

The Bioeconomy Consultants



## News Review

Issue Seventy

January 2018

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



# Contents

Contents.....	2
Foreword.....	3
Policy.....	4
Markets.....	4
Research & Development.....	6
Polymers .....	9
Chemicals .....	11
Consumer Products.....	14
Events.....	15
Price Information.....	18

# Foreword

Hello and welcome to the first NNFCC News Review of the New Year: Biobased Products.

Of course, we all know that biomass is very chemically complex. This presents biorefineries with an interesting problem: the opportunity to produce multiple different chemicals from biomass. After breaking down biomass, two common products (which then form the basis of biorefinery) are glucose from cellulose, and xylose from hemicellulose. Each of these can be used to produce either the same products or different ones, and deciding what to produce with each is a decision that involves both technical and economic consideration. Ethanol is a popular choice due to it being relatively easy to produce, and with biofuels providing it with an easily accessible suitable market. This month we feature two examples, one where analysis is conducted on whether to produce ethanol, lactic acid, or both, from sugarcane bagasse. The four possible combinations are analysed, and while solely producing lactic acid from both sugars was found to be the most profitable, and producing solely ethanol was the most environmentally beneficial, the optimal balanced solution was found to be producing ethanol from xylose, and lactic acid from glucose. In another analysis focusing on succinate production, it was found to be more profitable to produce ethanol from both sugars, than to produce succinate from the hemicellulose portion. Both of these examples show how when performing any biobased production, there are usually many options available, and careful consideration must be taken when deciding which production route to take.

Elsewhere, we have a story that is a little different to what we normally feature. When dealing with new biobased products, often we focus on the applications, the manufacturing process, or the sustainability certifications they receive. However, it is important to note, if the bioeconomy is to succeed, it must surpass cultural hurdles as well. That is why it is encouraging news that Reverdia's biobased succinic acid Biosuccinium has been approved to have both Halal and Kosher status. This is particularly important, as it is used in food flavouring, and the Muslim and Jewish faiths forbid the consumption of such products if they aren't Halal or Kosher respectively. This provides a good example that there are sometimes unforeseen barriers to product development in the bioeconomy.

Read on for the latest news.

# Policy

## Latvia becomes first EU-13 nation to publish bioeconomy strategy

Latvia has become the first EU-13 Member State to publish its national Bioeconomy Strategy.

Bioeconomy Strategy provides for the development of knowledge-based bioeconomy in Latvia that enhances the export and added value of bioeconomy sectors. Latvia's vision of the bioeconomy strategy – the bioeconomy sectors of Latvia are innovation leaders in the Baltic States in preserving natural capital, increasing its value and efficiency as well as its sustainable exploitation.

In Latvia, innovative approaches for the efficient and sustainable exploitation of natural resources are developed and introduced in the bioeconomy industries in order to provide growth of the national economy, providing a higher value-added, promoting exports and employment. This shall be achieved while simultaneously balancing economic interests with ensuring of environmental quality and preserving and enhancing biodiversity.

The strategic goals of the bioeconomy development are divided into three main groups: 1) advancement and retention of employment in the bioeconomy sectors for 128 thousand people, 2) increasing the value added of bioeconomy products to at least EUR 3,8 billion in 2030, 3) increasing the value of bioeconomy production exports to at least EUR 9 billion in 2030.

Click [here](#) for more information.

---

# Markets

## Lumen bioscience raises \$13m in capital



*Lumen Bioscience*

Lumen Bioscience, a synthetic biotechnology company developing a novel bio-based product development platform, announced it has raised \$13 million of new capital, including a Series A investment round totalling \$11.2 M and a \$1.8M grant from the US Department of Energy. The financing was led by Avista Development, BioEconomy Capital, company founders and other Seattle-area biotech investors. The funding will scale up Lumen's first product launch in 2018.

Lumen Bioscience is the first company to successfully use modern biotechnology tools in Spirulina, a blue-green alga that is widely grown for use in food, cosmetics and nutritional supplements.

Lumen's tools and methods use Spirulina to make high-value proteins and other molecules for foods, cosmetics, medicine, and industry. Traditional biotech platforms, many based on yeast and E. coli, have proven unsuitable for the large-scale production of certain classes of proteins and other biologics. Thanks to Lumen's technology, Spirulina has the chance to join these as an important new production platform for the biotechnology industry.

Used first as a high-protein, high-vitamin, antioxidant nutritional supplement, Spirulina extract sales soared after its 2014 FDA approval for use as a food colour additive. Lumen's improved strains produce more of this protein pigment at higher purity but a fraction of the cost of traditional methods, and without introducing foreign gene pathways from other species. More stable versions of this pigment and a palette of additional colours are also in the pipeline.

Click [here](#) for more information.

---

## **Arzeda raises \$15m for protein design technology**

Arzeda, The Protein Design Company™, announced that it has officially closed its Series A funding round with a total investment of \$15.2 million.

