

The Bioeconomy Consultants



News Review

Issue Sixty-Three

June 2017

Each month we review the latest news and select key announcements and commentary on feedstocks used in the bioeconomy.



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Foreword

Welcome, subscribers, to a landmark NNFCC News Review: it is our 250th!

And much like any good party should involve classic, timeless records, we're ringing in our quarter-millennium with a timeless debate: land use.

It is impossible to avoid the land use debate wherever feedstocks are concerned: are we sacrificing valuable food crop land in order to grow crops for energy or biomass? Can the available land be successfully managed to find a happy medium between the two? Does the short-term problem of food scarcity outweigh the long-term problem of climate change? If there was a right answer to this debate then there wouldn't be a debate in the first place. Last month we reported on a study that demonstrated that only 0.6% of America's prime food crop land need be utilised for biomass, and America's entire biomass needs could still be met. This would, of course, require micro-management to a degree that is not realistic for an area so large. Fortunately, however, there are several stories that indicate the land use problem can be dealt with without micro-management. As figures are released by AHDB forecasting record global wheat stocks in 2018, the same organisation has analysed the last 20 years of wheat production, finding that the increases over that time have come more from increased yield, as opposed to increased land use. This does, however bring with it the risk of production drastically falling if yields fall in any way (due to climate effects, disease, etc), and it is unclear how much yield potential remains to be exploited in practical terms (we reported earlier this year on a new world record), but there appears to be potential. There is still much to do to drive output on land that is significantly underperforming, though with an eye remaining on the sustainability of any agronomic practice.

Elsewhere, there is good news on the palm oil front: this crop has seen its fair share of bad press thanks to unsustainable land use change as crop area has expanded, but Smart Tbk, a subsidiary of Golden-Agri Resources may have gone some way to ameliorating this by looking to improve oil output, as they have successfully bred a strain of oil palm with a yield 25% higher than traditional strains.

By coupling sustainable management with continued crop and agronomic development the use of land can be optimised to address both productivity and environmental concerns reducing competition between increasing demands on the land resource.

Read on for the latest feedstocks news.

Policy

Federal funding for US wood projects

U.S. Forest Service Chief Tom Tidwell recently announced over \$8.3 million to substantially expand and accelerate wood products and wood energy markets. Federal funds will leverage almost \$37 million in matching funds from 36 business, university, non-profit, and tribal partners in 19 states for a total investment of over \$45 million. The public-private partnerships leveraged with these grants will lead to the removal of hazardous fuels from forests while spurring the economic development of rural communities.

Of the 38 projects funded, 26 focus upon expanding wood products markets, and 12 increase wood energy markets. The mission of the U.S. Forest Service, an agency of the U.S. Department of Agriculture, is to sustain the health, diversity and productivity of the nation's forests and grasslands to meet the needs of present and future generations. The agency manages 193 million acres of public land, provides assistance to state and private landowners and maintains the largest forestry research organization in the world.

Click [here](#) for more information.

US Algae Biomass seek support in campaign to reverse cuts

The US Algae Biomass Organisation is campaigning against proposed cuts to federal funding for algae-related research in the US and is asking any individuals or organisations who have benefitted from federal support to complete a

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short survey. The latest edition of ABO's newsletter leads with a plea for support of their campaign against potential cuts which could 'reverse US technology leadership, force layoffs, reduce post-doc funding and possibly end the nation-wide effort to transform algae cultivation into a sustainable engine for economic growth, nutrition, energy, medicine and more.' ABO is intending to put the results of their survey to Congress.

Click [here](#) for more information.

Brazil's sugarcane shows food-based biofuels not necessarily bad - FAO official



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A senior official from the Food and Agriculture Organisation of the United Nations has said sugarcane cultivation can supply both food and fuel without harming the environment.

Speaking at a 7 June EURACTIV event, Olivier Dubois said Brazil shows that biofuel production doesn't necessarily have to raise food prices or damage the environment. In particular, he stressed the importance of avoiding oversimplification of the debates surrounding

biofuels as such generalisations rarely reflect reality.

One such "sweeping statement", according to Dubois, "is that food-based biofuels are necessarily bad for food."

