The Bioeconomy Consultants

NNFCC

Bio-based Products

News Review

Issue Sixty-Seven

October 2017

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 October's free edition of NNFCC's Biobased Products News Review.

Sugar is an integral product of the bioeconomy, and ubiquitous across several sectors. It is, of course, a massive component of the food industry, but is also hugely important in the biobased chemicals and biofuels industry, as it can be fermented into a numerous and expanding range of commodity and fine chemicals.

Global sugar supply is produced predominantly through sugar cane cultivation, with cane meeting over 80% of the worlds demand. In Europe, sugar is produced from sugar beet, a tuberous crop suitable for cultivation in temperate climates.

Around 50% of global sugar beet cultivation takes place in the European Union and on the 30th September a key legislation, known as the 'Sugar Regime' was lifted, granting a huge opportunity for Europe's sugar industry in the coming years.

The Sugar Regime was part of the EU's Common Agricultural Policy (CAP), a policy created to stimulate greater farm production in the EU. One of the main objectives of the CAP was to encourage agricultural production with financially rewarding and stable prices for farmers and thereby achieve self-sufficiency in the continent's food production. Sugar was the only agricultural sector in the European Union where production was subject to a quota system. At the time of introduction, quotas, together with a support price for sugar production, gave a welcome incentive to achieve productivity and self-sufficiency goals in the sugar sector.

However, times change and agriculture moves on. The CAP was reformed to move away from product (crop) payments to direct farm payments. For the sugar industry, a significant reform package was agreed in 2006. EU member states agreed to progressively reduce subsidies for sugar and sugar beet and phase out the payment of export refunds. Alongside the reduction of payments, the reform also included the removal of the quota system. With the support of a €5.4 billion package in compensation, the EU sugar industry voluntarily restructured itself, reducing the production quota by 6 million tonnes and creating an industry able to compete in a deregulated EU market, with prices closer to world prices, and ready to benefit from new commercial opportunities, in both domestic and world markets.

Under the CAP, the quota for sugar production was 13.3 million tonnes. Production volumes above this quota could be exported, but only up to the World Trade Organisation limit of just under 1.4 million tonnes. EU sugar production in the 2016/2017 marketing year was 16.84 million tonnes.

The vast majority of sugar produced under quota or imported from less-developed countries is used by the EU food and drink industry for both the domestic market and the

export of processed products. Only a small portion of the sugar production is marketed and directly consumed as sugar. Out-of-quota sugar production is used for exports (up to the export limit), a variable volume goes for bioethanol production (1.35 million tonnes in 2016/2017) and to specified chemical uses (800 000 tonnes estimated for 2016/2017).

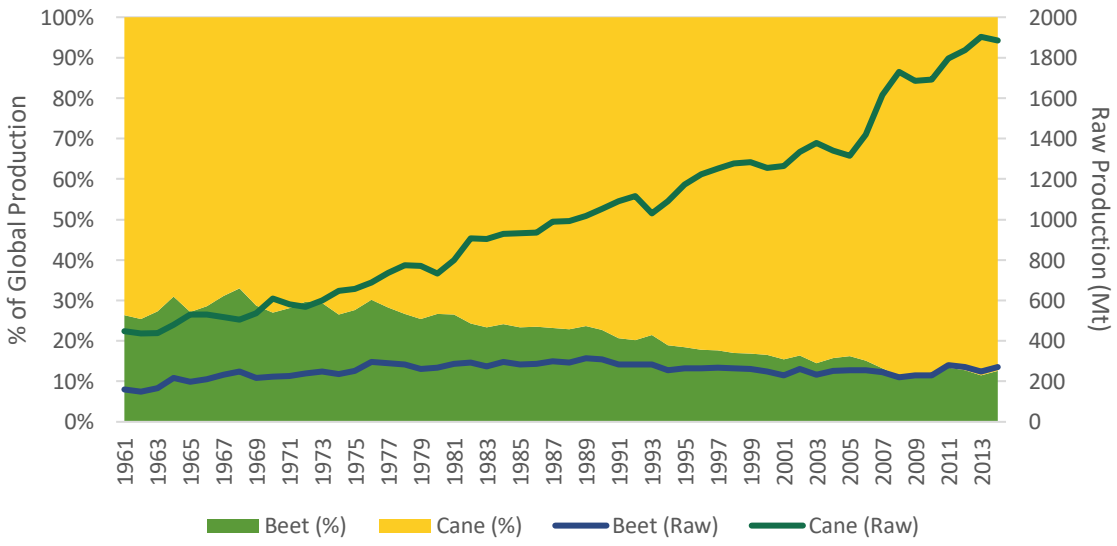
EU officials anticipate that between 2016 and 2026 sugar production will increase by 6%. Isoglucose production could triple from 700 000 tonnes to 2.3 million tonnes. Imports will continue to drop from 3.0-3.5 million to 1.8 million tonnes and exports are expected to increase from 1.3 million tonnes to 2.5 million tonnes.

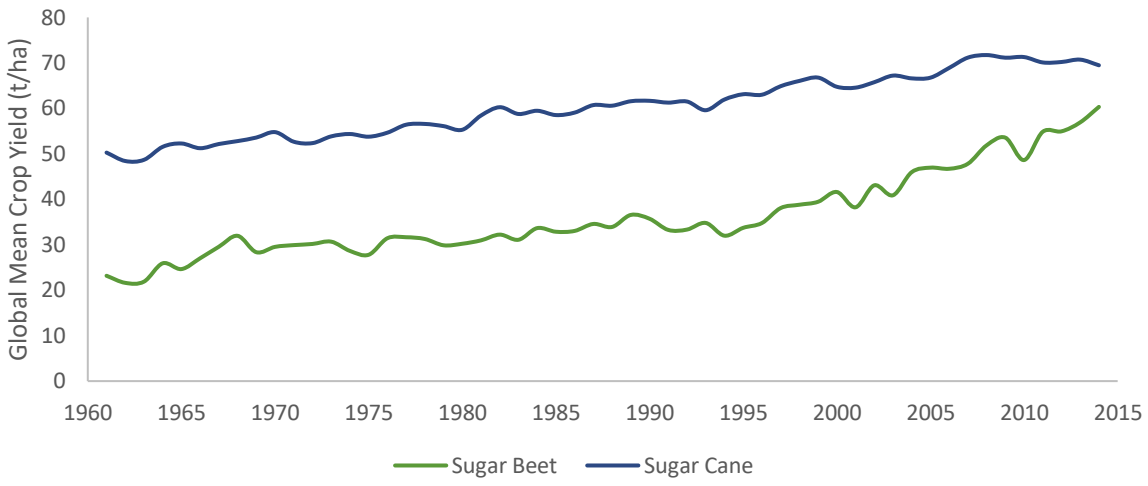
For the upcoming harvest, no longer bound by the limitations of the quota, an increase in production of roughly 20% (to a level of 20.1 million tonnes) is expected. This increase results from both an increase in area and higher yields because of good climatic conditions. This production, however, follows two marketing years with relatively low production levels.

