

FEEDSTOCKS & BIOREFINING

Each month we review the latest news and select key announcements and commentary from across the feedstock and biorefining sector.

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Your Partners for Business Insight and Market Intelligence

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

Contents

Contents	2
Foreword	3
Policy.....	4
Markets	4
Research & Development.....	6
Wood & Crop	9
Other Feedstocks	10
Events.....	12
Feedstocks Prices	13

Foreword

Welcome readers, to this month's Feedstocks News Review.

For 11,000 years, since the invention of agriculture, mankind has striven to improve plants for food use by selecting the tastiest, most resistant and most productive lines, and breeding them. Despite recent technological advances, selective breeding remains common practice and is now also being used to improve feedstocks destined for the production of biofuels, bioenergy and biobased products.

Undeveloped plants like hairy stork's-bill have been identified as having the potential to become a pharmaceutical crop and to be grown on an industrial scale. Over the past decade, researchers have developed agricultural practices that can increase yield by 10-fold, however, they believe that selective breeding will be key to increase yields to a point where this could become an industrial crop. This hypothesis is supported by long-term experimentation and breeding performed on other crops, such as sugar beet. The significance of sugar beet for industrial purposes has been well documented since the 1700s. Since then, centuries of selective breeding have improved sugar content, and increased the crops' resistance to pests and diseases. More recently, molecular markers have allowed researchers to improve these traits even further, as it allowed them to better target key trait selection in the breeding process.

Going one step further than selective breeding, gene editing (GE) is a practice that offers the promise of even more precise and more efficient breeding development, resulting in the faster development of more nutritious and pest resistant crops. GE is different from genetic modification (GMO) in that it only involves a small modification to an organism's already existing DNA. In contrast GM techniques involve introducing foreign gene(s) (into the target organism.

Use of GM production has been controversial for a long time in Europe, where there is currently limited growth of only one specified crop approved by the EU. However as the UK leaves the EU, the situation could change, particularly for GE. Following a consultation earlier in the year, the UK government has published its initial plans to enable the use of gene editing to allow UK farmers to grow more crops, better products and all at a lower cost to the environment. For instance, GE technologies could lead to the development of sugar beet varieties which are resistant to viruses. This could prevent significant yield losses and reduce costs to farmers every year, which at the same time reduce farmers' reliance on toxic pesticides.

Read on for the latest news.

Policy

UK Government takes first steps to relax gene editing regulation



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New plans to unlock the power of gene editing to help our farmers grow more resistant, more nutritious and more productive crops have been published as part of the government response to the gene editing consultation. The response sets out how we plan to pave the way to enable use of gene editing technologies, which can help better protect the environment.

Gene editing is a tool that makes plant breeding more precise and efficient so we can breed crops that are more nutritious, resistant to pests and disease, more productive and more beneficial to the environment, helping farmers and reducing impacts on the environment.

Research could lead to sugar beet varieties resistant to viruses that can cause serious yield losses and costs to farmers unless pesticides are used. Such new varieties would help make our farmers more productive and, importantly, also reduce the need for chemical pesticides, protecting our bees and other pollinating insects.

Gene editing is different from genetic modification, because it does not result in the introduction of DNA from other species and creates new varieties similar to those that could be produced more slowly by natural breeding processes - but currently they are regulated in the same way as genetically modified organisms.

Click [here](#) for more information.

Markets

Neste acquires US waste oil interests

Neste has agreed to acquire 100% of Agri Trading, one of the largest independent renewable waste and residue fat and oil traders in the United States, and its affiliate entities. The transaction is subject to the completion of customary closing conditions and regulatory approval.

Agri Trading is based in Minnesota and was established in 1977. It has become an industry leader in trading animal fat waste, used cooking oil, technical corn oil, and other vegetable oils throughout the lower 48 States, Canada, Mexico, and Europe. The company manages all aspects of transportation, logistics, transloading, and export services, providing on-time pick-up and delivery.

The transaction supports Neste in its efforts to build a solid, resilient and flexible global waste and residue raw material platform that can keep pace with the customer's growing demand for renewable products.

Click [here](#) for more information.

Danimer scientific receives grant from United Soybean Board



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Danimer Scientific, a leading next generation bioplastics company focused on the development and production of biodegradable materials, has announced it has received a \$400,000 grant from the United Soybean Board to expand the Company's evaluation of high-oleic soybean oil (HOSO) as a feedstock in the production of polyhydroxyalkanoate (PHA), a sustainable biopolymer that serves as a biodegradable alternative to traditional plastic.

