The Bioeconomy Consultants

NNFCC

Feedstocks

News Review

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

Contents

Foreword

A warm welcome, subscribers, to May's edition of NNFCC Feedstocks News Review.

Our cover stories this month concern, shall we say, the dispelling of some widely-held misconceptions. The first remains a highly contentious issue: genetically modified organisms or GMOs. Most fears around GMOs stem from their potential adverse effects on ecosystems; and in theory these are well-founded. While we can assess the risks and model potential impacts it's difficult to predict what might happen as a result of wide-scale release. This is an issue that has held back the field-scale deployment of GM technologies across Europe but not elsewhere. In contrast contained GM development (e.g. for microbial fermentation) has continued to deploy. The same fears have surfaced regarding outdoor culturing of GM algae for use in biofuel production, as there are concerns of risks to natural populations, which GM protagonists deny as most GM organisms are seen as being less environmentally 'fit' than native species. Recently scientists in California conducted an empirical test in which they cultured GM algae outdoors and monitored both their spread, and competition against wild species. They found that the GM algae were somewhat less mobile that non-GM counterparts but in local freshwater sources faired equally to their non-GM counterparts, being indistinguishable in terms of their ecological impact and behaviour. While these initial results appear to demonstrate that a least some GMOs present little threat to ecosystems, in the main this work establishes a framework for further evaluation of GE algae risks, something that the NGO's are calling for. The results have not been met with the same enthusiasm everywhere: Friends of the Earth have issued a statement denouncing the experiment, claiming it in fact backs-up fears around GMOs rather than dispelling them, as the GM algae were shown to establish outside of culture). This highlights the ever-present need for consistent and better communication of positive messages regarding biotechnology, to build public understanding and the need for proper risk analysis

Elsewhere, a study from the University of Illinois has found that another commonly held belief - that any serious commitment to a biomass-based bioeconomy would have a serious impact on food production – is not the case if managed properly. Their model finds that in the highest-demand scenario, only 3% of the USA's food crop land need be utilised for biomass, with 80% of that being marginal land. This is a highly encouraging finding, and adds weight to the argument that a bioeconomy can feasibly be supported as long as biomass supply is well managed.

Read on for your monthly Feedstocks News fill.

Policy

UK Government and Supermarkets need to do more about food waste

The House of Commons EFRA committee have published a report urging Government and Supermarkets to do more to prevent food waste.

The REA welcomed this long overdue report by the EFRA Committee into the social, economic and environmental impacts of food waste. There is now widespread recognition that as a nation not only do we produce far too much food waste, but compared to our devolved neighbours we are doing far too little to address the issues to reduce it and make best use of it as a valued resource.

The REA is delighted that this report highlights the need to do more. The proposed recommendation to incentivise local authorities to collect more food waste is welcome as is the suggestion to mandate through a phased approach for food businesses and retailers to separate their food waste in order that this can be treated through either composting or anaerobic digestion. The outputs from these two technologies are now well documented and contribute not only to securing home grown energy but also regenerating our soils through the use of compost and digestate as a soil enhancer and artificial fertiliser replacement.

Recycling rates have stagnated in England compared to Wales and Scotland and unless there is a policy requirement to collect food waste in both the household and commercial sector, it is unlikely that the step change sought will occur based on a voluntary approach. This report is a significant step forward and we hope that we see adoption of these recommendations by the next Government after June 8th.

The REA advised that the Government should establish a national food waste reduction target to drive efforts to reduce the food waste costing the average person in the UK £200 per year. Supermarkets should publicly report data on the amount of food they bin and relax rules that prevent the sale of "wonky vegetables" to combat food waste, the cross-party Environment Food and Rural Affairs Committee has said in a new report.

Click here for more information.

WRAP's guide to minimising plastic in AD digestate

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WRAP have published some industry guidance focused on dealing with household food waste at AD Facilities – Management of Liners. This guidance will help AD operators to limit the amount of plastic that ends up in digestate as a result of food waste caddy liners.

WRAP has consulted with relevant stakeholders to produce guidance that will ensure food waste collection and treatment systems are more closely aligned. Standard Operating Procedures have been developed to assist AD operators in limiting

the amount of plastic and compostable liners that end up in digestate.

There are also recommendations for increasing collaboration between those producing the waste, those collecting it, and AD operators; and for staff training to ensure that any measures introduced to improve the quality of food waste are sustained.

The guide has been produced as part of the Food Waste Recycling Action Plan, an industry-led plan to improve the capture, supply and quality of household and commercial food waste.