The company raised an additional \$3.2 million since announcing an initial \$12 million raise on July 20. Additional investors in the Series A include Universal Materials Incubator Co., Ltd. (UMI) and Casdin Capital, LLC. They join Series A lead investor OS Fund and Bioeconomy Capital, Sustainable Conversion Ventures, and Arzeda's seed investor, WRF Capital. Arzeda's board now includes Jeff Klunzinger, Co-Founder and General Partner at OS Fund.

The Series A funding will expand the throughput capacity of Arzeda's proprietary protein design platform and product development pipeline, with a focus on delivering novel proteins and biological pathways that are ready for commercial production. The integration of design and commercial-scale production will enable Arzeda's partners to harness the potential of synthetic biology to produce virtually any chemical for any need.

Arzeda's advanced protein design technology can deliver revolutionary new production pathways for

a wide range of valuable chemicals and materials, including many that have previously been impossible to produce. The company has already successfully developed proteins for global manufacturers, such as DuPont, Mitsubishi Chemical, INVISTA and others to improve crop yield and resilience, increase the performance and sustainability of advanced polymers, reduce the cost of producing high-value food ingredients, and more.

Click [here](#) for more information.

---

## **Bio-on stock listed on World Small Cap index**

Bio-on, listed on the AIM segment of Borsa Italiana and one of the main players in the new eco-sustainable chemical industry, announced that from 1st December 2017 Bio-on stock is listed on the MSCI World Small Cap Index.

This index, created by Morgan Stanley Capital International, represents 4,263 companies from 23 developed countries. The companies within the index are 55.44% from the USA, followed by 12.32% from Japan and 7.42% from the United Kingdom.

The most-represented sector on the index with 18.22% is industrial, followed by Information Technology (14.49%) and the financial sector (13.6%). In recent years, the MSCI World Small Cap Index has offered investors an annualized return of 10.8% in a three-year time frame, 13.81% in a five-year time frame and 6.73% in a ten-year time frame.

Click [here](#) for more information.

---

# Research & Development

## Report discusses EU finance available for bioeconomy projects

The Bio-based Industries Consortium (BIC) has released a new overview of financial instruments available to support European bioeconomy development. 'Access to EU financial instruments suitable for the implementation of large bio-based industry investments' outlines a range of funding opportunities and explores the synergies between different instruments for co-financing bio-based projects.

Since BIC's 2014 report 'Combining BBI (H2020) and European Structural and Investment Funds (ESIF)', the funding landscape for bio-based projects has evolved. The European Commission launched the Juncker Plan in 2015 and the European Investment Bank (EIB) published a 'Study on Access to Finance' in June 2017, which was compiled in close collaboration with BIC and its members and discusses the barriers and opportunities for bioeconomy investments. The EIB and the European Commission have recently pledged a stronger commitment to the European circular economy and bioeconomy sectors through a set of actions aiming to facilitate access to finance.

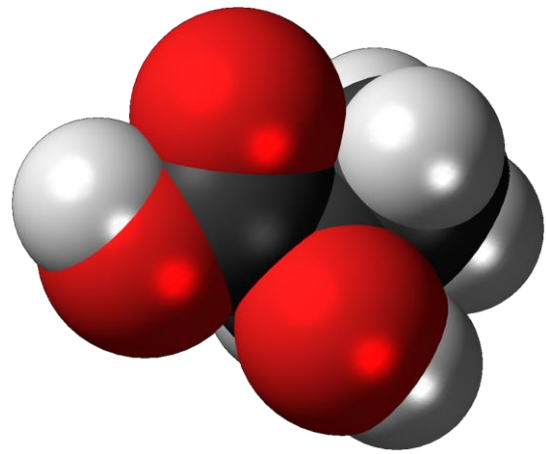
BIC's latest report factors in these new changes and raises awareness of the EU instruments available today for supporting bio-based ventures, especially for demonstration and flagship investments. EU financial instruments discussed include BBI JU/Horizon 2020 grants, EIB/InnovFin, the European Fund for Structural Investments (EFSI), European Structural and the Investment Funds (ESIF) and the recently announced Circular Bioeconomy Thematic Investment Platform (TIP).

The report also includes information on other sources of funding such as the European Bank for Reconstruction and Development (EBRD).

Click [here](#) for more information.