Dubois argued that biofuels should be seen as a tool for responsible investment in agriculture and rural development. He used Brazilian sugarcane as an example, which he argues hasn't caused land use changes or food changes through its use as a source for bioethanol.

Dubois also raised the highly contentious issue of palm oil, which the European Commission has recently agreed a resolution to phase out. Palm oil makes up two thirds of the vegetable oil produced worldwide, and has a yield three or four times higher than any other vegetable oil.

Click [here](#) for more information.

UFOP dubs rapeseed "The Power Plant"



Flickr

Over 1.3 million hectares of rapeseed oil fields are blossoming in Germany at the moment. The plants store the sun's energy in the seeds and in the rapeseed oil derived from these seeds. Its energy density is comparable to that of diesel fuel. As a

result, rapeseed oil and the rapeseed methyl ester produced from it, better known as biodiesel, is by far the most important fuel alternative certified as sustainable in Germany and Europe. This certification of sustainability also applies to all rapeseed cultivation in Germany, regardless of the end use, meaning it even applies to rapeseed cooking oil. The fact that only rapeseed free of genetic modification is cultivated in European Union countries is also very important for many consumers. This means that rapeseed meal, which is produced alongside rapeseed oil during pressing, is likewise free of genetic modification. This is a significant advantage compared to soya imports which are not usually free of genetic modification. Rapeseed meal thus provides protein feed that allows dairy products, eggs or beef to be labelled "GM-free".

The rapeseed plants are real power plants. From just two to three kilogrammes of seed sown per hectare, around 3,800 kilogrammes of rapeseed is produced at harvest just eleven months later. This yields 1,600 litres of rapeseed oil and 2,300 kilogrammes of GM-free rapeseed extraction meal. The use of rapeseed as a fuel ensures a guaranteed saving of 1.5 tonnes of CO₂ compared to conventional diesel fuels - per hectare.

Click [here](#) for more information.

WRAP publishes report on organic waste recycling in the UK

WRAP has just released the latest organics recycling industry report, covering 2015. It provides an update on Anaerobic Digestion and Composting development in the UK.

The recent growth trend in AD is set to continue with around 500 developments in the pipeline, that could potentially double or triple the size of the sector between 2014 and 2019. However, this

level of deployment is highly dependent on the policy landscape, current reviews of renewable energy incentives and access to suitable feedstocks.

The majority of feedstock processed in 2014 was food waste.

Local authorities sent 314,516 tonnes of food waste to AD facilities in Great Britain. The majority (1.53 million tonnes) of food waste processed by AD facilities in England, Wales and Scotland came from commercial and industrial sources.

The compost sector is more mature than the AD sector, and continues to grow albeit at a steadier rate, from 271 permitted sites in 2012, to 310 in 2014 and 330 in 2015. The majority of feedstock into the compost sector was consistently sourced from local authorities (70-88%), and consisted mainly of green waste, contributing more than 70%, and food waste. The survey also highlighted difficulties in gaining data from accessible resources due to the incomplete nature of such data including the Environment Agency's Waste Interrogator.

Click [here](#) for more information.

Markets

Record global wheat stocks expected in 2018



Pixabay

The UK's AHDB Cereals Market Intelligence reports that Global 2017/18 wheat production is forecast 2% lower year on year at 737.8Mt, at the second highest figure on record. However total consumption is also expected to decline, through only slightly, meaning that closing stocks for next season are seen 1.2% higher at a record 258.3Mt. Much of the balancing stocks reside in China which is less accessible to global grain trading markets.

As with grains, global soyabean output is expected to fall in 2017/18, with the new crop forecast at 344.7Mt compared with 348.0Mt in 2016/17. Consumption is forecast at 344.2Mt, 12.9Mt higher year on year. Subsequently, 2017/18 closing stocks are projected at 88.8Mt, 1.3Mt lower than 2016/17's record levels.

In both cases global stock to use ratios (carry-over stocks as a % of use) remain high - 34.7% for wheat and 25.8 for soybean.

Closer to home, EU common wheat production in 2017/18 is forecast to be more than 7.4Mt higher year on year, according to the latest cereals supply

and demand statistics from the European Commission. Despite being up on last year, the latest estimates place EU wheat production some 8.7Mt behind 2015/16. Barley production is forecast at 62.4Mt, 4.7% higher than in 2016/17.

