The Bioeconomy Consultants

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YOUR PARTNERS FOR BUSINESS INSIGHT AND MARKET INTELLIGENCE

Providing clients with a strategic view of feedstock, technology, policy, and market opportunity across the bioeconomy

News Review

Feedstocks

Issue Seventy-Eight

September 2018

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

Contents

Foreword

Welcome, subscribers, to September's Feedstocks News Review.

As demand for resources continues to grow, ascertaining where those resources are going to be available and sourced from is becoming an increasingly important area of research. Particularly where biomass in concerned, this is an issue, as there is regularly a conflict of interests: biomass can be utilised either as food or as a raw material, which creates competition for agricultural land, further exasperating the situation as available cropland becomes constrained. However, there is one key aspect that favours biomass' use as a raw material: the fact that wastes from agricultural and forestry can provide a useful and significant volume of resource with little conflict on other uses if sourced carefully. The Rehap project was established to look into the potential use for such waste biomass resources and has produced a tool which can be used to forecast the future availability of agroforestry waste. The tool takes into account the current uses and demand for these resources for example use of straw for animal bedding. In this way, the project has been able to identify the key areas where waste biomass availability exceeds current needs. It is hoped that with such tools the future of the European bioeconomy can be secured, by laying the foundations for the establishment of sustainable feedstock supply chains that do not conflict with other uses.

In other news, Swiss scientists have published some very exciting research, in which they have demonstrated that soil microbes have completely metabolised a form of plastic. It has not always been clear that the polymers are of any metabolic use to the microorganisms themselves, but by using carbon isotope labelling, the scientists were able to demonstrate that the carbon in the biodegradable plastic was indeed incorporated into the microbes' biomass. This is the first time that this has been successfully demonstrated, and shows that for some applications, where plastics may end up in soils, these plastics would be preferable. The plastic that was tested was polybutylenadipatterephthalat (PBAT), is one of several kinds of polymer used in compostable food waste bags, and in mulch films, which are the two foremost applications for plastic of this kind.

At the time of writing the sad news that Vivergo was halting production was announced. This was one of the flagship bioeconomy industries in the UK but succumbed to high feedstock prices and low ethanol prices. The irony is that the high feedstock price was fuelled by poor grain yield estimates after the long hot summer across the northern hemisphere. Such severe variations in weather patterns are a prediction by climate change scientists. The greenhouse gas savings delivered by Vivergo were an example of what could be achieved, but demonstrate the difficulty of being reliant on volatile feedstock prices. This emphasises the need to develop advanced fuels and materials from cellulosic wastes and by-products to try and reduce such volatility in the market place that will otherwise make investment appear too risky.

Read on for the latest news.

Policy

Recipients of US Department of Energy funding announced

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The U.S. Department of Energy has announced the selection of 36 projects totalling $80 million to support early-stage bioenergy research and development (R&D). This R&D will enable cost-competitive, drop-in renewable hydrocarbon fuels, bio-based products, and power from non-food biomass and waste feedstocks. This work supports the Department of Energy's (DOE) goal of reducing the cost of bio-based drop-in fuels to $3/gallon by 2022 to continue to provide consumers with affordable, reliable transportation energy choices.

16 selected candidate projects will create highly efficient conversion processes to increase the affordability of fuels from biomass and waste feedstocks by improving catalysts and new biological systems, identifying ways to better utilize waste streams like carbon dioxide (CO2) and biosolids, and creating high-value co-products that can improve the economic viability of biofuels production.

7 projects will improve the efficiency of carbon utilization and productivity of algal systems either through improving uptake and conversion of waste CO2 emissions--such as from a power plant or industrial facilities--or through the development of new, affordable technologies to capture CO2 directly from ambient air to enhance algal growth.

10 projects will research integrated processes for the production of biopower from biosolids and cost-competitive, renewable drop-in biofuels and bioproducts from domestic biomass feedstocks and waste resources.

