



This fact sheet will focus mainly on food waste for packaging, but also will explore brief information about food waste in general.

What is Food and Drink Waste?

FAO defines food waste as any change in the availability, edibility, wholesomeness or quality of edible material that prevents it from being consumed by people. According to FAO a third of the total weight of edible parts of food produced for human consumption is lost or wasted. Valorisation is creating value.

Why Improve or Valorise our Food/Drink Wastes?

Population growth- By 2050, the Indian population will exceed that of China and the overall world population is expected to exceed 9 billion (currently around 7 billion). This rapid increase in population and the required food supply to feed the world is unbalanced. Therefore, nations need to practice efficient methods for utilising available resources i.e. sustainable development approaches, including utilisation of food waste for further food products, for animal feeding, for packaging materials, for bioenergy and for composting materials (soil fertilizers).

Decline in agricultural productivity- The continued trend in using chemical fertilizers to boost productivity is now considered a short term solution that has a big drawback in the future as fertilizers will ultimately make the soil infertile

Underutilisation of the available resources- In most cases, the product of interest is the main focus for any industry, with less or even no utilisation of the by-products and wastes. Lack of complete scientific knowledge of the biochemical composition of food wastes/by-products may be the reason why their utilisation is currently limited.

Economic sustainability improvement- Effective waste management is crucial to increase profitability levels of food chain members. The principle is utilising material that otherwise will have been thrown away and using that material in an efficient way.

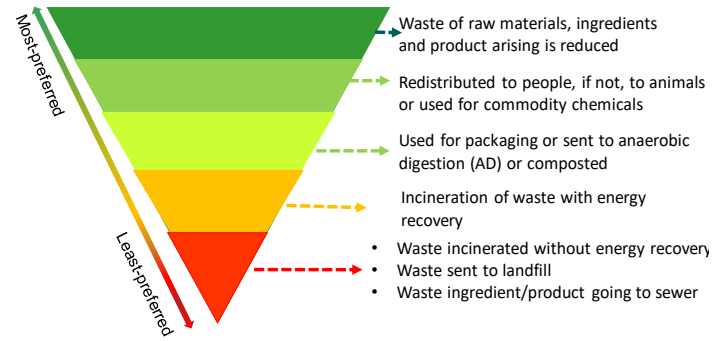
Food/Drink Waste Utilisation: Options and Opportunities

Food and drink waste could be valorised in various ways depending on the type and condition of the food. Examples include food/drink waste for:

- ✚ Further food products
- ✚ Food ingredients (commodity chemicals)
- ✚ Animal feed
- ✚ Energy or biofuel production
- ✚ Composting/soil fertilisers.
- ✚ Packaging materials

When all these options are not possible, food /drink waste ends up to landfill/sewer.

The waste heirarchy diagram below illustrates the most and least preferred ways of food waste utilisation.



Turn Food/Drink Waste into Further Food Products

- Brewers' spent grains (BSG) butter milk biscuits
- BSG for bread making
- BSG for fibre rich pasta
- Gluten free crackers from seed oil press-cake

Turn Food/Drink Waste into Functional Food Ingredients

A number of value added food ingredients could be valorised from food/drink waste: E.g. bread waste could be utilised for:

- Production of glucose
- Production of protein
- Production of yeast

Other examples include:

- Production of vinegar from vegetable waste
- Protein concentrates from potato by-products
- Fibre /pectine from apple pomace/citrus waste
- Natural colourants from coffee waste

Turn Food/Drink Waste into Feed for animals

- Apple pomace for cattle feed
- Coffee waste for animal feed
- Brewers' spent grains for animal feed
- Feeding food waste to insects to feed animals for protein

Turn Food/Drink Waste into Bio-energy

- Bioenergy from dairy waste
- Farm waste and animal fat as biofuel for airplanes
- Methane from Food/Drink waste (Anaerobic Digestion)

Turn Food/Drink Waste into Compostable materials

- Coffee husks as soil fertilisers
- Composting food/drink waste from catering, schools etc.

Turn Food/Drink Waste into Packaging Materials:

Definitions

Biodegradables: Products that have the ability to break down safely and relatively quickly. These products can be broken down by enzymes or micro-organisms into other organic molecules.

Compostable: Compostable materials are eventually turned into a nutrient-rich resources e.g. as soil fertilizer.

Bioplastics: are made from natural materials like vegetable oils, not fossil fuels. Depending on how they are processed bioplastics may be compostable, biodegradable or just degradable.

Biodegradable polymers (chemically modified plastics): Have certain degrees of inherent biodegradability to make it easily breakable in nature and so less harmful to environment.

Biodegradable biopolymers: are naturally occurring materials from plants or animals. Plants examples include, cellulose (fibrous) and polysaccharides (starchy). A good example of biodegradable biopolymers from animal sources is protein films from e.g. whey proteins used for food coating.

Packaging materials from agri-waste.

Making use of fibrous cellulose materials from sugar processing by-product known as bagasse for packaging. This is a good example of biodegradable biopolymers.



Another example of biodegradable biopolymers from plant starch is **poly-lactic acid (PLA)**. Sugars in the form of starch could be obtained from grains like corn, and fermented using Lactic acid to produce **PLA**, which could be easily moulded to different shapes and products. Pre-treated PLA (via commercial composting facility) is sent back to nature to break down.



How long does it take for some generally used products to break down when they are littered?

Cotton rags	1-5 months
Paper	2-5 months
Rope	3-14 months
Orange peels	6 months
Wool socks	1 to 5 years
Cigarette butts	1 to 12 years
Plastic coated paper milk cartons	5 years
Leather shoes	25 to 40 years
Nylon fabric	30 to 40 years
Plastic 6-pack holder Rings	450 years
Glass bottles	1 million years

How long does it take for some bio-compostable plastics to break down when they are littered?



Suppliers of bio-compostable products

TIPA is an international company, recently landed in the UK, and is among a number of companies worldwide involved in developing biodegradable films. TIPA claims that its films are fully compostable, with similar good quality packaging properties as fossil fuel based plastics. Their marketing statement reads: "TIPA biodegradable plastic decomposes like an orange peel when thrown away" see the figure above by TIPA.

Also there are a number of UK and European companies producing food packaging materials from food waste, mostly plant based (e.g. bagasse, bamboo, straw etc.), or from non-food but bio-sustainable sources.

See these below links for suppliers.

- i. KCC : <http://www.k-c-c.co.uk/>
- ii. Biopac: <http://www.biopac.co.uk/>
- iii. VaioPak: <https://www.vaiopak.co.uk/>
- iv. Vegware: <https://www.vegware.com/>
- v. Comp bio: <http://www.comp-bio.co.uk/>
- vi. Tipa : <https://tipa-corp.com/>

Further information: The more detailed information on this topic is also available in Food Waste Utilization document, which can be downloaded: <http://foodinnovationcentre.co.uk>.



This Food Factsheet is a public service of the Food Innovation Centre, the University of Nottingham intended for information only (for SMEs). This Factsheet and others are available to download free of charge at <http://foodinnovationcentre.co.uk>.

Written by Dr. Mohamed A. Gedi, Reviewed by Richard Worrall. July 2018. **Contacts:** email: enablinginnovation@nottingham.ac.uk; Tel: +44(0) 115 9516 696; Twitter:@UoNFIC.

