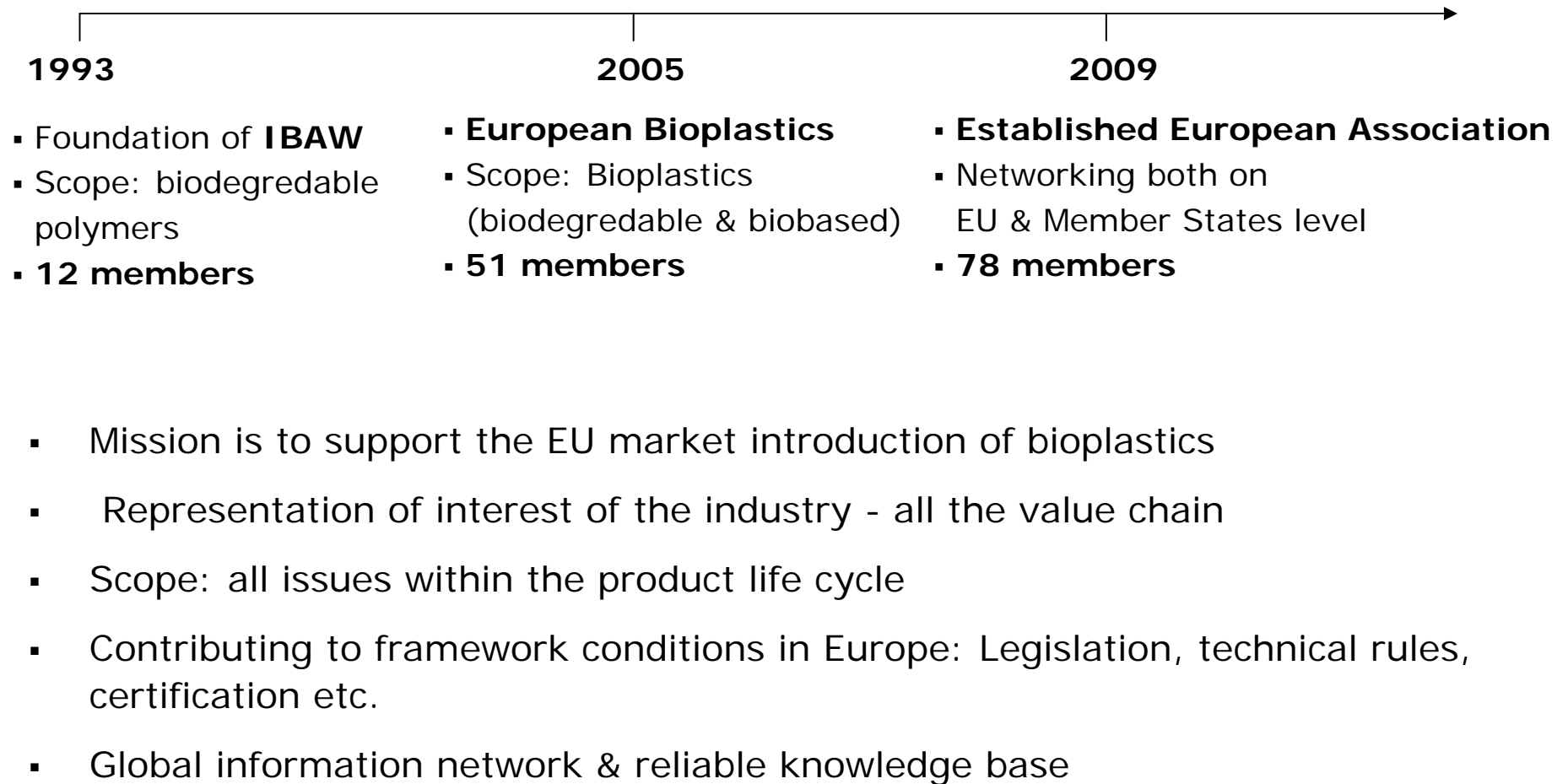


# Biodegradable & Bio-based Plastics Market Introduction & Framwork

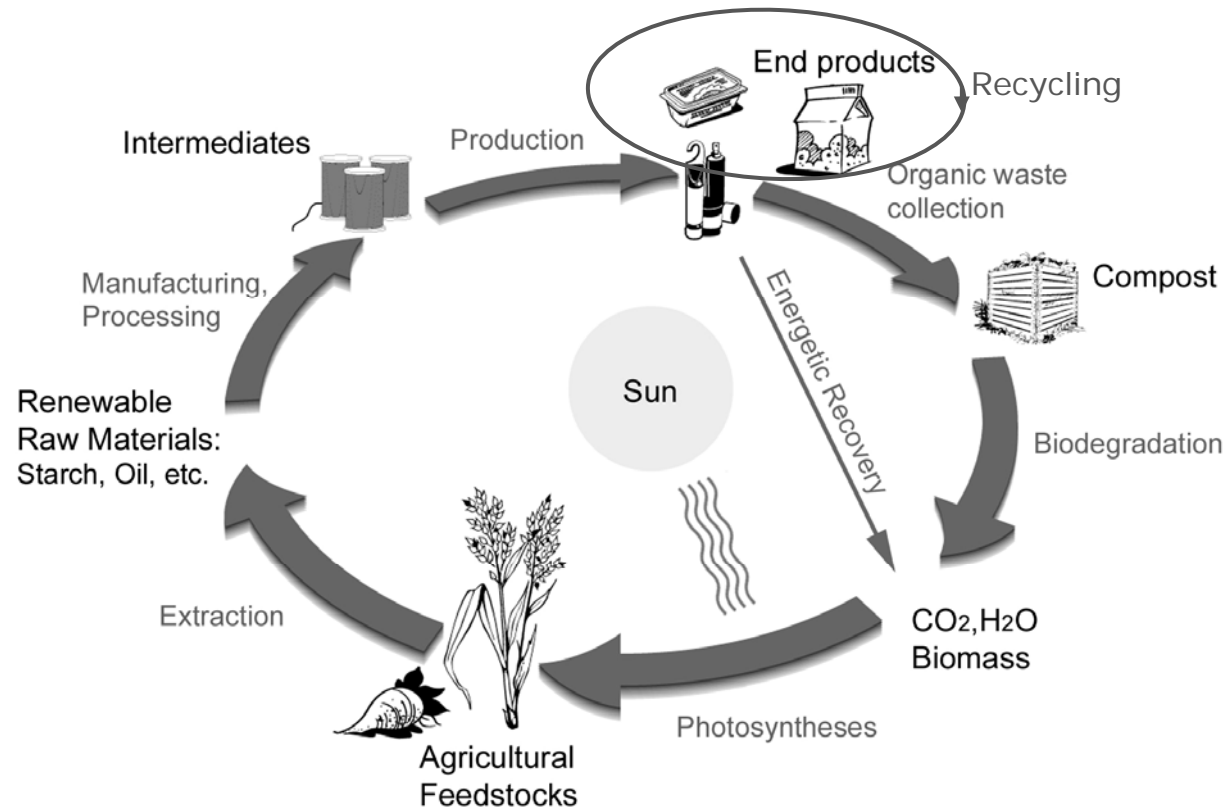
Marcel Dartee, Member of the board



# About European Bioplastics

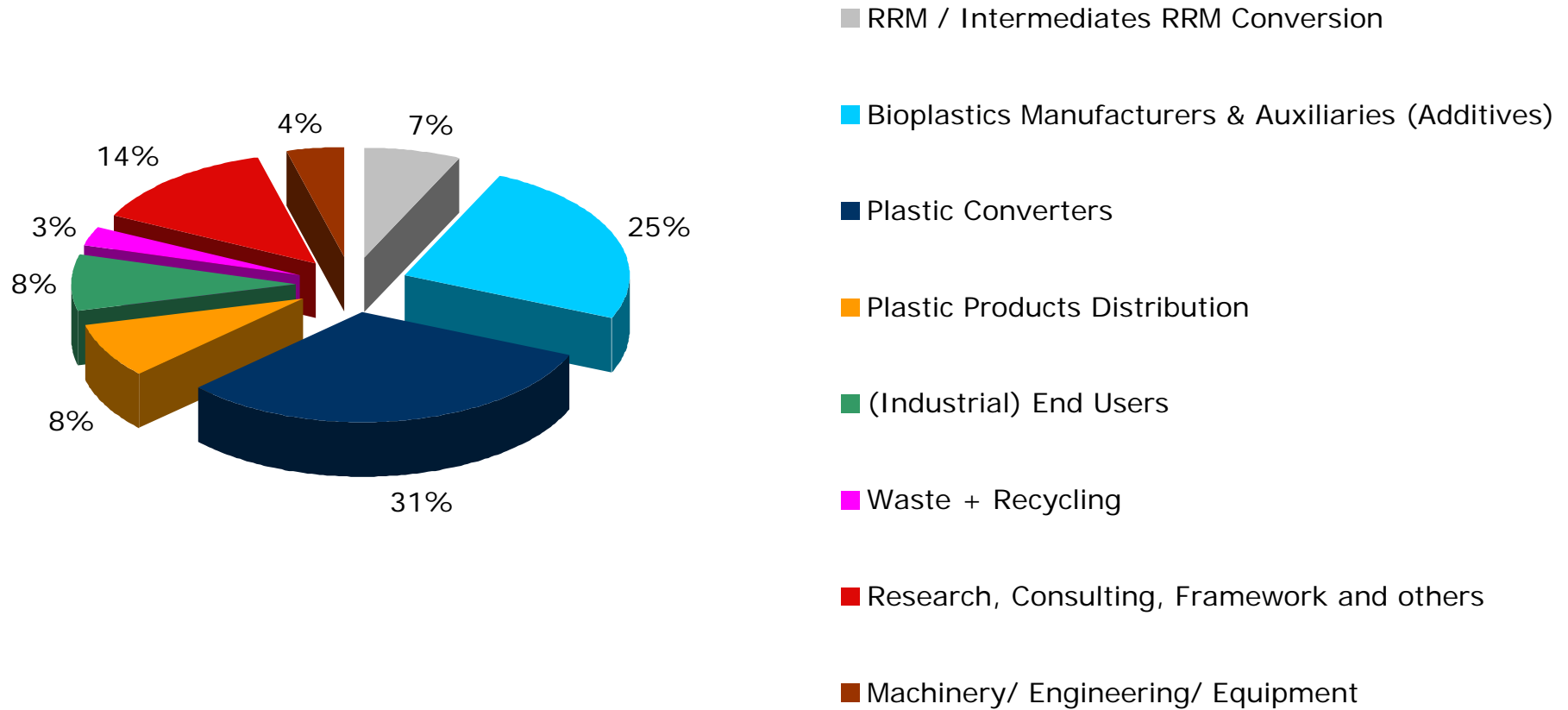


## Nature's closed loop is our guideline



- **Renewable raw materials for plastic manufacture.**
- **Organic Recycling (Composting) - A new option.**
- **CO<sub>2</sub> Recycling - For climate protection.**

# Membership Structure by Sectors



## What are Bioplastics?

- By definition of the association:
  - Biodegradable polymers according to standards (EN 13432 a.o.)