3 projects will conduct early-stage R&D related to the production of affordable and sustainable non-food dedicated energy crops that can be used as feedstocks for the production of biofuels, bioproducts, and biopower.

Click here for more information.

Markets

Dry weather continues to hit EU crop forecasts

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In its latest EU crop roundup, AHDB reports that EU-28 maize, barley and total wheat yield forecasts have been revised downward in the latest August European Commission MARS crop monitoring report. The forecast yield reductions are predominantly due to the impact upon spring crops from continued dry weather conditions persisting across much of Northern Europe.

The forecast yields and outlooks for maize are however a mixed picture, at an EU-28 wide level, yields are forecast to be above the five-year average but nearly 4% below last year. Conditions in France have led forecast grain maize yields to fall 7% below average with an 18% reduction from the previous July report. Meanwhile, excellent maize conditions in Bulgaria and Romania have led yield forecasts to be up 25% and 30% respectively from the five-year average.

By applying the August MARS report yields to the July EU Crop Observatory area forecasts, 2018 EU grain maize production could total 63.5Mt, down just 3.4% year on year. French grain maize production may represent just 19% of EU grain maize production, with 2018 production suggested to be 12Mt.

Following the good conditions and forecast yields in Romania and Bulgaria, 28% of EU grain maize could be produced by these two countries in 2018. The increased shift in the origin of EU maize production to Black Sea bordering countries may increase the influence that Ukraine and Russia have on EU maize markets.

Yield forecasts for total wheat at an EU-28 wide level were also revised down and now stand at 5.49t/ha, a further 1.8% reduction from the July report and down 4.2% on the five year average. Total EU barley has also been revised downward, undergoing a further 0.6% reduction from July and now 4% below the five-year average at 4.71t/ha.

Corn prices jump with Chinese biofuel commitment

China's corn futures were on track for their biggest one-day jump since May after the central government said it would promote the use of ethanol in vehicles, its first public statement on its ambitious biofuel policy in almost a year.

China will promote the use of ethanol in 15 regions this year, including Beijing and Tianjin municipalities and Hebei province, said a post on the government's official website that summarised a Wednesday meeting of the nation's State Council.

The most-active corn futures on the Dalian Commodity Exchange were up 0.85 percent on Thursday at 1,892 yuan ($275.24) per tonne, on track for their biggest daily jump in three months.

Beijing will lay out plans for grain-based ethanol production and accelerate the construction of cassava-based ethanol plants, the government posting said.

Click here for more information.

Enviva makes healthy profit despite Chesapeake fire

Enviva

In its latest quarterly financial and operating report, Enviva Partners LP highlighted its increasing exploitation of Asian (Japanese) markets and consolidation of existing contracts.

For the second quarter of 2018, Enviva generated net revenue of $132.1 million, an increase of 3.6 percent, or $4.6 million, from the corresponding quarter of 2017.

Adjusted gross margin per metric ton was $37.74 for the second quarter of 2018. Excluding the full financial impact of the Chesapeake export terminal fire incident, Enviva would have earned adjusted gross margin per metric ton of $40.40. Adjusted gross margin per metric ton was $45.18 for the second quarter of 2017.

The Partnership and sponsor executed three new 15-year take-or-pay off-take contracts with Japanese customers totalling 700,000 MTPY commencing in 2021 and 2022. This is in addition to the more than 730,000 metric tons per year of long-term contracts with Japanese counterparties that the Partnership and its sponsor have previously announced.

In its latest contracts the Partnership executed a 15-year, 180,000 MTPY take-or-pay off-take contract commencing in 2022 with a major Japanese trading house to supply a new power plant in Japan, subject to certain conditions precedent, which the Partnership expects to be met in 2018. The Partnership also announced that its sponsor executed two new take-or-pay off-take contracts with Sumitomo Corporation to supply a total of 520,000 MTPY to new biomass power plants in Japan. These new contracts include:

A firm 15-year, 270,000 MTPY contract commencing in 2022 with Sumitomo Corporation.

