



THE CATALYST FOR SUSTAINABLE
BIO-BASED INDUSTRIES IN EUROPE





THE BIO-BASED INDUSTRIES JOINT UNDERTAKING (BBI JU)

The BBI JU initiative is a €3.7 billion public-private partnership between the European Union (EU) and the Bio-based Industries Consortium (BIC). It is an autonomous EU body operating under Horizon 2020 rules and procedures, dedicated to investing in research and innovation projects.

Bio-based industries and their value chains are faced with complex and substantial technology and innovation challenges. BBI JU was created to act as a catalyst to tackle these challenges by de-risking investments for private research and innovation, structuring the sector to allow it to reach critical mass in a focused and coherent way. This will enable long-term stability and predictability for the sector and will keep the investments in Europe, thus creating new jobs – most of them in rural areas – and value to our citizens, while leading the transition towards a post-petroleum society.

BBI JU is about connecting key sectors, creating new value chains and producing a range of innovative bio-based products to ultimately create a new bio-based community and economy.







MISSION

BBI JU's mission is to implement the Strategic Innovation and Research Agenda (SIRA) developed by the Bio-based Industry Consortium (BIC), using Horizon 2020 rules and procedures.

BBI JU organises yearly calls for proposals to support research, demonstration and deployment activities enabling the collaboration between stakeholders along entire value chains, covering primary production of biomass, processing industry and final use.

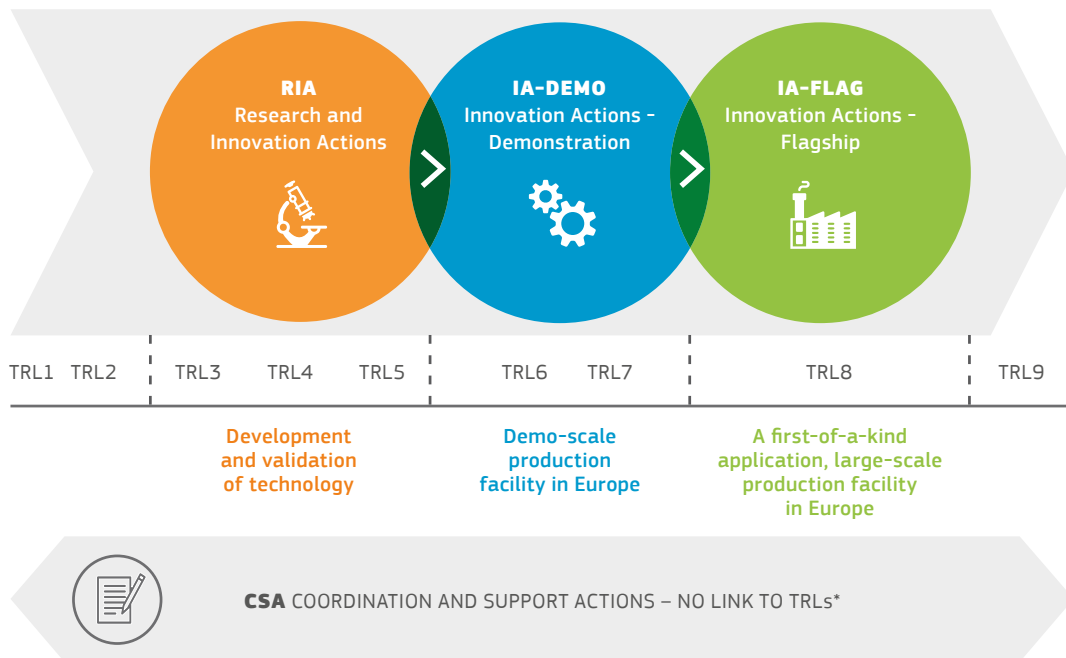
VISION

Our vision is a competitive, innovative and sustainable Europe leading the transition towards a post-petroleum society while decoupling economic growth from resource depletion and negative environmental impacts.

Together with pan-European and cross-sector industries/SMEs, research organisations, universities, regions, and countries, we will develop a bio-based economy for Europe.



BBI JU TYPES OF ACTIONS



***Technology Readiness Levels (TRLs)** are a method of measuring the maturity level of the technology development in a project. This method provides a common understanding of technology status and innovation.

The background of the slide is a photograph of a female scientist in a laboratory setting. She is wearing a white lab coat, safety goggles, and has her hair tied back. She is focused on a task, possibly using a pipette, though the image is heavily overlaid with a yellow tint. In the foreground, there are various laboratory glassware items like flasks and test tubes. The overall color scheme is dominated by yellow and orange hues.

RIAs

Research and Innovation Actions

ABACUS

Algae for a biomass applied to the production of added value compounds

BIOMASS: ALGAE

DEVELOPING THE POTENTIAL OF ALGAE

Algae production is currently limited to a few small industries, mainly for the feed, nutrition and cosmetic sectors. This is ripe for expansion. However, creating an economically viable and sustainable method of growing large quantities of algae and converting them into commercial products that the markets accept remains a challenge.

ENHANCED INNOVATION CAPACITY

The commercialisation of high value compounds sourced from microalgae could grow the existing industry considerably, while product innovation based on new molecular targets and biorefinery schemes could open new markets. The ABACUS project has been designed to synthesise a range of new molecules, in terpenoids family, from microalgae that will help bring competitive products to the market.

FROM ALGAE TO FOOD, FRAGRANCES, FLAVOURS

Algae are a fertile source of potential new natural materials. ABACUS will make a major step in mastering the value chain for competitive, algae based-products. ABACUS is tackling the biological and bioprocess challenges of oriented algal production of terpenoids and carotenoids in both well-established and more innovative (but promising) market sectors. ABACUS will enhance innovation capacity by connecting algae-producing companies with larger enterprises in the flavour and perfume sectors, which seek new natural, bio-based sources.

Website	www.abacus-bbi.eu
Start date	01 May 2017
End date	30 April 2020
BBi JU contribution	€ 4 653 659

AFTERLIFE

Advanced Filtration TEchnologies for the Recovery and Later conversion of relevant Fractions from wastEWater

BIOMASS: INDUSTRIAL WASTEWATER

HOLISTIC PROCESS DESIGN AT PILOT SCALE

The AFTERLIFE project proposes a flexible, cost- and resource-efficient process for recovering and valorising the relevant fractions from wastewater. It will represent an advance on existing approaches to wastewater treatment, which rely on physic-chemical and biological methods.

NEW BIO-BASED BIOPOLYMERS FROM INDUSTRIAL WASTE WATER

The AFTERLIFE process will separate out the different components of value using a series of membrane filtration units that will separate all the solids in the wastewater. These will then treated to obtain high-pure extracts and metabolites or, alternatively, to be converted into value-added biopolymers called polyhydroxyalkanoates(PHAs).

RETURNING PURIFIED WATER BACK TO THE ENVIRONMENT

In addition to the value extracted from the solids, the remaining outflow of the water will be ultrapure and ready for re-use. It will develop innovative approaches for separating the organic content of wastewater, transforming these into bio-based products and minimising waste produced. In addition it will show that the quality and purity of these intermediates is such that they can be converted to make the targeted end-products without further purification. AFTERLIFE will also demonstrate that the wastewater streams chosen for experimental validation are easily replicable in other sites in Europe.

Website

www.afterlife-project.eu

Start date

01 September 2017

End date

31 August 2021

BBi JU contribution

€ 3 890 593



AQUABIOPRO-FIT

AQUAculture and Agriculture BIOMass sidestream PROteins and bioactives for feed, FITness and health promoting nutritional supplements

BIOMASS: AQUACULTURAL AND AGRICULTURAL WASTE

VALORISATION OF SIDESTREAMS

AQUABIOPRO-FIT's main objective is to promote efficient utilisation of European aquaculture, fisheries and agriculture sidestreams in feeds and nutritional supplement products promoting fitness and health. To this end, the project will develop processing technologies to up-concentrate nutrients and bioactives. The safety, bioactivity and acceptance of the developed ingredients and products will be documented through different studies.

COST EFFICIENT PROCESSING

AQUABIOPRO-FIT will systematise existing knowledge and technologies on the field of organic nutritional supplements and identify gaps and opportunities for exploitation of major aqua and agriculture processing sidestreams in Europe. It will identify cost-efficient downstream processing methods for the production of standardised products and compounds and reduce environmental impact by reducing cage farming aquaculture waste and fisheries by-catch discards by 50% each.

HEALTH BENEFITS FOR CITIZENS

AQUABIOPRO-FIT's aim is to transform unused resources into high added-value nutrients and health supplements. It will analyse the bioactivity of new extracts and determine the therapeutic and health-promoting properties of selected ingredients to be incorporated in products for human consumption and use. The target bioactivity of the developed food products will be: improved athlete performance, anti-anxiety and anti-depression remedies and improvements to body pH balance, skin health and hair growth.

Website

www.aquabioprofit.eu

Start date

01 April 2018

End date

31 March 2022

BBI JU contribution

€ 3 349 527



B-FERST

Bio-based FERTilising products as the best practice for agricultural management SusTainability

BIOMASS: AGRICULTURE WASTE AND BIOWASTE

ACHIEVING A SUSTAINABLE AGRICULTURE BY VALORISING WASTE

B-FERST project believes that the agriculture sector in Europe needs a more sustainable approach, through enhanced processes, biochemical characterisation of biomass feedstocks and improvements to the quality and fertility of soils. This way, the EU can achieve a more efficient use of existing resources in the farming and fertiliser sectors, where the waste generated is unused, and have a more sustainable production model based on tailor-made specialised fertilisers that can be adapted to the needs of individual farmers.

REVOLUTIONISING THE FERTILISERS INDUSTRY

B-FERST will valorise local biowaste streams from agriculture as well as the use of proximity biowaste from other industries. This project aims to integrate the valorisation of biowaste into agriculture management plans and is focused on revolutionising the fertiliser value chain by creating eight specialised fertilisers with a reduced environmental impact.

ELIMINATING PRODUCTION BOTTLENECKS WHILE IMPROVING THE SUSTAINABILITY OF FERTILISERS

B-FERST will add value to the European fertiliser and chemical industries sector, by reducing European reliance on raw materials while supporting employment and the sector's technological advances. It will ensure intermediate product quality, avoid potential health risks and deliver a continuous supply of feedstock. It will also strive to ensure that bio-based fertilisers are as effective as their conventional counterparts.

Website	www.bferst.eu
Start date	01 May 2019
End date	30 April 2024
BBi JU contribution	€ 6 787 076



BARBARA

Biopolymers with advanced functionalities for building and automotive parts processed through additive manufacturing

BIOMASS: AGRO-FOOD SIDESTREAMS

NEW STARCH MOLECULES FROM AGRO-FOOD WASTE

The BARBARA project aims to convert the sidestream fractions and residues from agro-food production into novel polysaccharides and functional additives that can be valorised. These compounds will be selected to provide additional capabilities to polymers. These will be mixed with other compounds to create engineering bioplastics adapted for Fused Filament Fabrication (FFF) processes (3D printing).

ADDED VALUE FOR AUTOMOTIVE AND BUILDING INDUSTRIES

Improving building and automotive materials performance BARBARA will develop novel bio-based engineering bio-plastic materials that will be validated using functional prototypes in the building and automotive sectors. This will ultimately allow development of improved mechanical, thermal and aesthetic properties of novel bio-based engineering polymers as well as demonstrators of final parts for the automotive sector and moulds and tools for hybrid manufacturing in advanced building applications.

BIO-BASED MATERIALS, CONSUMER PRODUCTS AND VALUE CHAINS

BARBARA will develop four new bio-based materials and three new validated consumer products. It will develop innovations in four Key Enabling Technologies - industrial biotech, nanotechnology, advanced materials and advanced manufacturing technologies. In addition, it also establishes two new bio-based value chains and links European platforms by bringing together the BBi with the Vanguard initiative.

Website

www.barbaraproject.eu

Start date

01 May 2017

End date

30 April 2020

BBi JU contribution

€ 2 603 861

BioBarr

New bio-based food packaging materials with enhanced barrier properties

BIOMASS: WASTES AND AGRO-INDUSTRIAL CO-PRODUCTS

BIO-BASED FOR FOOD PACKAGING

BioBarr will develop new bio-based and biodegradable food packaging materials. These films will be produced using completely natural processes, using raw material derived from wastes and agro-industrial co-products. The project will study methods of polyhydroxyalkanoates (PHA) coating treatments without affecting the biodegradability. These have the potential to replace conventional polymers, possessing similar properties with higher biodegradability and better functional properties and mechanical strength.

IMPROVING THE SHELF LIFE

Currently, using PHAs for food packaging has some limitations, particularly in transmitting oxygen and water. This makes them less than ideal for dry products as bakeries, where loss of crispiness and oxidation of fats can be a problem. BioBarr aims to overcome this by improving vapour and gas barrier properties through material functionalisation. This involves compounding biodegradable materials in multi-layer structures specific for the food product category to be packed. It will also look at surface treatments as a further step.

NEW MARKETS FOR FOOD INDUSTRY

The BioBarr project should create a new bio-based value chain, from bio-plastic producer to food industry end-user. It is an opportunity for innovation and job creation as well as allowing Europe to reduce its dependency on imported oil. It will generate additional income and sustainable development to rural areas, create quality jobs and modernise the economy.

Website	www.biobarr.eu
Start date	01 June 2017
End date	31 May 2021
BBi JU contribution	€ 3 253 438



BIONTOP

Novel packaging films and textiles with tailored end of life and performance based on bio-based copolymers and coatings

BIOMASS: AGRI-FOOD WASTE

MEETING THE EU CIRCULAR ECONOMY AMBITIONS

Currently only around 30 % of plastics are recycled in Europe, and a truly circular economy cannot incinerate or bury packing waste at current rates. In order to deliver a genuinely circular economy, this recycling level needs to increase significantly.

TURNING AGRI-FOOD WASTE INTO BIODEGRADABLE PACKAGING

The BIONTOP project seeks to improve these levels by helping to deliver novel bio-based biodegradable packaging that continues to protect products while using more than 85 % renewable resources, thus conserving natural resources. These bioplastics, coatings and biocomposites can be used in food and personal care packaging, while having improved biodegradability properties.

A GROWING CONSUMER DEMAND FOR MORE SUSTAINABLE PACKAGING

BIONTOP aims to develop 'recyclable-by-design' cost-competitive packaging that can be mechanically recycled or industrially/domestically composted, reducing levels of waste plastics and, at the same time, provide improved end-of-life options. The BIONTOP project will markedly reduce packaging waste levels and improve the overall carbon footprint of plastics.

Website

www.bbi-europe.eu/projects/biontop

Start date

01 June 2019

End date

31 May 2023

BBi JU contribution

€ 4 219 697



BIOrescue

Enhanced bioconversion of agricultural residues through cascading use

BIOMASS: MUSHROOM ORGANIC WASTE AND OTHER LIGNOCELLULOSIC WASTE

EXPENSIVE WASTE

Europe's mushroom industry generates approximately five million tonnes of spent mushroom substrate (SMS). This is the extraneous substrate and mushroom mycelium that is left behind after harvesting the mushrooms. Storing and disposing of this SMS has become a significant economic and logistical problem, disposal costing up to €50/tonne, and a bill of up to €250 m for the mushroom industry each year. BIOrescue will turn this economic and logistical problem into biochemical materials that can be used as replacements to those derived from fossil resources.

CASCADING EFFECT

BIOrescue will demonstrate and develop the concept of an integrated bio-production process based on the cascading use of SMS supplemented with wheat straw (WS) and other underutilised lignocellulosic feedstocks like pruning residues, residual citrus peels and wastes. When applied within a conventional mushroom production farm, this will turn it into an efficient and sustainable biorefinery. This concept will avoid disposal and allow for the production of some biodegradable bio-based products and bioactive compounds that will help to replace the existing ones based on fossil resources.

DEMONSTRATING ADDED VALUE

This system will ensure year round operation by using SMS as a major component and wheat straw which is a resource that is already stored at mushrooms farms. Biomass is processed into a bio-based final product which is used at least once more, either for materials or energy. It will upgrade the SMS feedstock into higher value derived bioproducts.

Website

www.biorescue.eu

Start date

01 September 2016

End date

31 August 2019

BBi JU contribution

€ 2 635 141



BIOSEA

Innovative cost-effective technology for maximizing aquatic biomass-based molecules for food, feed and cosmetic applications

BIOMASS: ALGAE

ABUNDANT HOME-GROWN EUROPEAN PROTEIN SOURCE

EU society needs new sustainable bio-based feedstocks to meet population growth and reduce dependence on fossil fuels for raw materials; around 70% of the EU's protein needs are imported. Aquatic feedstock offers a potential solution, however its total production volume and market size are still relatively small.

NEW SMART BIO-BASED INGREDIENTS FOR FOOD, FEED AND COSMETICS

In addition, the algae feedstock market still relies on immature technologies for production and technologies not specifically designed for the purpose. The BIOSEA project aims to validate and scale up an entire production process of ingredients from the lipid, protein, carbohydrates and minority compounds fractions of four algae, including upstream and downstream steps.

SCALING UP TO A SUSTAINABLE LOWER-COST ALTERNATIVE

The BIOSEA process will be effective and environmentally friendly and the compounds will be obtained at low cost, leading to the future industrialisation of the process. The BIOSEA project will develop a new bio-based value chain based on aquatic biomass and obtain at least six new compounds for use in formulating different food, feed and cosmetic/personal care products. It will also validate the bio-based compounds obtained in a variety of final consumer applications. This way, BIOSEA will contribute in reducing Europe's dependence on feedstock imports, diminishing the pressure of land resources and opening new markets and business opportunities.

Website

www.biosea-project.eu

Start date

01 June 2017

End date

31 May 2020

BBI JU contribution

€ 2 611 223



BIOSMART

Bio-based smart packaging for enhanced preservation of food quality

BIOMASS: BIOPEF, BIOPET AND PLA

NEW BIO-BASED PACKAGING

BIOSMART will develop active and smart bio-based and compostable packages to meet the needs of both fresh and pre-treated food applications. It will demonstrate three new types of packages (flexible/rigid plastic and cardboard) with enhanced performance addressing consumer needs. All will be new concepts with an emphasis on consumer convenience and overall value chain value creation.

CONSUMER-FRIENDLY

In order to address future demands, packaging will need to enable 'lightweighting', reduced food residues, easier shelf life monitoring and longer shelf life, easier consumer waste handling, all without a price premium. BIOSMART will ensure that fresh food packages that should be biodegradable or compostable and processed food packages that should be recyclable are in line with the EU's objective of reducing the recyclable content in landfilled waste. An added benefit is the increase of shelf life of food products through improved preservation.

LINKING SECTORS

It will create a new cross-sectorial interconnection in bio-based economy clusters linking to the complete value chain, from bio-based raw material to end-users. BIOSMART will also introduce novel bio-based lipopeptide and peptide additives with anti-microbial, anti-fungal and/or anti-oxidant properties to increment food shelf life, new coatings with enhanced O_2 , CO_2 , water and UV barrier properties.

