The Bioeconomy Consultants

NNFCC

Feedstocks

News Review

Issue Sixty

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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 to March's edition of NNFCC's Feedstocks News Review.

It is an absolute delight to be able to say that our "cover story", if you will, comes from right at home: as the Island of Jersey has announced its new rural economy strategy, which includes policies which originated through consultation with NNFCC.

Jersey has struggled in recent years with a Potato Cyst Nematode problem, which has led to them looking for opportunities to grow alternative crops instead. After investigating a large number of low volume/high value non-food crops that could be grown on the island, NNFCC outlined a complete value chain for specialist oil crops to be utilised for cosmetics production on the island. Following a second consultation expanding out into food crops, the first tea plantations on Jersey are due to be established later in 2017. NNFCC's work was also recognised in the Island's Rural Economy strategy, with the government committing to "research on diversifying into high value crops and processing methods for supplying alternative markets" thanks to NNFCC's work.

However, the main story that has been doing the rounds in the bioeconomy circles this month is, alas, not a positive one. UK-based think tank Chatham House last month published a report on the use of biomass for heat and power, claiming that biomass power does not cut greenhouse gas emissions as much as it is widely believed, claiming that the figures often used by biomass power generators do not account for the emissions released by burning biomass (they do as long as there is a net positive growth in forest biomass) and that they do not account for long term effects on forest carbon stocks. The report has been widely criticised by members of the biomass power industry, for its lack of understanding of how forests are actually managed, and that carbon stocks in well-managed forest continually replenish themselves. The report's claims regarding emissions also appear to directly contradict established consensus. The furore will likely wear off soon, but this report provides a reminder that bioenergy solutions are not without their opponents, even in a more environmentally conscious world.

Read on for all this month's Feedstocks news.

Policy

Jersey to grow tea thanks to NNFCC

Since traditional nematocides have been dropping off the market like the nematodes they used to kill, thanks to their being deemed too environmentally hazardous, Jersey has faced an increasing problem of potato cyst nematodes (PCN) reducing crop yields and product quality. The only solution is to try and naturally reduce nematodes populations, which can take up to 7 years, with no potatoes or related species being grown in the meantime.

Jersey's Department of Environment got in touch with NNFCC to investigate opportunities to grow alternative crops on their land alongside potatoes, in an attempt to break the pest cycle by offering traditional growers an equally high-value option. Fields in Jersey tend to be much smaller than elsewhere, export costs are high, machinery is typically small and reliance on manual labour is high; hence the emphasis was on high value, low volume crops. NNFCC performed thorough investigations into various non-food crops: into their feasibility for growing on Jersey, but also into their potential value for the island. Eventually, a suite of speciality oil crops was chosen, in addition to an entire value chain being proposed that would not only produce the oil but convert it into cosmetics and healthcare products on the island. This made the proposition very lucrative for the island (who, understandably, wanted to keep their identity closely linked with the end product, much like the potatoes it would replace).

Subsequently, a second investigation was commissioned in order to find other potential value chains, of a similar ilk, but this time with food crops being considered. After considering several possible outlets, including "superfoods", the eventual decision was to grow tea. NNFCC then acted as mediator, putting Jersey in touch with the Scottish Tea Growers' Association, and now Jersey's first ever tea plantation is set to start growing later this year.

Click here for more information.

Chatham House report met with rebuke by the industry

A new report from the policy institute Chatham House has raised significant industry criticism after advising that subsidies should end for many types of biomass as they are "failing to help cut greenhouse gas emissions", in part by ignoring emissions from burning wood in power stations and failing to account for changes in forest carbon stocks. It argues financial and regulatory support should only be given to biomass feedstocks which cut carbon emissions in the short term – which it says is not the case for most of the woody feedstocks used for biomass energy

Carbon Brief (23rd Feb) reported on industry feedback on the report:

Drax insists the biomass it uses is sustainably sourced from working forests where biodiversity is protected, productivity is maintained, and growth exceeds what is harvested. In a statement released in response to the report it says:

"We agree that not all wood should be used for bioenergy. We source from working forests which supply other industries – including construction and furniture making – with high grade timber. We take the low-grade material to make the compressed wood pellets used to generate electricity. This includes tree tops, limbs, sawmill residues, misshapen and diseased trees not suitable for other use, as well as thinnings – small trees removed to maximise the growth of the forest. There is a widespread scientific consensus that this low-value wood is precisely the material which delivers the biggest carbon reductions."

