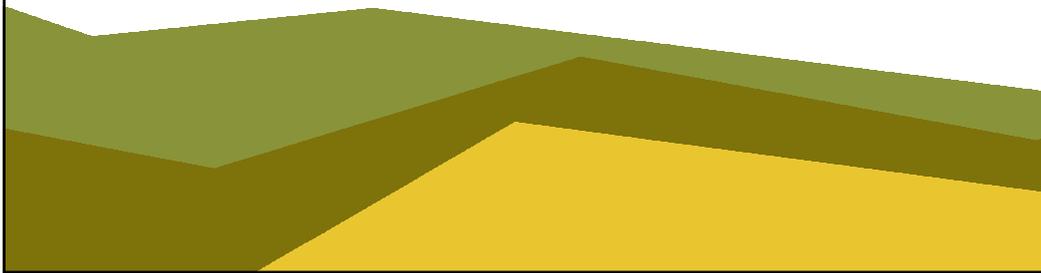


Carbon savings and biofuel production

Richard Safford – Industrial Uses Project Manager
Home-Grown Cereals Authority (UK)



Why biofuels?

Environmental
benefits

Transport =
c.25% of UK
carbon
emissions

Fuel security

Rising oil prices
and increasing
geo-political
instability

Alternative
markets for
farmers

Agriculture

Emphasis changes depending on the country

UK Renewable Transport Fuel Obligation (RTFO)



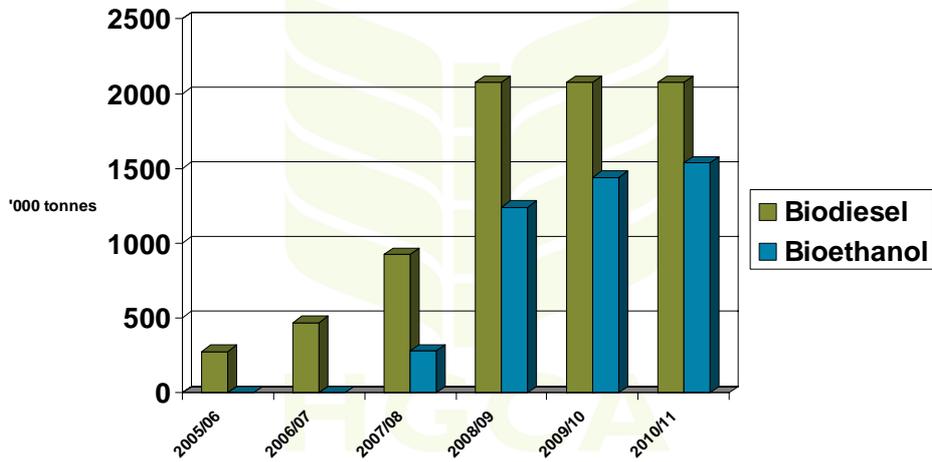
- RTFO aims to encourage supply of biofuels from sustainable sources to effectively contribute to reduction in GHG emissions
- Requires 5% volume of all UK fuel sold on UK forecourts should originate from a renewable source by 2010
- Biofuel inclusion targets:
 - 2.5 % 2008 (April)
 - 3.75% 2009
 - 5% 2010
- Fuel suppliers will have to meet these targets for which they receive certificates and 20ppl tax rebate
 - or buy certificates from other companies to make up any shortfall;
 - or pay a 'buy-out' price (15 ppl for 2008-9);
- **RTFO aims to deliver carbon savings of ca. 0.75 million tonnes pa by 2010, equivalent to removing 750,000 cars from the road**

Current UK biofuel situation



- At present, UK biofuels only account for around 0.70% of total road fuel (Oct 2007)
- Of this, biodiesel accounts for around 0.28 Mt and bioethanol 0.12 Mt
- Volumes set to increase due to RTFO and planned biofuel plants

