Sustainability; a key concept in the development of the agri-food based bioeconomy

Dr. Fionnuala Murphy
Assistant Professor

School of Biosystems and Engineering
University College Dublin
Ireland

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Presentation Outline

- The Bioeconomy
- Agri-food Waste and the Bioeconomy
- Irish Bioeconomy Activities
The Bioeconomy

As defined by the European Commission, refers to the "the production of renewable biological resources and the conversion of these resources and waste streams into value-added products, such as food, feed, bio-based products as well as bio-energy" (EC, 2017).
Bioeconomy – Circular Economy

The bioeconomy is often represented as the biological element of the circular economy, in which “the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste minimised” (EC, 2017).
## Bioeconomy Policies

<table>
<thead>
<tr>
<th>Country</th>
<th>Strategy</th>
<th>Year</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>OECD-countries</td>
<td>The Bioeconomy to 2030—Designing a policy agenda</td>
<td>2009</td>
<td>OECD</td>
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<tr>
<td>EU</td>
<td>Innovating for Sustainable Growth—A Bioeconomy for Europe</td>
<td>2012</td>
<td>EC</td>
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<td>The Netherlands</td>
<td>Framework memorandum on the Bio-based Economy</td>
<td>2012</td>
<td>The Dutch Cabinet</td>
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<td>Sweden</td>
<td>Swedish Research and Innovation—Strategy for a Bio-based Economy</td>
<td>2012</td>
<td>Formas¹</td>
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<td>USA</td>
<td>National Bioeconomy Blueprint</td>
<td>2012</td>
<td>The White House</td>
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<td>Malaysia</td>
<td>Bioeconomy Transformation Program—Enriching the Nation, Securing the Future</td>
<td>2013</td>
<td>Biotechcorp³</td>
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<td>South Africa</td>
<td>The Bio-economy Strategy</td>
<td>2013</td>
<td>DST⁴</td>
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<td>Germany</td>
<td>National Policy Strategy on Bioeconomy (in German)</td>
<td>2014</td>
<td>BMEL⁵</td>
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<tr>
<td>Finland</td>
<td>Sustainable growth from bioeconomy—The Finnish Bioeconomy Strategy</td>
<td>2014</td>
<td>MEE⁶</td>
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<td>West Nordic countries</td>
<td>Future opportunities for bioeconomy in the West Nordic countries</td>
<td>2014</td>
<td>Matis⁷</td>
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<tr>
<td>France</td>
<td>A Bioeconomy Strategy for France (in French)</td>
<td>2016</td>
<td>Alim’agri⁸</td>
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Bioeconomy versus Biobased Economy Terms

Bioeconomy

- Used predominantly by the **OECD** - “transforming life science knowledge into new, sustainable, eco-efficient and competitive products” (OECD, 2009. Thus, “[t]he concept of the BE is focused on the methods of conversion of raw material into value added products” (Staffas et al., 2013) and in particular on biotechnology as a conversion technology.

Bio-based Economy

- Used by the **European Union (EU)** “focuses on the raw material rather than the conversion process” (Staffas et al., 2013). The European Commission (EC) states that “a bio-based economy integrates the full range of natural and renewable biological resources—land and sea resources, biodiversity and biological materials (plant, animal and microbial), through to the processing and the consumption of these bio-resources” (EC, 2011).
Biotechnology-centred vision of the bioeconomy was the first to emerge and closely tied to the agenda of the life sciences and biotech industry.

The technological dimension is based on the contribution of technology to the bioeconomy over ecological principles.

Only later were environmental objectives included—in particular climate change mitigation and the transition to a sustainable post-fossil society—and the focus of the narrative shifted somewhat toward an economy based on renewable biomass and “green growth”.

Biotechnological, agro-ecological
Bioeconomy and the Environment

- Assumption that sustainability is an inherent characteristic of the bioeconomy, or the expectation of benefits under certain conditions.
- However – we must be careful about interventions:
  - Single or multiple environmental impact reduction interventions in a production system may not reduce the environmental impact – and may have the opposite effect.
Lessons Learned - Biofuels

  - Requiring each Member State to set national indicative targets to ensure that a minimum proportion of biofuels is placed on their markets
  - 2% biofuel on market by 2005, 5.75% by 2010 and 10% by 2020

- EU Biofuel sustainability criteria

- Experience of biofuel policies and impacts shows that the bioeconomy cannot be considered as “self-evidently sustainable”.
Summary of Bioeconomy Policy Issues

- The dominant “green growth” narrative regarding the bioeconomy has been criticised for being too reliant on technology by those who are more in favour of ecological practices and a more comprehensive understanding of societal sustainability.