Dr Nina Skorupska, chief executive of the Renewable Energy Association (REA), adds:

"This report hangs on the fallacy that it takes decades for a forest to recapture carbon. That isn't true. A well-managed forest is continually growing and it locks in carbon at an optimal rate.

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Composts remain low risk for agriculture use

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This report summarises the findings of three separate projects commissioned by WRAP to investigate the safety of composts meeting the BSI PAS 100 quality specification, when used in agriculture and field horticulture. A wide range of hazards were considered and risks from compost use were considered to be low or negligible in all scenarios examined.

The conclusions from this research underpin WRAP's 'Renewable Fertiliser Matrix', which clearly illustrates cropping and grazing situations where green and green/food composts can be safely used. The accompanying good practice guidance provides agronomic advice for compost use.

Click here for more information.

Low risk when using digestate in agriculture

This report summarises the findings of a project commissioned by WRAP to investigate the safety of digestate meeting the BSI PAS 110 quality specification, when used in agriculture and field horticulture. A wide range of hazards were considered and risks from digestate use were

considered to be acceptably low or negligible in all scenarios examined.

The study concluded that risks associated with the use of BSI PAS 110 digestates in GB agriculture are acceptably low and in many cases, negligible. It is also appropriate to recognise the importance of complying with regulations for the use of organic materials in agriculture and horticulture, and strict adherence to the requirements of the BSI PAS 110 digestate specification as practical steps to effectively manage risks. Normal hygiene practices should be followed, such as avoidance of direct handling, and statutory no graze periods should be observed where relevant.

Where growers of short growth period baby leaf salads wish to use digestates, they should satisfy themselves that the materials are of appropriate sanitary quality. This may require a degree of processing and testing over and above the standard requirements of the BSI PAS 110 specification.

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Markets

Mapping the Latin American Oil Palm industry

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Commodity crop expansion has increased with the globalization of production systems and consumer demand, linking distant socio-ecological systems. Oil palm plantations are expanding in the tropics to satisfy growing oilseed and biofuel markets, and much of this expansion has caused extensive deforestation, especially in Asia. In Latin America, palm oil output has doubled since 2001, and the majority of expansion seems to be occurring on non-forested lands. The project team used MODIS satellite imagery (250 m resolution) to map current oil palm plantations in Latin America and determined prior land use and land cover (LULC) using high-resolution images in Google Earth. In addition, they compiled trade data to determine where Latin American palm oil flows, in order to better understand the underlying drivers of expansion in the region. Based on a sample of 342 032 ha of oil palm plantations across Latin America, they found that 79% replaced previously managed lands (e.g. pastures, croplands, bananas) and primarily cattle pastures (56%). The remaining 21% came from areas that were classified as woody vegetation (e.g. forests), most notably in

the Amazon and the Petén region in northern Guatemala. Latin America is a net exporter of palm oil but the majority of palm oil exports (70%) stayed within the region, with Mexico importing about half. Growth of the oil palm sector may be driven by global factors, but environmental and economic outcomes vary between regions (i.e. Asia and Latin America), within regions (i.e. Colombia and Peru), and within single countries (i.e. Guatemala), suggesting that local conditions are influential. The present trend of oil palm expanding onto previously cleared lands, guided by roundtable certifications programs, provides an opportunity for more sustainable development of the oil palm sector in Latin America.

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Drop in biomass power price sees pellet surge in Japan

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Japanese trading houses and electricity retailers are increasing their imports of wood chips and palm shells, with demand expected to surge amid a rush of construction of biomass power plants, according to a report from the Nikkei Asian Review. The government is revising its fixed-price power purchase scheme so that the price for biomass-generated power falls to 21 yen (19 cents) from 24 yen per kilowatt-hour, effective October, according to the news channel.