The increase of production is likely to be compensated by a further reduction of imports, an increase in exports - which are expected to double to 2.8 million tonnes - and a possible rebuilding of stocks which were at their lowest ever level in summer 2017.

Sugar beet is a highly attractive feedstock for the European bioeconomy. In respect to fermentable sugar production the land efficiency of sugar beet is unrivalled. Beet yields have increased significantly in recent decades whereas cane yields have somewhat plateaued. Furthermore, the sugar content of beet (15-20% dry matter) is higher than cane (8-15% dry matter). It is notable that recent UK and Dutch sugar beet yields have outperformed Brazilian cane yields.

As shown in the Figures below, where sugar cane production has steadily increased over the last 50 years, sugar beet production has remained roughly constant, It is now anticipated that this will increase in the absence of the quotas, dovetailing with the aforementioned continued yield increases compared to cane, further increasing sugar beet's profitability.





Sugar beet serves as a useful rotation crop for farmers and provides several environmental benefits: because sugar beet pests and diseases are different from those of arable crops, its cultivation as part of a crop rotation reduces disease and pest levels, and therefore reduces pesticide application. Plant residues from the crop break down slowly and release nutrients to the soil reducing the level of fertiliser applied to following crops. Cultivation of sugar beets increases on-farm crop diversity; reduction in crop diversity is considered to be a contributing force behind reductions in farm biodiversity, especially in farmland birds.

Of key importance to the EU fermentation industry and biobased products producers is the impact of removing the quota restrictions on sugar prices. Since spring 2017, international prices have fallen on the anticipation that will sugar will return to a world surplus after two consecutive years of deficit. In September 2017, world market prices were around €311 per tonne. EU domestic prices have remained stable in recent months at around €501 per tonne however prices are expected to drop and become closer to world prices.

What price will represent a 'new normal' for EU sugar will depend on how the industry reacts to the changes and how the EU views the use of import tariffs. However, the probable increase in European production, and decreasing cost of sugar can only be positive for EU fermentation companies, biobased product producers, and the growth of the bioeconomy.

Read on for the latest news.

Policy

Paper tracks evolution of European bioeconomy policy

With the Lisbon agenda, the EU recognizes the important role of an economy driven by innovation in tackling contemporary societal challenges. This transition to innovative and sustainable modes of production and consumption is being shaped by policy efforts and policy instruments, including regulations, certifications, standards and sustainability assessment tools. In this paper, we present an overview of the different public policies and policy measures behind the establishment of a European sustainable bio-based economy. The aim of the paper is to describe the evolution of the policies and policy instruments that affect the establishment of a sustainable and innovative bio-based economy, in order to understand its limits, contradictions and existing gaps.

Click here for more information.

Dutch province uses competition model to source biobased materials for construction

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Located in the south-west of the Netherlands, the Province of Zeeland's government recently undertook an innovation procurement to commission a public works contract to widen a major road in the Netherlands from one to two lanes, and to build four new viaducts. To take into account the challenges of purchasing bio-based solutions (such as geotextiles, biodegradable underground tree anchoring systems, etc), as these are not widely available on the mainstream market, Zeeland carried out a process of competitive dialogue.

This type of approach enabled them and potential contractors' greatest flexibility in meeting their needs. During the dialogue process, the companies who responded to the initial expression of interest were asked to deliver two specific bio-based products, plus one or more products from a pre-identified list of market-ready bio-based options for on-site piloting.

The bio-based products were applied to the road construction itself for construction of the road's under-layer. Piloting of was undertaken for the installation of cabinets for traffic light installations made from bio-based composites.

Click here for more information.

Markets

Technavio forecasts growth in Bio-Polyamide market

Bio-polyamide (bio-PA) is an amide polymer, which is manufactured from renewable or bio-based raw materials. Bio-PAs are mainly derived from sebacic acids, commonly found in castor oil. The emphasis of the modern polymer science is on the production of polymers from renewable resources. Of the biopolymers presently known to the chemical industry, bio-polyamides (bio-PAs) are known as one of the most sophisticated biopolymers derived from renewable plant sources. The use of sustainable products is on the rise. It has impacted the consumer behaviour in terms of opting for eco-friendly products. Thus, several players in the market are opting for sustainable, eco-friendly bio-PA production processes. Most of these bio-based PAs are made from sebacic acid, which is derived from castor oils.

Technavio's analysts forecast the global bio-polyamide (BIO-PA) market to grow at a CAGR of 11.52% during the period 2017-2021.

The report covers the present scenario and the growth prospects of the global bio-polyamide (BIO-PA) market for 2017-2021. To calculate the market size, the report considers the sales of bio-PA products used in automotive, electrical and electronics, and packaging sectors.

Click here for more information.

Coherent Market Insights offer view of the Bio-Butanol market

Bio-butanol is an alcohol, which is used as a fuel or organic solvent. It is prepared by fermentation of sugar, starch or cellulosic feedstock such as wheat, sugar beet, corn, straw, and wood. The purpose of using bio-butanol is to reduce consumption of crude oil. They have higher octane number, larger flammability limits, higher flash point and higher heat of vaporization. Bio-butanol easily blends with gasoline due to its low vapor pressure. It contains as much as energy as gasoline and its non-corrosive nature gives it advantage over bioethanol.

Bio-butanol is also used as cleaner, adhesives, jet fuel, synthetic rubber, as a solvent in paints, bio-based plastics and fibres. They are also expected to meet 20% of the world's fuel demands. The requirement for clean energy is the main driver for the use of bio-butanol.

The raw materials used in process of bio-butanol are wheat, sugar beet, corn, straw and wood. The availability of raw material is a major concern with the bio-butanol preparation process. The properties like polymer chain formation, blending, paint and cleaner makes it applicable for the products such as acrylates, acetates, glycol ethers, solvent and plasticizer. Bio butanol is used as a fuel in internal combustion engines in petrochemical and automotive industry. Bio-butanol has the potential to reduce carbon emissions by 85% compared to gasoline. It is a possible large-scale alternative to gasoline.

The variation in availability and cost of raw materials is a major problem as it increases the production cost of bio-butanol. Currently, bio-butanol costs more than bio ethanol. Also, the government regulations against the use of raw material are the challenges for the bio butanol market.

Click here for more information.

