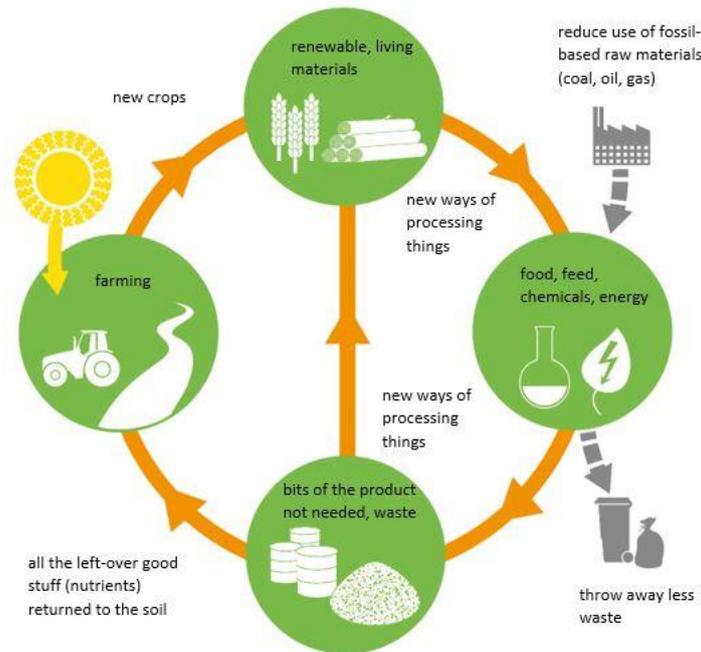


Use your loaf

The bioeconomy is all about using renewable, living materials to make things. Sometimes we can even make the products we need from what we might think of as 'waste'. Imagine being able to make and sell a product made from something someone is throwing away. They might even pay you to get rid of it for them - now that's a money-making opportunity!



Case study: bread.

Bread, a prime source of carbohydrates, has ancient roots and is a staple of many diets. Amongst the many forms of food waste, bread is a major contributor to the problem. Bread has a relatively short shelf life and about one-third of all that is produced goes to waste. It is estimated that approximately 1.2 million tonnes of bread are thrown away annually and that Britons throw away 24 million slices per day!

Question: How can we reduce waste?

How to reduce waste: <https://www.lovefoodhatewaste.com/article/keep-bread-fresh>

Question: What can you do with bread that's no longer fresh? What happens to it when you throw it away? Is there a separate food collection where you live?

Discuss the pros and cons of traditional waste treatment methods such as composting, incineration, landfill or other waste disposals.

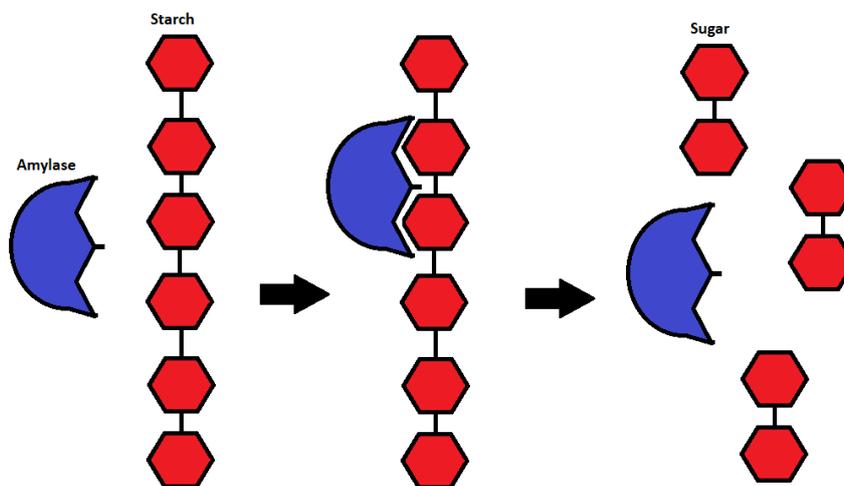
What's in bread?

Flour contains starch, which is a carbohydrate made of lots of sugars stuck together. Bacteria used for fermentation processes can only eat the simplest of sugars, and so the starch in bread needs to be converted into these simple sugars using a process called 'enzymatic hydrolysis'.

You can test this hydrolysis reaction out for yourselves.

- Take a small piece of bread and put it in your mouth.
- What can you taste? How sweet is it?
- Now chew the bread for at least 30 seconds but up to 2 minutes.
- How has the taste changed?

After a few minutes of chewing, the enzymes in your saliva (amylase) start to breakdown the starch molecules in the bread in to sugars as a result the bread should taste sweeter.



If we can convert waste bread into simple sugars it can be used to make valuable products (such as antibiotics).

From theory to laboratory

Antibiotics are any substance that can destroy or inhibit the growth of bacteria and similar microorganisms. Antibiotics are produced industrially by a process of fermentation, where the source microorganism is grown in large containers (100,000 – 150,000 litres or more) containing a liquid growth medium. One of the main constituents of liquid growth medium is glucose, a simple sugar and the preferred energy source of many microorganisms.

GlaxoSmithKline (GSK) is one of the world's largest pharmaceutical companies and one of the main ingredients they use at their production sites is food grade glucose. The price of food grade glucose varies a lot which is a problem for GSK, three years ago they embarked on a search for a more sustainable supply and asked the Biorenewables Development Centre to help them.

Together, we identified potential new sources of glucose from food manufacturing, using starchy by-products such as bread heels and potato waste as a starting material. Following successful trials at the BDC, we are now exploring significant opportunities to scale this process up to commercial level. To make the most out of the starting material, including the protein-rich residue, the BDC has also brought additional partners into the project.

This project is building a more sustainable and economically beneficial supply and could ultimately result in turning food by-products into high-value products.

And we're not the only ones...

TOAST ale use surplus fresh waste bread to make beer.

According to their website:

'We use surplus fresh bread to replace one-third of the malted barley in our grain bill. Bread is packed with carbohydrates, which are broken down to simple sugars by enzymes (Amylase) in the barley. Hops are added for aroma and bitterness, and to help preserve the beer, then yeast converts the sugars to alcohol during fermentation.

We use the heel end of loaves that would usually be discarded by the sandwich industry. We work with large factories like Adelle Foods in the UK. They donate and deliver the bread to us at no cost because it avoids a waste cost and they can have a positive impact – it's win-win! For our collaborations, we also use surplus bread from local bakeries.'

<https://www.toastale.com/>

Now that's using your loaf!

