Overview on How Sustainability of Bioeconomy Has and Should be Addressed at Global and National Levels

Olivier Dubois, FAO,
Bioeconomy Forum, Riga, 09 March 2017
Outline

1. Links between Bioeconomy and the SDGs
2. FAO’s Overview of Sustainability in Bioeconomy Strategies
3. How to Achieve Sustainable Bioeconomy - Examples of Challenges and Opportunities
4. How to Measure Achievements in Bioeconomy Development - The Indicator Issue
5. FAO’s Work on Sustainable Bioeconomy Guidelines
6. Some Key Messages on Sustainable Bioeconomy Development
1. Links between Bioeconomy and the SDGs
Bioeconomy not Sustainable per se - SDG Challenges and Opportunities

**Legend**

**STRENGTHS/OPPORTUNITIES**

**CHALLENGES/ RISKS**

- Blue bioeconomy - better use of the marine fauna (fish and their eggs) for high value bio-products such as cosmetics and biofuels.
- Over-utilisation of the marine and aquaculture bio-resources.
- Production of biomass should be done in a climate-smart way.
- Competition between productive uses of biomass and its role as carbon sink.
- Over-preservation of biomass due to extra-interest in bio-products.
- Rising consumer awareness, Pressure and/or better use of biomass loss and waste.
- Decoupling production and consumption from the use of fossil fuels.
- Taking social issues to urban centres through bio-products and bioenergy for urban consumption, sustainable buildings with higher bio-materials.
- Competition between sectors for the best location close to biomass production but also to urban centres.
- More equal access to modern energy through bioenergy.
- Bioenergy as growth factor for bio-industry and innovation.
- Bio-energy development at the interface of natural resources and poorer sections of population.
- Not enough support for sustainable bio-industry.
- Bioenergy and biomass as opportunities for rural jobs and additional income - hence contribution to local economy.
- Possibility for bioenergy rich developing countries to add value added bio-based products.
- Bioenergy to improve access to modern energy services and reduce the use of fossil fuels.
- Competition between the use of biomass for energy and food/feed.
- Increased pressure on water to grow biomass to produce non-food/non-feed goods and also in bioindustries.
- Over-pressure on water to grow biomass for bioenergy.
- Clean water through use of energy water to produce bioenergy.
- Women empowerment with the use of technology/knowledge for sustainable agriculture and medicinal plants.
- Women’s access to the bio-resources and benefits from bioeconomy due to unequal tenure rights and knowledge between men and women.
- Unequal access to the knowledge needed to benefit from BE.
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- Bioenergy for urban and rural areas.
- Bioenergy for urban areas to reduce the use of fossil fuels.
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2. FAO’s Overview of Sustainability in Bioeconomy Strategies
FAO’s Overview on How Sustainability has been Addressed in Bioeconomy Strategies at different Levels

- Undertaken from April to September 2016

- 20 Bioeconomy Strategies (4 International, 12 National, 4 Sub-national)

- Categories: Environmental Sustainability, Socio-economic Sustainability, Competition/Synergies between biomass end use sectors, Food security, Enabling factors)

- Includes both overview/gap analysis of:
  - Sustainability issues in bioeconomy strategies; and
  - Bioeconomy Action Plans and Approaches
### Summary of Gap Analysis on Sustainability in Bioeconomy Strategies

<table>
<thead>
<tr>
<th>Categories</th>
<th>International</th>
<th>National</th>
<th>Regional</th>
<th>LOCAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental sustainability</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Socio-economic sustainability</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Competition/synergies</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>among biomass end-use sectors</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Food security</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Enabling Factors</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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</tbody>
</table>

- **INTERNATIONAL**
  - EU: Innovating for Sustainable Growth, A Bioeconomy for Europe (2012)
  - West Nordic Countries - Future Opportunities for Bioeconomy in the West Nordic Countries (2014)
  - Denmark: Denmark as Growth Hub for a Sustainable Bioeconomy (2014)
  - Finland: The Finnish Bioeconomy Strategy (2014)
  - Malaysia: The Bioeconomy Transformation Programme (2012)
  - Russia: BIO-2020 (2012)
  - South Africa: The Bioeconomy Strategy (2013)
  - USA: National Bioeconomy Blueprint (2012)

- **NATIONAL**
  - ✓ indicates the issue is addressed

- **REGIONAL**
  - ✓ indicates the issue is addressed

- **LOCAL**
  - ✓ indicates the issue is addressed

- ✓ = The issue is addressed
Some Findings about Sustainability from Nordic Countries Bioeconomy Strategies

Environmental

- Climate change *resilience/adaptation* is mentioned in the West Nordic Countries document.
- **Secure tenure of land, water and other productive natural resources** is not an important factor, except from the West Nordic Countries document - property rights in the cultivation of algae and respect of the Sámi people rights.

