates 2.5 kilos of CO^2

Surely using biofuels produces carbon dioxide, too

Yes, but the plants from which biodiesel is made absorb carbon dioxide from the atmosphere as they grow, so to a large extent they "recycle" carbon dioxide that is already in the atmosphere

Apart from the nett balance of carbon dioxide, biodiesel exhaust emissions are much the same as from conventional diesel.

How much crude oil do we have left?

At current rates of consumption, proven reserves of more than 1,000 billion barrels will last another 50 years.

There are then known and predicted reserves that will last another 50 years after that, but they will be increasingly difficult and expensive to extract

Where will we get our fuel after that?

There are many alternative sources of energy, including solar, wind, geothermal, nuclear, hydro and tidal power. There's even the possibility of harnessing ocean currents, which generate ten times more energy than all the wind!

There are various other mineral fuels, fuel cell technology, and then there are biofuels

So what's the problem?

There are economic and technical pros and cons with all the alternative energies, too.

First, set-up and production costs are a major factor, especially while crude oil is still plentiful and cheap; and most of the alternatives offer us energy in the form of electricity.

Electricity can be abundant and is clean to use, but it has its difficulties and limitations…

What are the limits on electric power?

We do not yet have good technology for storing electricity in large quantities or in an easily portable form. Batteries are expensive, heavy and have limited capacity

Heavy users of electrical power need to be physically connected to the national grid.

For remote off-grid locations, and for road vehicles, ships and planes, electricity is not yet a viable alternative to liquid fuels

What are the benefits of liquid fuels?

They are easy to transport (pipelines, tankers) and can be stored (depots, fuel tanks) so they can be delivered anywhere, any time, and can be kept in reserve stock.

Combustion engines which use liquid fuel give good performance, and vehicles can carry enough fuel on board for extended range.

The whole distribution network and refuelling systems already exist, worldwide, even in remote areas

Future imperatives

We must moderate the use of crude oil to conserve remaining supply and to reduce our nett carbon dioxide emissions

That means using renewable energies, as much as possible and as soon as possible, to power everything…except vehicles

And it means reducing the quantity of fuel and toxicity of emissions from vehicles, too

Future solutions and trends

Several new technologies will make vehicles more fuel-efficient and reduce harmful exhaust emissions

These will include better engine design and management, lighter materials, hybrid and dual-system power units, and more user-efficient transport and traffic

Diesel engines will predominate, using an increasing proportion of biodiesel

Global biodiesel prospects

The EU is demanding a 20% proportion of biofuels within the next two decades, and many world systems will gear for that trend

There will be major investment in oil crops and refinery capacity for biodiesel and ethanol… where there are vast areas of spare arable land and/or huge food surpluses

Kenya's biodiesel prospects

The refined diesel we import may contain an increasing proportion of biodiesel which has been made…somewhere else. If and when it does, it will be considerably more expensive.

The viability of producing biodiesel on a large scale in Kenya will depend on identifying a high yield oil crop that will grow well where we do have spare land - in places too arid to grow valuable food crops

Does Kenya have such a crop?

A realistic candidate might be the castor bean, which already does well in marginal areas and might be hybridized to thrive in even drier conditions - semi deserts where there is a lot of available land and little other economic activity.

Meanwhile local biodiesel production might be active and enterprising, but on small scales (the micro-economics of individual businesses, not the national economy).

Reality check…

In projecting Kenya's land, food and fuel balances (or any other aspect of economics or demographics) always remember this:

Kenya's human population will double

- to 70 million people -

within the next two decades

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