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

Bio-based Products

Issue Ninety-Seven

April 2020

Each month we review the latest news and select key announcements and commentary from across the biobased chemicals and materials sector.

Contents

Foreword

Welcome to April's Biobased Products News Review.

For supermarkets, choosing suitable packaging for food and other items, while keeping environmental issues in mind is a complex issue. The full life cycle of the packaging should be considered, from production to use to disposal. Compostable packaging is one type of packaging that has been increasingly used as a means to reduce environmental issues of plastic disposal. It is most commonly certified as 'industrially compostable' which means it requires collection and specific treatment processes, but in the UK, the infrastructure for widespread use of industrially compostable material is arguably not yet in place. The large supermarket Tesco have recently made the decision to exclude it from their current preferred materials, on the basis that fewer packaging options makes the recycling process easier for the consumer, given the complexities of compostable packaging disposal.

However, the BBIA disagree with Tesco's decision. Compostable packaging has the potential to serve as a form of packaging where other types of packaging are unsuitable, like teabags and food caddy liners. While sufficient infrastructure and collection services are not in place, the BBIA say that compostable packaging in these types of applications is no worse that traditionally used plastics, which are not collected or effectively recycled. Some compostables however would be home compostable or could be treated in the small number of appropriate sites in the UK. Work is needed to develop the collection infrastructure for compostables, which Tesco and other supermarkets could play a part in.

Starbucks are working towards recyclable and compostable cups for their coffee and assorted drinks. They are to trial a cup made from biobased polybutylene succinate (BioPBS) in several stores to gauge customer experience with the new cup technology, and they also plan to investigate if the technology can indeed be recycled easier than their current cups. Bio PBS is polybutylene succinate with the succinic acid component derived from biomass such as corn, and it offers good heat resistance and decomposes in soil – potentially ideal material for a coffee cup.

Read on for the latest news.

Policy

Biobased industries on EU's industrial strategy

The European Commission recently published its new Industrial Strategy for a globally competitive, green and digital Europe.

Reacting in a statement, the Bio-based Industries Consortium (BIC) emphasised the progress already made by the bio-based industry in realising the Strategy's objectives while emphasising its readiness to take the Strategy forward.

Click here for more information.

Biobased industries role under EU's circular economy plan

The Bio-based Industries Consortium (BIC), Europe's leading industry association putting innovation, circularity and sustainability at the heart of the European bioeconomy, applauded the publication of the European Commission's new Circular Economy Action Plan.

The bio-based industries, already recognised as pioneers in providing sustainable and circular solutions, stands ready to assist the European Commission in achieving the Action Plan's objectives across several policy areas.

For instance, the sector is already actively putting alternative bio-based and bio-degradable products on the market. The proposed EU Strategy for Textiles also presents opportunities for Europe's flourishing bio-based textiles sector, which is based on using sustainably sourced biomaterials such as wood cellulose, biobased fibers and other sustainable alternatives.

At the same time, while the bio-based industries are already proactively valorising industry's side and residual streams, the sector also enables the valorisation of bio-waste by transforming it into bio-based products and materials.

The realisation of the next public-private partnership for the bio-based industries – 'Circular Bio-based Europe' – and the effective implementation of the EU's Bioeconomy Strategy will, nonetheless, be crucial for guaranteeing the bio-based industries proactive role in providing these sustainable, bio-based solutions that make the EU's Circular Economy Action Plan truly circular.

Click here for more information.

EUBP has concerns over EASAC report

PxHere

According to EUBP (European Bioplastics), the statements on bio-based and biodegradable plastics by EASAC (European Academies' Science Advisory Council) implicitly lead to some very questionable recommendations to EU institutions and citizens.

The recently published report 'Packaging plastic in the circular economy' by EASAC doubts that bio-based plastics are better for the environment, although it has been proven by third party researchers and many peer reviewed Life Cycle Assessments that bioplastics made from sustainably grown biomass carry multiple environmental benefits over their fossil counterparts.

Raising mainly emotional and not science-based arguments, EUBP says that the report is also critical about biodegradable plastics. It's posting the idea that biodegradability and durability are properties that cannot coexist, making biodegradable plastic an 'elusive' target. This claim is disavowed by many products that are present on the market today. The report also questions how 'soon' and 'well' biodegradable plastics degrade.

Click here for more information.