Socio-economic

- *Finnish strategy* mentions willingness to become a *hub for new products and innovation*.
- *Finland* and the *Nordic Countries’* strategies strongly stimulate the *market for functional food (nutraceuticals)* for social health and well-being.
- *Rural development* is a key issue in the *Finnish strategy*.

Food security

- *Denmark prioritises food production* within the bioeconomy.
<table>
<thead>
<tr>
<th>CATEGORIES</th>
<th>Stand-alone documents</th>
<th>Strategic objectives and measures</th>
<th>List of actions and actors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EU</td>
<td>Spain</td>
<td>Flanders</td>
</tr>
<tr>
<td>Knowledge enhancement and transfer</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>PPPs (for business innovation)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Human capacity development</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Stakeholder engagement</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Policy alignment and coherence</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Identification of possible value chains and feedstocks</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Markets and competitiveness</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Setting up industrial networks</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Labelling and consumer awareness</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Public procurement and mandates/regulations</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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</table>
Findings on Three Nordic Region Bioeconomy Action Plans

Stakeholder engagement

- The *Baltic Sea Region* plan includes a **steering group** to support forums and prepare the annual “State of Bioeconomy”

- The *Finnish* document mentions an action for setting a **process of stakeholder involvement in regulations development**

Markets and competitiveness

- *Finland* Action Plan includes:
  - **Roadmaps on future global demand** and sustainability challenges in trends
  - Creation of **cooperation platforms** among cross-sectorial activities to improve their competitiveness in the international market, with the allocation of Structural Funds
  - **Importance of communications** to influence consumer choices highlight on sustainability of products and support to the replication of good practices
  - **Public procurement**, including criteria
Markets and competitiveness

- The Baltic Sea Region document refers to specific actions to identify good green procurement practices and procedures.

Examples of decentralized implementation mechanisms- Regional programmes for hubs development

- The ScanBalt BioRegion is a successful example a mega-cluster partnership in the Baltic Sea Region.
Overview of Sustainability in Bioeconomy Strategies-Main Conclusions

RE: Strategies

▲ Significant interest in bioeconomy at different levels world wide confirmed
▲ Sustainable bioeconomy: easier said than done and no ‘one size fits all’ solutions
▲ Most current bioeconomy strategies are very broad
▲ Common weaknesses of strategies include land use, water and waste management, competition between different uses of biomass, energy security and small-scale farmer inclusion

RE: Implementation

▲ Efforts towards implementation through action plans only in a few cases
▲ A lot of knowledge on pitfalls and success factors for biomass production stage, much less for biomaterial production/use and disposal / end of life stages
▲ Messy picture and pragmatism needed regarding sustainability standards
3. How to Achieve Sustainable Bioeconomy
   Examples of Challenges and Opportunities
   * Food
   * Cascading use of biomass
   * Climate Change
Food is and will be a/the Major Component of Global Bioeconomy

- Food/Feed: 70% of bioeconomy demand in 2011; 40 to 60% in 2050

Source: Piotrowsky et al, 2015
Food Security is Relevant to Nordic Countries

- Maybe *not so much* in terms of *food insecurity* in Nordic countries

- But Nordic countries have *a lot to offer* to others regarding food security
  - *Exports of food* (fish)
  - *Know how* on important aspects of agrifood chains - for instance:
    - *Biogas* from livestock in *Denmark*
    - *Geothermal energy* for *post-harvest operations* in *Iceland*
    - *Use of all parts of fish* in *Norway, Iceland and Greenland*
Ensuring food security

“Food security exists when all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life”