A 15-year, 250,000 MTPY contract commencing in 2021 with Sumitomo Corporation, subject to certain conditions precedent, which the Partnership expects to be met in 2018.

In addition, Enviva executed a 650,000 MTPY, 5-year take-or-pay contract extension with Drax to supply 650,000 MTPY of wood pellets starting in 2022 and continuing through 2026.

The Partnership owns and operates six plants with a combined production capacity of nearly three million metric tons of wood pellets per year in Virginia, North Carolina, Mississippi, and Florida. In addition, the Partnership exports wood pellets through its owned marine terminal assets at the Port of Chesapeake, Virginia, and the Port of Wilmington, North Carolina and from third-party marine terminals in Mobile, Alabama and Panama City, Florida.

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The circular economy future of the chemicals industry

Pixabay

Although 2050 seems a long way off, in terms of the chemical industry's investment cycle – where large capital investment produces assets that endure for decades – it should be on the horizon.

By then, according to the EU's 2050 vision, the region will have an "innovative, circular economy where nothing is wasted and where natural resources are managed sustainably."

This long-term objective is driving current and future legislation including the objective, unveiled in January, of making all plastic packaging recyclable by 2030.

However, the implications of developing a truly circular economy go way beyond this to challenge the fundamentals underlying the petrochemical industry, namely its use of fossil fuel-derived feedstocks, according to consultants at PwC.

One of the concept's fundamental principles is to move from a "linear" economy relying on consumption of finite resources to one based on renewable resources.

For an industry that currently relies in 90% of cases on oil or gas-derived feedstocks there will be huge challenges ahead if customers, regulators and shareholders push this agenda hard.

A circular economy runs on renewable energy, biomass and smart usage of finite resources, but at present most of the chemicals industry is taking only modest steps in this direction, rather than re-examining core growth strategies with this in mind.

Companies must prepare for the shift to bio-based feedstocks and it would be impossible for them to ignore the EU's Emissions Trading System (ETS), which has a ceiling on carbon dioxide (CO2) emissions that may gradually increase energy costs.

Click here for more information.

Research & Development

Plastic fully metabolised by microbes

Researchers at ETH Zurich and the Swiss Federal Institute of Aquatic Science and Technology (Eawag) succeeded in an interdisciplinary study to demonstrate that soil microorganisms metabolically utilised the carbon in the PBAT polymer both for energy production and also to build up microbial biomass. The researchers used the biodegradable polymer PBAT (Polybutylenadipatterephthalat) labelled with a carbon isotope. This isotope label enabled the scientists to track the polymer-derived carbon along different biodegradation pathways in soil. It showed that the carbon from PBAT was not only converted into carbon dioxide (CO2) as a result of microbial respiration but also incorporated into the biomass of microorganisms colonizing the polymer surface. The researchers are the first to

successfully demonstrate where the carbon of a polymer ends up and that a plastic material is effectively biodegrading in soils.

The tested PBAT polymer is a fossil-based, biodegradable polymer, which is used amongst others for the production of biodegradable, certified compostable bio-waste bags (according to EN 13432) or biodegradable in soil certified mulch films (according to EN 17033).

Click here for more information.

Analysis of over 30 years of global land-use change

Geograph

Land change is a cause and consequence of global environmental change. Changes in land use and land cover considerably alter the Earth's energy balance and biogeochemical cycles, which contributes to climate change and—in turn—affects land surface properties and the provision of ecosystem services. However, quantification of global land change is lacking. Here the authors analyse 35 years' worth of satellite data and provide a comprehensive record of global land-change dynamics during the period 1982–2016. They show that—contrary to the prevailing view that forest area has declined globally—tree cover has increased by 2.24 million km2 (+7.1% relative to the 1982 level). This overall net gain is the result of a net loss in the tropics being outweighed by a net gain in the extratropics. Global bare ground cover has decreased by 1.16 million km2 (−3.1%), most notably in agricultural regions in Asia. Of all land changes, 60% are associated with direct human activities and 40% with indirect drivers such as climate change. Land-use change exhibits regional dominance, including tropical deforestation and agricultural expansion, temperate reforestation or afforestation, cropland intensification and urbanization. Consistently across all climate domains, montane systems have gained tree cover and many arid and semi-arid ecosystems have lost vegetation cover. The mapped land changes and the driver attributions reflect a human-dominated Earth system. The dataset we developed may be used to improve the modelling of land-use changes, biogeochemical cycles and vegetation–climate interactions to advance our understanding of global environmental change.

