SINCLAIR KNIGHT MERZ

Energy Efficiency and Conservation Authority
Te Tari Tiaki Pūngao

Consumer Information on Biofuel Sustainability

OPTIONS FOR INFORMING CONSUMERS ON BIOFUEL SUSTAINABILITY

- 3.0
- 25 February 2008

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1. Introduction

1.1 Background

The New Zealand government has announced the introduction of a Biofuels Sales Obligation as part of a broader policy agenda covering climate change, energy and sustainability. Biodiesel and bioethanol have the potential to reduce the escalating greenhouse gas emissions from the transport sector. From 1 July 2008 companies importing petrol or diesel into New Zealand, either direct from overseas or via the refinery, will be required to sell biofuels as a proportion of the energy content of their total annual sales. This obligation will increase year-on-year from 0.53 per cent in 2008 to 3.4 per cent by 2012.

While there is general support for moving away from total reliance on petroleum based transport fuels there have also been concerns expressed regarding the sustainability of biofuels. Sustainability in this context can be taken to mean the ability to produce biofuels to contribute to today's fuel needs without compromising the ability of productive land to meet current and future food and fuel needs. Issues considered under the sustainability banner include environmental (land use change, fertiliser use, biodiversity, energy intensity), social (labour conditions, land ownership) and economic (net benefit).

Key issues raised on the international stage include the potential for the production of biofuel feedstocks to compete with critical food crops, the energy required to produce biofuels and the potential for important forestry resources to be cleared for biofuel feedstock production. The debate has yet to address New Zealand specific issues but still may impact on public perceptions of the implementation of the Biofuels Sales Obligation.

There is also provision in the Biofuel Bill to implement mandatory sustainability standards for biofuels. This would mean companies supplying biofuels would be required to prove that their biofuel is sourced from suppliers who can demonstrate environmentally and socially acceptable practices. The Energy Efficiency and Conservation Authority (EECA) has committed to implementing a voluntary consumer information scheme in the recently released New Zealand Energy Efficiency and Conservation Strategy (NZEECS).

1.2 Biofuels in New Zealand

Biofuel is a generic term for fuels that can be produced from or are made up of a renewable material of plant or animal origin. Often they are substitutes or partial substitutes for petroleum derived fuels. Biofuels used in transport are typically bioethanol which is used as a petrol substitute and biodiesel which is used as a diesel substitute. These are the biofuels that are most likely to be used in New Zealand in the medium term.

Biodiesel - The most likely feedstock for biodiesel produced in New Zealand is tallow, the animal fat by-product produced at meat processing facilities. There is also potential for biodiesel from rapeseed with Solid Energy proposing to plant a 30,000 hectare crop in the South Island in 2008. Plant based oils may also play a role in New Zealand drawing on feedstocks grown within New Zealand and offshore. Other options include algae (early stages of development), and internationally traded products such as palm oil and coconut oil (both of which can be sourced from nearby Pacific Islands). All biodiesel and biodiesel blends sold in New Zealand will be required to meet the revised Petroleum Products Specifications Regulations under the provisions of the Biofuel Bill.

Bioethanol - The most likely feedstocks for bioethanol in New Zealand include whey, a by-product of the milk processing industry, and maize (corn). Demand for land for dairying is massive and that value (e.g. NZ$59,000/ha recently being paid in Southland) makes commodity cropping (i.e. wheat, maize, barley) unlikely. On this basis it is unlikely that enough maize could be grown to make a dedicated plant economic.

There is a large amount of research and development work focused on cellulosic ethanol utilising feedstocks such as straw, wood waste and willow (salix). However, processing technologies that would enable woody biomass to be used for biodiesel are probably only going to be available in the medium term (excluding demonstration scale plants).

Bioethanol is likely to be introduced as a low-level blend in some petrol, with concentrations between 3 per cent and the current maximum allowed level of 10 per cent. Gull New Zealand is currently marketing a 10% blend (E10) as a premium product across their service station network.

1.3 Biofuels and Sustainability

Concerns have been raised over the production impacts (environmental and social) and greenhouse gas reductions associated with biofuels. Research into the life cycle of different biofuel production methods has shown life cycle carbon emissions can sometimes be equivalent to, or even exceed, petroleum derived fuel. This is largely a result of farming practices involving forest clearance for biofuel crops or the use of large amounts of nitrogen fertiliser. Other sustainability concerns have had wide media coverage internationally and in New Zealand. These concerns relate to detrimental environmental and social impacts such as loss of ecological diversity, soil degradation, worker rights and land rights. There is a risk that awareness of these issues could have an adverse affect on the public perception of biofuels and their uptake.

For by-products (such as tallow and whey) or waste feedstocks the approach adopted internationally is to consider life cycle impacts differently from materials produced exclusively for biofuel production. Where a feedstock represents less than 10% of the 'farm gate income' it is deemed to have little impact on the environmental or social effects of the production systems at the farm level. For this scenario the sustainability reporting and greenhouse gas calculations cover only biofuel production (biodiesel manufacturing facility or distillery) and subsequent logistics.

The remainder of this report outlines some of the key sustainability issues for biofuels internationally, reviews initiatives to address these issues and then offers some recommendations for taking action in New Zealand.

2. Assessing the Sustainability of Biofuels

2.1 International Initiatives on Sustainable Biofuels

In response to growing awareness of sustainability issues there are a range of initiatives considering biofuels and biofuel feedstocks. Some of these have global focus while others are focused at national or regional level. Key initiatives include EU countries developing schemes to meet their Biofuel Directive obligations, agricultural suppliers developing assurance schemes and North American moves on carbon accounting for biofuels. These are discussed below.

2.1.1 European Union Initiatives

Several countries have started initiatives to better understand and control the sustainability of the biomass used for bioenergy. The UK and the Netherlands have worked together to develop criteria for sustainable biomass and have developed a greenhouse gas calculator to assess the benefits of specific bioenergy feedstocks. Other governments are working on concrete policies to ensure the greenhouse gas benefits and wider sustainability of their bioenergy. They include Germany (WWF 2006), and Switzerland (EPFL Energy Center, 2007).

The European Commission is undertaking public consultation on the sustainability of bioenergy in the EU at the time of writing of this report (D. Rutz R. Janssen, 2006). The study investigates certifying the sustainability of biofuel feedstocks, and intends to include minimum requirements on certain sustainability issues in the revision of Directive 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport, also known as the Biofuels Directive. The minimum sustainability standards are based on greenhouse gas savings of the production method and biodiversity conservation.

The UK intends to introduce a Renewable Transport Fuel Obligation (RTFO) which will require suppliers of road transport fuel to supply 2.5%v/v from renewable sources in 2008/2009. This percentage will increase to 5% in 2010/2011. The obligation would apply to both refiners and importers covering virtually all of the transport fuel sold into the UK market. All companies at the relevant point in the supply chain would be obligated. The government will issue certificates to companies supplying qualifying fuels that they can use to meet their obligation or trade with others who have a renewable transport fuel obligation.

For the first phase of the RTFO (2008-11) a carbon and sustainability reporting scheme will be introduced. The responses to a public consultation in the second half of 2007 are currently under review by the Renewable Fuel Agency which will oversee this reporting end enforce the RTFO. The system will require suppliers of biofuels to complete both monthly and annual reports outlining the percentage of their crops grown according to 'qualifying standards' in order to receive Renewable Transport Fuel Certificates (RTFCs). The information required will include:

- Greenhouse gas savings of the fuels supplied and the methods used to calculate the results;
- Details of the origin of the fuels;
- Details of the environmental standards observed in the cultivation and processing of crops; and
- Details of any land use change.

The UK has proposed a transitional phase where obligated fuel suppliers will be able to file reports with incomplete information where data is unavailable. The intention is that full reports will be required after 2011 and that ultimately certain feedstocks or production methods will not qualify for certificates. Annual reports are expected to be publicly available and will have to be independently verified. The Government has asked the Low Carbon Vehicle Partnership (LowCVP) to explore the feasibility of a voluntary labelling scheme to allow responsible retailers to show that their biofuels are genuinely sustainable.

Although the UK and the Netherlands have agreed upon the greenhouse gas calculation methodology the social and environmental impact criteria differ slightly. The Netherlands have included a recommendation that biofuels must result in a minimum GHG reduction of 30% (J. Cramer et al, 2007). They have also added that biomass for energy must not endanger food supply and other local applications (although criteria for this have yet to be established). Lastly they recommend that production of biomass must contribute to local prosperity.

2.1.2 North America

Low Carbon Fuel Standard

California intends introducing the world's first greenhouse gas standard for transportation fuels. The policy aims to achieve a 10 per cent reduction in the carbon intensity (measured in g CO_2e/MJ) of transportation fuels in California by 2020. This is expected to encourage research and uptake of biofuels. The work in California draws on research undertaken in the UK and aims to create a framework that could be integrated with the European approach in the future.

Biodiesel Council of California

This is an alliance of consumers, distributors and producers committed to the socially, economically and ecologically sustainable development of the biodiesel industry in California. It works to organise the public, advocacy for governmental acceptance of neat biodiesel and develops and protects the public biodiesel supply.

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2.1.3 Global

Other international institutions such as UNEP, G8[4], IEA[5] and FAO[6] also have programmes which address the sustainability of bioenergy. The Roundtable on Sustainable Biofuels is an initiative of the Swiss EPFL Energy Centre with the goal of 'Ensuring that biofuels deliver on their promise of sustainability'. Draft principles for sustainable biofuels production and processing have been drawn up which draw heavily on the Low Carbon Vehicle Partnership in the UK, the Dutch Cramer Commission work, and the Roundtable on Sustainable Palm Oil. A summary of international schemes aimed at ensuring minimum sustainability standards is provided in Table 1.

▪ **Table 1 Linking Sustainability Schemes with Criteria**

Criteria	RTFO (UK)	Germany	Netherlands	EU Commission	Roundtable on Sustainable Biofuels	California
Minimum GHG reduction	N	Y	Y	Y	Y (less than fossil fuel)	Y
Carbon storage	Y		Y	N	Y (covered in GHG reduction)	Y
Biodiversity conservation	Y	Y	Y	Y	Y	N
Soil quality/erosion	Y	Y	Y	N	Y	Y
Water use	Y	Y	Y	N	Y	N
Air quality	Y	Y	Y	N	Y	N
Displacement of food crops	N	Y	Y (but no criteria set)	N	Y	N
Worker rights and working relationships	Y	Y	Y	N	Y	N
Land rights and community relations	Y	Y	Y	N	Y	N
Local prosperity	Y	Y	Y	N	Y	N

[4] Global BioEnergy Partnership (GBEP), http://www.globalbioenergy.org/
[5] IEA takes 40 on bio-energy trade, http://www.bioenergytrade.org/
[6] International BioEnergy Platform (IBEP)

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2.2 Assessing Environmental and Social Impacts

The UK is leading the development of a framework for assessing environmental and social impacts. The assessment focuses on the following principles contained in Table 2 which define the RTFO biofuel **'Meta-Standard'**:

▪ **Table 2 Environmental and Social Principles**

Environmental principles
1. Biomass production will not destroy or damage large above or below **ground carbon** stocks
2. Biomass production will not lead to the destruction of or damage to high **biodiversity** areas
3. Biomass production does not lead to **soil degradation**
4. Biomass production does not lead to the contamination or **depletion of water sources**
5. Biomass production does not lead to **air pollution**
Social principles
6. Biomass production does not adversely affect **workers' rights and working relationships**
7. Biomass production does not adversely affect existing **land rights and community relations**

The full details of the specific indicators which underlie each principle are covered in a report by Ecofys for the UK's Department for Transport (Ecofys, 2007). A summary of the criteria is provided in Appendix A of this report.

Participation in existing assurance schemes can be used to demonstrate compliance with various criteria depending on the scope of the specific scheme as outlined in Table 3. Benchmarked standards that meet the required level of sustainability and audit quality are called Qualifying Standards. The applicability of existing assurance schemes to biofuels are evaluated in section 2.3. The relevant schemes include:

- The Assured Combinable Crops Scheme
- GlobalGAP, formerly EurepGAP
- LEAF Assurance Scheme
- Rainforest Alliance/Sustainable Agricultural Network Farm
- The Roundtable on Sustainable Palm Oil Standard (RSPO)
- The Basel Criteria (draft standards for soybean cultivation) - to become the Round Table on Responsible Soy
- Forest Stewardship Council (FSC)
- International Federation of Organic Agriculture Movements (IFOAM)

Table 3 Qualifying Assurance Schemes and Coverage

Standard	Coverage	Qualifying Environmental Standard?	Qualifying Social Standard?
LEAF	UK Farming	Yes	No
RSPO	Palm oil	Yes	Yes
Sustainable Agriculture Network/ Rainforest Alliance	Tropical crops	Yes	Yes
Basel Criteria	Soy oil	Yes	Yes
Forest Stewardship Council	Forestry including clearance	Yes	No
Social Accountability 8000	Working conditions	No	Yes
Assured Combinable Crops Scheme2	Combines livestock and crops	No	No
GLOBALGAP IFA formerly EurepGAP	Food crops	No	No
IFOAM	Organics	No	No

Source: E4tech, Ecofys, 2007

Under the proposed model, suppliers will also be able to organise additional supplementary checks to demonstrate that feedstock complies fully with the Meta-Standard criteria.

2.3 Existing Feedstock/Primary Produce Assurance Schemes

There is broad agreement in Europe for building upon existing systems and initiatives rather than starting from a ‘clean sheet’. Creating a new compliance scheme would mean duplication of effort and undermine progress made by many of the existing assurance schemes. An overarching international agreement on environmental assurance schemes for biofuels would be very demanding and cross compliance is an accepted approach used by several other schemes including LEAF and GLOBALGAP. Moreover, the cost of auditing and yearly subscriptions to these schemes can be a burden particularly for smaller farms - an additional scheme would not be welcomed by farmers.

Most of the standards which are benchmarked either already have options for group certification (GLOBALGAP, RA, FSC, IFOAM) or are developing these options (RSPO, LEAF). SAN/RA also specify special indicators for smallholders which are less stringent than for larger farms. Such special treatment of smallholders is encouraged with the Meta-Standard as long as it does not fundamentally undermine the sustainability criteria.

The coverage of these schemes is generally low particularly in New Zealand, however, it is expected that demand for certification will grow as the global biofuel market expands. The cost of certification is also often high.

The remainder of this section summarises the cross compliance checks between the Meta-Standard and existing assurance schemes. The scheme information sheets in Appendix C provide an overview of the schemes coverage, methodology and costs. It should be noted that while FSC, SAN, ACCS, EurepGAP and LEAF are operational assurance schemes the RSPO has yet to operationalise its agreed standards and the Basel Criteria are an initial draft that has yet to be formally discussed by the RTRS.

Expanded LEAF

The LEAF scheme is a new scheme operating within the UK, specifically designed to provide a higher level of assurance on environmental impacts than the much more widespread ACCS. There are currently around 1000 certified farms within the scheme, with an aim to increase this to around 5000 within three years. LEAF also has plans to rollout its scheme in a number of other countries in response to demands from retailers.

The LEAF standards appear to meet or exceed all the requirements of the basic level draft biofuel standards. No supplementary checks would, therefore, be required.

Development of the LEAF standard involved wide stakeholder consultation including NGOs. Farms can not be certified by LEAF alone but need a base standard such as EurepGAP or ACCS. Inspections for LEAF and the base standard can be combined, thereby reducing costs. Being a relatively new standard, LEAF certification is not widespread as yet but is expanding rapidly. While the initial focus was on the UK, the standard is now extending its activities beyond the UK.

Roundtable on Sustainable Palm Oil (RSPO)

RSPO is a multi-stakeholder initiative for the development and implementation of a standard for sustainable palm oil and its membership covers roughly 40% of world palm oil production. Its criteria were adopted in November 2005 and it is hoped that the standard will become operational by the end of 2007. Some producers have already been audited against the RSPO criteria. While they can’t claim to sell RSPO palm oil they can claim that they produce according to the RSPO criteria.

On most environmental aspects, the RSPO criteria and indicators appear to meet or exceed those of the draft biofuel standards. The only significant gap appears to be on the issue of protection of soil carbon stocks (prevention of planting on peat or other high organic matter soils). To cover this gap a “supplementary check” to ensure that high organic matter soils and peat were not converted to plantations would be required.

Sustainable Agriculture Network/Rainforest Alliance (SAN / RA)

The Sustainable Agriculture Network/Rainforest Alliance is a coalition of non-profit, independent conservationist organisations that promotes the social and environmental sustainability of agricultural activities by developing a standard, and certifying farms that comply with that standard.

The SAN/RA farm standard is the world's largest agricultural scheme for the environmental and social assurance outside the organic sector. Certified crops include bananas, citrus, cocoa, coffee, flowers and ferns. It is relevant to the biofuel sector insofar as it covers plantation crops that have agronomic and ecological similarities to potential biofuel crops grown in the tropics. A number of major producers are listed as certified including Chiquita and Favorita (bananas) plantations Arriba (cacao), and several thousands of coffee producers, from small to large-scale in Central and South America. (Brazil, Colombia, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Peru).

The SAN/RA farm standards appear to meet or exceed all the requirements of the basic level draft RTFO biofuel Meta-Standard. The SAN/RA standards have been shown to be practical to implement by smallholder farmers in Latin America (particularly in the case of coffee and cocoa producers).

While no specific standards yet exist for energy crops the generic standard gives a good coverage of the sustainability issues and RA has stated that it is interested in developing standards for energy crops if demand for such certified produce arises. In that case, certified produce could be on the market in 2-4 years time.