Markets

Carboxymethyl cellulose acquisition for Nouryon

Nouryon is continuing its growth acceleration plans with an agreement to acquire the carboxymethyl cellulose (CMC) business of J.M. Huber Corporation. The transaction will significantly broaden Nouryon's portfolio of products in CMC, a sustainable, bio-based water-soluble polymer used as a thickener, binder, stabilizer and film former. The companies have largely complementary positions in CMC end markets, which include home and personal care, mining, food, pharmaceuticals, and paper and packaging.

The acquisition underlines Nouryon's strategy of investing in attractive growth markets, including bolt-on acquisitions. The business manufactures a complete line of CMC grades and serves customers in over 80 countries, generating sales of around €135 million. It includes a world-class manufacturing facility as well as an advanced R&D facility located at Äänekoski, Finland. Around 240 employees from the business will transfer to Nouryon.

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MoU for personal care ingredient development

PickPik

Deinove, a French biotech company that uses a disruptive approach to develop innovative antibiotics and bio-based active ingredients for cosmetics, announced having signed a Memorandum of Understanding (MoU) with the Israeli group Sharon Laboratories, a specialist in preservative solutions for personal care. It aims at entering into an exclusive partnership for the development and marketing of a range of new bio-based solutions, including bioactives, arising from Deinove's platform.

Sharon Laboratories is a world leader in preservative solutions for personal care. Driven by the growing consumer and brand demand for

naturally and sustainably sourced ingredients, Sharon Laboratories wishes to entrust Deinove with joint development of a new range of bio-based and differentiated solutions.

This collaborative R&D program will benefit from Deinove's accumulated expertise in leveraging the properties of its collection of rare microorganisms. It will expand the potential of Deinove's biotechnology platform to a substantial and promising market, building on Sharon Laboratories 40 years of experience in the personal care preservation field. The global cosmetic market is seeking natural solutions to replace existing synthetic ingredients. As the natural cosmetics segment continues to grow, the demand for such ingredients will grow with it.

The draft agreement grants an exclusivity in various ingredient and functions to Sharon Laboratories, keeping Deinove's free to develop additional collaborations.

Click here for more information.

Partnership to create biobased Dyneema

Royal DSM, a global science-based company in Nutrition, Health and Sustainable Living, SABIC, a global leader in the chemical industry, and UPM Biofuels, a leading producer of sustainable raw materials, announced a partnership that will help to reduce the environmental footprint of Dyneema, the world's strongest fibre. The collaboration will see Dyneema transition to bio-based feedstock leveraging SABIC's ground-breaking Trucircle solutions for certified renewable products. As such, DSM is delivering on its commitment to improve the sustainability footprint of Dyneema, moving towards a circular, bio-based economy.

In December 2019, DSM announced ambitious sustainability targets for its Dyneema high performance fibres. This new partnership represents an important step in realizing the goal of sourcing at least 60% of its feedstock from bio-based raw material by 2030. The transition to bio-based feedstock will maintain the unique properties of Dyneema, enabling customers to adopt a more sustainable solution without compromising process efficiency or final product performance. The Dyneema bio-based material will be carrying the globally recognized ISCC Plus certification and will not require re-qualification of downstream products.

Click here for more information.

Renewable electricity for Gevo

Pxfuel

Gevo, Inc. and partners Juhl Energy (Juhl) and Harrison Street Investors held a ribbon cutting ceremony to celebrate the completed construction of two wind turbines that will supply up to 5.0 MW of fully renewable electricity to Gevo subsidiary Agri-Energy's production plant located in Luverne, MN. The electricity generated from wind will be wired directly to Agri-Energy, which is expected to enable it to utilize the emissions-free energy towards a lower carbon intensity score under the Low Carbon Fuel Standard in California. The wind electricity is expected to be on-line and available to Agri-Energy in April.

In connection with the wind project, Agri-Energy invested $1.5 million in the Series A preferred stock of Juhl's asset subsidiary Juhl Clean Energy Assets (JCEA). Juhl, Harrison Street and other JCEA investors funded the remainder of the approximate $8.75 million project cost. Juhl will be the owner and operator of the wind project. Agri-Energy has agreed to purchase the electricity from the City of Luverne and will also purchase the Renewable Energy Credits associated with the wind project from an affiliate of Juhl.

Click here for more information.

