



## **Workshop "From food waste to innovative bio-based products"**

**Brussels 12 October 2016**

### **1. AIM AND OBJECTIVES**

The food waste value chain has great social and economic opportunities, as well as environmental benefits by turning bio-waste from food production and processing into a profitable renewable raw material for valuable and innovative products. Moreover, it has the potential to combine different bio-waste streams, in a biorefinery cascading approach.

The workshop aimed to outline the potential of the food waste streams from food and beverages industry sectors to produce added value bio-based products: food supplements, feed, sustainable nutrients for agriculture, bio-based chemicals, bio-polymers, bio-based food packaging, etc.

The outcome of this workshop showed the best use of food waste in boosting a zero-waste circular economy at local level, by reducing resources depletion, and in fostering long-term economic growth.

### **2. THE APPROACH AND CONTEXT**

The workshop hosted ca. 50 persons, experts coming from big companies and research institutes. This workshop has been one of the four workshops taking place the day before the plenary session of the Conference Food 2030.

The workshop focused on new technologies for the conversion of food waste, the gaps between research and technological bottlenecks, as well as on the market of bio-based products.

### 3. DESCRIPTION

The workshop was opened by European Commission, with an introduction by **Waldemar Kütt**; head of Unit F2 Bio-based products and processing. In the opening session, a welcome has been extended by the moderator, **René Hartman** who has showed a video on the conversion of food waste. The video showcases 'de Verspillingsfabriek' (the Waste Factory), an initiative by Hutten Catering b.v. to transform food waste into new food products (video: <https://www.youtube.com/watch?v=gPf2hb4gyXk>).

The workshop was structured in 3 sessions reflecting the aims and objectives. Each session included a set of presentations and then adequate time was allowed for group discussions. All information presented and views discussed are summarised below. The agenda is presented at the Annex to this report. The presentations delivered at the event are available for details.

#### **SESSION 1: Inspiration from Finland and Scotland**

This session aimed to show the results of research from the Resources Institute of Finland and from the Scottish Enterprise on concerning food waste conversion.

##### Johanna Buchert of the Natural Resources Institute Finland

**Mrs Buchert** outlined we are losing a lot of valuable biomass as food waste in Europe. The Natural Resources Institute in Finland creates innovative solutions for bioeconomy and sustainable growth and well-being. She highlighted the potential of use by-product/waste to produce polymers, monomers/sugar, chemicals, fertilizer and energy.

Some of food waste is used as protein feed (pumpkin seed meat, poppy seeds meat, blue lapin seeds, wheat germs meat and rapeseed expeller). Lignin is unexploited dietary fibre component present in cereal waste.

She also mentioned insects as tools to valorize low-grade waste to food and feed, but regulation is needed together with initiatives to convince consumer perception.

She concluded by outlining the needs for R&I to facilitate the development of this value chain, mainly on-line-analysis on chemical/ macromolecular properties, advanced sorting and pretreatment technologies and novel biomass deconstruction/ fractionation methods. It is important also to develop new business models and industrial symbioses as well as to involve SMEs and venture capitalists.

##### Caroline Strain of Chemical Sciences at Scottish Enterprise

The Scottish Enterprise is an agency to help identify and develop the best opportunities for economic growth. It supports ambitious Scottish companies to compete within the global marketplace and build Scotland's globally competitive sectors. Scottish Enterprise also works with a range of partners in the public and private sectors to attract new investment to Scotland and to help create a world-class business environment.

**Mrs Strain** presented the Scottish Government priorities for moving towards a more circular economy towards a zero waste and resource efficiency agendas. The Food waste theme has being added to Scottish Government “Curriculum for Excellence”. The Government is also doing a comprehensive waste mapping exercise in order to understand the resource availability of the Country.

Food waste in Scotland is circa 1.3m tonnes p.a. 600kt p.a from domestic and 700kt from industrial (33% reduction target puts Scotland on track to achieve UN Sustainable Development Goal).

Scotland has also set up a national Industrial Bioeconomy Plan through industrial engagement, centres of excellence in order to facilitate partnerships and investments for innovation, biorefineries and the creation of sustainable skills programme to address areas of unmet need.