UK Biofuel Production capacity



Source: Industry and HGCA

Planned UK biodiesel plants



Year	Plant	Volume (000 t)	Location	Feedstock needed (000 t)
2005/06	Argent Energy	45	Motherwell	-
	Biofuels Corp.	250	Immingham	625
	D1 OILS	32	Hull	80
	Ebony Solutions	200	Cheshire	500
2006/07	Greenergy	100	Immingham	250
	Greenergy	200	Immingham	500
2007/08	D1 OILS	320	Hull	800
	DMF Biodiesel	110	Rosyth, Fife	275
	INEOS	500	Grangemouth	1,250
2008/09	Argent Energy	150	Ellesmere Port	-
	Biofuels Corp	650	Middlesborough	1,625
	D1 OILS	420	Hull	1,050

Set-aside in 2008; Food vs Fuel

how much will come back into production?

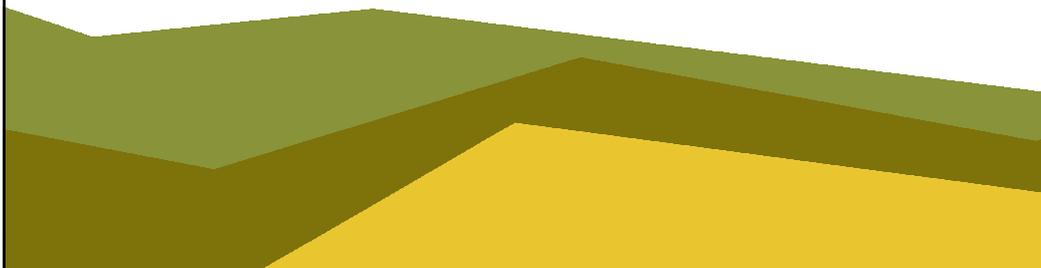


- EU commission confirmed 0% set-aside rate for 2008
- In EU 4M Ha plus land coming out of sugar production
- In EU 5% BF inclusion rate will require the equivalent of 24Mt grain
- In UK HGCA estimates that **45-55%** will come back into production, equivalent to 270 – 330k ha
- Using 2007/08 yields, potential **0.84-1.0 Mt** oil seed rape or **2.0-2.4Mt** wheat
- Estimate 2007 plantings up by ca. 13% compared to 2006
- So market responding to increased prices and land released

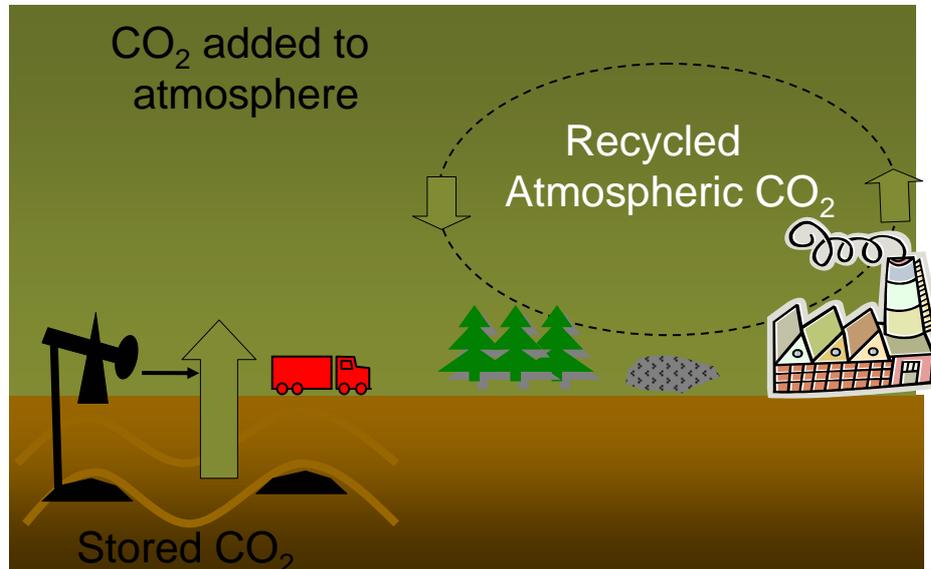
Home-Grown Cereals Authority



Carbon and Sustainability Accreditation for Biofuels



Biofuels: Environmental Issues



Carbon and Sustainability Reporting



- Green house gas (GHG) savings and sustainability impacts of different biofuels vary significantly depending on the system of cultivation, processing and transportation of feedstock
- The introduction of biofuels can also lead to unintended negative environmental and social impacts
- To encourage suppliers to source sustainable biofuels the Government proposes that the RTFO will require obligated companies to provide reports on both the **net GHG savings** and the **sustainability** of the biofuels they supply in order to receive Renewable Transport Fuel Certificates (RTFCs)

