

The Bioeconomy Consultants

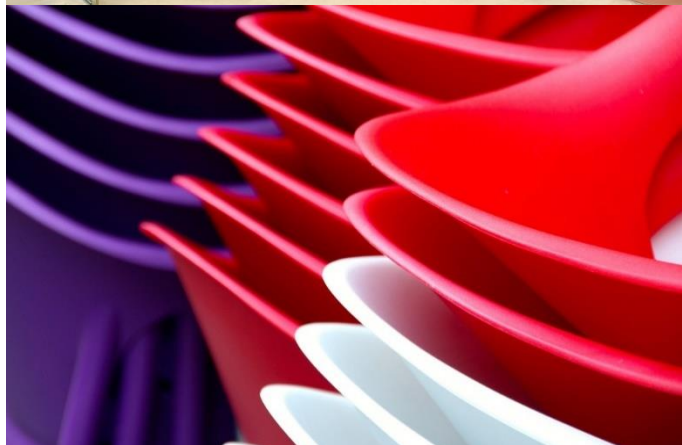


News Review

Issue Fifty-Five

October 2016

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



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Foreword

Welcome to this month's edition of the Biobased Product's market review.

For small companies working on innovative research hoping to take their ideas to the next level, the path to commercial success can oft be paved with many a challenge. SMEs and start-ups in the biobased and clean technologies sector unfortunately face the same challenges. The newly launched [Biobase4SME](#) has set out to change this however by helping companies turn their biobased research into commercial innovation. Through the European Commission's INTERREG NWE programme, the €5.84 million project offers training, innovation bio-camps, workshops and innovation coupons worth up to €100,000 to eligible businesses in North West Europe. NNFCC are proud to be working partners in the project, providing services including business plan support, feedstock analysis and market research to SMEs developing biobased products. Support for these businesses doesn't stop there however as Biobase4SME follows the launch of [SuperBio](#) in August, an EU Horizon2020 funded project which supports the development of promising industrial value chains in the bioeconomy.

As innovation in the biobased sector continues to drive forward, it's a different story for one 'traditional' petrochemical products market where across la Manche this month, France became the first government to ban disposable plastic cups, plates and cutlery, bidding adieu to these items from the year 2020. The ban does not cover all items however with exceptions made for some compostable, bio-based materials. This is good news for developers of bio-based and compostable plastics, creating potential for these plastics to emerge in other markets- note the compostable coffee capsules discussed in August's market review. The ban has not been welcomed by everyone however with opponents arguing the ban violates EU policies governing the free movement of goods. Pack2go, an organisation who represent European packaging manufacturers, are urging the European Commissions to step in and take legal action against France for the apparent breach of the EU law, stating if the EC won't, then they will. At this early stage, its unknown what the outcome will be but we look forward to keeping you informed as the case continue.

Read on for the latest market news

Policy

ASTM International's new subsidiary, the Safety Equipment Institute, awarded a five-year contract to manage bio-based certification and labelling program.

Earlier this year, ASTM members updated a test method to determine the biobased content of products made from renewable resources. Recently, ASTM International's new subsidiary, the Safety Equipment Institute, was awarded a five-year contract to manage a certification and labelling program based on that test method. Back in 2002, the U.S. Department of Agriculture created the BioPreferred certification program to encourage widespread development, purchase, and use of biobased products, which are derived from plants and other renewable agricultural, marine, and forestry products. The goal of certifying products as biobased was to reduce reliance on petroleum, increase the use of renewable agricultural resources, and help reduce adverse impacts on health and the environment.

Click [here](#) for more information.

France becomes the first country to ban plastic plates and cutlery



Wikimedia

France has become the first country in the world to ban disposable plastic plates, cups and utensils, passing a law that will go into effect in 2020. Exceptions will be allowed for items made of compostable, bio-sourced materials. The new law is a part of the country's Energy Transition for Green Growth Act, the same legislation that also outlawed plastic bags in grocery stores and markets beginning in July. The general idea behind the law - following the landmark conference held in Paris last fall on curbing global warming - is to promote a "circular economy" of waste disposal, "from product design to recycling," French lawmakers say.

Not all share the enthusiasm of France's Socialist government, which has made environmental progress one of its main goals. In Brussels, some argue that the laws violate existing European Union legislation regarding the free movement of goods and the protection of manufacturers.

Click [here](#) for more information.

Research & Development

New €5.83 million project to boost growth for biobased SMEs and Start-ups in North-West Europe



Interreg

The European Commission has launched through its INTERREG NWE Programme a three-year project "BioBase4SME" to further support the development of the biobased economy in North West Europe (NWE). The €5.83 million project will help start-ups and Small and Medium Enterprises (SMEs) to overcome technological and non-technological barriers on their path to turn biobased research into commercial innovation. BioBase4SME offers training, innovation bio-camps, workshops and innovation coupons worth up to €100,000. The BioBase4SME partnership includes eight organisations from six different countries. The BioBase4SME network, representing leading biobased economy experts, will advise SMEs from across North-West Europe on how to develop new ideas into marketable products. The project will offer training, innovation bio-camps, workshops and innovation coupons worth up to €100,000. These coupons can be used for technological assistance such as scale-up to pilot scale, Life-Cycle Assessment (LCA), techno-economic evaluation, market research, feedstock analysis, social acceptance, and business planning support or a combination thereof. BioBase4SME is a follow-up of the highly successful Bio Base

NWE project This three-year (2013-2015) project mentored 755 companies in total and granted 30 innovation coupons worth €10-30.000 for technological assistance to SMEs and start-ups. The work done within the innovation coupon scheme created a substantial leverage effect: up to €71million of investments and the creation of 320 new jobs in the biobased economy in the coming years.

