



Sustainable Agriculture, Forestry and Fisheries in the Bioeconomy A Challenge for Europe

4th SCAR Foresight Exercise



Erik Mathijs

Katholieke Universiteit
Leuven

&

Chair, 4th SCAR Foresight
Expert Group

European Parliament
12 January 2017

The sustainable bioeconomy: premises and preconditions

In 2012 EC launched the strategy for “Innovating for sustainable growth: A bioeconomy for Europe”, aiming *"to pave the way to a more innovative, resource efficient and competitive society that reconciles food security with the sustainable use of renewable resources for industrial purposes, while ensuring environmental protection"*.

The bioeconomy concept

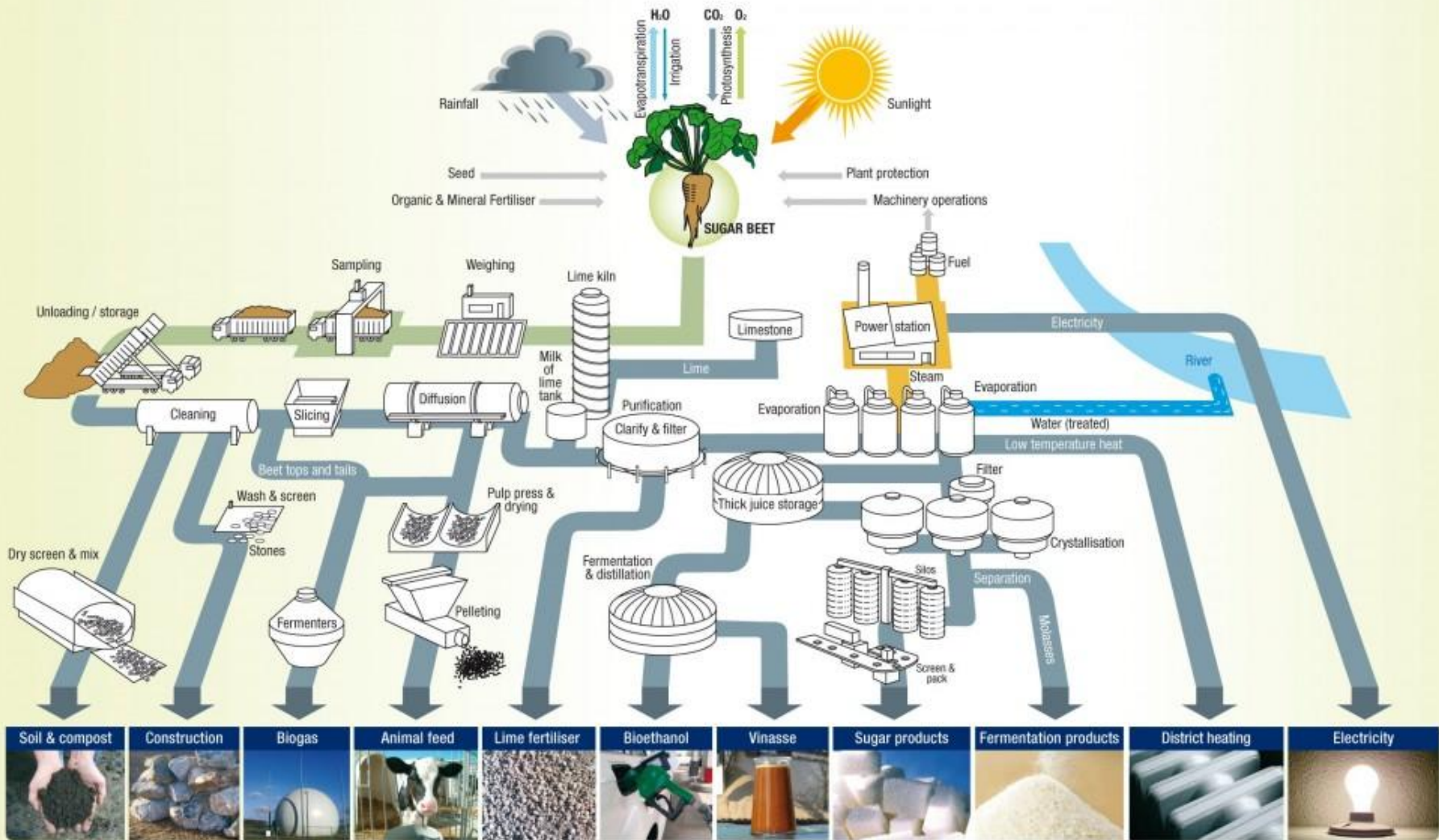
- Bio-economy or bio-based economy “... *encompasses the production of **renewable resources** and their conversion into food, feed, bio-based products and bio-energy. It includes agriculture, forestry, fisheries, food and pulp and paper production, as well as parts of chemical, biotechnological and energy industries*” (EC, 2012)
- However, bio-economy is more than simple addition of sub-sectors: set of existing relations between human societies and the **biosphere** in several aspects:
 - provision of goods and services,
 - emission of pollutions and negative externalities
 - but also of positive externalities
 - in order to keep biosphere capacities and functionalities viable and sustainable for future generations.