  - Polymers based on renewable raw materials (% renew. carbon)
- Most of the bioplastics are based on agricultural feedstocks:  
Sugar, starch, vegetable oils and cellulose, also food residues
- Many of the products are biodegradable / compostable
- Different polymers with different properties and functionalities
- Synthetic components are used for performance reasons, e.g. processing aids, additives, colors, inks, glues, ...

## Bioplastics: Many Types - A New Material Class

- **Biodegradable / compostable but not bio-based (examples):**
  - Synthetic Polyesters (BASF, Mitsubishi, a.o.)
  - Polyvinylalcohol
  
- **Biodegradable / compostable AND bio-based (examples):**
  - Polylactide PLA (NatureWorks Ingeo, Total-Galactic, Mitsui, a.o.)
  - Starch based materials (Novamont, SPHERE-Biotec, Plantic, a.o.)
  - Cellulose based materials (Innovia, a.o.)
  - PLA compounds / blends (BASF, FKUR, a.o.)
  - Polyhydroxyalkanoates PHA (Telles, Kaneka, a.o.)
  
- **Biobased but non-biodegradable (examples):**
  - Bio-PDO based polymers (DuPont)
  - PE from Bioethanol (announced by Braskem, DOW)
  - PVC from Bioethanol (announced by Solvay)
  - Polyamides PA 6.6.9 / 6.10 / 11 (Arkema, BASF a.o.)