Website

www.biosmart-project.eu

Start date

01 May 2017

End date

30 April 2021

BBi JU contribution

€ 3 610 866

CARBOSURF

New processes for the fermentative production of glycolipid biosurfactants and sialylated carbohydrates

BIOMASS: GLYCOLIPIDS

INCREASING AVAILABILITY

Glycolipid biosurfactants offer a vastly improved environmental compatibility compared to traditional surfactants, while specialty carbohydrates have applications in a very broad range of markets. Increasing the supply and availability of specialty carbohydrates from kilograms to hundreds of tonnes will massively widen the range of available applications.

ADDITIONALITY IN THE EXISTING MARKET

CARBOSURF is working to produce specific biochemicals called glycolipid biosurfactants and specialty carbohydrates, where market interest is already high. The project will significantly improve the flexibility, productivity and environmental performance of biosurfactants and specialty biochemicals industrial processes.

INNOVATIVE FERMENTATION PROCESSES

The project will develop innovative fermentation processes to produce glycolipid biosurfactants and specialty carbohydrates. It will test the market potential in a wide range of application fields, like nutraceutical, pharmaceutical and cosmetic industries to assess the technical, economic, environmental and social sustainability of these processes over the whole value chain, from biomass input to product application output. The project will contribute to the replacement of 5-10% fossil-based surfactants with biosurfactants, offering increased flexibility, productivity and environmental performance of the EU biochemical industries.

Website

www.carbosurf.eu

Start date

01 August 2015

End date

30 July 2018

BBi JU contribution

€ 2 730 605



CelluWiz

Process developments for a recyclable and compostable all-cellulose multilayer material for packaging

BIOMASS: FOREST-BASED

ENHANCING FOOD PACKING

Packaging is essential for transporting and protecting food and goods and communicating end-user information. The food packaging industry, agile to follow consumer expectations and societal changes, is nowadays taking the challenge to improve its sustainability and reduce its environmental impact.

DEVELOPING INNOVATIVE AND SUSTAINABLE PACKAGING

CelluWiz project will develop two innovative processes to produce a new all-cellulose packaging material. This renewable, biodegradable material will be capable of competing with existing plastics, while integrating directly into the paper and cardboard waste value chain.

A COMPETITIVE PROCESS THAT REDUCES THE ENVIRONMENTAL IMPACT

CelluWiz materials can offer a competitive alternative to existing multi-layer plastic materials or multi-materials while being renewable, recyclable/recycled in the paper waste value chain and biodegradable. CelluWiz aims to deliver a 20-50% reduction in the environmental footprint compared to existing cardboard and PET film products and between 30-70 % compared to existing recyclable fossil-based plastics or non-recyclable products, while reducing the cost and impact of the end-of-life of packaging products.

Website

www.celluwiz.eu

Start date

01 June 2019

End date

30 November 2022

BBJ JU contribution

€ 1 945 375

ECOAT

ECO sustainable multifunctional bio-based COATings with enhanced performance and end of life options

BIOMASS: WASTE FROM TOMATO, MELON, LEGUMES, SUNFLOWERS, MUSHROOMS AND LUPINES

CELLULOSE-BASED SOLUTIONS FOR WIDELY USED CONSUMER PRODUCTS

Cellulose is the most widely available renewable material on Earth but its common combination with polyethylene in a range of consumer products, such as disposable food products or personal care items, inevitably impacts product recyclability and therefore undermines the environmental benefits.

REDUCING THE ENVIRONMENTAL IMPACT OF PACKAGING

The ECOAT project aims to identify and develop coatings from readily-available, low-valorised biomass such as tomato processing residues, legumes and sunflower press cakes. These will be used to develop new bio-based coatings for application on two different substrates, specifically cellulosic and plastic-based. This will deliver materials for food and personal hygiene use that will offer better performance than currently available products as well as delivering more sustainable end-of-life options.

REPLACING FOSSIL-BASED PLASTICS WITH FULLY RENEWABLE AND RECYCLABLE ALTERNATIVES

This way, ECOAT will promote innovation and competitiveness while decoupling economic growth from environmental impacts, developing eco-technologies and promoting foreign investment in environmental technologies. This allows for benefits for jobs and economic growth across the EU, with a consequent reduction of the environmental impact of packaging and packaging waste.

Website	www.ecoat.eu
Start date	01 May 2019
End date	30 April 2022
BBi JU contribution	€ 4 613 778



ECOXY

Bio-based recyclable, reshapable and repairable (3R) fibre-reinforced EpOXY composites for automotive and construction sectors

BIOMASS: FLAX

IMPROVING ECO-FOOTPRINT

The lightweight and excellent mechanical properties of thermoset fibre-reinforced composites make them attractive materials for automotive and construction sectors. However, they are challenging to reprocess and difficult to repair and recycle increases the overall material cost and environmental concerns. The vast majority of existing products used in their manufacture rely on fossil-derived materials or use large amounts of energy.

BIO-BASED PARTS FROM FLAX FIBRES AND PLA

ECOXY will develop at least two innovative bio-based epoxy resins and fibre reinforcements with a wide range of applications and at least two new bio-based composite materials. It will create demo parts for the construction and automotive sectors including a window profile for construction by pultrusion, a dashboard fascia and the rear seat back panel for automotive sector by resin transfer moulding.

BIO-BASED FOR SUSTAINABILITY

By reducing GHG emissions and energy use, labour and waste costs, ECOXY proves reduces raw material costs, lower energy costs for manufacturing the target components, lower production costs and reparability. This means that through bio-based fibres and resins for composite manufacturing, the automotive and construction sectors have equal or better sustainability.

Website

www.ecoxy.eu

Start date

01 June 2017

End date

30 November 2020

BBi JU contribution

€ 4 850 960

EFFORTE

Efficient forestry by precision planning and management for sustainable environment and cost-competitive bio-based industry

BIOMASS: WOOD

IMPROVING EFFICIENCY IN FORESTRY

Forests and forestry will play a key role in making a European bio-based economy a reality. By applying modern technology to forestry techniques, the EFFORTE project will improve efficiency and sustainability throughout the entire forest-based value chain within EU.

ANALYSING ADDED VALUE

EFFORTE recognises that, like many businesses, forestry can be viewed as a chain of events over a long of time. As such, it can be improved using data analysis approaches that can optimise each stage adding value step-by-step and as a whole. In addition, deploying geographic information systems in combination with information about stand and soil properties, EFFORTE will help increase revenues and production while reducing undesirable environmental impacts.

INCREASING YIELD SUSTAINABLY

EFFORTE will improve efficiency in silviculture and harvesting operations and accessibility to wood resources leading to a significant increase in productivity in forest operations over a representative period of time. A 1% annual increase in forest growth over a 20 year period would increase yield by 22%, roughly equivalent to 2 years of forest growth gained. The project will also help by reducing negative environmental impacts on soil disturbance, thinning and extracted logging residues. It also aims at reducing fuel consumption in the forest harvesting process by at least 15%.

Website

www.luke.fi/efforte

Start date

01 September 2016

End date

31 August 2019

BBI JU contribution

€ 2 230 221

EnzOx2

New enzymatic oxidation/oxyfunctionalization technologies for added value bio-based products

BIOMASS: WILD TYPE AND ENGINEERED OXIDATIVE ENZYMES

BETTER BIOCHEMICAL TECHNOLOGY

Biomass bio-refineries can be greener and even more effective if they use efficient bio-chemical technologies. EnzOx2 explores the potential use of wild type 'occurring in nature' and engineered oxidative enzymes as innovative solutions to existing production bottlenecks. The EnzOx2 project aims to provide innovative answers to improving processes already in place in current biorefineries.

BETTER PROCESS FOR NEW PRODUCTS

The ultimate goal is in enabling transformation of plant-based molecules cannot be attained using classical chemical technologies. It will do this by incorporating bio-chemical technologies making them more efficient and cost-competitive and by developing a new generation of bio-chemical technologies for future biorefineries. This could lead to new products with significantly higher value.

APPLYING TECHNOLOGIES INNOVATIVELY

These new bio-chemical technologies based on the use of wild-type and engineered oxidative enzymes are largely unexplored at the industrial level. They can be used to provide innovative solutions to some relevant bottlenecks concerning selectivity, yield and cost efficiency in the production of biomass for example sugar-, lipid- and terpene-based chemical building blocks, flavours and fragrance ingredients and active pharmaceutical ingredients. ENZOx2 try to take advantage of the unique characteristics of these biocatalysts and demonstrate their uses at pilot level and later at flagship level.

Website	www.enzox2.eu
Start date	01 November 2016
End date	31 October 2019
BBi JU contribution	€ 3 000 000



EXCornsEED

Separation, fractionation and isolation of biologically active natural substances from corn oil and other sidestreams

BIOMASS: CORN OIL AND THIN STILLAGE

VALORISING BIOFUEL SIDESTREAMS

EXCornsEED will combine chemistry, biology, engineering and biotechnology tools and expertise to develop and validate processes for recovering a range of bioactive compounds from bioethanol and biodiesel refinery sidestreams, specifically corn oil and thin stillage.

THE POTENTIAL OF BIOACTIVE COMPOUNDS

EXCornsEED will characterise the quality and amount of compounds available for extraction from the industrial sidestreams of bioethanol and biodiesel production expecting to identify up to 25 compounds in useable amounts. Therefore, the project will develop and validate an innovative, environmental-friendly approach for extracting, purifying and concentrating the proteins and bioactive compounds from industry sidestreams and for scaling up the process. The extracted compounds will then be tested for their potential for high-value commercial products and validated as ingredients for food, specialty chemicals and cosmetics.

NEW TECHNOLOGIES FOR AN ENVIRONMENT-FRIENDLY APPROACH

EXCornsEED will assess the environmental sustainability, technical performance, the cost benefits of technological solutions and the final products. The aim will be to reduce the carbon footprint by 15% compared to current state-of-the-art methods of production. The project aims to evaluate the business potential of the proposed approach and to build a solid business case for exploiting the results.

Website	www.excornseed.eu
Start date	01 June 2018
End date	30 November 2021
BBi JU contribution	€ 4 259 297

GRETE

Green chemicals and technologies for the wood-to-textile value chain

BIOMASS: FOREST-BASED

IMPROVING THE EXISTING WOOD-TO-TEXTILE VALUE CHAINS

The GRETE project aims to develop new and better technologies for wood pulp modification, cellulose dissolution and fibre quality generation complying sustainability requirements and market needs.

PRODUCING LOW-IMPACT, HARD-WEARING TEXTILES FOR EUROPEAN NEEDS

Currently the raw material base to produce man-made cellulose fibres is limited, as only dissolving grade wood pulps are used commonly. The project will tackle this by widening the sustainable raw material basis for man-made cellulose fibres by including paper grade pulps. In addition, the solvent systems used to produce commercial man-made cellulose fibres are based on toxic and explosive chemicals; the GRETE processing technologies will increase safety, sustainability and feasibility of man-made cellulose fibre manufacturing.

ADDRESSING THE GROWING TEXTILES DEMAND

The issues addressed by the GRETE project play a significant role in developing sustainable and green technologies for the European industry. The partners of the project are strongly committed to face the challenge and achieve the ambitious results, supported by a dedicated stakeholder group with the aim to foster strategic decision-making.

Website

www.greteproject.eu

Start date

01 May 2019

End date

30 April 2023

BBJ JU contribution

€ 2 555 244



GreenLight

Cost effective lignin-based carbon fibres for innovative light-weight applications

BIOMASS: LIGNIN

BIO-BASED ALTERNATIVE

Carbon fibre's exceptionally high strength to weight ratio offers numerous advantages for many applications but is expensive to produce, meaning its restricted use in aerospace, high-end automotive construction and wind energy. A cheaper, renewable source is needed to tap into a ready and growing market.

ECONOMICALLY VIABLE ALTERNATIVES

The GreenLight project will demonstrate a value-chain for creating a new bio-based, renewable and economically viable carbon fibre precursor from lignin, produced in Europe with European raw materials. These precursors will be suitable for processing into carbon fibre and structural carbon fibre composites and make those more affordable and accessible, particularly in mass-market vehicles. By reducing weight fuel consumption is reduced and hybrids and electric cars can increase their range – a 10% weight reduction means a reduction of 7% in fuel consumption.

ADVANCED PROPERTIES, NEW OPPORTUNITIES

Greenlight will demonstrate the product's new customised properties to achieve a cost-efficient alternative to today's high-performing and relatively high-cost petroleum-based carbon fibre raw material, polyacrylo-nitrile. This will create new business opportunities and jobs in the pulp and paper industry though the separation and valorisation of the lignin from kraft pulp mills and contribute to the structural changes and increasing of competitiveness of the forest-based industry in Europe.

Website

www.greenlight-project.eu

Start date

01 July 2015

End date

30 June 2019

BBI JU contribution

€ 1 299 163

HYPERBIOCOAT

High performance biomass extracted functional hybrid polymer coatings for food, cosmetic and medical device packaging

BIOMASS: FOOD BY-PRODUCTS

SMART BIO-BASED FOOD PACKAGING

Biodegradable packing seems to be everywhere, but in fact is not used for a range of demanding applications. For many food products, current materials do not provide the required protection against water vapour, oxygen or flavours. The project HYPERBIOCOAT examines how existing technology can be used to develop biodegradable polymers derived from food processing by-products.

NEW MOLECULES WITH ADVANCED PROPERTIES

The project will identify potential biodegradable polymers, characterise their chemical composition and properties and focus on extraction processes that can be scaled up to industrial levels. These can provide the high levels of protection required for the demanding areas of food, cosmetic and medical device packaging. It will develop and validate at pilot scale a competitive and sustainable extraction process for candidate molecules from hemicellulose and bio-polyesters coming from waste sidestreams of lignocellulosic biomass like agro-food waste and sidestreams. Ultimately, this would permit packaging without the need for non-biodegradable additives.

REDUCING COSTS

It will synthesise and up-scale the process of a novel functional hybrid bioORMOCER® lacquer. Hyperbiocoat is expected to discover at least two new functional molecules for surface treatment, with enhanced or equal properties for the developed molecules with respect to conventional counterparts, measured against relevant industrial standards. This should reduce current costs by more than 10% as compared with conventional molecules.

Website

www.hyperbiocoat.eu

Start date

01 September 2016

End date

31 August 2019

BBi JU contribution

€ 4 617 424

iFermenter

iFermenter - conversion of forestry sugar residual streams to antimicrobial proteins by intelligent fermentation

BIOMASS: LIGNOCELLULOSE

LIGNOCELLULOSE – HIGH POTENTIAL FEEDSTOCK

Plant dry matter, also known as lignocellulosic biomass, is all the material of the plant excluding water. It is the largest source of renewable biomass feedstock. In Europe, there are 14m tonnes of sugar residual from biorefineries with the potential to be converted into potentially high-value products. Currently these sugars are either converted to ethanol, which is sold cheaply, or simply burned to provide heat or energy. This is usually because fermentation processes with these sugars are inefficient, and existing biorefineries struggle to make these processes profitable.

INCREASING PRODUCTIVITY BY USING AN INTELLIGENT FERMENTATION PROCESS

The overarching objective of the iFermenter project is to develop an intelligent fermentation system that exploits the sugar mixture in residual sidestreams, increasing yields and productivity. The process would provide a competitive and an attractive feedstock alternative to glucose for fermenting high-value proteins and peptides while reducing the carbon footprint of comparable processes, in particular by making incineration of sugars less commercially attractive and by reducing food waste (as an antimicrobial, nisin extends food shelf life).

TURNING SUGAR RESIDUES INTO HIGH-VALUE PRODUCTS

iFermenter will recover high-value sugar products from residual streams as part of their treatment process. It will also use gene-editing techniques to create cell factories to consume the remaining residuals and produce nisin, an important commercial food/feed preservative. Moreover, it aims to develop an online feedback system that can intelligently adapt the residual mixture during fermentation in order to maximise production.

Website

www.ifermenter.eu

Start date

01 May 2018

End date

30 April 2022

BBi JU contribution

€ 3 997 825

InDIRECT

Direct and indirect biorefinery technologies for conversion of organic sidestreams into marketable products

BIOMASS: AGRO-INDUSTRIAL AND FOOD SIDESTREAMS

REUSING AGRO-FARMING SIDESTREAMS

Currently, agro-industrial and food sidestreams are often used as feed or bio-energy source. Most biorefineries today are designed to process only one kind of feedstock with constant properties. The InDIRECT project introduces a new biorefinery concept that will process mixed feedstocks via its conversion to a homogenous biomass by insects. In many areas of Europe, where production is higher than can be recycled, animal manure has become a pollution problem. InDIRECT offers a new approach to recycle manure by utilising insects such as the larvae of the black soldier fly that can grow on manure by extracting nutrients.

NATURE'S OWN BIOREFINERIES

Insects have high feed conversion efficiency. Crickets, for example, require only 2 kg of feed for every 1 kg of bodyweight gain, compared to 8 kg for cattle. A 4x better biomass conversion efficiency for insects compared to cattle. The indirect biorefinery approach that will be used by InDIRECT aims to convert 1 ton of sidestreams into at least 300-400 kg of fresh insect biomass representing a 50% improvement of conversion efficiency.

GAINING ACCEPTANCE

The success of new farming types and the introduction of new products in the market, is also dependent on their acceptance by the society. The project will communicate about its results and public acceptance of recycled products from manure, insects, can be speed up. InDIRECT will lead to products with significantly higher values than the current application of the biomass.

Website	www.bbi-indirect.eu
Start date	01 November 2016
End date	31 October 2019
BBI JU contribution	€ 1 347 948



LIBBIO

Lupinus mutabilis for Increased Biomass from marginal lands and value for BIOrefineries

BIOMASS: LUPINS

IMPROVING THE LUPIN YIELD

The Andean lupin has long been grown in Ecuador, Peru and Bolivia. These plants are also suitable for cultivation in Europe, where they can thrive on what is currently marginal land. The LIBBIO project aim is to develop consumer food, feed, non-food and bio-energy products from Andean lupin varieties adapted to European farming conditions. It will apply biorefinery cascading principles for crop value creation and modern crop breeding technologies.

NEW BIO-BASED FEEDSTOCK

Once adapted for European conditions, these plants will offer the potential to produce food, animal feed and bio-energy products by applying biorefinery cascading principles and modern crop breeding technologies. The LIBBIO project will aim to increase the crop yield and the percentage of lupin beans in the overall harvest weight known as the 'harvest index'.

NEW PRODUCTS FOR CONSUMERS

LIBBIO will also aim to establish consumer demand by developing a number of products, including food applications based on lupin oil and seed protein, and some cosmetic uses. The project will also seek to accelerate development of the supply chain for lupin-derived products. This will bring economic benefits for farmers and the whole supply chain, and environmental benefits and benefits on a European level.

Website

www.libbio.net

Start date

01 October 2016

End date

30 September 2020

BBi JU contribution

€ 4 923 750



LIBRE

Lignin based carbon fibres for composites

BIOMASS: PULP AND PAPER

BIO-BASED ALTERNATIVE

The global carbon fibre based composites market is worth an estimated €25 bn. However, using fossil resources to produce the main precursor for carbon fibre, polyacrylonitrile, has limited production capability and high costs. In addition, it depends on finite resources. This means that the development of an alternative source of polyacrylonitrile, using innovative and novel bio-industrial feedstocks and processes, has huge potential to deliver an economic win-win. LIBRE will develop a product made from waste lignin.