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Incentives not big enough for grassland conservation on UK farms

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Traditional, high-nature-value (HNV) grasslands are at risk of being abandoned by farmers in the future — in turn, risking the wildlife they support, warns a new UK study. Farmers interviewed by the researchers had weak motivations to protect grasslands, as they felt that financial incentives for conservation are low and that traditional management practices are inconvenient. More dialogue between farmers and conservationists could be part of the solution, the study suggests.

HNV grasslands, such as floodplain meadows, need continued and traditional forms of land management for their survival. Traditional practices, such as following hay cutting with livestock grazing at particular times of the year, in harmony with local cycles of nature, are responsible for the historic creation of the grasslands in the first place. The best examples of grasslands are highly valued for their diverse range of plant species and are often protected, for instance, as part of the EU's Natura 2000 network.

All farmers interviewed acknowledged the environmental and cultural value of grasslands. However, they generally placed the most importance on the land's economic value. They noted that the financial reward for traditional management was very small and unpredictable from year to year. This means that they have little financial motivation to protect the land.

Perhaps energy or other bio-based markets requiring ligno-cellulose could provide the incentives to maintain traditional management. It's an idea that others have expounded with interest in the wider environmental benefits of traditional grassland management.

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European Parliament votes to phase out palm oil from biofuels

To counter the impact of unsustainable palm oil production, such as deforestation and habitat degradation, particularly in South-East Asia, the EU should introduce a single certification scheme for palm oil entering the EU market and phase out the use of vegetable oils that drive deforestation by 2020, say MEPs last April. The resolution was approved by 640 votes to 18, with 28 abstentions.

MEPs note that 46% of the palm oil imported by the EU is used to produce biofuels, requiring the use of about one million hectares of tropical soils.

They call on the Commission to take measures to phase out the use of vegetable oils that drive deforestation, including palm oil, as a component of biofuels, preferably by 2020.

MEPs note that various voluntary certification schemes promote the sustainable cultivation of palm oil. However, their standards are open to criticism and are confusing for consumers, they say. They advocate a single certification scheme to guarantee that only sustainably produced palm oil enters the EU market.

They also call on the EU to introduce sustainability criteria for palm oil and products containing palm oil entering the EU market. The Commission should improve the traceability of palm oil imported into the EU and should consider applying different customs duty schemes that reflect real costs more accurately until the single certification scheme takes effect.

MEPs also stress that a large part of the global production of palm oil is in breach of fundamental human rights and adequate social standards. It frequently uses child labour, and there are many land conflicts between local and indigenous communities and palm oil concession holders.

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Markets

UK wood recycling levels up, prices down

Max Pixel

WRAP data indicates that gate fees for high grade wood averaged £12.50 per tonne in March 2017, a decrease of £10 per tonne from the previous period in 2016. The wood gate fee for low grade wood was £47.50 per tonne in March 2017, a decrease of £15 per tonne from March 2016. (Gate fees are the price which councils or businesses may have to pay a wood recycler to take their wood waste. Prices vary considerably depending in cleanliness, volume and location.)

Wood PRN prices continued to remain low: in March 2017, they had declined to less than £2 per tonne. (PRNs are the shorthand term for a kind of currency in recycling – packaging waste recovery notes. They provide the evidence that businesses need to prove they have met the producer responsibility requirements of the Packaging and Packaging Waste Regulations)

In 2016 Q3, the amount of wood packaging reprocessed in the UK amounted to 112kt, an increase of 19kt compared with 2015 Q3 and 1kt higher than 2016 Q2.

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UK coal power drops by 60% from 2015 to 2016

Flickr

Government data released this week indicates a near 60% reduction in coal power generation between 2015 and 2016. Electricity generated from renewable sources also declined, falling from 24.6% in 2015 to 24.4% in 2016 due to lower wind speeds, less rainfall and fewer sun hours.

Domestic electricity use fell 1% between 2015 and 2016 despite similar weather patterns, indicating an increase in efficiency.

Click here for more information.

UK experiences first coal-free day since Industrial Revolution

The BBC reported on national grid figures showing on 21 April Britain went coal free for 24hrs for the first time since the 1880's.

According to Gridwatch.co.uk, around half of British energy on that Friday came from natural gas, with about a quarter coming from nuclear plants. Wind, biomass, and imported energy were also used

Part of the reason is that solar panels and wind turbines now provide much more electricity to factories and homes. Lower power demand is a factor too - that's normal on a Friday.

And as older, uneconomic coal fired plants have closed in recent years, the fossil fuel has been playing a much smaller role in our energy system.