Research & Development

Biotech routes to methacrylic acid

A review published in Frontiers in Bioengineering and biotechnology reviews the potential of biobased routes from sugars to the large volume commodity, methacrylic acid, involving fermentation-based bioprocesses. The researchers cover the key progress over the past decade on direct and indirect fermentation-based routes to methacrylic acid including both academic as well as patent literature. Finally, they take a critical look at the potential of biobased routes to methacrylic acid in comparison with both incumbent as well as newer greener petrochemical based processes.

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Orange tree extracts analysed

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Orange orchards are typical Mediterranean crops and a major feature of the heritage of the Mediterranean basin, where they play an important environmental and economic role. Their high availability, low price, and potential industrial application make the development of new and valuable uses of the orange's biomass of high interest. Recent research was focused:

- on recognition and mapping of orange cultivation in the Basilicata region;
- on the evaluation of the antioxidant capacity of extracts;
- on identification of extractives' traits.

To achieve these objectives, the anti-oxidative properties and chemical compounds of the extracts from orange orchard biomass were analysed. Different extraction techniques were applied, including maceration, ultrasound-assisted extraction, accelerated solvent extraction, and autoclaving. Results demonstrated the potential antioxidant activity of the bark and wood of orange-tree biomass, which has not been investigated before.

Click here for more information.

Circular economy in European bioeconomy clusters

Biomass is projected to play a key role in meeting global climate targets. To achieve a resource-efficient biomass use, European bioeconomy strategies increasingly consider the concept of a circular bioeconomy (CBE). The term CBE is defined via a literature review which analyses the concept's role in north-west European bioeconomy clusters through interviews. Researchers identify strategies regarding the clusters' feedstock and product focus, and investigate what role biorefineries, circular solutions, recycling and cascading play. They discuss gaps in CBE literature and the potential contributions of the CBE to sustainability. The analysed bioeconomy clusters move towards a CBE by increasingly considering residues and wastes as a resource, developing integrated biorefineries and focusing more on material and high value applications of biomass. However, there is so far only little focus on the end-of-life of bio-based products, i.e. on circular product design, recycling and cascading. Key challenges for implementing circular strategies are policies and regulations, costs and the current small size of bio-based markets.

Amongst the product sectors the interviewees identified as promising for the bioeconomy, plastics and construction & building materials have most recycling and cascading potential. While the CBE could contribute to improving the sustainability of the bioeconomy, the concept is not inherently sustainable, and its potential trade-offs need to be addressed. Especially social aspects, cascading, circular product design, and aspects related to product use seem to be underrepresented in CBE literature, while the topics biorefinery, wastes and residues as well as waste management are significantly covered.

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Catalytic oxidations for biorefinery review

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The role of bio- and chemo-catalytic aerobic oxidations in the production of commodity chemicals in a bio-refinery is reviewed in a new article published in the Frontiers in Chemistry Journal. It finds that the situation is fundamentally different to that in a petrochemicals refinery where the feedstocks are gaseous or liquid hydrocarbons that are oxidized at elevated temperatures in the vapor or liquid phase under solvent-free conditions.

In contrast, the feedstocks in a biorefinery are carbohydrates that are water soluble solids and their conversion will largely involve aerobic oxidations of hydroxyl functional groups in water as the solvent under relatively mild conditions of temperature and pressure. This will require the development and use of cost-effective and environmentally attractive processes using both chemo- and biocatalytic methods for alcohols and polyols.

Click here for more information.

Biochemical GHG calculations

In a recent paper, biochemicals with the potential to substitute fossil reference chemicals in Germany were identified using technological readiness and substitution potential criteria. Their greenhouse gas (GHG) emissions were quantified by using life cycle assessments (LCA) and their economic viabilities were determined by comparing their minimum selling prices with fossil references' market prices. A bottom up mathematical optimization model, BioENergy OPTimization (BENOPT) was used to investigate the GHG abatement potential and the corresponding abatement costs for the biochemicals up to 2050. BENOPT determines the optimal biomass allocation pathways based on maximizing GHG abatement under resource, capacity, and demand constraints. The identified biochemicals were bioethylene, succinic acid, polylactic acid (PLA), and polyhydroxyalkanoates (PHA). Results show that only succinic acid is economically competitive. Bioethylene which is the least performing in terms of economics breaks even at a carbon price of €420 per ton carbon dioxide equivalent (€/t CO_2 eq). With full tax waivers, a carbon price of 134 €/t CO_2 eq is necessary. This would result in positive margins for PHA and PLA of 12% and 16%, respectively. From the available agricultural land, modeling results show high sensitivity to assumptions of carbon dioxide (CO_2) sequestration in biochemicals and integrated biochemicals production. GHG abatement for scenarios where these assumptions were disregarded and where they were collectively taken into account increased by 370% resulting in a 75% reduction in the corresponding GHG abatement costs.