Click here for more information.

Tool to forecast future availability of biomass

Biomass is quickly becoming a sought-after resource as an alternative to fossil fuels, chemicals and energy in the bioeconomy. Having recognised the potential of agricultural and forestry waste for commercial use, the Rehap project has recently developed a unique tool that can forecast their future availability

Rehap partners at the University of Ausgburg used the project's own analysis of the current availability of agroforestry waste in Europe to create a tool that can forecast on a regional basis the future availability of lignocellulosic feedstock (a natural building block substitute for petrochemicals) from agricultural residues in Europe. The aim is to enable future enterprises to

securely produce sustainable bio-products from high quality renewables.

Further increase in residue potentials is expected to come mainly from eastern European countries such as Estonia, Lithuania, Romania, Czech Republic and Hungary due to improving farming patterns and crop yields.

Up until 2030, wheat straw is forecast to develop by approximately 10 per cent; grain maize stover to develop by up to 20 per cent; barley straw will see a slight growth of seven per cent; rape straw will drop by about four or five per cent.

While other studies simply calculate the technical potential of biomass, Rehap's methodology tool is interested in subtracting the important competing applications that repeatedly need these feedstocks, such as animal bedding. The amount that is left is the bioecomomic potential available for energy and material applications. However, these lignocellulosic residues are currently under-utilised. As more applications are found for this feedstock, it is fundamental that it is widely known how it will develop.

With its results, Rehap has provided the biomass sector with a lifeline for using not just lignocellulose but other biomass compounds wisely and sustainably. As soon as the methodology is published it will be widely available. The aim is for industry, transport, homes and businesses to forecast the future residue potential that matters to them, not just lignocellulose, in turn strengthening the European bioeconomy for the future.

Click here for more information.

Research into fungus resistance in sorghum

Public Domain Pictures

Sorghum, a more drought-tolerant cousin to corn, is grown throughout the dry western Corn Belt region of the United States. The crop is traditionally grown for the grain, but newer cultivars have been developed to maximize vegetative biomass, a key trait for lignocellulosic bioenergy production. But before sorghum can meet its full potential as a bioenergy crop, it will need to become more resistant to diseases that can reduce its ability to produce biomass.

With the announcement of a $1.1 million grant for sorghum disease resistance research led by the University of Illinois, the Department of Energy is signalling a new investment in the future of the crop.

Sorghum is susceptible to infection by the fungus that causes sorghum leaf blight, which is associated with decreased yields, reduced forage quality and quantity, and an increased risk of infection by other diseases, including anthracnose. Interestingly, the same fungus infects corn, a fact researchers ultimately hope to use to increase resistance in sorghum.

Although the fungus can attack multiple hosts, specific strains - or isolates - can only infect corn or sorghum, not both. Researchers will look closely at how that host specificity works, both from the viewpoint of the fungus and of the plant.

If they can isolate genes that control resistance to the fungus in each crop, they think they could eventually put those genes together in new corn and sorghum varieties, making them resistant to both strains.

Click here for more information.

Novel breeding strategy for bigger sugar beet

Geograph

Plant biotechnologists from the Ryan Institute at NUI Galway have identified genetic breeding strategies to develop bigger and better sugar beet.

Sustainable intensification of agriculture to meet rapidly growing global demand for food and non-food products produced by crops will require higher yielding crop varieties that can produce more food using less resources and land area.

For crops such as sugar beet, this means the development of varieties that produce more per hectare, while reducing inputs.