---

## Research seeks best solution for biorefinery co-production of Lactic Acid and Ethanol



*Wikimedia Commons*

Biorefineries are regarded as a key enabler to facilitate the transition toward a sustainable and low carbon bioeconomy. In this study, alternative lignocellulose biorefineries annexed to a typical sugar mill were investigated to co-produce ethanol (EtOH), lactic acid (LA), and/or electricity, utilizing bagasse and a component of harvesting residues (brown leaves) as feedstock. Studied scenarios included EtOH as the sole product from glucose and xylose (Scenario 1), LA as the sole product from these two sugars (Scenario 2), EtOH from glucose and LA from xylose (Scenario 3), and EtOH from xylose and LA from glucose (Scenario 4), all of which were associated with some level of export electricity production. Aspen Plus® simulations of the scenarios were developed considering all supplementary units, such as evaporation, water treatment, boiler, and steam/power generation in addition to the



process units required for the main product streams. Economic evaluation, energy assessment, and environmental life cycle assessment (LCA) were carried out on the developed simulations, in a multi-criteria analysis of the desirability of each scenario. To service the combined energy demands of a sugar mill and annexed biorefinery, a 35 to 40% bypass of lignocellulose directly to the boiler section was required to achieve integrated scenarios that were energy self-sufficient, i.e., not dependent on external (fossil) energy sources. Scenario 2 was economically most attractive with the highest internal rate of return (IRR) of 31.1%, whereas Scenario 1 had the lowest IRR of 10.0%. Scenarios 2 and 4 were economically the most robust, with the least sensitivity to variations in the key economic drivers, i.e., EtOH, LA and enzymes. The LCA suggested that LA producing scenarios introduced environmental burdens that were marginally higher than Scenario 1, due to higher consumption of processing chemicals. Overall, Scenario 4 was found to be the most desirable biorefinery scenario, by balancing financial and environmental considerations.

Click [here](#) for more information.

---

## **Producing succinic acid alongside ethanol and electricity from sugarcane**

Bio-based succinic acid is a potential building block for the production of renewable chemicals and polymers. The use of hemicellulosic hydrolyzate from sugarcane bagasse allows production of succinic acid without competing with food chains and increasing the biomass - aggregated value. This work assesses the economic impacts of integrating the production of -succinic acid on an optimized sugarcane biorefinery with the production of first-generation ethanol and electricity. Process simulation was performed to obtain mass and energy balances of the entire process, from bagasse pre-treatment to pentose fermentation and succinic acid recovery,

using several pieces of technical information and data taken from the scientific literature. After - assessing the impacts of key economic variables through risk analysis, the obtained results were benchmarked against those of an optimized ethanol distillery. Calculated succinic acid production cost was US\$ 2.32/kg, comparable to costs related to less expensive sugar sources. The integrated succinic acid biorefinery presented a slightly lower internal rate of return (IRR) compared to an -ethanol distillery. However, even when considering uncertainties, succinic acid production has a strong probability (84.6%) of achieving an IRR higher than 12%.

Click [here](#) for more information.

---

## **Developing coatings from potato starch**

If a surface has to be protected against corrosion, in 80 percent of all cases this takes place through coating it with paints or varnishes. When doing so, the proportion of bio-based, environmentally-friendly solutions is extremely small. Researchers at the Fraunhofer Institute for Applied Polymer Research IAP, in cooperation with the Fraunhofer Institute for Manufacturing Engineering and Automation IPA, are looking to close this gap and are developing a cost-effective coating based on renewable raw materials. The focus of the research is on potato starch.

The solution by the Potsdam scientists involves an initial degradation step of the starch in order to improve its solubility in water and the subsequently associated solids content of the starch in water, as well as its film forming ability. However, in order to produce a starch-based coating material, which is comparable with a conventional coating, this is not yet sufficient, as although the film former should initially be soluble or dispersible in water, the coating must subsequently no longer dissolve in water.

The starch must therefore be modified further. This takes place by way of a chemical process known as esterification. The resulting starch esters are dispersible in water, form continuous films and have very good adhesive properties on glass and aluminium surfaces. In cooperation with the Fraunhofer IPA, the esterified starch is then "cross-linked" through which the sensitivity of the coating to water is reduced further.

The stability tests to check the long-term stability are then also carried out at the Fraunhofer IPA. In the tests, the coated materials are exposed to rapidly changing temperature cycles in a time-compressed form to simulate the change from day to night and the course of the seasons. In addition, the test objects are exposed to electrolyte-enriched water in order to see how the coating reacts to water and how resistant it is under extreme conditions.

In the next step, the resistance to corrosion and adhesion of the modified starch on different metal substrates is examined. New "recipes" are also being tested, which are intended to optimize the properties of the coating even further.

Click [here](#) for more information.



## **DEINOVE and Greentech reach cosmetics R&D milestone**

DEINOVE reached a milestone in the R&D program initiated with GREENTECH in March 2017 to develop and market innovative cosmetic active ingredients.

At the end of Phase I, GREENTECH, a major player in the production and distribution of biotechnology-derived ingredients, selected six bacterial extracts with high potential, based on the results of in vitro tests conducted initially by DEINOVE.

DEINOVE then engaged the production of these six raw materials for testing in order to select the extract that will be marketed. The company is working in parallel on the optimization of fermentation performances for industrial production.