There is a rush to get plants approved before the new rate kicks in. When those facilities come online around 2020, demand for biomass fuel is expected to soar.

Sumitomo Corp. currently imports about 200,000 tonnes of wood chips and other wood-based fuel a year from Canada and Vietnam. It is planning to increase the figure to 1 million tonnes by 2019

Itochu is also planning a five-fold increase in imports of wood-based fuel to an annual 1.2 million tons by fiscal 2019. It plans to procure palm kernel shells and other materials from Southeast Asia.

Many of Japan's current biomass power plants run on waste from construction, among other materials. Imported fuel is eventually expected to become dominant.

Click here for more information.

Research & Development

Analysis of land-use change in Midwest America

Increasing demand for food and bioenergy has altered the global landscape dramatically in recent years. Land use and land cover change affects the environmental system in many ways through biophysical and biogeochemical mechanisms. This study evaluates the impacts of land use and land cover change driven by recent crop expansion and conversion on the water budget, carbon exchange, and carbon storage in the Midwest

USA. A dynamic global vegetation model was used to simulate and examine the impacts of landscape change in a historical case based on crop distribution data from the United States Department of Agriculture National Agricultural Statistics Services. The simulation results indicate that recent crop expansion not only decreased soil carbon sequestration (60 Tg less of soil organic carbon) and net carbon flux into ecosystems (3.7 $Tg \cdot year^{-1}$ less of net biome productivity), but also lessened water consumption through evapotranspiration (1.04 × 1010 $m^3 \cdot year^{-1}$ less) over 12 states in the Midwest. More water yield at the land surface does not necessarily make more water available for vegetation. Crop residue removal might also exacerbate the soil carbon loss.

Click here for more information.

Effect of biofuel & biomass feedstock crops on ecosystem services

Biomass cropping systems have the potential to alter the ecosystem services provided by agricultural landscapes. Depending on crop type and management, strategic incorporation of biomass cropping systems into existing agricultural landscapes could enhance a range of ecosystem services while mitigating some disservices. Here, we review the approaches and findings of eight years of research into the potential effects of a range of biomass cropping systems on ecosystem services in the North Central US. Our research was framed by an initial assessment of the abundance and distribution of multiple taxa (i.e., biodiversity) within candidate biomass cropping systems. The processes underpinning important ecosystem services in each system were then measured or modelled, related to biodiversity metrics, and used to explore the influence of management scenarios on biodiversity and ecosystem processes. We also used these data and models to develop a decision support system that allows stakeholders to consider trade-offs and synergies under alternative landscape composition, configuration, and agronomic management. Perennial grass cropping systems provided the greatest potential to promote multiple ecosystem services. More diverse perennial grasslands that include forbs have the potential to increase pest suppression and pollination, decrease greenhouse gas emissions, and enhance grassland bird communities, but likely at the expense of biomass yield. Providing stakeholders and policymakers with information about the expected mix of ecosystem services supported by different biomass feedstock cropping systems in advance of their adoption offers the potential for informed choices to guide the implementation and management of future biomass-producing landscapes.

Click here for more information.

Seaweed as feedstock for Biomethane

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Resource depletion and mitigation of climate change are the driving forces to find alternatives to fossil fuels. Seaweeds (macroalgae) have been considered as a promising alternative source of biofuels due to higher growth rates, greater

production yields and a higher rate of carbon dioxide fixation, than land crops. A comparatively easily depolymerized structure, lack of need of arable land and no fresh water requirement for cultivation, make seaweed a potential feedstock for gaseous biofuel production. Biomethane potential of seaweed is greatly dependent on its chemical composition that is highly variable due to its type, habitat, cultivation method and time of harvest. Saccharina latissima and Laminaria digitata are the highest biomethane yielding Irish brown seaweeds. Seaweed harvested in July (northern hemisphere) was estimated to give gross energy yields in the range 38–384 GJ ha−1 yr−1; higher values are dependent on innovative cultivation systems. An integrated model is suggested where seaweed can be co-digested with other feedstock for the sustainable production of gaseous fuel to facilitate EU renewable energy targets in transport.