The findings from their research has been published in the international journal, BMC Plant Biology.

Sustainable intensification of sugar beet supply will require the production of more sugar beet using less resources and land, which requires high yielding sugar beet varieties that require minimal inputs.

Using a combination of molecular genetics laboratory work and large-scale sugar beet experimental field trials conducted in Cork, the research team discovered that the most efficient way to develop higher yielding sugar beet varieties was by tapping the benefits of hybrid vigour, a topic of focus for the team.

Click here for more information.

Vast majority of earth's biomass is plants

Plants rule the planet—at least in terms of sheer mass. Many tallies of Earth's life use biodiversity as a measurement and simply count the number of species. A new census, based on biomass, compiled data from hundreds of studies to determine which kingdoms, classes and species carry the most global heft. The results show that plants (primarily those on land) account for 80 percent of the total biomass, with bacteria across all ecosystems a distant second at 15 percent. The findings were published online in May in the Proceedings of the National Academy of Sciences USA.

Higher-resolution satellite data and improvements in genomic sequencing have made such measurements possible by yielding more accurate estimates.

Click here for more information.

Irish forest bioeconomy

Geograph

Coillte is a commercial company managing over 440,000 hectares across Ireland and operating a forestry business, a land solutions business and two manufacturing plants producing timber panels for the construction sector. As producers of a renewable biological resource and value-added bio-based products, Coillte is already well established in the traditional forest bio-economy. However, they see this as just the beginning, and as part their strategy to 2030, they are actively exploring new and innovative bio-based products as a new bio-economy emerges in response to the pressing need for de-carbonisation of production and energy systems.

The future development of integrated and diversified biorefineries holds the potential to create synergies and economies of scale between agriculture, forestry and fisheries and would have particular advantage for an island nation with a strong agricultural base such as Ireland.

The bio-economy will need creative new business models for partnering the production of renewable natural resources with engineering and conversion technologies. Ireland has a relatively low population density, fertile soils, abundant freshwater resources and a mild year-round climate, creating excellent conditions for biomass growth generally and arguably some of the best conditions in the world for growing trees.

Coupling this with Ireland's strengths in life sciences and data technologies creates the potential for a world leading bio-economy.

The age structure of Irish forests is such that the total output is set to double in the next ten years. This coupled with developments in engineering and conversion technologies and a strong policy drive to reduce use of fossil derived materials and fuels creates a great opportunity for a thriving Irish bio-economy. The new bio-economy requires a shift in our thinking away from traditional sectorial conceptions and definitions and a move towards new collaborations between resource production and processing and conversion. Success has the prize of a range of innovative, resource efficient, dynamic and competitive industries responding to the key challenges of our times.

Click here for more information.

Wood & Crop

UK Consultation on domestic wood burning

Pxhere

DEFRA has launched a new consultation on the domestic burning of solid fuels and wood, continuing their focus on reducing particle matter emissions and the Clean Air Strategy.

The consultation considers a range of proposals focused on phasing out the sale of the most polluting products, enabling consumers to switch to less polluting alternatives. This includes restrictions on the sale of wet wood for domestic burning so that it can only be purchased in volumes over a specified cut-off point, applying sulphur standards and smoke emission limits to all solid fuels, and phasing out the sale of bituminous or traditional house coal.

Specifically, in relation to wood, consultation questions 6 to 13 seek views on introducing a cut-off point of 2m3 for the sale of wet wood to households. Note that the consultation explicitly states that wood pellets are dry enough not to be affected by these proposals and so are not in the scope of the consultation. Suppliers selling wet wood in volumes larger than the agreed cut-off point will require clear instruction to consumers on how long the wood should be seasoned before it is burnt.

Anyone wishing to sell wood in volumes under the specified cut-off will need to apply to the industry's certification agency or equivalent (currently Woodsure), to ensure that the wood is of a moisture content of 20% or less.

Click here for more information.