Mrs Strain has mentioned some companies that successfully turn waste into products, such us Ogilvy Spirits that produce vodka from potato. In particular she presented some success case studies: Cellucomp and Celtic Renewables.

Cellucomp is leading the way in biorefinery, with the establishment of Europe’s first biorefinery plant. It has devised a solution to the problem of unused vegetable by-product, by creating a sustainable material with a variety of applications. By recognising the significant potential presented by the production of bio-based products, CelluComp’s vision could help various industries (forestry, timber, agriculture) realise major economic benefits.

Celtic Renewables has developed the technology to turn whisky by-products into usable butanol thanks to Scottish Enterprise's support to the project, in particular through a *Concept Programme* to prove the idea was commercially viable, intensive business support and introduction to investors for the first tranche of private investment funding of £200,000.

She concluded by talking about the strengths (Policy context in place, Industry/Government support, multiple feedstock streams, etc.), the weakness (huge area to tackle, focus on limited resources, multiple priorities, limited companies interaction in Europe) and opportunities (commercialisation of IP, technology scale/development centres, cross EU collaborations). She concluded with the unmet challenges: acceleration of food waste reduction, reclassification of waste, impact of Brexit on Europe.

## **SESSION 2: Inspiration from Industry**

This session aimed to show concrete projects on food waste conversion from AINIA and BIO-on/Pizzoli companies.

Andres Pascual, Head of the environment and bioenergy department, AINIA.

Mr Pascual presented his company AINIA, a technological center based in Valencia which was funded 30 years ago. Its main technological specialities are food technology, biotechnology, chemistry, packaging, environment, instrumentation and ICTs. Valorization of food waste has always been a priority area of research for AINIA.

Mr Pascual gave an example of how waste from a winery can be transformed in valuable bioproducts to be used back in the vineyards in a circular approach. AINIA developed a Winery Waste Biorefinery, including new bioprocesses like a fermentation bioprocess to obtain *Bacillus cereus* group on wine to improve growth of vineyards and enzymatic bioprocess to produce aminoacids to be used as biofertiliser. He also mentioned Probiogas project, a database with 180 subcategories of agro-food waste in 330 Spanish subregions. Data has been used by the Spanish Government for its BioEconomy Strategic Plan 2020. Through INTEGRAL B project the company demonstrated a sustainable systems for collection and valorization of food waste from restaurants through an integration biogas and biodiesel production approach. He mentioned also AGROBIOMET project which allowed the circulation of Spanish cars with biomethane as biofuel obtained from biogas of an agro-food biogas plant.

He also mentioned PHBOTTLE project aimed at developing bioplastics (PHB, polyhydroxybutyrate) by fermentation of juice processing wastewater (<http://www.phbottle.eu/> and <https://www.youtube.com/watch?v=0mGkACE6usM>).

He concluded with the main challenges to create new bio-based value chains, notably the engagement of all stakeholders (food waste producers, waste management operators, logistics operators, government administrations and the processing and end-market actors) to boost the concept of a biorefinery in order to produce more bio-based products from solid food waste. He mentioned the importance of developing advanced bioconversion technologies of food waste into bio-based products as well as the recovery and/or bioconversion of valuable components and water reuse.

Diego Torresan, Bio-on project and Nicola Pizzoli, CEO of Pizzoli.

Bio-on is a company based in Italy working in the field of the modern biotechnologies applied to widely used materials. The aim of the company is to create 100% natural products/solutions based on renewable resources or agricultural processing waste materials. Pizzoli is the largest operator in Italy in the potato sector, leader both in fresh potatoes and in frozen french fries.

Bio-on and Pizzoli collaborated together to build the first PHAs bioplastic production plant. This is an integrated industrial plant which turns and valorises potato wastes and by-products into new-generation bio-based and biodegradable plastics: PHAs. PHAs is used in several applications: metal replacement automotive, toys, food containers etc.

Mr Torresan from Bio-on has highlighted the potentiality of feedstock availability in the different Countries: each EU country is self sufficient in term of feedstock availability, as an example, in Emilia Romagna region (in Italy) each year, 20 mio tons of wastes carbon sources are available.

