BBI JU: a high impact initiative structuring the EU bio-based industries sector

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BIOEAST as a driving force in the context of the European Green Deal
Brussels, 21 February 2020
Bio-based industries value chains

BBI JU value chains represent 3.7 million jobs* and € 698 bn turnover* but are extremely fragmented between actors and across geographies.

*Based on EUROSTAT figures 2015
BBI (Bio-based industries)?

BBI and their value chains are facing complex and substantial technological and innovation challenges.

- Biomass and waste
- Biorefineries
- Fuel
- Chemicals and materials
- Feed & food ingredients

- Feedstock supply risk
- Insufficient infrastructure
- High capital costs
- Technology risks
- Product delivery risk
- Product development risk
- Market access
- Fragmented supply chain
Public-Private Partnership (PPP) between European Commission & BIC (Bio-based Industries Consortium)

- BBI JU Budget: € 3.7 bn (25% EU - 75% BIC)
- Support R&I programme in Bio-based industries

European public-private partnership (iPPP) aims at:

- **De-risk** investments
- **Reach** critical mass
- **Organize** the value chains
- **Implementation**
  - Trigger - Keep - Attract
  - Mobilising effect
  - Structuring effect
Develop sustainable and competitive bio-based industries in Europe, based on advanced biorefineries that source their biomass sustainably.

How? By implementing SIRA

1. Demonstrating new technologies
2. Developing business models
3. Set up flagship biorefinery plants
SIRA Strategic Orientations (2017)

SO 1
Foster Supply of sustainable biomass feedstock to feed both existing and new value chains
- Agri-based feedstock
- Forest-based feedstock
- Aquatic feedstock
- Bio-waste and CO2

SO 2
Optimise efficient processing for integrated biorefineries through R&D&I
- Pre-treatment
- Conversion of pre-treated feedstocks to biobased chemicals and materials
- Downstream processing
- System modelling

SO 3
Develop innovative bio-based products for identified market applications
- Drop-in bio-based products
- Bio-based products that outperform fossil-based counterparts
- New breakthrough
- Chemicals
- Proteins and active ingredients

SO 4
Create and accelerate the market uptake of bio-based products and applications
- Policy & regulations, standardization
- Consumer awareness of the benefits of bio-based products
- Knowledge gathering and networking
The BBI JU annual cycle

Strategic level: SIRA
Strategic Innovation and Research Agenda guiding document developed by BIC

Operational Level
Annual Work Plan

Call for proposals (RIAs, IAs, CSAs)

Portfolio management

Drafting – Approval – Supporting

Scientific Committee
States Representatives Group

Publication & Implementation

Reporting – monitoring
Dissemination – comm.
RIAs fill specific gaps in Value Chains.

IAs address the whole Value Chains from feedstock sourcing to market applications.

CSAs address non-technological challenges of Value Chains.

RIAs Research and Innovation Actions
IA-DEMO Innovation Actions - Demonstration
IA-FLAG Innovation Actions - Flagship

**Types of Actions**

- **RIAs**: Research and Innovation Actions
  - **TRL 1-2**: Development and validation of technology
- **IA-DEMO**: Innovation Actions - Demonstration
  - **TRL 6**: Demo-scale production facility in Europe
- **IA-FLAG**: Innovation Actions - Flagship
  - **TRL 8**: A first-of-a-kind application, large-scale production facility in Europe
- **CSAs**: Coordination and Support Actions
  - **no link to TRLs**

*TRL = Technology Readiness Levels*
BBI JU Impact

By 2030

- 50% greenhouse gas emissions
- 20% biomass supply
- 25% mobilization of unused sources
- 30% replacement of petroleum-based products
- 10 times more bio-based materials
How to measure outcomes and impact

KPI 1  New cross-sector interconnections
KPI 2  New bio-based value chains
KPI 3* BBI JU Cooperation projects
KPI 4  New bio-based building blocks
KPI 5  New bio-based materials
KPI 6  New bio-based consumer products
KPI 7* BBI JU flagships projects
KPI 8  ‘TRL’ gain

Socio-economic and environmental impact

- All topics address KPI 3 and socio-economic and environmental impact
- KPIs specific to
  - RIAs: KPI 8
  - IAs: KPI 6
  - FLAGs: KPI 7
- KPIs 1, 2, 4 and 5 are present in all type of actions

*KPIs assessed during the evaluation!