Two premises

1. Biomass **is underexploited**:
 1. Too much fractions not used optimally
 2. More material and energy can be extracted from current biomass streams
2. The biomass potential **can be upgraded** by
 1. Closing yield gaps
 2. Introducing new or improved species
 3. Introducing new and improved extraction and processing technologies

Underlying idea

- Efficient and Sustainable Bio-economy is based on the principle of **fractionation**
- Based on fact that nutritional needs of animals and humans is never fulfilled by one crop only, such that a combination of fractions of plants and animals is always necessary
- Increases the **resilience** of the food system



Source: OBE and CEFS (after British Sugar)

Source: <http://www.comitesucre.org/site/about-sugar/sugar-production/>

CRADLE TO GATE

< Farmer to Product >



Soybean Farming

Soybeans



Soybean Processing

Crude Soybean Oil (20%)



Soy Oil Refining



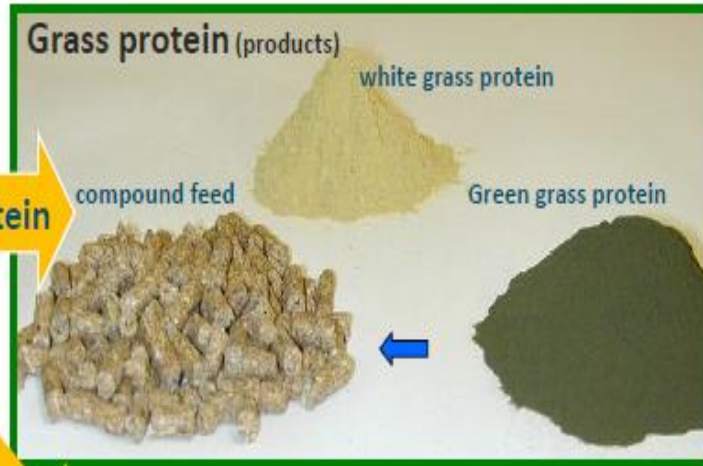
Soybean Meal (80%)



Animal Feed

Human Food





Source: GRASSA, Johan Sanders (WUR)