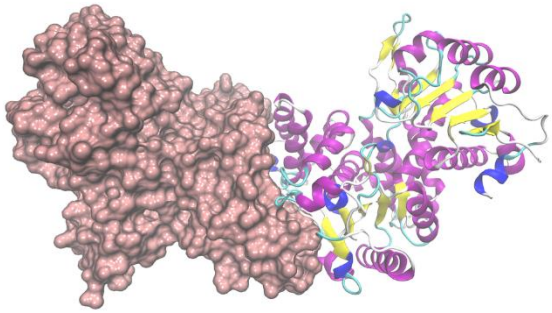
Technavio predicts big growth for Bio-based Propylene Glycol

Propylene glycol, which is also known as 1,2-propane diol, has various applications in industrial sectors such as pharmaceuticals, food, personal care, and construction. It is used as an antifreeze material such as in the de-freezing of aircraft before take-off. Propylene glycol is primarily used as a solvent, in binding and transporting other substances as an excipient. It also finds application as an emulsifier and assists in balancing insoluble fluids.

Technavio's analysts forecast the global bio-based propylene glycol market to grow at a CAGR of 8.27% during the period 2017-2021.

Click here for more information.

Technavio's White Biotechnology market forecast



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White biotechnology has enabled the commercial manufacturing of several products such as curd, cheese, and beverages by using natural metabolic pathways and various microorganisms. Earlier, these bio-based products were not commonly used in industries. They were used in niche industries such as biofuel production. However, today, several industries such as pharmaceutical and F&B use bio-based products to produce APIs and enzymes to enhance the texture and aroma of food.

Crude oil is the most important source of energy as many industries rely on the use of chemicals that are derived from crude oil. However, the lack of oil reserves and environmental concerns have driven the need to develop sustainable methods to produce such chemicals. White biotechnology helps produce such materials from renewable sources. It provides substantial benefits when compared with conventional methods.

Enzyme technology is one of the most important technologies used in industrial processes. Protein engineering has improved the development of industrial enzymes as it uses recombinant technology to produce enzymes with new activities that easily adapt to new processes. The manufacturing of enzymes involves recombinant expression in specific host organisms such as bacteria and yeast, fermentation, recovery, and formulation.

Enzymes have been used in the pulp, paper, and textile industries to soften wood fibres and improve drainage. Enzymes are a sustainable alternative to harsh chemicals that are used in industries. This is because they are suitable for working under moderate conditions such as warm temperatures and neutral potential of hydrogen (pH).

Click here for more information.

Research & Development

Lenzing opens application innovation centre in Hong Kong

The Lenzing Group is setting a further milestone in intensifying its cooperation with the partners along the value chain by its opening of a new Application Innovation Centre (AIC) in Hong Kong. New applications for Lenzing fibres will be developed and tested at the new facility, among them applications for recent innovations like the Refibra™ branded lyocell fibre and the EcoVero™ branded viscose fibre.

The Lenzing Application Innovation Centre starts its operation as of now and is open for visitors from the whole industry.

Click here for more information.

Covestro aims to develop bio-based timber resin

To reduce its dependency on fossil raw materials, Covestro is looking to manufacture a growing number of products and their associated precursors from renewable raw materials. Working with four partners, the company is aiming to develop bio-based reinforcing layers for solid wood construction materials to replace the petrochemical products used to date.

The polyurethane system, which is reinforced with cellulose fibres, is to be more than 90 percent bio-based, contain zero additives and exhibit excellent flame retardance and weathering resistance. State-of-the-art solid timber construction techniques are increasingly coming to dominate our urban spaces. The main materials used to manufacture construction elements are cross-laminated timber and glued-laminated timber. Both materials consist of alternate layers of wood and thinly spread polyurethane resin. If aramid, glass or carbon fibres are embedded into the layers of resin, they create reinforcing segments that further enhance the stability of the construction elements.

Over the course of the recently launched project, the researchers want to find bio-based alternatives to the fossil-based resins and fibres that have been used to date. They are pursuing a combination of biogenous, aliphatic polyisocyanates and polyols based on vegetable oils. The resultant polyurethanes should exhibit low flammability and good weathering resistance, so that no special additives are needed to enhance either property.

During the project, Sortimo will produce an industry-standard model component that will then be used to evaluate the technical, economic and ecological potential of the new material and production process for the construction industry. Beech wood is being used for the component, as this material is becoming available in growing volumes due to forest restructuring.

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3D-printed cellulose for decoration and wound care

Cellulose nanofibrils have properties that can improve the characteristics of bio-based 3D-printing pastes. VTT Technical Research Centre of Finland is developing a 3D wound care product for monitoring wound condition in hospital care. However, the first commercial nanocellulose applications will be seen in indoor decoration elements, textiles and the production of mock-ups.

Cellulose nanofibrils offer an opportunity for developing durable, bio-based commercial 3D-printing materials. They can offer an alternative to the currently used chemicals, such as resins, synthetic thickeners, strengtheners and plastics, the use of which might generate harmful emissions and even allergising compounds.

Nanocellulose is an attractive option for medical applications, for example as a carrier of drug molecules. VTT is currently developing a solution where a protein attached to a 3D-printed adhesive bandage can help to promote the growth of skin cells around a wound. The purpose is to have the healed wound area remain flexible instead of it developing stiff scar tissue. The development is done in collaboration with the University of Tampere and funded by The Academy of Finland under the BioDisp3D programme. The same materials development process can also be used in the cosmetics industry or in the manufacture of artificial bone, for example.

Nanocellulose has not yet been approved for medical use, which means that it will take several years before this application is used in hospitals.

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New process to produce methanol from CO2

bse engineering

Less buildings, more solutions

bse Engineering

BASF and bse Engineering today signed an exclusive joint development agreement for BASF to provide custom made catalysts for a new chemical energy storage process. This process will enable economically viable transformation of excess current and off-gas carbon dioxide (CO2) into the chemical energy storage methanol in small-scale, delocalized production units.

When generating current from renewable energy sources such as in wind or solar power plants, excess current is generated at times when consumers do not need it. This excess current can often not be reasonably used at the moment. The effective usage of this excess current is a decisive factor in making power production from renewable energy sources economically viable.

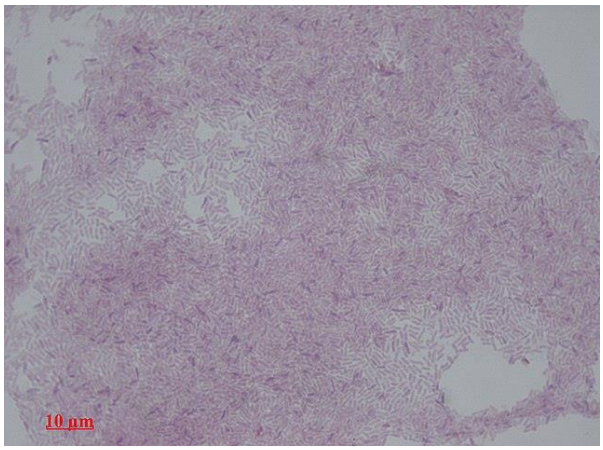
CO2 is generated in some industrial production plants such as in steel production, incineration plants or coal power plants. The reduction of this greenhouse gas is one of the most important targets set in the context of the 2015 Paris Climate Protection Agreement.