Roundtable for Responsible Soy (RTRS) using Basel Criteria for Responsible Soy Production

The Roundtable on Responsible Soy Association (RTRS) is a multi-stakeholder and participatory process that promotes economically viable, socially equitable and environmentally sustainable production, processing and trading of soy. It is not as far along as the RSPO and has not defined criteria yet. It has been estimated that with the proper funding the RTRS could be operational by 2008/2009. In the meantime, producers can be audited against the BASEL criteria.

As with the RSPO criteria and indicators, the Basel Criteria appear to meet or exceed those of the draft Meta-Standard. Again, the only significant gap appears to be on the issue of protection of soil carbon stocks. To cover this gap a "supplementary check" to ensure that high organic matter soils were not converted to plantations would be required. The criteria address several issues such as legal compliance, environmental criteria, forest conversion and workers' rights. Verification of compliance with the criteria is to be carried out by independent bodies.

Forest Stewardship Council (FSC)

The Forest Stewardship Council has received much attention as a likely environmental scheme that could be adapted to meet the life cycle components of biofuel production. It is the well known standard for sustainably produced wood and fibre products and has been operational since 1994. It is a performance based scheme covering biodiversity conservation, respect for local people's rights, use of pesticides and GMOs and a range of other issues.

Notwithstanding its rigorous approach, FSC certifies wood and fibre products only and is, therefore, not of direct interest for first generation biofuels. As cellulosic biofuels technology progresses this scheme could offer rigorous environmental assurance for biofuel from willow trees or timber processing by-products.

Social Accountability 8000 (SA8000)

Social accountability 8000 (SA8000) from SAI is a social standard only, which was initially designed to address labour conditions in factories. Of the more than 1000 facilities which are certified today, most are factories. Nonetheless, plantations are also certified to SA8000, most notably banana and pineapple plantations. Chiquita, for example, has its banana plantations certified by both SAN/RA and SA8000.

Assured Combinable Crops Scheme (ACCS)

The Assured Combinable Crops Scheme (ACCS) is a UK standard for combinable crops which started in 1997. The main focus of the ACCS is food safety and not so much environmental and social sustainability. The ACCS is a wholly owned subsidiary of Assured Food Standards (red tractor label) for the production of assured barley, oats, oilseeds, pulses, wheat and other crops.

The scheme covers over 12,000 farms in the UK, and over 75% of marketed output. There are a number of areas where the ACCS standards are weaker than those of the draft biofuel standards. The main areas where supplementary checks would be needed relate to the protection of carbon stocks and on biodiversity. The expansion of the scheme beyond the UK is restricted by demand for it.

GLOBALG.A.P IFA (formally EurepGAP)

The GLOBALG.A.P Integrated Farm Assessment, Combinable Crops is a world wide standard for combinable crops. Much like ACCS, GLOBALGAP focuses mainly on food safety with limited criteria related to environmental and social sustainability. The scheme appears to be developing rapidly in Europe, notably Germany, through benchmarking with existing national schemes. Until recently NGOs showed little interest in GLOBALGAP and stakeholders consisted mainly of growers, retailers and consumer representatives. Several palm oil plantations in Malaysia are currently certified by the Fruit and Vegetable Standard of GLOBALGAP. Currently only ZESPRI Kiwifruit and Horticulture New Zealand are members of GLOBALGAP.

There are similar levels of coverage and gaps as with the ACCS. Key areas where supplementary checks would be needed are on the protection of carbon stocks and on biodiversity. Aspects that are marginal relate to planning and continual improvement.

International Federation of Organic Agriculture Movements (IFOAM)

International Federation of Organic Agriculture Movements (IFOAM) is the worldwide umbrella organisation for the organic movement, uniting more than 750 member organisations in 108 countries.

IFOAM is actually a Meta-Standard by itself as it focuses on accrediting other standards for organic agriculture according to the general criteria set out by IFOAM. Currently, IFOAM has accredited 33 organic standards over the world for a variety of crops.

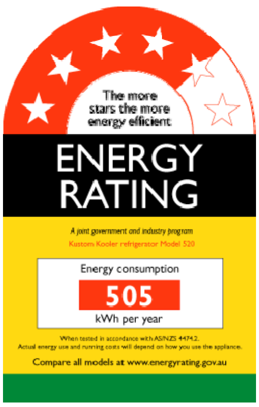
Better Sugarcane Initiative (BSI)

The Better Sugarcane Initiative is a standard under development for sugarcane production (food, fuel and chemicals). Draft principles and criteria have been proposed to enter a consultation process with the industry and producers. The demand from the bioenergy sector is likely to accelerate this process significantly.

Currently led by WWF and also in the early stages of development, an inaugural meeting in 2005 agreed objectives (similar to those for the RSPO and RTRS) and a steering committee was established in January 2006 to oversee technical work on the development of standards and best management practices.

2.4 Existing Product Labelling Schemes

Energy Rating Label



The Energy Rating Label was first introduced in 1986 in NSW and Victoria. It has been a trans-Tasman label since New Zealand mandated all labelled products in 2002. It is now mandatory in New Zealand and all states and territories of Australia for refrigerators, freezers, clothes washers, clothes dryers, dishwashers and air-conditioners (single phase only) to carry the label when they are offered for sale. In New Zealand the labelling programme is run by EECA.

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The Energy Rating Label has two main features:

- The star rating gives a quick comparative assessment of the model's energy efficiency (the more stars the better)
- The comparative energy consumption (usually kilowatt hours/year) provides an estimate of the annual energy consumption of the appliance based on the tested energy consumption and information about the typical use of the appliance in the home. Air conditioners show the power consumption of the appliance (kW or kWh/hour).

The star rating of an appliance is determined using joint Australia/New Zealand Standards which define test procedures for measuring energy consumption. In addition, air conditioners, fridges and freezers must also meet minimum energy performance standards (MEPS). Appliances must meet these minimum standards before they can be granted an Energy Rating Label.

The Energy Rating Label allows consumers to compare the energy efficiency of domestic appliances on a fair and equitable basis. It also provides an incentive for manufacturers to improve the energy performance of appliances.

ENERGY STAR®

ENERGY STAR is a voluntary labelling programme run by the US Environmental Protection Agency which identifies and promotes the most energy-efficient products (in various product classes) to reduce greenhouse gas emissions.

ENERGY STAR is administered in New Zealand by EECA. Product categories labelled to date in New Zealand are reverse cycle air conditioners, dishwashers, washing machines, TVs and home electronics, computers and imaging equipment. A New Zealand refrigeration and freezer ENERGY STAR specification is due for release in early 2008.

Manufacturers undertake self certification to qualify and label their energy-efficient products. Qualifying products are registered with the US EPA, or directly with EECA where New Zealand specifications apply.

Where possible, ENERGY STAR adopts existing testing procedures when developing product specifications and testing criteria.

Third-party testing facilities and laboratories should already be accredited or recognised by an independent laboratory certification organisation to conduct testing and review test results. For those facilities that are not already accredited or recognised, a facility inspection is required prior to approval of the facility. Representatives from authorities approved to test for ENERGY STAR qualification conduct this inspection to ensure the proper procedures and reporting requirements are in place. Companies must also comply with global and local health and safety standards.

Environmental Choice

The Environmental Choice Programme has been designed to support a continuing effort to improve and/or maintain environmental quality by reducing energy and materials consumption and by minimising adverse impacts generated by the production, use and disposal of goods and services in New Zealand. Environmental Choice New Zealand currently has over 200 products that are registered as using the label. The programme is administered by the New Zealand Ecolabelling Trust as a voluntary, multiple specifications based environmental labelling programme, which operates to international standards and principles. Certified products include paper products, printers, copiers, faxes, cleaners and detergents and flooring.

Licence holders must report annually to Environmental Choice New Zealand on energy management, including:

- total energy use;
- breakdown of total energy use to types of energy used;
- energy use related to production;
- initiatives taken to reduce energy use and improve energy efficiency;
- initiatives taken to calculate and reduce CO_2 emissions associated with energy use.

Carbon Labelling

The Carbon Trust is an independent company funded by United Kingdom Government. It aims to help the UK move to a low carbon economy by helping business and the public sector reduce carbon emissions now and capture the commercial opportunities of low carbon technologies. Its carbon labelling scheme is currently under implementation and is using Walkers (snack foods manufacturer) and Trinity Mirror (newspaper publisher) as pilot companies. The carbon reduction label is a measure of a product's carbon footprint (grams of CO_2 emitted) from source to store, with a commitment from the business to reduce this figure. Products are issued with a label showing the amount in grams of CO_2 equivalent used in the product's manufacture, delivery to store and disposal.

The construction of a carbon footprint for a particular product involves the following stages;

- Collect energy and emissions data, focusing on energy intensive stages across the supply chain
- Construct a mass balance for the supply chain, ensuring 'what goes in must come out' for raw materials, waste, energy and emissions
- Construct carbon footprints, showing emissions by process/supply chain stage
- The methodology also allows the inclusion of emissions from product use, re-use, recycling and disposal alongside emissions from production and distribution in an integrated way
- The scheme then identifies ways of making stages of the supply chain more efficient.

Tesco supermarket has a separate carbon labelling scheme making it the first supermarket chain in the world to assign carbon labelling indicating the amount of CO_2emitted during the production, transportation and consumption of all its 70,000 products.

However, the design of their label makes it unclear as to the meaning of the number it contains. The meaning of the down arrow is also unclear leaving the consumer to find this information on the scheme's website. It is important for a biofuel sustainability label to convey its meaning without the consumer needing to reference a website to understand it.

CO_2 Star

The CO_2Star Campaign was launched in the framework of the "Carbon Labelling" project supported by the European Commission within the 'Intelligent Energy for Europe" programme. It was formed as a non-profit initiative in 2006 to introduce fuel and lubricant additives, first/second generation biofuels[7] and other measures that can achieve fuel efficiency, air pollution and carbon reduction goals. To communicate carbon benefits of products to consumers and to motivate manufacturers to make products available, CO_2 Star is developing carbon labels for fuels, lubes, tyres, cars, trucks, buses and products that are shipped to create a demand for low carbon transport solutions. Furthermore, a consumer survey will assess the success of the labelling initiative. Stakeholders will be involved throughout project activities

[7] First-generation fuels' refer to biofuels made from sugar, starch, vegetable oil, or animal fats using conventional technology. Second-generation biofuels use a variety of non food crops including waste biomass, the stalks of wheat, corn, wood, special-energy-or-biomass crops and other cellulosic biofuels. Algae fuel is a biofuel from algae which shows promise. Algae are potentially low-cost/high-yield (30 times more energy per acre than land) feedstocks.

through an e-list information networking for farmers/processors and policy makers. The details of project workshops will be available on the project website.

The CO_2 Fuel Star label denotes fuel savings and carbon benefits to consumers from using fuels with bio-content while also providing detailed information about carbon life cycle benefits of different biofuels, alternative fuels and fuel additives at the " CO_2 Fuel Star" web site. The Carbon Labelling project will elaborate carbon life-cycle numbers for biodiesel on the basis of different vegetable oil feedstocks that can be used in the development of carbon labels for fuels.

In Germany, CO_2 Fuel Star label was introduced by the fuel retailer Q1 in July 2007 for its pure biodiesel. The label promotes CO_2 reductions of 60% for using biodiesel instead of fossil diesel. This reduction number applies for biodiesel from rapeseed produced in Germany.

A web site address will be indicated on the label and will contain detailed information about biodiesel and fuel additives and their impact on CO_2 reduction, air quality improvement and fuel efficiency improvement.

Lessons can be learnt from the current CO_2 Star website. Its interface including colours, graphic design and links could be more clearly designed to give a professional appearance. Long paragraphs with no visual aids such as pictures make reading more difficult. A well designed professional website would add clarity and respectability to the information presented.

BQ 9000 Quality Management Program

The National Biodiesel Accreditation Program is a cooperative and voluntary programme for the accreditation of producers and marketers of biodiesel fuel called BQ-9000. The programme is a unique combination of the American Society for Testing and Materials (ASTM) standard for biodiesel, ASTM D 6751, and a quality systems programme that includes storage, sampling, testing, blending, shipping, distribution, and fuel management practices.

EECA Biofuels Label

The EECA Biofuels Label is a voluntary labelling scheme at fuel pumps that assures biofuel buyers that the fuel meets minimum quality criteria. Audit ensures that the fuel meets quality specifications which guarantee that biofuel blends are of the correct quality to avoid any engine problems. Once the Biofuels Sales Obligation commences the government will introduce and monitor comprehensive specifications for the quality of biofuels and biofuel blends. Until then, the biofuels label will ensure consumers that biofuel blends meet quality specifications.

2.5 Greenhouse Gas Calculation Methodology

The UK, in conjunction with the Netherlands, has developed a methodology for calculating the carbon intensity of biofuels which covers feedstock production and biofuel manufacturing (E4tech, ECCM, Themba 2006). More recently, draft technical guidance for pilot companies has been produced (E4tech, 2007).

The methodology is based on a ‘well-to-wheel’ calculation that includes all significant sources of greenhouse gas emissions. There is also a provision to account for the GHG emissions from land use change as in cases where forest is cleared for energy crops the resultant release of GHGs would cancel out the potential benefits of biofuels. Therefore, fuel suppliers will be required to report on how the land used to produce a biofuel was being used in November 2005. Default values have been calculated which will enable fuel suppliers to determine the GHG impact of a land use change by selecting the appropriate default value based on

- The country in which the land use change occurred
- The land use in 2005 (grassland or forest land)
- The type of biofuel crop (annual or perennial)

Problems exist where no land use change information is available. Default values could be used based on the type of fuel, the feedstock and the origin of the feedstock. Such default values would be difficult to devise requiring a detailed knowledge of historical land use. These values could be converted to GHG impact (grams CO_2e / MJ) and this information disclosed to the public to encourage companies to report on land use change. In an effort to cover this gap in the reporting, land use change is also reported within the sustainability criteria. The size of the recommended acceptable carbon stock destruction is expressed in terms of a “carbon pay back time”: the number of years a biofuel feedstock crop needs to be grown before the destruction of the carbon storage resulting from land use change has been compensated. The maximum payback time is proposed as 10 years.

The carbon intensity calculations enable a direct comparison of fuel chain greenhouse gas saving on a like-for-like basis. Detailed calculations have been made for the principal feedstocks expected to be used for biofuel production for the UK at the start of the RTFO scheme. These are:

1) Ethanol from sugar cane, sugar beet, wheat or corn
2) Ethanol converted to ETBE
3) FAME biodiesel from tallow, used cooking oil, palm oil, soy or rapeseed
4) Biomethane from anaerobic digestion of MSW and manure.

It is expected that the Administrator will extend this list as significant new production pathways are introduced into the UK market. The Technical Guidance provides instructions for fuel chains not currently defined.

The calculation methodology uses default values that provide estimates of the carbon intensity of different fuel chains. Detailed qualitative or quantitative data, where available, can be used to improve the accuracy of the calculation. The scheme is designed to encourage better reporting of data by applying conservative default values (where little is known about the supply chain), but allowing for the use of less conservative figures where more detailed information is available. This is illustrated in Figure 1. This flexible calculation method provides a practical, cost-effective and credible reporting system. In the UK, suppliers will be required to report on the level of detail used in their greenhouse gas calculations. Worksheets in excel format are used to input company specific figures or default values in order to calculate carbon intensity. The default values from the worksheets are provided in Appendix B along with the worksheet used for rapeseed oil as an example.

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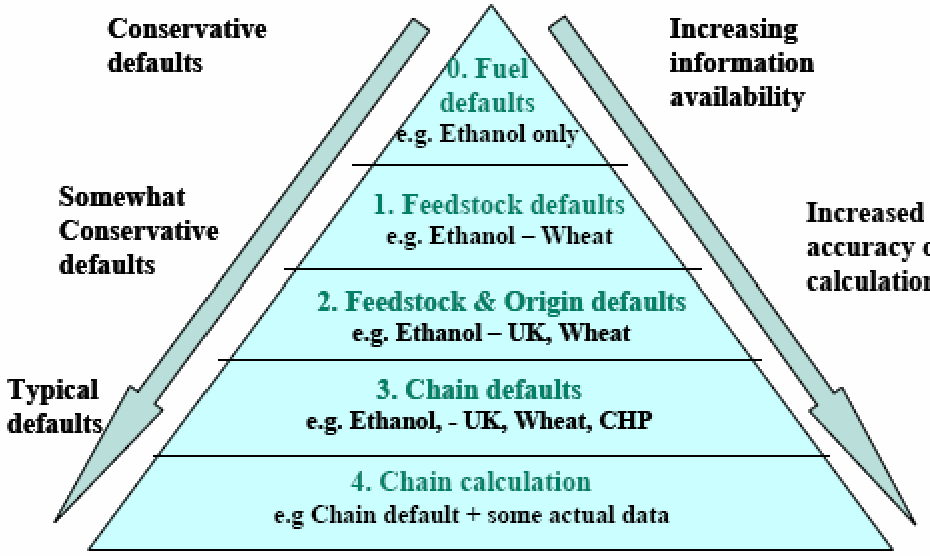
- **Figure 1 Hierarchy of default values used**



Source: *Ecofys, 2007*

Where information on previous land use is available, the calculation includes the effect on overall greenhouse gas savings. Default values for specific land use changes are based on Intergovernmental Panel on Climate Change guidelines. Where information is not provided, the calculation does not include any land use change carbon impacts.

It should be noted that the RTFO methodology calculates the GHG saving for a biofuel (neat) not a biofuel / fossil fuel blend. This provides a basis for comparing GHG savings of different production techniques relative to one another. This does not provide an indication of the greenhouse gas saving s associated with using a biofuel blend.