MORE RESOURCE-EFFICIENT

The LIBRE project will utilise this sidestream feedstock from the pulp and paper industry, blended with a biopolymer precursor fibre, to create a more resource-efficient and sustainable carbon fibre production process. The ultimate aim of the LIBRE project is to create carbon fibre materials with a superior structure that will open up potential new markets.

SUSTAINABLE AND PERFORMANT COMPOSITE

This will lead to the development of new bio-based composite materials utilising lignin from the pulp and paper industry blended with biopolymers as a precursor. It offers reductions in energy consumption and greenhouse gas emissions during the manufacturing process through the use of microwave and radio frequency heating technologies. New technologies like surface functionalisation using non-aqueous processes can enhance performance in polymer composites. This brings an increased sustainability of composite materials and a competitive edge for end-user sectors such as transportation, renewable energy and construction.

Website	www.libre2020.eu
Start date	01 November 2016
End date	31 October 2020
BBi JU contribution	€ 4 566 560

MACRO CASCADE

Cascading Marine Macroalgal Biorefinery

BIOMASS: MACROALGAE

HARVESTING 'BLUE POTENTIAL'

Europe will need more food; 70% more by 2050. Project MACRO CASCADE will help Europe increase the amount of food from the sea from a mere 2%, growing a valuable new technology sector for Europe and increasing food security for the future. It will do so while creating zero waste.

SHORT AND LONGER-TERM GAINS

MACRO CASCADE will develop patentable feed and food products with health promoting functionalities through innovative microbial refining methods of macroalgae in combination with rape seed. It offers novel business opportunities for on short term for feed and food products, and on midterm for high value pharma- and nutraceuticals, large volume chemicals and biomaterials and marine based proteins and fatty acids in high demand.

BLUE PRINT FOR BLUE BIOECONOMY

MACRO CASCADE will develop sustainable business cases for a "Blue Print" of the cascading marine macroalgal biorefinery. MACRO CASCADE will obtain optimized strains of seaweeds to increase levels of target components in sugar kelp, kombu and red seaweed and improve methods for seaweed biomass preparation and storage stability.

ADDING VALUE

By scaling up macro-algae cultivation and the pre-treatment industry, there will be an impact on the innovative biorefinery processes for turning seaweed into a commodity. The model created by MACRO CASCADE should increase the total value of biomass from €25/tons ww to €1000/tons ww, corresponding to an annual revenue of €2 bn in 2025.

Website

www.macrocascade.com

Start date

01 October 2016

End date

30 September 2020

BBi JU contribution

€ 4 156 356



MAGNIFICENT

Microalgae As a Green source for Nutritional Ingredients for Food/Feed and Ingredients for Cosmetics by cost-Effective New Technologies

BIOMASS: MICROALGAE

HIGH PERFORMANCE AND LOW ENVIRONMENTAL IMPACT

MAGNIFICENT seeks to develop a new value chain for food, aquafeed and cosmetic ingredients based on microalgae. Currently, market opportunities for microalgae-based products are restricted to high-value products, as production costs are currently prohibitive to use it as a feedstock. MAGNIFICENT will develop ten new bio-based value chains by 2020, including sustainable production of high-value food, drink and cosmetic ingredients. By using green solvents, it aims to establish truly sustainable value chains.

MAKING PRODUCTION OF MICROALGAE ECONOMICALLY VIABLE

There is an existing capacity for large scale production, but both the variety of products and number of market opportunities is currently limited, mainly to dietary supplements and cosmetics. Magnificent will use these facilities to develop the biorefinery concept further, validate the value chains and develop new ingredients.

NEW AND SUSTAINABLE PRODUCTION TO AREAS SUCH AS COASTS AND DESERTS

MAGNIFICENT will seek to expand the range of products and their market volume substantially and sustainably, improving current applications and developing new ones, such as food and aquatic feed. It will do this by developing and validating a new value chain for cultivating and processing microalgae, addressing both upstream and downstream processes.

Website

www.magnificent-algae.eu

Start date

01 June 2017

End date

31 May 2021

BBI JU contribution

€ 5 330 573

MANDALA

The transition of MultiLayer/multipolymer packaging into more sustainable multilayer/single polymer products for the food and pharma sectors through the development of innovative functional Adhesives

BIOMASS: BIO-BASED AND RECYCLED POLYMERS

NO CIRCULAR EUROPE WITHOUT SUSTAINABLE PLASTICS

Plastic recycling is a major technological challenge. Currently, only 14 % is recycled, with 72 % simply not recovered at all. Despite having an inherent value, virtually all – 95 % – is simply lost after a single use. Clearly, if Europe's ambitions for a circular economy are to become a reality, this must change dramatically. A major challenge is that, in order to improve performance, the packaging is becoming increasingly complex, often incorporating mixed materials that make it difficult to recycle.

MAKING RECYCLING EASY

The solution to this is twofold. First, to create bio-based mono-material packaging that offers the same benefits as existing, multi-material approaches. Second, to develop technologies that make it easier to separate and sort multi-material packaging.

ECO-DESIGNED PACKAGING

The MANDALA project will make the end-of-life phase for packaging more sustainable by developing a new laminated film approach that is easy to separate and thus recycle. It will also develop the technologies to enable separation of the different materials after use. Besides, the project will help to decouple plastics from fossil feedstocks by identifying and determining renewably-sourced alternatives.

Website

www.bbi-europe.eu/projects/mandala

Start date

01 June 2019

End date

31 December 2022

BBJ JU contribution

€ 3 650 922



NeoCel

Novel processes for sustainable cellulose-based materials

BIOMASS: CELLULOSE PULPS

TEXTILES FOR A SUSTAINABLE FUTURE

As the world's population increases, it needs more textiles. A source with great potential for long term increase in production volumes are man-made cellulosic fibres. The NeoCel project will develop innovative and techno-economically feasible processes for producing high quality textile fibres from reactive high cellulose pulps. It will enhance the use of cellulose from sustainable sources, with a special focus on textiles.

REDUCING ENVIRONMENTAL IMPACT

NeoCel will reduce the environmental impact and occupational health issues relating to man-made cellulose fibre production and promote sustainably produced, good quality man-made cellulosic fibres for the textile and fashion industries.

HIGHLY COMPETITIVE BIO-BASED ALTERNATIVE

NeoCel will develop innovative and techno-economically feasible alkaline processes for sustainable production of high quality textile fibres from reactive highcellulose pulps in connection to pulp mills.

REDUCED COSTS, IMPROVED PERFORMANCE

NeoCel aims to strengthen the market position of regenerated cellulose fibres for textile application by an expected reduction of production cost of at least 15% for the developed process in the project. The market share is expected to increase to 15% even if the total market for textile fibres is also expected to strongly increase.

Website

www.neocel.eu

Start date

01 September 2016

End date

31 August 2019

BBi JU contribution

€ 1 934 233

NEWFERT

Nutrient recovery from bio-based waste for fertiliser production

BIOMASS: BIOWASTE

CONVERTING WASTE TO FERTILISERS

Converting waste into resources is key to a circular economy. Europe produces more than 2.5 bn tonnes of waste per year. Around 20% is classifiable as biowaste. NewFert will design and develop technologies to re-use and valorise biowaste components, making them suitable as secondary raw material in the fertilizer industry.

RECOVERING AND REUSING SOIL NUTRIENTS

Newfert will develop a new value chain based on nutrient recovery bioprocesses from waste streams and residues for manufacturing a new generation of bio-based fertilisers. It will turn bio-based solid and liquid residues, specifically ashes of different origins and livestock effluents, into bio-based fertilisers. The project will build up a breakthrough concept for the fertiliser industry and develop a viable and cost-effective nutrient recycling scheme and effective bio-refining technologies aimed at increasing nutrient recovery ratios.

REDUCING EUROPE'S NEEDS FOR FOSSIL RAW MATERIALS

This will lead to a decrease raw material dependency, prevent resource depletion and reduce the environmental impact increasing the fertiliser industry sustainability. Enabling the substitution of a minimum of at least 10% of nitrogen and phosphorus with recycled components in commercial fertilisers will contribute to a reduction of imports of mineral resources while enhancing the reuse of waste products. In this way NEWFERT will improve fertilisers in view of environmental impact and price competitiveness as compared to the current non-bio-based alternatives.

Website

www.newfert.org

Start date

01 July 2015

End date

31 December 2018

BBI JU contribution

€ 1 209 521



NEWPACK

Development of new competitive and sustainable bio-based plastics

BIOMASS: ORGANIC WASTE

REDUCING FOSSIL-BASED PLASTIC

In 2015, the countries of the EU, along with Switzerland and Norway, used almost 50 million tonnes of plastic. Around 40% of this was in the packaging sector, with a great deal of that coming from the food industry. The NEWPACK project aims to develop a competitive, sustainable and innovative technology for making two new biodegradable, bio-based polymer materials.

BIODEGRADABLE PLASTIC MADE FROM POTATO PEELINGS AND CRAB SHELLS

Novel biodegradable plastic food packaging films from agro-food waste, including potato peelings and crab shells will be developed in NEWPACK with advanced mechanical properties. For example, the new packaging will have antioxidant/antimicrobial features that extend the shelf life of foods while retaining their nutritional value and their texture; an improvement over existing bio-based plastics.

FROM A LINEAR TO A CIRCULAR ECONOMY

This project will design a pilot plant and validate, at pilot scale, the manufacture of these innovative food-packaging materials based on novel materials coming from biomass streams. It also intends to prepare not only the market for these materials, but also a potential future scale-up to achieve for a pre-industrial production. NEWPACK will also reduce the environmental footprint of packaging materials: all will start from bio-waste and conclude as biodegradable materials, thus transforming the packaging film production from a linear to a circular economy approach.

Website

www.bbi-europe.eu/projects/newpack

Start date

01 June 2018

End date

31 May 2021

BBi JU contribution

€ 4 274 587

PERCAL

Chemical building blocks from versatile MSW biorefinery

BIOMASS: MUNICIPAL SOLID WASTE

INCREASING THE VALUE OF SOLID MUNICIPAL WASTE

PERCAL will use Municipal Solid Waste (MSW) as a feedstock for developing intermediate chemical products, producing high yield with high purity, making it attractive for industry. These will be complementary to the bioethanol (existing PERSEO Bioethanol® technology), thus creating a cascade of valorisation from the MSW components.

MAKING HIGH-VALUE PRODUCTS USING CASCADING TECHNIQUES

PERCAL aims to produce three main compounds. Lactic acid, which can be used to make eco-friendly ethyl lactate. This can be used in cleaning products, in ink and for hot-melt adhesives for cardboard; succinic acid, as an intermediate building blocks for the production of polyols for the polyurethane industry as well as biosurfactants from the remaining fraction of the MSW fermentation.

NEW VALUE CHAINS THROUGH VALORISING WASTE

The project should lead to four main innovations; new enzymatic cocktails to maximize hydrolysis of fermentable organic matter with low inhibitors production; high yield, specific and robust strains for each selected acid; extraction of fermentation by-products acting as inhibitors to succinic acid production via novel membrane electrolysis and optimised simultaneous saccharification and fermentation for lactic acid production followed by a downstream separation process. These should minimise issues of heterogeneous MSW composition.

Website

www.percal-project.eu

Start date

01 July 2017

End date

30 June 2020

BBI JU contribution

€ 2 518 518



POLYBIOSKIN

High performance functional bio-based polymers for skin-contact products in biomedical, cosmetic and sanitary industry

BIOMASS: BIOPOLYMERS

PERSONAL CARE PRODUCTS

Biopolymers offer high antimicrobial, antioxidant, absorbency, skin compatibility for high performance demanding skin-contact applications. POLYBIOSKIN will develop and validate four new bio-based materials based on biopolyesters and biopolymers that are capable of replacing current petrochemical-derived materials. It will develop and validate pilot processes for successfully converting the bio-based polymers into 'consumer' products, specifically preparing prototypes for three globally significant, high performance skin-contact products, namely nappies, beauty masks and wound dressing.

TECHNOLOGY BEHIND BIOPOLYMERS

Many of the polymers used in biomedical and cosmetic applications rely on fossil-derived sources. Although a number of alternative bio-based polymers is the subject of recent research, more effort is still needed to increase their specific functionalities and performances in order to proceed with their true translation into market.

CONSUMER-FRIENDLY BIOPOLYMERS

PolyBioSkin products will add benefit and value for consumers by broadening the use of biopolymers in strategic and demanding skin-contact applications. By developing skin-contact bio-polymer based product parts with increased performance and functionality derived from biomass and food waste, providing a more environmentally friendly end of life given their biodegradability allowing organic recycling.

Website	www.polybioskin.eu
Start date	01 June 2017
End date	31 May 2020
BBI JU contribution	€ 3 438 048

Pro-Enrich

Development of novel functional proteins and bioactive ingredients from rapeseed, olive, tomato and citrus fruit sidestreams for applications in food, cosmetics, pet food and adhesives

BIOMASS: AGRICULTURAL SIDESTREAMS

EXTRACTING HIGH-VALUE COMPONENTS

Pro-Enrich will demonstrate a new business model for extracting high-value components from agricultural sidestreams, demonstrating technical and commercial feasibility for both small and large-scale bio-processing units. It will apply components isolated from the bio-refining into key market areas and demonstrate their fitness for purpose.

CREATING A FLEXIBLE REFINING SYSTEM

The project will develop a flexible biorefinery approach able to process a range of agricultural residues from rapeseed meal, olives, tomatoes and citrus fruit industries making it possible for the first time to evaluate multiple feedstocks in a single bio-refining system. Pro-Enrich will take the process of fractionising biomass to a new level, identifying high quantities of high-purity functional proteins and bioactive components such as polyphenols, dietary fibres and pigments for use in food ingredients, pet food, cosmetics and adhesives.

TAKING PROCESSES FROM PILOT TO DEMONSTRATION SCALE

Pro-Enrich aims to develop the biorefinery processes in pilot scale before advancing the best business cases to demonstration scale. It will determine the components with the highest market potential from the four residue streams investigated, as evaluated by the project industrial end-user partners, and undertake sustainability assessments of process alternatives to ensure that any new product ranges developed provide environmental benefits.

Website	www.pro-enrich.eu
Start date	01 May 2018
End date	30 April 2021
BBi JU contribution	€ 3 312 891



Prolific

Integrated cascades of PROcesses for the extraction and valorisation of proteins and bioactive molecules from Legumes, Fungi and Coffee agro-industrial sidestreams

BIOMASS: AGRO-INDUSTRIAL RESIDUES

USING THE HIGH POTENTIAL OF AGRO-INDUSTRIAL RESIDUES

Agro-industrial residual biomass, sidestreams and food production by-products such as legumes, fungi and coffee are likely to constitute rich sources of valuable ingredients, but their potential is yet to be fully realised. The Prolific project will apply a range of processing technologies to these agro-industrial residues in order to recover significant amounts of proteins/peptides, fibres and other value-added compounds.

ISOLATING PROTEINS AND BIOACTIVE COMPOUNDS FROM PLANT RESIDUES

Prolific will contribute to meet the increasing demand for bio-based molecules and polymers to be used for polymer formulations and applications. During and after the project, Prolific will map the availability and sustainability of the chosen feedstocks necessary for production. Prolific will establish flexible, sustainable and fully-scalable biorefinery extraction protocols for isolating proteins and bioactive compounds from plant residues. Once extracted, the outputs will undergo enzymatic modification and conditioning techniques in an upscaled, industrially-relevant environment.

CORE INNOVATION CYCLE

Ultimately, this will provide viable amounts of the compounds and fractions necessary to produce 16 prototypes for the food, feed, packaging and cosmetic sectors. The Prolific project's R&D&I activities and partners are streamlined around a core innovation cycle, principally driven by industrial end-users that know precisely what their customers need and what the technical and industrial demands of their sector are.

Website

www.prolific-project.eu

Start date

01 September 2018

End date

31 August 2022

BBi JU contribution

€ 4 672 383



PROMINENT

Protein mining of cereal sidestreams exploring novel technological concepts

BIOMASS: WHEAT AND RICE SIDESTREAMS

USING RESOURCES BETTER

A growing population means a growing demand for protein. However, we can no longer fully depend on animal sources to meet our protein needs; it is simply not sustainable. PROMINENT is identifying ways to make sure we get as much as we can from our existing food sources for new plant-based protein ingredients in pasta, biscuit, cake and/or beverage production processes.

RE-CAPTURING LOST PROTEIN

In processing existing foods, even common cereal crops like rice and cereals, a great deal of protein is currently lost. PROMINENT is dedicated to finding ways to capture these proteins from production sidestreams, providing alternatives to animal proteins and making better use of both crop and land resources. The project will develop protein-based ingredients and foods based on the sidestreams of wheat and rice processing industries, and with desirable taste and texture.

BRINGING TO MARKET

The project will test the concepts, ensuring safety quality and feasibility of these processes, all the way to the technical considerations of food formulation and consumer acceptance. It will investigate different relevant parameters along the whole food chain: food safety and quality, techno-economic feasibility, (environmental) sustainability, as well as market potential of the new protein ingredients and foods. This provides new market opportunities for the agro-food industry and new plant-based end products for the consumer food market.

Website	www.prominent-protein.eu
Start date	01 July 2015
End date	31 October 2018
BBi JU contribution	€1 685 006



PROVIDES

Processes for Value added fibres by Innovative Deep Eutectic Solvents

BIOMASS: WOOD, PAPER AND AGRO-SIDESTREAMS

DEVELOPING ADVANCED TECHNOLOGIES

PROVIDES will develop a new, sustainable and techno-economically feasible pulping technology for wood and agro-based lignocelluloses. The PROVIDES project will provide tools that encourage radical innovations and a move towards low-energy mild pulping processes, which provide high quality cellulose, hemicellulose and lignin fractions.

CUTTING COSTS

The project will work to achieve technological breakthroughs spurring innovation across cellulose-based sectors. Its technology will reduce process energy intensity by at least 40% as compared to traditional pulping processes and reduce investment costs by 50% as compared to current pulping installations, due to a pressure-free layout and a simplified chemical recovery. It will map, select and develop appropriate lignin-dissolving DESs for new wood and agro-based lignocellulose pulping technologies and for cellulose-dissolving DESs, as well as others DESs for new paper for recycling pulping technologies that can add further value in papermaking.

NEW MARKETS

Using a new class of solvents, known as deep eutectic solvents (DES) with a lower investment cost and reduced carbon footprint will strengthen the market position of current wood-based products like paper and board and provide new applications with a high added value in the textile and chemical industries.

Website

www.providespaper.eu

Start date

01 July 2015

End date

31 December 2018

BBi JU contribution

€ 1 079 551

RefuCoat

Full recyclable food package with enhanced gas barrier properties and new functionalities by the use of high performance coatings

BIOMASS: FOOD BY-PRODUCTS

RE-DESIGNING FOOD PACKAGING

RefuCoat seeks to develop hybrid bio-based high oxygen/water barrier and active coatings to be used in monolayer bio-based packaging (films and trays) as alternative to current metallised and modified atmosphere (MAP) packages. Developing new full recyclable solutions with improved barrier properties from renewable origin creates an important competitiveness opportunity for Europe.