The profound effects of climate change on US agriculture

Rising temperatures are characteristic of the changing global climate and the warnings of the implications that this change could have on production and agriculture are no longer just hypothesises but a reality for many. Changes to regional and global temperature will continue to have damaging effects on agricultural systems at both national and global levels and by extension the bio-based economy. The evolution of weather patterns once considered rare to common only serves to highlight a need for agricultural Business-As-Usual models to adapt or face the consequences of not doing so.

Predictions have been made that temperatures will continue to increase in the long-term, caused by increases in CO2 and other greenhouse emissions that continue to build up in the atmosphere. By the middle of the 21st century, temperatures in the US Southern Plains will likely be 2.2°C to 3.3°C higher than the 20th century average. This will result in much milder winters with freezing rain instead of snow and hotter summers. Rainfall predictions are much less certain, but extreme rainfall is expected to continue to become more intense and frequent.

The results of this could be damning for U.S. crop production. Yield potentials would diminish

rapidly, triggered by higher night temperatures, which would weaken photo-protection systems in plant life (bio-chemical process that helps organisms cope with molecular damage caused by sunlight) and induce more persistent heat stress.

One positive to increasing temperatures, is that a warmer climate could extend the cultivation period for crops. The remarkable tendencies of plant life to adapt to extreme climate changes may be the saviour of crop industries in the short term due to the durability of plant metabolic processes. Yet, the positives to extended exposure to sunlight end there as long periods of prolonged heat will likely impair plant productivity.

The fact remains that plant metabolisms are temperature sensitive. Key crops such as winter wheat, rice and maize photosynthesise best at temperatures between 25°C and 30°C. Daily temperatures exceeding this range are likely to slow crop production and damage both the quality and quantity of crop yields.

Producers will be affected by increases in crop water requirements, the degradation of soil, intensive rainfall events and potential release of large-scale methane emission through thawing permafrost (ground, including rock or soil, at or below the freezing point of water 0 °C for two or more years).

Click here for more information.

S&W breeding sorghum with reduced moisture for increased efficiency

Flickr

S&W Seed Company has announced the integration of proprietary sorghum germplasm in the US and Brazil that it previously acquired from NexSteppe, Inc. The NexSteppe germplasm, which S&W acquired in April 2018, is a scalable, reliable and sustainable feedstock solution for the forage, grain, biofuels, biopower and bio-based product industries.

Integration of the NexSteppe germplasm is expected to bolster S&W's sorghum breeding effort, which already includes best-in-class hybrid forage and hybrid grain varieties.

All of NexSteppe's germplasm is adapted to different environments and seasons, providing a wide range of maturities to meet varying customer harvest-window profiles. In particular, NexSteppe's Palo Alto biomass sorghum hybrids provide a high-yielding, low-cost biomass feedstock for biopower and cellulosic biofuels.

Designed to have low moisture levels at maturity, Palo Alto biomass sorghum hybrids significantly lessen the amount of water harvested, thereby reducing the harvest and transport costs that can be 50% or more of total delivered feedstock cost. Lower moisture levels also provide a higher effective energy density for combustion.

Click here for more information.

Metsä plant produces millionth tonne of wood pulp

Metsä Group's next-generation bioproduct mill in Äänekoski reached its nominal capacity in August 2018, according to plan. This makes Metsä Group the world's largest producer of softwood market pulp. The bioproduct mill produced its millionth tonne of pulp on 8 August 2018.

The bioproduct mill was started up on 15 August 2017, on schedule and within budget. The start-up phase progressed in line with the target curve.

The bioproduct mill produces 1.3 million tonnes of high-quality softwood and birch pulp annually, in addition to other bioproducts, such as tall oil, turpentine and bioenergy. New bioproducts that already complement the product portfoforlio include product gas from bark, sulphuric acid from the mill's odorous gases and biogas from the sludge from its wastewater treatment plant, as well as biofuel pellets.