2.5.1 Calculating average GHG saving over year

Over the course of a year different biofuel sources are likely to have been used, therefore, it is important to calculate the average GHG saving across all sources. This could be calculated by using a pro rata method whereby fuel quantities from each feedstock are taken into account. The following equation would yield the average GHG saving from all biofuel sources combined.

$$\frac{A + B + C}{X} = \text{Average GHG saving}$$

A, B, C = Multiply GHG saving from each biofuel source with number of litres from that source

X = Total number of litres of biofuel from all sources

So, for example, if 100 tonnes of biodiesel was sourced from rapeseed and 1 tonne sourced from tallow over the course of the year the average GHG saving using the RTFO default values with a transport distance of 50 miles and fuel blend of 2.5% would be;

Rapeseed

Carbon intensity of diesel = 3647.06 Kg CO_2/T

Carbon intensity of rapeseed = 2866 Kg CO_2/T

Carbon intensity of rapeseed at 2.5% = 71.65 Kg CO_2/T

Carbon intensity of diesel at 97.5% = 3555.88 Kg CO_2/T

Total carbon intensity of fuel mix = 3555.88 + 71.65 = 3627.53 Kg CO_2/T

Therefore, GHG saving: $\frac{3647.06 - 3627.53}{3647.06} \times 100 = 0.535\%$

Tallow

Carbon intensity of diesel = 3647.06 Kg CO_2/T

Carbon intensity of tallow (UK) = 531 Kg CO_2/T

Carbon intensity of tallow at 2.5% = 13.275 Kg CO_2/T

Carbon intensity of diesel at 97.5% = 3555.88 Kg CO2/T

Total carbon intensity of fuel mix = 3555.88 + 13.275 + = 3569.155 Kg CO_2/T

Therefore, GHG saving: $\frac{3647.06 - 3569.155}{3647.06} \times 100 = 2.1361\%$

Average GHG saving from using 100 tonnes of rapeseed and 1 tonne of tallow based biodiesel:

$(2.1361 \times 1) + (0.535 \times 100) = 0.551\%$

Therefore, using 2.5% biofuel blend containing a tallow to rapeseed biofuel mix in a 1:101 ratio yields a GHG saving of 0.551%.

3. Sustainability Labelling

3.1 Background

The International Organization for Standardization (ISO) is an international standard-setting body that promulgates world-wide industrial and commercial standards. ISO has defined and provided best practice guidance for implementing labelling schemes (ISO/IEC Guide 59, 1994).

The ISO has identified and developed standards for three broad types of voluntary labels as follows:

- Type I (ISO 14 024) – a voluntary, multiple-criteria-based, third-party programme that awards a licence that authorises the use of environmental labels on products indicating overall environmental preferability of a product within a particular product category based on life-cycle considerations e.g. Energy Star, Environmental Choice or the EECA Biofuels Label.
- Type II (ISO 14 021) – informative environmental self-declaration claims.
- Type III (ISO/TR 14 025) – voluntary programmes that provide quantified environmental data of a product, under pre-set categories of parameters set by a qualified third party and based on life cycle assessment, and verified by that or another qualified third party e.g. Energy Rating Label.

3.2 Type I Label for Biofuels

The introduction of a seal of approval would require fuel suppliers to meet minimum sustainability criteria in order to be awarded with this label. As mentioned above, if the UK reporting approach is taken then fuel suppliers could be required to source a certain percentage of their biofuel from sources certified to qualifying assurance schemes. Minimum greenhouse gas savings of these fuels could also be specified as in the scheme proposed for the Netherlands. Setting standards too high may exclude too many biofuel sources and mean fuel suppliers would struggle to meet the minimum requirements of the label. Setting standards too low may result in fuel suppliers sourcing from production processes that lead to soil erosion, inefficient water use, biodiversity and carbon stock loss, working conditions and high greenhouse gas emissions etc.

3.3 Type II Label for Biofuels

A Type II label could be used by fuel suppliers to convey the sustainability of their fuels. However, without external third party verification any claims made may not been seen as credible.

3.4 Type III Label for Biofuels

A label using quantified indices such as the Energy Rating Label could convey the average degree of sustainability of certain aspects of the biofuel sources. A star or tick rating scheme could be developed according to ranges arising from actual data. This star or tick scheme could be incorporated into the label for each criterion such as conservation of carbon stocks, biodiversity conservation, soil conservation etc. Alternatively, the environmental sustainability and social criteria could be amalgamated into two star rating schemes to provide information regarding the average of the two aspects. The Energy Rating label provides a suitable template for this and could even include the average percentage greenhouse gas reduction figures of the biofuels located where the KWh figure is.

Labelling such as this would, however, be complex to devise especially taking into account quantifying aspects such as biodiversity and soil degradation. Setting ranges for these values would be subjective and again averaging these criteria into a star scheme for environmental and social impacts could prove to be difficult. The label may also need to be changed as feedstocks and blend levels change throughout the year or even removed if no biofuel is being sold at any point. Averaging sustainability criteria and greenhouse gas savings at the end of the obligation year would be more feasible.

The consumer may also have difficulty interpreting such a label especially considering the range of factors and onus placed on the consumer to decide which criteria is most important and worthwhile when making a purchasing decision. A possible scenario even for the less complex averaged environmental and social aspect star rating would be that one would be high while the other low. A consumer would have to decide whether to apply more weight to the social or environmental criteria.

4. Providing Information for Consumers

The majority of media coverage of biofuels has been negative. Reports suggest that some production methods result in higher greenhouse gas emissions per litre of fuel compared with conventional fossil fuels. Poorly managed farming practices may lead to a host of environmental problems such as biodiversity loss, soil erosion, water resource depletion and displacement of food crops. Furthermore, conflicts are arising particularly in developing countries regarding land rights, working conditions and pay.

There is no source of accurate, objective information currently available to inform the consumer on these issues. Information is confusing with variations from crop to crop and country to country. A website would provide a means to convey the positive and negative impacts of different biofuels so that the consumer can make an informed decision as to which biofuel source offers GHG reductions while being environmentally responsible in its production. The objective of web material would be to cover the key issues for sustainability of biofuels in New Zealand. These are;

1) Greenhouse gas reductions relative to fossil fuel derived fuels
2) Environmental Conservation
3) Social responsibility

Web material must cover these issues for each biofuel source. Once this has been done one key problem remains – how does the consumer weigh each issue in order to make a purchasing decision. One source may offer large greenhouse gas savings while being overly destructive to the environment. Alternatively, a biofuel source may be environmental and socially responsible in its production but offer little greenhouse gas savings relative to fossil fuels. The philosophy underlying providing information on the web is similar to that for Type III Labels – informing the consumer but allowing them to make their own judgment.

4.1 Website Information Requirements

Below is a summary of the information likely to be made available through the website.

From the biofuel supplier:

- percentage of biofuel from each biofuel source
- percentage of biofuel from each qualifying assurance scheme
- greenhouse gas savings from each biofuel source using the RTFO calculation methodology
- average greenhouse gas savings for the biofuel obligation year (as in section 2.5.1).

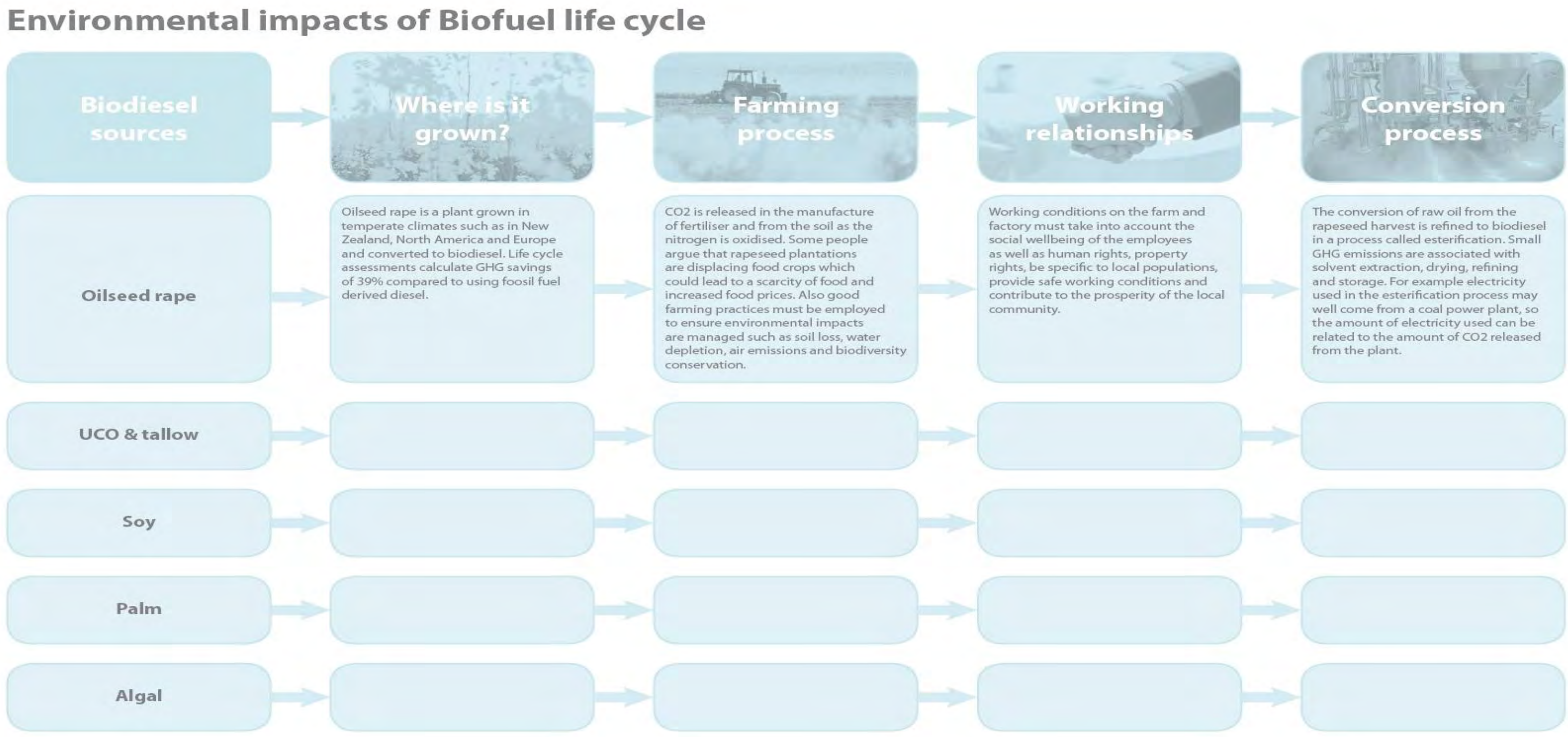
General material;

- Environmental impacts of production method.
- Social impacts.
- Details of qualifying assurance schemes and links to websites.

The introduction would include a brief description of what biodiesel and bioethanol are and how they provide a means for helping New Zealand reduce the carbon intensity of its transport energy usage.

The impacts associated with biofuel production could be given context by using case studies from around the world to explain how the impacts differ depending on the location i.e. climate, soil condition, previous land use and farming practices. This provides an opportunity to counter the negative publicity for crop based biofuels by describing likely biofuel sources for New Zealand such as tallow and whey. These are less energy intensive and have a lower overall environmental footprint. The fuel vs. food debate could also be discussed in a New Zealand context for example the concept of converting marginal grazing land to forestry for ethanol.

These supply chain sustainability issues could be displayed graphically with text boxes appearing over icons that provide further information. These boxes could describe the life cycle of each production method and the carbon and environmental footprint of each step. Specific sustainability information would include the impacts of farming practices, conversion methods and transport of the fuel to the pump. An example is provided in the figures below for rapeseed and whey feedstocks. Issues for each feedstock that should be included in the remaining text boxes are provided in Table 4.


Environmental impacts of Biofuel life cycle
Biodiesel sources
Where is it grown?
Farming process
Working relationships
Conversion process
Oilseed rape
Oilseed rape is a plant grown in temperate climates such as in New Zealand, North America and Europe and converted to biodiesel. Life cycle assessments calculate GHG savings of 39% compared to using foosil fuel derived diesel.
CO2 is released in the manufacture of fertiliser and from the soil as the nitrogen is oxidised. Some people argue that rapeseed plantations are displacing food crops which could lead to a scarcity of food and increased food prices. Also good farming practices must be employed to ensure environmental impacts are managed such as soil loss, water depletion, air emissions and biodiversity conservation.
Working conditions on the farm and factory must take into account the social wellbeing of the employees as well as human rights, property rights, be specific to local populations, provide safe working conditions and contribute to the prosperity of the local community.
The conversion of raw oil from the rapeseed harvest is refined to biodiesel in a process called esterification. Small GHG emissions are associated with solvent extraction, drying, refining and storage. For example electricity used in the esterification process may well come from a coal power plant, so the amount of electricity used can be related to the amount of CO2 released from the plant.
UCO & tallow
Soy
Palm
Algal

Environmental impacts of Biofuel life cycle

Bioethanol sources	Where is it grown?	Farming process	Working relationships	Conversion process
Whey	Whey is byproduct of New Zealand's extensive diary farming industry. Whey or milk plasma is the liquid remaining after milk has been curdled and strained and is used to make cheese or can be added to processed foods, including breads, crackers and commercial pastry, and in animal feed.	Whey is considered to be a secondary biofuel source as the cows have been farmed for milk, meat, cheese and leather therefore, any associated GHG emissions can be discounted. This yields larger GHG savings compared to other biofuels.	Dairy farming in New Zealand is governed by employement laws that ensure safe working practices and minimum wages.	Whey is converted to bioethanol by first cooling the serum then fermenting the sugars into ethanol. This process releases small amounts of CO2. The yeast is then removed from the liquid and the ethanol separated out by distillation.
Corn				
Willow (Cellulosic)				
Wheat				
Sugar beat				
Straw (Cellulosic)				
Wood Waste (Cellulosic)				

Table 4 Environmental and Social Impacts of Biofuel Production Methods

	Bioethanol					Biodiesel								
	Petrol	Wheat	Sugar beet	Corn	Whey	Diesel	Rapeseed	Soy	Palm	UCO & Tallow	Straw (cellulosic)	Wood waste (cellulosic)	Willow (cellulosic)	Algae
Greenhouse Gas source														
Crop production (fertiliser & machinery use)	-	Y	Y	Y	N	-	Y	Y	Y	N	N	N	Y	N
Drying and storage	-	Y	Y	Y	N	-	Y	Y	Y	N	Y	Y	Y	Y
Feedstock transport	-	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
Conversion	-	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
Liquid fuel transport and storage	-	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
Environmental impact														
Carbon storage	-	Y	Y	Y	N	-	Y	Y	Y	N	N	N	Y	N
Biodiversity conservation	-	Y	Y	Y	N	-	Y	Y	Y	N	Y	N	Y	N
Soil quality/erosion	-	Y	Y	Y	N	-	Y	Y	Y	N	Y	N	Y	N
Water use	-	Y	Y	Y	N	-	Y	Y	Y	N	Y	N	Y	N
Air quality	-	Y	Y	Y	N	-	Y	Y	Y	N	Y	N	Y	N
Displacement of food crops	-	Y	Y	Y	N	-	Y	Y	Y	N	N	N	Y	N
Social impact														
Worker rights and working relationships	-	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
Land rights and community relations	-	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
Greenhouse Gas Emissions (kg CO2 /L)	2.78	1.57	1.03	2.52		3.10	2.38	1.83	1.59	0.44				

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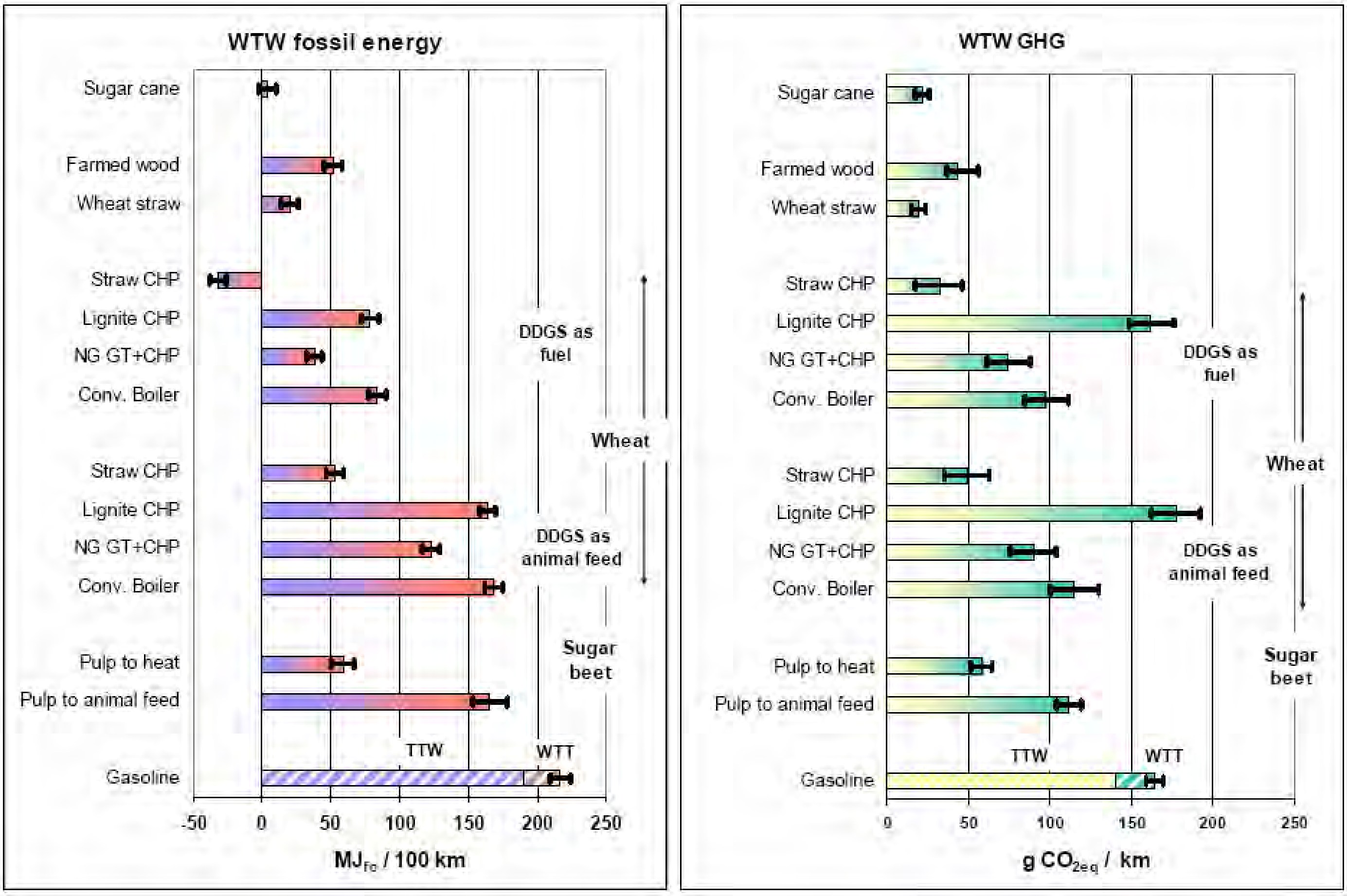
Displaying the greenhouse gas saving of each biofuel in a graph such as in Fig 2 and Fig. 3 would provide a visual aid to allow a comparison of the energy intensity of different production methods. The net greenhouse gas savings of using different combinations of biofuel feedstocks could be displayed in flow diagrams by using information in this graph. Both figures pertain to the neat fuels. In practice they are most likely to be used in blends and the effects will be spread over a large number of vehicles.