The new process developed by bse Engineering enables the sustainable use of current and CO2 with small-scale, delocalized production units built where the two components are generated, i.e. near power plants using renewable sources of energy as well as large-scale industrial plants producing CO2. The excess current will be used to produce hydrogen through discontinuous electrolysis. In a second step, methanol is produced from CO2 and hydrogen, thus leading to a valorising of excess current and CO2 off-stream gas.

In the second process step, BASF's catalysts will be used for the methanol synthesis step. Those catalysts have been further tuned and adapted for this specific process to enable the most efficient production of methanol. Methanol is one of the most important basic chemicals used in numerous industrial applications. For example, it is blended into diesel or gasoline in some countries.

Click here for more information.

Bacterial genetics discovery may pave the way for methanol-based biotechnology



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Many chemists are currently researching how small carbon molecules, such as methane and methanol, can be used to generate larger molecules. The earth is naturally rich in methane, and artificial processes like the fermentation of biomass in biogas plants also produce it in abundance. Methanol can be generated from methane. Both are simple molecules containing only a single carbon atom. However, using them to produce larger molecules with several carbon atoms is complex.

While challenging for chemists, bacteria learned long ago to build large molecules out of small ones: Some bacteria use methanol as a carbon source in order to create energy carriers and cellular building material. They live primarily on plant leaves and occur in large numbers on every leaf. The bacterium most extensively researched is called Methylobacterium extorquens. A team led by Julia Vorholt, Professor of Microbiology, has now identified all the genes required by this bacterium to live on methanol.

The researchers were particularly surprised by one of the genes detected. The gene was previously known from plants and bacteria that metabolize CO2 from the air, but Methylobacterium extorquens does not do this. The gene provides the instructions for an enzyme that produces a sugar crucial for CO2 use.

The researchers could now demonstrate that Methylobacterium extorquens is also able to produce this sugar when it encounters methanol. However, in contrast to plants, the bacterium does not use this sugar as a cellular building material. Instead, the scientists believe that it is used as a signal in order to switch to methanol consumption.

After uncovering the significance of this particular gene, the scientists now want to further investigate the other newly identified genes.

Click here for more information.

Need for a standard cellulose vocabulary

Cellulose is a polymer produced by nature. In plants, animals, algae and bacteria, cellulose is extruded from terminal enzyme complexes (TC). TCs are made up of many identical subunits, each containing at least one catalytic site from which a single cellulose chain is synthesized. Cellulose chains from a single TC combine to form an elementary fibril. As TCs in plants, animals, algae, and bacteria have different numbers and configurations of subunits, the elementary fibrils they produce have different geometries. Whether

cellulose nanomaterials are separated by industrial processes or produced directly by organisms, they all contain a common structural component, which is the elementary fibril. This common component, the elementary fibril, provides a way to describe cellulose nanomaterials from all manufacturing methods and cellulose sources.

In industrial productions, cellulose nanomaterials can be manufactured by conversion of wood pulp through chemical, biological or mechanical processes. In the case of bacterium-based cellulose nanomaterials, they are produced directly by bacteria and can be further acid-hydrolysed to smaller dimensions. Besides trees and bacteria, algae are another potential source of cellulose nanomaterials for industrial applications. Due to their renewable nature and unique properties, cellulose nanomaterials have developed into platform materials that have application potential in a wide range of products including those that currently utilize petroleum-based ingredients.

In the current stage of development, several terms to describe cellulose nanomaterials coexist and have created confusion among users. Rather than delaying standards development until knowledge accumulated with market maturity is available, we have an opportunity to define a standard vocabulary for cellulose nanomaterials as they enter the market place. It is anticipated that as the market for cellulose nanomaterials matures, so too will the standard vocabulary. Beginning to define a standard vocabulary now will facilitate future communication, eliminate confusion, remove trade barriers and provide policy makers and regulators with a set of consensus-based terms.

Click here for more information.

German scientists question plastic-eating caterpillar discovery

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In April, the report of plastic bag eating caterpillars caused sensation in worldwide media. The authors around Federica Bertocchini of the University in Santander had reported that the larvae of wax moth Galleria mellonella were able to digest polyethylene (PE). This polymer is mainly used for making plastic packaging and bags. Co-workers of Till Opatz, professor for Organic Chemistry at the Johannes Gutenberg University Mainz (JGU), now critically examined the released data and experimental procedures by Bertocchini et al. and published a counterstatement. According to their report, a sufficient proof for the bio-degradation of polyethylene is missing in the first publication.

It all started when the Spanish authors had accidentally observed above named caterpillars biting holes in shopping bags. The researchers now investigated whether it is actually a matter of a biochemical digestion by enzymes and/or bacteria in the caterpillars' digestive tract or simply a mechanical milling. In the latter case, the plastic would be excreted chemically unchanged. The group developed an experimental procedure, in which the influence of caterpillar homogenate on a polyethylene surface was examined. The homogenate is a mass of deep frozen and squashed caterpillars, rich in proteins and lipids and with intact enzymes from the digestive system. They chose spectroscopic and microscopic evaluation methods for their analyses.

Bertocchini et al. report a decomposition of polyethylene into ethylene glycol, a potential oxidative metabolite, after the treatment of polyethylene bags with caterpillar homogenate. However, particularly the interpretation of the results obtained by infrared spectroscopy are questionable and doubts arouse about the actual detection of ethylene glycol. The group of Opatz now demonstrated in simple control experiments which had not been carried out by the Spanish scientists that essential signals of ethylene glycol are missing in the previously published spectra. On the other hand, the reported signals of the assumed biochemical degradation products are identical to signals caused by an animal protein-fat mixture, as they would arise from caterpillar residues on the surface. To test this hypothesis, Opatz et al. treated a polyethylene surface with egg yolk and ground pork which produced highly similar spectral signatures.

Click here for more information.

Polymers

Eastman engineering plastic receives USDA certification

Eastman Chemical Company, the world's leading producer of cellulosic materials showcased Eastman TRĒVA at Bio-Based Live. TRĒVA, a breakthrough in engineering bioplastics designed to help companies overcome the trade-off between sustainability and performance, recently received its USDA Certified Biobased Product Label from the United States Department of Agriculture's BioPreferred® program. This certification verified that TRĒVA GC6011 has a biobased content of 45 percent and TRĒVA GC6021 has a biobased content of 42 percent.