Grass juice

Fibers



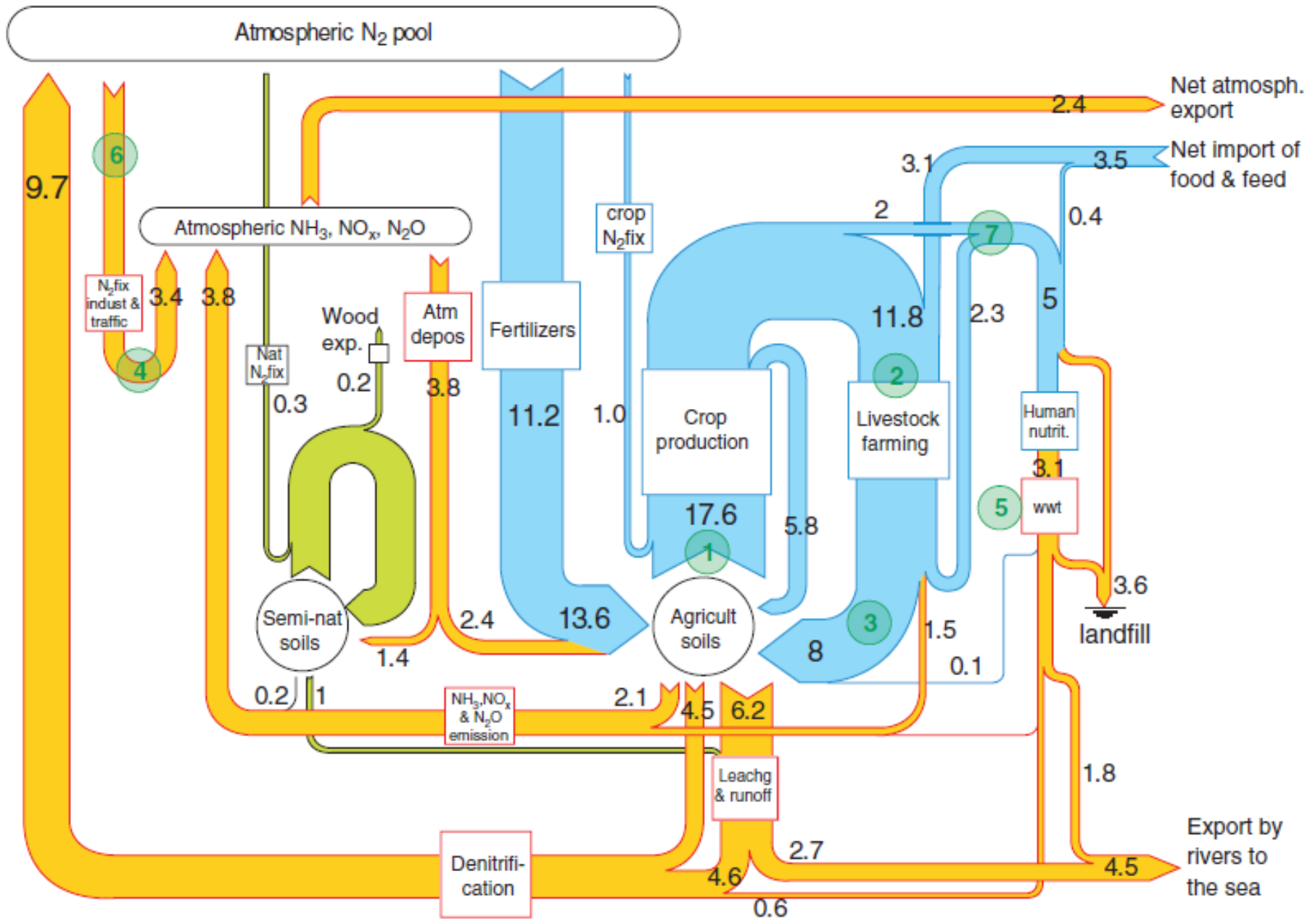
Mobile grass refinery unit ensures farmers can capture value added of bio-economy

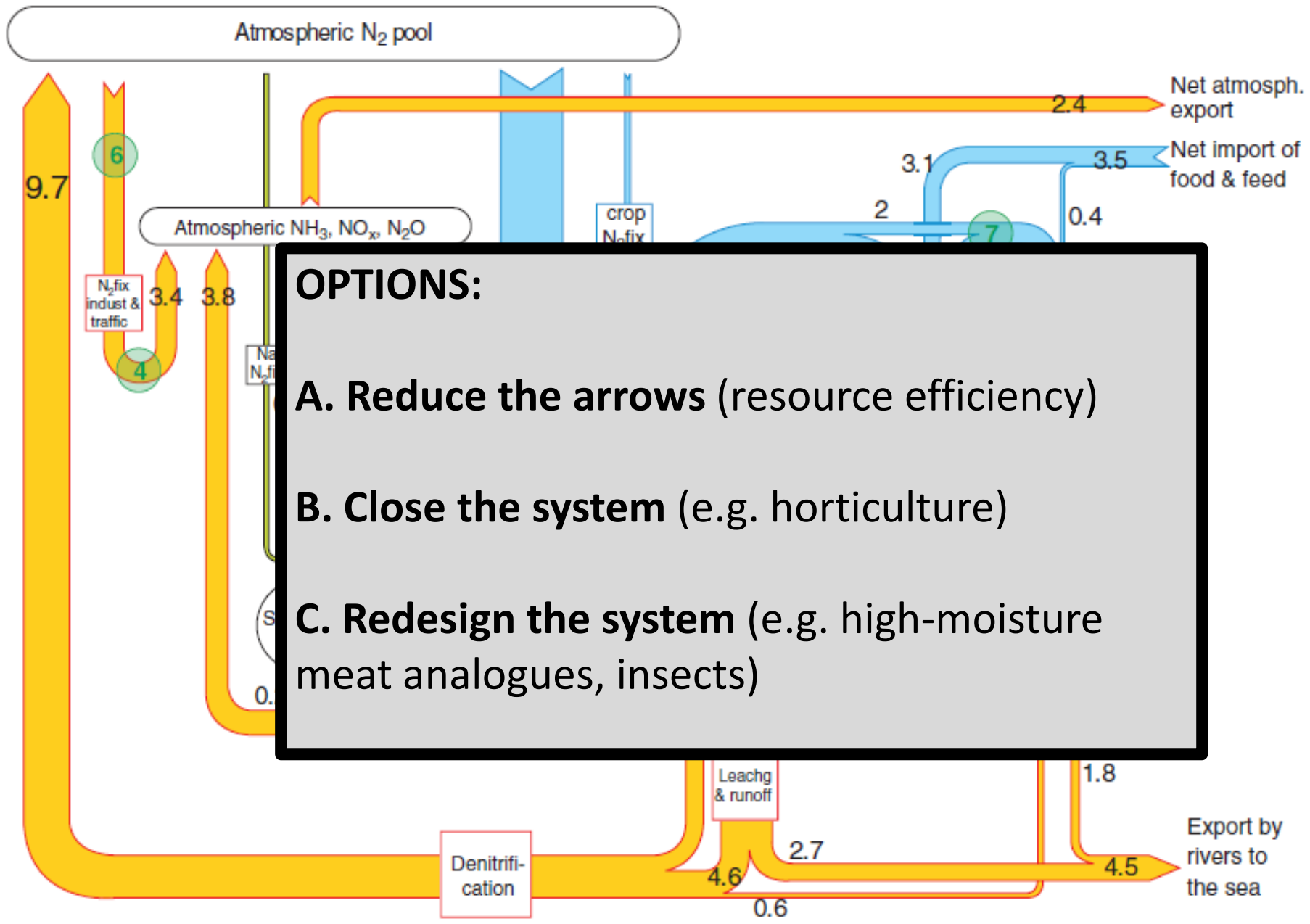
Actors and activities will be reassembled in time and in space