- **Figure 2 Well To Wheels fossil energy requirement and greenhouse gas emissions for ethanol pathways (2010+ vehicle)[8].**

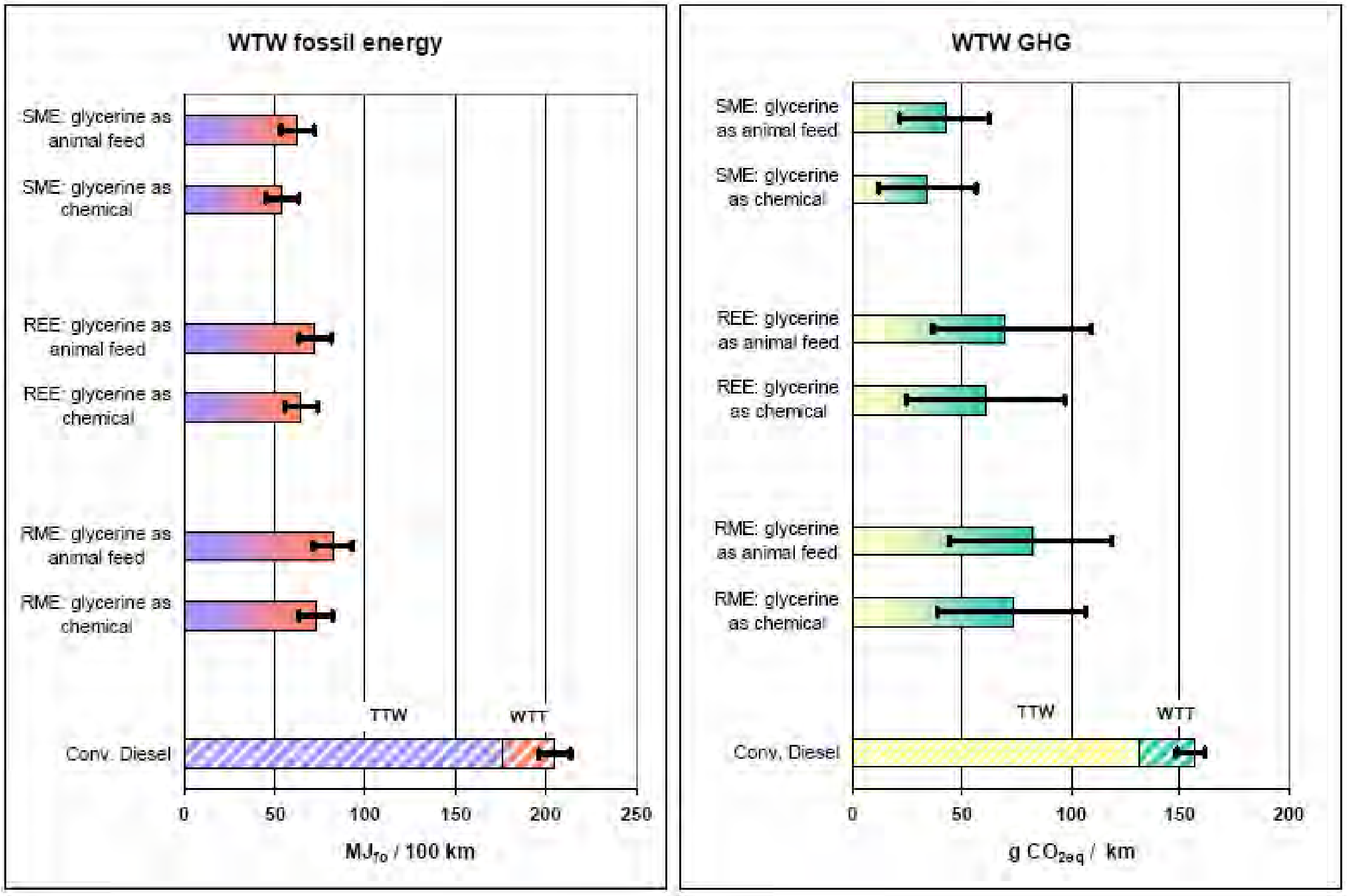


Source: CONCAWE et al 2006

[8] WTW = Well To Wheel, TTW = Tank To Wheel, WTT = Well To Tank

Figure 2 shows that conventional production of ethanol as practised in Europe[9] gives modest fossil energy/ greenhouse gas savings compared with gasoline. For sugar beet and wheat, with conventional energy production scheme and the currently most economic way of using by-products the schemes save about 23% of the fossil energy required for gasoline and just over 30% of the GHG emissions.

- **Figure 3 WTW fossil energy requirement and GHG emissions for biodiesel pathways (2010+vehicles)** **(GHG bars represent the total WTT+TTW)**



Source: CONCAWE et al 2006

Bio-diesel is less energy-intensive than ethanol as the manufacturing process involves relatively simple, low-temperature / low pressure steps. In greenhouse gas terms the picture is different because of the nitrous oxide emissions which account for an important fraction of the total and for most of the large variability ranges.

[9] Conv. Boiler with Dried Distillers Grains with Solubles (DDGS) as fuel or animal feed

In the most favourable case RME (Rapeseed Methyl Ester) can save 64% of the fossil energy and 53% of the greenhouse gas emissions required for conventional diesel fuel. As would have been expected the balance of REE (Rapeseed Ethyl Ester) is somewhat more favourable than that of RME because of the use of partly renewable ethanol. SME (Sunflower seed Methyl Ester) gives even more favourable results for a variety of reasons including a smaller requirement for fertilisers.

Information from the fuel suppliers is also essential in providing the consumer with knowledge of where their biofuel is coming from. This information can largely be sourced from each company's reporting requirements on feedstock as part of the biofuel obligation. The information could be augmented with the percentage of total biofuel that is sourced from qualifying assurance schemes and average greenhouse gas savings from all sources combined. The consumer will, therefore, know how much of an oil company's biofuel is considered sustainable according to the biofuel meta standard and also how much greenhouse gas is being saved over the course of the year from all biofuels combined. Web content would also include descriptions of the qualifying farm assurance schemes that are working to ensure sustainable farming practices including the SAN/RA, RSPO, Basel, LEAF, ACCS, GlobalGAP and the FSC.

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5. Options for Promoting Sustainable Biofuels in New Zealand

5.1 Options Assessment Background

Once the obligation has commenced, biofuels and biofuel blends on sale in New Zealand will have to meet the appropriate regulated fuel quality standards and other regulations such as labelling of pumps selling biofuels and biofuel blends. Retailers may also elect to use the EECA Biofuels Label subject to approval from EECA.

While there has been a lot of media attention focused on 'food vs fuel' and biodiversity impacts of biofuel feedstock production, there is minimal New Zealand specific data informing this debate. In fact biofuel produced in New Zealand is likely to be relatively benign through the use of by-products (tallow, whey). There is also the potential for the conversion of marginal grazing land to trees for ethanol production.

Biofuels for blending are likely to be sourced from a mix of locally produced biofuels (ethanol and biodiesel) and biofuels traded on the international commodity markets. In the context of escalating demand for biofuels worldwide New Zealand fuel retailers face significant challenges in sourcing cost competitive biofuels. A staged introduction of any biofuel sustainability initiative while clearly signalling long term intentions in this area is likely to be the most pragmatic approach to addressing sustainability concerns.

The objective of the government's biofuel policy is to reduce the carbon intensity of transport in New Zealand. The Biofuel Bill includes provision to specify a minimum level of performance against sustainability criteria implying an interest in the life cycle performance of biofuels when compared with petroleum derived transport fuels. Life cycle impacts include competition with food, loss of ecological diversity, soil degradation, worker rights and land rights and concerns detailed in Appendix A. In this context, the policy objective could be stated as "*promoting the use of biofuels in New Zealand while avoiding negative environmental or social impacts associated with their manufacture*"[10]. The focus of this proposal is to avoid negative environmental or social impacts associated with biofuel manufacture.

[10] Environmental impacts may include loss of biological diversity, soil degradation or high life cycle greenhouse emissions. Social impacts may include degradation of workers rights, limiting access to traditional land holdings or fuel production competing with food production.

Options for achieving this may involve:

- Assessing environmental and social impacts based on a consideration of a series of criteria or objectives;
- Determining the life cycle carbon emissions associated with different feedstocks, manufacturing and logistics scenarios; and
- Setting acceptable benchmarks for performance against the criteria and life cycle carbon emissions.

The following subsections follow a cost benefit analysis framework starting with establishing the status quo and identifying options for ensuring biofuels in New Zealand are sustainable. The impacts (cost and benefits) of each option are then examined with the resulting analysis providing insight in selecting preferred options for supporting sustainable biofuels in New Zealand.

5.2 The Status Quo

For the purposes of this assessment, it has been assumed that the Biofuels Sales Obligation is in place. Inherent in this assumption is that the costs associated with sourcing biofuels, assessing and maintaining fuel quality and reporting against the sales obligation are built into the cost of fuel at the pump. For this scenario, while fuel retailers may choose to highlight the ‘sustainability credentials’ of their products there is no existing third party certification or commonly agreed criteria to provide a basis for any claims.

It is likely that fuel retailers will be taking an active interest in the full life cycle for biofuels they are purchasing. While the key driver for understanding the supply chain is to maintain quality, this will also provide insights into the sustainability of the feedstock production and biofuel manufacturing process.

5.3 Options for Promoting Sustainable Biofuels in New Zealand

There is an emerging international consensus on key sustainability issues of relevance to biofuel feedstock production and manufacture. The research undertaken for this project covering work in the UK, other parts of Europe and North America provides a good basis for developing criteria for a voluntary reporting scheme. A voluntary scheme could form the basis for a labelling scheme, mandatory reporting or qualifying criteria. These scenarios are outlined below. To maintain consistency with international initiatives in this area, reporting would cover both carbon intensity and a qualitative assessment of social and environmental factors.

1) Provide a basis for voluntary reporting against agreed criteria

   A voluntary reporting scheme could easily be implemented drawing on the criteria being developed in the UK. Reports would need to be independently verified and readily available to interested parties. This analysis assumes that EECA would make the reports available along with some background/context material in the biofuels section of their website.

2) Develop a voluntary point of sale labelling scheme, analogous to the EECA Biofuels Label or the Environmental Choice Label

   There is potential to create or adapt a label for biofuels and/or biofuel blends that meet appropriate sustainability criteria. This would involve deciding on minimum performance with respect to social, environmental and carbon intensity. Rather than creating a new label, the most cost effective option is likely to be adapting the existing EECA Biofuels Label to incorporate sustainability and carbon intensity considerations. The labelling scheme will require some modification to allow for variation in blend ratios and feedstock source.

3) Introduce mandatory reporting against sustainability criteria

   The UK Government is introducing mandatory reporting against sustainability criteria as part of their Renewable Transport Fuel Obligation (RTFO). Their work on sustainability issues for biofuels is leading much of the discussion internationally and is likely to be reflected in the criteria adopted in New Zealand. Mandatory reporting, with no thresholds or assessment of performance, could be introduced in regulation under the existing proposals for biofuels legislation.

4) Require qualifying biofuels to meet sustainability criteria

   The existing proposals for biofuel legislation include the ability to exclude biofuels that don’t meet appropriate sustainability criteria. Displacement of food production is mentioned and is an issue that has yet to be adequately addressed in international discussions on this issue.

5.4 Impacts of Each Option

There are likely to be a range of impacts associated with the options that go beyond the status quo. Some of these represent a cost to one or more of the participants in the fuel life cycle, others are a benefit. Potential costs and benefits and who they are likely to impact are summarised in Table 5 below. The arrows note the fact that where additional costs are incurred by fuel retailers or there suppliers these will be passed on to fuel consumers. Where the ‘conventional’ supplies of biofuels are sustainable according to the emerging definition there will be no premium for sustainable biofuels.

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Table 5 Impacts of Each Option on Key Stakeholders

		Government	Fuel Retailers	Fuel Users	NZ 'Inc'
1)	Collecting information on the product life cycle		$		
2)	Calculating life cycle carbon emissions for each biofuel		$		
3)	Verifying performance against sustainability criteria and carbon emissions calculations		$		
4)	Developing qualitative sustainability criteria	$			
5)	Adapting a carbon accounting methodology	$			
6)	Developing a sustainable biofuel label	$			
7)	Developing regulations	$			
8)	Promoting reporting and/or the sustainable biofuel label	$	$		
9)	Possible premium on fuels containing sustainable biofuels		$	$	
10)	Reducing the 'carbon intensity' of transport fuels in New Zealand				✓
11)	Ensuring the use of biofuels in New Zealand results in a net environmental benefit				✓

5.5 The Magnitude of the Impacts for Each Option

The cost estimates set out in this section are indicative only and are based on previous experience of scheme set up and the costs associated with developing technical guidance. Further work would better define these costs.

5.5.1 Government Set-up Costs

The existing EECA Biofuels Label is given to companies that can demonstrate that their product complies with the specifications for biodiesel or bioethanol blends. The specifications relate to the quantity of the biofuel component and compliance with appropriate quality standards (NZS or ASTM). If this is to be extended to sustainability and greenhouse gas intensity there are no existing criteria that can be referenced.

The first stage in developing an information scheme in New Zealand is to set out the criteria to be reported against including the methodology for calculating life cycle greenhouse gas emissions. If a label is to be developed then a threshold for each criterion will need to be established in consultation with key stakeholders. There is also some work involved in developing default values

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for New Zealand specific feedstock and supply chains. This is an important aspect of keeping the greenhouse gas assessment process simple and cost effective

Rather than creating a series of technical reports on the various issues it is proposed that a single Technical Guidance document be produced. The guidance would assist companies looking to report (or obtain a label) to meet the requirements of the scheme. The guidance would cover:

- Sustainability criteria – environmental impacts, social impacts, use of existing assurance schemes;
- Carbon accounting methodology – including product, process and feedstock default values;
- Reporting format;
- Internal quality systems and audit procedures; and
- External validation requirements.

There is also a need for consumer information on biofuel sustainability to be developed. This should cover background on biofuels, sustainability issues for biofuel production (in New Zealand and internationally), the criteria being applied and how they apply to different feedstocks and a reporting summary by product. This may be the only consumer information channel or could support a point of sale labelling scheme utilising an adaptation of the existing EECA Biofuels Label. Following on from EECA's research conducted on consumer willingness to uptake biofuels, and their knowledge of biofuels, it is clear that there is a lack of understanding amongst consumers when it comes to biofuels. A large part of convincing people of to use the fuel, and understand sustainability, will come down to educating them and the media with the correct, New Zealand relevant information.

If labelling is confirmed as part of the information programme the existing EECA Biofuels Label will need to be adapted. This will include amended graphic design and modification of the label use agreement. The amended agreement would need to reflect variations in blend ratios and biofuels sources over time and geography. Options include the label confirming a commitment to sourcing sustainable biofuels or a label that comes on and off the pump depending on the specific fuel mix being supplied.

If labelling is not part of the information programme additionally resources will be required for promotion. This additional funding would be required to make consumers and other users of the information aware of the background material and biofuel supplier information being made available.

Costs associated with scheme set up are outlined in the following table. These figures have been used in the preliminary analysis presented in Section 6.0:

Task	Cost Estimate
Develop technical guidance Draft for discussion with stakeholders Consultation Finalise technical guidance	$ 25,000
Develop generic consumer information and present product reports	$25,000
Label adaptation Graphic design Drafting of agreement Audit cost recovery arrangements	$25,000
TOTAL	$ 75,000

Ongoing scheme administration will depend on the number of participants and the complexity of the supply chains being assessed. 0.25-0.5 FTE at EECA is likely to be adequate for processing applications, liaising with scheme participants, maintaining publicity material and arranging audit verification activity. An additional $75,000-$200,000 of operational funding should be adequate for ongoing promotion of the web material and/or biofuel mark depending on which option was chosen. Where a labelling scheme is in place or mandatory requirements are in place this will be at the lower end of the range. Where the focus is on reporting and providing material through a web site or similar more significant funding will be required to ensure consumers and media are aware of the information.