Click [here](#) for more information.

Assessing energy performance of bio-based succinic acid production using LCA

Bio-succinic acid (bio-SAC) is a promising industrial alternative to the currently used petroleum counterparts. This is mainly due to its energy and environmental performances, which were both, assessed using a cradle-to-gate LCA approach. The foreground data used in this LCA were based on real production data from a facility in Louisiana, USA that uses a non-food crop feedstock. Results indicate that electricity use and heat generation were identified to have the biggest impact on the energy and environmental performances of bio-SAC and to have the highest improvements potential. In addition, bio-SAC has lower GWP and non-ren CED values in comparison to petroleum-based SAC by 385% and 1045%, respectively. Scenario analyses indicate that using an energy intensive feedstock (e.g., dextrose) instead of sorghum will have an adverse impact on bio-SAC GWP and non-ren CED.

Click [here](#) for more information.

Can bio-based chemicals meet demand? Global and regional case-study around citrus waste-derived limonene as a solvent for cleaning applications

One common factor across many economies around the world is their high dependency on petroleum. The chemical sector is no exception and considering the paramount role that solvents play within this industry they make an ideal focus for investigating green transition potential. This work attempts to shed some light on the scarce literature regarding the quantitative assessment of substitution capacity in target markets, by examining a case study of toluene use as an industrial cleaning agent and its replacement by limonene, a widely established citrus-peel-derived alternative in a number of applications. The systematic approach presented here compares market demand against potential supply by evaluating current and projected scenarios based on citrus fruit and juice production both at global and regional level. The results clearly show that the potential for complete substitution of toluene by limonene at global level is certainly out of reach, but encouraging results were obtained in specific regional substitution case studies, considering both citrus-producing and citrus-importing countries. In these cases, there is a clear potential for limonene to substitute toluene as a solvent within and beyond the cleaning sector, leaving space for future work in this area to investigate the transition potential for other important bio-based chemicals.

Click [here](#) for more information.

Terpene Based Sustainable Elastomer for Low Rolling Resistance and Improved Wet Grip Application: Synthesis, Characterization and Properties of Poly(styrene-co-myrcene)

Incited by the unprecedented surge of developing sustainable polymers, this work demonstrates a green emulsion polymerization route toward the development of sustainable rubbery materials based on β -myrcene (MY) and styrene (ST) for low rolling resistance and improved wet grip applications. The microstructure of the synthesized copolymers was found to be governed by the ST weight percent. For example, the copolymers having less than 40 wt% of ST had 1,2 vinyl and 3,4 addition products along with 1,4-cis and -trans microstructure of the polymyrcene unit, whereas the copolymers having higher weight percent of ST had only 1,4-cis and -trans microstructure of the polymyrcene unit. The copolymers displayed improved onset degradation temperature and sub ambient glass transition temperatures. The copolymer having a 70/30 weight/weight ratio of MY/ST displayed a molecular weight of 51 500 Da and a glass transition temperature of -35.2 °C. The 70/30 rubber vulcanizate exhibited satisfactory mechanical properties (tensile strength of 6.4 MPa and elongation at break of 395%). Dynamic mechanical analysis of the vulcanizate reveals improved traction and low rolling loss over a standard tire tread compound, thereby making it a promising material for tires.

Click [here](#) for more information.

Meta-Analysis of Life Cycle Energy and Greenhouse Gas Emissions for Priority Bio-based Chemicals

Research and development for bio-based chemicals production has become a strategic

priority in many countries, due to the widespread availability of renewable feedstocks and the potential for reduced life cycle greenhouse gas (GHG) emissions and fossil energy use compared to petrochemicals. These environmental benefits are not assured, however, as a multiplicity of processing features (i.e., bio feedstock, conversion platform, energy/solvent recovery) and life cycle modelling factors (i.e., coproducts, allocation scheme, study scope, location) influence the overall GHG emissions and energy use of a bio-based chemical production scheme. Consequently, there has been high variability in reported environmental impacts of bio-based chemical production across prior life cycle assessment (LCA) studies. This meta-analysis considers 34 priority bio-based chemicals across 86 discrete LCA case studies. Most bio-based chemicals exhibited reduced GHG emissions and net energy use compared to petrochemical counterparts, with exceptions including p-xylene, acetic acid, and adipic acid. Seven priority bio-based chemicals had no reported results, predominantly lignin-derived. GHG emissions reductions were compared against proposed thresholds from the Roundtable on Sustainable Biomaterials (RSB), the International Sustainability & Carbon Certification (ISCC), and those applied to U.S. biofuels under the Renewable Fuels Standard (RFS2) program. ANCOVA and ANOVA statistical tests were utilized to identify process and life cycle modelling factors that contribute significantly to environmental metrics. Conversion platform was found to be statistically significant ($\alpha=0.1$) for GHG emissions, with thermochemical routes having the highest results, while LCA coproduct allocation scheme was significant for non-renewable energy use. Recommendations for harmonizing and prioritizing future work are discussed.