TRĒVA offers a combination of thermoplastic properties and performance, design flexibility — and price — that other bioplastics cannot match. The cellulose in TRĒVA is sourced exclusively from reputable suppliers holding internationally recognized certifications attesting to their sustainable forest management practices. Free of BPA and phthalates, TRĒVA stands up better than other engineering thermoplastics to some of the harshest chemicals including skin oils, sunscreens and household cleaners. Additionally, TRĒVA does not exhibit the rainbow effect some plastics experience with polarized light, improving the user experience with electronic device screens. These attributes make TRĒVA the naturally better choice for eyeglass frames, wearable electronics, headphones, electronic displays and housings, automotive interior components and other applications with demanding sustainability and performance requirements.

Click here for more information.

Braskem's polyethylene to be used in Rotomoulding process

Braskem, the largest petrochemical company in the Americas, has entered into a partnership with A. Schulman, Inc., a leading global producer of high-performance plastic compounds and resins, to produce and market a new Green Polyethylene application: a solution for the rotomolding process. A. Schulman will bring this solution to the market by featuring the "I'm greenTM" seal, which indicates its helping to reduce greenhouse gas emissions.

After identifying a market demand for more sustainable solutions in rotomolded products, Braskem started to develop a solution to enable the rotational moulding of general-purpose parts, with applications ranging from toys and furniture to agricultural tools that can contain more than 50% of Green Plastic in their composition.

A. Schulman, which contributes to the partnership through its industrial and commercial expertise in serving clients directly with products that meet market needs, will introduce the product at Rotoplas 2017, the largest trade fair of the rotomolding industry, which takes place from September 26-28 in the United States.

In March 2017, with investments of US$ 540 thousand, Braskem inaugurated the Brazilian Technology and Innovation Centre of Triunfo, RS, a complete rotomolding laboratory that includes a commercial-size Rotoline equipment.

Click here for more information.

Grasim fibres now certified biobased by USDA

Grasim

Grasim Industries Limited, a flagship company of Aditya Birla Group has been awarded the US Department of Agriculture (USDA) certified biobased product label for its dope dyed fibres - Birla Spunshades. Utilising renewable, bio-based 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 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.

Lenzing looks to expand fibre operations in Thailand

The Lenzing Group aims to substantially increase its share of speciality fibres as a proportion of total revenue. Following the expansion drive already underway in Lenzing and Heiligenkreuz (both in Austria), Grimsby (Great Britain) and Mobile, Alabama (USA), the Supervisory Board of Lenzing AG approved the proposal of the Management Board yesterday to build the next state-of-the-art facility to produce lyocell fibres in Thailand. For this purpose, Lenzing is establishing a subsidiary in Thailand and purchasing a commercial property in Industrial Park 304 located in Prachinburi near Bangkok. In the coming months, the required permits and licenses as well as technical planning will be finalized. A definitive decision on constructing the new production plant will be made in the first quarter of 2018. Completion is scheduled for the end of 2020.

The selection of Industrial Park 304 in Prachinburi was based on its excellent overall infrastructure, outstanding expansion opportunities and the sustainable biogenic energy supply. Similar to the plant in Mobile, the planned production facility will be constructed on the basis of the latest state-of-the-art technology and feature a capacity of up to 100,000 tons annually. This site will strengthen the worldwide lyocell network of the Lenzing Group and enable its global customers to source TENCEL® branded fibres from Europe, North America and Asia.

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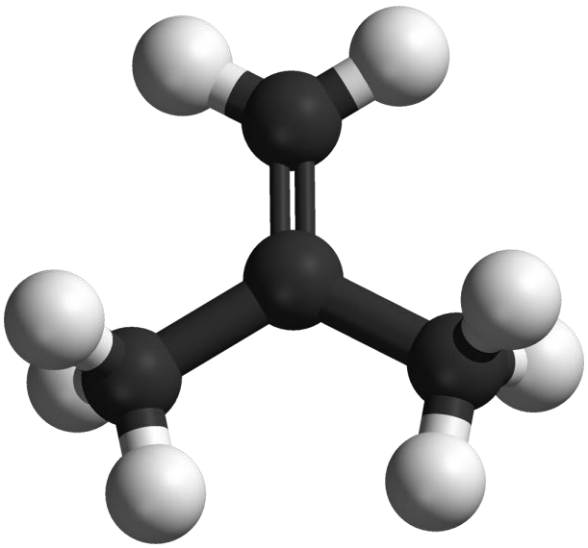
Chemicals

Global Bioenergies bottles first biobased isobutene at demo plant



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Global Bioenergies announced that its demo plant, located at the Leuna refinery site, has successfully operated its entire technical process: fermentation, purification, and filling station. The first bottle containing renewable isobutene has been filled.

The construction of the Leuna demo plant was completed at the end of 2016, and the first months of 2017 were devoted to the gradual start-up of the unit. The fermentation unit was the first section started-up and the fermentation performances previously obtained on the pilot plant located at Pomacle-Bazancourt, near Reims in France, were replicated and even exceeded. Until recently, the renewable isobutene produced by this unit, was sent directly to the flare to be incinerated as operation of the purification unit and the filling station (bottle and container filling) had yet to be started-up.

The month of August 2017 was devoted to site maintenance. The demo plant restarted in September, and an initial test involving the full technical process: fermentation, purification, packaging – was successfully carried out and the first bottle was filled.

Click here for more information.

AkzoNobel and Itaconix to develop biobased chelates

AkzoNobel's Speciality Chemicals business and Itaconix have signed an application agreement to evaluate and develop innovative bio-based chelates for use in the consumer and industrial detergents and cleaners markets.

It is the second partnership stemming from a joint development agreement signed by the companies earlier this year to develop and commercialize sustainable products made from renewable feedstocks using Itaconix technology. Products from this collaboration will be marketed under AkzoNobel's Dissolvine® brand.

Click here for more information.

Origin Materials announces location of Oxidation Pilot Plant

Origin Materials announced that it will locate its oxidation pilot plant at the Western Sarnia-Lambton Research Park for terephthalic acid (PTA) and furandicarboxylic acid (FDCA) production. Origin recently purchased this asset from Eastman Chemical Company. This major applications development ($6 million) project is being supported by Bioindustrial Innovation Canada through its COMM SCI initiative with its partners; Lambton College and the Western Sarnia-Lambton Research Park. This project will include the relocation, commissioning and process

validation of the pilot plant. BIC will provide advice, services and financial support for the removal of technical and market application barriers to commercialization of bio-based PTA and FDCA to enable commercial production of bio-based polyethylene terephthalate (PET) and polyethylene furanoate (PEF).