5.5.2 Biofuel Supplier Costs

For the purposes of this assessment it has been assumed that there will be no license or similar costs charged for participation in any reporting or labelling scheme. This is consistent with the current EECA Biofuel label. Some sustainability labelling schemes do operate on a cost recovery basis, for example Environmental Choice NZ.

In addition to the cost of setting up a scheme and administration carried by EECA there will be a cost to scheme participants (the retailers) and/or biofuel producers. This will include:

- Accounting for the greenhouse gas emissions through the life cycle of their product; and
- Assessing their product against environmental sustainability criteria;
- Assessing their product against social sustainability criteria;
- Independent audit.

For each product, a preliminary costs estimate is outlined in the table overleaf.

Task	Cost Estimate
Assess product	$ 12-15,000
Environmental and social impacts	
Greenhouse gas emissions	
Independent audit	$ 5-10,000
TOTAL Per Product	$17 – 25,000

5.5.3 Assumptions for the Cost Benefits Analysis

Because the options under consideration are related, many of the costs are similar. The difference between the options lies in the magnitude of the change in the fuel mix achieved. Unfortunately, this is hard to predict in the absence of a regulatory requirement to supply sustainable biofuels. It is also hard to quantify the impact of using sustainable biofuels in New Zealand on some of the key issues of concern such as biodiversity protection and labour conditions.

While costs will be to a large degree dependent on feedstocks and availability of information from suppliers, the following costs provide a basis for estimating any differences between the options. Note that these estimates are over any costs incurred in meeting the sales obligation.

1) Collecting information on the product source/life cycle	$15,000 per producer?
2) Calculating life cycle carbon emissions for each biofuel	Included in above
3) Verifying life cycle and carbon emissions reporting	$10,000 per producer?
4) Developing sustainability criteria	$25,000
5) Developing a carbon emissions calculation methodology	Included in above
6) Developing a sustainable biofuel label	$25,000
7) Develop regulation (mandatory reporting, qualifying criteria)	$50,000
8) Promoting reporting and/or sustainable biofuel label	$75 – 200,000pa
9) Premium paid per litre (over generic biofuel, see discussion below)	$0.00 per litre
10) Reducing carbon intensity	30% less than fossil fuels
11) Consistent with sustainability criteria	Intangible

The impact of each option on the proportion of biofuels coming from sustainable sources is hard to assess without understanding drivers for consumer behaviour in this area. To provide a basis for comparison we have assumed the following:

- For Option 1 (voluntary reporting) 30% of biofuels are procured from sustainable sources;
- For Option 2 (voluntary label) 50% of biofuels are procured from sustainable sources;

- For Option 3 (mandatory reporting) 75% of biofuels are procured from sustainable sources; and
- For Option 4 (qualifying criteria) 100% of biofuels are procured from sustainable sources.

It is not clear what premium would be payable for biofuels that meet sustainability criteria. Biofuels will initially be selected on the basis of availability, price and quality. The most likely sources of biofuel for New Zealand in the short term (tallow based biodiesel, whey based ethanol and Brazilian sugar based ethanol) are likely to meet the sustainability criteria. If the preferred supplies are ‘sustainable’ there will be no premium associated with meeting the criteria. There will also be no additional reduction in carbon emissions as a result of introducing greenhouse gas reduction or sustainability criteria.

It is possible that other sources of biofuel will be needed to meet the obligation and/or quality requirements. Examples could include northern hemisphere bioethanol, vegetable based biodiesel and palm oil based biodiesel. For these biofuels cases it is possible that there will be a premium associated with verified ‘sustainable’ products. For the purposes of the assessment this premium has been set at $0.00 per litre at the pump, but a reasonable high end estimate could be $0.10 per litre. If there was a $0.10 premium there would be an increase at the pump of between 0.2 and 0.3% once the 3.4% sales obligation is in place. This will depend on the mix of bioethanol and biodiesel and is based on a petrol price of $1.70 and diesel price of $1.20 at the pump and translates to a $0.02-0.05 increase per litre of fuel.

	Voluntary Reporting			Voluntary Label	
	Start up	Annual		Start up	Annual
Collecting information on the product life cycle	$15,000	$15,000		$15,000	$15,000
Calculating life cycle carbon emissions for each biofuel	Incl in above	Incl in above		Incl in above	Incl in above
Verifying-	$10,000	$10,000		$10,000	$10,000
Developing qualitative sustainability criteria	$25,000	-		$25,000	-
Adapting a carbon accounting methodology	Incl in above	-		Incl in above	-
Developing a sustainable biofuel label	-	-		$25,000-	-
Developing regulations	-	-		-	-
Promoting reporting and/or the sustainable biofuel label	$25,000	$200,000		$25,000	$75,000
A premium on fuels containing sustainable biofuels	-	$0.00/l 30% of biofuel		-	$0.00/l 50% of biofuel
Reducing the 'carbon intensity' of transport fuels in New Zealand	-	Medium		-	Medium
Ensuring the use of biofuels in New Zealand results in a net environmental benefit	-	Low		-	Medium
Impact		Med-Low			Medium
Cost – Government	$50,000	$200,000		$75,000	$75,000
Cost – Biofuel Producers	$25,000	$25,000		$25,000	$25,000
Greenhouse gas reduction	0.31% (25-30 kt CO_2 pa)			0.51% (41-48 kt CO_2pa)	

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	Mandatory Reporting		Qualifying Criteria	
	Start up	Annual	Start up	Annual
Collecting information on the product life cycle	$15,000	$15,000	$15,000	$15,000
Calculating life cycle carbon emissions for each biofuel	Incl in above	Incl in above	Incl in above	Incl in above
Verifying	$10,000	$10,000	$10,000	$10,000
Developing qualitative sustainability criteria	$25,000	-	$25,000	-
Adapting a carbon accounting methodology	Incl in above	-	Incl in above	-
Developing a sustainable biofuel label	-	-	-	-
Developing regulations	$50,000	$25,000 monitor	$50,000	$25,000 monitor
Promoting reporting and/or the sustainable biofuel label	$25,000-	$200,000	$25,000-	$75,000
A premium on fuels containing sustainable biofuels	-	$0.00/l 75% of biofuel	-	$0.00/l 100% of biofuel
Reducing the 'carbon intensity' of transport fuels in New Zealand	-	Medium	-	Medium
Ensuring the use of biofuels in New Zealand results in a net environmental benefit	-	Medium	-	High
Impact		Medium		Med/High
Cost – Government	$100,000	$225,000	$100,000	$100,000
Cost – Biofuel Producers	$25,000	$25,000	$25,000	$25,000
Greenhouse gas reduction	0.77% (62-72 kt CO_2pa)		1.02% (82-96 kt CO_2pa)	

5.6 Comments on the Preferred Options

The analysis presented above is based on preliminary figures rather than a detailed assessment of costs incurred by biofuel suppliers and users. Further work may better define these costs but analysis to date suggests that ongoing (annual) costs for biofuel suppliers are likely to be similar for each option. Government costs vary with the level of promotional activity required and the nature of any regulatory intervention.

Cost for government will vary depending on the level of regulation required, the cost of monitoring compliance and promotional activities. Much of the reporting and monitoring would intersect with requirements associated with the Biofuels Sales Obligation and, therefore, result in minimal additional cost. Adapting the EECA Biofuels Label to incorporate sustainability issues is a cost effective option. Subject to confirmation of the key assumptions regarding implementation costs and net carbon benefit, this option would appear to warrant further consideration. The flip side of this option is how it will work in the context of changing fuel mix across geographical locations and over time.

Given the similarity between the options and the short term challenges for fuel suppliers relating to supply and quality a staged approach is recommended. An investment in developing sustainability criteria and New Zealand appropriate carbon accounting methodology will enable voluntary reporting to be introduced quickly. This is likely to be particularly relevant if reporting fails to gain traction in the market. This could be followed by a sustainable biofuel label, again in a short timeframe if the existing EECA Biofuels Label is adapted for this purpose. Mandatory reporting and/or qualifying criteria could be introduced through regulations allowed for in the Biofuel Bill. The approach adopted in the UK has relevance here – encouraging reporting with a view to introducing qualifying criteria in the medium to long term once appropriate feedstocks start to become available. The key in this approach is to provide clear and early signals to suppliers so they are able to access appropriate feedstocks.

6. Conclusions and Recommendations

Based on the analysis presented in this report, a staged approach to publicising biofuel sustainability issues is recommended. This allows the considered development of criteria and calculation methodologies that align well with approaches being adopted internationally. It also clearly signals to all of the key stakeholders the likely long term outcome – mandatory sustainability standards. A clear development track also enables stakeholders to actively participate in the development and refining of a New Zealand approach to the issue.

Briefly, it is recommended that EECA consider:

1) Develop technical guidance on assessing the sustainability of biofuels based on the sustainability meta standard for the UK RTFO and carbon intensity methodology developed by the UK and the Netherlands;
2) Implement a voluntary sustainability reporting scheme for biofuels by the end of 2008;
3) Investigate developing a voluntary sustainability labelling scheme, either at the pump or at a supplier level, by the end of 2009;
4) Work with other relevant government agencies to develop mandatory biofuel sustainability reporting requirements and/or qualifying sustainability criteria based on the work undertaken in 1) and 2) and subsequent implementation.

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References

D. Rutz R. Janssen (2006) Overview and Recommendations on Biofuel Standards for Transport in the EU

E4tech & Ecofys (2007) CARBON AND SUSTAINABILITY REPORTING WITHIN THE RENEWABLE TRANSPORT FUEL OBLIGATION Second Draft Technical Guidance for Pilot Companies

E4tech, ECCM, Themba (2006) A methodology and tool for calculating the carbon intensity of biofuels

E4tech & Ecofys (2007) CARBON AND SUSTAINABILITY REPORTING WITHIN THE RENEWABLE TRANSPORT FUEL OBLIGATION Second Draft Technical Guidance for Pilot Companies

Ecofys (2007) (SUSTAINABILITY REPORTING WITHIN THE RTFO: FRAMEWORK REPORT

EUCAR, CONCAWE and JRC (the Joint Research Centre of the EU Commission) (2006) WELL-TO-WHEELS ANALYSIS OF FUTURE AUTOMOTIVE FUELS AND POWERTRAINS IN THE EUROPEAN CONTEXT

ISO/IEC Guide 59:1994. Code of good practice for standardization

J. Cramer et al (2007)Testing framework for sustainable biomass

Roundtable on Sustainable Biofuels , EPFL Energy Center, 2007
Draft Global Principles for Sustainable Biofuels Production Discussion Document for Global Stakeholder Feedback

UK DfT (2007). UK Renewable Transport Fuels Obligation: http://www.dft.gov.uk/pgr/roads/environment/rtfo/\

WWF Germany 2006, Sustainability Standards for Biofuels

Assurance Scheme Websites

ACCS http://www.assuredcrops.co.uk/ACCS2/

RTRS http://www.responsiblesoy.org/eng/index.htm

BQ 9000 http://www.bq-9000.org/

Carbon reduction label from the Carbon Trust
http://www.carbontrust.co.uk/carbon/briefing/carbon_label.htm

http://www.carbon-label.co.uk/

CO_2 Star http://www.co2star.eu/links/links.html

http://www.co2star.org/

EECA Biofuels Label http://www.eeca.govt.nz/renewable-energy/biofuels/eeca-biofuels-label.html

Energy Rating Label http://www.energyrating.gov.au/con3.html

Energy Star http://www.energystar.gov/

Environmental Choice http://www.enviro-choice.org.nz/

FSC http://www.fsc.org/en/

GlobalG.A.P. http://www.globalgap.org/cms/front_content.php?idart=3&idcat=9&lang=1

IFOAM http://www.ifoam.org/

LEAF http://www.leafuk.org/leaf/

RSPO http://www.rspo.org/

SA8000 http://www.sa-intl.org/

SAN/RA http://www.rainforest-alliance.org/

Appendix A Biofuel Evaluation Criteria

Environmental principles and criteria based on the UK and Dutch criteria for sustainable biomass.

- **Table 3-1 Environmental principles and criteria based on the UK and Dutch criteria for sustainable biomass.**

Principle 1: CARBON STOCK CONSERVATION	**Biomass production will not destroy or damage large above or below ground carbon stocks**
Criterion	Indicators
1.1 Preservation of above ground carbon stocks (reference date November 2005).	• Evidence that biomass production has not caused direct land use change with a carbon payback time exceeding 10 years*.
1.2 Preservation of below ground carbon stocks (reference date November 2005).	• Evidence that biomass production does not take place in areas with a large risk of significant soil stored carbon losses such as peat lands, mangroves, wetlands and certain grasslands.

Principle 2: BIODIVERSITY CONSERVATION	Biomass production will not lead to the destruction or damage of high biodiversity areas
Criterion	Indicators
2.1 Compliance with national laws and regulations relevant to biomass production and the area where biomass production takes place.	• Evidence of compliance with national and local laws and regulations with respect to: o Land ownership and land use rights o Forest and plantation management o Protected and gazetted areas o Nature and wild life conservation o Land use planning o National rules resulting from the adoption of CBD[11] and CITES[12]. • The company should prove that: o It is familiar with relevant national and local legislation o It complies with these legislations o It remains informed on changes in legislation
2.2 No conversion of high biodiversity areas after November 30, 2005	• Evidence that production does not take place in gazetted areas. • Evidence that production does not take place in areas with one or more HCV areas[13]: o HCV 1, 2, 3 relating to important ecosystems and species o HCV 4, relating to important ecosystem services, especially in vulnerable areas o HCV 5, 6, relating to community livelihoods and cultural values. • Evidence that production does not take place in any areas of high biodiversity as listed below this table.

* The "carbon pay back time" is defined as the number of years an energy crop needs to be grown before the destruction of the carbon storage resulting from land use change has been compensated.
This can be calculated by: (carbon stock destruction expressed in resulting tonne C/ha) / (annual C abatement as a result of bioenergy production which is a function of crop yield and GHG-reduction
of the bioenergy chain.) By taking the difference in average carbon stocks of the original vegetation and the energy crop, perennial energy crops are stimulated because they have a higher average
carbon stock.

[11] http://www.biodiv.org/com/convention/convention.shtml
[12] http://www.cites.org/eng/disc/text.shtml
[13] The definition of the 6 High Conservation Values can be found at http://www.hcvnetwork.org.

Principle 2: BIODIVERSITY CONSERVATION	Biomass production will not lead to the destruction or damage of high biodiversity areas
Criterion	Indicators
2.3 The status of rare, threatened or endangered species and high conservation value habitats, if any, that exist in the production site or that could be affected by it, shall be identified and their conservation taken into account in management plans and operations.	• Documentation of the status of rare, threatened or endangered species and high conservation value habitats in and around the production site. • Documented and implemented management plan on how to avoid damage to or disturbance of the above mentioned species and habitats. *Recommendation* • Evidence that a minimum of 10% of the production area is set aside and properly managed for nature conservation and ecological corridors.

Principle 3: SOIL CONSERVATION	**Biomass production does not lead to soil degradation**
Criterion	Indicators
3.1 Compliance with national laws and regulations relevant to soil degradation and soil management and agrochemical inputs.	• Evidence of compliance with national and local laws and regulations with respect to: o Environmental Impact Assessment o Waste storage and handling o Pesticides and agro-chemicals o Fertilizer o Soil erosion • Compliance with the Stockholm convention (list of forbidden pesticides). • The company should prove that: o It is familiar with relevant national and local legislation o It complies with these legislations o It remains informed on changes in legislation
3.2 Preservation of soil health and productivity.	• Documentation of soil management plan aimed at sustainable soil management, erosion prevention and erosion control. • Annual documentation of applied good agricultural practices with respect to: o Prevention and control of erosion o Maintaining and improving soil nutrient balance o Maintaining and improving soil organic matter o Maintaining and improving soil pH o Maintaining and improving soil structure o Maintaining and improving soil biodiversity o Prevention of salinisation *Recommendations (provision of this data can replace the narrative reporting on applied good practice above)* • Records of annual measurements of: o Soil loss in tonnes soil/ha/y o N,P,K balance or use / ha / year o SOM and pH in top soil o Soil salts content
3.3 The use of agricultural by-products does not jeopardize the function of local uses of the by-products, soil organic matter or soil nutrients balance.	• Documentation that the use of by-products does not occur at the expense of important traditional uses (such as fodder, natural fertilizer, material, local fuel etc.) unless documentation is available that similar or better alternatives are available and are applied. • Provision of the recommended data in 3.2 can proof stable or improving soil health.

Principle 4: SUSTAINABLE WATER USE	Biomass production does not lead to the contamination or depletion of water sources
Criterion	Indicators
4.1 Compliance with national laws and regulations relevant to contamination and depletion of water sources.	• Evidence of compliance with national and local laws and regulations with respect to: o Environmental Impact Assessment o Waste storage and handling o Pesticides and agro-chemicals o Fertilizer o Irrigation and water usage • The company should prove that: o It is familiar with relevant national and local legislation o It complies with these legislations o It remains informed on changes in legislation
4.2 Maintain water availability where water is scarce and prevent water pollution.	• Documentation of water management plan aimed at sustainable water use and prevention of water pollution at watershed and/or aquafiers. • Annual documentation of applied good agricultural practices with respect to: o Efficient water usage. o Responsible use of agro-chemicals o Waste discharge Recommendations (provision of this data can replace the narrative reporting on applied good practice above) • Records of annual measurements of: o Water applied (litres/ha/y) o Agrochemical inputs / ha/ year] o BOD level of water discharged, and downstream of biomass production and processing.