Click here for more information.

PEF building blocks progress

PxHere

The next-generation polymer poly(ethylene 2,5-furandicarboxlate) (PEF) has gained great popularity, since it is associated with significant reduction of energy use and GHG emissions compared to petroleum based plastics, as well as superior barrier properties. This drop-in polymer is a promising 100% bio-based alternative to its petroleum-based counterpart poly(ethylene terephthalate) (PET). PEF can be effectively synthesised by polymerisation between 2,5-furandicarboxylic acid (FDCA) and ethylene glycol (EG), which represent biomass-derived building blocks. These bio-building blocks are an important commodity and platform chemicals that can be used for a variety of applications, including the synthesis of PEF. A recent review covers recent progress in the production of novel bio-building blocks for the preparation of PEF. Among various synthesis methods, the researchers reviewed the catalytic conversion of biomass-derived hydroxylmethylfurfural (HMF) into FDCA and the biological route from biomass feedstock into EG. In addition, they covered recent progress in the synthesis of HMF from biomass since a reliable supply of HMF is important for the synthesis of FDCA. Finally, research goals and challenges for future development of bio-building blocks production were proposed.

Click here for more information.

CA of bio and fossil plastic

A recent review assesses the state-of-the-art in comparative Life Cycle Assessment of fossil-based and bio-based polymers. Published assessments are critically reviewed and compared to the European Union Product Environmental Footprint (EU PEF) standards. No published articles were found to fully meet the standards, but the critical review method was used to classify the articles by their level of compliance. 25 articles partially met the PEF standards, giving 39 fossil-based and 50 bio-based polymer case results.

Ultimately, it was possible to compare seven bio-based polymers and seven fossil-based polymers across seven impact categories (energy use, ecotoxicity, acidification, eutrophication, climate change, particulate matter formation and ozone depletion). Significant variation was found between polymer types and between fossil-based and bio-based polymers, meaning it was not possible to conclusively declare any polymer type as having the least environmental impact in any category.

Significant variation was also seen between different studies of the same polymer, for both fossil-based and bio-based polymers. In some cases, this variation was of the order of 400%. Results suggest that a large part of this variation is related to the Life Cycle Assessment methodologies applied, particularly in the end-of-life treatment, the use of credits for absorbed Carbon Dioxide, and the allocation of multifunctional process impacts. It is proposed that the PEF standards should be adopted more widely in order to homogenise the methods used and allow meaningful comparison between LCA studies on fossil-based and bio-based polymers, and between studies of the same polymers.

Click here for more information.

Waste management of biobased products

Wallpaper Flare

A recent article focuses on the end-of-life management of bio-based products by recycling, which reduces landfilling. Bioplastics are very important materials, due to their widespread use in various fields. The advantage of these products is that they primarily use renewable materials. At its end-of-life, a bio-based product is disposed of and becomes post-consumer waste. Correctly designing waste management systems for bio-based products is important for both the environment and utilization of these wastes as resources in a circular economy. Bioplastics are suitable for reuse, mechanical recycling, organic recycling, and energy recovery. The volume of bio-based waste produced today can be recycled alongside conventional wastes. Furthermore, using biodegradable and compostable bio-based products strengthens industrial composting (organic recycling) as a waste management option. If bio-based products can no longer be reused or recycled, it is possible to use them to produce bioenergy. For future effective management of bio-based waste, it should be determined how these products are currently being managed. Methods for valorising bio-based products should be developed. Technologies could be introduced in conjunction with existing composting and anaerobic digestion infrastructure as parts of biorefineries. One option worth considering would be separating bio-based products from plastic waste, to maintain the

effectiveness of chemical recycling of plastic waste. Composting bio-based products with biowaste is another option for organic recycling. For this option to be viable, the conditions which allow safe compost to be produced need to be determined and compost should lose its waste status in order to promote bio-based organic recycling.

Click here for more information.

