EDENTREE SRI EXPERT BRIEFING – AUGUST 2016
BIOFUELS

CAN YOU INVEST RESPONSIBLY IN BIOFUELS?

Q. WHAT ARE BIO-FUELS AND HOW ARE THEY DERIVED?

A. Biofuels constitute an energy source made from natural products or waste, such as animal fats or vegetable oils, corn starch or wood. Now commonly referred to as either 'first' or 'second' generation bio-fuels, the former, in the main, refer to fuels produced from food crops such as sugar, starch or corn. The latter, second generation 'advanced' fuels, are produced from non-food sustainable feedstock' products such as non-edible plant material, algae or animal fats. Second generation fuels are defined by their being derived from non-consumable sources. Biofuels derived from algae are now also being classed as 'third generation' fuels owing to their higher yields at lower input costs.

Q. WHAT TYPES OF BIOFUELS ARE AVAILABLE?

A. Biodiesel is the most common bio-fuel in Europe and is derived from reacting vegetable oils or animal fat catalytically with an alcoholic substance, usually ethanol. Biologically produced alcohols (bio-ethanol and more uncommonly bio-propanol and bio-butanol) are produced from the fermentation of sugar and starch to produce bio-alcohols, which can be used as a substitute for petroleum gasoline. Other first-generation biofuels include Green Oil (made from vegetable feedstock), biogas (green-methane made from anaerobic digestion with a solid residue that can in turn be used as fertilizer), and bio-ethers that can be used as octane racing enhancers. Second generation biofuels comprise cellulosic ethanol made from wood, grass or plant husk, algae based biofuels, bio-hydrogen, methanol and fuels made from fructose or waste from paper and pulp manufacturing. Corn is the primary source of the world's ethanol supply followed by sugar cane, soybeans and other vegetable oils and fats.

Q. IS THE DIFFERENCE BETWEEN FIRST AND SECOND GENERATION BIOFUELS SIGNIFICANT?

A. Yes. First-generation or conventional biofuels have limitations in that they typically utilise vegetable feedstock, which ultimately diverts cultivation away from food production. At a time of growing global population and competing demands for land and water, the early optimism about biofuels being a viable alternative to hydrocarbons has turned increasingly negative, with ten international agencies including the World Bank and World Trade Organisation calling for a halt to biofuel targets and subsidies. When oil prices are high and a crop's value in the energy market exceeds its value as a food crop, land is diverted away from edible production, which in turn increases food prices. This is the classic food vs fuel debate. Moreover, on a calculated life cycle assessment, first-generation biofuels have proved disappointing in leading to reduced greenhouse gas emissions. By contrast, second-generation bio-fuels hold out the prospect of being a genuine alternative to fossil fuels, may have significant benefits in reducing emissions, and are more cost effective. Second-generation biofuels utilise non-edible plants and crop waste (stems, stalks, husks) and do not risk diverting land cultivation away from food production. First and second generation fuels account for 99% of current global production1. Emerging is 'third generation' biofuels focused on algae, which have the potential to deliver higher yield at lower feed input.

Jatropha curcas – a versatile shrub with potential as a bio-fuel

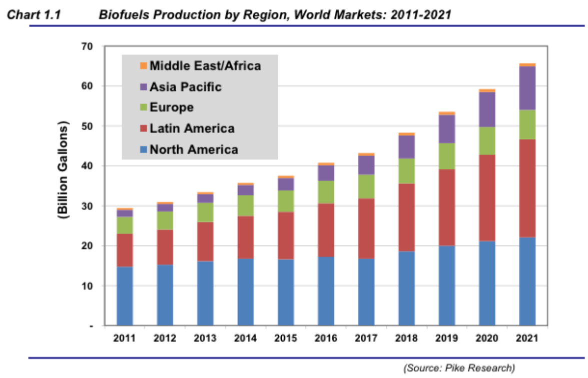
Q. DOES THIS MAKE THEM MORE SUSTAINABLE?

A. Possibly. One of the criticisms levelled at first-generation bio-fuels is that subsidies have made it economically worthwhile to divert land use away from food production in favour of fuel. At a time of acute pressure to feed the world's population, this has brought 'sustainable' bio-fuels into disrepute. However, second-generation concepts manufactured from inedible waste obviate the need for land to be given up. Some of these technologies are embryonic or experimental and have yet to achieve scale. Jatropha, for instance, is a versatile shrub that can be cultivated in arid, saline or stony environments with the minimum of intervention. The seed pods contain up to 40% oil, which can be processed into a high-grade bio-diesel. The husks (press cake) can also be used as bio-mass in power generation making it a wholly recyclable plant.

