

## Production Methods Summary

There are essentially three methods used to produce ethanol:

- Manufacture from ethene using steam (the "synthetic" route)
- Production from sugars and starches by fermentation, using yeasts
- Production from biomass waste, using bacteria.

### Synthetic ethanol

Ethene, produced by the cracking of oil, is converted to ethanol using steam and a catalyst. The reaction also produces toxic by-products, so synthetic ethanol is never used for human consumption. A further purification stage is necessary to remove water and by-products, and newer methods are making use of safer reagents.

This is the principal method used in the UK for industrial ethanol. [Click here for more information on this process.](#)



### Fermented ethanol

Fermentation has been carried out for millennia and is the traditional method of common alcohol production. Most of the world's ethanol is produced by fermentation, using crops such as sugar cane, sugar beet, corn, rice and maize. Municipal waste can also be used as feedstock, reducing landfill disposal and turning rubbish into a valuable product.

The fermentation is a complex series of reactions that convert carbohydrates, mainly sugars and starches, into ethanol and carbon dioxide. It works best at temperatures in the range 25°C - 37°C in the absence of oxygen (anaerobic), and will produce aqueous solutions of up to 14% ethanol. Higher alcohol contents require further distillation.

To find out more about production by ethanol fermentation, [click here](#).

### Biotechnology

Recent advances in biotechnology have led to the development of a process to produce ethanol from waste biomass using bacteria. Genetically engineered E-coli bacteria are used to convert plant sugars into ethanol, rather than to ethanoic or lactic acid as usually happens.

This allows ethanol to be processed from forestry waste, rice hulls, sugar cane residues (called "bagasse"), and the main crop can be grown as a food source. It is expected that in time ethanol will be able to compete economically with fossil fuels, removing the need for an ethanol fuel subsidy.

The use of waste to produce ethanol may also help solve the problem of disposal that has arisen since many places have begun to ban burning crop residues because of environmental concerns over its impact, or where ploughing-in waste is not possible because of the soil type.

[Click here for more on producing ethanol from waste biomass.](#)

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