REDUCING FOSSIL-BASED MATERIALS

Replacing oil-based packaging materials with bio-based ones could give a competitive advantage due to their more sustainable and greener image. Currently, bioplastics represent about 1% of the about 300 million tonnes of plastic produced annually. But as demand is rising and with more sophisticated materials, applications, and products emerging, the market is already growing by about 20 to 100% per year.

CREATING THE MARKET PLACE

RefuCoat will seek to demonstrate the potential and economic opportunity offered by the use of bio-based polymers, including PHA from food by-products and other commercial bio-polymers. It will enable European industries to better bridge the 'innovation gap' and the 'valley of death' between technology development and commercialisation.

Website	www.refucoat.eu
Start date	01 June 2017
End date	31 May 2020
BBJ JU contribution	€ 2 300 735



ReSolve

REnewable SOLVENTs with high performance in application and improved toxicity profile

BIOMASS: LIGNOCELLULOSIC SIDESTREAMS AND WOOD

SAFER BIO-BASED PRODUCTS

ReSolve sets out to replace two hazardous solvents – toluene and NMP (N-methyl-2-pyrrolidone) with safer alternatives derived from non-food carbohydrates. The new, safer solvents will have a wide range of applications which will improve public health and safety by reducing the use of the toxic and environmentally damaging substances. It will also demonstrate that bio-based alternatives provide sustainability, low health impact and high application performance.

HIGHER SAFETY STANDARDS

The REACH regulation presents a major opportunity for Europe's bio-based industry to bring alternatives on stream. These bio-based solvents will allow Europe's solvent industry to avoid the negative economic impact of the regulatory restrictions on the use of aromatic and nitrogen-containing solvents. It will also make a difference for many thousands of downstream users, while reducing the health impact on millions of European citizens that are routinely exposed to solvents as part of their job.

NEW JOBS FOR EUROPE

ReSolve intends to create a pipeline of new solvent candidates with candidates at TRL 5, and other candidates for specific applications moving towards to TRL 3-4, offering further substitution options for hazardous solvents in the near future. ReSolve can sharply reduce EU imports of solvents and create thousands of new jobs.

Website

www.resolve-bbi.eu

Start date

01 June 2017

End date

31 May 2020

BBi JU contribution

€ 4 358 413



SElectiveLi

Conceptual Study of Electrochemical based novel process using Lignosulfonates to produce bio-based monomers & polymers

BIOMASS: LIGNIN

IMPROVING EFFICIENCY OF THE PROCESS

Using Europe's own biomass resources improves raw material security by reducing reliance on fossil-based feedstock imports. However, extracting higher-value compounds from lignin, one of the most important low-cost feedstocks, is currently inefficient and expensive. The SElectiveLi project will reduce the cost of production by using electrochemical processes that take advantage of surplus energy available via smart grids.

WIDE RANGE OF APPLICATIONS

SElectiveLi will extract a range of aldehydes for potential food, adhesive, and pharmaceutical applications and intermediates for conversion into polymers. It will also develop downstream separation and purification processes for the latter.

SAVING ENERGY AND DEVELOPING BIO-BASED PRODUCTS

The project will research, develop and innovate ways to improve the efficiency of integrated biorefineries. This will produce higher-value chemicals at a lower cost and will use less energy. SElectiveLi also aims at developing innovative bio-based products for identified markets. These will include aldehydes and derivatives suitable for use in common polymers. Moreover, this project will create and accelerate the uptake of bio-based products and applications, by working closely with industrial companies already supplying lignin-based products to global markets.

Website

www.bbi-europe.eu/projects/selectivelib

Start date

01 May 2019

End date

30 April 2022

BBi JU contribution

€ 2 497 224

SHERPACK

Innovative structured polysaccharides-based materials for recyclable and biodegradable flexible packaging

BIOMASS: WOOD

DEVELOPING THE NEW GENERATION OF BIO-BASED PACKAGING

The SHERPACK project will develop a renewable, biodegradable and recyclable flexible paper-based packaging material that can be converted by heat-sealing and folding, with improved stiffness and grip. It will replace materials currently used to manufacture FFS (Form Fill Seal) packaging, such as plastics or aluminium foil with an advanced biomaterial.

LIGHTER, BETTER PERFORMING, NOVEL PAPER-BASED PACKAGING

This new packaging material will at least match the technical performance of existing competitor materials while reducing the weight/performance and the cost/performance ratios. This material will also meet end-of-life requirements by developing a new material that is both recyclable and biodegradable and which will enter in the paper waste stream, thus reducing the recyclable content in landfilled waste.

REDUCED PRODUCTION COSTS MAKE IT THE MATERIAL OF CHOICE

It will also reduce costs compared to existing materials over the entire lifecycle, not only by using a bio-based material but also by producing packaging with better stiffness-to-weight and lower weight, reducing transport costs.

SMARTER SOLUTIONS TO REDUCE RELIANCE ON PRECIOUS RAW MATERIALS

This means we can replace materials such as plastics or aluminium foil in many applications. SHERPACK will address all current challenges for a future packaging value chain - technical performance, customer safety and cost effectiveness.

Website	www.sherpack.eu
Start date	01 June 2017
End date	30 November 2020
BBi JU contribution	€ 1 294 445



SMARTBOX

Selective Modifications of ARomatics through Biocatalytic Oxidations

BIOMASS: HARDWOODS AND SOFTWOODS

ENABLING ENZYMATIC PROCESSES

Oxidative enzymes have the potential to substantially improve the economic and environmental sustainability of biorefineries. However, enzyme-based processes rely on costly and relatively slow enzyme engineering technologies before the industrial implementation of the enzymatic processes can be considered. This has prevented their widespread uptake. The SMARTBOX project is designed to address this perception and to make oxidative biocatalysis an effective approach in biorefining.

COMPUTING AUTOMATION FOR BIOREFINING

SMARTBOX will develop an advanced computational engineering platform specifically for oxidative enzymes, capable of automatically screening for improved enzyme variants with a high degree of automation by using e.g. machine learning. This should reduce the time and costs associated with oxidative enzyme engineering by ten-fold compared to the current state of the art approaches.

IMPROVING ENVIRONMENTAL AND ECONOMIC SUSTAINABILITY

Already during SMARTBOX, the platform is applied to make a number of biorefining processes more sustainable and to create new ways of valorising lignin and carbohydrates. In the long term, this will offer a significant economic opportunity for biorefineries and decrease their environmental impact.

BOOSTING PRODUCTIVITY

SMARTBOX will increase productivity across all value chains compared to current state-of-the-art processes, either by reducing production costs or by increasing productivity.

Website

www.smartbox-project.eu

Start date

01 May 2019

End date

30 April 2023

BBi JU contribution

€ 3 924 163



SmartLi

Smart technologies for the conversion of industrial lignins into sustainable materials

BIOMASS: LIGNIN

DEVELOPING BIO-BASED ALTERNATIVES

Currently, manufacturers use aromatic chemicals to manufacture polymers which come from fossil-based sources. Bio-based raw material lignin has the potential to replace these non-renewable resources. By providing a lignin-based source for these chemicals, SmartLi can make a major contribution to a true bio-based economy, reducing greenhouse gas emissions and creating value from currently underexploited biomass sidestreams.

NEW GREENER COMPOSITES

The project SmartLi will develop valorisation routes for lignin, creating materials such as composite materials and resins and source them from underutilised lignin by-products from the pulp and paper industry. The project will develop and demonstrate technologies and processes to use technical lignin products as raw materials to produce biomaterials, such as components with improved properties for composites, plasticisers and different types (PU, PF, epoxy) of resins. This will enable, for example substituting 25-75% of phenol in formaldehyde resins, to replace at least 50-70% of polyols in polyurethane foams.

TESTING SUSTAINABILITY

The project will conduct a Life Cycle Analysis to assess the economic, environmental and social sustainability of the developed products and identify a strategy for market penetration. It will also identify the most promising technologies and evaluate their wider sustainability potential. The project will facilitate market penetration of these bio-based products in the respective sectors with high demand, thereby creating business opportunities and jobs.

Website

www.clicinnovation.fi/activity/smartli

Start date

01 July 2015

End date

30 June 2018

BBi JU contribution

€ 1 481 258



SSUCHY

Sustainable structural and multifunctional bio-composites from hybrid natural fibres and bio-based polymers

BIOMASS: PLANT FIBRES

PLANT FIBRES FOR THE FUTURE

SSUCHY will contribute to developing bio-based composite products with advanced functionalities and high structural properties for transportation sectors and in high value market niches. The use of plant fibres is increasing dramatically, with demand expected to grow by 300% in the next 25 years.

NEW FUNCTION AND MARKETS

Plant fibres offer superior renewable resource usage, recyclability, biodegradability and offer wide availability with low production costs. SSUCHY will create opportunities to expand market applications for bio-based composites to semi-structural and functional applications in ground transportation and aerospace along with new opportunities in high value niches such as acoustics and electronic sectors.

EXPLORING BIO-BASED POSSIBILITIES

The SSUCHY project will increase the sustainability and the competitiveness of Europe's industry through engagement in the bio-based composite sector through the materials and process technologies it develops and create new bio-based composite structures and products and demonstrate their advanced functionalities at demonstrator level. The project will create new bio-based material, in this case specialty fibres, plastics, composites and packaging solutions. It will develop new consumer product demonstrators derived from bio-based chemicals and materials.

Website

www.ssuchy.eu

Start date

01 September 2017

End date

31 August 2021

BBJ JU contribution

€ 4 457 195



SUSBIND

Development and pilot production of SUsustainable bio BINDER systems for wood based panels

BIOMASS: AGRO-INDUSTRIAL RESIDUES

BIO-BASED ALTERNATIVES FOR FOSSIL-BASED BINDERS

Currently, wood boards such as Particle Board (PB) and Medium Density Fibreboard (MDF) rely on the use of fossil-based binders, mainly formaldehyde-based binders. Although there has been a great deal of investigation into potential alternatives, to date none of the bio-based alternatives have performed satisfactorily on an industrial scale.

IDENTIFYING ADEQUATE FEEDSTOCKS

By bringing together partners with an extensive technological background built up in recent years, the SUSBIND project aims to successfully produce and test bio-based binders as alternative to fossil-based binders. It will identify adequate feedstocks for production; develop new and greener production techniques including novel epoxidizing enzymes. In addition, it will produce and validate binders for Particle Board (PB) and Medium Density Fibreboard (MDF) with leading manufacturers.

BENEFITTING CONSUMER HEALTH AND REDUCING ENVIRONMENTAL IMPACT

The SUSBIND resulting binder system will prove better performance in PB and MDF in terms of 50 - 75% reduction of emissions than current fossil-based wood boards. The active participation of industry and a consumer brand owner secures post-project scale-up into existing plants. On the basis of cost analyses performed, an economically viable and better performing precursor will increase the marketability of bio-based furniture products concerned. The results of SusBind will not only benefit consumer health and help mitigate climate change but also strengthen the European furniture industry by providing cost efficient bio-based binders.

Website	www.susbind.eu
Start date	01 May 2018
End date	30 April 2022
BBi JU contribution	€ 4 414 419

TECH4EFFECT

Techniques and technologies for effective wood procurement

BIOMASS: WOOD

GREATER EFFICIENCY

Europe's forests are a major source of sustainable materials and essential to Europe's ambitions as a leading bio-economy. As we strive for a genuinely circular economy, greater efficiency in how we manage our renewable resources becomes increasingly important.

MAXIMISING VALUE OF RESOURCE

Increased biomass demand generates a need for more accessible forests to maintain a sustainable supply and maximise the value of this resource. The TECH4EFFECT project aims to deploy technological advances to advance forest management to a new level. The project will increase efficiencies including both lowering the cost and the environmental impact of harvesting from forests.

EXPLOITING DATA

By developing a state-of-the-art knowledge-based decision-support system aimed at increasing efficiency, TECH4EFFECT will offer a novel way to exploit the increasing amounts of data generated in modern forestry. TECH4EFFECT seeks to implement the developed efficiency management tool in five participating countries.

BENCHMARKING TOOL

The project will develop the TECH4EFFECT web-based benchmarking tool to collect and systematize data from forest management and provide a foundation for knowledge-based management of European forest operations in the future. This will help to improve efficiency in silviculture and harvesting operations, and a significant increase in productivity in forest operations.

Website

www.tech4effect.eu

Start date

01 October 2016

End date

30 September 2020

BBI JU contribution

€ 4 999 903

UNRAVEL

UNIQUE Refinery Approach to Valorise European Lignocellulosics

BIOMASS: LIGNOCELLULOSE

OPTIMISED PROCESSES AND TECHNOLOGIES

UNRAVEL aims to develop advanced pre-treatment, separation and conversion technologies optimised for complex lignocellulosic biomass streams. The technology relies on pre-extraction, fractionation using low-temperature acetone and subsequent downstream processing to isolate and convert the lignocellulosic constituents into high-value applications.

COMBINING EXPERTISE

It will bring together specialists with expertise of the entire value chain from feedstock composition, chemical pulping and pre-treatment, enzymes production, polymer chemistry, separation and reactor engineering, techno-economic and sustainability assessments and knowledge dissemination, exploitation and communication. It will create a new cross-sector interconnection between the forestry, pulp and paper industries, the biotechnology industry and the building and construction material industry. It will also develop a new bio-based value chain using currently-underexploited feedstocks such as forest residues and bark, straw and nut shells.

REDUCING THE ENVIRONMENTAL IMPACT AND COSTS

UNRAVEL will show a 30% reduction in expenses by reducing the operating temperatures required and through lower overall energy consumption and costs as compared with a benchmark pre-treatment process. It aims to demonstrate an overall reduction of at least 15% in the carbon footprint of biorefineries by reducing emissions and increasing the efficiency resource and chemical use compared with the state-of-the-art bio-based operation.

Website	www.unravel-bbi.eu
Start date	01 June 2018
End date	31 May 2022
BBi JU contribution	€ 3 603 545



USABLE PACKAGING

Unlocking the potential of Sustainable Biodegradable Packaging

BIOMASS: SIDESTREAMS FROM THE PRODUCTION OF PASTA, BREAD, CAKES, FROZEN FOOD AND WINE

FACING BIOPLASTICS CHALLENGES

Bioplastics currently hold only a 2 % market share in the EU; the remainder is fossil-based. In addition, many bioplastics are only partially biodegradable and can't solve end-of-life issues. They also compete with feedstock for the food and feed sectors, pushing up costs. The amount of non-biodegradable bio-based plastics on the market is expected to grow as replacements for fossil-based counterparts continue to grow.

BIODEGRADABLE PACKAGING

It is crucial to increase the usage of biodegradable bioplastics, ideally using different materials. However, many bioplastics lack adequate functional properties for packaging requirements. In addition, the complexity of multilayer packaging limits the biodegradability and compostability of the whole packaging item. USABLE PACKAGING will convert the biomass into poly-hydroxy-alkanoates (PHA), which can be tuned to specific packaging needs and specifications. This will realise packaging items suitable for replacing fossil-based materials in high-performance packaging while retaining biodegradable characteristics in different environments, including marine settings.

GREEN BY DESIGN

USABLE PACKAGING will improve circularity by eco-design over existing fossil-based and bio-based plastics over the full range of applications. It will ensure that the end-of-life phase is wholly sustainable by creating a fully-circular, vertically-integrated supply chain. Besides, the packaging will also be suitable for home composting.

Website

www.bbi-europe.eu/projects/usable-packaging

Start date

01 June 2019

End date

31 May 2022

BBi JU contribution

€ 4 813 045

US4GREENCHEM

Combined ultrasonic and enzyme treatment of lignocellulosic feedstock as substrate for sugar based biotechnological applications

BIOMASS: LIGNOCELLULOSIC FEEDSTOCK

GREEN TECHNOLOGIES REDUCE COSTS

Bio refinery feedstocks in Europe can be sourced from agro-forestry feedstocks. The European Forest based sector can provide a range of materials and products and is the largest single producer and consumer of bioenergy in Europe. The US4GREENCHEM project aims to design a biorefinery concept for the complete valorisation of lignocellulosic biomass that is energy and cost-efficient and based solely on green technologies. By developing efficient and integrated pre-treatment processes it will lead to a tangible reduction of costs over the entire conversion process.

NEW PROCESSES

US4GREENCHEM will deliver fermentable sugars at prices comparable to current market prices at the same time as reducing greenhouse gas emissions by at least 30% over the whole value chain of the targeted products. The project combines mechanical pre-treatment methods with ultrasound pre-treatment capable of disrupting the lignocellulosic matrix with reduced energy input and minimal production of inhibitory by-products.

OPTIMISING YIELD

Ultrasound can be up to three times less energy than current approaches for lignin removal. It will also examine further breaking down lignocellulose with carbon dioxide technologies to maximise release of sugars as the main target products. This should lead to the optimisation of yield and reduce the cost of enzymatic hydrolysis of cellulose fibres by 50%.

Website	www.us4greenchem.eu
Start date	01 July 2015
End date	30 June 2019
BBI JU contribution	€ 3 457 603



VALUEMAG

Valuable products from algae using new magnetic cultivation and extraction techniques

BIOMASS: ALGAE

INCREASING DEMAND ON WORLD RESOURCES

It is estimated that by the 2050 world population will exceed nine billion adding pressure to the demand for more energy, food, recycled nutrients and water. Interdisciplinary research projects like VALUEMAG have the potential to offer a valid alternative: large-scale rapid biomass production.

MICROALGAE CAN BE USED IN NEW PRODUCTS FOR FOOD, COSMETIC AND NUTRACEUTICALS

Micro-algae produce approximately one half of the oxygen generated on earth while simultaneously consuming CO₂ during photosynthesis and fixing NO_x during their anabolism. Moreover, biomass from micro-algae is a promising source of primary/secondary metabolite products with considerable use in the aquaculture, food additive industry, bio-fertilization, pharmaceutical and cosmetic industry.

MAGNETIC NANOPARTICLES HOLD SECRET FOR PRODUCTION AND HARVEST OF MICROALGAE

VALUEMAG aims to provide ground-breaking solutions for microalgae production and harvesting as well as scaling up biomass transformation systems in order to provide new technologies for aquatic/marine biomass integrated biorefineries.

SUSTAINABLE BIO-BASED VALUE CHAINS

In VALUEMAG, nothing is wasted. All the cultivated micro-algae are used to develop useful products and all the used water is self-cleaned by the cultivation process. The magnetic methodology proposed within the VALUEMAG project is effectively the solution for the sustainable development of large-scale micro-algae cultivation.

Website	www.valuemag.eu
Start date	01 April 2017
End date	31 March 2020
BBJU contribution	€ 4 789 000

VIPRISCAR

Validation of an industrial process to manufacture isosorbide bis(methyl carbonate) at pilot level

BIOMASS: DIFFERENT SOURCES OF BIOMASS

A HIGH-POTENTIAL BIO-BASED CHEMICAL

Isosorbide bis(methyl carbonate) (IBMC) is a mainly bio-based chemical with no fossil-based counterpart and the potential to help manufacture a range of products, many of which currently rely on fossil-based raw materials. It has a number of applications in packaging, coating, printing and even healthcare, and shows particular promise in making parts for PC manufacturing.

