

# Invited Speakers

## S6.1

### Impacts of Biofuels on Ingredient Availability, Alternatives and Economics

JH BELL

SAC Consulting, UK

Feed is a major cost in poultry production and changes in the price and availability of feeds can have a major impact on profitability. Grain and oilmeal prices have risen sharply in recent years and biofuels have been a major contributing factor along with weather and economic factors. Biofuels have doubled the annual rate of global demand growth over the last five years in grains and vegetable oils. This has made it more difficult for agricultural production to keep up with demand and so has contributed significantly to higher feed prices. Biofuels have also increased the supply of protein co-products such as DDGS and oil meals. Government incentives are expected to continue to support biofuel demand and world grain prices in the next few years though the pace of growth is slowing. UK grain and oilseeds prices could be supported further if significant biofuel capacity is built here though investment has so far been limited. Higher grain and oilseed prices however are a strong incentive for farmers world wide to maximise production. In addition, government and public support for biofuels is likely to be increasingly linked to the greenhouse reduction and environmental benefits of different fuels and the need to avoid conflict with food production. Biofuels are therefore expected to be less important in determining feed prices in the future.

Keywords: biofuels, feed, demand, prices

### BIOFUEL PRODUCTION

Biofuels production and the associated demand for agricultural feed stocks have grown strongly in recent years though the pace has eased in the last two years. According to SAC estimates the total use of grain and vegetable oil feed stocks (excluding sugar and molasses) has risen by 81mt (225%) from 64mt in 2005 to 145mt in 2009. This growth has up to now been driven by a wide range of incentives from governments seeking benefits for environmental, fuel security and agricultural support reasons. In addition high mineral oil prices over much of this period have further supported biofuel use.

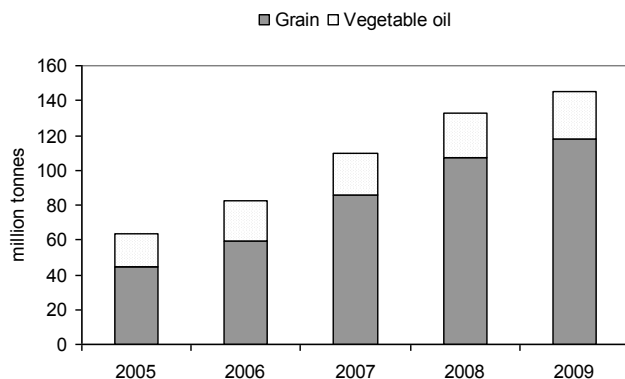


Figure 1. World use of grain and vegetable oil in biofuel production -

Source: SAC estimates based on USDA, EC, FAPRI data

The greatest expansion in biofuel use has occurred in the US where the use of maize for bioethanol production has risen from 41mt in 2005 to 104mt in 2009. However the pace of expansion has slowed sharply in the last 2 years as ethanol production margins have declined and capital availability has decreased due to the credit crisis.

In Brazil, the low cost of bioethanol production from sugar cane and the wide scale adoption of 'flex-fuel' vehicles able to use either petrol or ethanol has enabled use to be driven by market demand..

# Invited Speakers

In the EU the focus has been on biodiesel production driven by EU targets which aim for 5.75% of EU road fuels to be supplied from renewable sources by 2010, though most member states are falling behind. In 2007 the European Commission (EC) introduced targets to reach 10% biofuels in road fuel by 2020 subject to sustainability criteria being met.