Note * KPI3 & KPI7 will be measured at program level; the numbers will refer to successful projects. Source: SIRA
Socio-economic and environnemental impact monitoring

Yearly survey of BBI JU projects:

• Investment and job creation
• Environmental impact
• Scientific and knowledge
• Primary producers and rural deployment
• Education and citizen
• Market and industry
• Regional and local impact
• Safety and health
• Contribution to the UN SDGs
Key achievements
Outputs and Impact
BBI JU Portfolio

Calls 2014 - 2018
602 Million EUR
1179 Beneficiaries
35 Countries
101 Funded projects
9 Flagship
29 Demonstration
52 Research
11 Coordination & Support
High representation by SMEs

Beneficiaries from Calls 2014 – 2018

SME participation

- BBI JU 2014-2018: 40%
- H2020 SME participation: 20%
# A well balanced project portfolio

**Calls 2014 + 2015 + 2016 + 2017 + 2018 (*)**

## Per Type of Action

<table>
<thead>
<tr>
<th>Origin of feedstock</th>
<th>RIA</th>
<th>DEMO</th>
<th>FLAGSHIP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agri-based</strong></td>
<td>Carbosurf, PROMINENT, LIBBIO, HYPERBIOCOAT, Zelcor, BIOrescue, EnzOx2, Indirect, BioBarr, SSUCHY, ReSolve, BIOSMART, ECOXY, REFUCOAT, POLYBIO SKIN, NEWPACK, Pro-Enrich, Prolific, EXCOrnsEED, VIPRISCAR iFermenter, USABLE PACKAGING, ECOAT</td>
<td>Pulp2Value, AgriMax, Funguschain, GreenProtein, LIPES, GRACE, OPTISOChem, BIOMOTIVE SUSFERT, Reinvent, EFFECTIVE INGREEN</td>
<td>FIRST2RUN, LIGNOFLAG, BIOSKOH AgriChemWhey, PEFerence, FARMYNG *</td>
</tr>
<tr>
<td><strong>Forest based</strong></td>
<td>Smartli, Greenlight, PROVIDES, US4GREENchem NeoCel, LIBRE, TECH4EFFECT, EffeRTE, SHERPACK SusBind, WoodZymes, UNRAVEL, GRETE, SelectiveLi, CelluWiz, SMARTBOX</td>
<td>ValChem, BIOFOREVER, GreenSolRes, PULPACKTION, FRESH, LigniOx Dendromass4Europe SYLFEED, EUCALIVA, VEHICLE</td>
<td>EXILVA SWEETWOODS</td>
</tr>
<tr>
<td><strong>Bio-waste and CO₂</strong></td>
<td>NewFert, AFTERLIFE, PERCAL, BARBARA, BIOnTop, MANDALA</td>
<td>EMBRACED, URBIOFIN, DEMETER, Biowaste, B- FERST, DEEP PURPLE, VAMOS</td>
<td></td>
</tr>
<tr>
<td><strong>Aquatic Biomass</strong></td>
<td>MACROCASCADE, BIOSEA, ABACUS, MAGNIFICENT, VALUEMAG, AQUABIOPROFIT, STREAMLINE</td>
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## Per SO4 Market uptake

<table>
<thead>
<tr>
<th>SO4</th>
<th>Policy, regulations and standardization</th>
<th>Consumer awareness of the benefits of the bio-based products</th>
<th>Knowledge gathering and networking</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSA</td>
<td>STAR4BBI</td>
<td>BioCannDo, BIOWAYS</td>
<td>BIOPEN, Pilots4U, RoadToBio ICT-BIOCHAIN CELEBio, UrBiOfuture, LIFT</td>
</tr>
</tbody>
</table>