MULTIPLE APPLICATION SECTORS

The VIPRISCAR project aims to improve and validate more sustainable production methods and demonstrate, through proof of process, the added value it can bring in three existing high-volume sectors - automotive and furniture, hot melt adhesives and biomedical applications. The VIPRISCAR project intends to establish a viable production method that paves the way for introducing a new secondary bio-based chemical that has a structure and properties which make it a promising candidate to substitute current oil-derived chemicals.

CREATING PARTNERSHIPS IN THE FORESTRY AND TIMBER INDUSTRIES

The project foresees to create new cross-sector interconnections in bio-based economy clusters, such as the forestry and timber industries. It will contribute to reducing the EU's oil dependency and boost the wider sustainable economy. It also aims to confirm that the isosorbide derivatives and the final products meet the toxicology requirements of the European Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

Website	www.vipriscar.eu
Start date	01 June 2018
End date	31 May 2021
BBi JU contribution	€ 2 814 876

WASEABI

Optimal utilization of seafood side-streams through the design of new holistic process lines

BIOMASS: SEAFOOD SIDESTREAMS

IMPROVING EFFICIENCY AND SUSTAINABILITY

Aquatic biomass processing is a sizeable European industrial sector, with a turnover approaching €30 million and employing more than 120 000 people. However, the sector is facing increasing pressure from rising costs and falling margins. At the same time, existing resources are not being used sustainably, with substantial inefficiency ending up at best as by-products or sidestreams, at worst as waste.

NEW SOLUTIONS FOR THE AQUATIC SECTOR

Processes that could exploit these resources more effectively would, therefore, be highly desirable. The WASEABI project is designed to solve some of these challenges and allow more effective exploitation of aquatic resources. It will develop solutions for storage, sorting and decision tools that will secure an efficient, sustainable supply system from typical European aquaculture, fisheries and aquatic processing industries. This will provide the opportunity to valorise these into potentially marketable products.

HEALTHIER AND MORE SUSTAINABLE FOOD AND FEED

The WASEABI project will encourage sustainable production and consumption of aquatic resources by reducing waste and improving the efficiency of the resources. Moreover, it will contribute to human and animal health by providing bioactive molecules as food and feed ingredients, thus reducing the use of antibiotics in feed. It will also secure sustainable food production, helping provide availability and access to affordable food for low-income groups.

Website	www.waseabi.eu
Start date	01 May 2019
End date	30 April 2023
BBi JU contribution	€ 3 197 397



WoodZymes

Extremozymes for wood based building blocks: from pulp mill to board and insulation products

BIOMASS: WOOD

USING THE POTENTIAL OF ENZYMES

Many wood processing techniques require extreme conditions of heat and alkalinity. WoodZymes seeks to develop extremozymes (enzymes that can function under extreme environments) and extremozyme-based processes required to remove or modify hemicelluloses and recalcitrant lignin protecting cellulose in the plant cell wall, which will allow underutilised lignin and hemicellulose fractions of kraft pulp mills to be valorised. This will produce high-value bio-based compounds to be used as bio-equivalents of existing petroleum-based chemical building blocks and precursors.

BIO-BASED MATERIALS FOR THE BUILDING AND FURNITURE INDUSTRY

In doing so, WoodZymes will create substitutive components (lignin-based phenolic resins and polyols) for the manufacture of medium-density fibreboards (MDF) and polyurethane (PU) insulation foams, potentially reducing or avoiding the use of toxic ingredients, whereas the sugar-derived compounds will be used as fibre-bonding enhancers in papermaking.

CONTRIBUTING TO THE COMPETITIVENESS OF CELLULOSE MANUFACTURE

WoodZymes illustrates the potential of extremozymes in the global bio-based economy, contributing to the sustainability and competitiveness of cellulose and fibreboard and polyurethane manufacture by reducing the use of petroleum-based components, and establishing a direct link between the pulp and wood industrial sectors. The project aims to save energy during refining of paper thanks to the use of sugars extracted from pulp as fibre-bonding enhancers, to decrease the use of resins in MDF thanks to new enzymatic technology and to reduce the overall carbon footprint of industrial processing.

Website	www.woodzymes.eu
Start date	01 June 2018
End date	31 May 2021
BBJ JU contribution	€ 3 253 874

Zelcor

Zero waste lignocellulosic biorefineries by integrated lignin valorisation

BIOMASS: LIGNOCELLULOSIC RESIDUES

EXTRACTING THE LIGNIN

Lignocellulosic feedstocks like dry matter plant biomass are commonly used in the production of biofuels and bio-based chemicals. However, a major disadvantage of these feedstocks is the presence of substantial amounts of lignin, an aromatic polymer that is difficult to break down. This so called “recalcitrance” means lignocellulosic feedstock is often considered primarily as a waste product, utilised to produce energy through burning.

IMPROVING SUSTAINABILITY

The Zelcor project will place strong emphasis on the benefits of insects in bioconversion, as insects, especially termites and their gut microbia, are some of the few organisms capable of utilising lignins and soil humins as carbon sources. The project aims to recycle waste bio-based products while seeking to improve the sustainability of existing second generation biorefining.

NEW BIO-BASED PRODUCTS

The project should optimise the economic values from agricultural residues and valorise the lignin fraction of lignocellulosic biomass into valuable products, reaching at least a 3-fold value increase as compared to the current energy value. This should produce at least three new bio-based products resulting from purified lignin.

Website

www.zelcor.eu

Start date

01 October 2016

End date

30 September 2020

BBi JU contribution

€ 5 256 993



The background of the slide is a photograph of an industrial facility, possibly a refinery or chemical plant, with large storage tanks and complex piping. In the foreground, there is a field of tall corn plants. The entire image is overlaid with a semi-transparent blue filter.

DEMOS Innovation Actions – Demonstration

AgriMax

Agri and food waste valorisation co-ops based on flexible multi-feedstocks biorefinery processing technologies for new high added value applications

BIOMASS: CROPS AND FOOD PROCESSING WASTE

FOOD SIDESTREAMS REVALORISED

Around a third of all food produced globally is wasted each year. This waste occurs throughout the whole value chain, from farmers to consumers. However, there are significant amounts of valuable compounds contained in the wasted food that could and should be recovered. AgriMax will establish the technical and economic viability using bio-refining process on waste from crops and food processing to deliver new bio-compounds for the chemical, bioplastic, food, fertilisers, packaging and agriculture sectors.

AFFORDABLE PROCESSING

The project will map the available Agricultural and Food Processing Waste (AFPW) and their features and aims to set up two flexible pilot plants for processing bio-wastes to process AFPW into value added biocompounds. It will combine affordable and flexible processing technologies, including ultrasound assisted and solvent extraction, filtration, thermal and enzymatic treatments for the valorising sidestreams from horticultural and food processing industries that can be used in a cooperative approach by local stakeholders.

NEW BUSINESS MODELS

AgriMax will also demonstrate the safety and regulatory compliance and environmental and economic sustainability of the developed processes and products.

A close-up photograph of various food waste items, including dark purple plums, a red apple, and some dried, browned plant matter, all resting on a bed of dry straw or hay.

Website	www.agrimax-project.eu
Start date	01 October 2016
End date	30 September 2020
BBI JU contribution	€ 12 484 461

BIOFOREVER

BIO-based products from FORestry via Economically Viable European Routes

BIOMASS: WOOD

GREEN CHEMICALS

Modern chemical building blocks and materials are primarily produced from fossil resources. Switching to a bio-based feedstock model would both safeguard against supply dependency and generate a lower carbon footprint, create more sustainable production systems and strengthen the competitive position of the bio-based chemicals industry.

FINDING THE WINNING COMBINATION

BIOFOREVER will prepare for construction of a commercial scale bio refinery that can be replicated, completely or in part. BIOFOREVER will evaluate the techno-economic performance of the value chains in order to define the optimal biorefinery set-ups for scale-up towards commercial plants. It will demonstrate opportunities for commercial scale follow-up, including analysis of markets and engagement with key stakeholders for different end-products as well as providing insights for the conceptual engineering design of the “winning” value chain.

JOB AND KNOWLEDGE CREATION

The project offers job creation in the agricultural/forestry sector by sourcing European biomass and the creation of biorefinery technologies as export product outside the EU, positioning European ports for the transition to renewables driven business. It will demonstrate 5 lignocellulosic (LC) value chains at pre-industrial scale including 3 new valorisation routes for co-products utilising 4 different cascading biorefinery concepts.

Website

www.bioforever.org

Start date

01 September 2016

End date

31 August 2019

BBi JU contribution

€ 9 937 997

BIOMOTIVE

Advanced BIO-based polyurethanes and fibres for the autoMOTIVE industry with increased environmental sustainability

BIOMASS: VEGETABLE OILS

BIO-BASED OFFERS ADVANTAGES

Automotive manufacturers are under growing pressure to either use less fuel or go further on same battery charge. Much of this improved performance will come from making cars lighter, known as 'light weighting', which is decreasing the weight they need to move. Every 10% reduction in vehicle weight delivers a 5-7% reduction in fuel usage.

LOWER CARBON FOOTPRINT

As a result, manufacturers are showing increasing interest in lightweight material. A noticeable fraction (around 20%) of modern cars is made of plastic and such an amount is expected to increase thanks to the recognized properties of polymers in absorbing sound and vibration. Despite these advantages, there is no single bio-based plastic that provides the aesthetics and haptics that the automotive manufacturers seek in tandem with the technical properties (shock resistance, heat resistance, fire resistance and weight reduction) they require.

BIO-BASED CAR PARTS AND COVERINGS

The BIOMOTIVE project aims to demonstrate, in relevant industrial environments, the production of innovative and advanced bio-based materials such as thermoplastic polyurethanes, 2-k thermoset polyurethane foams and regenerated natural fibres specifically for the automotive industry. The improved performance of these materials within the automotive sector, will allow massive penetration of bio-based polyurethanes and regenerated fibres into additional large volume markets.

Website	www.biomotive.info
Start date	01 June 2017
End date	31 May 2021
BBI JU contribution	€ 10 659 353



DEEP PURPLE

Conversion of diluted mixed urban bio-wastes into sustainable materials and products in flexible purple photobiorefineries

BIOMASS: URBAN BIOWASTE

A WASTED OPPORTUNITY

The EU generates almost 140 million tonnes of urban biowaste every year. Around 75 % of this is sent for incineration or landfilled and has a major environmental impact. It is also a lost opportunity as much of this waste has the potential to be recycled.

AN INNOVATIVE APPROACH TO TREAT URBAN BIOWASTE

The DEEP PURPLE project aims to demonstrate a method of transforming diluted urban biowaste, including mixed waste streams, the organic fraction of municipal solid waste, wastewater and sewage sludge into a sustainable source of feedstock for various bioindustries. To achieve this goal, the project will use a novel multi-platform biorefinery concept (biomass, cellulose and biogas) that can replace current destructive and polluting practices.

NEW ENVIRONMENTALLY FRIENDLY BIO-BASED PRODUCTS

DEEP PURPLE will reduce the amount of waste currently going for incineration or landfill, by recycling and reusing between 60 % to 85 % of the sludge produced at a wastewater treatment plant. Additionally, it will develop a range of bio-based products – fertilisers, polyesters for film applications, packaging applications, cosmetics and a 'self-healing' additive for concrete, all of which will offer improved environmental performance.

Website

www.deep-purple.eu

Start date

01 May 2019

End date

30 April 2023

BBi JU contribution

€ 6 983 049



DEMETER

Demonstrating more efficient enzyme production to increase biogas yields

BIOMASS: AGRICULTURAL, INDUSTRIAL AND MUNICIPAL WASTE

POWER OF ENZYMES

A recently developed enzyme has the potential to increase biogas yield by 10% or more. However, the current fermentation process does not yield enough to make it cost effective for industrial deployment. DEMETER wants to increase this yield by at least 20%, making it far more cost effective and more easily available for widespread use.

IMPROVING THE YIELD

The project will improve and scale-up fermentation to improve protein yields while retaining quality using a number of techniques. It will improve downstream processing of the fermentation broth, reducing costs by at least 15% and demonstrate industrial and economic the feasibility of the entire project using a 15,000 litre pilot plant. It will also develop a model that can predictive how adding the enzyme will impact biogas yield.

DEMONSTRATING THE MODEL

It will demonstrate a yield increase and cost reduction of the C1-LC4 enzyme production process and its positive effect on biogas production in Europe. It aims to improve and scale-up the C1-LC4-producing fermentation process to yield at least 20% more protein while retaining quality and to improve downstream processing of the fermentation broth leading to a cost reduction of at least 15%.

Website

www.demeter-eu-project.eu

Start date

01 August 2016

End date

31 July 2019

BBJ JU contribution

€ 4 629 586



Dendromass4Europe

Securing sustainable dendromass production with poplar plantations in European rural areas

BIOMASS: LIGNEOUS BIOMASS, BARK AND WOOD

NEW USES FOR MARGINAL LAND

Dendromass4Europe aims at establishing sustainable, short-rotation coppice)-based (SRC) regional cropping systems for agricultural dendromass production on marginal land. Its value chains are based on dendromass which originates from agricultural tree crops that are created “de novo” on marginal land.

DEVELOPING THE DENDROMASS SECTOR

D4EU will establish a large regional SRC dendromass supply chain dedicated for separate material use of wood and bark. The supply chain will meet European structural and legal framework conditions. It will include efficient supply logistics to reduce CO2 emissions along the value chains. The dendromass feedstock from D4EU's plantations will be harvested for 20 years in four five-year rotations.

BOOSTING THE REGIONAL ECONOMY

Biomass production will take place on unused land for conversion into added-value products while boosting rural and industrial development. The various activities of the D4EU project consortium aim to generate profit for the rural economy on a regional scale through value adding processes and marketing activities that will allow access for innovative bio-based materials to specific consumer markets. D4EU brings together three industrial partners in an innovative bio-economy cluster to cooperate for the first time to exploit lightweight Slovakian and Hungarian poplar wood and the poplar bark.

Website

www.dendromass4europe.eu

Start date

01 June 2017

End date

31 May 2022

BBJ JU contribution

€ 9 801 014

EFFECTIVE

Advanced Eco-designed Fibres and Films for large consumer products from bio-based polyamides and polyesters in a circular Economy perspective

BIOMASS: SUSTAINABLE SUGARS AND VEGETABLE OILS

BIO-BASED POLYAMIDES AND POLYESTERS

Polyamides (nylon) and polyesters are two of the most widespread families of polymers, with applications spanning from garments, carpets and sportswear to automotive parts, packaging materials, fishing products, electric and electronic components. In recent years, the developers of such large-volume products have started to increase their interest in the production of green products at affordable prices, which implies not only the use of bio-based materials but also the application of strategies that ensure a sustainable end-of-life of the products.

FIBRES AND FILMS WITH ENHANCED PROPERTIES

In this view, the EFFECTIVE project aims to demonstrate first-of-its-kind and economically viable routes for the production of bio-based polyamides and polyesters from sustainable renewable feedstock towards the obtaining of fibres and films with enhanced properties, market competitiveness and increased sustainability. It will create a new bio-based value chain by establishing an interconnection among sectors, which usually do not cooperate.

TARGETING MULTIPLE FIELDS OF USE

These materials endowed with better performance and improved sustainability compared to the benchmarks will be applied into eco-designed large consumer products targeting different markets, such as construction, automotive, primary and secondary packaging and textile. Moreover, their replication into many other markets such as fishing, engineering plastics, agriculture, hygiene and personal care will be also investigated.

Website	www.effective-project.eu
Start date	01 June 2018
End date	31 May 2022
BBJ contribution	€ 7 171 907

EMBRACED

Establishing a Multi-purpose Biorefinery for the Recycling of the organic content of AHP waste in a Circular Economy Domain

BIOMASS: ABSORBENT HYGIENE PRODUCTS (AHP) WASTE

RECYCLED WASTE

Absorbent Hygiene Products (AHP) waste, which includes post-consumers nappies, adult incontinence products, feminine hygiene items, wipes, etc. are currently considered a non-recyclable fraction of the Municipal Solid Waste (MSW), with 8,500,000 tons of such waste incinerated or landfilled in Europe each year. The EMBRACED project will turn Absorbent Hygiene Products waste destined to landfill or incineration into a source of valuable bio-based materials

ADDED VALUE AND NEW JOBS

EMBRACED will demonstrate a replicable, economically viable and environmentally sustainable model for an integrated biorefinery to valorise the cellulosic fraction of post-consumer AHP waste to make bio-based building blocks, polymers, and fertilizers. The biorefinery will use a circular economy approach, closing the cycle of raw materials and minimising the use of primary resources.

NEW VALUE CHAINS

EMBRACED will demonstrate one new bio-based value chain from AHP waste to building blocks, polymers and fertilizers. It will also create three new bio-based materials and products including packaging films for AHP products, medical devices with PHB based polymers and organic fertilizers. The project will also bring new jobs to the sector.

Website	www.embraced.eu
Start date	01 June 2017
End date	31 May 2022
BBI JU contribution	€ 10 695 211

EUCALIVA

EUCalyptus Lignin VALorisation for advanced materials and carbon fibres

BIOMASS: EUCALYPTUS WASTE

VALUE FROM EUCALYPTUS WASTE

Lignin from pulping processes represents a major source of underexploited material with an estimated 17 million tonnes of lignin available from pulping processes across Europe. However, much of this lignin is simply burned onsite to provide steam for heat and power production. EUCALIVA aims to create a whole value chain from lignin, using Eucalyptus waste as its source. The project's main focus will be to increase the efficiency, yield and cost-effectiveness of technologies through new approaches.

ADVANCED LIGNIN AND CARBON FIBRES PROPERTIES

The demonstration activities address the scalability of the proposed concepts. Replication will be first simulated and then delivered within the industrial project partners to validate each one of the key innovations provided within EUCALIVA. Demonstration will take place at already existing pilot plants and industrial installations, bringing further evidence and possible routes to market for the envisaged added value products.

CASCADING BIO-BASED APPROACH

EUCALIVA present a synergy between the innovation and the application of new processes and materials. This will lead to the optimisation of this biorefinery process from an economic and an environmental perspective. EUCALIVA will create a new bio-based value chain covering the production of carbon fibre mats and nonwovens produced by electro- and melt-spinning of lignin blends.

Website

www.eucaliva.eu

Start date

01 September 2017

End date

28 February 2021

BBI JU contribution

€ 1 795 010

FRESH

Fully bio-based and bio-degradable ready meal packaging

BIOMASS: CELLULOSE-BASED COMPOSITE

BIO-BASED AND BIO-DEGRADABLE

Ready meal consumption continues to grow throughout Europe – 6.5 billion and growing. The trays they come in are creating vast quantities of waste, many of which go for landfill. The FRESH project will demonstrate an innovative, cellulose-based alternative to existing fossil-based plastic trays, which is a fully bio-based and biodegradable composite material. FRESH will deliver a full value chain that will demonstrate the techno-economic viability, including customer satisfaction, of a 100% bio-based, biodegradable alternative made from an innovative cellulose-based composite, using a new lamination technology.