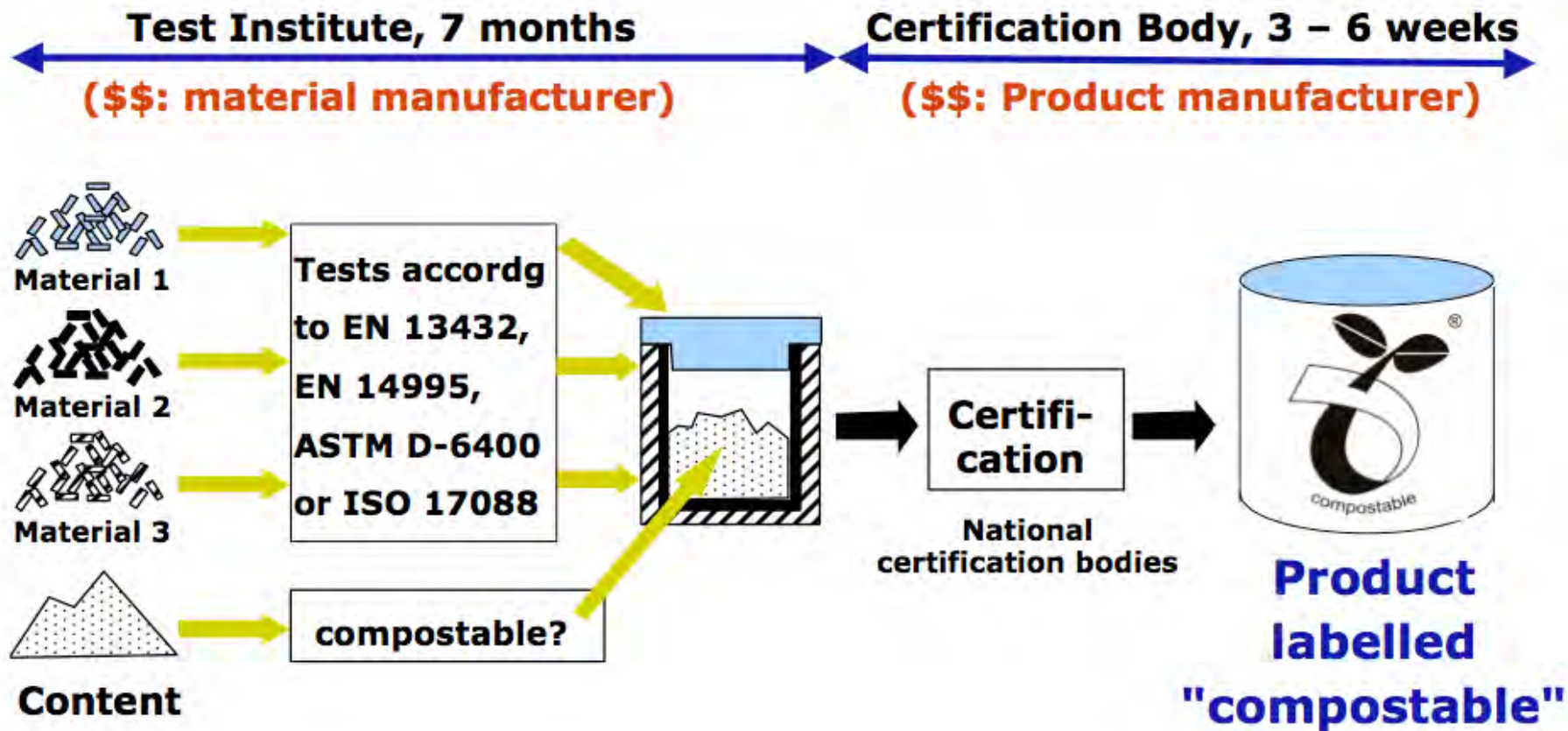


## Compostability is one basic pillar of ,Bioplastics'

- After testing of materials or products according to the standards, third party certification provides a Quality mark (the so-called "seedling")
- Main tool for identification at buying and disposal; tool for differentiation from conventional plastics
- EU wide approach, certification schemes have been established in B, CH, D, I, NL, PL, UK
- EU industry signed a voluntary self-commitment to use certification based on the EN 13432 standard if compostability is claimed (acknowledged by the EU Commission, DG Enterprise)
- Certification according to EN 13432 serves as a definition of products eligible for legal privileges



## 2-step system of Compostability Certification





## Certification of the renewable resource basis of Bioplastics

- How determine the biobased content?
- Do we need further criteria?
- Broad range of different materials – establish certification as an instrument of fair competition



→ We have clear definitions and a certification system in place for the Compostability of materials & products. We need a similar system for the ,Biobased Content'.