*Note: (*) indicates additional specific projects or initiatives marked for emphasis.*
• Highest success comes from the EU13 countries Slovakia (BIOSKOH) and Estonia (SWEETWOODS)
• Despite the higher BBI JU funding received by EU15 countries in absolute terms, EU13 countries perform more than two times better, when normalized against R&D investment
• Greece performs better than the average of EU15, despite the low BBI JU funding received
>100 expected new bio-based value chains against a target of 10 by 2020

New value chain means either the feedstock, the processing & technologies or the final product is new in relation to existing value chains

Main aspects of novelty reported in the expected new value chains

- 70% new market/product
- 50% new technology
- 50% new feedstock
- 40% new business model

→ Detailed information in AAR2018
SIRA 2014 defined a linear value chain in which:

1 feedstock → non-food value chain → 1 product

The reality of the sector
Outcome monitoring
KPI 5/8 from SIRA

>140 expected new bio-based materials
against a target of 50 by 2020

- 30% drop-in
- 60% improved functionality

Some important aspects of novelty reported in the expected new bio-based materials

- >70% CO2 emissions reduction
- > 40% Improved biodegradability
- > 35% Improved health & safety aspects

→ Detailed information in AAR2018
Outcome monitoring – KPI 6/8 from SIRA

>60 expected new bio-based consumer products (TRL 6-8) against a target of 30 by 2020 (KPI defined for IAs only)

Percentage of projects reporting expected improvements in the new bio-based consumer products

- >70% CO2 emissions reduction
- > 40% Improved biodegradability
- > 40% Improved recyclability
- > 40% Improved health & safety aspects
- > 40% Reduction in energy consumption
## Sectors of application

### Some examples

<table>
<thead>
<tr>
<th>Packaging</th>
<th>Medical &amp; healthcare</th>
<th>Textiles</th>
<th>Food &amp; Feed</th>
<th>Automotive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bio-based packaging for food &amp; others</td>
<td>Nutritional products</td>
<td>Advanced bio-based materials</td>
<td>Food &amp; feed ingredients</td>
<td>Advanced materials</td>
</tr>
<tr>
<td>FRESH, PULPACKTION, SHERPACK, BioBarr, BIOSMART, PEFerence</td>
<td>AQUABIOPROFIT, MAGNIFICENT</td>
<td>EFFECTIVE</td>
<td>SYLFEED, BIOSEA, GreenProtein, MACROCASCADE, MAGNIFICENT, Pro-Enrich</td>
<td>BIOMOTIVE, GreenLight, BARBARA</td>
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<tr>
<td>Bioactive compounds</td>
<td>Biorescue</td>
<td>NEOCEL</td>
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### Personal & home care

<table>
<thead>
<tr>
<th>Cosmetics</th>
<th>Detergents &amp; soaps</th>
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</thead>
<tbody>
<tr>
<td>BIOSEA, EXILVA, LIBBIO, ABACUS</td>
<td>EXILVA</td>
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</tbody>
</table>

### Agriculture

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<thead>
<tr>
<th>Fertilisers</th>
<th>Herbicides</th>
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<tr>
<td>NewFert, SUSFERT</td>
<td>FIRST2RUN</td>
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</table>

### Sustainable management of resources

<table>
<thead>
<tr>
<th>Forest management: EFFORTE, TECH4EFFECT</th>
<th>Rural revitalization: FIRST2RUN</th>
<th>Algae cultivation: BIOSEA</th>
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</table>

### Construction

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<tr>
<th>Construction materials</th>
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<tr>
<td>ECOXY, GreenSolRes</td>
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### Bioenergy

| BIOSKOH | LIGNOFLAG |
Project impact on jobs & investment

- Total new skilled jobs: 33% RIAS, 17% Demos, 6% Flagships (% of all projects)
- In the product development and engineering: 26% RIAS, 14% Demos, 4% Flagships (63%)
- In rural regions: 15% RIAS, 11% Demos, 6% Flagships (46%)
- In coastal regions: 3% RIAS, 2% Demos, 1% Flagships (9%)
Outcome monitoring – KPI 7/8 from SIRA

