

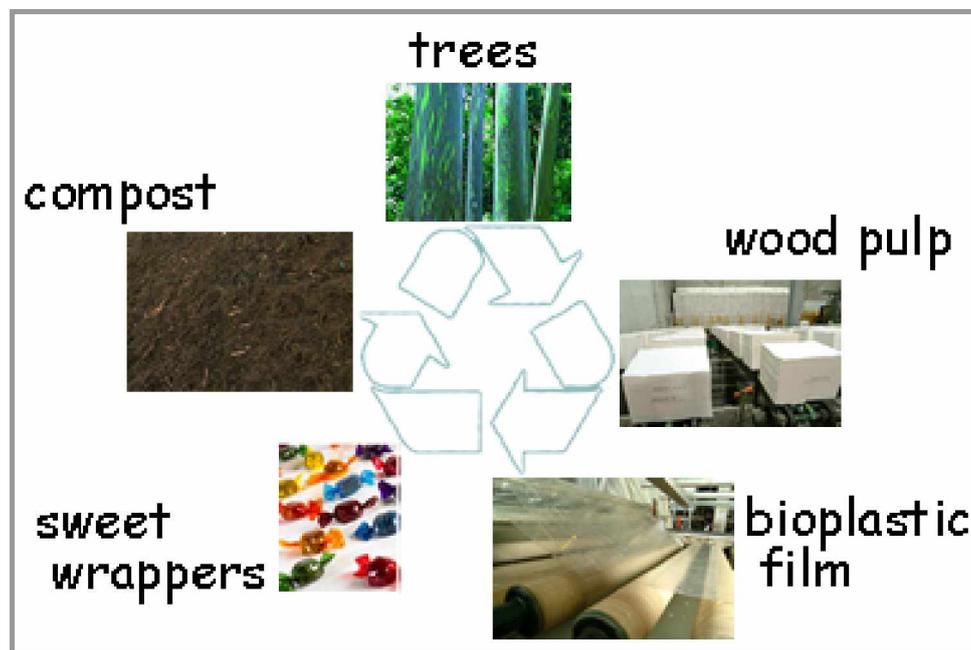
Bioplastic packaging films – teachers' notes and activity sheets

This section introduces children to the idea that packaging is changing.

Plastics are typically made from petrochemicals. This depletes a non-renewable resource and we are now trying to develop systems to recycle plastics. This is made less easy by the many different types of plastic.

Plastic made from plant materials use a renewable resource. One benefit of this is an impact on climate change. As the plants grow, they remove carbon dioxide from the atmosphere and 'lock' it into the plastic. Whilst this is a positive effect, it should be remembered that this is balanced by the carbon dioxide released when the plastic breaks down or composts. As with plastics from petrochemicals, bioplastics also require energy to be used in their processing and production. It is a complex picture over the whole life of the product. It may prove impractical to grow sufficient plant material to satisfy our current demand for plastics.

The life cycle of a bioplastic is shown below.

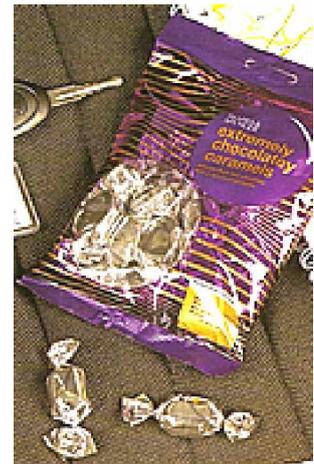


Pick and mix properties

Bioplastics can be made with different properties.

This plastic has a metallic look, which is attractive to view, and stays twisted around the chocolates when they are wrapped. It does not spring off like other films. The plastic film protects the sweets by acting as a barrier to UV light, air and moisture.

Films can be designed with different properties to suit the products they are used to protect.



Making plastic film

The web page has a short video slide show that shows the process of making the plastic film. It has an audio commentary and a text script is also available.

After viewing the slide show, children can complete a paper-based sort and sequence activity using the statement sheets and photographs following the end of these notes. These should be cut out and laminated.

The images used here are courtesy of Innovia Films Ltd, Wigton, Cumbria.

Plastics are types of polymer. That means they have lots of molecules all linked and cross-linked together. These polymers can then be modified to make a range of plastics. In this case, a thin, flexible film to wrap food.

