Bioplastics in Food Packaging: Potentials and Challenges from an Environmental Point of View

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Hamburg Sustainability Session #2 – Towards a Circular Economy

The Unsolved Issue of Plastic Littering

- About **8 million** tonnes of plastic waste are entering the oceans every year
- Global plastic production expected to **triple until 2050**
- Despite improvements in waste collection frameworks: littering remains an undeniable reality
- Particular threat to marine ecospheres and (via food chains) also terrestrial beings

⇨ Need for a coherent **technology switch**

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What are „Bioplastics“?

- Whole family of polymer materials characterized by different properties and suitable for different applications
- Common definition: Plastic materials which are bio-based **and/or** biodegradable

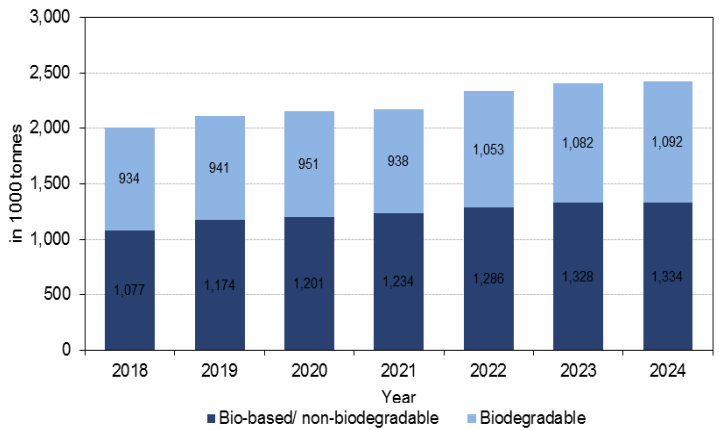
Bio-based: the material or product is (partly) derived from biomass (plants). Biomass used for bioplastics stems from e.g. corn, sugarcane, or cellulose.

Bio-degradable: Biodegradation is a chemical process during which microorganisms that are available in the environment convert materials into natural substances such as water, carbon dioxide, and compost (artificial additives are not needed).

Source: European Bioplastics

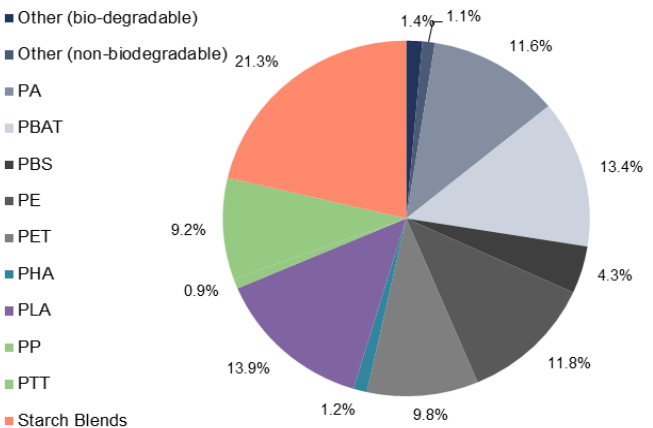
The Market for Bioplastics

Global production capacities of bioplastics



Source: European Bioplastics (2020).

Global production capacities 2019 by material type



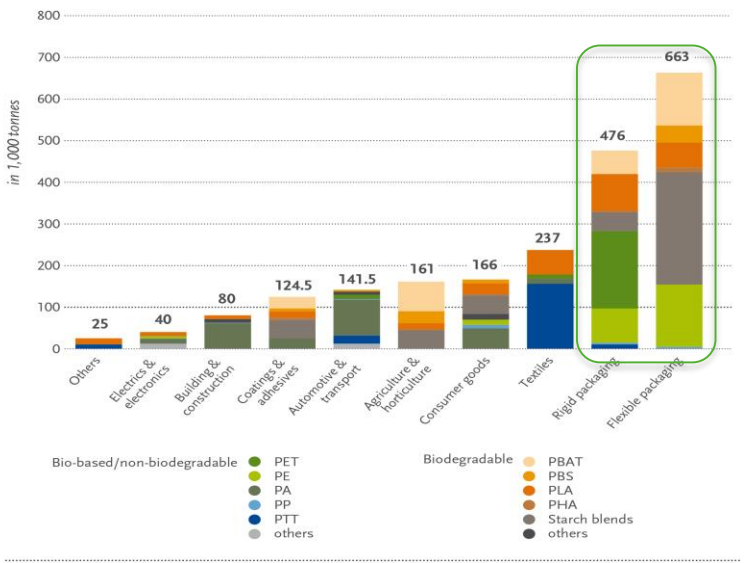
Source: European Bioplastics (2020).

Bioplastics in the Packaging Sector

Potentials of bioplastics for food packaging:

- Variety of materials can address different requirements (e.g. bags, bottles, trays, foils)
- Blending with other materials / additives to adapt to specific use cases (e.g. multi-layer films)
- In case of **bio-based materials** (e.g. Bio-PET): contribute to a reduction of the carbon footprint
- In case of **biodegradable materials** (e.g. PLA): composting as a way to circumvent the issue of food contamination in recycling

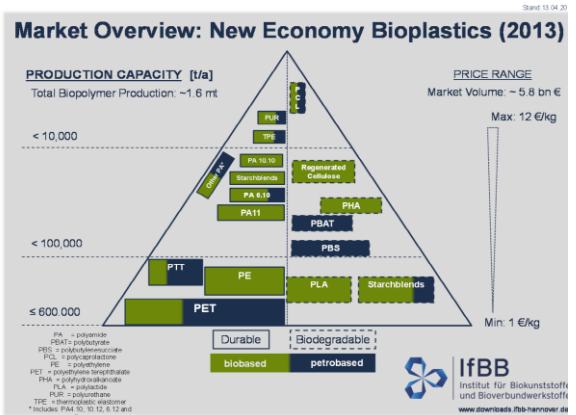
Global production capacities of bioplastics 2019 (by market segment)