A process book will be provided to GREENTECH who will implement the production in their own units. The technology transfer step was initiated in order for GREENTECH to evaluate the activity of the strains subjected to different operating protocols.

GREENTECH plans to launch a first active ingredient co-developed with DEINOVE in the spring of 2018.

Click [here](#) for more information.

---



## Ginkgo Bioworks opens third organism "foundry"



*Ginkgo Bioworks*

Ginkgo Bioworks, the organism company, has announced the opening of Bioworks3 – Ginkgo's third foundry for prototyping and scaling engineered organisms. Bioworks3 will bring the power of biology to new markets including pharmaceuticals, agriculture and textiles, and accelerate the timeline for bringing current projects to commercial scale.

Ginkgo designs and prints DNA, the digital code that underlies all living things. With the tools in its foundries, Ginkgo can design this living code to build custom microorganisms for customers in a wide range of industries. Its work includes everything from yeasts that produce fragrance and flavor ingredients to bacteria that can decrease farmers' reliance on chemical fertilizers to living medicines that work with the body to cure disease.

The new foundry and funding will be used to accelerate Ginkgo's expansions into new markets and scale existing projects. Ginkgo's foundries leverage advanced technology to automate the highly manual processes typically required in organism design. The space and technology afforded by Bioworks3 is expected to further accelerate Ginkgo's ability to bring designs to scale, and support work on Ginkgo's first foray into agriculture through a \$100M joint venture with Bayer.

Click [here](#) for more information.

---

## Polymers

### Mitsubishi and Mazda develop biobased engineering plastic for cars

Mitsubishi Chemical Corporation has developed jointly with Mazda Motor Corporation a new grade of bio-based engineering plastic DURABIO™ that can be applied to large automotive exterior components. The new grade has been adopted for the front grill of the Mazda CX-5.

The MCC-developed DURABIO™ is bio-based engineering plastic made from isosorbide deriving from renewable plants. The material features superior properties compared to general bio-based engineering plastics in terms of impact resistance, heat resistance and weathering, among other aspects. It also has good colour-capability and, simply by adding pigments, creates a "mirror-like smooth surface and deep colour tone" surpassing painted products with similar properties.

Furthermore, its hard surface and resistance to scratch eliminates the need for any coating process, enabling reduction in volatile organic compound (VOC) emissions during manufacture. Capitalizing on these features, DURABIO™ has been adopted for pillars and other exterior design components in addition to interior components, thus enhancing a broad range of applications in the automotive sector.

The new grade of DURABIO™ exhibits a good, balanced combination of superior resistance to impact and weathering and better formability due to improvement in resin composition compared with properties of conventional grades, thereby making it possible to apply the new product to the front grill and other large exterior components. The new grade is expected to be adopted for future models launched by Mazda following the CX-5. MCC will continue to

accelerate R&D on DURABIO™ to expand applications not just for automotive interior components but also for larger exterior design components, thus contributing to the production of environment-friendly motor vehicles.

Click [here](#) for more information.

---

## Big investment in "World Scale" Rilsan plant in Asia



*Arkema*

Eager to sustain its customers' strong growth, in particular in automotive, 3D-printing, and in consumer goods markets such as sports and electronics, Arkema announced an investment plan of some 300 million euros over five years in the biosourced polyamide 11 chain. This major investment will enable the Group to increase by 50% its polyamide 11 global production capacities. The project falls in line with Arkema's strategy to speed up its development in advanced materials, one of the key pillars of its future growth, sustained by a unique portfolio of innovations around the main sustainable development trends.

Over the next five years, the Group plans to invest some 300 million euros in building, in Asia, a world-scale plant dedicated to producing Rilsan® PA11 biosourced polyamide from castor oil. The new plant, which will produce both the amino 11 monomer and its polymer, Rilsan® PA11, should come on stream in late 2021. It will enable Arkema to increase by 50% its Rilsan® PA11 (powder and granule) production capacity. The investment also includes a 50% increase in global production capacities for Pebax®, in particular Pebax® RNew of which amino 11 is a key component. Pebax® RNew is a biosourced polyamide elastomer with

unique properties such as energy return and flexibility, earmarked in particular for the sports and electronics markets.

With this upcoming plant, Arkema will have a second amino 11 monomer production site, complementing its historical site in Marseille, France.

Rilsan® PA11 is the only high performance 100% biosourced polyamide to qualify for the most exacting applications in particular in the electronics, 3D-printing and automotive markets, where it serves as a metal substitute.

Click [here](#) for more information.

---

## Perstorp launches renewable polyol portfolio

The world's first renewable Penta, known as Voxtar™, was launched in 2010. It can reduce carbon footprint by up to 80% compared to fossil alternatives. The addition of two new innovative products; Evyron™ (partly renewable TMP) and Neeture™ (partly renewable Neo) will give Perstorp's customers a clear market advantage in creating pro-environmental low carbon footprint products.