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Renewables great for employment in Scotland

Employment in Scotland's low carbon and renewables sector increased by more than a third in 2015. The sector generated a turnover of £10.5 billion, 14% of the total UK sector, in 2015, according to figures released by the Office of National Statistics.

The number of employees in Scotland's low carbon and renewables sector rose from 43,500 in 2014 to 58,500 in 2015.

Scotland is a major contributor to the UK's green energy sector as a whole, according to the new information. 33% of all UK employment and 28% of turnover in low carbon electricity generation is in Scotland, as is 24% of UK employment and 26% of turnover in low carbon services.

Click here for more information.

High export value for US pellets and ethanol

The combined US export value of wood pellets, ethanol and biodiesel for U.S. producers has flirted with $3 billion since 2012, and depending upon how the final numbers shake out for last year, 2016 may very well be the year this milestone is surpassed. For both wood pellets and fuel ethanol, export numbers have never been higher than they are right now, and all three sectors are eyeing foreign markets as a means to significantly grow their businesses.

While foreign markets are an important part of the overall market picture for fuel ethanol and biodiesel producers, exports account for less than 10 percent of annual production while, from a volumetric perspective, wood pellet production in the U.S. is heavily reliant on foreign markets.

In both the fuel ethanol and wood pellet categories, the U.S. can boast the largest production capacity and the largest share of the global export market. In both cases, U.S. exports outstrip the closest competitor by a wide margin. Wood pellet export volumes for U.S. producers were well over 4 million tons, while Canada has yet to surpass 2 million tons of exports. Brazil is the world's second leading producer of fuel ethanol, and while production and export volumes there vary from year to year, in 2015, its export volumes were about half of what U.S. producers achieved.

Strong competition continues to emerge in the pellet sector, particularly from Baltic nations like Latvia and Estonia. Latvia has posted strong export growth since 2012, when its export volumes had not yet exceeded 1 million tons. Since then, Latvia has added about 250,000 tons to its export total each year. Similarly, Estonia has doubled it pellet export business since 2012.

Home to the world's largest inventory of wood fibre, Russia has the feedstock available to compete with both Canada and the U.S., but its wood pellet industry is constrained by the country's size and limited infrastructure. Pellets produced in Siberia are thousands of miles from ports near St. Petersburg.

In 2015, the U.K., the world's largest single buyer, took just 12,000 tons of pellets from Russia, barely enough to fill a handy-sized cargo vessel. The largest buyers of Russian pellets in 2015 were Denmark and Sweden, taking 380,000 and 150,000 tons, respectively.

Vietnam has emerged as an important supplier in Asia, and has been very disruptive in South Korea, a market Canadian producers have been eyeing for years on their western sea border. Pellet export volumes out of Vietnam into South Korea ballooned in 2014 to nearly 600,000 tons from 130,000 in 2013. Volumes in 2015 were down slightly, but remained above 500,000 tons for the year. For now, South Korean buyers are unwilling to enter into long-term pellet offtake contracts, and instead are utilizing tenders. This approach has essentially limited involvement in the South Korean market to ultralow-cost producers in Vietnam. The Vietnamese industry is dominated by small producers who convert residuals from furniture manufacturing into volumes that are then aggregated by brokers, who fill empty containers bound for return to South Korea. Tenders are often filled at prices that are lower than the cost of production for Canadian and U.S. producers.

Click here for more information.

Research & Development

GM Algae Outdoor Cultivation tests successful

Genetically engineered (GE) algae offer the promise of producing food, fuel, and other valuable products with reduced requirements for land and fresh water. While the gains in productivity measured in GE terrestrial crops are predicted to be mirrored in GE algae, the stability of phenotypes and ecological risks posed by GE algae in large-scale outdoor cultivation remain unknown. Here, we describe the first US Environmental Protection Agency (EPA)-sanctioned experiment aimed at understanding how GE algae perform in outdoor cultivation. Acutodesmus dimorphus was genetically engineered by the addition of two genes, one for enhanced fatty acid biosynthesis, and one for recombinant green fluorescence protein (GFP) expression; both the genes and their associated phenotypes were maintained during fifty days of outdoor cultivation. The study also observed that while the GE algae dispersed from the cultivation ponds, colonization of the trap ponds by the GE strain declined rapidly with increasing distance from the source cultivation ponds. In contrast, many species of indigenous algae were found in every trap pond within a few days of starting the experiment. When inoculated in water from five local lakes, the GE algae's effect on biodiversity, species composition, and biomass of native algae was indiscernible from those of the wild-type (wt) progenitor algae, and neither the GE nor wild type algae were able to outcompete native strains. The study authors conclude that GE algae can be successfully cultivated outdoors while maintaining GE traits, and that for the specific GE algal strain tested here they did not outcompete or adversely impact native algae populations when grown in water taken from local lakes. This study provides an initial evaluation of GE algae in outdoor cultivation and a framework to evaluate GE algae risks associated with outdoor GE algae production.