Q. HOW MUCH BIOFUEL IS CURRENTLY PRODUCED, AND WHO USES IT?

A. In 2015 the global value of the biofuels market was $15.3bn with 72% of production occurring in OECD countries2. According to the International Service for the Acquisition of Agri-biotech Applications (ISAAA), 18m farmers in 28 countries committed 179.7m hectares to biofuel cultivation in 20153.

Bioethanol production is concentrated, with the US and Brazil accounting for 85% of global production4. The US alone produced 15bn gallons in 2015 out of a total production of 26bn gallons5; US bioethanol is derived in the main from corn (38% of US corn harvested6), whilst Brazilian production derives from sugar. EU bioethanol production passed 2bn gallons in 2015, with France being the main production centre (18%) followed by Germany and Hungary7. The EU is the largest global producer of biodiesel (53% of global production) at 12.5bn litres in 20158; Germany, France, the Netherlands, and Spain are the main producers10. Rapeseed oil (Canola) is still the dominant biodiesel feedstock in the EU, accounting for 55% of total production9. The increased use of palm oil and recycled vegetable stock is reducing the influence of rape-seed.



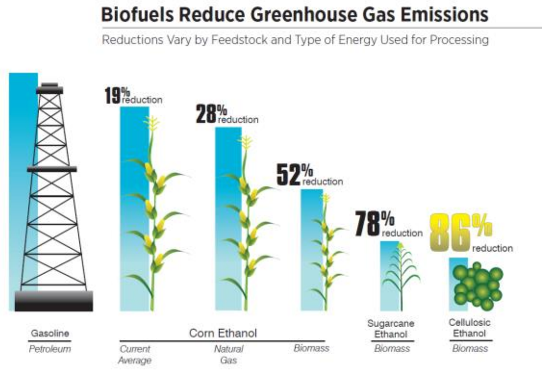
The International Energy Agency believes that by 2050 bio-fuels have the potential to meet more than 27% of global transportation fuel needs10. The EU Renewable Energy Directive set an overall cap of 7% on the share of food crop based biofuels in EU transport fuel by 2020, but expects the share of biofuels to be around 12% of renewable energy use by 2020, heat and power obtained from biomass making up 45%11.

Q. CAN BIOFUELS BE USED IN POWER GENERATION?

A. Yes. Co-firing biomass such as willow or elephant grass alongside coal has emerged as a viable technology that can drive down emissions in coal fired electricity generation. Drax, Europe's largest coal-fired power station and responsible for supplying 8% of the UK's electricity, now co-fires 43% of its output or 11.5TWh from 'renewable' sources, principally wood, compressed into pellets12. Drax now positions itself as Europe's largest producer of renewable power, in the process nearly halving carbon emissions. However, co-firing bio-mass does come with a caution: it can be typically three to five times more expensive than coal, and depends on farmers and foresters diverting production away from crops or timber suggesting that it may not, in the long run, be sustainable.

Q. CAN BIO-FUELS CLAIM TO BE SUSTAINABLE IN TERMS OF REDUCING GREENHOUSE GAS EMISSIONS?

A. The International Resource Panel reported that not all biofuels perform equally in terms of environmental benefits, and that each needs to be assessed individually on a full life cycle basis. Certainly for first-generation biofuel crop production, arguments are compelling that on a life-cycle basis biofuels may have greater greenhouse gas intensity than refining the equivalent volume of crude oil or diesel.



This is especially true if land previously acting as a carbon-sink (forest or peat) is diverted for bio-fuel cultivation. These concerns have partly fostered the imperative towards second and third generation biofuels made from waste, algae or crop husks. These fuels typically can reduce greenhouse gas emissions by up to 90% when compared with fossil fuels, and compare well against first-generation bio-fuels with their savings on average of between 20-70% on conventional fuel oils (see diagram above13). Drax reports that the conversion of three of its burners to wood pellet combustion has reduced the use of coal burned by four million tonnes since 2010, achieving a carbon saving of up to 80% when compared to coal equivalent14.