Table 1. World biofuel production by country – 2007

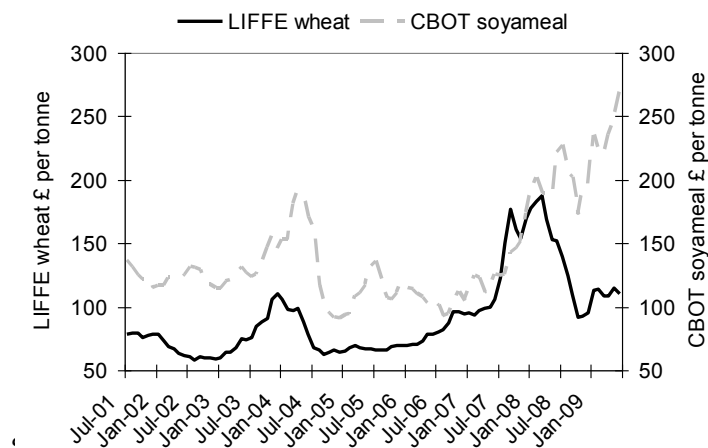
	Fuel ethanol raw material	Fuel ethanol (m t)	Biodiesel raw material	Biodiesel (m t)
US	Maize	18.85	Soya	3.63
Brazil	Sugarcane/molasses	15.39	Soya	1.04
EU	Wheat/sugar beet/molasses	1.80	Rape/imported oils	5.62
China	Maize	1.41	Soya	0.35
Canada	Maize/wheat	0.65	Canola	0.55
Others		0.91		1.75
<b>World total</b>		<b>39.01</b>		<b>12.94</b>

Source: LMC 2008

## WORLD GRAIN MARKET IMPACT

Global wheat prices rose to record levels in early 2008 following a succession of weather problems around the world that brought global grain stocks to their lowest level in 30 years. Subsequently a large increase in the world grain harvest in 2008 resulted in a rise in grain stocks and prices fell back. Despite this global grain prices remain well above the average of the previous decade. Global Soya meal prices also rose strongly in 2008 but have continued climbing during 2009 due to drought reducing soybean output in South America.

Figure 2. World grain and Soya meal future prices



While weather and wider economic factors continue to be important factors grain and Soya meal prices have been increasingly influenced by growth in demand for biofuel production. In 2009 ethanol is expected to account for 7% of global grain demand and biodiesel for 20% of global vegetable oil demand (SAC estimates). While biofuels may still represent a relatively small share of global grain and oilseed demand they have shown very high rates of growth in recent years. In the five year period (2005-09) biofuels generated between 40% (biodiesel) and 58% (ethanol) of global demand growth in vegetable oil and grains respectively (SAC estimates). It is this pace of growth that has contributed most to the increase in commodity prices as it has proved difficult for farmers to raise output quickly enough to meet demand.

The greatest growth in biofuel production has occurred in the US where ethanol is expected to account for 105mt or 33% of US maize demand in 2009/10 (USDA-WASDE, 2009). By removing such a large tonnage of grain from the world export market, the US ethanol sector has contributed strongly to the rise in grain and related commodity prices in recent years.

# Invited Speakers

Biofuels have also led to shifts in the profitability and production of different crops. In 2007 expansion of the US ethanol sector led to high maize prices and resulted in US farmers increasing maize plantings by 22% to a record 35m ha. This displaced other crops particularly soybeans and affected the price of feeds such as Soya meal.

In the EU ethanol demand for grain remains small by comparison at around an estimated 7.8mt in 2009, or 2.7% of demand. (EC, 2009). However if the EU is to meet biofuel targets grain usage for ethanol is expected to grow to almost 20.4mt by 2015 (EC, 2007). Over the same period in the US maize use in ethanol is expected to climb 30mt to 133mt though this is a smaller increase than the 70 mt rise seen in the previous 6 years.

Biofuels have increased demand for grain and contributed to higher prices however at the same time higher prices have encouraged farmers to increase production by planting more land and applying more inputs to raise yields. Biofuel co-products have also substituted for grain in feed rations lessening the impact on grain demand.

## WORLD OILSEED MARKET IMPACT

On the world market industrial uses (mainly biodiesel) are expected to account for 27mt (20%) of the worlds 136mt of vegetable oil demand in 2009 (USDA-WASDE 2009) an increase of 7mt since 2005.