Polymers

USDA certified BioRice

Natural Resins, LLC announced that it has earned the U.S. Department of Agriculture (USDA) Certified Biobased Product label. The products:

- BioRice™ BR-PP50-25, and
- BioRice™ BR-PP50-8

are now able to display a unique USDA label that highlights its percentage of Biobased content. Third-party verification for a product's Biobased content is administered through the USDA BioPreferred Program, an initiative created by the 2002 Farm Bill (and recently reauthorized by the 2018 Farm Bill). One of the goals of the BioPreferred Program is to increase the development, purchase and use of Biobased products. Natural Resins, LLC worked with Beta Analytic and The Safety Equipment Institute an affiliate of ASTM International throughout the process.

The USDA Certified Biobased Product label displays a product's Biobased content, which is the portion of a product that comes from a renewable source, such as plant, animal, marine, or forestry feedstocks. Utilizing renewable, Biobased materials displaces the need for non-renewable petroleum-based chemicals. Biobased products, through petroleum displacement, have played an increasingly important role in reducing greenhouse gas (GHG) emissions that exacerbate global climate change. Biobased products are cost-comparative, readily available, and perform as well as or better than their conventional counterparts.

Click here for more information.

Wood fibre composites comparison

Needpix

While bio-based composites (bio-based plastics reinforced with natural fibres) have been discussed as potential sustainable alternatives to petroleum-based plastic composites, there are few quantitative environmental impact assessments of these materials. An article presents comparisons of petroleum-based and bio-based plastics as well as their composites to:

- assess environmental impacts from plastics and composite production;
- and determine which environmental impacts can be mitigated through production of bio-based composites, based on current manufacturing methods.

Click here for more information.

Renewable dispersible polymer

Needpix

Wacker is expanding its new product line of polymeric binders based on renewable raw materials. With its Vinneco brand, the Munich-based chemical Group will offer a re-dispersible polymer powder manufactured using biobased acetic acid. The new re-dispersible polymer powder Vinneco 5044 N is mainly suitable for producing construction materials, such as waterproofing membranes or dry-mix mortars for external thermal insulation composite systems.

Ecological and sustainable building construction plays a key role in global efforts to reduce climatically harmful carbon dioxide. As architects and property developers increasingly turn to renewable raw materials, ever more manufacturers of construction materials are now offering such solutions.

Click here for more information.

Borealis produces renewable PP

Borealis has started to produce polypropylene (PP) based on Neste-produced renewable feedstock in its production facilities in Kallo and Beringen, Belgium. This marks the first time that Borealis has replaced fossil fuel-based feedstock in its large-scale commercial production of PP. The Belgian plants were recently awarded by the International Sustainability and Carbon Certification (ISCC) organization with ISCC Plus certification for its renewable PP. Taking its commitment to the next level for advancing the circular economy, Borealis once again furthers its EverMinds ambitions. This path breaking venture in sustainable production is being driven in close collaboration with upstream and downstream value chain partners such as Neste and Henkel. It also aligns with the Borealis aim to ensure that 100% of its consumer products are recyclable, reusable, or produced from renewable sources by 2025.

Click here for more information.

Chemicals

Epichlorohydrin scale up

Bio-based chemical company Advanced Biochemical (Thailand) Co., Ltd. has announced a capacity increase at its plant in Map Ta Phut, Thailand, which will now produce 120,000 mt/year of bio-based epichlorohydrin (ECH) – an increase of 20,000 mt/year. Permission for this increase was granted by the Industrial Estate Authority of Thailand.

The capacity increase at ABT's plant was made possible thanks to improvements in process efficiency and process optimizations in production. Less waste is also being produced at the plant due to optimized recycling technology.

A wholly-owned subsidiary of the Vinythai public company, ABT has produced its bio-based ECH since 2012 using a patented technology, based on natural and renewable glycerine instead of propylene, a fossil fuel derivative.

Click here for more information.

Consumer Products

New cup solution in Starbucks

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On its journey to develop a more recyclable and compostable hot cup solution by 2022, Starbucks announced details for in-market testing of a more sustainable cup technology from the NextGen Cup Challenge. A new BioPBS-lined cup will be in circulation in select stores in Vancouver, Seattle, San Francisco, New York and London.

The tests are designed to provide key insights and learnings into the partner and customer in-store experience with the goal of no noticeable differences in performance between the new cup and current cup. In addition, in conjunction with Closed Loop Partners, Starbucks is conducting separate tests designed to validate that this particular cup technology can be recycled more readily than the current cup.