These detailed notes are intended as additional background information. Making bioplastics has several stages:

1. Wood is obtained from sustainably-managed plantations. Typically these harvest fast-growing Eucalyptus trees that can be coppiced on a 7-year cycle. Using trees offers an alternative to plastics that are made from petrochemical, mineral oil, raw materials.
2. The wood is pulped. The pulp contains wood fibres which are predominantly cellulose polymers. These are not yet linked to each other. The pulp is the consistency of a thick porridge.
3. Pulp is dried into sheets to facilitate transport to the plastic factory.
4. At the factory the pulp is reconstituted into a thick slurry.
5. The pulp is treated so that the cellulose polymers begin to join together. It is then filtered to remove any large fibres or contaminations.
6. The mixture is poured through a narrow slot into an acid solution and this links the cellulose fibres permanently. This is now the polymer,

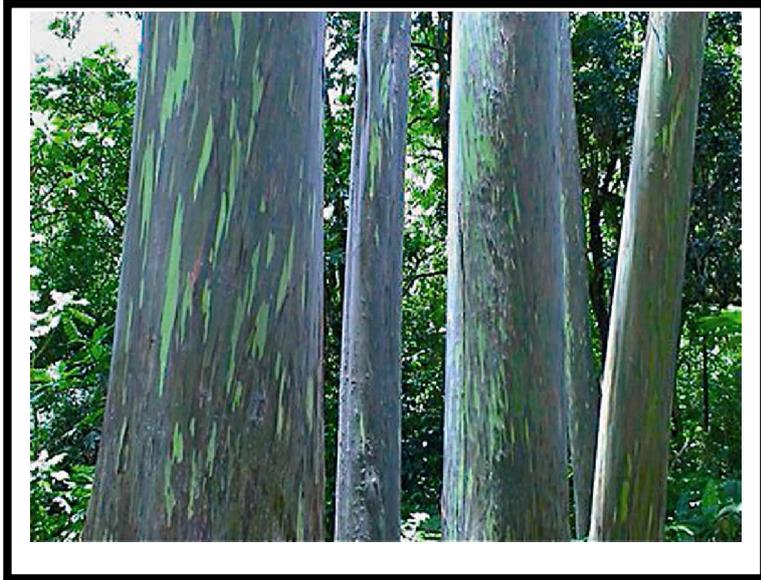
called viscose. It is drawn out of the acid on rollers as a continuous plastic sheet.

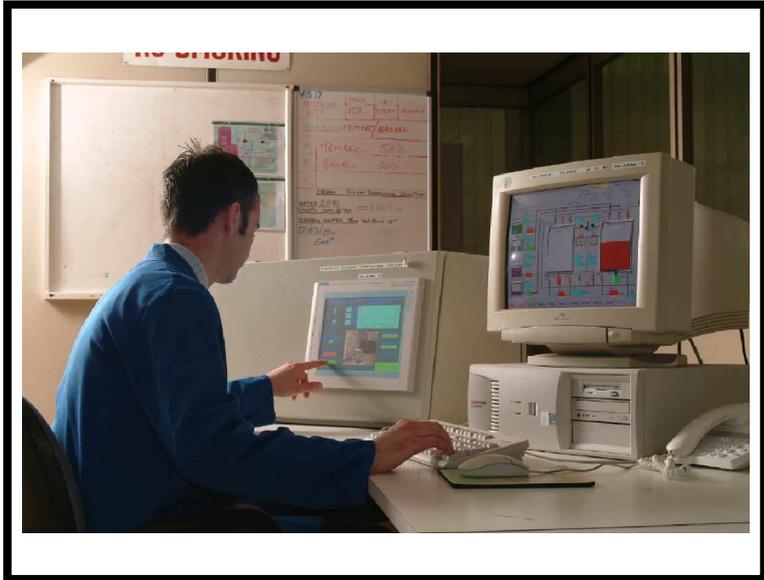
7. The plastic sheet, or film, goes through a series of baths containing solutions to remove any impurities.
8. At this stage the plastic would be quite brittle if it was dried and so it has further processing.
9. Products, such as glycerol, are added to maintain the plastic film's flexibility. Coatings can be added to give different properties depending on the final use of the film. These include the ability to be heat-sealed, form a moisture barrier, take inks for printing or have a metallic finish.
10. The film is cut and turned onto large rolls depending on the final requirements of the customer.

Compostable and biodegradable

There are different terms applied according to how the biopolymer breaks down after it has been used.

Biodegradable	The material breaks down due to microbes or other biological action to produce simple compounds, water and carbon dioxide. There is no limit to the time scale for this to take place.
Compostable	Material will biodegrade under conditions of heat, aeration and moisture in an industrial composting facility.
Home compostable	Material will compost in cooler conditions, such as those found in a home composter.







Trees grow and make the wood which is the raw material for the plastic sweet wrapper. As the raw materials come from trees, the plastic produced is called a bioplastic.

The trees are mashed up with water and turned into a thick, liquid pulp. This is dried and turned into flat sheets which are then sent to the plastics factory.

The wood pulp has ingredients added that change it into a new material, the bioplastic. This is stretched out over lots of rollers to turn it into a long, thin, clear film.

All of the processes in the factory are controlled with computers.

The operator sees that everything is running smoothly.

The plastic can be coloured and cut into thinner strips. These are what the customer has asked for. It is more useful like this for making the sweet wrappers.

This type of plastic has been used to make sweet wrappers. It twists around the sweets and protects them before they are eaten.

The bioplastic made from trees can be put into compost. It breaks down and becomes soil. This can then be used to grow plants. Maybe even new trees to make new plastics.