The grant marks the continuation of Danimer's collaboration with the United Soybean Board after the successful completion of a one-year project to develop a practical model for using HOSO as a feedstock in manufacturing Nodax®, Danimer's signature PHA, which is used to create a wide variety of products, including straws, bottles, and flexible film packaging. The second year of the project will focus on scaling up the use of HOSO on a commercial level.

Click [here](#) for more information.

Global wood fibre markets

Softwood pulpwood saw higher price increases worldwide than hardwood pulpwood, resulting in the widest margin between the two fibre sources in 14 years.

Softwood fibre costs were generally higher worldwide in the 2Q/21 than in the previous quarter despite an increase in the supply of residuals from sawmills in Europe and North America. Practically all regions covered by the WRQ experienced q-o-q price increases in the range of 1-5%. The major exception was British Columbia, where wood chip prices were up by almost 20% because of tighter fibre supply and higher NBSK pulp prices.

Over the past year, softwood fibre costs have gone up worldwide between 5% and 20%, except for in the US and Germany, where wood chip prices have fallen substantially. The higher softwood fibre prices resulted in a two-year high of over \$92/odmt for the Softwood Fibre Price Index (SFPI) in the 2Q/21. However, with only a modest increase of the Hardwood Fibre Price Index (HFPI) by one percent q-o-q to \$84.41/odmt, the discrepancy between the two indices rose to the widest margin since 2007.

Hardwood fibre prices in most major pulp-producing countries saw minor price adjustments in the 2Q/21. However, a few regions, such as the US South, Eastern Canada, and Spain, stand out as being places where the costs of hardwood pulplogs have gone up over 5% from the 1Q/21.

Click [here](#) for more information.

Research & Development

The battle for biomass: A systematic review of food-feed-fuel competition

Animal Production Researchers at Wageningen University reviewed 75 studies on the competition for biomass and production resources such as land, water, labour and capital across food, feed and fuel production.

The researchers identified seven factors that are key to the availability and effective use of biomass and production resources. These ranged from ones related to production, such as crop yields to ones related to policy. Many of these factors resulted in trade-offs across different uses of biomass. Studies had different perspectives (e.g. economic, biophysical) on setting priorities for biomass and suggested different solutions to address competition (e.g. marginal lands).

To connect these perspectives we suggest a framework that prioritises biomass and production resources for the use of human food before its use as feed or bioenergy.

Click [here](#) for more information.

The multifaceted environmental and bioeconomy potential of industrial hemp (*Cannabis sativa L.*)



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In the emerging context of circular bioeconomy, industrial hemp (*Cannabis Sativa L.*) biomass is a valuable resource for the sustainable implementation of second-generation biorefineries. Potentially, all the main hemp components can find application within different biorefinery approaches, adding value to the conventional production of hemp fibres and seeds. Hurds, leaves and inflorescences, constituting most of the hemp plant biomass, and often considered as low-value residues, can indeed play a key role in the sustainable production of both bioenergy and high-value bioproducts.

The present article reviews the advances and outlines the potential future perspectives of hemp-based biorefineries. After critically overviewing some of the most established applications of hemp, spanning from soil bioremediation to bioenergy and biofuel production, particular attention is given to novel valorisation schemes to synthesize highly demanded bioproducts such as microbial protein and biopolymers.

Click [here](#) for more information.

Sugar beet improvement with next-generation breeding technology



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Sugar beet (*Beta vulgaris ssp. vulgaris L.*) is mainly grown in temperate countries of the Northern Hemisphere and supplies around 20% of the world sugar consumption. Cultivated in the past as a vegetable or fodder crop, selection of sugar beet began at the end of 1700s.

The first objective was to improve sugar content in the taproot and a number of traits required for successful industrial processing. The most important breeding advancements took place during mid 1900s after the discovery of genetic monogermity and cytoplasmic male-sterility. This allowed the production of monogerm hybrid varieties, now employed worldwide.

Sugar yield is severely impacted by a wide range of pests, diseases and abiotic stresses. As a consequence, the discovery and improvement of relevant genetic resistances remain among the main breeding targets. More recently, the development of several linkage maps using molecular markers have advanced the identification of additional resistances to biotic and abiotic stresses.

This chapter discusses the timeline of sugar beet breeding in tandem with the technological advancements. Traditional and

molecular methods for improvement of disease resistance are discussed, together with the current knowledge of genomic resources. The development of varieties by means of next-generation breeding technology is summarized as well.