1996 World Food Summit

<table>
<thead>
<tr>
<th>Four dimensions</th>
<th>Explanations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AVAILABILITY</strong></td>
<td>The ‘supply side’ of food security: Levels of production, stocks and net trade. Often not the main issue because globally there is enough food to feed the world. But often the main/only dimension considered</td>
</tr>
<tr>
<td><strong>ACCESS</strong></td>
<td><em>Economic</em> and <em>physical access</em> to food: Enough income to buy food/food prices, accessible markets, enough land. Often a key, if not the key issue but often overlooked</td>
</tr>
<tr>
<td><strong>UTILIZATION</strong></td>
<td><em>Quality of food</em>: What type of food and how people use it. Key aspects include enough sustainable energy for <em>proper cooking</em> and <em>nutrition aspects</em>. Currently, globally roughly <em>as many malnourished</em> people as <em>undernourished people</em></td>
</tr>
<tr>
<td><strong>STABILITY</strong></td>
<td><em>Stability of the three other dimensions over time</em></td>
</tr>
</tbody>
</table>
Examples of links between bioeconomy on food AVAILABILITY

+ Investments to sustainably increase yields of non-food goods can also increase food availability (e.g. sugarcane ethanol in Brazil)

- Land used for the production of non-food goods (including 2ndG biofuels) can compete with land needed to produce food

- Biomass residues not a panacea! Risk of competition in the use of residues between soil management/food production, animal feed, bioenergy and biomaterials

+ Production of non-food goods can increase availability of food/feed as by-product (e.g. DDGS from corn) and the reverse is also true (e.g. biogas)
Examples of links between bioeconomy and food access

+ Income from the production of non-food goods and bioeconomy jobs can help local people to buy food

- Non-responsible investments in bioeconomy can lead to a reduction in land access by local farmers to produce food

+/- Increase in food prices caused by the production of non-food goods will negatively affect net food buyers but will positively affect net food sellers
Vertical cascading use of biomass- Easier said than done!

It all depends on local circumstances! The sequence of use of biomass should be decided through an inclusive local multi-stakeholder process.

Also consider horizontal cascading (biorefineries)

- Production of every type of product requires energy!
- And it should be sustainable, renewable energy - hence also bioenergy!

Whose and What value? Resource efficiency / Income (also to buy food) / Costs / Needs (e.g. energy needed for cooking, algae for food or feed)

- It all depends on local circumstances! The sequence of use of biomass should be decided through an inclusive local multi-stakeholder process
- Also consider horizontal cascading (biorefineries)
<table>
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<th>Climate change mitigation</th>
<th>Carbon Sequestration</th>
<th>Climate change adaptation</th>
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</thead>
<tbody>
<tr>
<td><strong>Biomass production</strong></td>
<td>- GHG emissions from biomass production</td>
<td>+ Carbon sequestration through good soil and water</td>
<td>+ Higher diversity in applications increases security, stability</td>
</tr>
<tr>
<td></td>
<td>+ Precision agriculture to optimize agricultural practices</td>
<td>management</td>
<td>and farmers’ resilience</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Reduced soil carbon if too much biomass removed</td>
<td>- climate change impacts leads to displacement of biomass production</td>
</tr>
<tr>
<td><strong>Bio-material production</strong></td>
<td>+ Most bio-products reduce GHG emissions compared to their petrochemical counterparts</td>
<td>+ Future carbon capture and use technologies will use renewable CO₂ sources</td>
<td>+ Employment and value added to rural areas</td>
</tr>
<tr>
<td></td>
<td>+ Significant improvements in efficiencies of new biotech pathways possible</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Bio-material use (cascading)</strong></td>
<td>+ Long-living products show lowest GHG emissions</td>
<td>+ Long living products show long sequestration</td>
<td>+ Specific benefits from locally used (traditional) bio-based products</td>
</tr>
<tr>
<td></td>
<td>– A lot of energy to recycle products may add GHG emissions</td>
<td>+ Cascading use can expand CO₂ sequestration</td>
<td></td>
</tr>
<tr>
<td><strong>End of Life</strong></td>
<td>+ energy from incineration substitutes fossil energy</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>+/- Biodegradation may require a lot of energy</td>
<td></td>
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</table>

Adapted from Nova Institute, 2017
4. How to Measure Achievements - Indicators for different stages of the value chain

Stages of the bioeconomy value chain

Stage 1: Biomass production
Stage 2: Biomaterial production
Stage 3: Biomaterial use
Stage 3: Disposal/end of life
Impact Indicators

- At biomass production stage: A lot of systems that cover more or less the same things - So a bit confusing at times
- At biomaterial production & use stage: Many less emphasis on energy use & bio-based content
- At disposal/end of life stage: Not much
- Measuring these indicators is often expensive and takes time
- Several systems concern the impacts of specific programmes (e.g. EU, Germany)

What to do?

