SUSTAINABLE PRODUCTION & HEALTHY EATING
FACT SHEET



SHEET NO. 1

This fact sheet is one of a series compiled by the Food Innovation Centre at the University of Nottingham, providing clear, concise and scientifically reliable information on key topics for SMEs

Sustainable food & drink packaging

Why do we need packaging?

Because it offers many essential functions such as: protection, containment, preservation, information and branding.

However, as the production, transport, use and disposal of current packaging solutions can have great environmental costs, more sustainable alternatives are needed and becoming increasingly desired by consumers.

Why is important to reduce packaging?

1) It makes good business sense

- Target eco-conscious consumers – increase brand equity.
- Increase customer satisfaction through easier disposal and recycling of packaging.
- Cut raw material costs of packaging.
- Reduce distribution costs with improved transit and storage efficiencies by improving pallet loading.
- Cut the cost of compliance with growing legal obligations by being prepared for future changes in legislation.

2) Changes in the law

- Annual targets set by UK packaging regulations to increase the obligation of producers to recover and recycle it.
- New legislation and regulations to reduce carbon emissions such as the reform of UK packaging EPR (Extended Producer Responsibility) system with changes expected to come into effect in 2023. Changes to include the introduction of the Plastic Packaging Tax and the Deposit Return Schemes (DSR).

3) Environmental impact

- Reduce use of natural resources (oil, minerals, sand, forest, land, etc.) and associated pollution, the power used in the manufacturing process, and the creation of landfill sites by its disposal.
- Reduce indirect environmental impacts, such as the energy used transporting packaging throughout the supply chain.
- Contribute to the circular economy.
- Reduce the size of your company's carbon footprint.
- Reduce land and oceans pollution.

How to be more sustainable?

- Check weight against best in class and consider lightweighting
- Choose recycled and sustainably sourced raw materials
- Design packaging to be easy to reuse, recycle or compost

Packaging materials & sustainability

Material	Pros	Cons
Glass (bottles, jars, food containers)	Strong, durable, inert, heat resistant, easy to sterilize. Suitable for recycling and reuse	Heavy and fragile. Raw materials costly, not renewable and intensive energy required during manufacturing
Metal (tin & drink cans, foil, trays)	High strength-to-weight ratio; strong and flexible. 100% recyclable. Hight recycled content. Provide long shelf-life	Raw materials not renewable and intensive energy required during manufacturing
Paper and board (box, bags, sleeves, food containers)	High strength-to-weight ratio, lightweight, flexible. Recyclable, compostable. High recycled material content	Poorer physical strength. Absorbent. Cannot be recycled indefinitely. Biodegrades and release methane in landfill
Plastic (bottles, pots, trays, food container)	Versatile, cheap, high strength-to weight ratio. Can use high recycled content (i.e., rPET)	Difficult to recycle and reuse. Non-renewable raw materials. Heavy polluters of land and oceans
Composite (drink cartons)	Lightweight. Provide long shelf life. Use minimal raw materials	Little recycled content and hard to recycle
Bio-plastic (bottles, pots, trays, food container)	Versatile, high strength-to-weight ratio. Can be made from renewable raw materials and waste products. Can be industrially compostable	Potential contamination of standard plastic recycling streams when bio-plastic not disposed correctly. Can biodegrade and release methane in landfill. Not heat resistant

University of Nottingham
UK | CHINA | MALAYSIA
European Union
European Regional Development Fund
MIDLANDS ENGINE
HM Government

Are bioplastics more sustainable than plastic?

The bioplastic family

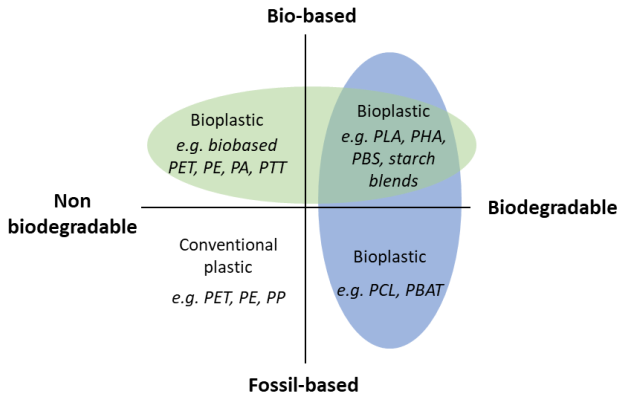
Bioplastics are not just one single substance; they comprise of a whole family of materials with differing properties and applications. Plastic material is defined as a bioplastic if it is either:

1. **bio-based** and **not-biodegradable** (e.g., PET, PP, or PE)
2. **bio-based** and **biodegradable** (e.g., PLA and PHA or PBS)
3. **fossil-based** and **biodegradable** (e.g., PBAT, PCL)

Bio-based does not equal *biodegradable*

- **Bio-based**: material or product is derived from renewable biomass (e.g., corn, sugarcane or cellulose—potentially from food waste streams), as opposed to conventional plastic that is derived from oil.
- **Biodegradable:** material or product that can be broken-down by microorganisms when specific environmental conditions (e.g., temperature, humidity, pH, oxygen etc.) are met.

The property of biodegradation does not depend on the resource basis of a material (i.e., plant or fossil-based) but is rather linked to its chemical structure. In other words, 100% bio-based plastics may be non-biodegradable, while 100% fossil-based plastics may be biodegradable.



To complicate the matter further, some bio- and conventional plastic can be **degradable**. These plastics materials, such as PP (polypropylene) or PE (polyethylene), have a small amount of a heavy-metal compound added during manufacture that helps to break down the plastic in a controlled timeframe.

Biodegradable does not equal *compostable*

The standard EN13432, administered by the UK Composting Association, sets strict requirements for packaging recoverable through composting and biodegradation for both home and commercial composting systems. It covers: (1) level of biodegradability, (2) amount of disintegration during treatment, (3) effect on the treatment process and (4) on the quality of the resulting compost.

Packaging that has achieved EN13432 certification should be labelled clearly with the wording 'compostable' and the 'seedling' logo as to ensure bioplastic packaging are disposed correctly.

Generally, home composting is only possible with compostable films (e.g., bioplastic bin liners), as rigid compostable polymers would require the higher temperatures associated with industrial composting facilities to begin biodegradation.

Bioplastic that enters the standard plastic recycle streams can cause serious contamination problems, hence it should be sent to incineration or landfill if composting is not possible.

Industrial composting facilities are currently scarce in the UK; however, the government has committed to the roll-out of a country-wide household food waste collection by 2023, with the associated potential development of the industrial composting infrastructure. Click here for a practical cost vs sustainability comparison of different food containers available in the market.

Future packaging—smart packaging

Smart food packages are being developed with the potential to offer active solutions to keep food safer, high-quality and to reduce waste:

Active packaging refers to the active components (e.g., moisture absorbers; ethylene, carbon dioxide and oxygen scavengers; antimicrobial; antioxidants) that are incorporated in the package to maintain or extend the product quality and shelf-life.

Intelligent packaging refers to indicators (time-temperature, freshness, gas), sensors (chemical, biosensors) and data carriers (barcode, RFID-tags) added to the packaging to monitor the condition of food to provide quality information during transport and storage.

Packaging symbols—examples

Recycle	Packaging collected for recycling by ≥ 75% of local authorities	Don't Recycle	Packaging collected for recycling by ≤ 50% of local authorities
X%	Indicates that the packaging is recyclable. '%' indicates the percentage that has been made from recycled material		
	Fully recyclable glass packaging	alu	Fully recyclable aluminium packaging
Corrugated Recycles	Fully recyclable corrugated packaging	FSC	Made of wood/paper from well managed forests
	Packaging producer contributes to Green Dot packaging recovery scheme	compostable	Product is certified to be industrially compostable according to EN13432 standard
OK compost VINÇOTTE	Product is certified to be industrially compostable according to EN13432 standard. Products suitable for home composting are marked with 'HOME'		
1 PET / 3 PVC	Number indicated the plastic type. For example: 1: PET (polyethylene terephthalate). Recyclable 3: PVC (polyvinyl chloride). Not recyclable		

Resources

D'Agostino D (2021) 'Sustainable food and drink packaging'. In: D'Agostino D (2021) 'Sustainable production in the food and drink sector'.

Contacts & further information

Written by Dr Daniele D'Agostino (Jan 2021).

SB-FoodInnovCentre@exmail.nottingham.ac.uk

To download this document, the main reference guide and more: https://www.nottingham.ac.uk/biosciences/facilities/food-innovation-cetre/research-sustainable-production.aspx