Click [here](#) for more information.

Economic evaluation of bio-based supply chains with CO₂ capture and utilisation

Carbon capture and storage (CCS) and carbon capture and utilisation (CCU) are acknowledged as important R&D priorities to achieve environmental goals set for next decades. This work studies biomass-based energy supply chains with CO₂ capture and utilisation. The problem is formulated as a mixed-integer linear program. This study presents a flexible supply chain superstructure to answer issues on economic and environmental benefits achievable by integrating biomass-coal plants, CO₂ capture and utilisation plants; i.e. location of intermediate steps, fraction of CO₂ emissions captured per plant, CO₂ utilisation plants' size, among others. Moreover, eventual incentives and environmental revenues will be discussed to make an economically feasible project. A large-size case study located in Spain will be presented to highlight the proposed approach. Two key scenarios are envisaged: (i) Biomass, capture or utilisation of CO₂ are not contemplated; (ii) Biomass, capture and CO₂ utilisation are all considered. Finally, concluding remarks are drawn.

Click [here](#) for more information.

Yorkshire plans to become a global leader in food manufacturing, agri-tech and biorenewables



Wikimedia Commons

The Bioeconomy is a catch-all term for those industries that are involved in producing food, energy and other useful materials from biological resources. Over 10 per cent of Yorkshire's economy comes from this sector, a higher proportion than any other UK Local Enterprise Partnership area. Yorkshire also have double the national average of people working in research and development in the sector, around 2,800 people, a significant economic asset to capitalise on. York is becoming the Cambridge of the North as a hub for innovation, research and technology and we're making strides in the right direction. BioVale is at the heart of this ambition, by linking the different institutions to work together including FERA Science, Stockbridge Technology Centre and the Biorenewables Development Centre, and we continue to support them in their work.

Major strides forward have also been made with the establishment of Yorkshire's first Food Enterprise Zone in Malton, and with major investments in the National Agri-Food Innovation Campus at Sand Hutton.

Click [here](#) for more information.

Avantium opens pilot plant



The chemical technology company Avantium has opened a pilot plant facility at Brightlands Chemelot Campus. For Avantium this a new step in the development of the YXY technology which

is a ground-breaking technology for a bio-based future. The YXY technology platform helps to produce a wide range of novel materials and products, all 100% bio-based, by converting plant-based sugars into chemical building blocks, like Furanics and Levulinics, for plastics and other applications. YXY is a game-changing technology that offers bio-based products and fuels with superior properties at market competitive prices, enabling a green way of doing business. The basic philosophy behind Avantium's YXY technology is to develop products from renewable sources that compete on price and performance and with a superior environmental footprint.

For Brightlands Avantium's pilot plant facility is a new a step in the development of the campus as a place to be for developing and installing pilot plant scale processes. Earlier this year, Chemelot InSciTe and Flowid have opened their pilot plant facilities at the campus.

Click [here](#) for more information.

Markets

Global Polyolesters for Bio-based Lubricant Market 2016 Industry Research Report

The Global Polyolesters for Bio-based Lubricant Consumption 2016 Market Research Report is an in-depth study on the current state of the Polyolesters for Bio-based Lubricant market. First, the report provides a basic overview of the Polyolesters for Bio-based Lubricant industry including definitions, classifications, applications and industry chain structure. Development policies and plans are also discussed as well as manufacturing processes and cost structures. Secondly, the report states the global Polyolesters for Bio-based Lubricant market size (volume and

value), and the segment markets by regions, types, applications and companies are also discussed. Third, the Polyolesters for Bio-based Lubricant market analysis is provided for major regions including USA, Europe, China and Japan, and other regions can be added. For each region, market size and end users are analysed as well as segment markets by types, applications and companies. Then, the report focuses on global major leading industry players with information such as company profiles, product picture and specifications, sales, market share and contact information. The Polyolesters for Bio-based Lubricant industry development trends and marketing channels are also analysed and finally, the feasibility of new investment projects is assessed, and overall research conclusions are offered.

Click [here](#) for more information.

Gevo Announces Proposed Public Offering of Common Stock and Warrants



Gevo

Gevo, Inc., a leading renewable chemicals and next-generation biofuels company, have announced that it intends to offer and sell, subject to market and other conditions, Series E units, with each Series E unit consisting of one share of common stock and Series I warrants to purchase a certain number of shares of common stock. The Company is also offering Series F units, in lieu of Series E units, to those purchasers whose purchase of additional Series E units in the offering would result in the purchaser beneficially owning more than 4.99% of Gevo's outstanding common stock following the completion of the offering. The

Series F units will consist of pre-funded warrants to purchase one share of common stock and Series I warrants to purchase a certain number of shares of common stock. The units are to be sold by Gevo subject to market and other conditions in an underwritten public offering. Gevo currently intends to use the net proceeds from the offering, excluding any future proceeds from the exercise of the warrants, to fund working capital and for other general corporate purposes. In connection with the offering, Oppenheimer & Co. Inc. is acting as sole underwriter.