Click [here](#) for more information.

First steps to domesticate hairy stork's-bill as a commercial pharmaceutical crop for arid regions

Hairy stork's-bill (*Erodium crassifolium*) (HSB) is one of the few Geraniaceae species that produce tubers. While HSB tubers were occasionally used as a food source by desert nomads, they have not yet been taken up in the modern kitchen.

Recently, HSB tubers were recognized as harboring potential to become an industrial pharmaceutical crop. The objective of this study was to determine a set of agricultural practices that would maximize the yield of the bioactive compounds of the present HSB genetic material.

During 10 years of research, the adopted agricultural practices increased yield by an order of magnitude (from about 0.2–2.0 kg m⁻²) without any dilution of the bioactive compounds. Nevertheless, further research and development are required to achieve HSB potential as an industrial field crop, including selection and breeding of outstanding infertile clones, optimization of fertigation, and development of various concrete pharmaceutical products.

Click [here](#) for more information.

Economic determinants on the implementation of a Eucalyptus wood biorefinery



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The economic impact of different potentially scalable process improvements was here assessed for the first time in the specific context of a Eucalyptus wood biorefinery producing biofuels, high-value chemicals and energy.

The base case scenario referring to bioethanol as the only product was clearly unviable, which mostly resulted from the high cost of cellulases and heat transfer utilities and the moderate final ethanol titers. By supplementing cheese whey to eucalyptus wood hydrolysis, ethanol production increased 51% leading to a notable improvement on the NPV, from -14.4 to -3.4 M\$.

Similarly, when an additional section was included for the recovery of XOS present in the autohydrolysis liquor, the operating costs raised 36% but annual revenues increased around 5 M\$, resulting in a very solid NPV of 18.9 M\$. Internally burning the final stillage led to savings of 98% on low-pressure steam consumption and an additional electricity revenue.

Click [here](#) for more information.

Foams from wood and hemp

Researchers at SRUC and Riga Technical University (RTU) in Latvia, have found that waste materials from wood and hemp biomass can be processed into sustainable foams for use in packaging, cushions and insulation.

Unlike foams sourced from petrochemicals, biomass-derived foams can significantly capture and sequester atmospheric CO₂. In addition, the biorenewable and biodegradable foams promise both high performance and sustainability.

The researchers used an economic process of microfluidic processing and freeze-drying to create nanocellulose (NC) foams from wood and hemp fibres.

They found that while both types of NC foams showed great mechanical response, porosity, thermal conductivity and thermal degradation, those made from hemp demonstrated higher performance characteristics.

While other bio-based products have yet to be commercialised at scale due to high cost and low quality, this research has the potential to change the synthetic foam industry through the commercialisation of high-performance biodegradable materials – creating new jobs and addressing the key issue of synthetic polymers and plastics polluting the planet at the same time.

Click [here](#) for more information.

Wood & Crop

FutureMetrics addresses forest carbon debt fallacy

FutureMetrics has published a new white paper revisiting the flawed assumption that there is a carbon debt after wood is harvested and explaining why some academics continue to perpetuate the carbon debt fallacy.

The paper, authored by FutureMetrics Founder and President William Strauss, references the “infamous Manomet study” on carbon debt that “had several critical errors that were addressed in a series of four FutureMetrics white papers in 2011.” Since then, other FutureMetrics papers, and numerous other publications have demonstrated “that there is no carbon debt if fundamental sustainability criteria form the basis for the management of the forest landscape,” Strauss wrote.

According to Strauss, the core of the carbon debt story is a failure to grasp the dynamic nature of the growing working forests that are managed to produce the raw materials needed for the production of a wide variety of commodity items, such as building materials, paper, tissue, packaging and biochemicals.

Click [here](#) for more information.

Miscanthus research gets government funding to help the UK to meet net zero



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A project to facilitate more planting of the perennial bioenergy crop, Miscanthus, has been awarded over £150,000 of funding through the government’s Biomass Feedstocks Innovation Programme, to help contribute to 2050 net zero targets.

Miscanthus specialist, Terravesta, has been successful in its bid to secure Phase 1 funding for its OMENZ project which stands for ‘Optimising Miscanthus Establishment through improved mechanisation and data capture to meet Net Zero targets’.

According to Terravesta, success in Phase 1 of the project will enable upscaling to contribute to the recommendation from the Climate Change Committee’s Sixth Carbon budget in Phase 2. To fulfil the need of planting at least 30,000 hectares a year by 2035, so that 700,000 hectares are planted by 2050.