## Bioplastics Market Development: Main Drivers

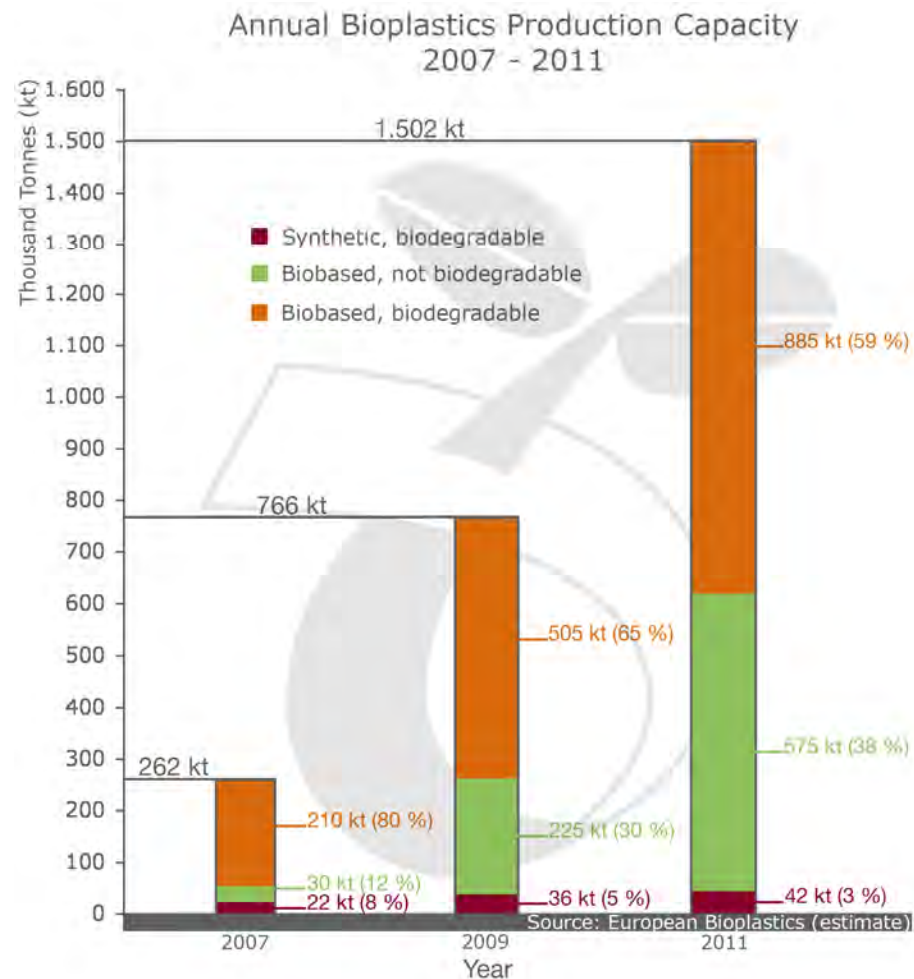
- Technical properties & functionality is selling
- High consumer acceptance (eco marketing)
- Organic recycling is a cost-efficient new recycling option
- Reduce global warming through CO2 savings
- Reduce fossil raw material dependence & cost
- Biorefinery concept - regional economy sourced from biomass
- Corporate social responsibility programmes (CSR)
- In the longer term: Economical perspectives
  - Petrobased conventional plastics: Price increase (50-80% in 2 y)
  - Bioplastics: Significant potential for cost reduction through economy of scale (today: 1,3-4 EUR/kg)