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Ice Plant may hold key to drought tolerance in post-global warming crops

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A University of Nevada research proposal to the U.S. Department of Energy's Joint Genome Institute has been picked for a partnership under its Plant Flagship Genomes program. The proposal, focuses on the common or crystalline ice plant and its demonstrated tolerance to stressors such as salinity and drought.

The University's lab is looking at the functional genomics of crassulacean acid metabolism or CAM. CAM is a water-conserving photosynthetic pathway that helps plants survive in seasonally arid climates or those with intermittent water supply.

The importance of the ice plant, which originated in the Namibian desert in Africa, is that it is the first reported plant species that could be induced

to switch from C3 photosynthesis to CAM following salinity stress or water-deficit treatment.

Most plants use what is known as the C3 pathway to photosynthetically fix atmospheric carbon during the day. However, plants that rely on the water-conserving CAM pathway take up and fix carbon during the night, thereby avoiding water losses that normally occur through evapotranspiration, which helps keep plants cool during the day. However, daytime transpiration results in water loss through small pores in the leaf surfaces called stomata.

However, CAM plants limit this water loss by keeping their stomata closed during all or most of the day, and only opening them at night when evapotranspiration is low because it is cooler and the sun is not shining. Thus, CAM plants are five-to-six times more water-use efficient than C3 photosynthesis plants.

The research objectives are to understand how the expression of CAM is controlled by environmental stress and the circadian clock. The lab is conducting integrated transcriptome, proteome and metabolome analyses using the ice plant, which is capable of surviving under extremely harsh environmental conditions.

During the past 30 years, Earth's temperature has begun to rise, and the resulting heat and drought effects are beginning to slow the rate of increasing crop productivity. One of the predictions of global warming is that with all of this heating, we are going to need to make more drought-tolerant plants in the very near future.

Click here for more information.

US can meet renewable targets with biomass - without conflicting with food

Geograph

This paper identifies that Renewable energy policies in the electricity and transportation sectors in the United States are expected to create demand for biomass and food crops (corn) that could divert land from food crop production. This paper develops a dynamic, open-economy, price-endogenous multi-market model of the US agricultural, electricity and transportation sectors to endogenously determine the quantity and mix of bioenergy likely to be required to meet the state Renewable Portfolio Standards (RPSs) and the federal Renewable Fuel Standard (RFS) if implemented independently or jointly (RFS & RPS) over the 2007–2030 period and their implications for the extent and spatial pattern of diversion of land from other uses for biomass feedstock production. It finds that the demand for biomass ranges from 100 million metric tons (MMT) under the RPS alone to 310 MMT under the RFS & RPS; 70% of the biomass in the latter case can be met by crop and forest residues, while the rest can be met by devoting 3% of cropland to energy crop production with 80% of this being marginal land. The findings show significant potential to meet current renewable energy goals by expanding high-yielding energy crop production on marginal land and using residues without conflicting with food crop production.

Click here for more information.

Forest-based power shows 98% carbon reduction on natural gas

The Biomass Power Association has released a study by two professors demonstrating dramatic carbon benefits by using forest residue-based biomass fuel instead of natural gas in a power generation facility. The study, conducted by Dr Madhu Khanna, distinguished Professor in Environmental Economics at the University of Illinois Department of Agricultural and Consumer Economics, and Dr Puneet Dwivedi, Assistant Professor in Sustainability Sciences at the University of Georgia Warnell School of Forestry and Natural Resources, found that emissions from a biomass power facility using forest residue-based fuel are 115% lower than those of a natural gas facility in one year. Over one hundred years, those savings remain at 98% after accounting for emissions from logging activities.

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Improving batteries and superconductors with seaweed

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Researchers have made a seaweed-derived material to help boost the performance of superconductors, lithium-ion batteries and fuel cells.

Traditional carbon materials, such as graphite, have been essential to creating the current energy landscape. But to make the leap to the next generation of lithium-ion batteries and other storage devices, an even better material is needed, preferably one that can be sustainably sourced.