But

- Not all is “recycled” and “reused”
- Main challenges of agriculture relate to water-soluble and gaseous substances, mainly N and P related

Sutton et al., 2011. The European Nitrogen Assessment





Potential benefits and concerns: values

- Predominantly positive perception
- Concerns:
 - global food security and resource overexploitation (LDCs)
 - tension between policy focus on quality production and rural development versus cheap biomass as feedstock for non-food uses
 - impact of large-scale exploitation of feedstocks on primary sectors

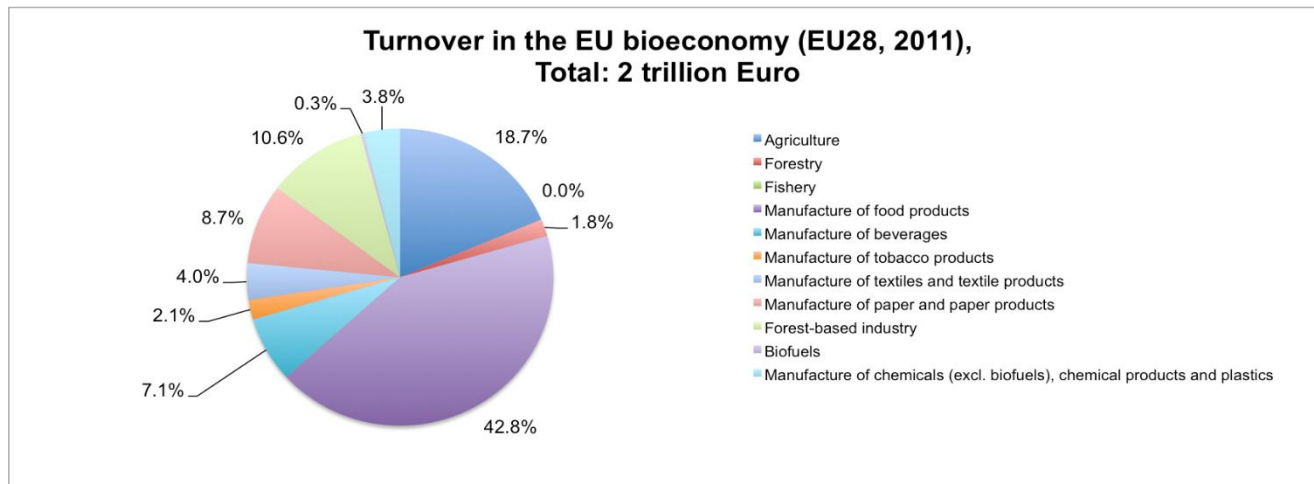
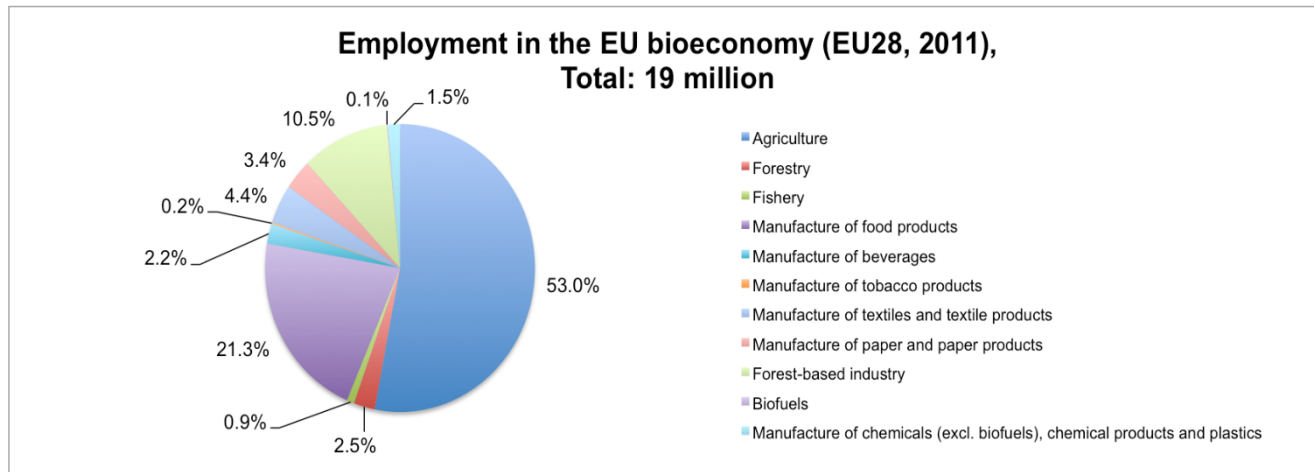
Addressing societal challenges