Click [here](#) for more information.

Hemp success for York



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The University of York, alongside the Biorenewables Development Centre (BDC), won funding under the Government's scheme for its HEMP-30 project, an initiative set up to accelerate the cultivation and use of industrial hemp in the UK between the 2020s and 2030s. Under the project, the team aims to increase the amount of industrial hemp in Britain from 800 hectares to 80,000 hectares.

The project will draw on the University's history in molecular plant breeding technology, which will be harnessed to modify and improve hemp strains to suit the needs of current and future markets.

Under the scheme the university will also survey the industrial hemp landscape (both domestic and abroad), and develop a 10 year roadmap to set hemp on the path to expansion.

Click [here](#) for more information.

Other Feedstocks

DS Smith exploring how seaweed fibres can be used as a raw material in paper and packaging products

DS Smith are exploring how seaweed fibres can be used as a raw material in paper and packaging products amid increasing demand for sustainable goods from customers and consumers alike

In an industry first, the move could see seaweed used across packaging network as an alternative fibre source to wood. Following initial testing, the company is also exploring the potential of seaweed to play a significant role in the purge on plastics by acting as a barrier coating to replace petroleum-based packaging used to protect many foodstuffs.

Given its wide range of uses, Seaweed in manufacturing is burgeoning market. The European seaweed industry alone is predicted to be worth almost £8billion by 2030, generating some 115,000 jobs.

The seaweed project is part of the company's £100m Circular Economy R&D programme announced earlier this year. Its work on natural fibres also includes other innovative natural materials such as straw, hemp, miscanthus and cotton, as well as from more unusual sources such as the daisy-flowered cup plant and agri-cultural waste like cocoa shells or bagasse - the pulp fibre left over after sugarcane is processed.

Click [here](#) for more information.

Biomethanol: possibilities towards a bio-based economy

Biomass conversion into energy and chemical vectors represents an interesting direction for reducing dependence on fossil fuels and safeguarding the environment. It signifies a viable approach from an economic as well as environmental perspective.

Methanol is one such vector that is extensively used as an energy source and a raw material for various value-added products. Methanol synthesized from fossil fuels such as natural gas and coal as raw materials is not sustainable and therefore, much interest has been diverted towards utilizing biomass for biomethanol synthesis. Thermochemical conversion, biological routes and other novel strategies demonstrate an effective pathway for biomethanol production.

Biomass-based feedstocks appear to be an ideal substrate for such pathways. Nevertheless, the concept of biomethanol refinery still seems to be in infancy considering the hurdles, both technical and economical, that impair the prospects of its commercialization.

This article discusses the various routes and substrates reported to date for biomass-based methanol production and their associated techno-economic assessments. An overview of challenges and future prospects of the technology is also discussed.

Click [here](#) for more information.

Events

European Biomass to Power 2021 Manchester, 17th-18th November 2021

This two day event will bring together key industry stakeholders to join our forum discussions and excellent networking, including senior representatives from Power Companies, Biomass Producers, Biomass Traders & Distribution Companies, Trade Associations, Renewable Energy Consultancies, EPC Contractors and OEMs, Regional & National Governments and Regulatory & Research Bodies.

Click [here](#) for more information.

Lignofuels 2022 Helsinki, 2nd – 3rd February 2022

Building on the success of Lignofuels annual conference series which celebrated its 10th anniversary by bringing 140+ senior level attendees to Finland, we are looking forward to returning to Helsinki for the 11th edition which will take place on the 2nd & 3rd of February 2022 – this time also featuring an exclusive site visit to UPM Lappeenranta Biorefinery.

The 2022 edition of the conference will once again bring together key lignofuels and advanced biofuels & materials stakeholders to join our forum discussions, hear latest industry case studies and benefit from excellent networking opportunities.

Click [here](#) for more information.

Low Carbon Agriculture Stoneleigh, 8th-9th March 2022

Supported by NNFCC, the event will provide practical guidance on sustainable land use, renewable energy generation and emission control, cutting through the noise to get to the heart of what new changes mean for farmers, by covering specific pressing topics such as policy, carbon storage, soil health, natural capital, net zero, renewable energy, low emission vehicles and agri-tech.

Low Carbon Agriculture show incorporates four expos including: 'Environmental Business Expo', 'Farm Technology Expo', 'Energy Now Expo' and 'Low Emission Vehicles Expo.'

Click [here](#) for more information.