With these factors in mind, the researchers turned to the ocean. Seaweed is an abundant alga that grows easily in salt water. The researchers have previously tried to make porous carbon nanofibers from seaweed extract. Chelating, or binding, metal ions such as cobalt to the alginate molecules resulted in nanofibers with an "egg-box" structure, with alginate units enveloping the metal ions. This architecture is key to the material's stability and controllable synthesis.

Testing showed that the seaweed-derived material had a large reversible capacity of 625 milliampere hours per gram (mAhg-1), which is considerably more than the 372 mAhg-1 capacity of traditional graphite anodes for lithium-ion batteries. This could help double the range of electric cars if the cathode material is of equal quality. The egg-box fibres also performed as well as commercial platinum-based catalysts used in fuel-cell technologies and with much better long-term stability. They also showed high capacitance as a superconductor material at 197 Farads per gram, which could be applied in zinc-air batteries and supercapacitors. The researchers published their initial results in ACS Central Science in 2015 and have since developed the materials further.

For example, building on the same egg-box structure, the researchers say they have suppressed defects in seaweed-based, lithium-ion battery cathodes that can block the movement of lithium ions and hinder battery performance. And recently, they have developed an approach using red algae-derived carrageenan and iron to make a porous sulphur-doped carbon aerogel with an ultra-high surface area. The structure could be a

good candidate to use in lithium-sulphur batteries and supercapacitors.

More work is needed to commercialize the seaweed-based materials, however. Currently more than 20,000 tons of alginate precursor can be extracted from seaweed per year for industrial use. But much more will be required to scale up production.

Click here for more information.

Wood & Crop

Wood pellets from waste supplied to Sheffield energy plant

East Midlands-based waste management and recycling firm Mid UK Recycling has delivered its first load of waste-derived biomass wood chip to a £30m energy facility in Sheffield.

The company has been handed a ten-year contract to supply 25,000 tonnes of wood chip per-year to the Holbrook Community Renewable Energy Centre Combined Heat and Power Plant.

The plant is currently being commissioned and once running will be managed by Veolia Energy Services Ltd.

This contract has seen Mid UK Recycling invest close to £1.6 million in its operations, including upgrading its waste wood processing facilities at its Caythorpe site and purchasing three new Scania vehicles and three Legras walking floor trailers to deliver the product to the CHP plant.

It has also increased its waste wood in-take sourced from Household Waste Recycling Centres and waste transfer stations in the Midlands and East Anglia areas, as well as local businesses.

Once operational, the Holbrook Community Renewable CHP plant will generate 6.5 MW of renewable electricity and supply heat to around 6,700 local homes and commercial properties, with a capacity to handle up to 55,000 tonnes per year of in-feed material.

Click here for more information.

Grim outlook for Malaysian palm oil

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Palm oil forecasts have hit a six-month low on the Bursa Malaysia Derivatives Exchange. Unexpectedly high levels of production and end stocks data from industry regulator the Malaysian Palm Oil Board (MPOB) are believed to be behind the drop.

MPOB showed end stocks in March increased by 6.5% from February to 1.55million tonnes. Output had surged by 16.3% to 1.46 million tonnes, marking the first monthly gain since September 2016, and the first month on month gain for over a year.

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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 (£/tonne, 5% VAT)	UK Ex-Farm Barley Straw (D1000) (£/tonne)	UK Ex-Farm Wheat Straw (D1000) (£/tonne)
10 Feb	224-271 (–-↑)	47-63(–-↑)	40-60(↓-↑)

For wood pellets prices, we considered UK pellet traders. 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 change 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	148.1 (↓)			423.2 (↓)	367.7 (↓)	965.25 (↑)
Aug-17			366.5 (↑)			966.50 (↑)
Sep-17		166.2 (↓)		438.0 (↓)	375.5 (↓)	962.75 (↑)
Nov-17	141.0 (↑)		369.7 (↑)			960.75 (↑)
Dec-17		170.5 (↓)		458.7 (↓)	385.2 (↓)	
Jan-18	142.5 (↑)					968.25 (↑)
Feb-18			373.0 (↓)			
Mar-18	144.5 (↑)	174.2 (↓)		477.5 (↓)	394.7 (↓)	972.00
May-18	146.2 (↑)	176.7 (↓)	374.5 (↓)	489.0 (↓)	401.2 (↑)	
Jul-18	145.2 (↑)			495.5 (↓)	406.7	
Aug-18			358.0 (↓)			
Sep-18		176.5 (↓)				
Nov-18	140.0 (↓)		361.2			
Dec-18		179.2 (↓)				
Jan-19	140.4 (↓)					
Mar-19	141.9 (↓)	181.7 (↑)				
May-19		181.7				

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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