Currently Perstorp is devoting 80% of its R&D resources to finding new sustainable solutions and in addition, all Perstorp Swedish plants will switch to using only renewable electricity in 2018.

The two new Pro-Environment Polyols – Evyron™ and Neeture™ - complete the portfolio of the three essential polyols in renewable options. The new portfolio is based on a certified mass balance concept. Mass balance is about mixing fossil and renewable in the same existing systems but keeping track of their quantities and allocating them to specific products. This ensures that the quality and performance of the molecules are

exactly the same giving customers a real go-pro-environmental choice.

Perstorp's Pro-Environment Polyols are all ISCC certified which among other things ensures a traceability of the bio-based raw material back to its country of origin.

Click [here](#) for more information.

---

## Chemicals

### Biosuccinium is both Halal and Kosher

Reverdia has been awarded Halal and Kosher certifications for its Biosuccinium® S grade of bio-succinic acid. The speciality grade, which is registered under the ECOCERT Natural and Organic Cosmetics Standard as 100% natural origin, is designed for markets which require high quality and purity.

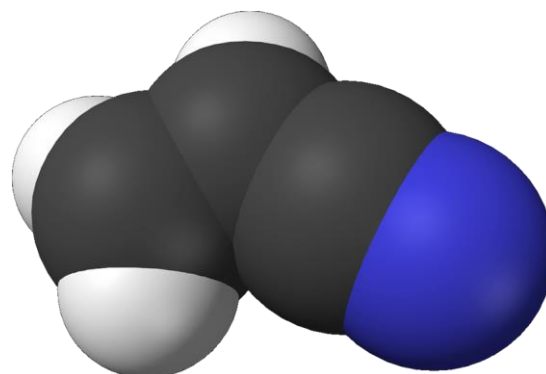
Biosuccinium® S is an active ingredient for health and beauty products. Its derivatives can be used in a wide variety of markets. Consumer applications down the value chain include personal care and pharmaceuticals through to food and flavours. Reverdia's new certifications mean that it can now offer its global supply for the growing Halal and Kosher consumer segments.

The Union of Orthodox Jewish Congregations of America granted Kosher certification to Reverdia's Biosuccinium® S, produced in its Cassano production plant in Italy. The Halal certification has been approved by the Halal Correct Certification Foundation based in Leiden, Netherlands.

Click [here](#) for more information.

---

### Novel method for biobased acrylonitrile



*Wikimedia Commons*

A new study from the Energy Department's National Renewable Energy Laboratory establishes a novel catalytic method to produce renewable acrylonitrile using 3-hydroxypropionic acid (3-HP), which can be biologically produced from sugars. This hybrid biological-catalytic process offers an alternative to the conventional petrochemical production method and achieves unprecedented acrylonitrile yields.

Acrylonitrile, a petroleum-derived commodity chemical, is one of the most widely used monomers in the chemical industry with many commercial applications. Today, acrylonitrile is used in the production of acrylic fibres for carpets, clothes, and fabrics, and in plastics such as food containers, and packaging materials. Most importantly for this project, acrylonitrile is also the primary building block in carbon fibre composites, which are used for lightweighting applications in automotive and air transportation. Acrylonitrile is produced today industrially via an energy-intensive and chemically hazardous process.

Propylene price volatility and environmental sustainability have motivated a search for alternative pathways using bio-derived feedstocks such as glycerol and glutamic acid. Yet none have been able to compete with the traditional process in terms of cost and yield. Now, new NREL

research is showing promise toward achieving this goal.

Newly published in Science, "Renewable Acrylonitrile Production" shows a path toward a cost-effective, bio-based acrylonitrile manufacturing process. Researchers were able to achieve a 98 percent yield of acrylonitrile using a new, robust catalytic process. Based on yields alone, this is a very important discovery: in comparison, after six decades of commercial-scale improvements and optimization, the traditional acrylonitrile production process achieves yields of approximately 80 percent to 83 percent.

Click [here](#) for more information.

---

## **First DEINOVE carotenoid begins industrial production**

DEINOVE, a biotech company that discovers, develops, and produces high-value compounds from rare bacteria, notably from the *Deinococcus* genus, announces the launch of the industrial production of its first carotenoid. The company's fermentation platform has developed an optimized process in terms of performance and robustness on a 20-liter scale. At the same time, the collaboration with Processium led to the definition of the downstream process of extraction, purification, and formulation, and the drafting of the "Process Book" detailing its implementation. To ensure future commercialization, SAS PIVERT was selected as a partner to take over the fermentation on an industrial scale. Technology transfer is underway and production on a scale of several cubic meters will start in January. The fermentation step will be followed by that of extraction, purification, and formulation. Several batches will be produced to validate the industrial process, and sampled for the commercial effort that will begin in the second quarter.