Click [here](#) for more information.

Advancing the Biobased Economy: Renewable Chemical Biorefinery Commercialization, Progress, and Market Opportunities, 2016 and Beyond

A newly published report provides a review of operating biorefineries which display a range of technology solutions undergoing commercial development – beyond just advanced biofuels – to produce commodity and specialty renewable chemicals. Industrial biotechnology companies are pursuing renewable chemicals and biobased materials because they can be commercialized at smaller scale, as well as promise environmental benefits, stable costs and novel properties in comparison to fossil fuel-derived chemicals. Competition to produce platform renewable chemicals provides manufacturers assurance of a steadily available, high-quality supply of renewable chemicals for consumer product applications.

Click [here](#) for more information.

Tesoro to Acquire Virent in Support of Commercializing Renewable Fuels and Chemicals

Virent and Tesoro have announced they have reached an agreement for Tesoro to become Virent's new strategic owner. The acquisition will support the scale up and commercialization of Virent's BioForming® technology for the production of low carbon bio-based fuels and chemicals. As a result of the acquisition, Virent will become a wholly owned subsidiary of Tesoro and remain in Madison, Wisconsin.

The companies initiated a strategic relationship earlier this year, and have worked together to establish a forward plan to scale-up the technology and reduce deployment risks to meet the increasing demands for high quality, renewable fuels and chemicals.

Click [here](#) for more information.

United States Bio-Based Butadiene Market Report 2021

This report studies sales (consumption) of Bio-Based Butadiene in USA market and focusses on the top players, with sales, price, revenue and market share for each in USA.

Click [here](#) for more information.

Unilever to acquire Seventh Generation, Inc.

Unilever has announced that it has signed an agreement to acquire Seventh Generation, Inc., the North American home and personal care products company. Based in Vermont, Seventh Generation is a pioneer in corporate responsibility and sustainable product innovations, including plant-based detergents and household cleaners.

The company's turnover exceeded US \$200m in 2015 and it has seen double digit compounded annual growth over the last 10 years. Seventh Generation has a comprehensive product portfolio and a distribution network covering the 'natural' category in grocery, mass merchandise and e-commerce channels. Terms of the deal were not disclosed and the transaction is subject to customary regulatory approvals.

Click [here](#) for more information.

Amyris & Ginkgo Bioworks Complete Collaboration Agreement to Accelerate Commercialization of Bio-Based Products

Amyris, Inc. has announced that it has completed a subsequent collaboration agreement with Ginkgo Bioworks, which is expected to be approved by the boards of both companies. The agreement finalizes details of how the two companies will jointly develop cultured products more efficiently and cost effectively, accelerating time to market. This breakthrough biotech collaboration was initially announced at the end of June and, upon board approval, both companies plan to move quickly to establish a leading position within the market for sustainable, bio-based products. Per the agreement, Ginkgo and Amyris will share in the value of new cultured ingredients brought to market across several industries including food and nutrition, flavour and fragrance, and cosmetics and personal care. These ingredients, produced via fermentation with engineered microorganisms, leverage the end-to-end biotechnology stack that Ginkgo and Amyris have developed, from high throughput automated strain development, analytics, and optimization, to process development, full-scale manufacturing, and product recovery operations.

Click [here](#) for more information.

BioAmber Achieves Important Milestone in U.S. DOE Loan Guarantee Process

BioAmber Inc. has announced an important milestone in its application for a \$360 million loan guarantee from the U.S. Department of Energy (U.S. DOE). This loan guarantee is in connection with the company's goal of securing non-dilutive funding for its proposed second manufacturing facility that would be located in the United States. The U.S. DOE's Loan Program Office (LPO) administers a four phase process under the Title XVII Innovative Clean Energy Projects loan guarantee program. This program finances innovative renewable energy and efficient energy projects. BioAmber successfully completed the first two phases of the process and was selected for the next phase in which it will engage the LPO in the negotiation of terms and conditions of the potential loan guarantee, and work with the LPO to validate the engineering, environmental, market and financial information that BioAmber submitted in the previous phases. BioAmber's proposed second facility will be over six times the size of its existing Sarnia plant, with annual capacity of 70,000 tons of bio-based 1, 4-butanediol (BDO), 24,000 tons of bio-based tetrahydrofuran (THF) and 60,000 tons of bio-based succinic acid. Using ten year average feedstock and chemical pricing, and the same performance targets as the Sarnia plant, this facility is forecast to generate annual sales of over \$350 million and \$150 million of EBITDA at full capacity.

Click [here](#) for more information.