Click here for more information.

Discussion of organic waste as suitable biorefinery feedstock

Biorefineries have been established since 1980s for biofuel production, switching lately from first to second generation feedstocks in order to avoid the food versus fuel dilemma. To a lesser extent, many opportunities have been investigated to produce chemicals from biomass using by-products of present biorefineries, simple waste streams. Current facilities apply intensive pre-treatments to deal with single substrate types such as carbohydrates. However, most organic streams such as municipal solid waste or algal blooms present high complexity and variable mixture of molecules, which makes it difficult to target specific compound production and separation. A UK team has focused on the potential to use flexible anaerobic fermentation and hydrothermal processes to treat complex biomass as a whole to obtain a range of products within an integrated biorefinery concept.

Click here for more information.

Singapore's A*STAR to research feedstock opportunities for biorefining

*A*STAR*

Each year more than half a billion tons of oil—more than an eighth of the total global oil consumption—are used to produce chemicals and plastics. The demand for oil leaves the petrochemical industry, with a market value slated to exceed US$758 Billion by 2022, critically exposed to oil price fluctuations and the uncertainty of dependence on a finite fossil resource. Researchers and chemical engineers around the world have been trying to find ways to use alternative raw materials such as agricultural waste or 'biomass' to replace petroleum in the production of common industrial chemicals as a step toward a more sustainable chemical industry.

In 2012, A*STAR (Agency for Science, Technology and Research, Singapore) brought together scientists working on research related to biomass feedstocks to form the Biomass-To-Chemical (B2C) programme. Led by the A*STAR Institute of Chemical and Engineering Sciences (ICES) in close collaboration with the Institute of Bioengineering

and Nanotechnology (IBN), the B2C programme has worked towards developing a complete value chain, from raw biomass to commodity and specialty chemicals, as a commercially viable demonstration of biomass-based sustainable chemical production.

To support the B2C programme, the ICES has brought several technologies together to establish an integrated biorefinery process specifically for the production of acrylic acid from Empty Fruit Bunches from palm oil extraction.

Under the IBN programme, researchers have developed highly efficient processes for a number of industrially important reactions, including the conversion of mucic acid to adipic acid—a fundamental step in the production of nylon—and of sugars to furandicarboxylic acid, which is an important emerging bioprocess with many potential applications in polymer production and medicine.

Click here for more information.

Wood & Crop

Drax in bid to acquire struggling pellet plants

Biomass Magazine reports that Drax is participating in separate processes for the acquisition out of bankruptcy for the operating assets of Texas Pellets in Woodville, Texas, and Louisiana Pellets in Urania, Louisiana.

Drax notified investors that it has submitted initial cash bids for the assets as part of an auction process, which were to be held on March 1 and March 2 (but have since been delayed). German Pellets, builder of both plants, filed for bankruptcy protection in February 2016.

The Louisiana plant, commissioned in early 2015, has a reported production capacity of 578,000 metric tons, and though German Pellets reported plans for an expansion project to its double capacity, it was not completed.

The Texas plant, which began operating in 2013, has an annual production capacity of about 500,000 metric tons. It leases a five-silo pellet storage facility located at Port Arthur, Texas, which can hold 75,000 tons of wood pellets and includes a loading device for vessels up to Panamax size, or about 60,000 tons, according to previous statements by German Pellets.

This announcement backs up statements in its recent 2016 annual report where Drax indicated its wish to secure up to 30% of its own pellet requirement within its own supply chains, in part through what it saw as acquisition of distressed plants. Recent mild winters have led to cashflow problems for both European and US pellet plants supplying the heat market.

Click here for more information.

Partnership to strengthen miscanthus for energy industry

Miscanthus grower network Terravesta and biomass boiler installer Core Biomass have announced a partnership to strengthen the UK miscanthus to energy value chain.