Source: European Bioplastics, nova-Institute (2019). More information: **www.european-bioplastics.org/market** and **www.bio-based.eu/markets**

Obstacles to Market Penetration

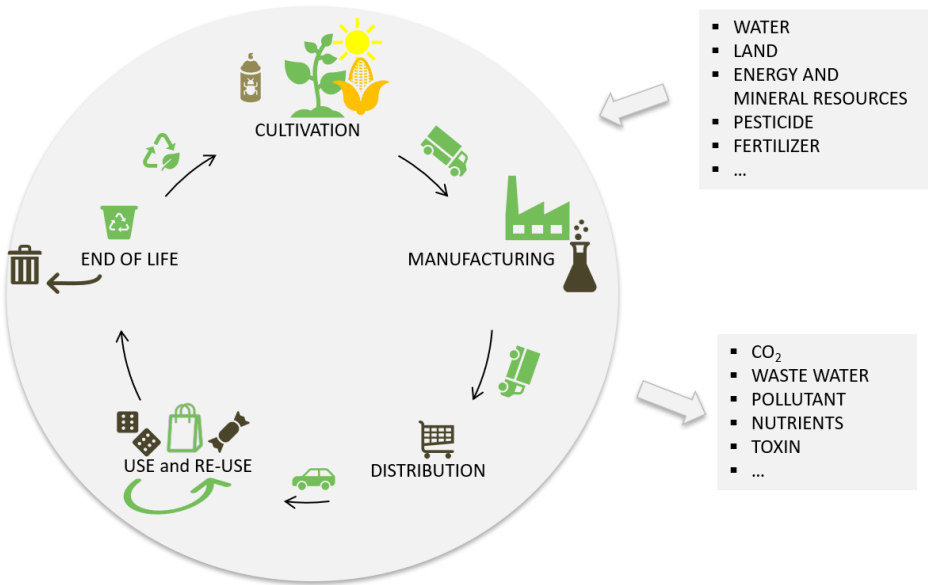
- High prices
- Uncertainty about material properties
- Uncertainty about end-of-life fate
- Sustainability concerns



Required: Life Cycle Oriented Thinking

Life Cycle Assessment as a tool for …

- Identifying environmental and economic hotspots in the life cycle
- Comparing the consequences of different end-of-life treatment options



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Lessons from the ELCA Literature

Advantages compared to conventional plastics

- Low contribution to global warming (carbon credit)
- Less dependent on scarce (and concentrated) fossil resources
- Offer alternative end-of-life options

Drawbacks compared to conventional plastics

- Land occupation and emissions in land conversion
- Release of chemical substances from use of fertilizers and additives (acidification, eutrophication, human toxicity…)
- General ethic consideration: competition with food supply chain

Three Central Challenges in the Supply Chain

Feedstock cultivation:
Need to overcome dependency on food plants

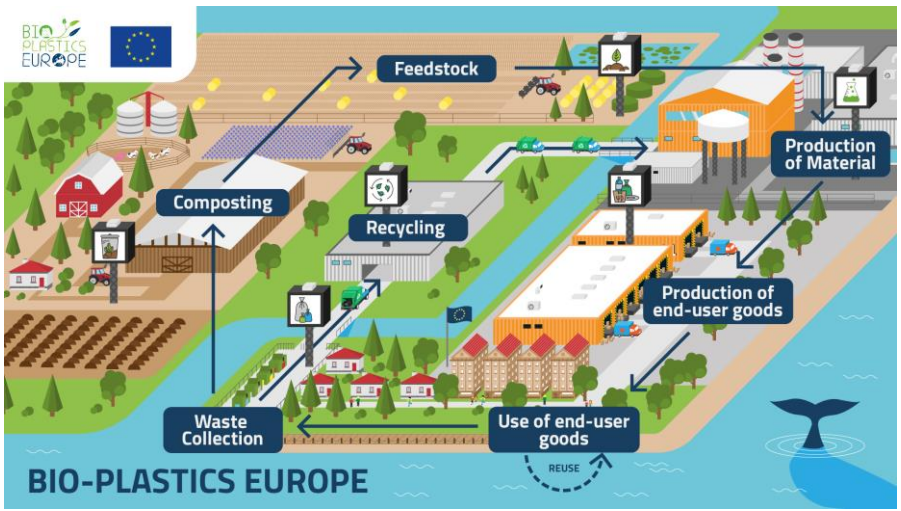
Bio-refinery:
Improve energy balance of polymer processing

End-of-Life treatment:
Create sustainable waste management frameworks

Goals of the BIO-PLASTICS EUROPE Project

Create sustainable strategies for bio-based plastics by means of…

1. Innovative product design
2. Development of health and safety standards
3. Development of business models for efficient reuse and recycling
4. Environmental and economic life-cycle assessment



Work Package on Life Cycle Analysis

Specific goals:

- Life cycle analysis for products / supply chains developed in the project:
  - Potential environmental impacts
  - Cost performance
  - Future demand potential
- Integrated assessment: conditions for products as successful business case / means to overcome the plastic debris

Contributions to project-wide goals:

- Contribution to the development of innovative business models
- Contribution to knowledgebase and thus the communication strategy of the project

Work Package Lead

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Many thanks for your attention!