In parallel, DEINOVE conducted a comprehensive program to demonstrate the safety of the strain involved in the production process of the ingredient, *Deinococcus geothermalis*. The tests were conducted on a GRAS self-affirmation scheme - a US-specific regulatory approach - and are in line with OECD guidelines and the demands of both European and US regulatory authorities. These studies have been successfully concluded and show a total absence of toxicity of the producing strain. These very satisfactory results offer promising prospects for marketing the various compounds manufactured by this strain, including carotenoids, in the field of cosmetics and also nutrition.

Click [here](#) for more information.

---

## **SEKISUKI & Lanzatech make MSW-to-chemicals progress**

SEKISUI CHEMICAL CO., LTD., the multibillion dollar Japanese diversified chemicals company, and carbon recycling company LanzaTech, have made significant progress on a waste to chemicals platform converting municipal solid waste (MSW) to new products.

With the fall in global renewable power costs and the rise of emissions reductions targets, SEKISUI, together with LanzaTech, they have taken an existing gasification system at a landfill site and added LanzaTech's fermentation capability to a slipstream of the gas. They have shown that it is possible to recycle the carbon from unsorted MSW destined for landfill or the incinerator and ferment it to make new products, that would otherwise come from fossil resources or sugars.

In contrast to traditional fermentation that uses yeast to convert sugars into products such as ethanol, LanzaTech ferments gases and produces ethanol and a variety of chemicals using a naturally occurring bacteria. These chemicals are precursors to plastics, rubber and synthetic fibres

and can be used to produce new packaging, sneakers, cell phone covers and yoga pants while avoiding the need for more fossil resources to come out of the ground.

This technology, which was first demonstrated in 2013 in a laboratory unit, has now been demonstrated at pilot scale achieving commercial productivity and stability targets.

Click [here](#) for more information.

---

### **DSM acquires Brazilian farnesene facility from Amyris**



*Royal DSM*

Royal DSM, a global science-based company active in health, nutrition and materials and Amyris, Inc., the industrial bioscience company, today announced that they have enhanced their strategic alliance through the sale of Amyris Brasil Ltda to DSM and the establishment of a long-term manufacturing partnership for Amyris' high-volume products.

DSM will continue existing supply-agreements to Amyris and other parties. DSM will also supply Amyris with speciality compounds until it realizes its Brotas 2 specialties production facility. Amyris is accelerating the construction of its second facility dedicated to speciality products while maintaining the manufacturing process development and business support capability located in Campinas, Brazil.

With the acquisition of the Brotas 1 facility, DSM adds a state-of-the-art biotechnology-based production site in Brazil to its global network, with abundant availability of sustainable raw materials (sugar cane), securing production capacity for its rich pipeline of sustainable and bio-based solutions. Having broad experience in operating large-scale fermentation plants, DSM will optimize the operational performance of the site.

The sale of the Brotas 1 facility, which was designed to produce high volumes of farnesene, together with the creation of a long-term production relationship for high-volume farnesene-based intermediates will enable Amyris to focus on its core strength of developing breakthrough bioscience technologies through a portfolio approach that continues to target key markets, as well as the production of specialty products.

Click [here](#) for more information.

---

### **Genomatica's 1,3-butylene glycol to be marketed in Asia**

Genomatica and Daicel Corporation announced that Daicel will be responsible for marketing Genomatica's new, naturally sourced, award-winning 1,3-butylene glycol, in the Asia-Pacific region. Daicel earns revenues of USD \$4 billion per year and is a leading supplier and marketer of ingredients for the personal care industry.

A naturally sourced, sustainable alternative; Genomatica's biobased 1,3-butylene glycol already honoured for innovation 1,3-Butylene glycol, a four-carbon alcohol, is commonly used in personal care products to increase moisture retention (as a humectant), improve texture and provide antimicrobial properties. Additionally, it is used as a solubilizer for plant extracts, flavours and fragrances. Genomatica produces biobased 1,3-butylene glycol from natural, plant-based sugars using its safe and sustainable

fermentation-based process technology. This new approach has high appeal in personal care applications where demand for natural ingredients is growing. Genomatica's technology and product has already been recognized with the prestigious ICIS Innovation Award. Daicel to identify customers and applications for Genomatica's naturally sourced 1,3-butylene glycol in Asia-Pacific. The cosmetic market in the Asia-Pacific region has been growing rapidly, and demand for natural cosmetics has been growing twice as fast. The initial focus of the collaboration will be to identify potential customers for Genomatica's naturally sourced 1,3-butylene glycol in the personal care market plus additional potential markets. Genomatica has been producing tons of biobased 1,3-butylene glycol for sampling since mid-2017.

Click [here](#) for more information.

---

# Consumer Products

## **Patent protection issued for biobased antiperspirants**

BRAIN AG has been granted patent protection by the United States Patent and Trademark Office (USPTO) for novel screening systems which help find biological compounds that reduce the production of sweat. The protected molecular biological systems are based on a key molecule discovered by BRAIN researchers which paves the way for the systematic screening of natural compounds that reduce the production of sweat. The US patent was granted in November 2017. EU area patent protection by the European Patent Office (EPO) is expected to follow in early 2018.