BETTER PERFORMANCE, LOWER FOOTPRINT

The overall objective is to do a demonstration with an innovative cellulose-based packaging composite material as fully bio-based and biodegradable alternative for the PET/ CPET ready meal trays. These will be food safe, GMO-free and 100% bio-based and biodegradable product which is at least 10% lighter than the fossil alternative (PET). The product should have the same or better technical and functional properties than a PET food tray with a radically improved environmental footprint over the product lifecycle than competing fossil-based packaging material.

NEW APPLICATIONS AND OPPORTUNITIES

FRESH will open up new applications and markets and increase the competitiveness of the European pulp, board and paper making industries, additionally showing high potential in terms of job creation in rural areas, moreover showing high potential for replicability in Europe.

Website

www.huhtamaki.com/web/fresh

Start date

01 February 2017

End date

31 July 2020

BBI JU contribution

€ 5 636 813

FUNGUSCHAIN

Valorisation of mushroom offcuts to obtain high value products

BIOMASS: MUSHROOM OFFCUTS

IMPROVING PRODUCTIVITY

Currently, mushroom cultivation is not effectively exploited. Extracting valuable biomolecules before residues are sent for lower value applications creates a number of opportunities for valorising valuable natural products. This can boost innovation on agricultural waste management. As this can often be carried out with relatively fresh biomass at a local level and on a relatively small scale, it presents the opportunity to promote and develop new innovative bio-based enterprises in rural areas.

EXTRACTING THE ADDED VALUE

The FUNGUSCHAIN project aims to extract value from the agricultural offcuts of commercial mushroom farming. It will aim to process these offcuts into bio-based functional additives and biopolymers using a cascading approach to separate the valuable components into a spectrum of products. It also seeks to prove its industrial viability by building a new biorefinery and modifying industrial current manufacturing lines.

MUSHROOM WASTE FOR NEW CONSUMER PRODUCTS

The bio-molecules and building blocks isolated from the mushroom wastes will be validated for industrial production in three value chains for the European economy, notably food supplements for the elderly, plastic products and industrial film products such as bags and gloves. FUNGUSCHAIN will demonstrate an integrated process of valorisation of agro-residues from mushroom industrial cultivation into bio-based functional additives and biopolymers and the industrial viability by building a new biorefinery and modifying industrial current lines.

Website

www.funguschain.eu

Start date

01 November 2016

End date

31 October 2020

BBi JU contribution

€ 5 700 547



GRACE

GRowing Advanced industrial Crops on marginal lands for bioEfineries

BIOMASS: NON-FOOD INDUSTRIAL CROPS MISCANTHUS AND HEMP

LOW-IMPACT CULTIVATION

GRACE will explore the potential of the non-food industrial crops miscanthus and hemp as a source of biomass for the bio-economy. Both miscanthus and hemp are relatively under-exploited, but offer an interesting business opportunity for farmers and industry. When cultivated on marginal, contaminated or unused/abandoned land, the impacts on food security can be minimized, and the potential introduction of pollutants into the food chain can be prevented.

REVALORISING ABANDONED AND MARGINAL LANDS

GRACE will demonstrate and optimise the techno economic viability and environmental sustainability of 10 promising miscanthus and hemp biomass-based value chains using marginal, contaminated and unused land at an industry relevant scale.

SUSTAINABLE RENEWABLE BIOMASS

The aim is to identify hemp varieties suitable for marginal lands and to have commercial miscanthus cultivars available by the end of the project. It will contribute new EU biomass-based building blocks and new bio-based materials; insulation material from miscanthus columnar mark, formaldehyde-free miscanthus panels and polyesters. In addition, it will demonstrate novel bio-based value chains and create novel feedstocks for advanced biofuels, such as bioethanol. Importantly, more than 50% of the project partners are SMEs, exceeding the EC H2020 target of 20% and contributing to the BBi JU objective of 'a shorter time to market'.

Website

www.grace-bbi.eu

Start date

01 June 2017

End date

31 May 2022

BBi JU contribution

€ 12 324 633

GreenProtein

Revalorisation of vegetable processing industry remnants into high-value functional proteins and other food ingredients

BIOMASS: FOOD SIDE STREAMS

USING FOOD INDUSTRY SIDE STREAMS

RuBisCO is a protein found in all green vegetables and plants. It represents around 50 percent of the total protein content of green leaves. The GreenProtein project aims to produce high-added value, food grade proteins and other ingredients from vegetal by side streams. The primary objective will be to extract and purify food-grade, fully functioning RuBisCO protein on an industrial scale using sugar beet leaves and other side streams from arable crops.

EXTRACTING HIGH-GRADE PROTEIN

GreenProtein aims to process 1500 kg/h of green residue raw material into 28 kg of RuBisCO protein powder per hour. The protein has many valuable food industry applications based on functionalities like gelling, foaming and emulsifying, with excellent market projection in growing markets like high protein, vegan and halal foodstuff. The project will construct a DEMO plant and fine-tune the biorefinery process in order to boost the profits of agri-food industries including farmers, while contributing to sustainability, total crop valorisation and increase protein availability.

ADDED VALUE

Green protein will lead to an improvement of environmental performance and cost efficiency of resulting products as compared to state-of-the-art benchmarks and the demonstration of an integrated process with more than 40% of the raw material to be valorised into high added value additives with a 2-5 times higher value than the current applications of the raw material. This means significantly higher total valorisation of agricultural crops, contributing to rural development and employment in rural areas.

Website

www.greenproteinproject.eu

Start date

01 September 2016

End date

28 February 2021

BBi JU contribution

€ 4 246 123



GreenSolRes

Demonstration of solvent and resin production from lignocellulosic biomass via the platform chemical levulinic acid

BIOMASS: LIGNOCELLULOSE

SCALING UP GREEN CHEMICALS

Exploiting the sustainability potential of bio-based products from a renewable non-food feedstock means the increased usage of lignocellulosic residues for high value-added products. Levulinic acid (LVA) has long been identified as a versatile 'green' chemical precursor for many applications. It is widely recognised as a platform substance for chemical synthesis and is seen as a key element in moving Europe towards bio-based manufacturing. However, to make that a reality, there has to be adequate production to meet demand at a realistic price.

NEW CONSUMER PRODUCTS

GreenSolRes will demonstrate the commercial viability of converting lignocellulosic biomass to levulinic acid for the manufacturing of solvents and adhesive resins with added-value and/or functionalities. GreenSolRes will pave the way to the first commercial plant for sustainable production of levulinic acid (at 50 kta), and its derivatives, leading to a rapid gain in spectrum and production volume of bio-based consumer products. This includes bio-based derivatives for industrial and consumer adhesives.

NEW COMPETITIVE VALUE CHAIN

GreenSolRes will demonstrate the competitiveness of the levulinic acid value chain in terms of costs, environmental impact and technical performance. It will use a novel process to convert the platform chemical levulinic acid into 2-methyltetrahydrofuran, gamma-valerolactone and 1-methyl-1,4-butanediol with development of novel catalyst. This will optimise a competitive value chain for bio-based LVA and downstream products.

Website

www.greensolres.eu

Start date

01 September 2016

End date

31 August 2021

BBi JU contribution

€ 7 451 946



INGREEN

Production of functional innovative ingredients from paper and agro-food side-streams through sustainable and efficient tailor-made biotechnological processes for food, feed, pharma and cosmetics

BIOMASS: WHEAT, RYE MILLING SIDESTREAMS, PAPER MILLING SIDESTREAMS

EXPANDING THE RANGE OF POTENTIAL RESOURCES AVAILABLE

There is a steadily-growing demand for bio-based chemicals, as they increasingly find new applications in industrial chemicals and pharmaceuticals as ingredients for food, feed and in agriculture. The sidestreams and by-products of paper mills and agro-food production offer particularly rich sources of unexploited organic fractions suitable for exploitation.

THE WIDESPREAD BENEFITS AND POTENTIAL OF FUNCTIONAL FOODS

The purpose of the INGREEN project is to demonstrate the feasibility of sustainable, efficient and safe tailor-made biotechnologies in real operational environments. It will also show eco-friendly approaches for producing safe and/or health-promoting microbial biomasses, functional ingredients such as prebiotics, pre-fermented food ingredients and biochemical raw materials to supply the food, feed, pharmaceutical and cosmetic sectors. Once they have been demonstrated as safe, the ingredients from the INGREEN project will find their way into foods such as cheeses, bakery products and other nutritious products.

DEVELOPING NEW ADDED-VALUE BIO-BASED INGREDIENTS

The INGREEN ingredients will be part of so-called 'functional' foods, which can provide health benefits beyond basic nutrition. These include improving digestion, strengthening the immune system, helping control body weight and preventing conditions such as high blood pressure. The market for functional foods is estimated to reach € 88.2 billion by 2023.

Website

www.ingreenproject.eu

Start date

01 June 2019

End date

31 November 2022

BBi JU contribution

€ 6 400 000



LigniOx

Lignin oxidation technology for versatile lignin dispersants

BIOMASS: LIGNIN-RICH SIDESTREAMS

ENABLING TECHNOLOGY

The aim of LigniOx project is to demonstrate the techno-economic viability of the unique alkali-O₂ oxidation technology (LigniOx) for the conversion of several lignin-rich sidestreams into versatile dispersants, and especially high-performance concrete and mortar plasticizers. LigniOx will see the creation of at least one new lignin-based value chain to concrete plasticizer admixtures with several potential lignin producers and at least one new cooperation project through cross-industry clusters.

SUSTAINABLE, COST-COMPETITIVE AND PERFORMANT

Annually, approximately 60 million tons of lignin is extracted from wood as a by-product of the pulping industry. Even more is expected to originate from second generation bioethanol production in the future. LigniOx will strengthen Europe's competitiveness by developing novel processes and bio-based products, and promoting the shift from a fossil-based economy to a bio- and circular economy.

UPGRADING TECHNOLOGY

To fully exploit these raw material streams, there is an urgent need to commercialise economically and sustainably viable lignin upgrading process technologies such as the LigniOx technology outlined in this project. Substituting petroleum-based polymers with lignin in superplasticizers can lead to a 30% reduction in energy use and a 50% cut in CO₂ emissions.

Website

www.ligniox.eu

Start date

01 May 2017

End date

30 April 2021

BBI JU contribution

€ 4 338 375

LIPES

Life Integrated Process for the Enzymatic Splitting of triglycerides

BIOMASS: VEGETABLE OILS AND FATS

ENVIRONMENTALLY-FRIENDLY ENZYMES

Trans fatty acids are a common by-product of processing plant oils, particularly seed oils. These are notably difficult to dispose of in downstream processing. The LIPES process, using enzymes rather than heat or saponification, recycles the amount of the by-product while offering a more environmentally friendly approach. This will create a new source of high value products while reducing waste releases into the environment and associated water treatment costs. Using this approach will make the process far more resource efficient, saving at least 45% water, 70% enzymes and 80% energy over current approaches.

HEALTHIER GREENER FATTY ACIDS

LIPES is dedicated to bringing the first market replication of greener and healthier fatty acids. The objective is to create high purity bio-based intermediates and end products from vegetable oils and fats. The LIPES approach replaces current thermal hydrolysis and saponification production routes, instead using a new enzyme-based, environmentally friendly alternative.

NEW APPLICATIONS FOR FOOD, COSMETICS AND POLYMERS

Enzyme-based approaches such as LIPES are increasingly important in converting renewable resources into high purity chemicals and into valuable materials displaying new properties. This approach will increasingly deliver more stable products for use in food, cosmetics, lubricants and specialty polymer applications.

Website

www.lipes.eu

Start date

01 September 2016

End date

31 August 2021

BBi JU contribution

€ 4 295 154

OPTISOCHEM

OPTimized conversion of residual wheat straw to bio-ISObutene for bio based CHEMicals

BIOMASS: RESIDUAL WHEAT STRAW

ALTERNATIVE TO FOSSIL-BASED ISOBUTENE

OPTISOCHEM will demonstrate the feasibility of transforming excess wheat straw into bio-Isobutene (bio-IBN) derivatives. It will create at least one new bio-based value chain, centred on IBN, while facilitating others centred on butadiene and propylene, as well as establishing two bio-based products families. IBN will also be a major biomass-based building block that currently stems from the petrochemical industry.

NEW VALUE FOR WASTE WHEAT STRAW

The process will provide two different groups of chemical compounds derived from bio-IBN, currently used in a wide range of applications such as lubricants, adhesives, sealants, flavours and fragrances and substituted phenols. Now this market relies on products derived from fossil-based isobutene.

INCREASING RENEWABLE PRODUCTS FOR MARKET

Comparable performance of products provides a renewable supply for a sizeable and valuable market. OPTISOCHEM will be a true breakthrough, using bio-IBN to feed existing processes designed for fossil-based isobutene to obtain the first bio-based PIBs and DIB. OPTISOCHEM could lead to significant substitution of fossil-based equivalents in a wide market, paving the way for several production plants in EU.

Website

www.optisochem.eu

Start date

01 June 2017

End date

31 May 2021

BBi JU contribution

€ 9 755 493

PULP2VALUE

Processing Underutilised Low value sugar beet Pulp into VALUE added products

BIOMASS: SUGAR BEET PULP FROM WASTE AND SIDESTREAMS

EUROPE'S SUGAR BEET POTENTIAL

Europe produces more than one third of all sugar beet in the world – more than 100 million tonnes per year. This activity produces around 13 million tonnes of sugar beet pulp each year. Currently, most of this pulp finds its way into low value feed, bio-fertilizer or it is used for creating green fuel gas.

NEW HIGH-VALUE PRODUCTS

By using multiple extraction techniques, PULP2VALUE will extend the high value products by between 20-50 times. The process will convert of 65% of the pulp's dry mass into high value products of microcellulose fibers (MCF), arabinose and galacturonic acid. these high value applications will find their way into products like detergents, personal care, oil and gas, paints and coatings, flavour and food products or cosmetics. This has a market potential of 350k tonnes and value of € 200 m.

CASCADING PRINCIPLES

The project demonstrates an integrated and cost-effective cascading biorefinery. By creating local cross-sectoral value chains involving the sugar, chemical and food industries, PULP2VALUE will spur rural development in sugar beet growing districts by linking them to value chains with the chemical and food industry.

Website	www.pulp2value.eu
Start date	01 July 2015
End date	30 June 2019
BBi JU contribution	€ 6 589 180

PULPACKTION

Optimised moulded pulp for renewable packaging solutions

BIOMASS: WOOD PULP

REDUCING PACKAGING WASTE

A key component of achieving Europe's circular economy ambitions will be the reduction of materials that cannot be recycled. Packaging is major part of this challenge. The most common of these are multilayered materials with high barrier requirements. The latter are usually difficult to recycle or valorise. Adapting high cellulose-level packaging to compete with existing approaches will reduce waste by at least 30% and by reducing total weight, these bio-based alternatives would lower the product's footprint by reducing the impact of transport.

SAFE AND 100% BIODEGRADABLE

The PULPACKTION project will develop cellulose-based packaging solutions for the specific demands of the food and electronic packaging industries, reducing dependence on non-renewable fossil fuel based plastics. PULPACKTION will take advantage of the flexibility in wet-moulding production of wood pulp based materials, delivering a safe 100% bio-based and biodegradable product. Products are expected to be at least 10% lighter than the fossil alternatives at the same functional properties and show a radically improved environmental footprint over the product lifecycle

NEW APPLICATIONS

PULPACKTION will develop applications for new bio-based polymer blends to be processed into multilayer films, composites and coatings that will deliver 100% bio-based integral packaging with similar properties to existing fossil-based packaging. 100% bio-based inks together with a specific QR code will be used for implementing a full traceability system.

Website

www.pulpacktion.eu

Start date

01 October 2016

End date

30 September 2020

BBi JU contribution

€ 8 303 374



ReInvent

Novel products for construction and automotive industries based on biomaterials and natural fibres

**BIOMASS: AGRO AND FOREST BASED BIOMASS
AND AGRO-INDUSTRIAL RESIDUES**

NEW BIO-BASED MATERIALS FOR THE BUILDING AND AUTOMOTIVE INDUSTRY

The automotive industry is constantly looking for new materials in order to reduce the vehicle weight and comply with legislation while buildings consume large amounts of resources to construct and operate. Europe's construction and automotive industries are seen as having strong potential when it comes to implementing the EU's bioeconomy action plan.

REPLACING PETROLEUM-BASED INSULATION AND STRUCTURAL PRODUCTS

The overarching objective of the ReInvent project is to develop and combine bio-based materials and fibres that can replace the petroleum based polyurethane (PUR) insulation and structural products used in buildings and soft foams for vehicle interior products. It aims to develop and deliver novel bio-based, multifunctional, sustainable and low-cost rigid moulded and spraying insulation foam systems with high insulating effectiveness for the construction industry and novel bio-based soft and semi-rigid foams for the automotive industry.

ENHANCED PROPERTIES AND PERFORMANCE

The products derived in the ReInvent project will be validated for their enhanced properties and performance, environmental sustainability and low cost, and compared to currently available petroleum- and bio-based counterparts. To enhance the sustainability of these products and materials, new energy and cost-efficient recycling technologies will be developed.

Website	www.bbi-europe.eu/projects/reinvent
Start date	01 June 2018
End date	31 May 2022
BBi JU contribution	€ 6 525 275



SpiralG

Production of phycocyanin from the spirulina arthrospira sp. Revisiting the sourcing, extraction and co-valorisation of the whole algae in the frame of an industrial biorefinery concept

BIOMASS: MICROALGAE

MICROALGAE WITH MACRO POTENTIAL

The aquatic environment has huge potential value. Microalgae have the capacity to make best use of light, to protect against light and deploy defence systems and molecules involved in chemical communication. Microalgae are also among the fastest-growing plants on Earth, capable of doubling or even trebling their biomass daily.

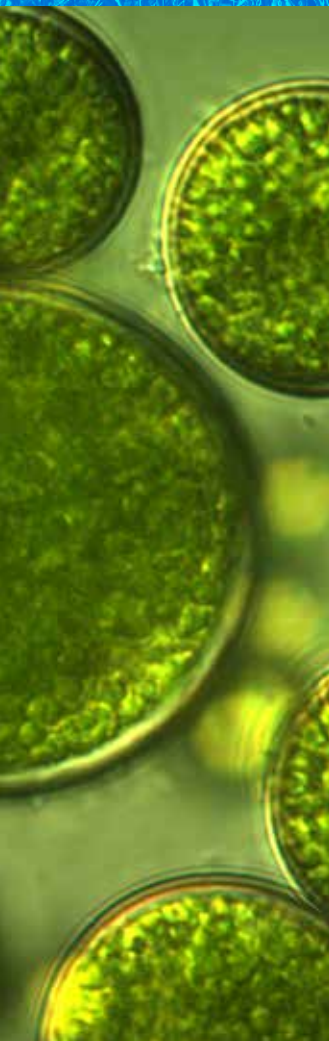
EXTRACTING PIGMENTS FOR CONSUMER PRODUCTS

SpiralG aims to build an algal biorefinery capable of taking advantage of the various components and hence maximising the value derived from the biomass feedstock. It intends to build a demonstration plant with an anticipated production capacity of several metric tonnes of phycocyanin per year. Phycocyanin is a pigment widely used in the pharmaceutical, cosmetic and food industries.