## Market Introduction of Bioplastics in Europe

- Total Market Consumption (2007): 50,000 - 100.000 t
- Compare to standard plastics: 48,000,000 t
- High market growth rates (>20% p.a.)
- Most important biodegradable polymer applications are
  - (Organic) Food and service packaging (compostable)
  - Compostable biowaste and shopping bags
  - Biodegradable mulch film & horticulture auxiliaries
- Biobased but non-biodegradable plastics today are marketed in technical segments (specialities like automot. fuel lines) but expected to start a big "second wave" in the next years when RRM will be "entering" traditional plastics manufacture (e.g. PE)

# Mission possible: Global Production Capacities

- Capacity will triple in the next two years and again double until 2011.
- All bioplastics categories will grow but non-biodegradable biobased plastics the most
- Be aware: Estimates based on recent announcements - not all might come true
- Constant high growth





## Trend: "Organics come into organic packaging"





## Trend: Shopping and biowaste bags double use & added value



## Trend: Compostable Service Packaging for Catering

- Disposable compostable cups, cutlery, trays, plates, bags etc. can be composted together with food residues, for take away food or event catering (e.g. rock concerts or sport events)



## Biobased but non-biodegradable bioplastics

- Biobased plastics like "Bio-PE",  
 biobased polyester blends  
 or polyamides
  
- Use mainly in "Durable Products"  
 application sectors:
  - Automotive
  - Electronic devices (boxes)
  - Textiles / apparel
  - Compounds (construction)
  
- RRM use, CO2 savings and technical  
 performance are drivers for use



## Bioplastics – Environmental Profile

- Most bioplastics use agricultural feedstocks (biobased carbon), (renewable) energy is consumed for their production
- First LCA results reveal significant potential to reduce fossil energy consumption and CO2 emissions, however no generalisation possible
- Neither their manufacture (processing), nor the product design or distribution as well as their best EoL option has been much optimised yet (initial phase of market introduction, small production facilities)
- The optimisation and improvement potential is huge: - more efficient processes (by upscaling) - use of non-edible crops (switch grass, wood) or food waste - install use cascades with re-use/recycling and thermal recovery
- LCA comparison of premature bioplastic products with mature products could be misleading (calculate with realistic future improvement)



## End of Life Options: Recovery and Recycling

- Organic recycling (composting) is a new option for plastics. It is the preferred route for those bioplastics products, which are certified compostable according to EN 13432 and for which composting offers an added value, e.g. biowaste bags, mulch film and food contact packaging "contaminated" with food residues (e.g. catering products)
- All other recycling options for plastics can be applied as well. Depending on the volumes and market concentration also back-to-plastic recycling of bioplastics can be established in the future. With low bioplastics volumes on the market thermal recovery often is favored (economical constraints)
- Labelling and communication is key to establish best practice waste management solutions for bioplastics



## EU Framework Conditions for Bioplastics

- **Incentives & Funds**
  - FP7 funds available for research (biorefineries)
  - Environmental Technology Action Plan (incl. unspecific funds)
- **Policies**
  - Lead Markets Initiative for Biobased Products announced 2008
  - MS Memorandum on Industrial RRM Products (call for action plan)
  - Sustainable Product Policy (SPC; Green Book MBI) and Sustainable Industrial Policy (SIP)
- **Legislation**
  - Specific and supportive legislation for bioplastics exist only in MS
  - Packaging and Packaging Waste Directive: Organic recycling
  - Biowaste Directive urgently required (regulate organic recycling)