- The current mainstream vision of the bioeconomy has been further criticised on the basis that available biomass will be insufficient to meet the demand if food security and the maintenance of environmental capital and ecosystem services are given priority.

- The technology-based approach will reinforce the excessive consumption of resources and that sustainable consumption and behaviour change must be part of the transition process.
Summary of Bioeconomy Policy Issues

• Many countries indicate that sustainability standards and guidelines should be developed and agreed on at international level.

• This is being addressed by the programme on sustainable bioeconomy guidelines being developed under FAO’s coordination (FAO 2016).
Agri-Food Waste

Europe generates around 700 million tonnes of agricultural waste!
Current Solutions

Animal feeding

Composting & fertilising

Anaerobic digestion

Incineration

Landfilling
Agri-Food Waste Availability

Source: AgroCycle D1.3 - Report on the holistic analysis of AWCB chains and logistics of AWCB valorisation systems
Quantification of sustainable removal rates - the level of agricultural residues removal that can be achieved without causing adverse effects on the performance of agricultural systems.

Source: AgroCycle D1.3 - Report on the holistic analysis of AWCB chains and logistics of AWCB valorisation systems
Agri-Food Waste Availability: Avoidable and Unavoidable

- There is an inherent wastage in the form of unavoidable waste (by-products, co-products, residues) built into agri-food systems that cannot be prevented.
  - E.g. on average ¼ of a vegetable crop is not edible (peels, leaves, stems, roots, etc.).
- While there are unavoidable agri-food wastes, significant amounts of food waste is avoidable.

<table>
<thead>
<tr>
<th>Waste Type</th>
<th>Description</th>
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<tbody>
<tr>
<td>Avoidable</td>
<td>Avoidable wastes are material streams that have been mismanaged and disposed of, and are typically a mixture of different components (heterogeneous). These include wasted foods generated in processing, retail, catering and households. Avoidable agri-food waste occurs when foods are discarded because they are regarded as ‘suboptimal’, or when they pass their ‘best-before’ date, or due to product flaws.</td>
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<tr>
<td>Unavoidable</td>
<td>Unavoidable agri-food wastes, on the other hand, are materials arising from food production systems that are not consumable, typically described as by-products, co-products, or residues (e.g. manures, crop residues, leaves and peels). Unavoidable agri-food wastes cannot be prevented and are typically homogeneous streams.</td>
</tr>
</tbody>
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Avoidable food waste from on-farm cosmetic grade-outs estimated to be up to 50 million tonnes per year in the European Economic Area.
Agri-Food Waste Availability

Source: AgroCycle D1.3 - Report on the holistic analysis of AWCB chains and logistics of AWCB valorisation systems
Embedded emissions in avoidable food waste

Emissions arise from;

• Application of fertilisers, creating direct emission of nitrous oxides from soil processes.
• Energy for planting, harvesting, transport.

• The later in the supply chain a product is wasted, the higher are its environmental impacts.

Bioeconomy activities in Ireland

National Bioeconomy Policy Statement – March 2018

Sustainable use of renewable biological resources

Decarbonisation / Changing Economic Model

Mitigation

Economic Opportunity / Rural Employment

A coordinated cross-sectoral approach will be required to make the transition to a low carbon and circular economy and society.
An integrated biorefinery for the conversion of dairy by-products to high value bio-based chemicals.
AgriChemWhey

AgriChemWhey will build a first-of-a-kind, industrial-scale 25,000 tonnes (100% dry matter) biorefinery to valorise dairy processing by-products to several added value bio-based products for growing global markets, such as lactic acid (LA).

- Optimise and scale-up process biorefinery technologies
- Establish a new dairy processing by-products to high value-added products value chain
- Establish industrial symbiosis with local partners to valorise side streams arising from the biorefinery process
- Ensure techno-economic viability and successful long-term commercial operation of the biorefinery
- Develop a blueprint for replication of the AgriChemWhey model in other regions across Europe
Agri Bio Circular Economy

Develop new sustainable value chains for the circular bioeconomy in Ireland by maximising value and minimising environmental impacts through cascading of biomass for production of biobased products and energy.

• ABC Economy will engage with key stakeholders through project partner, Cré, and project collaborators, Tipperary County Council and Monaghan County Council, to develop sustainable value chains based on the bioresources available in each region.

• Key stakeholders (primary producer, processors, waste management companies etc.) will be engaged throughout the project to identify important resources, constraints to valorisation, and potential opportunities.
Thank you for your attention.

Contact details:
fionnuala.murphy@ucd.ie