BioAmber closes on a \$19.2 million corporate loan

BioAmber Inc. has announced that it has closed on a \$19.2 million (CDN\$25 million) loan from Bridging Finance Inc., acting as sub-advisor to the

Sprott Bridging Income Fund LP. Proceeds from the loan will be used to retire an \$8 million loan from Tennenbaum Capital Partners, with the balance applied to general corporate purposes. The loan does not contain any convertible features or warrants.

Mario Saucier, Chief Financial Officer of BioAmber stated: "This non-dilutive loan from Bridging Finance is a strong endorsement of our facility, technology and team, and has allowed us to both lower our financing costs and strengthen our balance sheet. We remain committed to rewarding the confidence that Bridging Finance and our shareholders have shown in us as we ramp-up towards full capacity".

Click [here](#) for more information.

Global Bio based Polyethylene Terephthalate Market 2016 Industry Research Report

A new market research report on the current state of the 2016 Bio based Polyethylene Terephthalate industry has been published. Firstly, the report provides a basic overview of the industry including definitions, classifications, applications and industry chain structure. The Bio based Polyethylene Terephthalate market analysis is provided for the international market including development history, competitive landscape analysis, and major regions development status. Secondly, development policies and plans are discussed as well as manufacturing processes and cost structures. This report also states import/export, supply and consumption figures as well as cost, price, revenue and gross margin by regions (United States, EU, China and Japan), and other regions can be added. Then, the report focuses on global major leading industry players with information such as company profiles, product picture and specification, capacity, production, price, cost, revenue and contact

Toyobo and Avantium partner on PEF polymerization and PEF films

Toyobo and Avantium have jointly developed thin films made from PEF, a 100% biobased plastic based on Avantium's proprietary YXY technology for the production of FDCA. These PEF films are about 10 micrometre in thickness (one hundredth of a millimetre) and can be applied for food packaging, in electronics applications such as displays or solar panels, industrial and medical packages. Compared to standard PET films, PEF films have a 10x higher oxygen barrier, 2~3x higher water vapour barrier, improved mechanical strength and are fully transparent. The performance benefits enable new packaging opportunities, such as transparent pouches for soups, sauces or baby foods. The barrier properties extend the shelf life when packaging oxygen sensitive products like meat, fish, dairy products, or fresh pizzas, or moisture sensitive products such as cereals, cookies, crisps, personal care or medical products, and enhance the aroma barrier for packaged cheeses, fish or detergents. The market development of the PEF films in Asia will be performed in collaboration with Mitsui & Co., Ltd. ('Mitsui'), with which Avantium announced a partnership in December 2015. The parties expect to offer samples for packaging tests from 2017 onwards.

Click [here](#) for more information.

Thailand's circular, biobased economy: home grown bioplastics set to improve efficiency of local rubber agriculture

Corbion, Global Bio-Polymers and Maxrich have announced their collaboration on the development of a biodegradable root growth container to improve the agricultural efficiency and environmental performance of rubber tree

plantations. The container is intended to bring threefold benefits to the Thai rubber industry; encourage young rubber trees to root more effectively to increase tree longevity, improve survival yield rates during outplanting, and offer a more environmentally sustainable alternative to traditional, non-biodegradable plastic containers.

Currently, rubber trees are planted in nurseries, above ground, in polyethylene (PE) film bags or polypropylene (PP) cones. The PE bags (or parts thereof) can end up left on the land or blown away - resulting in litter, polluting the local environment and endangering local wildlife. The bioplastic container project is intended to provide an alternative to the existing options of PE bag / PP cone. A bioplastic cone would offer the benefits of directed root growth (promoting longer tree life and increasing economic value per tree) combined with biodegradability at end of life (no need to cut off the container, thus reducing the current root damage yield loss created during container removal when outplanting). The biodegradable containers would eliminate the current littering of non-biodegradable plastics currently caused by the existing PE bag solution.

Click [here](#) for more information.

Arkema increases its specialty polyamides global capacities



Arkema

To support its customers' growth around the world, in particular in the sports, consumer electronics and automotive markets, Arkema continues to expand its specialty polyamides production capacities in China and the United

States. In China, at its Zhangjiagang site (Jiangsu Province), Arkema is increasing its compounding capacities and in 2017 will bring on stream two production lines to manufacture polyamide 11 in addition to polyamide 10 already produced on the site. With these developments and other investments made in recent years on the site amounting to €10 million overall, Arkema is significantly consolidating its offering together with the flexibility of its manufacturing plants in Asia for biosourced polyamides marketed under the trade name Rilsan®. In the United States, a new investment in the Birdsboro site (Pennsylvania) will enable the manufacture of new Pebax® biosourced grades for the sports and electronics market. Hence Arkema is complementing its Pebax® thermoplastic elastomer range particularly sought after for their light weight, impact resistance, sturdiness and flexibility at temperatures as low as -40°C. These investments are part of the development of the Group's research and growth platforms related to weight reduction of materials, design of materials, solutions for electronics, and the development of biosourced products.

Click [here](#) for more information.