European Algae Industry Summit Reykjavik, 27th – 28th April 2022

Following the success of its 9 previous editions and to mark our 10th year anniversary, ACI is pleased to be hosting next edition of European Algae Industry Summit on the 27th & 28th April 2022 in Reykjavik, Iceland

The conference will once again bring together key players within the algae industry including leaders from food, feed, nutraceuticals, pharmaceuticals and cosmetics across the globe to gain a deeper understanding of recent industry developments and economically viable applications and benefit from excellent networking opportunities.

Click [here](#) for more information.

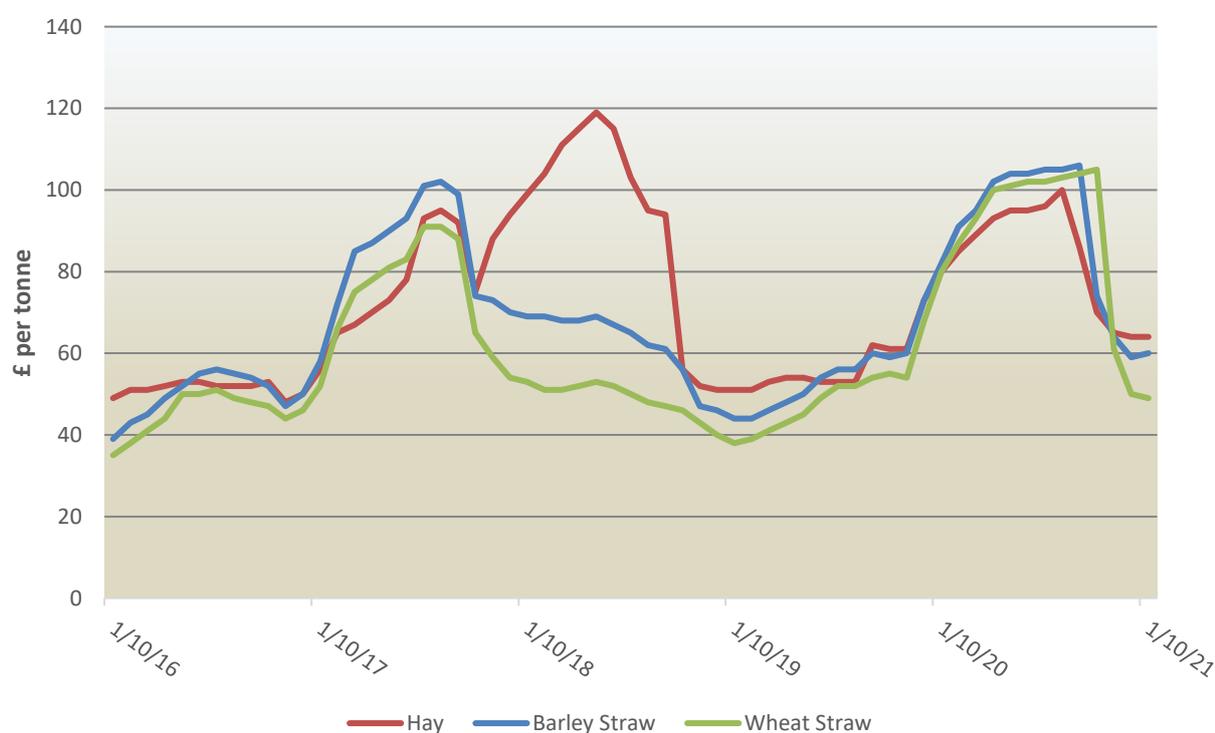
Feedstocks Prices

UK spot prices of bagged wood pellets, delivered. Grain and oilseed prices are across all main regions of the UK.

	Wood Pellets £/tonne, 5% VAT	Milling wheat £/tonne, ex- farm	Feed wheat £/tonne, ex- farm	Feed barley £/tonne, ex- farm	Oilseed rape £/tonne, ex- farm
High	328.13	234.00	203.00	190.00	568.00
Low	261.54	217.00	183.00	176.00	536.00
Average	290.55	228.00	193.46	180.92	551.92

For wood pellets prices we consider UK pellet traders advertised selling prices.
 For details on grains and oilseed prices, see [Farmers Weekly](#).

Monthly prices of ex-farm Hay and Straw in England and Wales. Prices shown are for 5 years up to October 2021.



Source: British Hay and Straw Merchants' Association, Defra

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NNFCC is a leading international consultancy with expertise on the conversion of biomass to bioenergy, biofuels and biobased products.

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