The latest UK trade data published by HMRC revealed that the UK was a net importer of wheat in March for the fourth month running.

On a cumulative basis, the UK was still a net exporter of wheat in March with total exports (Jul-16 to end Mar-17) amounting to 1.32Mt, while total imports during this period equalled 1.27Mt. However, if the current trend continues, it is likely that figures for April will show the UK as a net wheat importer on a cumulative basis. This is not surprising given the tight UK wheat supplies this season.

Maize imports in March were also high (183.9Kt), bringing the cumulative total for the season until end-March to 1.41Mt (compared with 1.37Mt by this point in time last season).

Click [here](#) for more information.

Research & Development

Improvements in lignin-derived carbon fibres

The application of lignin carbon fibres has been hindered by their low quality and mechanical performance. Researchers addressed this challenge by developing a new approach to fractionate and modify lignin to produce quality

carbon fibres using an enzyme-mediator system, which derives lignin fractions with different molecular weights, functional groups, and interunitary linkages. The fractionated lignin in general improves the miscibility and spinnability of lignin. In particular, the insoluble lignin fraction renders carbon fibres with a significantly improved turbostratic carbon structure as revealed by XRD and Raman spectroscopy. The improvement in the carbon structure leads to the significantly improved elastic modulus. The results suggest that higher molecular weights, less –OH groups, and more linear structures may contribute to the improved crystallization and mechanical performance of lignin carbon fibres. The technical breakthrough produces lignin-based carbon fibres with a similar elastic modulus to commercial carbon fibres for the first time, and paves the path for replacing PAN with lignin for producing quality carbon fibres.

Click [here](#) for more information.

Biofuel algae genome sequenced



Pixabay

The growing human population generates increasing demand for food and energy. Microalgae are a promising source of sustainable bioproducts whose production may not exacerbate worsening environmental problems. The green alga *Chromochloris zofingiensis* has potential as a biofuel feedstock and source of high-value nutraceutical molecules, including the

carotenoid astaxanthin. This paper presents a high-quality, chromosome-level assembly of the genome by using a hybrid sequencing approach with independent validation by optical mapping. Our analyses of the genome and transcriptome, in addition to experiments characterizing astaxanthin production, advance understanding of the green lineage and carotenoid production, and enhance prospects for improving commercial production of *C. zofingiensis*.

Click [here](#) for more information.

Camelina touted as crop solution for variable conditions



Geograph

Oil extracted from camelina seeds has several uses. It can be used for biodiesel and renewable jet fuel production. It is also a good source of α -linolenic acid, a precursor for other healthy fatty acids essential for human and animal health. Together with camelina meal, the oil can also be used to manufacture adhesives, coatings, gums, resins, and varnishes.

Most of the US research on camelina cultivation has focused on the northern parts of the Great Plains - parts of Montana and Wyoming. But the Great Plains stretches over 500 miles east to west, and 2000 miles north to south. Environmental

conditions can vary widely in different parts of the Plains.

A new study, led by Augustine Obour at Kansas State University, looks at how three varieties of camelina perform when grown in two different regions within the Great Plains.

The end goal is to find the camelina variety that performs best in each location or environment.

Camelina is a short-season, cold-tolerant crop that grows well on marginal lands. It is also compatible with existing farm equipment used for grain crops.

Click [here](#) for more information.

Inhibiting lignin production increases cellulose yield from rice fermentation

A collaborative research effort by the University of Hong Kong and Kyoto University has revealed a new strategy to allow cellulose in rice straw to release its fermentable sugar more efficiently. The research breakthrough was recently published in the plant science journal *Plant Physiology*.

Lignin in the stems and leaves of grasses contain a special component called triclin. HKU plant biochemists Clive Lo Sze-chung and his student Lydia Lam Pui-ying, together with Kyoto U lignin specialist Yuki Tobimatsu, started a collaborative project two years ago. According to their discovery, when flavone synthase II (FNSII), a key enzyme involved in triclin synthesis, is knocked out, not only is triclin not produced, but the lignin content in rice straw was also reduced by approximately one-third. In addition, the yield of glucose from cellulose degradation was increased by 37 percent without any chemical treatment.