- Ensuring food security
- Managing natural resources sustainably:
 - New region-specific balance between production and ecosystem carrying capacity:
 - Sustainable intensification in areas with growth potential
 - Sustainable extensification in areas with high negative externalities
 - Better use of waste: circular economy
- Reducing dependence on non-renewable resources
- Mitigating and adapting to climate change
- Creating jobs and maintaining competitiveness

Scope (billion tonnes dry matter)

Sector	Status 2011
Food	1.75 (14%)
Feed	7.06 (58%)
Bio-based chemicals & materials	1.24 (10%)
Bioenergy	2.98 (16%)
Biofuels	0.15 (1%)
Total supply of biomass	12.18 (99%)
Total demand for biomass	12.18

Estimated employment and turnover in EU-28 in 2011



Five key principles for a sustainable bioeconomy

- **Food first:** ensure the primacy of food security
- **Sustainable yields:** amount harvested < regrowth → agriculture?
- **Cascading approach:** sequential use of biomass according to 'value added' → value?
- **Circularity:** reduce/reuse/recycle
- **Diversity:** systems are diverse, using context-specific practices at different scales, producing a diversity of outputs

Policy frameworks

- Many regulations and strategies in Europe: CAP, EU forest strategy, Common fisheries policy, Blue growth agenda, New EU framework for aquaculture, quality schemes, Renewable Energy Directive, 2030 framework for climate and energy, standards for bio-based products and circular economy,...
- **Conflicting interests but need for coherence: an integrated policy framework**

ISSUE 1: Governance

- Outcomes of bioeconomy will depend on the rules put in place to **regulate** the system.
- Bio-based materials and bio-energy may create pressure on natural resources and on **social inequalities** in a scarcity-dominated world.
- Bioeconomy involves both positive and negative **externalities** influencing the future of the biosphere and the ways in which societies will use it
- So bioeconomy **governance** is critical
- **Research** should help develop framework aimed at fostering the bioeconomy - policies that are coherent, create a level playing field, avoid the overexploitation of natural resources and foster a diversity of practices

ISSUE 2: Business models

- Circularity = new ways of designing and manufacturing products, new relationships between economic actors, new ways of recycling components and waste, etc.
- Actors and activities will be **reassembled** in time and in space
- Different production models in terms of scope and size should not **co-exist** and work together
- **Public goods** are part of the new production (ecosystem services) and could involve public sector

ISSUE 3: Socio-cultural dimensions

- Knowledge on impacts and mechanisms of social change should **co-evolve** with technology
- All **stakeholders** should be fully involved in governance of bioeconomy
- Science may radically **change food production and consumption patterns**, with potential to reduce pressure on ecosystems
- This may break established routines and create **resistance**, which needs to be better understood.
- Approaches have **legal** implications that need to be understood and addressed by research.

ISSUE 4: Down the chain

- By-products are exploited upstream, but waste and losses occur mainly downstream
- Particularly at the level of the consumer: largest share of waste in rich countries + no “end-of-life” valorisation of food
- Probably the biggest challenge of the bioeconomy