BRAIN's protected technology offers efficient and reliable solutions to meet the growing demand in biological deodorants and antiperspirants.

The patent protection granted in the US is based on a joint scientific breakthrough by BRAIN AG and the Darmstadt Dermatology Clinic (Hautklinik Darmstadt) which improves the understanding of sweat production in human skin. The paper published in *Experimental Dermatology* by the involved scientists is regarded as pathbreaking, both in terms of basic research and concerning the development of gentle and skin-friendly body care products which reduce the production of sweat. The patent's claims protect BRAIN's work on a specific membrane protein which occurs in the secretory cells of the sweat glands and plays a direct role in the production of sweat. Development work based thereon involves in vitro procedures to identify natural active ingredients for antiperspirant cosmetics. These in vitro procedures harness cell cultures with the protected active molecule integrated in their membranes. Using this cell-based procedure and fluorescent dyes, some initial natural active ingredients from the BRAIN BioArchive have been directly screened for their inhibiting properties and are currently being further investigated.

Click [here](#) for more information.

---



# Events

## **CLIB International Conference Düsseldorf, 17th-18th January 2018**

Since 2010, the CLIB International Conference is the meeting place for the industrial biotechnology community. Being the first symposium of the year, it brings together international experts from all over the world in Düsseldorf, Germany. The conference

discusses technical, commercial and political implications of novel value chains based on innovative biotechnological processes and alternative feedstocks.

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.

---

## **ECO-BIO 2018 Dublin, 4th-7th March 2018**

ECO-BIO 2018 will highlight the latest research and innovation towards developing industrially viable, safe and ecologically friendly biobased solutions to build a sustainable society.

A topical and comprehensive programme will include plenary and invited speakers, forum discussions, contributed oral presentations, a large poster session and exhibition.

The conference will bring together all concerned with the biobased economy to review industrial, academic, environment and societal approaches, discuss the latest research and progress, and encourage new research partnerships to enable new cascaded biobased value chains.

Click [here](#) for more information.

---

## **World Bio Markets Amsterdam, 20th-22nd March 2018**

With governments committed to reducing emissions and consumers becoming more educated about where their products come from, there are opportunities for the bio-based sector to become a true contender to fossil oil. Yet long development times, lack of investment, and challenges in attaining a secure and sustainable supply chain have made it difficult for the bio-economy to achieve commercial success.

This event provides a platform for the entire global value chain, from feedstock producers to consumer brands, to work together to overcome these challenges.

Click [here](#) for more information.

---

## **Global Bioeconomy Summit 2018 Berlin, 19<sup>th</sup>-20<sup>th</sup> April 2018**

The first Global Bioeconomy Summit was held in 2015 and brought together more than 700 bioeconomy stakeholders from over 80 countries. Since then, Bioeconomy has taken a steep and exciting way forward. Many notable initiatives and collaborative efforts have been initiated by the bioeconomy community in order to drive the development of sustainable bioeconomies in their countries and regions.

The 2nd GBS will focus on emerging concepts and future trends in bioeconomy, the latest on challenges and opportunities related to ecosystems, climate action and sustainable development along with the bioeconomy innovation agendas and global governance initiatives to manage them.

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.

There will 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.

Click [here](#) for more information.

---

## **1st PHA Platform World Congress Köln, 4th-5th September 2018**

PHA (Poly-Hydroxy-Alkanoates or polyhydroxy fatty acids) is a family of biobased polyesters. As in many mammals, including humans, that hold energy reserves in the form of body fat there are also bacteria that hold intracellular reserves of polyhydroxy alkanoates. Here the micro-organisms store a particularly high level of energy reserves (up to 80% of their own body weight) for when their sources of nutrition become scarce. Examples for such Polyhydroxyalkanoates are PHB, PHV, PHBV, PHBH and many more. That's why we speak about the PHA platform.

This congress will address the progress, challenges and market opportunities for the formation of this

new polymer platform in the world. Every step in the value chain will be addressed. Raw materials, polymer manufacturing, compounding, polymer processing, applications, opportunities and after-use or end-of-life options will be discussed by parties active in each of these areas. Progress in underlying technology challenges will also be addressed.

When there is sufficient interest there will be a workshop on the basics of the PHA-platform in the afternoon of September 3rd, preceding the conference.

Click [here](#) for more information.

---

## **EFIB 2018**

### **Toulouse, 16<sup>th</sup>-18<sup>th</sup> October 2018**

The 11th European Forum for Industrial Biotechnology and the Bioeconomy (EFIB) travels to Toulouse in October 2018 and will attract industry executives committed to a shift towards renewable, biologically-based manufacturing. EFIB is organised by EuropaBio, Europe's largest and most influential biotechnology industry group.