As plants in the grass family all contain triclin-bound lignin, this strategy can be applied to other

cereals like maize, wheat, and barley as well as grass species (e.g. sorghum and switchgrass) cultivated around the world exclusively for ethanol production, so that they can be utilized more efficiently as raw materials for biofuel.

Click [here](#) for more information.

Polymer filler from egg shells



Public Domain Pictures

Bioplastics magazine report on the successful innovative use for discarded egg shell. Just Egg Ltd is an award-winning manufacturer of hard boiled eggs, egg mayonnaise and egg-related products. As a producer of over 60 million eggs per year, Just Egg Ltd was looking for an innovative and ecologically sound way to discard egg shells. Sending them to landfill cost £50,000 per annum, so the company turned to Leicester University to help identify an alternative solution. It was here that the concept of using the egg shells, of which the major component is made of calcium carbonate, as a bio-filler for plastics was presented to Pancholi.

Pancholi presented these findings at last year's Plastikcity Conference in London where he met Silvergate Plastics. At its manufacturing facilities in Wrexham, North Wales, Silvergate produces colour, additive and multi-component masterbatches that improve production processes,

enhance the performance of end applications and maintain brand integrity.

Having discussed the innovation, Silvergate agreed to take in crushed and cleaned egg shells from Just Egg Ltd, and process them into filler for masterbatch, which can be used in any application. The egg shells replace traditional filler and help reduce the amount of ground polymer used in the masterbatch formulation. This novel bio-filler can be used to create any colour, including black.

Click [here](#) for more information.

UK to research greenhouse gas removal possibilities

The UK has launched an £8.6m research programme on ways to remove greenhouse gases from the atmosphere in an effort to counteract global warming.

The programme is thought to be the first of its kind, and will involve public money funding projects that explore the potential of negative emissions technologies.

This will include research in soil carbon management, afforestation, bioenergy with carbon capture and storage, and direct capture of methane from the air, as the UK pursues efforts to keep global temperature rises well below 2°C.

Recognising that the UK cannot halt climate change alone, the research will also address the political, socio-economic, technological and environmental issues concerning greenhouse gas removal on a global scale.

Four interdisciplinary, multi-institute consortiums, and seven topic-specific projects have been awarded funding so far.

Around 100 researchers from 40 UK universities and partner organisations will be involved, while seven research studentships providing PhD training will also be supported.

NERC, the Economic & Social Research Council, the Engineering & Physical Sciences Research Council, and the Department for Business, Energy & Industrial Strategy will jointly fund the programme, while The Met Office and the Science & Technology Facilities Council are providing in kind support.

Click [here](#) for more information.

Wood & Crop

UK pellet production up, provisional figures show

Provisional 2016 UK Wood Production and Trade figures were released by the Forestry Commission in May. These include data on UK wood pellet and briquette production.

A total of 357 thousand tonnes of wood pellets and briquettes are estimated to have been made in the UK in 2016. This represents an increase of 4% from the 2015 production level.

At the same time inputs of sawmill products to wood based panel mills has increased slightly to 1.7 million tonnes, though wood panel output has shown little consistent growth in recent years and contracted slightly in 2016.

Click [here](#) for more information.

New palm oil strain increases yield with no increased land-use



Wikimedia Commons

Smart Tbk, a subsidiary of Golden-Agri Resources, has registered two clones of high-yielding oil palm plant material in Indonesia's Catalogue of Seeds, receiving approval for use from the Ministry of Agriculture.

Currently labelled Eka 1 and Eka 2, the new seedlings will allow the company to increase yields without increasing land use. Under optimal conditions, current palm oil yields stand at around 8 tonnes per hectare per year. Smart Tbk's seeds could increase that number to 10 tonnes of crude palm oil per hectare per year.

The new seedlings were developed naturally through a conventional selection programme and tissue culture from elite palms. They are the result of two decades of collaboration between SMARTRI and Smart's Biotechnology Centre.

Click [here](#) for more information.