Future operation of UK RTFO



- **From 2008 all biofuels to be rewarded**, but carbon and sustainability reporting required for certificates
- **From April 2010** it aims to reward biofuels under the RTFO according to their **carbon savings**
- **From April 2011** it aims to reward biofuels under the RTFO **only if they meet appropriate sustainability standards**



Carbon Footprint: - how do we measure that?



Document - Biofuels Greenhouse Calculator - Microsoft Internet Explorer

Address http://www.hgca.com/document.aspx?fn=load&media_id=3534&publicationId=2135

HGCA

BIOFUELS GREENHOUSE GAS CALCULATOR

This tool calculates the life-cycle greenhouse gas emissions resulting from production, supply and use of biofuels in the United Kingdom. It also compares these greenhouse gas emissions with those from equivalent quantities of the fossil-based transport fuels that the biofuels are used to substitute.

Please select a biofuel type and raw material from the drop-down boxes below and then click on NEXT.

Biofuel:

made from:

Start Sheet > Wheat Farming > Wheat Drying > Wheat Transport > Ethanol Production > Ethanol Distribution > Rape Farming > Rapeseed Transport

Carbon Footprint for Biofuel production - elements of calculation



Farming	Fertiliser Seeds Pesticides Fuel Straw ploughed in or removed Crop Yield
Pre-processing	% moisture of wheat grain pre- & post-drying Diesel fuel & electricity consumed in drying and storing
Feedstock transport	Diesel fuel consumed transporting dried wheat to plant
Conversion	Energy generation at ethanol plant Natural gas consumption Imported electricity Surplus electricity Straw consumption Straw transport Straw transport distance Ethanol yield
End fuel transport	Transport to distribution site Transport mode Transport distance

Carbon Footprint for Biodiesel - each step in production chain must be monitored

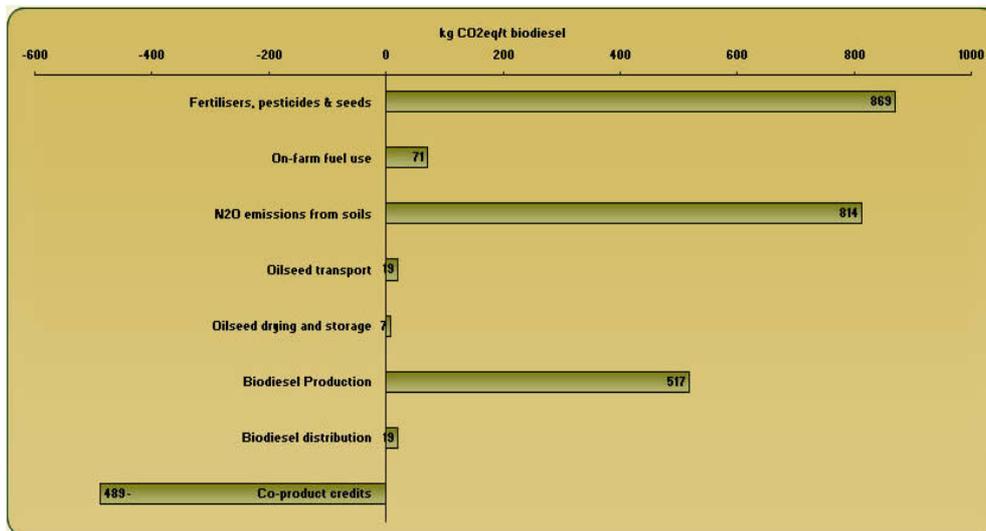


Life-cycle inventory results: WELL-TO-TANK CO₂-EQUIVALENT EMISSIONS
(co-products attract credits for avoided emissions from products displaced)