VALORISING COASTAL AREAS

SpiralG seeks to connect Spirulina with biorefineries by producing not only phycocyanin for the food market, but also several other Spirulina fractions as raw materials. SpiralG will develop a range of bio-based extracts suitable for their use in consumer products including pet food, plant health and potentially disease prevention in humans. By using increasingly levels of renewable energy sources, SpiralG will be able to decrease the overall carbon footprint of the biorefinery.

Website	www.spiralg.eu
Start date	01 May 2018
End date	30 April 2022
BBI JU contribution	€ 4 051 693



SUSFERT

Sustainable multifunctional fertiliser – combining bio-coatings, probiotics and struvite for phosphorus and iron supply

BIOMASS: STRUVITE

INDEPENDENCY FROM CRITICAL RESOURCES

Agriculture depends heavily on the use of non-renewable, resource-intensive fertilisers to meet the ever rising demand for food and feed. The major fertiliser component phosphorus is mined and has been identified as a critical resource with 90% being imported into the EU. At the same time, there is a huge loss of nutrients from fertilisers in agriculture because they are often not available at the right amounts and at the right time to optimise plant growth. SUSFERT will develop more sustainable, multifunctional fertilisers for phosphorus and iron supply that fit into existing production processes and EU agricultural practice.

REPLACING NON-RENEWABLE COMPONENTS

SUSFERT seeks to obtain compatible probiotic and sustainable solutions for phosphorus and iron fertilisation and to achieve cost-effective, enzymatically-modified, lignin-based coatings for product stabilisation and controlled release. The project will use a specifically developed demonstration plant to produce microbial siderophore for use in fertilisers.

STRENGTHENING THE CIRCULAR ECONOMY AND RURAL COMMUNITIES

SUSFERT plans to reduce non-renewable phosphorus in fertilisers by 40%, to replace synthetic chelates for iron fertilisation and synthetic controlled release coatings and to produce four compound fertilisers. The project plans to valorise waste and by-products and thus to increase circular economy effects. It will reduce soil and water contamination and demonstrate novel green technologies. By establishing local value chains and feedstock sourcing, the SUSFERT project will strengthen rural communities.

Website

www.susfert.eu

Start date

01 May 2018

End date

30 April 2023

BBJU contribution

€ 6 554 979

SYLFEED

From forest to feed: enable the wood industry to bridge the protein gap

BIOMASS: WOOD RESIDUES

BRIDGING THE PROTEIN GAP

Europe faces a major protein deficit, ranging between 80–70% in the past 40 years and this has to be covered by imports. As the world population grows, the demand for food will increase globally. Agriculture uses large amounts of water, fertilizers and land. Disruptive animal feed and protein solutions must look at raw materials other than purely agricultural products.

PROTEIN FROM SUSTAINABLE FORESTRY RESIDUES

The production of fish feed from wood residues has the potential to be a game changer, reducing dependence on soybean derivatives. SYLFEED will start to bridge this gap by upscaling a biorefinery concept that can convert woody biomass into high-value Single Cell Protein (SCP) for use as animal feed, most notably in increasing fish production. SYLFEED will create a demonstration plant with a capacity to process up to 15t/day of lignocellulose into SCP for use in aquaculture. This will demonstrate a synergy between forestry industry and protein fish feed market, creating new high value opportunities for the former and an alternative, sustainable, protein source for the latter.

NEW VALUE CHAINS

It will create a new cross sectorial interconnection between bio-based economy clusters. It will create another connection between the historic bio-based industry of paper mills and bio-refineries. In addition, it will create a new bio-based value chain, in this case incorporating feedstock suppliers and protein end-users.

Website

www.sylfeed.eu

Start date

01 September 2017

End date

31 August 2021

BBi JU contribution

€ 10 892 599

URBIOFIN

Demonstration of an integrated innovative biorefinery for the transformation of Municipal Solid Waste (MSW) into new bio-based products

BIOMASS: MUNICIPAL SOLID WASTE (MSW)

ORGANIC WASTE RECYCLED

Every European generates an average of 500kg of municipal solid waste (MSW) per year. Around 50% is organic waste, made up of carbohydrates, proteins and lipids, which represent useful raw materials for creating valuable products. Converting these will reduce pollution and help us to the shift to a circular economy. URBIOFIN will demonstrate the techno-economic and environmental viability of converting the organic fraction of MSW on a semi-industrial scale.

ADDING VALUE

Digesting and composting help reduce biodegradable fraction of MSW sent to landfill but the low economic value of compost and biogas means that citizens need to pay higher taxes for separate sourcing systems, slowing the potential uptake. New bio-based products can help to improve sustainability of such approaches.

NEW VALUE CHAINS

URBIOFIN will connect materials (bioplastics) with horticulture (bioplastic PHA used in agricultural applications) and chemicals (bio-based ethylene) with AgriFood (fruit ripening gas). It will also create two new bio-based value chains from municipality to agriculture using bioplastics and fertilizers. It will also deliver a new cooperation between the chemical and agrifood industries in a cross-using bioplastics, horticulture, ethylene and fertilisers and fruit producers.

Website

www.urbiofin.eu

Start date

01 June 2017

End date

31 December 2021

BBi JU contribution

€ 10 946 366

VAMOS

Value added materials from organic waste sugars

BIOMASS: LIGNOCELLULOSIC SUGARS

FINDING THE APPROPRIATE SOURCE OF SUGARS

Sugar is one of the most essential raw materials for industrial bioprocessing. Currently, the sector relies on first-generation sugar from agricultural biomass such as sugar cane, sugar beet and other crops. However, these crops often have a high environmental and social impact and are subject to fluctuations in cost and supply. Second-generation lignocellulosic sugars can overcome some of these issues but face their own challenges to become a fresh, sustainable and renewable resource for the industrial bioprocessing sector.

NO LONGER JUST WASTE

Second-generation sugars are easily available from municipal solid waste, composed of either mixed domestic residual waste or waste rejected from sorting and recycling processes and often contain significant quantities of paper and cardboard, both lignocellulosic-based materials. The sugar will be utilised in the production of competitive, sustainable, affordable and high-performance bio-based materials.

PREVENTING LANDFILLING AND REDUCING PRICES

The VAMOS project will reduce the levels of waste being sent to landfill, thus reducing environmental plastic pollution levels. The use of second-generation sugars will reduce the amount of suitable food-producing land diverted to biomass production. It will also help reduce the current high price of bio-based materials and increase sustainability in the construction sector.

Website

www.bbi-europe.eu/projects/vamos

Start date

01 September 2019

End date

31 August 2022

BBI JU contribution

€ 6 984 813



VEHICLE

Valorise Extensive quantities of Hemicellulosic and Cellulosic sugars from Lignocellulosic biomass into high-value End products

BIOMASS: RENEWABLE RAW MATERIALS INCLUDING LIGNOCELLULOSIC BIOMASS FROM PULP MILLS AND NON-FOOD FEEDSTOCK FROM BIOREFINERIES

OVERCOMING THE CHALLENGES

Modern pulp mills seek to valorise as many components as possible from their feedstock. This offers benefits to both the pulp mills, making them more profitable, and society, by reducing the environmental impacts. However, this process faces a number of challenges, including low technology readiness levels and competition from cheap fossil fuels. For second-generation biorefineries, it is vital to overcome these challenges.

BOOSTING VIABILITY OF BIOREFINERIES

For pulp mills, the main sidestream is hemicellulose-containing process liquors, which have little commercial value, given the difficulties isolating and purifying the hemicellulose carbohydrates. However, this represents a vast untapped carbohydrate resource available for production of high-value products. It also represents a large potential revenue stream for modern biorefineries, helping underpin their long-term viability.

ENVIRONMENTALLY AND ECONOMICALLY SUSTAINABLE

The VEHICLE project will demonstrate novel technologies for converting a large portion of the organic material from pulp mills, currently considered waste, into valuable products. They will replace oil-based materials in pulp and paper applications with fully biodegradable hemicellulose polymers. VEHICLE will also reduce water consumption substantially – by up to 70 % – with associated improvements in energy consumption. This will improve the economics of the process and reduce its environmental impact.

Website

www.bbi-europe.eu/projects/vehicle

Start date

01 May 2019

End date

30 April 2023

BBi JU contribution

€ 5 872 354



The background of the slide is a photograph of a large industrial facility, possibly a refinery or chemical plant, with several tall distillation columns and storage tanks. The image is covered with a semi-transparent green filter. Overlaid on this image is the main title text in white.

FLAGS Innovation Actions – Flagship

AgriChemWhey

An integrated biorefinery for the conversion of dairy sidestreams to high value bio-based chemicals

BIOMASS: DAIRY SIDESTREAMS

UNUSED POTENTIAL IN DAIRY-PROCESSING SIDESTREAMS

The European dairy industry produces substances known as whey permeate and delactosed whey permeate. These dairy-processing sidestreams lack effective, reliable disposal routes. AgriChemWhey proposes to convert these sidestreams into added-value products – specifically L-Lactic acid, polylactic acid, minerals for human nutrition and bio-based fertiliser – for growing global markets.

A FIRST-OF-ITS-KIND BIOREFINERY TURNING FOOD-PROCESSING RESIDUES INTO BIO-BASED CHEMICALS

AgriChemWhey's main objective is to develop the world's first integrated biorefinery for converting food-processing residues into bio-based chemicals. To this end, it will see a dedicated plant developed in a rural area of Ireland. AgriChemWhey will also develop a blueprint for an economic sustainability model that can be replicated throughout Europe.

DEVELOPING RURAL AREAS AND IMPROVING THE EU TRADE BALANCE

Replicating AgriChemWhey biorefineries has the potential to create over 1,000 rural jobs within four years of project completion. It will secure the future for dairy farming by making milk production more sustainable and increase the amount that farmers can earn from their outputs and thus protect them against price volatility. AgriChemWhey will improve the EU trade balance through greater resource efficiency and by reducing current EU L-lactic acid imports and ultimately turn Europe into a net exporter. Another of its objectives is to create CO₂ savings in a range from 18,000 - 89,000 tonnes CO₂eq/year.

Website

www.agrichemwhey.com

Start date

01 January 2018

End date

31 December 2021

BBJ JU contribution

€ 22 007 931

BIOSKOH

BIOSKOH's innovation stepping stones for a novel European second generation bioeconomy

BIOMASS: SIDESTREAMS FROM WHEAT STRAW

ABUNDANT RAW MATERIALS

Lignocellulosic biomass is one of the most abundant resources of fixed renewable carbon on earth. While bio-ethanol produced from food crops is already on the market, the second generation (2G) bio-ethanol which can be produced from lignocellulosic feedstock opens up huge opportunities for enhancing sustainability and ultimately making bio-ethanol affordable as a fuel. The BIOSKOH project will demonstrate a first-of-its-kind full commercial scale 2G biorefinery in Europe.

RURAL REGENERATION

The BIOSKOH project will improve bioethanol yields using easily copied technology at low capital costs. The project will use a brownfield site, specifically abandoned infrastructure in Slovakia, minimising capital expenditures on greenfield sites. It will demonstrate a new regional bio-based value chain by valorising sidestreams from conventional land and by growing and valorising cellulosic fractions of dedicated crops grown on marginal land. This model offers regions an opportunity to regenerate rural areas bring jobs and investment from industry, supporting the local economy.

TRANSFERABLE 'STEPPING STONES' MODEL

The project has identified four 'Innovation Stepping Stones' for a breakthrough in the techno-economic viability of lignocellulosic biorefineries. These stepping stones deliver superior biorefinery technology, with a 15 - 20% higher biomass to ethanol yield than currently. It will produce its own energy from renewable sidestreams.

Website	www.bioskoh.eu
Start date	01 June 2016
End date	31 May 2021
BBJ JU contribution	€ 21 568 194

EXILVA

Flagship demonstration of an integrated plant towards large scale supply and market assessment of MFC (microfibrillated cellulose)

BIOMASS: FORESTRY SIDESTREAMS

ADDED VALUE FROM FORESTRY SIDESTREAMS

Using a novel scaling up technology the Exilva project is extracting the value from forestry side and waste streams and creating Microfibrillated cellulose (MFC), a high value product with multiple uses in a range of business and consumer products. MFC has potentials in a huge range of applications, like personal care and cosmetics, home care, pharmaceutical excipients, adhesives and sealants, composites and resins, agricultural chemicals, oil field, fish, bait, concrete, and CO₂ capture. It could also replace many fossil fuel-based products.

FIRST OF ITS KIND FLAGSHIP

Commercialisation of production of MFC has proved challenging. The process still needs adjustment. The project will promote a successful technology transfer from the pilot plant to the flagship plant and optimization of the full scale process. The plan is to reach a stable production of at least 1000 tons MFC per year of sufficient quality. Through the support of the BBI JU programme this flagship in Norway has a unit capital intensity of €33 m per 2000 tonnes of MFC.

ADDED VALUE AND JOBS

The project brings mutual economic benefits between biomass industry and advanced market segments by supplying high performance MFC for an array of applications. It has a low CO₂ footprint in marketable applications and during MFC manufacturing, and is creating direct and indirect jobs throughout the entire value chain.

Website	www.exilva.com
Start date	01 May 2016
End date	30 April 2019
BBI JU contribution	€ 27 433 611



FARMYNG

FLAGship demonstration of industrial scale production of nutrient Resources from Mealworms to develop a bioeconomY New Generation

BIOMASS: BIO-WASTE AND CO₂

PUTTING LESS PRESSURE ON OCEAN STOCKS

The world's population is increasing rapidly and is set to reach 10 billion people by 2050 – almost one-third higher than it is currently – and consequently the increasing demand for protein from animals, including fish, is putting tremendous strain on our ability to increase feedstock demand. Currently, the preferred source of protein for animal food is fish meal. However, meeting growing demand is unsustainable and likely to generate economic, social, environmental and health issues.

THE FIRST INDUSTRIALISED INSECT-BASED NUTRIENT PRODUCTION

A potential alternative solution lies in replacing fish meal with insect sources, specifically mealworm. Insects multiply rapidly and are highly effective in converting organic matter from vegetal byproducts. FARMYNG seeks to develop insect breeding and transformation to produce animal nutrition on an industrial and automated scale. It will demonstrate the first-of-its-kind bio-based value chain capable of producing sustainable, safe and premium feed products from mealworms, and doing so on a large-scale.

REDUCING THE CURRENT CARBON FOOTPRINT OF ANIMAL PROTEIN PRODUCTION

The FARMYNG approach can convert mealworms into sustainable proteins and lipids for fish feed and pet food end markets. This approach is environmentally friendly, producing no waste. The FARMYNG project will set a new level of production for insect protein production while creating jobs at a rural area of France currently facing depopulation.

Website	www.farmyng.eu
Start date	01 June 2019
End date	30 June 2022
BBI JU contribution	€ 19 630 412



FIRST2RUN

Flagship demonstration of an integrated biorefinery for dry crops sustainable exploitation towards bio-based materials production

BIOMASS: CARDOON THISTLES

FIRST-OF-A-KIND BIOREFINERY

Europe needs to move towards a bio-based economy at the same time as regenerating rural areas for economic and social benefits. The FIRST2RUN project will demonstrate the environmental sustainability and economic profitability of an integrated biorefinery to treat carduon thistles and other low input and underutilized oil crops grown in arid and marginal lands, not in competition with food nor feed.

ADDING VALUE TO LOW-VALUE CROPS

The project is working on the potential valorisation of currently unexploited 3500 ha of marginal lands, to produce at least 0.375 ton/ha of vegetable oil processed to bioproducts, and 16.2 MWth of installed thermal power from the energy generation plant using the lignocellulosic fraction. The project is looking at ways to turn the whole of the plant into a variety of useful materials. The extracted vegetable oils are converted into bio-monomers like pelargonic and azelaic acids and used as building blocks for high added value products like biolubricants, cosmetics, bioplastics, additives.

RURAL REGENERATION

The project creates a cost-effective and environmentally sustainable closed-loop system that will have no impact on valuable land use for food production. It will also generate new incomes for local farmers. It demonstrates the potential revitalization of the local economy by reconvertng old industrial sites and the creation of skilled jobs, providing an estimated 60 new skilled jobs per kton of bioplastic produced, looking at the whole value chain, from agriculture to the end life of the final products.

Website	www.first2run.eu
Start date	01 July 2015
End date	30 June 2019
BBJ JU contribution	€ 16 995 882



LIGNOFLAG

Commercial flagship plant for bioethanol production involving a bio-based value chain built on lignocellulosic feedstock

BIOMASS: AGRICULTURAL LIGNOCELLULOSIC RESIDUES

BIO-BASED SOLUTIONS

Europe needs to increase its biorefinery capacity quickly to meet its commitments on climate and energy. The cellulosic ethanol from project LIGNOFLAG will provide biofuels for the transport sector, an area that is growing rapidly with considerable implications for CO₂ emissions. A solid and robust supply of bioethanol will make a substantial contribution to the EU strategy of decarbonising the transport sector aiming at reducing greenhouse gas emissions.

ADVANCED LIQUID FUELS FROM WASTE

LIGNOFLAG will create an integrated biorefinery that will transform agricultural lignocellulosic residues including straw into advanced liquid transportation fuel, heating power and fertilizer. The low quality feedstock means that it will not compete for agricultural land. Collaboration and linking of agricultural, logistics, energy and chemical sectors will create a new bio-based value chain for cellulosic ethanol production, mobilizing an underutilized renewable feedstock.

LOOKING TO THE FUTURE

LIGNOFLAG will create jobs in a rural area of Romania. Ultimately, the flagship production plant will have a yearly production capacity of 60,000 tonnes per year from lignocellulosic biomass. LIGNOFLAG will provide proof of commercial production of cellulosic ethanol and thus creation of a new, competitive and sustainable source of domestic renewable energy for the EU.

Website	www.lignoflag-project.eu
Start date	01 June 2017
End date	31 May 2022
BBI JU contribution	€ 24 738 840

PEference

From bio-based feedstocks via di-acids to multiple advanced bio-based materials with a preference for polyethylene furanoate

BIOMASS: GLUCOSE FROM STARCHY-BIOMASS

BIO-BASED REPLACES FOSSIL-BASED

PEference aims to replace a significant share of fossil-based polyesters, such as polyethylene terephthalate (PET), and packaging materials like glass and metal with 100% bio-based furanics polyesters (PEF). PEF's excellent barrier properties and its calculated cost price indicate that it can compete on price and performance when produced at scale with traditional, packaging products like aluminium cans, multilayer packaging and small size multilayer PET bottles. PEF is sustainable and also completely recyclable.

BIO-BASED BUILDING BLOCKS

Bio-based FDCA can be used to make a wide range of chemicals and polymers such as polyesters, polyamides, coating resins and plasticizers and, crucially, can also be used to make PEF (polyethylene furanoate), a 100% bio-based polyester used to make bottles, films and fibres. Other promising materials to be validated in the project include PBF (Polybutylenefuranoate) and FDCA-based polyurethanes.