AGRICHEMWHEY - Co. Tipperary (Ireland)
BBI JU contribution: €22M
Feedstock: > dairy processing side streams
Product: lactic acid (building block for PLA production; minerals for food supplement; fertilizer

REFERENCE - Antwerp (Belgium)
BBI JU contribution: €25M
Feedstock: fructose from starch of wheat, corn
Product: purified FDCA (furan dicarboxylic acid)

BIOSKOH - Strážske (Slovakia)
BBI JU contribution: €22M
Feedstock: 370 kt/year of lignocellulose from non-food agricultural residues and dedicated crops on marginal lands
Product: 2G bioethanol bio-ethylene oxide production

PLENITUDE - Ghent (Belgium)
BBI JU contribution: €17M
Feedstock: sustainable cereal crops from BioEtOH plan
Product: mycoproteins; bioethanol

FARMYNG - Amiens (France)
BBI JU contribution: 19.6M
Feedstock: Tenebrio molitor (mealworm) larvae, Agro-food wastes
Product: protein meal; organic fertilizer

LIGNOFLAG - Podari (Romania)
BBI JU contribution: €25M
Feedstock: wheat and barley straw
Product: bioethanol (cellulosic ethanol)

FIRST2RUN - Porto Torres (Italy)
BBI JU contribution: €17M
Feedstock: lignocellulosic biomass, seeds (dry oil crops in marginal lands, mainly cardoon)
Product: industrial building block of azelaic acid for polyester production, vegetable oils

SWEETWOODS - Imavere (Estonia)
BBI JU contribution: €21M
Feedstock: wood
Product: high quality C5/C6 sugars and dried lignin (85% purity)

EXILVA - Sarpsborg (Norway)
BBI JU contribution: €27M
Feedstock: spruce wood pulp
Product: MFC: microfibrillated cellulose

9 FLAGSHIPs
3,300 direct jobs
> 10,000 indirect jobs
Total Grant: €195 million
€1.2 billion private investment
High replicability potential
Examples of 2\textsuperscript{nd} generation biofuels and bioenergy projects
• Flagship in Podari, Romania
• Biomass: agriculture residues (wheat straw)
• Objective: establish an energy self-sufficient, highly sustainable production process for cellulosic ethanol by using co-products for renewable energy production (50.000 ton/year) and soil fertilization.
• Extension of current biofuel production to new, currently underutilized non-food biomass

Contribution to economic growth, job creation and rural development
• Plant in Craiova: contribution to EU Strategy for Danube Region
• Diversify farmers income
• Green jobs in agricultural and transport sector
New jobs linked to feedstock supply: local farmers, transport and logistics to secure up to **300,000 tons** of agricultural residues like straw per year

Development of appropriate contract systems to accommodate **different straw suppliers needs**

Dedicated workshops to **local farmers** to share know-how and best practices with local farmers for **sustainable harvesting**
BIOSKOH

BIOSKOH’s Innovation Stepping Stones for a novel European Second Generation BioEconomy

- Flagship inStrážske (SK), in the East of Slovakia
- Biomass: agrobased residues and dedicated crops
- Objective: showcase the first full commercial scale biorefinery in Europe for the production of 2G bioethanol (55 kton). To realise a new local 2G biomass to ethanol value chain based on multi-biomass feedstock available made of agricultural residues and energy crops to be grown in marginal lands.

Impact
- Demonstrate a new concrete regional bio-based value chain, by valorising side streams from conventional land and by growing and valorising cellulosic fractions of dedicated crops grown on marginal land
- Create estimated 160 direct and 500 indirect green jobs per year
- Improve innovation capacity and the integration of new knowledge
The consortium

**Timing:** 60 months
- Start date: 1\textsuperscript{st} June 2016
- End date: 1\textsuperscript{st} June 2021

**Project budget:** €\textsuperscript{30.122.313,75}
- €21.568.195 public contribution
- €9.201.318,75 private contribution
  - €8,554,118.75 In-kind
  - €647.200 Additional activities
DEMETER