Mr Pizzoli has explained how his company decided to use potatoes by-products and make the best use of it. Some potatoes (est 2-4%) remain on the fields after mechanical harvesting operations. Automatic sorting generate a total 15% to 20% not conform product to be packed. As regards frozen fries, peeling operation generate 6-10% of waste. Sorting of fries, generate further 4 to 6% of by-products from processing (small parts, defects etc). Pizzoli valorises the current usage of wastes (peel, rotten potatoes) to produce energy, fertilizer and animal feed. Mr

Pizzoli was asked why he has decided to invest in the new valorising technologies and he answered that the shift in the public opinion in favour of transforming food waste is the major reason why his company is investing in these new processes.

### **SESSION 3: Introduction on Foresight and Creative Thinking Skills**

During this session there was a short presentation given by **Erik op ten Berg** to get the participants in the optimal thinking mode for this session of the workshop.

The participants were requested to be split in 4 team and work on the 6 following questions:

1. How can we speed-up a successful market entry of bio-based products?
2. Which opportunities do you see for market-disrupting technological innovations, within the EU and globally?
3. How do you see the 'food waste to bio-based products' value chain in 2030?
4. How can the EU support the business case of 'food waste to bio-based products'?
5. How can we bridge the gap between research and technological bottlenecks?
6. How can we, as frontrunners, seduce the rest of the industry to spend more time and effort on the conversion of food waste (such as upgrading the available technologies, on research scale, to an industrial level, etc)?

The role of the participants was of high importance to provide the necessary background information, focusing on the opportunities and identified challenges and needs for the food waste value chain, in relation to 'biomass-to-bioproducts' potentials.

They first listed the main points discussed according the following **6 segments**:

1. Speed-up market entry
2. Disrupting technological innovation
3. Value chain 2030
4. EU support business-case
5. Gap research- industry
6. Seduce industry.

Each group had to select the top 5 points considered the most important for the development of the food waste value chain. The table below present the main conclusions from the discussions among the participants.

### Group 1

<b>IDEAS/INSIGHTS/OPPORTUNITIES</b>
<b>Involvement of industry and all stakeholders involved in the value chain from the start to uptake the problems.</b>
<b>Focus on barriers in industry, use these as innovation challenges + support uptake</b>
<b>Show that profitability + (brand)reputation go hand-in-hand</b>
<b>Metrics + valuations; success stories showing 'waste = money'</b>
<b>Shift regulation + incentives</b>

### Group 2

<b>IDEAS/INSIGHTS/OPPORTUNITIES</b>
<b>Consumer as actor (start from the end)</b>
<b>Importance of cross-sectoral partnerships (PPP)</b>
<b>Include "out of the box" experts</b>
<b>Financial incentives (tax reduction) for SMEs</b>
<b>New IP concept</b>

### Group 3

<b>IDEAS/INSIGHTS/OPPORTUNITIES</b>
<b>Brew your own (food from waste)</b>
<b>Disrupt the legislation</b>
<b>Build consumer pull. Shake up the demand side! Consider children as new consumers</b>
<b>Marketing using Jamie Oliver as role-model</b>
<b>Force the sector to mix it up</b>

#### Group 4

<b>IDEAS/INSIGHTS/OPPORTUNITIES</b>
<b>Inspiration: decrease research- industry gap</b>
<b>New coin: introduce carbon credits for bio-based products</b>
<b>Create virtual market place (ex. amazon). The EU can create the demand and provide incentives for transforming waste into products</b>
<b>Allow room for experiments – legislation-free zones</b>
<b>Make legislation more flexible and decrease the bureaucracy</b>

#### Group 5

<b>IDEAS/INSIGHTS/OPPORTUNITIES</b>
<b>Technology: heterogenous processing; 3/4 D printing ; optimisation of chemistry chain</b>
<b>Supply chain as a circular system with accessible knowledge of technologies for processing along the value chain (including small scale availability at affordable economics).</b>
<b>Database of regional co-products availability, including real availability and quality (not only quantity).</b>
<b>Energy consumption technologies to reduce consumption throughout the manufactory process (not just bio- feedstock)</b>