Chemicals

Amyris Wins Three-Year, Multi-Million-Dollar Contract from U.S. Department of Energy to Further Manufacturing of Cellulose-Derived Farnesene



Amyris

Amyris, Inc., the industrial bioscience company, have announced that it has won a three-year multi-million dollar contract from the U.S. Department of Energy to further the manufacturing of cellulose-derived farnesene for biofuels. Amyris, in co-operation with Renmatix and Total New Energies USA, will work to develop a manufacturing-ready process utilizing wood as the cellulosic feedstock to produce farnesene, a hydrocarbon building block used to manufacture a variety of products ranging from cosmetics to detergents, as well as base oils, lubricants, diesel and jet fuel. Advancements in the use of cellulosic materials as a source of low-cost sugars for fermentation are anticipated to bring down the cost of production and has the potential to increase geographical distribution of manufacturing plants, especially in rural areas in need of new economic opportunities. The goal of this project is to produce farnesene at the same projected cost of current farnesene produced from sugarcane syrup. This would expand the global availability of farnesene in general, as well as increase the number of potential product applications for which this building block can be used.

Click [here](#) for more information.

Enerkem's facility in Edmonton becomes the first ISCC certified plant in the world to convert municipal solid waste into biomethanol

Enerkem Inc., a waste-to-biofuels and chemicals producer, announced it has obtained certification from the International Sustainability and Carbon Certification (ISCC) system for the biomethanol production of its Enerkem Alberta Biofuels full-scale facility in Edmonton, Canada. This biorefinery therefore becomes the first ISCC certified plant in the world to convert municipal solid waste into biomethanol. Biofuels used in Europe, such as biomethanol and ethanol, must prove, through

third-party certification under an approved certification scheme such as ISCC EU, that they comply with stringent criteria in terms of greenhouse gas savings, sustainability and traceability of the entire supply chain and are compliant with the European Renewable Energy Directive (RED). Under the RED Directive, all EU countries must ensure that at least 10% of their transport fuels come from renewable sources by 2020. The RED Directive also gives waste-based biofuels such as Enerkem's methanol and ethanol the advantage to count double towards this 10% requirement.

Click [here](#) for more information.

Gevo Signs Heads of Agreement with Lufthansa for Commercial Supply of Renewable Jet Fuel

Gevo, Inc., have announced that it has entered into a heads of agreement with Deutsche Lufthansa AG to supply Gevo's alcohol-to-jet fuel (ATJ) from its first commercial hydrocarbons facility, intended to be built in Luverne, MN. The terms of the agreement contemplate Lufthansa purchasing up to 8 million gallons per year of ATJ from Gevo, or up to 40 million gallons over the 5 year life of the off-take agreement. The heads of agreement establishes a selling price that is expected to allow for an appropriate level of return on the capital required to build-out Gevo's first commercial scale hydrocarbons facility. The heads of agreement is non-binding and is subject to completion of a binding off-take agreement and other definitive documentation between Gevo and Lufthansa, expected to be completed in the next few months.

Click [here](#) for more information.

Strategic Consortium Announced to Commercialize Virent's BioForming Technology for Low Carbon Fuels and Bio-Paraxylene

Virent has announced that it has established a strategic Consortium with Tesoro, Toray, Johnson Matthey and The Coca-Cola Company focused on completing the development and scale up of Virent's BioForming technology to produce low carbon bio-based fuels and bio-paraxylene (a key raw material for the production of 100% bio-polyester). The Consortium members will work together to finalize technical developments and commercial arrangements, with the objective of delivering a commercial facility to produce cost effective, bio-based fuels and bio-paraxylene. The Consortium will connect the key strengths and commercial opportunity of each member, who are all leaders in their sectors with a strong desire to advance competitive sustainable solutions. Each member will bring unique capabilities and resources in support of the primary Consortium objective to develop the first commercial production facility for the BioForming process. Individual members will contribute to that effort through technical and engineering assistance, infrastructure, supply chain support and/or product off-take commitments while the Consortium will work jointly to develop the scale up strategy, including the size and location of the first plant, which will be underpinned by fuel and chemical offtake commitments.

Click [here](#) for more information.

Borregaard invests in bioethanol upgrade

Borregaard has decided to invest NOK 63 million in a project which includes an upgrade of the bioethanol plant and a facility to capture and store biogas. The project has been awarded a grant of NOK 18.9 million from Enova, a

Norwegian government agency which promotes environmentally friendly restructuring of energy end-use, renewable energy production and new energy and climate technology. The bioethanol plant upgrade includes installing modern production technology which will reduce significantly the specific use of energy in the production process. As a result of the rebuild, there will be sufficient capacity to deliver the whole production as 100% water-free bioethanol. This market is growing, mainly driven by increased demand for bioethanol in automotive fuel. Borregaard is a significant producer of biogas from process residues, which is used internally as an environmentally friendly source of energy. The new installation will make it possible to capture and store a bigger part of the available biogas, and thus increase the internal use. The project work will start up during the second half of 2016. The bioethanol rebuild will be completed in 2017, and the biogas installation will be finished in 2018. Borregaard has one of the world's most advanced biorefineries. By using natural, sustainable raw materials, Borregaard produces advanced and environmentally friendly biochemicals and biomaterials that can replace oil-based products. Borregaard has 1080 employees in 16 countries and is a global leader in lignin-based products. Lignin accounts for almost half of Borregaard's sales, with plants in seven countries.