In a recent news release, Eastman Chemical Company, headquartered in Tennessee, USA, announced that, in addition to the sale of the pilot plant, Eastman and Origin Materials have entered into an agreement for Eastman to license its proprietary 2,5-Furandicarboxylic Acid and FDCA derivatives production technology from renewable resources to Origin Materials. Terms of the deal were not disclosed.

Earlier this year, Bioindustrial Innovation Canada (BIC) announced a COMM SCI investment in Origin Materials, Sacramento, California, through BIC's Sustainable Chemistry Alliance (SCA) investment fund, as part of an investment round that will see Origin construct its first commercial scale demonstration facility in Sarnia in late 2018.

Click here for more information.

Comparing biobased lubricants to their petrochemical counterparts

In transportation and industrial sectors, the world relies heavily on petroleum-based products which may cause grave concern related to future energy security. On certain cases, these products would end up back to the environment causing serious environmental pollution and hazards. Recognized as potential substitutes to mineral-based lubricants, bio-based lubricants have received growing interest as they play a significant role in overcoming above problems. Bio-based lubricants have been found to exhibit superior lubricant properties over the conventional mineral lubricants, with renewability and biodegradability being their strongest suit. There is a strong need to review the available literature to explore the potential of bio-based lubricants for various applications. In this regard, the goal of this paper is to highlight the potential of biolubricants for a broad range of applications based upon the published researches over the past decade. The correlation between molecular structures, physicochemical properties and lubrication performance of natural oil were reviewed which is essential for lubricant development and selection. This review also acknowledged some applications of which the potential use of bio-based lubricant has been explored. Based on the key findings, it can be concluded that bio-based lubricant is a promising substitute for various applications due to their availability in wide arrays of properties which are essential for some applications. However, for certain applications, prior chemical modification is required to overcome the limitations including substandard low temperature characteristics and oxidative stability. With proper base oil and additive packages formulation, bio-based lubricants can perform better than the conventional lubricants.

Click here for more information.

Consumer Products

Modern Meadow debuts bioengineered leather

Wikimedia Commons

Modern Meadow, the company applying biofabrication to transform how we make everyday goods, is previewing their first generation of materials at a pop-up exhibit in SoHo until October 12th. After five years of research and development in the lab, Modern Meadow is excited to share a series of product prototypes with the public, and unveil the brand: Zoa. This begins a broader conversation about the design and manufacturing possibilities available with biofabrication.

In its first application, Modern Meadow is proud to debut its biofabricated leather materials at the Museum of Modern Art's exhibit Items: Is Fashion Modern? on view October 1st – January 28th. The company's in-house design team have chosen to reinterpret an iconic item worn by revolutionaries: the graphic-tee. By applying biofabricated leather in a way that was not previously possible with traditional leather, like creating a stitch-less seam with liquid leather, they provoke new thought about the design potential offered with novel manufacturing techniques.

To complement the MoMA exhibit and to deepen the conversation about grown materials, Modern Meadow is holding a pop-up exhibit in SoHo now through October 12th to showcase a broader range of material prototypes. Revealing not just a first prototype product, but also the new material brand in a much-anticipated sneak preview into our material world.

Click here for more information.

Plasto unveils 90% biobased toys

Plasto, a toy company in Finland has over 60 years of experience in manufacturing high quality plastic toys. Their focus is very strong on safety and durability. Furthermore, they are extremely focused on environmental values. For several decades they have been using recycled plastic from their own production in order not to waste any material and they keep on investing more to save the environment and be good to nature. In spring 2017, Plasto launched their own I'm greenT toy range. All the toys in this range are over 90% biobased. The raw material which is used derives from sugar cane. By doing this, Plasto will significantly reduce the carbon footprint of its toys as well as the use of fossil resources. For every kg of I'm greenT Polyethylene used in Plasto's toys more than 5 kg of CO2 is saved. The toys are food contact safe and dishwasher safe. At the end of their life cycle they can be recycled and the raw material can be reused which is in accordance with Plasto's philosophy. The I'm greenT toys have been extremely well received. For Christmas Plasto will be expanding its range with new items.

Click here for more information.

Bath salt pouch to be made with Braskem's plastic

Pixabay

Braskem, the largest producer of biopolymers in the world, has announced that Buhbli Organics, together with Peel Plastics, will be utilizing Braskem's I'm greenT bio-based Polyethylene in their Himalayan Bath Salts pouch. Buhbli Organics bath salts are now available in over 1,000 Walmart stores in the U.S. in the Naturals section of the Cosmetics department.

The accelerating shift to more sustainable packaging solutions fits with the consumer market's movement towards the growing Organic Foods and Organic Products market. Braskem's green plastic is made from sugarcane - a renewable and sustainable resource produced in Brazil - and a drop-in biopolymer substitute to conventional polyethylene. Cultivation of sugarcane utilizes CO2 and releases O2, which gives the material a negative carbon footprint. For every 1 ton of Braskem's I'm greenT Polyethylene that is used, Buhbli Organics is sequestering 3.09 tons of CO2 from a cradle to Braskem gate perspective.

Click here for more information.

Tierra releases 100% biobased jacket

After the Paris Climate Change Conference where oil dependency was a hot topic, Tierra decided to develop a jacket fully free from fossil based material. The result is Deterra® Jacket – the first ever 100 % bio-based jacket including materials from castor beans, wool, corn, Tencel, cotton and corozo nuts. The Deterra® Jacket has already been honoured with international awards and soon it will be available to customers.

With the Deterra® line Tierra wanted to create the most technical jacket possible without using any fossil based material.

The outer fabric is woven of EVO yarn consisting of polyamide made of oil from castor beans. The padding is made of wool from German sheep and the threads of Tencel made from wood pulp cellulose. The buttons are made out of corozo nuts from the tagua palm. The hood is adjusted with a knot instead of a plastic stopper like we're used to. By reducing the number of different components in the jacket, transportation has also decreased during production.

Deterra® Jacket is a symbol of how technical a garment can be today if it should be fully bio-based. We can of course make lighter, more durable, more water resistant and cheaper jackets, but then they won't be 100 % bio-based.

Tierra will use this jacket as a platform to talk about new materials and solutions as part of our quest to make technical clothes that are sustainable both for us users and the planet.

Click here for more information.

Braskem's Polyethylene to be used for Pet Food Packaging

Braskem, the largest producer of biopolymers in the world, has announced that Midwestern Pet Foods, Inc. has launched its new Earthborn Holistic® VentureTM brand pet food line offering sustainable packaging produced by Peel Plastics Products Ltd., utilizing Braskem's I'm Green bio based Polyethylene (PE). Peel Plastics manufactures the new Earthborn Holistic® VentureTM pet food bags, utilizing Braskem's bio-based polyethylene, helping mitigate the carbon footprint associated with its packaging.