Click here for more information.

BBIA on Tesco's strategy for packaging

Tesco has recently issued an updated series of guidelines on the preferred materials and formats that it will accept as packaging. In these updated guidelines Tesco has included all compostable materials in its 'Red list' under the category of packaging "Not to be used as customers cannot easily recycle (UK)".

Tesco explains this decision as an attempt to simplify the choices customers have to make over how to recycle their packaging when they take it out of the store. By reducing the number of packaging options open to their supply chain and simplifying material choices, it hopes to be able to communicate with consumers more easily on how to recycle those materials and use materials that are more easily recyclable, given the existing UK collection infrastructure.

Tesco also states that its position will change as infrastructure matures and this decision only reflects their current thinking.

Whilst BBIA understand Tesco's desire to simplify what is a complex, international supply chain, we respectfully disagree with its choice. As the Plastics Pact (to which Tesco is a signatory) made clear in guidelines for the use of compostable materials, published on 6th February 2020, there are certain uses for which plastics are simply not suitable. These currently include teabags, coffee pods, sticky labels on fruit and vegetables, ready meal trays and food caddy liners and that list continues to grow as collections and market uptake develop.

Click here for more information.

Patents

Biobased, UV-curable nail poliosh compositions and related methods

The disclosure relates to aqueous and non-aqueous radiation-curable nail coating compositions having a substantial amount of bio-based material in the corresponding polymeric binder. The compositions incorporate a vinyl-functionalized epoxidized bio-based unsaturated compound, which provides substantial bio-based content, vinyl functionality for curing, and soft segment functionality for ease of removal. The aqueous coating compositions generally include:

a. a bio-based polymeric binder including a reaction product between a polyurethane pre-polymer and the vinyl-functionalized epoxidized bio-based unsaturated compound,
b. a photoinitiator, and
c. water.

The non-aqueous coating compositions generally include:

a. a bio-based polymeric binder including the vinyl-functionalized epoxidized bio-based unsaturated compound, a reactive diluent, and a vinyl functional oligomer, and
b. a photoinitiator.

Related methods of forming a nail coating are also disclosed.

Click here for more information.

Polyarylene ether copolymer

A polyarylene ether copolymer comprising

(i) at least one block comprising in polymerized form A) isosorbide, isomannide, isoidide or a mixture thereof and B) at least one unit comprising at least one difunctional compound comprising at least one dichlorodiaryl sulfone, a dichlorodiaryl ketone or a mixture thereof and
(ii) at least one block comprising in polymerized form C) at least one polyalkylene oxide, a process for its preparation and its use in the preparation of coatings, films, fibres, foams, membranes or moulded articles.

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Low impact CO_2 emissions polymer compositions and method of preparing same

Blended polymer compositions and methods of making same may include a first component including one or more biobased polymer compositions; a second component including one or more recycled polymer compositions; and an optional third component including one or more virgin petrochemical resins, wherein the wt % of each component is selected such that the polymer composition exhibits an Emission Factor Blend of less than or equal to 1.0 kg CO_2/kg of the blended polymer composition.

Click here for more information.

Events

SynbiTEC
London, 6th-7th July 2020

SynbiTECH is Europe's leading international synthetic biology conference for innovators and experts in synthetic biology research, commercialisation, investment and policymaking. SynbiTECH 2020 will focus on the greatest opportunities and challenges for building a multibillion-dollar synthetic biology industry that will contribute to the fast-growing bioeconomy.

Click here for more information.

EUBCE
Marseille, *6th-9th July 2020*

Event rescheduled due to Covid-19 outbreak.

This world leading event for the biomass sector is a global forum for exchanging knowledge and information on the latest technological developments and innovative biomass applications.

Click here for more information.

IFIB
Rome, 1st-2nd October 2020

The IFIB 2020 (International Forum on Industrial Biotechnology and Bioeconomy) Enterprise Europe Network Partnering Event is organized by InnovhubSSI. Two days of pre-arranged face-to-face bilateral meetings (B2B) between Startups, Companies, Universities, public and private Research Centres in the field of industrial biotechnology and bioeconomy.

Participants will come from Europe and beyond to find potential partners for collaborations, business development, licensing agreements, joint ventures, research projects, exchange of experiences and partnership opportunities.

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EFIB
Frankfurt, 5th-6th October 2020

EFIB is the market leading annual event in Europe for Industrial Biotechnology and the Bioeconomy.