Click [here](#) for more information.

Ginkgo Bioworks to Design Custom Microorganisms for ADM

Ginkgo Bioworks has announced that it has signed an agreement with Archer Daniels Midland Company, one of the world's largest agricultural processors and food ingredient providers, to develop custom strains of microorganisms that will be used to produce a key cultured ingredient. "ADM's expertise in ingredients and customization is unparalleled," said Jason Kelly, co-founder and

CEO of Ginkgo Bioworks. "With our bioengineering resources, we are excited to offer them a more affordable and sustainable way to produce these ingredients and continue to educate the market about what is possible." Ginkgo Bioworks is rapidly expanding to deliver designer organisms to customers across a range of industries, including cosmetics, nutrition, flavors, fragrances, insect control, AgBio, sweeteners and others. They recently closed a \$100 Million C round of financing, which is enabling growth of their organism engineering foundries, where new strains are prototyped for customers. These strains produce cultured ingredients in a process similar to a microbrewery.

Click [here](#) for more information.

Consumer applications

Seventh Generation Develops EPA Safer Choice Certified Laundry Detergent

Seventh Generation, a leading household and personal care products company and a pioneer in the eco-friendly products space, have announced the launch of new Free & Clear Laundry Detergent Packs. Safer Choice Certified by the Environmental Protection Agency, the latest innovation from the brand offers consumers a premium biodegradable laundry detergent pack, while continuing the company's mission to encourage ingredient transparency within the industry. Its new laundry packs are USDA Certified Bio-based products at 94 percent, as well as free of optical brighteners, dyes and VOCs.

Click [here](#) for more information.

Neste and Ikea of Sweden announce partnership to deliver renewable, bio-based plastics



Ikea

Neste and IKEA have joined forces to take leadership in renewable, bio-based materials, and invite other companies to join the initiative. The partnership includes the production of plastics and other materials utilizing Neste's renewable solutions in polymer production. The partnership combines IKEA's commitment to reduce their dependence on virgin fossil based materials and Neste's expertise in renewable solutions. The companies aim to produce plastics and other materials that are used today, but instead replacing virgin fossil feedstock with renewable or recycled waste and residue raw materials. The companies will work with a number of partners in the supply chain. Partners are provided with an opportunity to address the growing market for bio-based products while utilizing their existing production assets.

Click [here](#) for more information.

Patents

Biobased Membrane

A composition for forming a bio-compatible membrane applicable to building material, such as concrete, cement, etc., to a method of applying said composition for forming a biocompatible

membrane, a biocompatible membrane, use of said membrane for various purposes, and to building material comprising said membrane.

Click [here](#) for more information.

Processes for preparing estolide base oils and biobased compounds that include ethyleneolysis

Provided herein are compounds prepared from processes that include ethyleneolysis. Exemplary processes include the preparation of terminally-unsaturated fatty acid reactant by ethyleneolysis catalyzed by a cyclic alkyl amino carbene ruthenium complex. The subsequent oligomerization of terminally-unsaturated fatty acid reactants provides estolide compounds.

Click [here](#) for more information.

Flame retardant block copolymers from renewable feeds

A flame retardant block copolymer is prepared from renewable content. In an exemplary synthetic method, a bio-derived flame retardant block copolymer is prepared by a ring opening polymerization of abiobased cyclic ester and a phosphorus-containing polymer. In some embodiments, the biobased cyclic ester is lactide. In some embodiments, the phosphorus-containing polymer is a hydroxyl-telechelic flame retardant biopolymer prepared by a polycondensation reaction of a biobased diol (e.g., isosorbide) and a phosphorus-containing monomer (e.g., phenylphosphonic dichloride). In other embodiments, the phosphorus-containing polymer is synthesized from a dioxaphospholane monomer.

Click [here](#) for more information.

Nanotechnologies and bioplastic to diagnose and combat tumours

For the very first time, bioplastic can be used to diagnose and treat tumours thanks to the first patent registered by Bio-on in the nanomedical field, particularly in nanodiagnostics (nano-imaging). Bio-on researchers use nanotechnologies to create minerv BIOMEDS: these are revolutionary and innovative nanocapsules in PHAs bioplastic (polyhydroxyalkanoates) capable of simultaneously containing two contrast media: magnetic nanoparticles and gold nanocylinders. These two elements flag up diseased areas of the body, e.g. a tumour mass, using traditional Nuclear Magnetic Resonance and the more innovative Photoacoustic imaging.

Click [here](#) for more information.

Events

Life Cycle Assessment Workshops, 18-19 October in York, UK



Following the success of our previous Life Cycle Assessment (LCA) workshops, NNFCC and North Energy are holding two new training workshops providing you with insight into how LCA's work and their applications.

Click [here](#) for more information.