The bioproduct mill serves as a platform for the production of new bioproducts, as well as further developing and expanding the industrial ecosystem in Äänekoski. Metsä Group is actively exploring various processes and product paths. Key bioproduct development projects include pulp-based lignin products and textile fibres.

Click here for more information.

Mobilising the Irish private forestry sector

Geograph

Approximately 40% of the total forest area in Ireland is owned and managed by farmers, with the majority of plantations reaching production in the coming decade.

Forecasts show that timber production is to grow from 3.1 million m3 in 2017 to 7.9 million m3 by 2035, with almost all of the increased volume coming from farmers.

The mobilisation of this resource is not without significant challenges. Many factors influence a farmer's decision to harvest these, including the size of the forest, the level of bureaucracy, lack of knowledge, investment in infrastructure, available harvesting technologies, transportation, etc.

The IFA's five-point plan to revitalise the farm forestry sector emphasised the importance of producer organisations to overcome some of the barriers to mobilisation.

The peer-to-peer support offered by producer organisations has proven to be hugely successful in mobilising private sector resource elsewhere in Europe.

The IFA's budget 2019 submission is looking for the introduction of supports for existing forest

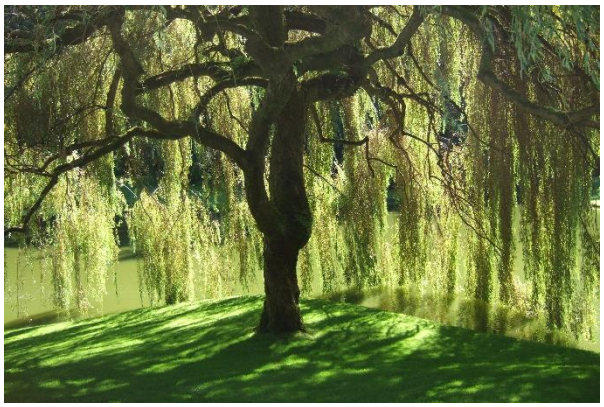
producer groups to help them create the necessary scale to optimise efficiencies in the supply chain and ensure the long-term sustainability of the group and supply.

Properly functioning forest producer organisations are the key to improving efficiency and building further capacity within the sector to satisfy the growing demand for biomass and ensure the long-term sustainability of the sector.

The IFA advocates a network of centralised biomass trading centre, regional service stations that supply top-quality wood fuels.

Click here for more information.

Analysis of Swedish willow for bioenergy



Wikimedia

Energy from biomass, including lignocellulosic crops such as willow (Salix spp.), is expected to increase in importance in Sweden. This study assesses the average annual net energy yield and the ratio between gross energy yield and total primary energy input for well-managed current commercial willow production systems in Sweden subject to three levels of fertilization with mineral nitrogen (N): N-high, N-medium, and N-zero. The average annual net energy yields are estimated at 175, 133, and 86 GJ ha−1 yr−1, and the (dimensionless) energy ratios are estimated at 19, 32, and 47, for N-high, N-medium, and N-zero, respectively. Thus, there is a trade-off between achieving a high net energy yield and achieving a high energy ratio. Since the total primary energy input amounts to ≤ 5% of the gross energy yield in all cases, and the amount of arable land is limited, productivity increases may be considered more important than energy efficiency improvements. Substantial improvements in energy performance can be achieved by increasing harvest levels and improving energy efficiency in ammonia production and biomass transportation. The results should be interpreted with caution since several input parameters, especially energy use in ammonia production, fuel consumption rates, and the yield response to fertilization, are associated with considerable uncertainties.

Click here for more information.

Events

Biomass for Industrial Applications Amsterdam, 26th-27th September 2018

The VDI conference Biomass for Industrial Applications focuses on the industrial utilization of biomass. The presentations consider both the energy-related as well as the material usage of biomass. Discuss the newest technical, economic and political developments in the industry with leading experts and find out what's in store for the biomass market in the future. This knowledge will help you to make the right strategic decisions for your company and to clear the way of implementation barriers.

Click here for more information.