Do we need anything else?
If so, what and how to go about it?
Maybe a stepwise process - Start with performance indicators and global systems as proxy indications

- **Performance indicators to measure the quality of implementation of good practices** combining
  - **Quantity** (e.g. number of hectares under good practice X, number of companies using good practice Y)
  - **Quality** in the implementation of these good practices

Such indicators **acknowledge** and **measure progress**

As a result **progress reward** can be **included in incentives**

But one needs a **threshold level**

- **Global systems**: Indications based for instance on **remote sensing** (e.g. combine regular fire monitoring with land cover maps to assess availability and use of crop residues)
Maybe a stepwise process - Start with performance indicators and global systems as proxy indications

Such *proxy systems*

- provide *preliminary indications* at regular periods of time between measurements of impact

- *allow for corrections* before measuring impacts

- Are much *less costly* and *time consuming*
5. FAO’s work on Sustainable Bioeconomy Guidelines
Background of FAO’s work on Sustainable Bioeconomy Guidelines

- **FAO received a mandate to coordinate international work on ‘food first’ sustainable bioeconomy** from 62 Ministers present at the 2015 Global Forum for Food and Agriculture (GFFA) in Berlin.

- FAO has received **support from the Government of Germany to develop guidelines on sustainable bioeconomy development** (Phase 1: 2016; Phase 2: 2017-mid 2020).
Results of phase 1 of the project on sustainable bioeconomy guidelines (Nov 2015 - October 2016)

- **International Multi-stakeholder Working Group on Sustainable Bioeconomy:**
  17 members so far - 6 countries (NL, GE, US, ARG, SA, MA), German Bioeconomy Council, EU, OECD, CIAT, UNEP, WWF, Nordic Council of Ministries, EU Bioeconomy Public-Private Consortium, Wageningen University, WBCSD and FAO

- **Overview of how sustainability is addressed in about 20 bioeconomy strategies** (regional, national and sub-national) - published in September 2016

- **Principles and Criteria for Sustainable Bioeconomy**
Agreed elements of phase 2 of the project on sustainable bioeconomy guidelines (2017 to mid-2020)

- **Lessons** from *examples* of successful and problematic experiences in bioeconomy development

- A compilation of *good bioeconomy practices*

- A report on *policies to promote good bioeconomy practices*

- A ‘**toolbox**’ on sustainable bioeconomy, building to a large extent on the FAO sustainable bioenergy toolbox (at least for biomass production stage)
Agreed elements of phase 2 of the project on sustainable bioeconomy guidelines (2017 to mid-2020)

- **Agreed indicators** on **impacts** and **performance of good bioeconomy practices**
  - *Combining impact and proxy indicators* is the current direction for FAO guidelines on sustainable bioeconomy
  - But these are early days and *more thinking* and *collaboration are needed to achieve something practical yet robust*

- **Outreach**: Presentation and validation of the sustainable bioeconomy guidelines (P&C's, good practices, supporting policies, toolbox and indicators) at **regional level** and with **different stakeholder groups**
Some Lessons for the Development of Bioeconomy Strategies

- It does not start from scratch and should not reinvent wheels - It should build on existing knowledge and fill gaps with innovations where needed

- It will have to combine general aspects (e.g. aspirational Principles and Criteria) with enough flexibility to adapt solutions to local conditions

- It should be coordinated through a coordinated multistakeholder national/international mechanism

- It should be supported by a massive communication effort to gain sufficient societal acceptance
FAO’s Key Messages on Sustainable Bioeconomy Development

- Links between bioeconomy and food security are complex, multifaceted and context-specific

- We must embrace this complexity with context specific assessment rather than oversimplifying the reality with overreliance on models and global studies - as often done with bioenergy - because

- We have tools to address this complexity - including those related to sustainable bioenergy
**FAO’s Key Messages on Sustainable Bioeconomy Development**

- *Food First* bioeconomy: Yes but need to **consider ALL dimensions of food security**, not just food availability/production

- We should make sure that **bioeconomy does not leave anyone behind**

- So let’s go for *‘Bioeconomy that Works for People, Food Security and Climate Change’*

- This requires **multistakeholder** and **internationally-coordinated efforts**

- *FAO is playing its part* and is **ready to keep doing it**
Questions & Feedback Welcome

Thank you for your attention

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