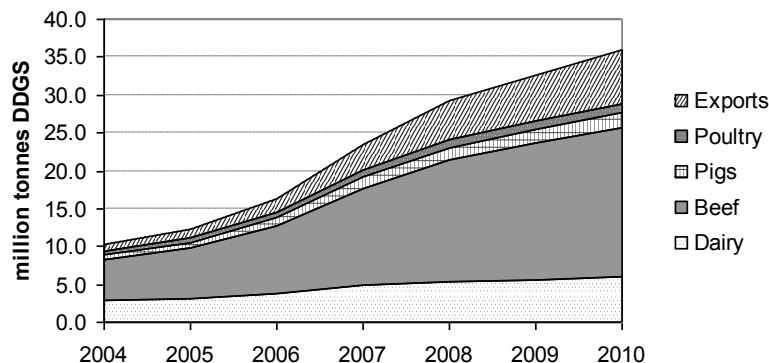
In the EU, crushing for biodiesel now accounts for over 70% of rape oil produced. EU bio-diesel production rose 17% in 2007 to 5.7Mt. Despite the preference for rape oil, EU imports of Soya oil biodiesel increased sharply in 2007 and 2008 in response to the so called 'splash and dash' tax loophole. This has enabled subsidised biodiesel imported via the US to undercut EU produced biodiesel.

Looking to the future demand for oilseeds to supply the biodiesel market is expected to grow strongly within the EU from 16mt in 2009 to 18.5mt in 2015 (EC 2009a). Several other countries are also encouraging domestic biodiesel production and use including the US, Argentina, Brazil and Malaysia which is likely to continue to support vegetable oil demand and oilseed prices into the future.

## BIOFUEL CO-PRODUCTS

In the US the production of Distillers Dark Grains (DDGS) has risen from 10.2mt in 2004/05 to an estimated 29.2mt in 2008/09, a rise of 19mt or 186% in 5 years. In 2008/09 this is estimated to have replaced the equivalent of 21mt of maize and 4.5mt of Soya meal in animal feed rations. Over 90% of DDGS in the US is fed to cattle with just under 5% fed to poultry.

Figure 3: US Distiller Grain Use



Source: Agricultural Resource Marketing Center 2009

# Invited Speakers

In the EU, increased crushing of oilseed rape for biodiesel production has resulted in a 59% increase in rape meal production in the last five years to reach 11.8mt in 2009/10. On the world market, over the same period the production of oil meals has risen 15% from 207mt to 237mt in 2009/10 (USDA-PSD 2009). While both rape meal and DDGS are of limited value in poultry rations, their increased availability has encouraged greater use in ruminant and pig rations, releasing more soybean meal for poultry production.

In recent years the increase in the availability of biofuel co-products has tended to make protein cheaper relative to starch in the ration than would otherwise have been the case.

## **BIOFUELS IN THE UK**

### Policy drivers

UK biofuel use has until recently lagged behind EU targets and the level of use in most other EU states. In 2007 UK biofuel use represented just 0.8% of road fuel use against an EU average of 2.6% (EC, 2009b). However in April 2008 the UK introduced UK Renewable Transport Fuels Obligation (RTFO) which has sharply increased UK biofuel use to reach 2.7% in the first 9 months of 2008/09 (target is 2.5%).

The RTFO came into effect on 1 April 2008 and requires all transport fuel suppliers to ensure that a designated proportion of their fuel sales comprise biofuels. Those who fail to meet their obligation are required to pay a buyout penalty. The target started at 2.5% by volume in 2008/09 and was originally set to rise to 5% by 2010/11. However the government has since put back the 5% target to 2013/14 in response to environmental and food security concerns over biofuel use raised in the Gallagher Review (Gallagher, 2008).

In terms of feedstock requirements the 5% target by 2013/14 equates to 1.2 mt of biodiesel (3.1mt of rapeseed) and 0.98mt of bioethanol (2.8mt of wheat). However experience from the first year of operation of the RTFO has highlighted that imported rather than UK produced biofuels and feed stocks are likely to supply the majority of the obligation. According to the Renewable Fuels Agency (RFA) currently, only around 8% of biofuel used in the UK is produced from UK feed stocks. The major source of biodiesel is American soya (around 26% of biodiesel supplied) and the main source for bioethanol is Brazilian sugarcane (81% of ethanol supplied).