Click [here](#) for more information.

---

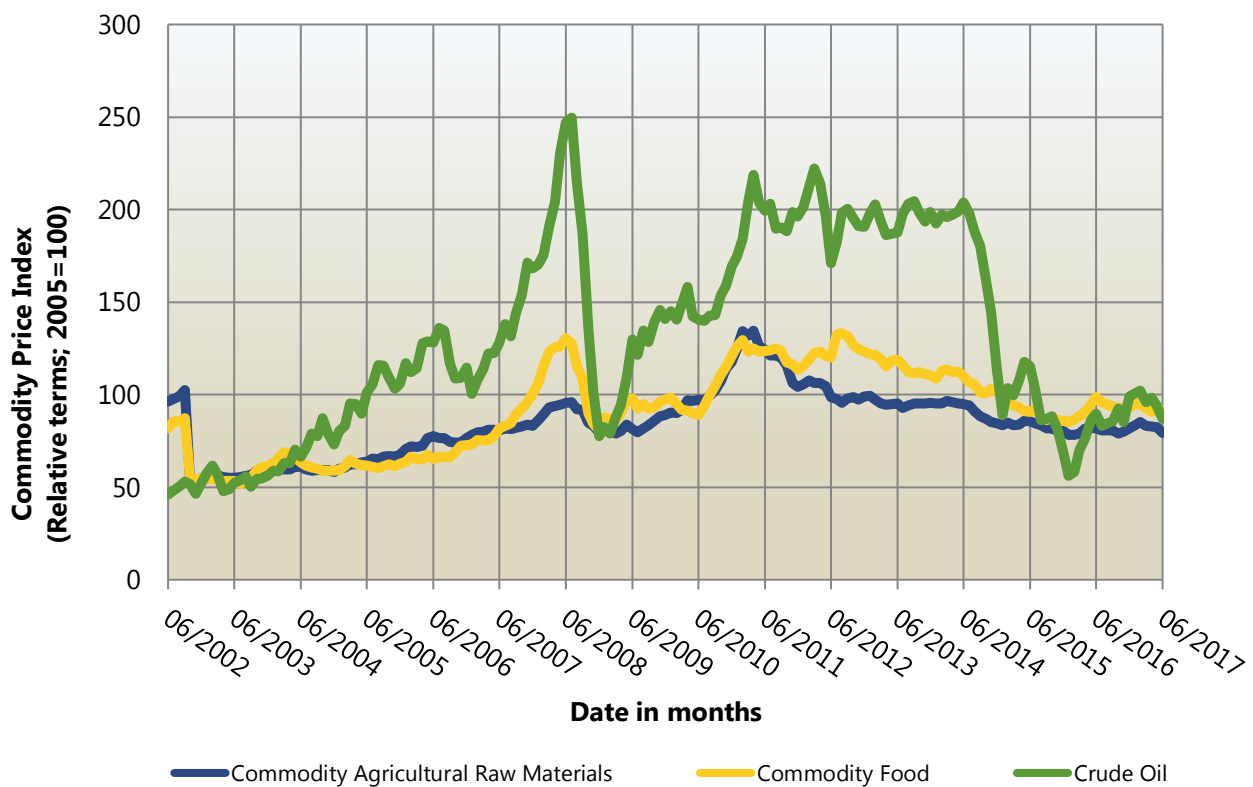
# Price Information

**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\$ (Oct 12)	Price, US\$ (Oct 17)	Price Change
Crude oil (petroleum, barrel)	101.19	59.93	-41%
Maize (corn, metric ton)	308.65	148.70	-52%
Sugar (pound)	0.43	0.32	-23%
Rapeseed oil (metric ton)	1190.00	930.00	-22%
Soybean oil (metric ton)	1163.00	881.00	-24%
Ethanol (gallon)	2.37	0.98	-59%

For details on indexes please see [www.indexmundi.com/commodities](http://www.indexmundi.com/commodities); Ethanol prices from Govt of Nebraska at [www.neo.ne.gov/](http://www.neo.ne.gov/)

## Raw materials 15-year Price Indices



For details on the nature of these commodities please see [www.indexmundi.com/commodities](http://www.indexmundi.com/commodities)

# Credits and Disclaimer

NNFCC Market Review is edited by Bob Horton for NNFCC subscribers. Feedback is welcome. The Review has been compiled in good faith and NNFCC does not accept responsibility for any inaccuracies or the products or services shown.



**NNFCC**  
**Biocentre, York Science Park**  
**Innovation Way**  
**Heslington, York**  
**YO10 5DG**

**Phone: +44 (0)1904 435182**  
**Fax: +44 (0)1904 435345**  
**Email: [enquiries@nnfcc.co.uk](mailto:enquiries@nnfcc.co.uk)**  
**Web: [www.nnfcc.co.uk](http://www.nnfcc.co.uk)**  
**Twitter: @NNFCC**