INNOVATING FOR SUSTAINABLE GROWTH

PEference will establish a unique, industrial scale, cost-effective biorefinery flagship plant making a bio-based building block to produce high value products. PEference will maximise the use of regional agricultural resources and decreasing dependence on oil imports while increasing added value to the European economy. It will establish a new bio-based value chain that will create jobs in rural areas while developing technological know-how and translating it into industrial products.

Website

www.peference.eu

Start date

01 September 2017

End date

31 August 2022

BBJ JU contribution

€ 24 999 610

PLENITUDE

First-of-its kind large-scale production of proteins for food applications from alternative, sustainable sources using a zero-waste biorefinery process

BIOMASS: PRIMARY GRAINS, SUCH AS WHEAT AND MAIZE

ANIMAL PROTEIN: AN ENVIRONMENTAL CHALLENGE

Emissions from livestock are a major contributor to rising CO₂ levels causing almost 15 % of anthropogenic greenhouse gas emissions. In addition, the amount of land devoted to food production is a major cause of a loss of biodiversity. Without action, due to the growing population and consequently increasing demand for food – particularly proteins – the situation is likely to deteriorate.

GREEN PRODUCTION OF PROTEINS

The PLENITUDE project will address this issue by sustainably producing food-grade protein by integrating an aerobic fermentation plant with a conventional first-generation biorefinery. This will help to meet the growing demand for protein without the impact on CO₂ emissions or on biodiversity. The process will use sustainable cereal crops as its feedstock. The process will be highly efficient, with zero waste, while producing food-grade protein with a feed conversion ratio superior to current alternatives.

HEALTHY AND AFFORDABLE FOOD

PLENITUDE will provide access to a food source that is high in protein and fibre, cholesterol-free, with the potential to contribute to improving cardiovascular health. Moreover, the project will make proteins more available and affordable, with the potential to reduce the challenge of increasing levels of obesity. Lastly, thanks to PLENITUDE, 200 direct jobs will be created at the initial scale of production, reaching 4 350 in the long-term.

Website

www.bbi-europe.eu/projects/plenitude

Start date

01 October 2019

End date

30 September 2024

BBI JU contribution

€ 16 937 335

SWEETWOODS

Production and deploying of high purity lignin and affordable platform chemicals through wood-based sugars

BIOMASS: WOOD

DEVELOPING A FIRST-OF-A-KIND BIOFRACTIONATION FLAGSHIP PLANT

The SWEETWOODS project aims to develop a first-of-a-kind biofractionation flagship plant in Estonia that uses sustainable hardwood biomass and demonstrates several new value chains to convert currently poorly valorised hardwood residues into high purity intermediate building blocks of cellulosic sugars and high-quality lignin. Sugars and lignin can be further processed and converted to high-value biomaterials capable of replacing fossil-based chemicals in a wide range of products.

NEW PRODUCTS FROM WOOD-BASED BIOMATERIALS

The project, which uses wood processing residues as a feedstock, will lead to wood-based biomaterials being produced on an industrial scale for the first time. The produced wood-based biomaterials can be used to replace fossil-based materials in various everyday applications (biocomposites, bio-based foams, coatings, biochemicals and biofuels) in order to create a range of new bio-based consumer products including sports mats, insulation panels and replacements for plastic parts.

MORE REGIONAL EMPLOYMENT

The flagship plant's modular design allows minimized regional environmental impact and sustainable resource use. The project aims to reduce waste from biorefining processes by at least 80% over the current state-of-the-art. The establishment of a wood fractionation plant in Estonia opens an avenue to a diversity of new industrial intermediates and end-use applications. Moreover, the SWEETWOODS project will support regional development and employment.

Website

www.sweetwoods.eu

Start date

01 June 2018

End date

31 May 2022

BBI JU contribution

€ 20 959 745

The background of the slide is a solid yellow color with a faint, abstract network pattern of thin yellow lines connecting small yellow spheres, resembling a molecular or digital network.

CSAs Coordination and Support Actions

BIOBRIDGES

Bridging consumers, brands and bio-based industry to improve the market of sustainable bio-based products

INCREASING THE CONFIDENCE IN BIO-BASED PRODUCTS

In addition to the price tag, public acceptance of bio-based products depends on a variety of factors including their social, economic and environmental impact. The BIOBRIDGES project aims to increase consumers' and brand owners' confidence, trust and benefits' awareness to boost the marketability of bio-based products. To achieve this, BIOBRIDGES will establish close cooperation and partnership between bio-based industries, brand owners and consumers' representatives.

STRENGTHENING BUSINESS OPPORTUNITIES AND PARTNERSHIPS

The ultimate goal is to stimulate and support engagement and interaction among stakeholders, particularly local communities and local authorities and to improve the market acceptance of bio-based products. Therefore, BIOBRIDGES will design and implement replicable methodologies, procedures and good practices while supporting multi stakeholder interaction, leading to new cross-sector partnerships and business opportunities.

INCREASING INVOLVEMENT AND COMMITMENT

BIOBRIDGES will increase the brand owners' involvement in and commitment to the bioeconomy as well as the marketability of bio-based products. BIOBRIDGES also aims to increase consumers' awareness of sustainability and promote bio-based products with better features and improved performance compared with their fossil-based counterparts.

Website

www.biobridges-project.eu

Start date

01 September 2018

End date

31 August 2020

BBI JU contribution

€ 995 485



BioCannDo

Bioeconomy awareness and discourse project

RAISING AWARENESS

Bio-based technologies will be vital in driving Europe's ambitions to become a smarter, greener and more circular economy. A core component of success in this process will be public support for the benefits. Unfortunately, in many settings, there is little awareness or enthusiasm.

MAKING BIO-BASED ACCESSIBLE TO PUBLIC

BioCannDo will help bridge awareness gaps, and inform about the potential and long-term benefits of a vibrant bioeconomy sector to the wider public. It will show to the public that the bio-based economy offers something desirable, with new products, functionalities and day-to-day applications.

ENGAGING STAKEHOLDERS

BioCannDo will offer a platform for feedback, interaction and engagement in the wider discussion on the value of a bio-based economy. It will develop multi-stakeholder key messages for communicating functionality and sustainability aspects of bio-based products with the broader public and engage a European stakeholder network dealing with communication issues regarding the bioeconomy in a joint communication undertaking.

COMMUNICATING WITH CITIZENS

The project will create synergies for existing materials and develop missing communication formats and educational material to communicate topics of the bioeconomy and bio-based products to the European citizens.

Website

www.allthings.bio/about

Start date

01 October 2016

End date

30 September 2019

BBi JU contribution

€ 998 345

BiOPEN

Accelerating and supporting business development of bio-based industries and downstream sectors

CONNECTING PROJECTS, KNOWLEDGE AND NETWORKS

The bio-based economy thrives on integrated value chains that cross sectoral barriers, oriented to developing products driven by societal needs. These require sectors to collaborate across these bio-based value chains, from feedstock to products. Rather than hope they will form spontaneously, it can be advantageous to stimulate their development.

OPEN INNOVATION WILL ADDRESS STRATEGIC CHALLENGES

The BiOPEN project is a specialised consortium made up of five European bio-based clusters, three open innovation expert companies, and one research centre. It intends to drive a programme of collaboration and knowledge sharing within the bio-based industry. This will stimulate innovation partnerships for developing new products and markets in the sector. In doing so, it will provide a single voice for the bio-based industries in Europe, bringing together expertise and promoting engagement and involvement of industry, researchers and academia at European and national level, by setting up an Open innovation platform addressing strategic cross-cutting challenges.

COORDINATED APPROACH TO DEVELOPING EUROPEAN BIO-BASED SECTOR

By offering an open platform for collaboration, the BiOPEN project will help realise the business and innovation potential of Europe's bio-based sector.

Website

www.biopen-project.eu

Start date

01 May 2017

End date

31 October 2019

BBi JU contribution

€ 994 531



BIOWAYS

Increase public awareness of bio-based products and applications supporting the growth of the European bioeconomy

COMMUNICATING THE POTENTIAL

The European bio-economy is an exciting prospect. BIOWAYS will provide the materials and activities to engage the public and excite them about its potential. The project will analyse the potential of the sector and identify champions to help increase its visibility. It will also identify and develop a method for ensuring there is ongoing communication on the value of bio-based products. It will help build constructive dialogue between BIOWAYS and the other bio-based initiatives in Horizon 2020.

EDUCATING AND INFORMING

BIOWAYS will oversee the development of educational materials on the benefits of the bio-economy, while helping to ensure that the BBI JU programme as a whole is implemented effectively. It will increase awareness amongst Europe's general public, students, scientists, media and policy makers of the value of bio-based products and applications to industry, the economy and the whole of the wider society, both in terms of what they deliver now and in terms of their future potential.

IMPROVING VISIBILITY OF BIO-BASED

BIOWAYS will seek to understand the potential of bio-based products and bio-based stakeholders to create sustainable multidisciplinary communities that enhance the visibility of bio-based products and applications. It will communicate on general bio-based and scientific knowledge in an accessible, non-scientific way for citizens to improve awareness about bio-based products and applications and to increase the societal confidence related to bio-based products and industries.

Website

www.bioways.eu

Start date

01 October 2016

End date

30 September 2018

BBI JU contribution

€ 965 750



CELEBio

Central European Leaders of Bioeconomy Network

GETTING EASTERN COUNTRIES MORE INVOLVED IN THE BIO-BASED INDUSTRIES

The level of activities of BBI JU and BIC is not balanced throughout Europe – central and south-eastern European countries register a scarcer interest for the activities and opportunities offered by the bio-based industries sector, in particular in the funding opportunities. This may be the result of insufficient knowledge of the potential of the sector in these countries.

COMMUNICATING THE POTENTIAL OF BIO-BASED INDUSTRIES

CELEBio aims at fostering the bioeconomy implementation in eight countries of Central and Eastern Europe, through the development of fact-based action plans and the dissemination of information on the opportunities offered by BBI JU. Through a network of BBI JU 'info-points' from Czech Republic, Slovakia, Hungary, Croatia, Slovenia and Bulgaria, the project team will promote the uptake of innovative technologies and raise awareness on the opportunities of the valorisation of sustainable biomass resources.

PROMOTING THE NETWORKING AMONG STAKEHOLDERS

CELEBio's goal will be pursued by mapping bioeconomy stakeholders and facilitating the matchmaking between stakeholders in research and industry in a broader regional and continental scope, through the elaboration of evidence-based action plans for each one of the targeted countries.

Website

www.bbi-europe.eu/projects/celebio

Start date

01 June 2019

End date

30 May 2020

BBI JU contribution

€ 749 350



ICT-BIOCHAIN

ICT tools in efficient biomass supply chains for sustainable chemical production

USING ICT TO IMPROVE EFFICIENCY

The main aim of the ICT-BIOCHAIN project is to identify ways to use ICT effectively to increase the efficiency of biomass supply chains for the bio-based industry. The use of technology will help improve the efficiency of biomass supply chains, maintaining a future competitive advantage for the European bio-economy.

DIGITAL INNOVATION HUBS

Specifically, it intends to establish multi-actor digital innovation hubs for biomass supply chains and to produce a feedstock-specific database of best practice and new opportunities where digitisation could improve the efficiency of biomass supply chains within MDRs. ICT-BIOCHAIN also aims at establishing a user-friendly online platform to allow for wider exploitation of ICT, IoT and Industry 4.0 tools. It will pave the way for replicating digital hubs in the EU bioeconomy regions as well as disseminate and exploit ICT-BIOCHAIN results.

ENSURING BIOMASS SUPPLY

By 2020, the ICT-BIOCHAIN project plans to increase biomass supply by 10% and to ensure 20% of Europe's chemicals and materials production will be bio-based. It will guarantee a secure and sustainable supply of biomass feedstock for European bio refineries and reduce biomass losses and costs associated with feedstock supply logistics compared with similar existing benchmark supply chains thus improving competitiveness of the EU and pushing it to the forefront of bio-based economy.

Website

<https://ictbiochain.eu>

Start date

01 June 2018

End date

31 May 2020

BBi JU contribution

€ 949 685



Pilots4U

A network of bioeconomy open access pilot and multipurpose demo facilities

KEEPING INNOVATION MOVING

A key challenge for the bio-economy is to bring newly developed molecules and techniques from the lab to the market. The main bottleneck in the innovation chain is the step from technology development to deployment. This step has to be performed first in a pilot plant and later in a demonstration plant where a production process can be tested and optimized in an industrial production setting. Pilot- and demo-plants are expensive, require specific expertise to run and most SMEs and also a lot of large companies have no direct access to such facilities. As a result, promising innovation processes can grind to a halt.

PILOT FACILITIES ACROSS EUROPE

A solution to this problem are 'open access pilot- and multipurpose demo-infrastructure'. However, these infrastructures are not well known in Europe. Pilots4U builds on existing projects that gather pilot and multipurpose demo-infrastructure, and will reach out to all European regions.

EUROPEAN NETWORK OF PILOT FACILITIES

Pilots4U will help innovators, especially SMEs, bridge the so-called 'Valley of Death' in the innovation phase between the developments in the laboratory and market introduction, by showing them the way to shared scale up facilities. Pilots4U will group all European open access bio-economy pilot- and multipurpose demo facilities under one, very visible and easily accessible network.

Website

www.BioPilots4U.eu

Start date

01 June 2017

End date

31 May 2019

BBI JU contribution

€ 902 462

LIFT

Unleash the potential of CSAs results to contribute to sustainable and competitive Bio-Based Industries in Europe

ENVIRONMENTAL AND ECONOMIC BENEFITS FOR EUROPE

Europe is shifting to an economy that is making greater and more sustainable use of renewable resources. Aside from the clear environmental benefits, embracing wider use of a bioeconomy offers numerous opportunities, including increased European competitiveness, reduced reliance on imports of energy, food and raw materials and new employment opportunities.

WIDE RANGE OF CHALLENGES FACED BY CSA PROJECTS

To accelerate this transition to a circular economy, a number of Coordination and Support Actions (CSAs) have been established. These deal with areas such as standardisation, public awareness-raising, foresight and market studies, education, business model and business cases helping establish and grow the industry and boosting market uptake of the products.

BRIDGING THE GAPS BETWEEN GOALS AND RESULTS

Several of these CSAs are funded through the BBI JU. The role of the LIFT project is to maximise the value and impact of these CSAs by promoting collaboration between stakeholders. LIFT will map the completed and ongoing CSA projects and analyse them to provide a global overview of their results and findings. This will allow for a gap analysis of what is between the BBI JU's objectives and what the CSAs have achieved and also which challenges remain to be addressed.

Website	www.lift-bbi.eu
Start date	01 May 2019
End date	30 April 2020
BBI JU contribution	€ 249 875



RoadToBio

Roadmap for the chemical industry in europe towards a bioeconomy

GREEN CHEMISTRY FOR EUROPE

The focus of the European chemical industry will have to change within the next 15 years because of the diminishing fossil resources, climate change and growing chemical industry in Asia. RoadToBio's focus on globally competitive bio-based chemicals will help shape the future of Europe's chemical industry and help to secure jobs in Europe's rural and less developed regions.

OPPORTUNITIES FOR MULTIPLE SECTORS

RoadToBio's key function is to act as change agents to inspire the fossil-based sector. Specifically, RoadToBio will deliver and act on a roadmap and action plan illustrating the 'sweet spots' for Europe's chemical industry towards the Bioeconomy over the coming decade, up to 2030.

CONNECTING THE CHEMICALS INDUSTRY AND SOCIETY

RoadToBio will create a platform to bring together the chemical industry, civil society and governing bodies to deliver the full potential of its action plan. By connecting the chemical industry with governmental organisations, it can help communicate the chemical industry's critical role as a driver of change into the bioeconomy and the circular economy, and for the removal of regulatory hurdles. Finally through connecting the chemical industry with non-governmental organisations, it will identify societal needs and show benefits of bio-based products to increase public awareness and trust in the bio-based chemical sector.

Website	www.roadtobio.eu
Start date	01 May 2017
End date	30 April 2019
BBI JU contribution	€ 996 820



STAR4BBI

Standards and regulations for the bio-based industry

ESTABLISHING THE FRAMEWORKS

A proactive regulatory approach is an important driver in developing emerging industries and attracting investment. Similarly, a proactive approach to standardisation can help harmonise supply chains and create an environment that stimulates investment by reducing risks and offering a better potential return on investment.

LEADING EUROPE FORWARD

The STAR4BBI project will help establish a coherent, well-coordinated and favourable regulatory framework that helps develop a cutting-edge bio-based economy for Europe. STAR4BBI will support the adaption of the regulatory framework and of relevant standards for the full deployment of selected existing value chains and for the concrete development of new value chains based on biomass from forests, from agriculture and from organic waste.

LEVEL PLAYING FIELD

STAR4BBI will support the adaption of the regulatory framework and of relevant standards for selected existing value chains and the development of new value chains based on biomass from forests, from agriculture and from organic waste. It aims to establish a level playing field for bio-based products. It should contribute to more coherent policy environment, better interrelations between regional, national, EU and global bioeconomy policies and the removal of barriers to investments to grow towards a bioeconomy, for example link to waste legislation.

Website

www.biobasedeconomy.eu

Start date

01 September 2016

End date

31 August 2019

BBi JU contribution

€ 995 878



UrBIOfuture

Boosting future careers, education and research activities in the European bio-based industry

EDUCATION TO BOOST THE BIO-BASED ECONOMY

The European Union has already made substantial progress in adopting a bio-based economy. However, it cannot afford to stand still; it must continue to advance. To do so requires continued analysis of the specific needs of this industry sector. The UrBIOfuture project has been designed to address this, by boosting education, research and careers in the bio-based industries in order to keep Europe at the forefront of the sector.

STIMULATING THE STUDENTS' INTEREST

The project will map industry needs and the skills gap and facilitate interaction between the education sector, academia and industry. Based on its insights and engagement, UrBIOfuture will create a series of promotional events, including train-the-trainer and train-the-student workshops. This will help Europe sustain its leading position in the bio-based sector by ensuring that there are adequate numbers of well-trained and enthusiastic people entering the industry.

FINDING AND FILLING THE GAPS

UrBIOfuture will provide the sector with a detailed overview of completed and ongoing programmes addressing bio-based activities. This will identify skills gaps and help provide the resources to bridge them. It will assist the sector in defining potential career paths for those choosing to enter the bio-based industry sector. Furthermore, it will align education and research with industry expectations, offering the skills employers need and the opportunities entrants seek.

Website

www.urbiofuture.eu

Start date

01 May 2019

End date

30 April 2020

BBi JU contribution

€ 946 568





Contact us:

@ info@bbi.europa.eu

www.bbi-europe.eu

White Atrium

Avenue de la Toison d'Or 56-60

1060 Brussels, Belgium

Follow us:

Bio-based Industries Joint Undertaking

Bio-based Industries Joint Undertaking (BBI JU)

@BBI2020

The BBI JU has received funding from the European Union's Horizon 2020 research and innovation programme.