In terms of animal feed availability and price, the development of a UK biofuel industry has two main impacts; increased competition for feedstock (grains and oilseeds) and increased production of animal feed co-products (distillers grains and rape meal). So far the reliance on imported feedstock has meant a limited local impact however this could change given the large scale increase in UK ethanol processing capacity currently underway.

### Ethanol

The UK already has a well established grain distilling industry producing potable alcohol based in Scotland and using around 600,000t of UK produced wheat and 70,000t of imported maize every year. The industry also produces a range of feed co-products including wet draff, pot ale syrup and dried Distillers Dark Grains with Solubles (DDGS).

At present there is just one operational bioethanol plants based on sugar beet in Norfolk (British Sugar) and one grain starch plant that produces feedstock for ethanol as a co-product in Manchester (Cargill). However there are two grain ethanol plants under construction in the UK; Ensus on Teeside and Vivergo on Humberside. Once operational they will have a combined demand of around 2.3mt of wheat, will produce over 700 m litres of ethanol and 0.8mt of DDGS.

# Invited Speakers

Table 1. Operational and in construction UK bioethanol plants

Operating from -	Plant	Volume (000 t)	Location	Grain Feedstock (000 t)	DDGS (000t)
2007/08	British Sugar	30	Wissington	-	-
	Cargill	225	Manchester	643	-
2009/10	Ensus	360	Teesside	1,200	400
20010/11	Vivergo	360	Humberside	1,100	400

Source: HGCA 2009

The wheat price impact of these new plants will depend on a number of factors. The UK has a significant surplus of wheat ranging between 1.0mt and 4.0mt in recent years. The UK also has the potential to increase wheat production significantly in response to better prices. UK agriculture could therefore potentially meet the projected 2.3mt increase in demand without resorting to grain imports in a normal year. In which case there would be relatively limited impact on average grain prices here in the UK. However there are likely to be regional price impacts starting as early as 2009/10. All the planned grain ethanol plants are located in the north of England whereas the main grain surplus is in the South and East. Wheat price differentials based on haulage costs of between £10 and £15/t could therefore develop between the north and south of the UK over the next couple of seasons.

## Biodiesel

The UK already has two large oilseed rape crushing plants; ADM at Erith (Kent) and Cargill at Liverpool. The combined capacity of these plants is estimated at around 1.6mt to 1.7mt per year which compares with total UK rapeseed production of around 1.9mt. The vegetable oil produced by these plants is supplied into both the food processing and biodiesel markets. These plants also produce over 1mt of rapeseed meal for use in the animal feed sector. There have been several proposals in recent years to expand UK crushing capacity in order to supply the market for biodiesel with new plants proposed for Hull, Avonmouth and Rosyth in Scotland. However unfavourable economics have resulted in all these proposals being either shelved or postponed.

Turning to biodiesel production several large scale biodiesel plants have been built however due to the unfavorable economics of biodiesel production in the UK at present almost all are currently mothballed or decommissioned. The main large scale operating plant is the Argent plant in Motherwell producing 45,000t of biodiesel from tallow.