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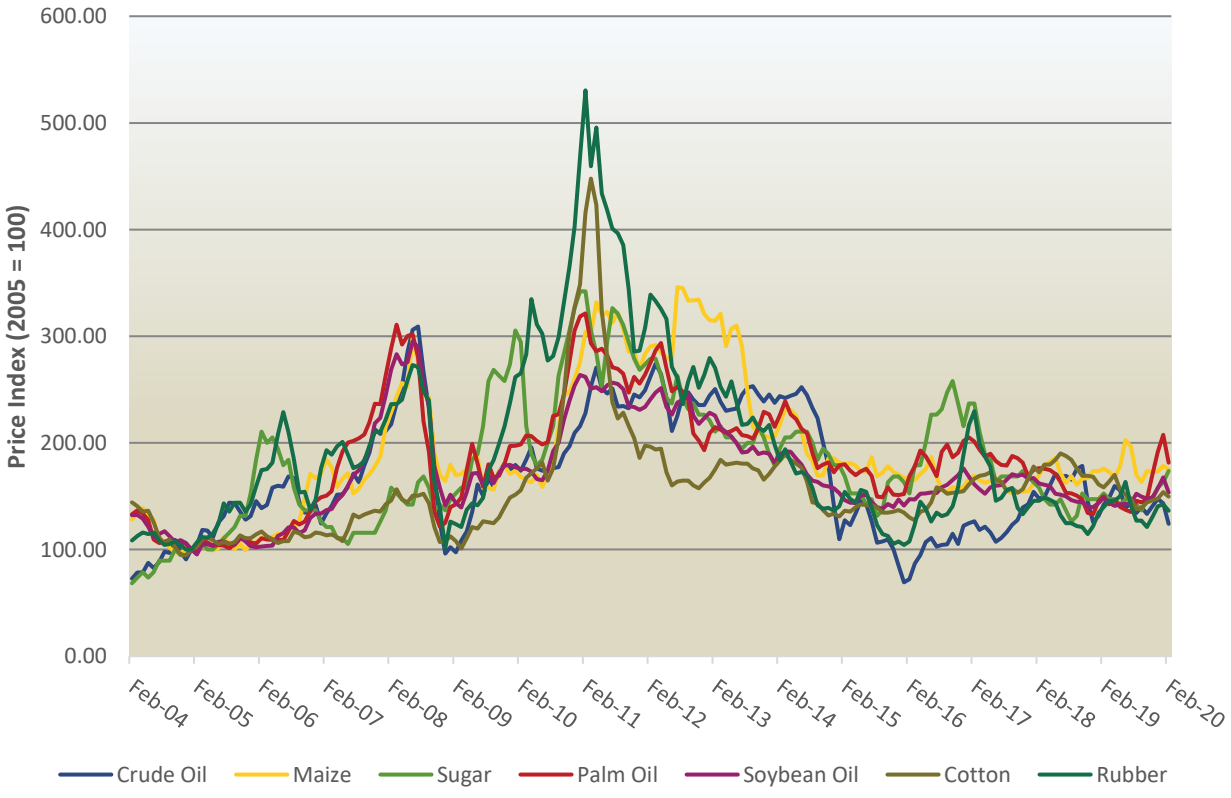
Price Information

Spot Prices of feedstocks as of today and five years ago, and percentile price change. Arrows indicate rise (↑), constant (–) or fall (↓) from previous month.

Item	Price, US$ (Feb 15)	Price, US$ (Feb 20)	Price Change
Crude oil (petroleum, barrel)	54.79 (↑)	53.35 (↓)	-3%
Maize (corn, metric ton)	173.70 (↓)	168.71 (↓)	-3%
Sugar (pound)	0.32 (↓)	0.33 (↑)	3%
Palm oil (metric ton)	723.04 (↑)	728.81 (↓)	1%
Soybean oil (metric ton)	762.61 (↓)	800.41 (↓)	5%
Cotton (kilogram)	1.54 (↑)	1.69 (↓)	10%
Rubber (kilogram)	1.82 (↑)	1.61 (↓)	-12%

For details on indexes please see www.indexmundi.com/commodities; Ethanol prices from Govt of Nebraska at www.neo.ne.gov/;

Raw materials 16-year Price Indices



For details on the nature of these commodities please see www.indexmundi.com/commodities

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