## Possible Initiatives & Measures for Support

- **The strategy:**

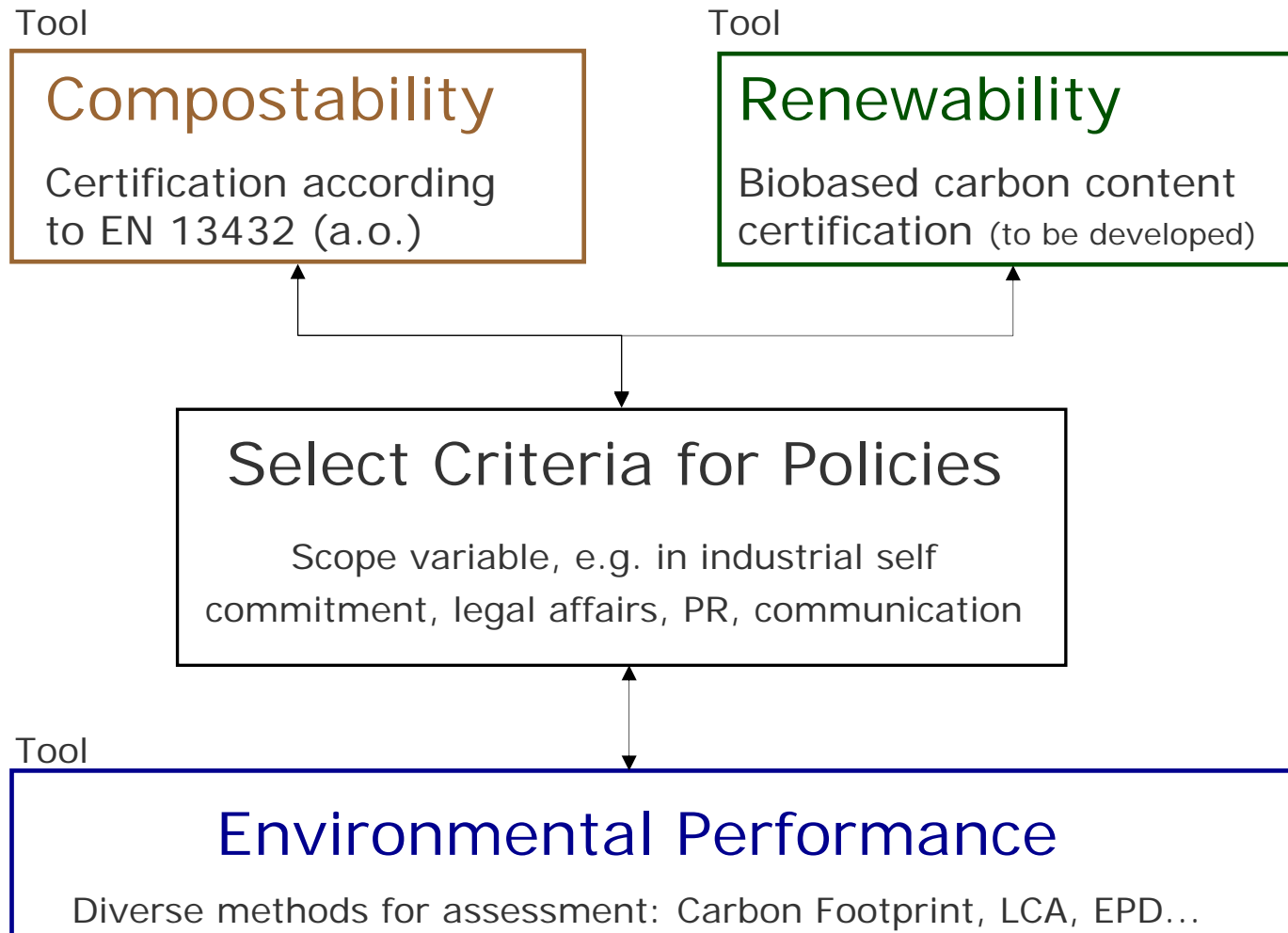
Integration of high-tech biobased products, biofuels and bioenergy in one biomass strategy (policy). The objective is to establish synergistic high value **use cascades**: produce a high tech/value bioproduct, recycle it (if possible) and produce green energy/fuels from the production residues or its waste.

Short shelf life products should be biodegradable / compostable if composting or biodegradation is useful for the system (mulch film, food contact packaging, disposable catering etc.)

- **Possible measures:**

- remove legal barriers (e.g. allow the organic recycling)
- provide legal/fiscal/CO<sub>2</sub> incentives during market introduction
- support information campaigns to educate consumers

# Fundamental Toolbox for Bioplastic Policies



## Summary & Conclusions

- Bioplastics are an important innovation of the chemical & plastics industry and developed worldwide
- Cover a range of polymers (biodegradable / biobased), and a wide range of products and applications
- Biodegradability (functionality) and renewability (sourcing) are outstanding features (USP)
- EU Market introduction has started successfully (performance driven), the packaging sector has a huge potential for bioplastics
- EU framework conditions so far lack specific measures to support market introduction and trigger growth of this innovation
- European Bioplastics is building a network of interests to shape framework conditions

# Thank you!

**4<sup>th</sup> European Bioplastics Conference**  
10./11. November 2009 in Berlin



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