Braskem's I'm GreenTM Polyethylene (PE) is a bio-based resin made from ethanol, a renewable and sustainable resource produced from Brazilian sugarcane, that is a drop-in substitute for conventional oil-based polyethylene. Cultivation of sugarcane utilizes carbon dioxide (CO2) and releases oxygen (O2), which means I'm Green Polyethylene has a negative carbon footprint. The use of Braskem's I'm Green bio-based plastic in the production of one ton of Venture pet food packaging equates to 3.09 tons of CO2 captured from the atmosphere from a cradle to Braskem gate life cycle perspective.

Click here for more information.

Elopak releases first unbleached paperboard carton

The collaboration between Elopak and Stora Enso has resulted in the launch of the first gable top carton made from natural brown unbleached paperboard, creating the Naturally Pure-Pak® carton with a highly distinctive, natural look and feel.

The new paperboard, Natura Life by Stora Enso, retains the natural brown colour of the wood fibres and has a visible fibre structure. This creates a naturally different, sustainable and authentic package that meets demands from growing trends in ethical, ecological and organic products. The natural look and feel of the new Pure-Pak® carton supports the values of organic products and brings outstanding presence on shelf.

Arla Foods in Sweden announced the launch of several products in its organic EKO brand range using Pure-Pak® cartons made of natural brown paperboard.

The Pure-Pak® carton with the new natural brown paperboard is available in 1 litre and 500 ml sizes. It runs on existing filling lines for both fresh and ESL products without modifications or changes in machine settings. The new Pure-Pak® cartons are 100% recyclable and can be recycled through existing channels.

Click here for more information.

Patents

Novel polyamide, preparation process therefor and uses thereof

The present disclosure relates to a novel polyamide synthesized from biobased monomers. The novel polyamide comprises the repeating unit of formula I, described herein, in which R represents a covalent bond or a divalent hydrocarbon-based group chosen from saturated or unsaturated aliphatics, saturated or unsaturated cycloaliphatics, aromatics, arylaliphatics and alkylaromatics. The present disclosure also relates to a process for preparing the said polyamide, to its uses, and to articles and compositions comprising the said polyamide.

Click here for more information.

Biobased hydroxyl or carboxyl polyester resins

The invention concerns a polyester resin having a linear or branched structure and free of unsaturated fatty acids, which is hydroxylated or carboxylates and characterised in that it is made from: a) an acid component comprising: a1) at least one C4 to C6 carboxylic polyacid or anhydride, a2) at least one Cs to C54 carboxylic polyacid or anhydride, a3) optionally, at least one C2 to C22 saturated monoacid, b) an alcohol component comprising: b1) at least one biobased polyol having a functionality of at least 2, and at least one of the following two polyols b2) or b3): b2) at least one polyol different from b1) having a functionality of at least 2, b3) at least one polyol different from b1) and b2) having a functionality of at least 3. Said resin is more particularly 100% biobased. The invention also concerns a resin solution and a coating composition comprising said resin and the use of same in coatings having a high strength and made from renewable raw materials.

Click here for more information.

Method for the production of bio-sourced acrylic acid

The present invention relates to the manufacture of biobased acrylic acid from glycerol as starting material, the term "biobased acid" indicating that the acrylic acid is essentially based on a carbon source of natural origin.

Click here for more information.

Smit & Zoon files patent for lignin-modified leather

Smit & zoon have filed a European patent application for 'lignin modified polyphenolic leather chemicals'. This makes Smit & zoon the first leather chemical company to use lignin modified polyphenolic in its products. Smit & zoon's product development team is currently testing lignin-based products. The patent describes the smart utilization of industrial lignin to mix with phenol in the production of otherwise 100% petrol-based polyphenolic retanning chemicals. Part of the phenol in the concerning products is replaced by lignin during the chemical conversion process.

Smit & zoon's Bio-based platform aims to increase the bio-based content and the degree of biodegradability in the company's leather chemical portfolio. This is in line with Smit & zoon's CSR ambition to play a catalysing role in making the leather value chain largely sustainable by 2025.

Lignin is a natural cross-linked polyphenol derived from biomass that is formed in the cell walls of wood or agricultural crops and plants providing structural strength. Lignin constitutes about 20-35% of the mass of every tree or plant and is the most abundant natural aromatic resource. As a by-product from the pulp and paper industry, lignin is currently mainly burned to generate energy.

Click here for more information.

Events

Total Food
Norwich, 31st October - 2nd November 2017

Total Food 2017 will be the 5th in a series of international conferences which focus on the sustainable exploitation of agri-food co-products and related biomass, thereby helping to minimise waste.

Under the auspices of the Royal Society of Chemistry (Food Group), this three-day event organised by staff from the Biorefinery Centre provides an open forum to highlight recent developments and to facilitate knowledge transfer between representatives of the agri-food industries, scientific research community, legal experts on food related legislation and waste management, and consumer organisations.

Click here for more information.

European Biosolids & Organic Resources Conference
Leeds, 20th - 21st November

Now in its third decade this event provides practitioners with an annual update on legislatory changes; new technologies; best practice and site-experiences with existing technologies and an insight into relevant research in the science and engineering of biosolids and organic resources. The conference is attended by recognised experts from around the world both, as speakers and delegates.

Click here for more information.

European Bioplastics Conference
Berlin, 28th - 29th November

Today, there is a bioplastic alternative to almost every conventional plastic material and corresponding application. While offering the same qualities and functionalities as their conventional counterparts, bioplastics strive to be even better by providing innovative solutions with improved properties and performances as well as the unique ability to reduce emissions and our dependency on fossil resources. The 12th edition of the annual European Bioplastics Conference will showcase just how biopolymers are Making the Difference in driving innovations forward for more sustainability, resource efficiency, and functionality.

Click here for more information.

Biocomposites Conference
Koln, 6th - 7th December 2017

The wide range of successful new technologies and applications of biocomposites in consumer goods, automotive industries and construction will be presented at the Biocomposites Conference Cologne, 6-7 December 2017 in Cologne, Germany. It represents the wide spectrum of innovative applications and material choices of WPC and NFC.

Click here for more information.

BBI JU Stakeholder Forum
Brussels, 7th December 2017

The inaugural Stakeholder Forum is a one-day public event dedicated to engaging directly in dialogue with BBI JU's stakeholders. Save the date and make sure you are part of the day. The event will include plenary keynote speeches, high-level discussions with expert panels, thematic breakout sessions, with plenty of networking possibilities.

You can also find out about our work through meeting all 65 of our ongoing projects who will be presenting their work in the permanent exhibition, accessible throughout the event.

The agenda includes opening and closing keynote speeches from champions of the bio-based economy. In the plenary sessions key contributors will present their views on defining the roadmap for a bio-based Europe, the strategic context of the BBI initiative & achievements, lessons learned & sector development and rapporteur feedback.