Yield increases maintaining wheat production growth

Recent AHDB analysis of the 6 key long-term trends in the global grain market highlights that while demand keeps growing. Over the last 20 years, increases in wheat production have come from yield rather than area growth. This is likely due to a combination of breeding and application of more agronomic knowledge in emerging economies but does raise some questions:

Is global wheat production at greater risk from weather impacts? if yields have further to fall, will they fall further?

Will yields feel a greater impact from market signals? For example, during periods of low price, will farmers in emerging economies pull back on inputs?

In contrast to wheat, although flat-lining in recent years, the growth in maize area (the dominant global cereal crop) has supported production increases as well as improved yields. Yield growth has had a multiplier effect on output and will likely have more of a prominent role in the future. Area expansion has in part come from confidence fuelled by the ethanol sector over the last 15 years. With ethanol industries now maturing and demand growth coming more from animal feed, it is likely that the area trend will be more stable going forward.

Click [here](#) for more information.

Miscanthus may be good habitat for brown hares



Flickr

A paper published in the European Journal of Wildlife Research has examined the impacts of miscanthus planting schemes on value to UK brown hare, a declining farmland species. The team intensively radio-tracked hares in Miscanthus blocks of contrasting size and analysed hare diet for evidence of the consumption of Miscanthus.

Home ranges differed starkly averaging 10.5 versus 49.6 ha in the small and the large Miscanthus blocks, respectively. Despite entirely avoiding the crop as food, hares appeared able to exist and even thrive in areas planted with Miscanthus though impacts are expected to lessen where dense Miscanthus is planted over a wide area. As a component of a mixed farming landscape, Miscanthus may provide biodiversity benefits by increasing spatial heterogeneity and refuge areas for declining farmland species like brown hares.

Click [here](#) for more information.

Feedstock Prices

UK spot prices of bagged wood pellets, and wheat and barley straw. Arrows indicate rise ↑, unchanged – or fall ↓ from previous month.

Date	UK Wood Pellets Delivered	UK Ex-Farm Barley Straw	UK Ex-Farm Wheat Straw
	(£/tonne, 5% VAT)	(D1000) (£/tonne)	(D1000) (£/tonne)
10 Feb	224-260 (–↓)	47-60(–↓)	40-60(–)

For wood pellets prices, we considered UK pellet traders selling prices.

For details on straw spot prices, see <http://www.farming.co.uk>

UK (LIFFE), French (MATIF) and US (CBOT) future prices for wheat, rapeseed, maize, and soybean. Arrows indicate rise ↑, unchanged – or fall ↓ from previous month's predictions.

Date	UK (LIFFE) Feed Wheat (£/tonne)	MATIF Wheat (£/tonne)	MATIF Rapeseed (£/tonne)	CBOT Wheat (cnts/bsh)	CBOT Maize (cnts/bsh)	CBOT Soyabean (cnts/bsh)
Jul-17	141.4 (↓)			445.0 (↑)		932.50 (↓)
Aug-17			360.2 (↓)			936.25 (↓)
Sep-17		171.0 (↑)		459.2 (↑)	388.5 (↑)	936.75 (↓)
Nov-17	143.0 (↑)		363.7 (↓)			939.00 (↓)
Dec-17		174.7 (↑)		480.7 (↑)	399.0 (↑)	
Jan-18	143.7 (↑)					946.25 (↓)
Feb-18			367.0 (↓)			
Mar-18	145.9 (↑)	178.0 (↑)		498.2 (↑)	408.2 (↑)	951.00 (↓)
May-18	147.8 (↑)	180.0 (↑)	368.7 (↓)	510.7 (↑)	414.0 (↑)	
Jul-18	147.5 (↑)			520.2 (↑)	419.0 (↑)	
Aug-18			353.5 (↓)			
Sep-18		179.0 (↑)				
Nov-18	143.0 (↑)		355.2 (↓)			
Dec-18		181.0 (↑)				
Jan-19	143.5 (↑)					
Mar-19	145.1 (↑)	182.5 (↑)				
May-19	145.6	183.7 (↑)				

For details on future prices see <http://www.hgca.com>

Other biomass feedstock prices are available upon request, simply contact enquiries@nnfcc.co.uk

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