- DEMO project (8 DEMO plants)
- Objective: To demonstrate a yield increase and cost reduction of the C1-LC4 enzyme production process as well as its positive effect on biogas production in Europe
- Demonstrate improved production process at 15,000 L scale
- Develop a predictive model of the effect of enzyme addition on the biogas yield of a given process
- The improvement of the biogas production process due to the use of the enzyme is being demonstrated in practice in 8 field trials

Impact:
- Higher process yields of at least 20% compared to the state of the art
- Cost reduction of at least 15% compared to conventional down-stream processing of the fermentation broth
- Increasing the overall productivity leading to more economically feasible processes, to be proven at demonstration scale
Web site
http://www.demeter-eu-project.eu

Project details
Type of action: Innovation Action - Demonstration
Value Chain: Across VC
Start date: 01 August 2016
End date: 31 July 2019
BBI JU € 4,629,586.00
contribution:

PARTNERS
THE NETHERLANDS
GENENCOR INTERNATIONAL BV (PART OF DUPONT INDUSTRIAL BIOSCIENCES GROUP)
BELGIUM
BIO BASE EUROPE PILOT PLANT VZW
BELGIUM
MIAVT OMB
CELMAM
DBFZ DEUTSCHES BIOMASSEFORSCHUNGSZENTRUM GEMEINNAEUZIGE GMBH
BELGIUM
ORGANIC WASTE SYSTEMS NV

ITALY
CIATECH SRL

THE NETHERLANDS
BIMOER ENERGIE BV
Lessons learnt (1/2)

Key achievements

• Specific KPIs and socio-economic & environemental impact from SIRA well on track and monitoring works;

• BBI JU is achieving its objectives with two main effects:
  - Structuring effect: value chain-driven cooperation across sectors creating competitiveness
  - Mobilizing effect: innovation-driven mobilising key stakeholders

• Financial leverage effect overall on track with some contrast

• Well balanced portfolio showing an optimal value chains coverage

• Public funding of high TRL research projects: Demonstration and Flagships coverage (geographic and feedstock)

• High % of SME participation (and with key role)

• The industry invest in EU: in 2014: € 2 bn → 2018: € 5.5 bn

• Europe back on the map (BIC CEOs, BBI JU Advisory bodies)
Lessons learnt (2/2)

“We are not there yet” – Horizon Europe

- Huge and still risky investments
  - Issues accessing private capital
  - Remaining funding gaps in Demo and Flag
- Structuration still ongoing: market and demand risks
- Some areas not yet covered enough
  - Farmers participation
  - Full feedstock potential
  - Geographic coverage
  - ...
- Brand owners and retailers participation
- Sector request coherent, supportive and stable regulatory framework
- Better tell the story of BioEconomy & Bio-Based products: Consumer awareness, education
- Go beyond “fossil to biobased” story: climate mitigation, water quality, human and animal health, biodiversity…
Join us

• Register on our partnering platform: https://bbi-ju.lifepartnering.com/
  • Access a network
  • Receive all relevant information about our calls
  • Access to reports and information
  • E-Newsletter

• BBI JU Info-day 2020 in Brussels
  • Information on Call for Proposals 2020
  • Brokerage and networking event
  • 2019 edition had 550 participants and 1200 face-to-face meetings

22 April 2020
Charlemagne building, European Commission, Brussels
Thank you!

Contact us
- info@bbi.europa.eu
- www.bbi-europe.eu

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BBI JU contribution to technical and policy-relevant reports

Outcomes of the joint survey JRC-IEA- BBI JU to understand the status of policies and strategies and other activities taken at national level on bioeconomy.

Article on the role of BBI JU as an opportunity for the development of a sustainable, competitive and innovative bio-based industries sector in Europe.

Outcome of the JRC’s event with the participation of CleanSKY and FCH describing different models and opportunities for collaboration with regions applied by various JUs.
Overview of the status of policies and strategies to support the bio-based industrial sector at national level during 2017. It provides examples of good practices and lessons learnt as reported by SRG to support the deployment of the BBI JU and enhance its impact at national level.

Outcome of the joint workshop organised by BBI JU & SCAR BSW to encourage the participation of less active regions in bioeconomy and BBI JU