Q. ARE BIOFUELS A VIABLE FUEL SOURCE IN ALL FORMS OF TRANSPORTATION?

A. Potentially, yes. Whilst hydrocarbons are the only solution to mass shipping and aviation for now, in practice blending bio and conventional fuel is already well advanced. For instance, there is no alternative at present to kerosene to fuel commercial flights. However, aviation powered in part by biofuels has commenced and is the most likely innovation in terms of reducing GHG emissions given no new breakthroughs in solar or battery energy storage are anticipated. KLM is a pioneer of biofuel flights and in 2016 commenced 80 short-haul flights powered by a biofuel/kerosene mix to supplement the 200 commercial flights it commenced in 2011. These are based on a 50% bio-kerosene blend refined from used cooking oil. In shipping, Maersk is trialling biodiesel in a large container vessel commencing with a 5-7% biodiesel mix. In the UK, Stagecoach the UK transport group pioneered the use of biodiesel buses which reduce CO2 emissions by up to 80% compared to conventional diesel15. The conversion of household waste into bio-methane is also being used to fuel Stagecoach buses in Lincolnshire and the East Midlands. Transport for London, among the largest providers of bus transport in the world, has announced that a third of the London fleet (3,000 vehicles) will be converted to green diesel made from a renewable mix of waste products including cooking oil and tallow.

Q. WHAT SHOULD RESPONSIBLE INVESTORS LOOK FOR?

A. Biofuels present challenges and opportunities for the responsible investor, but we do believe second and third generation biofuels present a potentially interesting contribution towards fulfilling future energy needs. The UK faces the prospect of coal fired power being retired by 2025, and all but one of the nuclear fleet by 2030 without, at present, a plan for bridging the gap. Biofuels can and should play a meaningful role given existing plant can be converted relatively easily from coal to bio-mass generation as is witnessed at Drax.

In production terms, we remain cautious and negative on first-generation biofuels given the ongoing risks associated with de-forestation and diversion of land away from food production. At present, only Brazil has sufficient available land to manage these risks appropriately as cultivation in protected areas is forbidden. In the US and Europe, legislators have begun to impose limitations on first-generation cultivation and to restrict subsidies that may well impede supply, at least in the short-term (as much as 70% of the Iowa corn crop is diverted into ethanol production based on $6bn of annual Federal subsidies). We view second-generation biofuels, (some of which are still to reach technical or economic critical mass), as presenting a more sustainable and viable alternative to hydrocarbons without the associated negative impact edible crop bio-fuels may have on food prices and land use. These may well provide an exciting opportunity for responsible investors in the medium to long-term, as we see a shift in appetite among some of the world's largest corporations, (Boeing, Chevron, Exxon, BP, Shell, Statoil, DuPont, and Petrobras) in beginning to commercialize and scale their potential. We are well positioned to benefit from innovation and increasing demand in the biofuels arena from positions in well established companies such as BASF and Siemens, the latter with growing expertise in synthetic biofuels, algae, bioethanol produced from straw and biomass pyrolosis (bio-gasification). BASF has invested in proprietary biomass processes to create cellulosic sugar from fractionation of biomass and the separation of solids using water as a solvent. The resultant product has applications in transportation as well as chemical production

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Further information

For further information on EdenTree's SRI range of Amity Funds please contact your EdenTree Business Development Manager, visit www.edentreeim.com or call our IFA support team on 0800 011 3821.

Notes:

[1] 1 International Service for the Acquisition of Agri-biotech Applications http://www.isaaa.org/resources/publications/pocketk/16/

[2] ISAAA ibid

[3] ISAAA ibid

[4] Alternative Fuels Data Centre www.afdc.energy.gov

[5] AFDC ibid

[6] www.worldofcorn.com

[7] http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual_The%20Hague_EU-28_7-15-2015.pdf

[8] GAIN ibid

[9] GAIN ibid

[10] IEA ibid

[11] https://ec.europa.eu/energy/en/topics/renewable-energy/renewable-energy-directive

[12] Drax Annual Report & Accounts 2015 www.drax.com

[13] US Dept. of Energy 'the facts about bio-energy' http://www.energy.gov/sites/prod/files/2014/04/f14/biomass_basics.pdf

[14] Drax ibid

[15] www.stagecoach.com/sustainability