Principle 5: AIR QUALITY	Biomass production does not lead to air pollution
Criterion	Indicators
5.1 Compliance with national laws and regulations relevant to air emissions and burning practices	• Evidence of compliance with national and local laws and regulations with respect to: o Environmental Impact Assessment o Air emissions o Waste management o Burning practices • The company should prove that: o It is familiar with relevant national and local legislation o It complies with these legislations o It remains informed on changes in legislation
5.2 No burning as part of land clearing, harvesting or waste disposal.	• Evidence that no burning occurs as part of land clearing, harvesting or waste disposal, except in specific situations such as described in the ASEAN guidelines on zero burning or other respected good agricultural practices.

Principle 6: WORKERS RIGHTS AND WORKING RELATIONSHIPS	
Criterion	
Criteria has not been decided but is likely to cover the following; • Compliance with national laws concerning working conditions and workers rights • Contracts • Provision of information • Subcontracting • Child labour • Young workers (15-17) • Health and Safety • Wages • Discrimination • Forced labour • Working hours	Indicators yet to be decided

Principle 7: LAND RIGHT ISSUES AND COMMUNITY RELATIONS	
Criteria has not been decided but is likely to cover the following; • Land right issues • Consultation and communication local stakeholders	Indicators yet to be decided

Appendix B Feedstock default values and example GHG calc. worksheet

Fuel and Origin Defaults

Fuel Default Values

Fuel	Feedstock	Origin	kg CO_{2eqv} / tonne	g CO_{2eqv} / MJ
Ethanol			2,096	78
Biodiesel			0	0
Biomethane			--	36
ETBE			3,114	86

Feedstock Default Values

Fuel	Feedstock	Origin	kg CO_{2eqv} / tonne	g CO_{2eqv} / MJ
Ethanol	Wheat		2,096	78
	Sugar beet		1,377	51
	Corn		3,362	125
Biodiesel	Oilseed rape		0	0
	Soy		2,197	59
	Palm		1,907	51
	UCO & tallow		526	14
Biomethane	MSW & manure		--	36
ETBE - refinery isobutene (isobutylene)	Wheat		2,626	72
	Sugar beet		2,301	63
	Corn		2,435	67
ETBE - non-refinery isobutene (isobutylene)	Wheat		3,114	86
	Sugar beet		2,789	77
	Corn		2,923	81

Feedstock & Origin Default Values

Fuel	Feedstock	Origin	kg CO_{2eqv} / tonne	g CO_{2eqv} / MJ
Ethanol	Wheat	Canada	2,797	104
		France	2,232	83
		Germany	2,057	77
		United Kingdom	2,096	78
	Sugar beet	UK	1,377	51
	Sugar cane	Brazil	547	20
	Corn	US	3,362	125
		France	1,674	62
Biodiesel	Oilseed rape	Australia	2,920	78
		Canada	2,877	77
		France	2,488	67
		Germany	2,566	69
		Poland	2,465	66
		United Kingdom	0	0
	Soy	Argentina	825	22
		Brazil	2,197	59
		USA	1,182	32
	Palm	Malaysia	1,893	51
		Indonesia	1,907	51
	UCO & tallow	UK	526	14
Biomethane	MSW or manure	UK	--	36
ETBE - refinery isobutene (isobutylene)	Wheat	Canada	2941	81
		France	2686	74
		Germany	2607	72
		United Kingdom	2626	72
	Sugar beet	UK	2301	63
	Sugar cane	Brazil	1926	53
	Corn	US	3196	88
		France	2435	67
ETBE - imported isobutene (isobutylene)	Wheat	Canada	3429	94
		France	3174	87
		Germany	3095	85
		United Kingdom	3114	86
	Sugar beet	UK	2789	77
	Sugar cane	Brazil	2414	67
	Corn	US	3684	101
		France	2923	81

Fuel chain summary	Carbon intensity [kg CO2 / t biodiesel]					
Module	Australia	Canada	France	Germany	Poland	United Kingdom
1 - Crop production	2139	2058	1802	1809	1667	2185
2 - Drying and storage	0	311	302	328	339	327
3 - Feedstock transport	24	120	96	96	96	32
4 - Conversion (crushing)	-162	-225	-239	-198	-182	-201
5 - Feedstock transport	400	95	8	12	27	0
6 - Conversion (esterification)	519	519	519	519	519	519
7 - Liquid fuel transport and storage	0	0	0	0	0	0
TOTAL	**2920**	**2877**	**2488**	**2566**	**2465**	**2862**

Feedstock origin: Default (UK)

Stage 1 - Crop Production

Description: Cultivation and harvesting of oilseed rape

Basic Data	Units		
Yield @ traded moisture content	[t/ha.a]	3.03	Y
Traded moisture content	%	9	

Soil Emissions	Emissions factor ($kgCO_{2e}$/ha)		Total Emissions ($kgCO_{2e}$/t OSR)
N2O emissions	1140	÷ Y =	376

Farming Inputs		Mass of input		Emissions co-efficient [$kgCO_{2e}$/kg nutrient]		Total emissions
N fertiliser	[kg nutrient/ha.a]	185	x	6.8	÷ Y =	415
P fertiliser (P2O5)	[kg nutrient/ha.a]	45	x	1.62	÷ Y =	24
K fertiliser (K2O)	[kg nutrient/ha.a]	48	x	0.80	÷ Y =	13
Lime (CaCO3)	[kg nutrient/ha.a]	18.9	x	0.56	÷ Y =	4
				Emissions co-efficient [$kgCO_{2e}$/kg]		
Pesticides	[kg/ha.a]	0.28	x	17	÷ Y =	2

Machinery Inputs						
Diesel fuel consumption	[litres/ha.a]	67	x	3.1	÷ Y =	68

Totals	
	Total Emissions ($kgCO_{2e}$/t OSR)
Module total	900
	Total Emissions [$kgCO_{2e}$/t biodiesel]
Contribution to fuel chain	2185

Country	Yield [t/ha]	N Fertiliser	P Fertiliser	K Fertiliser
Australia	1.2	61	16	12
Canada	1.5	75	20	15
Default (UK)	3.0	185	45	48
France	3.2	155	45	80
Germany	3.4	170	45	90
Poland	2.4	102	35	44
United Kingdom	3.0	185	45	48

Stage 2 - Drying and storage

Description: Drying and storage of oilseed rape

Basic Data		
Moisture removed	% by weight	5

Drying and storage inputs				Emissions factor ($kgCO_{2e}$/MJ)		Emissions ($kgCO_{2e}$/t OSR)
Fuel for heating	[MJ/t OSR]	1403	x	0.087	=	122
Electricity	[MJ/t OSR]	93	x	0.131	=	12

Totals	
	Emissions ($kgCO_{2e}$/t OSR)
Module total	135
	Total Emissions [$kgCO_{2e}$/t biodiesel]
Contribution to fuel chain	327

Country	Moisture removed	Fuel for heating	Electricity	Electricity emissions co-efficient
Australia	0.0	0	0	0.24
Canada	5.0	1403	93	0.06
Default (UK)	5.0	1403	93	0.13
France	5.0	1403	93	0.02
Germany	5.0	1403	93	0.14
Poland	5.0	1403	93	0.18
United Kingdom	5.0	1403	93	0.13

Stage 3 - Feedstock Transport

Description	From farm to oilseed crusher					
				Emissions factor (kgCO2e/MJ)		
Transport distance	[km]	100	dist			
Fuel consumption	[MJ/t-km]	1.53	FC			
Totals						Emissions ($kgCO_{2e}$/t OSR)
Module total	[MJ/t OSR]	153	x	0.086	=	13
						Total Emissions [$kgCO_{2e}$/t biodiesel]
Contribution to fuel chain						32

Country	Mode	[km]	[MJ/t-km]
Australia	Rail	300	0.38
Canada	Rail	3000	0.19
Default (UK)	Truck	100	1.53
France	Truck	300	1.53
Germany	Truck	300	1.53
Poland	Truck	300	1.53
United Kingdom	Truck	100	1.53

Stage 4 - Conversion

Description: Oil extraction

Basic Data

Plant yield	[t rapeseed oil / t oilseed rape]	0.43	z1

Conversion Inputs

				Emissions factor ($kgCO_{2e}$/MJ)		Emissions ($kgCO_{2e}$/t ethanol)
Natural gas	[MJ/t rapeseed oil]	1985	x	0.062	=	123
Electricity imported	[MJ/t rapeseed oil]	337	x	0.131	=	44

Co-products	**Description**	**Treatment**
Co-product 1:	Rape meal - sold as animal feed	Substitution

Co-products treated by substitution

Co-product 1: rape meal

				Credit [$kgCO_{2e}$/t rape meal]		
- substitutes US soy meal (soybeans crushed in EU)						
Quantity of rape meal produced & sold as animal feed	[t rape meal / t rapeseed oil]	1.32	x	-273	=	-360

Totals

Module total	-192
	Total Emissions [$kgCO_{2e}$/t biodiesel]
Contribution to fuel chain	-201

Country	Natural gas emissions factor (kg CO2e / MJ)	Electricity emissions factor (kg CO2e / MJ)
Australia	0.062	0.241
Default (UK)	0.062	0.131
Canada	0.062	0.062
France	0.062	0.023
Germany	0.062	0.139
Poland	0.062	0.184
United Kingdom	0.062	0.131

Stage 5 - Feedstock Transport

Description	From extraction facility to biodiesel plant			
				Emissions factor (kgCO2e/MJ)
Transport distance	[km]	0	dist	
Fuel consumption	[MJ/t-km]	0	FC	

Totals						Emissions ($kgCO_{2e}$/t rapeseed oil)
Module total	[MJ / t rapeseed oil]	0	x	0.0864	=	0
Contribution to fuel chain						0

Country	Mode	[km]	[MJ/t-km]
Australia	Ship	22000	0.2
Canada	Ship	5200	0.2
Default (UK)	None	0	0
France	Ship	450	0.2
Germany	Ship	650	0.2
Poland	Ship	1500	0.2
United Kingdom	None	0	0

Stage 6 - Conversion

Description	Biodiesel plant					
Basic data						
Plant yield	[t biodiesel / t rapeseed oil]	0.95	(z2)			
Conversion Inputs				Emissions factor ($kgCO_{2e}$/MJ)		Emissions ($kgCO_{2e}$/t ethanol)
Natural gas	[MJ/t biodiesel]	1690	x	0.062	=	105
Electricity imported	[MJ/t biodiesel]	335	x	0.131	=	44
				Emissions factor (kgCO2e/kg)		
Methanol	kg/t biodiesel	113	x	2.8	=	311
Potassium hydroxide	kg/t biodiesel	26	x	2.4	=	63

Co-products	**Description**	**Treatment**
Co-product 1:	Crude glycerine sold as chemical	Allocation - by market value
Co-product 2:	Potassium sulphate	Allocation - by market value

Co-products treated by allocation by market value

Co-product 1: Glycerine				Market value [£ / t gylcerine]		
Quantity of crude glycerine produced	[t glycerine / t biodiesel]	0.1	x	0	=	0
Co-product 2: Potassium sulphate				Market value [£ / t potassium sulphate]		
Quantity of potassium sulphate produced and sold as chemical	[t potassium suplhate / t biodiesel]	0.04		75	=	3
Primary product: biodiesel				Market value [£ / t biodiesel]		
Market value of biodiesel				340	=	340
Total market value of products						
Total market value	[£ / t biodiesel]					343
Allocation factor (%age of emissions attributable to biodiesel)	%					99
Totals						Total Emissions [$kgCO_{2e}$/t biodiesel]
Module total						519
Contribution to fuel chain						519

Stage 7 - Liquid fuel transport and storage

Description	From biodiesel plant to refinery / blending facility					
Transport distance	[km]	0	dist			
Fuel consumption	[MJ/t-km]	0	FC			
Totals				Emissions factor (kgCO2e/MJ)		Total Emissions [$kgCO_{2e}$/t biodiesel]
Module total	[MJ/t biodiesel]	0	x	0.0864	=	0
Contribution to fuel chain						0

Table 1 - Fertiliser emission coefficients

Product	kg CO_2e/kg N	References
N Fertiliser (AN)	6.8	Jenssen, T.K. and Kongshaug, G. (2003). Energy consumption and greenhouse gas emissions in fertiliser production. *Proceedings of the International Feriliser Society*.
N Fertiliser (SOA)	1.6	
N Fertiliser (Urea)	2.9	
	kg CO_2e/kg P_2O_5	
P fertiliser (TSP)	1.6	
P fertiliser (Rock)	0.4	
P fertiliser (MAP)	2.7	
	kg CO_2e/kg K_2O	
K fertiliser (MOP)	0.8	
	kg CO_2e/kg CaCO3	
CaO fertiliser	0.6	JEC (2006). Well-to-wheels analysis of future automotive fuels and powertrains in the European context. Well to wheels report. CONCAWE, EUCAR and JRC.
	kg CO_2e/kg MgO	
MgO fertiliser (kieserite)	1.7	(assuming CO2 emissions are similar to those for potassium chloride) Jenssen and Kongshaug
	kg CO_2e/kg N	
NPK fert (N from Urea)	0.3	Jenssen and Kongshaug
	kg CO_2e/kg pesticide	
Pesticides	17.3	JEC

Table 2 - Natural gas emission coefficients by region

	Upstream		Combustion		Total CO2 eqv
	kg $CO_{2\ eqv}$ / MJ_{fuel}	Reference	kg $CO_{2\ eqv}$ / MJ_{fuel}	Reference	kg $CO_{2\ eqv}$ / MJ_{fuel}
Argentina	0.0056	JEC	0.0564	Concawe	0.0620
Australia	0.0056	JEC	0.0564	Concawe	0.0620
Brazil	0.0077	JEC	0.0564	Concawe	0.0641
Canada	0.0056	JEC	0.0564	Concawe	0.0620
European Union	0.0056	JEC	0.0564	Concawe	0.0620
United Kingdom	0.0056	JEC	0.0564	Concawe	0.0620
USA	0.0056	JEC	0.0564	Concawe	0.0620

Table 3 - Electricity emission coefficients by region

IEA online database, data is for 2003

Country	g CO2 / kWh	kg CO2 / MJ
Africa	642.6513	0.179
Argentina	274.5642	0.076
Australia	868.278	0.241
Brazil	78.1102	0.022
Canada	223.509	0.062
China (including Hong Kong)	771.5213	0.214
France	82.077	0.023
Germany	498.61	0.139
Indonesia	776.195	0.216
Malaysia	491.6029	0.137
Netherlands	466.4	0.130
Poland	662.303	0.184
United Kingdom	472.923	0.131
United States	574.699	0.160

Table 4 - Characteristics of various fuels

	Upstream GHG emissions		Combustion emissions (assuming perfect combstn.)			Total GHG emissions	Density	LHV	LHV	LHV	Total CO2 eqv
	kg $CO_{2\ eqv}$ / MJ_{fuel}	Reference	kg $CO_{2\ eqv}$ / MJ_{fuel}	g $CO_{2\ eqv}$ / $litre_{fuel}$	Reference	kg $CO_{2\ eqv}$ / MJ_{fuel}	kg/litre	MJ/kg	MJ/litre	MJ/tonne	kg $CO_{2\ eqv}$ / $litres_{fuel}$
Gasoline	0.012	JEC	0.073	2359	JEC	0.085	0.745	43.2	32.2	43200	2.78
Diesel	0.013	JEC	0.073	2625	JEC	0.086	0.832	43.1	35.9	43100	3.10
HFO	0.007	JEC	0.081	3166	JEC	0.087	0.97	40.5	39.3	40500	3.39
Biodiesel	N/A		0.075	2496	JEC	N/A	0.89	37.2	33.1	37200	2.86
Ethanol	N/A		0.071	1519	JEC	N/A	0.794	26.8	21.3	26800	1.84
Coal	0.015	JEC	0.096	0	JEC	0.112					
LPG	0.004	JEC	0.066	0	JEC	0.069					
ETBE	N/A		0.071	1944	JEC	N/A	0.75	36.3	27.2	36300	2.35
MTBE	0.013	JEC	0.071			0.084					
Biomethane	N/A		0.055	1497	JEC	N/A		45.1		45100	

Table 5 - Energy intensity of transport by heavy truck

WBSCD/IEA (2004) Transport spreadsheet model - Mobility 2030 Project. IEA/OECD and WBSCD

Region	MJ/t-km
OECD North America	1.46
OECD Europe	1.53
OECD Pacific	1.61
FSU	1.82
Eastern Europe	1.72
China	1.89
Other Asia	1.80
India	1.94
Middle East	1.89
Latin America	1.80
Africa	1.94
World Average	1.62

Table 6 - Energy intensity of transport by rail

WBSCD/IEA (2004) Transport spreadsheet model - Mobility 2030 Project. IEA/OECD and WBSCD

Region	MJ/tkm
OECD North America	0.19
OECD Europe	0.38
OECD Pacific	0.38
FSU	0.19
Eastern Europe	0.24
China	0.33
Other Asia	0.24
India	0.19
Middle East	0.24
Latin America	0.24
Africa	0.24
World Average	0.24

Table 7 - Energy intensity of other transport modes

	MJ/t-km
30000 dwt ship	0.20
Biomethane pipeline	0.36

Table 8 - Carbon intensity of a chemicals

Mortimer, N.D. and Elsayed, M.A. (2006) *North east biofuel supply chain carbon intensity assessment* North Energy Associates.

Chemical	kg CO2 / kg product	kg CH4 / kg produ	kg N2O / kg product	kg CO2 / kg product
Hexane	0.5	0.0	0.0	0.7
Methanol	2.7	0.0	0.0	2.8
Sulphuric acid	0.1	0.0	0.0	0.1
Potassium hydroxide	2.3	0.0	0.0	2.4
Nitrogen	0.1	0.0	0.0	0.1

Table 9 - Coefficient for N2O emissions from soils

Calculated on the basis of the methodology given in: IPCC 2006 *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, Prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). Published: IGES, Japan.