Revolution in Food and Biomass Production Köln, 1st-2nd October 2018

Revolution is a strong term, but it might just be the right word for what is going on in food and biomass production. In nine areas, major upheavals and innovations are taking place, largely independently of each other. But taken together, they represent a transformation that brings our entire food and biomass production to a whole new level, being more efficient, sustainable, healthier and more in harmony with nature. The unique conference "Revolution in Food and Biomass Production" brings together pioneers and innovators in Cologne, Germany's fourth-largest city and meeting place for international business, on 1 and 2 October 2018.

Click here for more information.

International Biomass Congress & Expo Berlin, 10th-11th October 2018

The International Biomass Congress & Expo aims to bring together leading producers, suppliers, regulators and other engaged organisations over a two-day period. High-level speakers, experts in their field, will address a range of topical issues relating to the biomass sector.

Brought to you by Bioenergy Insight, the leading international biomass magazine, this year's conference will be co-located with the International Biogas Congress & Expo as well as the renowned Biofuels International Conference and Expo, making this series of bio events our largest gathering yet of bio related companies, giving participants unrivalled coverage.

Click here for more information.

EFIB Toulouse, 16th-18th October 2018

Join over 650 bio-based leaders in 2018 for the 11th edition of EFIB in Toulouse, France, on the 16th, 17th and 18th of October.

Click here for more information.

EBRI Master Class Course: Value from Waste
West Bromwich, 17th-18th October 2018

Redundant material such as food waste, cardboard boxes, plastic waste, sawdust, waste oils, manure, hay straw, sugar beet residue, spent grain waste from breweries are only a few examples of waste that could potentially open up fresh possibilities for your business.

EBRI's series of Master Class Courses provides exclusive content for entrepreneurs and business leaders covering the technical and commercial fundamentals of bioenergy. Companies looking to develop new products and services can benefit from attending this event, as can those who are simply looking for a better understanding of the bioenergy market.

Click here for more information.

Agrocycle Mission to China
Beiling, 22nd-26th October 2018

The Agricultural waste and residue management for a circular bio-economy event will be held in China from the 22nd to the 26th of October 2018 and will bring together stakeholders from industries, research, public bodies, educators and policy-makers from China and Europe.

The programme of the event includes 2 days of plenary conferences in Beijing (22-23 October) and three days of workshops, brokerage meetings and on-the-field visits (24-25-26 October).

Click here for more information.

European Biosolids & Organic Resources Conference
Leeds, 13th-14th November 2018

Now in its third decade, the conference provides an essential annual update on the latest industry innovations, best practice, cutting-edge technology and research in the waste water and resource management industries.

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	285-316 (↑-–)	60-80(–-↓)	45-70(–-↓)

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)
Sep-18		192.5 (↓)		486.0 (↓)	353.0 (↓)	833.00 (↓)
Nov-18	174.2 (↓)		372.7 (↓)			842.75 (↓)
Dec-18		197.7 (↓)		511.2 (↓)	365.5 (↓)	
Jan-19	177.3 (↓)					855.75 (↓)
Feb-19			372.2 (↓)			
Mar-19	179.8 (↓)	200.0 (↓)		532.2 (↓)	377.7 (↓)	868.50 (↓)
May-19	179.0 (↓)	201.2 (↓)	371.5 (↓)	546.2 (↓)	385.5 (↓)	880.25 (↓)
Jul-19	176.9 (↓)			544.0 (↓)	391.7 (↓)	890.50
Aug-19			361.0 (↓)			
Sep-19		187.2 (↓)		554.7 (↓)	392.5 (↓)	
Nov-19	161.0 (↓)		364.7 (↓)			
Dec-19		189.2 (↓)				
Jan-20	165.3 (↓)					
Feb-20			364.2 (↓)			
Mar-20	166.9 (↓)	189.0 (↓)				
May-20	168.1 (↓)	189.7 (↓)				
Nov-20	162.0 (↓)					

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

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

Credits and Disclaimer

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