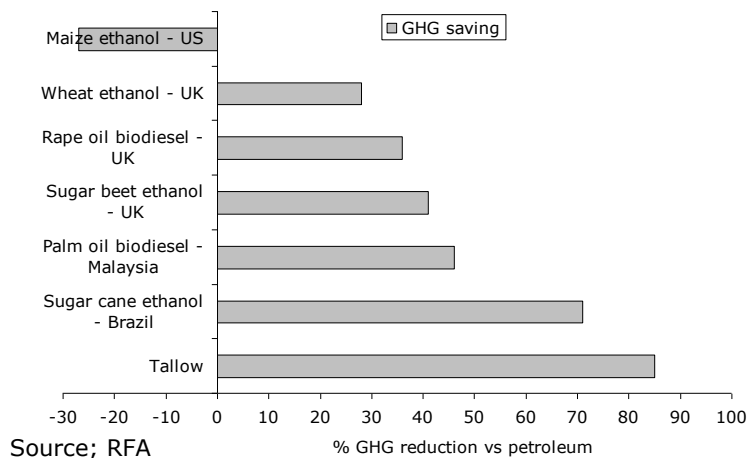
Without an increase in crushing capacity and a reliance on imported vegetable oil or biodiesel the biofuel sector is therefore having only limited impact on the price and availability of UK produced feed stocks (rapeseed) and feed co-products (rape meal). However the UK demand created for biodiesel under the RTFO is contributing to global demand growth in the oilseeds sector and so supporting global oilseed prices.

## **GREENHOUSE GAS SAVINGS AND BIOFUELS**

While government support for biofuels continues concerns are growing over the impact of biofuels on greenhouse gas emissions and food prices. In the UK companies participating in the RTFO scheme are required to report the origin of the biofuel feed stocks used and the provide details of Green House Gas (GHG) savings and sustainability according to methodology set out by the Renewable Fuels Agency. The RFA have established default values for different feed stocks with a current minimum carbon saving of 40% expected which will rise to 50% by 2010-11. The table below details default GHG savings for different biofuel types.

# Invited Speakers

Figure : Default GHG savings by biofuel type and source



Within the EU, an extension of the biofuels target beyond 5.75% of road fuels from 2010 will be linked to whether biofuels can achieve GHG reductions of more than 35% compared to petroleum fuels. The EC is increasingly looking towards more advanced biofuels from biomass and wastes in order to deliver greater GHG savings and reduce the conflict with food production.

In the US the 2007 Renewable Fuels Standard requires that a growing share of ethanol is supplied from second generation biofuels with limits set on the quantity of maize feedstock that will be permitted to be used for ethanol production. In some US states such as California, minimum GHG savings for biofuels are being proposed that are likely to prohibit the use of much of the ethanol currently produced in the US mid west.

## OUTLOOK FOR FEED PRICES

Current plans for biofuel production in the UK are not expected to increase demand for UK grown wheat and oilseed rape sufficiently to greatly affect the price in an average year although the north of the country may see a relative increase in wheat prices of around £10/t at times. Global growth in biofuel demand is expected to continue to support grain and oilseed prices in the future though the pace of demand growth is expected to slow. Prices will continue to be driven by weather and economic factors such as exchange rates and the price of crude oil. Longer term price trends will also depend in part on whether technology can help raise agricultural production to meet additional demand biofuel and food demand. Politically biofuels are also facing growing scrutiny over GHG savings and their potential impact on food prices. As a result a slower expansion of biofuel demand is expected to give more time for agriculture to raise productivity and lessening the future price impact on the feed and livestock sectors.

## REFERENCES

EC (2007) The impact of a minimum 10% obligation for biofuel use in the EU27 in 2020 on agricultural markets, AGRI G-2/WMD(2007)

EC (2009a) Prospects for agricultural markets and income in the European Union 2008-15, European Commission report March 2009

EC (2009b) Renewable energy progress report, European Commission, April 2009

FAPRI (2009), 2009 U.S. and World Agricultural Outlook (<http://www.fapri.iastate.edu/outlook/2009/>)

**Gallagher, E.** (2008) The Gallagher Review of the indirect effects of biofuels production, report for the Renewable Fuels Agency July 2008

LMC (2008) A primer on global and UK biofuels, report produced by LMC International for Future Capital Partners Ltd, January 2008

# Invited Speakers

RFA (2009) Monthly Report 11:15 April 2008 - 14 March 2009 (<http://www.renewablefuelsagency.org/>)

USDA-PSD (2009), Production, Supply and Disposal Online, (<http://www.fas.usda.gov/psdonline/>)

USDA-WASDE (2009), World Agricultural Supply and Demand,  
(<http://www.usda.gov/oce/commodity/wasde/>)