N2O-N / kg synthetic nitrogen fert.	0.01325

Appendix C Scheme Information Sheets

LEAF – Linking Environment and Farming

The LEAF scheme is a new scheme operating within the UK and is a significant development in environmental assurance for food crops. It has been developed through a multi stakeholder process with some 30 members representing national government departments, farmers, supermarkets, conservation, environmental and consumer groups, educational establishments and industry. Farms can not be certified by LEAF alone but need a base standard such as EurepGAP or ACCS. Inspections for LEAF and the base standard can be combined, thereby reducing costs. The scheme is expanding beyond the U.K.

▪ **Methodology** – *Cost (who covers cost, how much, audits)* – *Rigour (LCA (ISO), specific calcs, checksheet)* – *Lead time (how long would it take to get in place* – *International links (ISO, other assessment approaches)*	ISO guide 65(EN 45011), thinking introduce risk based assessment where high risk farms audited more frequently
▪ **Products Covered**	Wide coverage of arable and pastoral farming
▪ **Type I, II or III, other**	Type 1 (accredited certification bodies used) with a few exceptions for some products
▪ **Criteria Development**	
▪ **Product Assessment** ▪ Coverage (raw materials, manufacture, logistics, use)	▪ Organisation and Planning ▪ Soil Management and Fertility ▪ Crop Protection Pollution Control and Management ▪ Animal Husbandry ▪ Energy Efficiency ▪ Landscape and Nature Conservation ▪ Community Relations
▪ **Scheme set up/administration** ▪ Cost (who covers cost, how much, audits)	Range from Farms below 121 hectares $160 per year to Corporate farms of 50 -100 employees $4,700 per year $400 to $950 per year depending on structure of farming business. Developing group certification option
▪ **Coverage** ▪ Specific to biofuels or wide ranging ▪ Brand level awareness	2800 U.K members, 300 are certified. Leaf expects 10,000 farms certified by 2010. also expanding beyond U.K. Some biofuel crops are covered e.g maize, rapeseed Low

■ **Rigour of assessment**	Rigorous system to ensure that audits are carried out to sufficient quality. Yet few Leaf marquee certifications not carried out by accredited certification body and does not have a mechanism to review the quality of these audits.
■ **Applicability to Biofuels**	
Carbon storage	P
Biodiversity conservation	P
Soil conservation	Y
Sustainable water use	Y
Air pollution	Y
Labour conditions	N
Land right and community relations	Y

Round table on Sustainable Palm Oil (RSPO)

Palm oil is the world's second largest oil crop after soyoil. Not yet fully operational, The Roundtable on Sustainable Palm Oil (RSPO) is a global, multi-stakeholder initiative aimed at promoting the growth and use of sustainable palm oil through cooperation within the supply chain and open dialogue between its stakeholders. It uses a certification scheme to verify compliance with environmental standards, and in supply chain audits requirements for sustainable palm oil traceability. Its members make up an estimated 40% of world production of palm oil. It is estimated that the scheme will become operational in late 2007 and 20% of global production can be certified within the next 2-4 years.
.

▪ **Methodology** – *Rigour (LCA (ISO), specific calcs, checksheet)* – *Lead time (how long would it take to get in place* – *International links (ISO, other assessment approaches)*	Rigorous system to ensure audits carried out to sufficient quality. All certification carried out by accredited certification bodies Certification bodies must be accredited by national or international accreditation bodies, such that their organisation, systems and procedures conform to ISO Guide 65 (EN 45011), and/or ISO Guide 66. Accreditation body itself must be operating in accordance with the requirements of ISO 17011:2004 Conformity assessment – general requirements for accreditation bodies accrediting conformity assessment bodies eg. Membership of ISEAL auditors must meet ISO 19011: 2002 Guidelines for quality and/or environmental management systems auditing,
▪ **Products Covered**	Palm oil
▪ **Type I, II or III, other**	**Type I**
▪ **Criteria Development**	
▪ **Product Assessment** ▪ Coverage (raw materials, manufacture, logistics, use)	
▪ **Scheme set up/administration** ▪ Cost (who covers cost, how much, audits)	Ordinary Member**:** $3700.00 per year Membership fee waivers/discounts available for applicants that can demonstrate insufficient funds Audit cost depends on country and auditing body. No audits yet as criteria still in consultation Developing group certification option
▪ **Coverage** ▪ Specific to biofuels or wide ranging ▪ Brand level awareness	Includes 40% of all companies involved in global palm-oil production. When operational 20% of global palm oil could be certified in 2-4years Specific to biofuel from palm oil Low to medium with strong potential
▪ **Rigour of assessment**	Accreditation complies with ISO 65 (EN 45011) auditor competency requirements, clear and appropriate.
▪ **Applicability to Biofuels**	
Carbon storage	P

Biodiversity conservation	Y
Soil conservation	Y
Sustainable water use	Y
Air pollution	Y
Labour conditions	Y
Land right and community relations	Y

SAN-RA

The Sustainable Agricultural Network / Rainforest Alliance includes environmental groups in Belize, Brazil, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras and Mexico, with a watchdog group in Denmark and many associated academic, agriculture and social responsibility groups around the world. The SAN seeks to transform the environmental and social conditions of tropical agriculture through the implementation of sustainable farming practices. The conservation and rural development groups that manage the certification program understand local culture, politics, language and ecology and are trained in auditing procedures according to internationally recognized guidelines.

Sustainable Agricultural Network provides certification services for farmers and agricultural companies in their respective countries, while offering knowledge and experience in working towards the development of the Sustainable Agriculture standard. Rainforest Alliance is the Sustainable Agricultural Network Secretariat and administers the certification systems. The Sustainable Agricultural Network uses the Rainforest Alliance-certified seal.

▪ **Methodology** – *Rigour (LCA (ISO), specific calcs, checksheet)* – *Lead time (how long would it take to get in place* – *International links (ISO, other assessment approaches)*	rigorous system to ensure that audits are carried out to a sufficient quality Accreditation complies with ISO 65 (EN 45011) Complies with ISEAL
▪ **Products Covered**	Coffee, bananas, cocoa, orange, pineapple, flower and fern, macadamia nuts, passion fruit and plantains. Standards are crop specific but generic standards exist
▪ **Type I, II or III, other**	Type I (accredited certification bodies used)
▪ **Criteria Development**	
▪ **Product Assessment** ▪ Coverage (raw materials, manufacture, logistics, use)	The standard has 12 principles which apply to all its certified crops. 1. Social and Environmental Management System. 2. Ecosystem Conservation. 3. Wildlife Protection. 4. Water Conservation. 5. Fair Treatment and Good Working Conditions for Workers. 6. Occupational Health and Safety. 7. Community Relations. 8. Integrated Crop Management. 9. Soil Management and Conservation. 10. Integrated Waste Management.
▪ **Scheme set up/administration** ▪ Cost (who covers cost, how much, audits)	Developing group certification option

▪ **Coverage** ▪ Specific to biofuels or wide ranging ▪ Brand level awareness	As of 2007, we had certified almost 10,000 farms and cooperatives on about 215,000 hectares
▪ **Rigour of assessment**	Accreditation complies with ISO 65 (EN 45011) auditor competency requirements clear and appropriate.
▪ **Applicability to Biofuels**	
Carbon storage	P
Biodiversity conservation	P
Soil conservation	Y
Sustainable water use	Y
Air pollution	Y
Labour conditions	Y
Land right and community relations	Y

Basel Criteria for Responsible Soy Production

The Swiss government with the support of the WWF, Coop has developed the Basel Criteria for responsible soy production. The Basel Criteria include existing standards such as SA 8000, the requirements of the International Labour Organization (ILO) and the EurepGAP for good agricultural practice. As such they are compatible with all relevant international regulation.

Methodology – *Rigour (LCA (ISO), specific calcs, checksheet)* – *Lead time (how long would it take to get in place* – *International links (ISO, other assessment approaches)*	Rigorous system to ensure audits carried out to sufficient quality. ISO 65(EN 45011), SA 8000, ILO & EurepGAP verification through third party assessment All certification carried out by accredited certification bodies
Products Covered	Soy
Type I, II or III, other	1 (No label)
Criteria Development	
Product Assessment	▪ Compliance with relevant national legislation ▪ Maintaining soil and water quality ▪ Chemical use and crop protection ▪ Planting material ▪ Harvest and post harvest management ▪ Assessing and managing environmental impacts ▪ On-farm Conservation ▪ Waste and pollution management ▪ No conversion of primary vegetation and High Conservation Value Areas (HCVA) to agriculture land after July 31, 2004; compensatory measures for conversions between January 1, 1995 and July 31, 2004 ▪ No use of genetically modified material ▪ Minimum wages, fair working conditions, ban on child or forced labour and other ILO requirements ▪ Safeguarding of land rights and participatory land use planning involving all stakeholders ▪ Monitoring social consequences for the local population and the requirement to favour local employees, products and services ▪ Group certification schemes for small farmers ▪ Full traceability and independent control throughout the supply chain
Scheme set up/administration	

▪ **Coverage** - *Specific to biofuels or wide ranging* - *Brand level awareness*	So far, two Brazilian soy suppliers, IMCOPA and Agrenco, adhere to the Basel Criteria. Currently, their combined annual supply capacity is 2.2 million tons. Specific to Soy production for biodiesal low
▪ **Applicable to Biofuels**	
Carbon storage	Y
Biodiversity conservation	Y
Soil conservation	Y
Sustainable water use	Y
Air pollution	Y
Labour conditions	Y
Land right and community relations	Y

Managing social impacts

- Compliance with applicable legislation,
- Technical management and production,
- Environmental management,
- Social Management,
- Continuous improvement,
- Traceability.

FSC (Forest Stewardship Council)

The Forest Stewardship Council is a stakeholder owned system for promoting responsible management of the world's forests. Over the past 13 years, over 90 million hectares in more than 70 countries. It accredits independent third party organizations who can certify forest managers and forest product producers to FSC standards. Its product label allows consumers worldwide to recognize products that support the growth of responsible forest management worldwide.

▪ **Methodology**	
– *Rigour (LCA (ISO), specific calcs, checksheet)*	Rigorous system to ensure that audits are carried out to a sufficient quality. All certification carried out by accredited certification bodies and farms are audited at least once a year
– *Lead time (how long would it take to get in place*	five year lead time between FSC starting, as a 'certification working group' established in 1991, and the first certified products were introduced into the market in 1996. The time was required to launch FSC, establish a definitive set of ten principles, and accredit certification bodies.
– *International links (ISO, other assessment approaches)*	ISEAL, ISO 65 (EN 45011), ISO 19011 (guidelines for auditing of quality and/or environmental management systems.
▪ **Products Covered**	Sustainable forestry - wood and fibre products
▪ **Type I, II or III, other**	Type 1 (accredited third party certification bodies used)
▪ **Criteria Development**	
▪ **Product Assessment** ▪ Coverage (raw materials, manufacture, logistics, use)	▪ Compliance with laws and FSC Principles ▪ Tenure and use rights and responsibilities ▪ Indigenous peoples' rights ▪ Community relations and worker's rights ▪ Benefits from the forest ▪ Environmental impact ▪ Management plan ▪ Monitoring and assessment ▪ Maintenance of high conservation value forests ▪ Plantations
▪ **Scheme set up/administration** ▪ Cost (who covers cost, how much, audits)	This cost of setup in America ranges from less than 30 cents per acre to several dollars per acre depending on factors such as size and location of the property. Annual audits cost from less than 6 cents to more than 26 cents per acre. Allows group certifiction

▪ **Coverage** ▪ Brand level awareness ▪ Specific to biofuels or wide ranging	Wide globally High level of awareness globally
▪ **Rigour of assessment**	Accreditation complies with ISO 65 (EN 45011) Auditor competency complies with ISO19011
▪ **Applicability to Biofuels**	
Carbon storage	P
Biodiversity conservation	Y
Soil conservation	Y
Sustainable water use	P
Air pollution	P
Labour conditions	N
Land right and community relations	Y

Revenue from;
Evaluation fees paid by certification bodies to cover the costs of the accreditation process;
Accreditation fees charged to accredited certification bodies;
Fees for sue of FSC trademarks;
Grants and donations.
Membership dues;
Returns from investments and charges for FSC products and services (e.g. FSC standards, technical reports)

SA8000 (SAI)

Social Accountability International (SAI) 2001 promotes workers' rights primarily through the voluntary SA8000 system established in 2001. SA8000 is an international standard for improving working conditions. Based on the principles of thirteen international human rights conventions, it is a tool to help apply these norms to practical work-life situations. It was the first auditable social standard and creates a process that is independent (it is neither a government project, nor dominated by any single interest group).	
▪ **Methodology** – *Rigour (LCA (ISO), specific calcs, checksheet)* – *Lead time (how long would it take to get in place* – *International links (ISO, other assessment approaches)*	Rigorous system to ensure that audits are carried out to a sufficient quality complies with ISEAL
▪ **Products Covered**	Labour practices in company facilities and those of their suppliers and vendors.
▪ **Type I, II or III, other**	Type I (accredited certification bodies used)
▪ **Criteria Development**	
▪ **Product Assessment** ▪ Coverage (raw materials, manufacture, logistics, use)	Applicable to working conditions and worker rights of farm/factory workers; Child Labor, Forced Labor, Health and Safety, Freedom of Association and Right to Collective Bargaining, Discrimination, Discipline, Working Hours, Compensation, Management Systems.
▪ **Scheme set up/administration** ▪ Cost (who covers cost, how much, audits)	Audit costs $650-$2,000 per day dependant on size & type of operation and certification body
▪ **Coverage** ▪ Brand level awareness ▪ Specific to biofuels or wide ranging	
▪ **Rigour of assessment**	Has rigorous auditor accreditation process and auditor competency requirements are clear and appropriate. Allows surveillance audits between full audits
▪ **Applicability to Biofuels**	
Carbon storage	N
Biodiversity conservation	N

Soil conservation	N
Sustainable water use	N
Air pollution	N
Labour conditions	N
Land right and community relations	N

ACCS

Assured Combinable Crops Scheme is a UK standard for combinable crops which started in 1997. The main focus of ACCS is food safety/hygiene and not so much environmental and social sustainability. ACCS is a wholly owned subsidiary of Assured Food Standards (red tractor label) for the production of assured barley, oats, oilseeds, pulses, wheat and other crops. It has received 20,000 registrations have been received and verified and The Red Tractor logo can now be found on over £6.4bn of food every year. SAI Global/FABBL are the certification body and 'Qualifying' scheme for the Red Tractor logo meaning that products from the scheme are identified to consumers as they carry the Little Red Tractor label.	
▪ **Methodology** – *Rigour (LCA (ISO), specific calcs, checksheet)*	Rigorous system to ensure that audits are carried outto a sufficient quality. Auditor competency requirements, clear and appropriate.
– *Lead time (how long would it take to get in place*	Accreditation complies ISO 65 (EN 45011) Complies with UKAS requirements Farming standards include three DEFRA Codes of Good Practice for the Protection of Soil, Air and Water
▪ **Products Covered**	Barley, oats, oilseeds, pulses, wheat
▪ **Type I, II or III,**	Type 1 (accredited certification bodies used)
▪ **Criteria**	
▪ **Product Assessment**	Mainly food safety • Literature Requirements • Crop Protection • Granular/Dust Application of pesticides • Seed Treatment • Fertiliser and Crop Nutrition • Crop Storage and Handling • Hygiene • Haulage • Contractors • Genetically Modified Crops • Complaints • Fuel Storage • Contaminants

Scheme set up/administration	Cost of audit/membership £124.00 crops - under 200 hectares £165.00 crops – over 200 hectares Routine surveillance assessment will be carried out once in every crop cycle prior to harvest; with a minimum of six months and a maximum of eighteen months between assessments.
Coverage - Specific to biofuels or wide ranging - *Brand level awareness*	Certified roughly 85% of combinable crops in the U.K No coverage outside the U.K. but have plans to according to demand Only wheat covered Low globally
Applicability to	
Carbon storage	P
Biodiversity	N
Soil conservation	Y
Sustainable water use	Y
Air pollution	Y
Labour conditions	N
Land right and community relations	N

GLOBALGAP IFA (formally EurepGAP)

GLOBALG.A.P.

GLOBALGAP (Global Good Agricultural Practice Integrated Farm Assurance) is a private sector body that sets voluntary standards for the certification of agricultural products around the globe. The standard serves as a global reference system for other existing standards and can also easily and directly be applied by all parties of the primary food sector. It is an industry initiative focused on business to business rather than consumer label. They are hoping to change this to put labels at a box rather than pallet level. The scheme is very popular and is almost becoming a prerequisite for European supermarket goods.