#### Group 6

<b>IDEAS/INSIGHTS/OPPORTUNITIES</b>
<b>No waste anymore!</b>
<b>Circular &amp; local decentralized system</b>
<b>Gain/value for everybody involved in the chain</b>
<b>Cross-sectoral collaboration</b>
<b>More bio-based products</b>

They were requested also to make a list of **29 take away**. Some of them are highlighted below:

Not only about technology

Barriers to uptake

Industry should be more focused

Consumer Focus

Legislation more flexible

Less bureaucracy

Sharing new ideas and best practices

Always questioning

Cross sectorial business



## ANNEX

Time	Programme
13.30	<b>Registration</b> of participants
14.00	<p><b>Start of workshop:</b> welcome by Waldemar Kütt, head of Unit F2 Bio-based products and processing,</p> <p>Setting the scene: what is the goal of today (mentioning what is intended for feedstock and bio- based products in relation to the Working group); what is the link to the conference FOOD 2030 - introducing René Hartman, moderator of the workshop.</p>
14.10	<b>Introduction</b> of the programme and presentation of the working method; getting to know each other; short intermezzo to meet 4-6 fellow participants in the audience
13.20	<p><b>Showcase video:</b> what is the subject of today; inspiration for workshop.</p> <p><b>Inspiration</b></p>
14.25	<b>Inspiration from Research;</b> introduction of 2 speakers (Mrs Strain and Mrs Buchert).
14.35	<p><b>Inspiration from Finland:</b> Johanna Buchert of the Natural Resources Institute Finland.</p> <p><b>Inspiration</b></p>
14.45	<p><b>Inspiration from Scotland:</b> Caroline Strain of Chemical Sciences at Scottish Enterprise.</p> <p><b>Inspiration</b></p>
14.55	<p><b>Inspiration Debate:</b> what can we learn from the research in Finland and Scotland?</p> <p><b>Inspiration</b></p> <ul style="list-style-type: none"> <li>- Looking back: what have you learned, about hurdles and opportunities</li> <li>- Looking forward: where should we invest, cooperate or challenge industry</li> <li>- Questions from audience</li> </ul>
15.10	<b>Inspiration from Industry;</b> introduction of 3 speakers (Mr Pascual, Mr Torresan and Mr Pizzoli).
15.15	<p><b>Inspiration from Spain:</b> Andres Pascual, Head of the environment and bioenergy department, AINIA.</p> <p><b>Inspiration</b></p>
15.30	<b>Q&amp;A</b>

<b>15.35</b>	<b>Inspiration from Italy:</b> Diego Torresan, Bio-on project and Nicola Pizzoli, CEO of Pizzoli.
<b>Inspiration</b>	
<b>15.50</b>	<b>Q&amp;A</b>
<b>15.55</b>	<b>Introduction on Foresight and Creative Thinking Skills:</b> getting the participants in the optimal thinking mode for the workshop by Erik op ten Berg.
<b>16.00-16.15</b>	<b>Coffee break in the room "Arc Foyer";</b> opportunity to talk to fellow participants.
<b>16.20</b>	<b>IdeaCarrousel;</b> 4 teams of 12 participants work on 6 questions:
<b>Ideation</b>	<ol style="list-style-type: none"> <li>a. Ideation; finding ideas and solutions</li> <li>b. Selection; choosing the optimum ideas</li> <li>c. Concepting; combining and elaborating of chosen ideas per question; make Top 5 list of ideas/insights/opportunities</li> <li>d. Presenting and choosing concepts in team of 8-10</li> </ol> <p>The questions are focussing on how to give food waste conversion a boost. What can we learn from each other, how can we challenge ourselves? What is the role of the EU? Etc.</p>
<b>17.20</b>	<b>Plenary presentation of 5 concepts</b>
<b>17.35</b>	<b>Discussion</b> on next steps and what to take along to conference next day.
<b>17.45</b>	<b>End closing</b> of workshop and invitation to join the opening of Food Village exhibition of successful food projects.
<b>18.00</b>	<b>Opening</b> of Food village by Ruxandra Draghia-Akli, Deputy Director-General for Research and Industry.