According to Terravesta, the "new relationship" with Core Biomass is to develop new markets for the crop and "ensure the miscanthus supply chain is future-proofed for years to come". Using Danish combustion technology Core Biomass installs biomass heating solutions for residential as well as

commercial, industrial and agricultural applications.

Terravesta is looking to work closely with Core Biomass and others to promote long-term fixed price whole bale miscanthus supply to large heat and power generation plants. These range from agricultural uses like poultry, to horticultural glasshouses and non-agricultural industrial processes, like food and manufacturing.

Geograph

Click here for more information.

Roundwood prices continued to rise in 2016

In 2016, the average price paid for Finnish pine logs procured from non-industrial private forests in standing sales was EUR 53.3 and for spruce logs it was EUR 55.3 per cubic metre. The stumpage price of pine pulpwood was EUR 15.5 and that of spruce pulpwood EUR 17.3 per cubic metre. The stumpage price level of both logs and pulpwood increased year-on-year, in real terms, by more than one percent. The real stumpage price level was slightly higher, even in comparison with the previous five-year period.

Standing sales accounted for 82 per cent, or 33.8 million cubic metres, of all roundwood purchased by the forest industry. Most standing sales involved spruce logs, which accounted for 29 per cent of all roundwood in standing sales. Pine pulpwood (24%) and pine logs (18%) accounted for the next highest shares of standing sales.

Approximately two thirds of roundwood purchased in standing sales came from regeneration fellings. The price paid for the roundwood varies according to the type of stand marked for harvesting. In regeneration felling, the price of logs was two per cent and that of pulpwood, 12 per cent above the average stumpage price. In thinning, the price paid for logs was 14 per cent and that of pulpwood eight per cent below the average stumpage price. The price of roundwood from first thinnings was a little less than 30 per cent below the average stumpage price.

In 2016, the roadside price for pine pulpwood was EUR 27.9, that for spruce pulpwood was EUR 30.4, and for birch pulpwood was EUR 28.5 per cubic metre. The real roadside price level of pulpwood rose by one per cent year-on-year. Delivery sales focus heavily on pulpwood, which accounted for 73 per cent of roundwood felled for delivery sales.

Click here for more information.

Expansion of US Pellet Fuels Institute's Standards Program

The Pellet Fuels Institute is a non-profit association that serves the pellet industry, which is comprised of pellet mills, pellet appliance manufacturers and industry suppliers. The Institute is active in educating consumers about the convenience and practicality of using wood pellet fuel in both residential and commercial applications.

The Institute oversees the PFI Standards Program, a third-party accreditation program providing

specifications for residential and commercial-grade pellet fuel, now representing 19 pellet manufacturing companies, among 32 facilities in the US and Canada.

PFI Standards Program participants can display the PFI Quality Mark on their pellet bags, signifying their qualification to the program requirements. This quality mark demonstrates to consumers that the product comes from a facility that submits its product to regular third party audits by an independent accredited auditing agency and testing laboratory. Random audits are regularly performed at production facilities to ensure qualified companies are following a quality control program. Wood pellets are tested according to the program specifications, also on a monthly basis. By taking these steps, participants ensure that their pellet quality remains consistent.

Click here for more information.

Spencer Group builds three Pellet Silos at Port of Tyne

Three major silos have been erected as the centrepiece of large-scale wood pellet facilities at the Port of Tyne, a significant milestone in what is an important project from Northern England.

The structures, each 36m (118ft) tall and 45m (147ft) in diameter, have been built by engineering specialist Spencer Group as part of a major, multi-million-pound contract awarded by Lynemouth Power Ltd. In due course, the silos will be topped off with structures housing the drive mechanism for the wood pellet conveyor system, taking the full height of the buildings to 45m.

The facilities, at Tyne Dock in South Shields, Tyne and Wear, will handle up to 1.8m tonnes of wood pellets annually, to support the full conversion of Lynemouth Power Station on the Northumberland coast from coal-burning to biomass.