▪ **Methodology** – *Rigour (LCA (ISO), specific calcs, checksheet)* – *Lead time (how long would it take to get in place* – *International links (ISO, other assessment approaches)*	Rigorous system to ensure audits carried out to sufficient quality. All certification carried out by accredited certification bodies ISO 65 (EN 45011) which sets out general requirements for bodies operating assessment and certification of quality systems
▪ **Products Covered**	Wide global coverage of broad range of crops including fuel crops soy,palm oil,suger cane, rapeseed, suger beet, wheat, corn/maize **Crops base**: Cotton, Tea, Green Coffee, Combinable Crops, Flowers & Ornamentals, Fruit & Vegetables **Livestock base**: Cattle & Sheep, Dairy, Pigs , Poultry, **Aquaculture base**: Tilapia, Shrimp, Pangasius, Salmon & Trout
▪ **Type I, II or III, other**	Type I (accredited certification bodies used)
▪ **Criteria Development**	
▪ **Product Assessment** ▪ Coverage (raw materials, manufacture, logistics, use)	Hazards and first aid Worker welfare Waste and pollution management, recycling and re-use Impact on environment/biodiversity Conservation of unproductive sites Energy efficiency Complaints Traceability All certified farms are audited at least once a year
▪ **Scheme set up/administration** ▪ Cost (who covers cost, how much, audits) ▪ On going cost	Certification fees of Certification Body are free market prices and not fixed by EUREPGAP Allows group certifiction Expensive to get certified especially small farms in LEDC's Annual membership fee is around $3800 (NZ dollar) Certificates cover a period of three years, but they are reviewed annually, expensive to be audited

▪ **Coverage** ▪ Brand level awareness ▪ Specific to biofuels or wide ranging	Awareness is high
▪ **Rigour of assessment**	Auditor competency requirements, clear and appropriate.
▪ **Applicability to Biofuels**	
Carbon storage	N
Biodiversity conservation	N
Soil conservation	Y
Sustainable water use	Y
Air pollution	P
Labour conditions	N
Land right and community relations	N

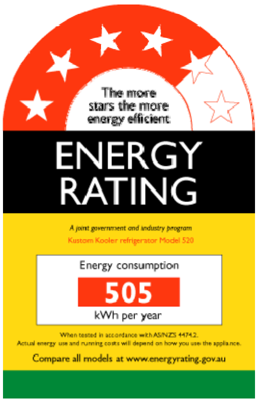
IFOAM - International Federation of Organic Agriculture Movements

IFOAM is a multi – stakeholder organisation that accredits other standards for organic agriculture according to its general criteria. Assisting its membership, IFOAM implements specific projects that facilitate the adoption of organic agriculture, particularly in developing countries. IFOAM also represents the organic agriculture movements at United Nations and other intergovernmental agencies. The AgriQuality Organic Certification Programme has been assured by IFOAM and assures customers that the product they are buying is absolutely organic. Accredited by the world's leading organic organisation, IFOAM, the AgriQuality Organic Standard has market access to USA, European Union, Australia, South East Asia, UK and Japan.	
■ **Methodology**	
– *Rigour (LCA (ISO), specific calcs, checksheet)*	Rigorous system to ensure audits carried out to sufficient quality. All certification carried out by accredited certification bodies
– *Lead time (how long would it take to get in place*	
– *International links (ISO, other assessment approaches)*	ISO guide 65(EN 45011), uses risk based auditing of farms ISO 19011 ISEAL International Organic Accreditation Service Inc. (IOAS) carries competency checks of certification bodies
■ **Products Covered**	Organically farmed crops
■ **Type I, II or III, other**	Type 1 (accredited certification bodies used) IFOAM Seal used on product
■ **Criteria Development**	
■ **Product Assessment** ■ Coverage (raw materials, manufacture, logistics, use)	

▪ **Scheme set up/administration** ▪ Cost (who covers cost, how much, audits) ▪ On going cost	Yearly fee between $220 and $2750 for companies between $115,160 and 3,450,000 annual turnover For companies over $3,450,000 annual turnover yearly fee is $3850 Allows group certifiction
▪ **Coverage** ▪ Specific to biofuels or wide ranging ▪ Brand level awareness	The total land under certified organic production worldwide has reached over 26 Million hectares. IFOAM plays a large part in this. Has 750 members in over 108 countries.
▪ **Rigour of assessment**	Accreditation complies with ISO 65 (EN 45011) Auditor competency complies with ISO19011 Uses risk based auditing to allow survallance of high risk farms
▪ **Applicable to Biofuels**	
Carbon storage	P
Biodiversity conservation	P
Soil conservation	Y
Sustainable water use	P
Air pollution	Y
Labour conditions	N
Land right and community relations	N

ISEAL (working for standardisation of assurance schemes internationally)

Energy Rating Label



The Energy Rating label was first introducing in NSW inn 1986. It enables consumers to compare the energy efficiency of domestic appliances on a fair and equitable basis. It also provides incentive for manufacturers to improve the energy performance of appliances. The star rating gives a quick comparative assessment of the model's energy efficiency

The comparative energy consumption (usually kilowatt hours/year) provides an estimate of the annual energy consumption of the appliance based on the tested energy consumption and information about the typical use of the appliance in the home. Airconditioners show the power consumption of the appliance (kW or kWh/hour).

▪ **Methodology** – *Rigour (LCA (ISO), specific calcs, checksheet)* – *Lead time (how long would it take to get in place* – *International links (ISO, other assessment approaches)*	
▪ **Products Covered**	refrigerators, freezer, clothes washers, clothes dryers, dishwashers and air-conditioners
▪ **Type I, II or III, other**	Type III
▪ **Criteria Development**	
▪ **Product Assessment** ▪ Coverage (raw materials, manufacture, logistics, use)	
▪ **Scheme set up/administration** ▪ Cost (who covers cost, how much, audits)	Electricity use of appliance Cost of testing cover by manufacturer Independent lab carry out testing
▪ **Coverage** ▪ Specific to biofuels or wide ranging ▪ Brand level awareness	95% of consumers in Australia and New Zealand recognize the label Only applicable to electrical products High level of awareness in Australia and New Zealand
▪ **Rigour of assessment**	▪ . test reports or data to the relevant standard (the number of units to be tested varies - see particular requirements by product); ▪ demonstration that the relevant performance requirements have been met by the model in addition to the measurement of energy consumption
▪ **Applicable to Biofuels**	

Carbon storage	N
Biodiversity conservation	N
Soil conservation	N
Sustainable water use	N
Air pollution	N
Labour conditions	N
Land right and community relations	N

Energy Star

ENERGY STAR is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy which implement a voluntary labeling program designed to identify and promote energy-efficient products to reduce greenhouse gas emissions.

ENERGY STAR is administered in New Zealand by EECA. The mark is used on leading heat pumps, dishwashers, washing machines, TVs, DVD players, home theatre systems, computers and office equipment and is planned to include fridges and freezers in the future.

▪ **Methodology** – *Rigour (LCA (ISO), specific calcs, checksheet)* – *Lead time (how long would it take to get in place* – *International links (ISO, other assessment approaches)*	Energy star partners are responsible for testing ISO compliant
▪ **Products Covered**	Computers, monitors, office equipment, residential heating and cooling equipment., lighting, home electronics and health safety of equipment, buildings and homes.
▪ **Type I, II or III, other**	Type **I** Mark sometimes accompanied with efficiency level denoted by a Roman numeral under the energy star mark
▪ **Criteria Development**	
▪ **Product Assessment** ▪ Coverage (raw materials, manufacture, logistics, use)	Overall energy efficiency performance based on KWh elec. consumption criteria Third Party Testing and Verification using accredited laboratories that qualify Energy Star testing standards. manufactures performs efficiency tests on randomly selected products, all must meet standard but average used on label Partners are required to self-certify those product models that meet the ENERGY STAR guidelines and report information to EPA. ENERGY STAR qualifying product lists, including information about new models as well as notification of discontinued models, must be provided on a quarterly basis, or more frequently if desired by the manufacturer.
▪ **Scheme set up/administration** ▪ Cost (who covers cost, how much, audits)	

■ **Coverage** ■ Specific to biofuels or wide ranging ■ Brand level awareness	 Not related to biofuels High - 65% have heard of it in America
■ **Rigour of assessment**	The product must meet energy consumption criteria as well as relevant safety standards. The mark is sometimes accompanied by a roman numeral from I to VI representing its level of energy efficiency. ENERGY STAR can change the specification should technological and/or market changes affect its usefulness to consumers, industry, or the environment.
■ **Applicability to Biofuels**	
Carbon storage	N
Biodiversity conservation	N
Soil conservation	N
Sustainable water use	N
Air pollution	N
Labour conditions	N
Land right and community relations	N

Environmental Choice NZ

Environmental Choice NZ is a government owned, Type I eco-label with wide coverage. The labelling scheme is administered by the New Zealand Ecolabelling Trust and is affiliated with the Global Ecolabelling Network (GEN). proeducts meeting mininimum sustainability criteria specific to each one can use the seal of approval.

■ **Methodology** – *Rigour (LCA (ISO), specific calcs, checksheet)* – *Lead time (how long would it take to get in place*	Conformance with this requirement shall be stated in writing and signed by the CEO or authorised representative of the applicant company. This statement shall be accompanied by relevant quality control and production documentation. Documentation must also identify the applicable regulatory requirements and demonstrate how compliance is monitored and maintained.
– *International links (ISO, other assessment approaches)*	ISO 14024 standard "Environmental labels and declarations - Guiding principles." And other ISO standards e.g. ISO 9000, ISO 14001
■ **Products Covered**	Paper Products, Printers, Copiers, Faxes & consumables, Cleaners & Detergents, Recycled Plastic Products, Paints Furniture and Fittings, Flooring, Laminate and Wood panel, Gypsum Plasterboard Products, Thermal (resistive-type) insulants, Mulch Mats
■ **Type I, II or III, other**	Type I – externally verified, label appears on wholesale and retail packaging for the product
■ **Criteria Development**	$20,000
■ **Product Assessment** ■ Coverage (raw materials, manufacture, logistics, use)	$5,000 est Considers raw materials, manufacture, and management options after use (e.g. recyling) Raw material inputs must come from sustainable sources. Must demonstrate initiatives being developed to measure, report on and mitigate overall GHG emissions.
■ **Scheme set up/administration** ■ Cost (who covers cost, how much, audits)	Covered by license fees, dependant on scale but for major sales like biodiesel likely to be $17,500 per annum $250 application fee, verification and application processing charged at an hourly rate
On going cost	Annual license fee range $750 – $17,500 dependant on ex factory value of product
■ **Coverage** ■ Brand level awareness ■ Specific to biofuels or wide ranging	Medium globally

▪ **Rigour of assessment**	Not overly. Producer only has to show effort in GHG management – no targets. However maximum energy consumption per unit of product and programmes to minimise overall GHG emissions. Only internal quality control and documentation of production processes – no external audit Only 30% of forest products must be sourced from forest complying with certification schemes
▪ **Applicable to Biofuels**	
Carbon storage	P (natural forest conservation and restoration)
Biodiversity conservation	Y
Soil conservation	Y
Sustainable water use	P
Air pollution	P
Labour conditions	N
Land right and community relations	Y

Environmental and social criteria are meet through compliance with other assurance schemes where relevant e.g. FSC, Pan European Forest Certification Council (PEFC), Sustainable Forestry Initiative® (SFI)

Note: Environmental choice only requires 30% of forest products to comply with forest certification standards.

Carbon Labelling

This U.K based labelling scheme has been set up by the Carbon Trust. The carbon reduction label is a measure of a products carbon footprint from source to store, with a commitment from the business to reduce this figure. The scheme is being piloted by eight companies including Walkers and Mirror trinity. Companies commit to reducing their carbon emissions over a two year period, if they don't they lose the label. The Carbon Trust is a private company set up by government in response to the threat of climate change, to accelerate the transition to a low carbon economy. The number on the label is the amount of Co2 released to the atmosphere fro the products manufacture, transportation and disposal.

▪ **Methodology** – *Rigour (LCA (ISO), specific calcs, checksheet)* – *Lead time (how long would it take to get in place* – *International links (ISO, other assessment approaches)*	
▪ **Products Covered**	Cosmetics, food, drinks
▪ **Type I, II or III, other**	*III*
▪ **Criteria Development**	
▪ **Product Assessment**	Carbon emissions calculated across product life cycle by; ▪ analyzing internal product data ▪ building a supply chain process map ▪ defining boundary conditions and identifying data requirements ▪ collecting primary and secondary data ▪ collecting carbon emissions by supply chain process steps.
▪ **Scheme set up/administration** ▪ Cost (who covers cost, how much, audits)	Participating companies gather information and do calculations

■ **Coverage** ■ *Specific to biofuels or wide ranging* ■ Brand level awareness	 Retail products Medium becoming strong – has received media coverage in Europe
■ **Rigour of assessment**	
■ **Applicable to Biofuels**	
Carbon storage	N
Biodiversity conservation	N
Soil conservation	N
Sustainable water use	N
Air pollution	N
Labour conditions	N
Land right and community relations	N

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Co2 Star

The Co2 star label was launched in 2006 with the core goal of developing effective, sustainable strategies for producing biofuels and combining biofuel use with efficiency measures. Co2 Star is developing carbon labels for biofuel, lubes, and freight services to create a strong demand for low carbon transport solutions. It plans to work with various organizations certifying sustainability of biofuel feedstocks to insure that biofuels are produced in a sustainable manner that optimizes Co2 reduction and greatly improves biodiversity. The Co2 star website provides information concerning the environmental impacts of biofuel production and information regarding CO2 star's efforts in promoting sustainable practices. The 60% reduction in GHG emissions relates to B100 at Germany's Q1 fuel pumps.

▪ **Methodology**	
– *Rigour (LCA (ISO), specific calcs, checksheet)*	60% reduction figure from Ifeu institute (Germany). Derived from rapeseed production
– *Lead time (how long would it take to get in place*	Quick to implement
– *International links (ISO, other assessment approaches)*	
▪ **Products Covered**	biofuel, lubes, and freight services
▪ **Type I, II or III, other**	Type III
▪ **Criteria Development**	
▪ **Product Assessment** ▪ Coverage (raw materials, manufacture, logistics, use)	Well to wheels life cycle anaysis. Crop production, conversion and transport
▪ **Scheme set up/administration** ▪ Cost (who covers cost, how much, audits)	GHG saving figure my have to be changed as production methods change
▪ **Coverage** ▪ Specific to biofuels or wide ranging ▪ Brand level awareness	Pilot project for biofuel label is used at Germany's largest biofuel retailer Q1. Low at present
▪ **Rigour of assessment**	
▪ **Applicable to Biofuels**	
Carbon storage	Y

Biodiversity conservation	N
Soil conservation	N
Sustainable water use	N
Air pollution	N
Labour conditions	N
Land right and community relations	N

BQ-9000

The **BQ-9000** standard by the National Biodiesel Accreditation Commission is a cooperative and voluntary programme for the accreditation of producers and marketers of biodiesel fuel. The programme is a combination of the ASTM standard for biodiesel, ASTM D 6751, and a quality systems program that includes storage, sampling, testing, blending, shipping, distribution, and fuel management practices. BQ-9000 is open to any biodiesel manufacturer, marketer or distributor of biodiesel and biodiesel blends in the United States and Canada.

■ **Methodology**	
– *Rigour (LCA (ISO), specific calcs, checksheet)*	Rigorous third party auditing
– *Lead time (how long would it take to get in place*	N/A
– *International links (ISO, other assessment approaches)*	no
■ **Products Covered**	Biodiesel
■ **Type I, II or III, other**	Type I
■ **Criteria Development**	
■ **Product Assessment**	Raw material , production technique and quality of end product
■ **Scheme set up/administration**	Application fee of $1,000. Audit fee of $2, 000 plus auditor travel expenses for a company seeking the Accredited Producer status with one production location or the Certified Marketer status with 1 – 3 distribution locations. Or Audit fee of $3,750 plus auditor travel expenses for a company seeking both the Accredited Producer and Certified Marketer designations at the same time with a maximum or one production location and 1 – 3 distribution locations. In instances when multiple audits are required, each audit beyond the base audit performed in 8b will cost an additional $1,000 plus auditor travel fees. Recertification Fee of $2,000 plus auditor travel fees. This fee is for companies who are recertifying under the BQ-9000. Recertification fees are due at the end of each 3-year accreditation period. Administrative Fee of $250 for companies submitting a name change request for their BQ-9000 registration.

■ **Coverage** - Specific to biofuels or wide ranging - Brand level awareness	Biodiesel quality in USA and Canada High
■ **Rigour of assessment**	Annual surveillance audit External auditor and external verified testing laboratory
■ **Applicable to Biofuels**	
Carbon storage	N
Biodiversity conservation	N
Soil conservation	N
Sustainable water use	N
Air pollution	N
Labour conditions	N
Land right and community relations	N

EECA Biofuel Label

The EECA biofuels label ensures that the fuel meets quality specifications which guarantee that biofuel blends are of the correct quality to avoid any engine problems. Once the Biofuels Sales Obligation commences the government will introduce and monitor comprehensive specifications for the quality of biofuels and biofuel blends. Until then, the biofuel label will ensure consumers that biofuel blends meet quality specifications.	
▪ **Methodology** – *Rigour (LCA (ISO), specific calcs, checksheet)* – *Lead time (how long would it take to get in place* – *International links (ISO, other assessment approaches)*	Fuel supplier covers cost of
▪ **Products Covered**	Biodiesel/bioethanol
▪ **Type I, II or III, other**	Type I
▪ **Criteria Development**	
▪ **Product Assessment** ▪ Coverage (raw materials, manufacture, logistics, use)	▪ Stringent controls on fuel quality – compliance with biodiesel NZS 7500:2005. ▪ Compliance with ASTM D 4806-01 and PPSR fuel standards ▪ must contain min 1% biofuel and max 5% and 10% for biodiesel and bioethaneol respectively
▪ **Scheme set up/administration** ▪ Cost (who covers cost, how much, audits)	Low Set up cost covered by EECA Ongoing cost is minimal
▪ **Coverage** ▪ Specific to biofuels or wide ranging ▪ Brand level awareness	Only Gull are using label (only company selling biofuel)
▪ **Rigour of assessment**	▪ Must prove fuel quality by independent inspection body or expert in chemical and fuels processing ▪ Register and conform to quality management system e.g. ISO 9001. this system is peer reviewed at regular intervals and records kept for 2 years ▪ Random sampling of product
▪ **Applicable to Biofuels**	

Carbon storage	N
Biodiversity conservation	N
Soil conservation	N
Sustainable water use	N
Air pollution	N
Labour conditions	N
Land right and community relations	N

Petroleum Products Specifications Regulations 2002 (the **PPSR**).