Click here for more information.

Bioeconomy Investment Summit
Helsinki, 14th-15th December 2017

Join us on 14-15 December 2017 in Helsinki, Finland for the 2017 Bioeconomy Investment Summit.

Over 30 speakers from across the globe will share their views on how we can bring together the economy and the environment.

New advances in technology mean that everything that can be made out of oil can be made from renewable, biological resources. There are huge environmental and business opportunities for a wide range of industries: construction, chemicals, textiles, energy, plastics.

The bioeconomy gives us a unique opportunity for building a sustainable future. Our speakers will focus on what investment steps we need to take to make it happen.

Click here for more information.

IBioIC's 4th Annual Conference
Glasgow, 25th-26th January 2018

Now in its fourth year, IBioIC's annual conference has established itself as the 'go to' event for the biotech industry in Scotland. This two-day event attracted over 400 biobased professionals, academics and students from across the UK and Europe in 2017, and 2018's event is set to be even bigger.

The conference will celebrate the success of the biotechnology industry in Scotland to date, look ahead to the future and the challenges still to be overcome, and provide delegates with the networking opportunities needed to drive new collaborations.

Click here for more information.

EUBCE
Copenhagen, 14th-18th May 2018

We look forward to the 26th EUBCE in 2018 in Denmark and to the many vibrant topics that will be included in the agenda. The core of the traditional EUBCE conference will be held over 4 days.

There will however be an extension to the core conference and exhibition in order to showcase the many achievements in the field of full scale biomass utilisation in Denmark that are an integral and major part of the country becoming fossil-free by 2050. Members of the national organising committee will organise special technical visits to

sites in the centre of the country where biomass is the key renewable feedstock into processes producing renewable energy, biofuels, biochemicals and biomaterials as well as integrating bioproducts into traditional established fossil-based systems.

Click here for more information.

RRB 14
Ghent, 30th May - 1st June 2018

The 14th edition of the International Conference on Renewable Resources & Biorefineries will take place in Ghent, Belgium from Wednesday 30 May until Friday 1 June 2018. Based on the previous RRB conferences, this conference is expected to welcome about 350 international participants from over 30 countries.

Delegates from university, industry, governmental and non-governmental organizations and venture capital providers will present their views on industrial biotechnology, sustainable (green) chemistry and agricultural policy related to the use of renewable raw materials for non-food applications and energy supply. The conference further aims at providing an overview of the scientific, technical, economic, environmental and social issues of renewable resources and biorefineries in order to give an impetus to the biobased economy and to present new developments in this area.

The conference will provide a forum for leading political, corporate, academic and financial people to discuss recent developments and set up collaborations.

The three-day international conference will consist of plenary lectures, oral presentations, poster sessions and an exhibition. Companies and research organizations are offered the opportunity to organize a satellite symposium.

Click here for more information.

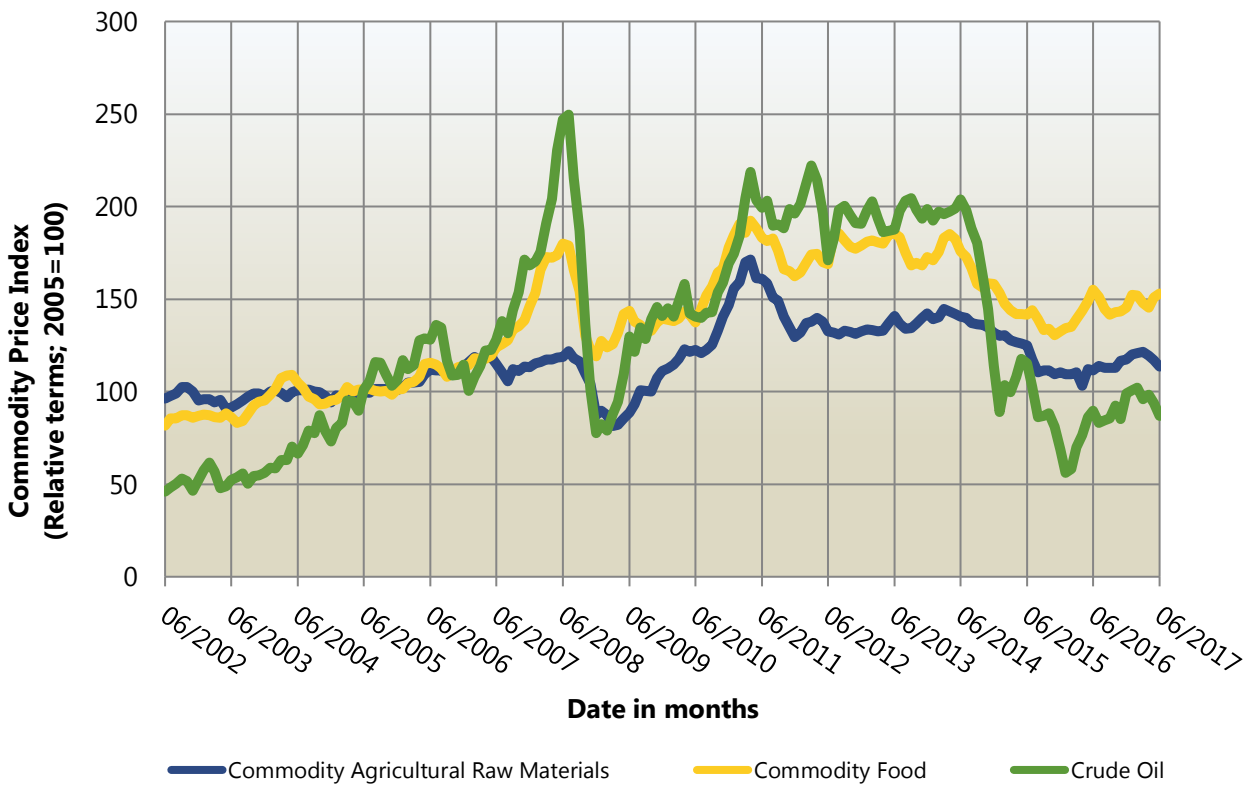
Price Information

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$ (Jun 12)	Price, US$ (Jun 17)	Price Change
Crude oil (petroleum, barrel)	105.28 (↑)	46.13 (↓)	-56
Maize (corn, metric ton)	332.17 (↑)	157.96 (↓)	-52
Sugar (pound)	0.2056 (↑)	0.1375 (↓)	-33
Rapeseed oil (metric ton)	1,221.67 (↑)	830.44 (↓)	-32
Soybean oil (metric ton)	1,188.51 (↑)	704.83 (↓)	-41
Ethanol (gallon)	2.72 (↑)	1.6 (↓)	-41

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

Raw materials 15-year Price Indices



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

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