The project will enable wood pellets to be conveyed mechanically to one of three newly-built silos, each capable of storing 25,000 tonnes of material. The pellets will then be discharged from the silos via two conveying streams to a rail-loading facility to take the material to Lynemouth Power Station by train.

Click here for more information.

Other Feedstocks

Airex unveils torrefaction plant

Airex

On Feb. 24, Airex Energy officially inaugurated its biomass torrefaction plant, located in the La Prade industrial park in Bécancour, Quebec. The industrial-size demonstration plant, which required around $10 million in public and private investments for its design, construction, and start-up, showcases the latest trademarked biomass torrefaction technology, CarbonFX. The technology, designed by Airex Energy, significantly reduces greenhouse gas emissions for many industries still using coal or coal by-products.

Airex Energy's torrefaction process transforms biomass residues into biocoal pellets, a clean and

renewable fuel that can replace coal and oil. Biocoal's unique properties allows it to easily disintegrate, so it can be ground up and combined with bituminous coal in thermal power stations producing electricity, without major changes to existing systems for handling, storing, and grinding coal.

The CarbonFX system also produces biochar, a product with a high carbon content used for soil remediation, liquid filtration and metal reduction. Biochar, when mixed with compost or peat moss, promotes plant growth. Biochar also helps reduce metals and enables rehabilitation of former mining sites.

Airex Energy's business model is to export its CarbonFX systems worldwide. The entire forest industry, including sawmills, pulp and paper, and wood pellet producers, is Airex's primary market for the CarbonFX systems. The processing of wood residues into value-added products can allow companies in the sector to increase their profitability while diversifying their sources of income. And because of its simple design and small footprint, the CarbonFX technology is cost-competitive.

Click here for more information.

Bio-bean turns Caffe Nero's waste beans into pellets

The London Evening Standard reports that Caffè Nero has become the first major high street coffee brand to devise a scheme where recycling vans pick up used beans to be converted into fuel for homes and cars.

All 122 Caffè Nero stores in London are involved in the scheme, which will see 218 tonnes of used coffee grounds recycled into 98 tonnes of biomass pellets in its first year. These can be used in wood burners to heat 453 homes.

Caffè Nero is working with London-based recycling firm First Mile to deliver the scheme, launched last July.

Baristas load used coffee grounds into special sacks for First Mile, which runs 65 trucks across the capital, to collect every night.

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 (£/tonne, 5% VAT)	UK Ex-Farm Barley Straw (D1000) (£/tonne)	UK Ex-Farm Wheat Straw (D1000) (£/tonne)
10 Feb	224-257 (↓-↓)	45-68 (–-↑)	40-63 (–-↑)

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

For details on straw spot prices, see http://pages.fwi.co.uk/pdf/market-prices/FWMP_Hay_Straw.pdf

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)
Mar-17	146.2 (↓)	168.5 (↓)		436.0 (↑)	369.5 (↑)	1014.7 (↓)
May-17	149.5 (↑)	174.2 (↑)	415.2 (↑)	456.5 (↑)	376.0 (↑)	1025.2 (↓)
Jul-17	149.9 (↑)			471.5 (↑)	383.2 (↑)	1034.7 (↓)
Aug-17			380.2 (↓)			1035.2 (↓)
Sep-17		173.0 (↑)		486.2 (↑)	389.5 (↑)	1022.0 (↓)
Nov-17	141.5 (↑)		382.5 (↓)			1013.5 (↓)
Dec-17		175.7 (↑)		504.2 (↑)	396.0 (↑)	
Jan-18	139.9 (↑)					
Feb-18			385.7 (↓)			
Mar-18	141.3 (↑)	177.7 (↑)		517.7 (↑)	404.2 (↑)	
May-18	146.0 (↑)	180.0 (↑)	385.2 (↓)			
Jul-18	142.2 (↑)					
Aug-18			368.5 (↓)			
Sep-18		178.7 (↑)				
Nov-18	141.0 (↑)					
Dec-18		180.2 (–)				
Jan-19	140.8 (↓)					

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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