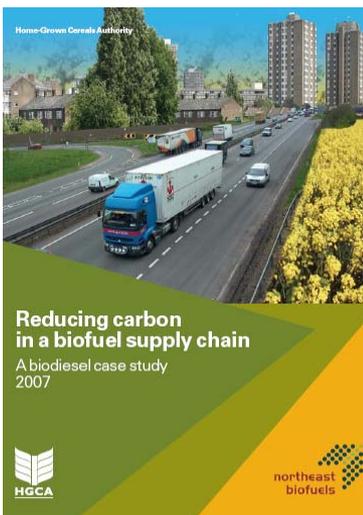
Production Chain Details	Greenhouse Gas Emissions Units: kg CO ₂ eq/t biodiesel
FERTILISER, SEEDS & PESTICIDES Inputs per hectare per year: Total 196 kg N (196 kg as mineral fertilizer & 0 kg as manure/sludge), 50 kg P2O5, 48 kg K2O 0 kg lime 2.8 kg pesticide 5 kg seed Oilseed yield: 4 t/ha	869.5 kg CO ₂ eq/t
ON-FARM FUEL USE 67 litres diesel/ha	71.32 kg CO ₂ eq/t
N₂O EMISSIONS FROM SOILS Assumed proportional to quantity of nitrogen fertilizer applied	813.8 kg CO ₂ eq/t
OILSEED TRANSPORT Rapeseed transported by road on average 93 km to distillery	7.132 kg CO ₂ eq/t
OILSEED DRYING AND STORAGE 137 l Diesel/t dried oilseed 5 kWh electricity/t dried oilseed	19.24 kg CO ₂ eq/t
BIODIESEL PRODUCTION NG Boiler and steam turbine 3.66 GJ natural gas and 144.2 kWh/t biodiesel	517.3 kg CO ₂ eq/t
BIODIESEL DISTRIBUTION Biodiesel transported by road on average 225 km to end use	19.08 kg CO ₂ eq/t
CO-PRODUCT CREDITS Rape meal animal feed - displaces soya feed Potassium sulphate - displaces potassium sulphate fertilizer from KCl and kieserite	-489 kg CO ₂ eq/t
TOTAL:	1829 kg CO ₂ eq/t biodiesel
Percent reduction relative to diesel emissions:	36.5%

Net calculation:

- CO₂ emissions in biodiesel production

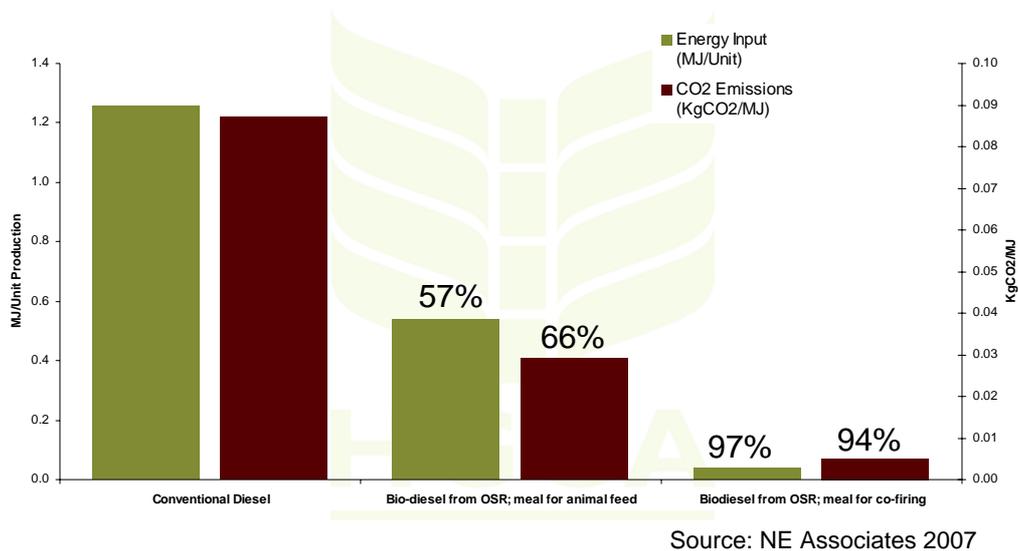


Reducing Carbon in a Biodiesel Supply Chain



- HGCA funded case study to help develop biodiesel supply chains in NE England
- To understand implications for GHG emissions & energy use for 'seed to tank' production of biodiesel from oil seed rape
- Study showed substantial savings in
 - a) GHG emissions and
 - b) Energy requirement for production of biodiesel compared to ultra low sulphur diesel

Carbon and Energy saving - benefits of biodiesel vs conventional low S diesel



Other HGCA Biofuel Activities



- Environmental Impact of Cereal and Oilseed Rape for food and biofuels in the UK - *being updated*
- Green Fuel you can trust, HGCA Carbon Accreditation Report – *updated wheat to bioethanol / OSR to biodiesel calculators / farm audits*
- Wheat as feedstock for alcohol production; breeding programme to optimise fatty acid profile OSR for biodiesel production (lower PUFA) -*ongoing*
- Consumer Research on Biofuels, Oxford Partnership - *ongoing*

Environmental impact of cereals and oilseed rape for food and biofuels to the UK

Green fuel you can trust

Growing wheat for alcohol/biofuel production

Consumer Survey Results:

Group	Percentage
Up to 10p	12%
10p-15p	1%
15p-20p	2%
20p-25p	2%
25p-30p	2%
30p-35p	2%
35p-40p	2%
40p-45p	2%
45p-50p	2%
50p-55p	2%
55p-60p	2%
60p-65p	2%
65p-70p	2%
70p-75p	2%
75p-80p	2%
80p-85p	2%
85p-90p	2%
90p-95p	2%
95p-100p	2%
100p-105p	2%
105p-110p	2%
110p-115p	2%
115p-120p	2%
120p-125p	2%
125p-130p	2%
130p-135p	2%
135p-140p	2%
140p-145p	2%
145p-150p	2%
150p-155p	2%
155p-160p	2%
160p-165p	2%
165p-170p	2%
170p-175p	2%
175p-180p	2%
180p-185p	2%
185p-190p	2%
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195p-200p	2%
200p-205p	2%
205p-210p	2%
210p-215p	2%
215p-220p	2%
220p-225p	2%
225p-230p	2%
230p-235p	2%
235p-240p	2%
240p-245p	2%
245p-250p	2%
250p-255p	2%
255p-260p	2%
260p-265p	2%
265p-270p	2%
270p-275p	2%
275p-280p	2%
280p-285p	2%
285p-290p	2%
290p-295p	2%
295p-300p	2%
300p-305p	2%
305p-310p	2%
310p-315p	2%
315p-320p	2%
320p-325p	2%
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330p-335p	2%
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340p-345p	2%
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400p-405p	2%
405p-410p	2%
410p-415p	2%
415p-420p	2%
420p-425p	2%
425p-430p	2%
430p-435p	2%
435p-440p	2%
440p-445p	2%
445p-450p	2%
450p-455p	2%
455p-460p	2%
460p-465p	2%
465p-470p	2%
470p-475p	2%
475p-480p	2%
480p-485p	2%
485p-490p	2%
490p-495p	2%
495p-500p	2%

Summary



- Fuel security, fossil fuel prices and GHG savings driving global biofuels market
- World bioethanol market growing and driven by US (corn)
- Europe leader of global biodiesel production
- UK biofuel targets to come in April 2008
- Many biofuel plants are planned in UK
- Increased UK plantings in response to higher crop prices and zero set-aside
- Seeking to increase usage of domestic feedstocks, but will require imported biofuels / feedstocks
- RTFO promoting both carbon savings and sustainable sourcing, so providing marketing advantage for such biofuels
- New market opportunities for farmers via provision of renewable feedstocks

Thank you