EFIB 2016, 18-20 October in Glasgow, UK



Glasgow will be the host city for EFIB 2016, the leading European event for industrial biotechnology and the bioeconomy.

Click [here](#) for more information.

11th European Bioplastics Conference. 29-30th November, Berlin, Germany



This year the leading international conference dedicated to bioplastics will be held in Berlin in November.

Click [here](#) for more information.

Research and innovation pathways towards a circular bio-economy, 25-26th October 2016, Copenhagen, Denmark.

UNIVERSITY OF
COPENHAGEN



This conference presents research and innovation University pathways to increase resource utilization in bio-based value chains and a shift towards a circular bio-economy. The aim of the conference is to gather research organisations across different research disciplines, industry and transfer, networking and spur future innovation and collaboration between industry and research organisations as well as between countries governmental organisations from different European countries to facilitate knowledge

Click [here](#) for more information.

Biobased World, 15-16th February 2017, Cologne, Germany



Biobased World will showcase the world of bioeconomy as a whole. It offers an overview of the latest enabling innovations, products, technologies and services – ready to be applied today

Click [here](#) for more information

13th International Conference on Renewable Resources and Biorefineries, 7-9th June 2017, Wrocław, Poland



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.

Click [here](#) for more information.

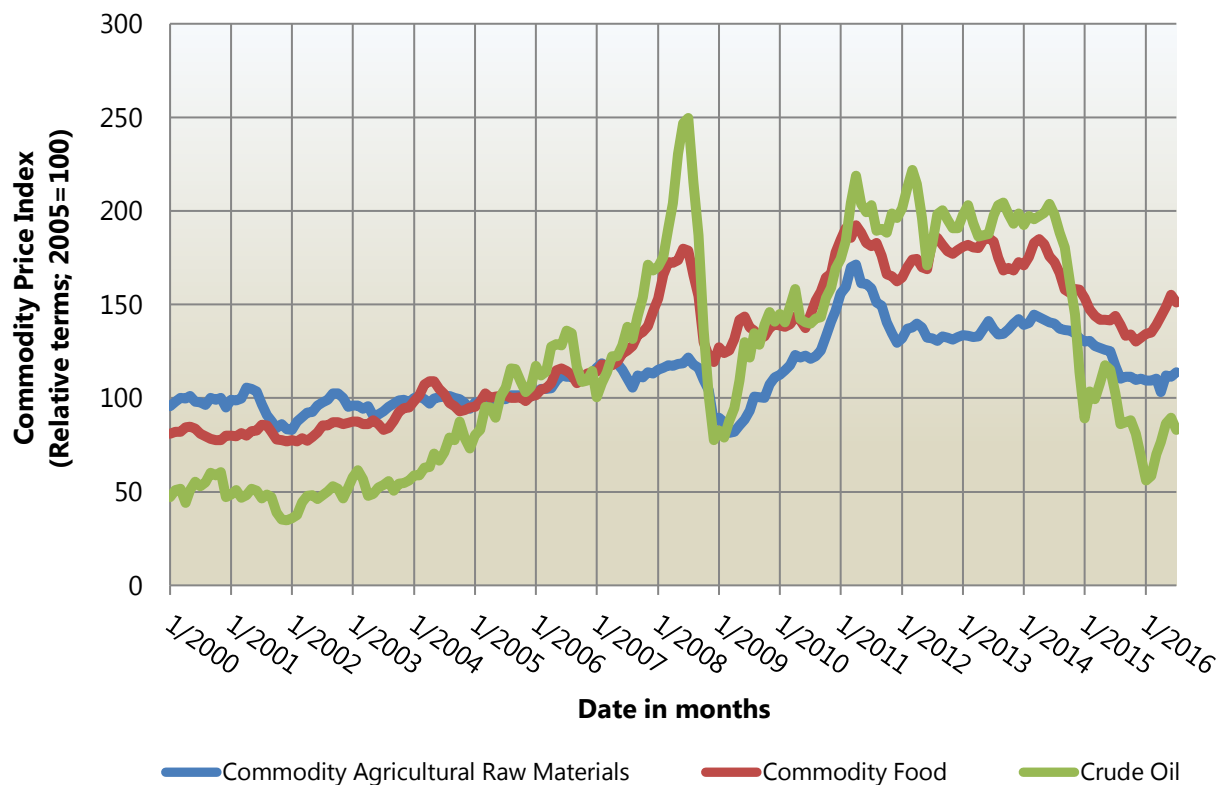
Price Information

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\$ (Aug 11)	Price, US\$ (Aug 16)	% Price Change
Crude oil (petroleum, barrel)	100.45	44.84(↑)	-55
Maize (corn, metric ton)	310.24	150.16(↓)	-52
Sugar (pound)	0.2887	0.2001(↑)	-31
Rapeseed oil (metric ton)	1,356.65	818.88(↑)	-40
Soybean oil (metric ton)	1,225.27	711.74(↑)	-42
Ethanol (gallon)	2.72	1.43(↓)	-47

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

Credits and Disclaimer

NNFCC Market Review is edited by Dr Paula McNamee for NNFCC members. 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.

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