

# The difference between **Organic** and **Conventional** produce

Organic production isn't simply a case of not using pesticides.  
It is a production method linking back to the very soil produce is grown in.

There is a measurable difference between organic and conventional produce by looking at stable isotope ratios of nitrogen.  
Quite simply, the majority of organic products have more heavy nitrogen ( $^{15}\text{N}$ ) than their conventional counterparts.

## Organic cultivation

- Organic fertilisers must be used
- Has more heavy nitrogen ( $^{15}\text{N}$ ) than conventional

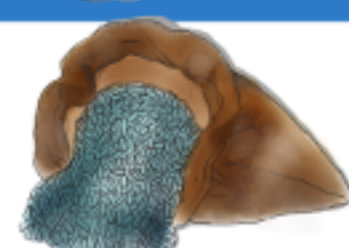


## Conventional cultivation

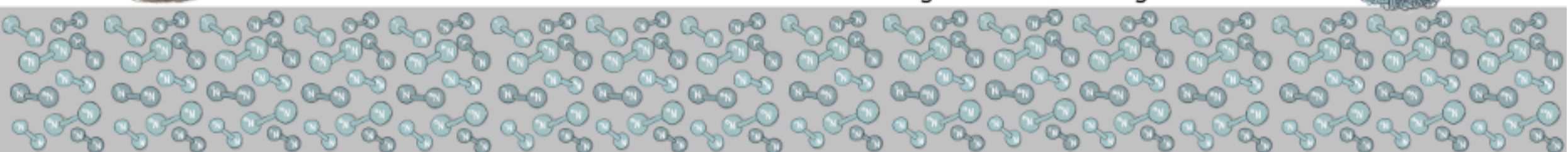
- Soil is fertilised with mineral (NPK)
- Has less heavy nitrogen ( $^{15}\text{N}$ ) than organic



**Why?**



To understand more we have to look at where the nitrogen in our food originates from



In both systems the nitrogen initially comes from the air

**Here's where they differ:**

## Organic:

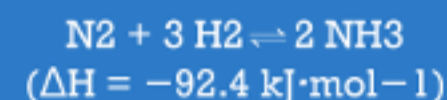
Nitrogen is initially 'fixed' from the air by bacteria in the roots of leguminous plants (e.g. peas)



Root nodules

## Conventional:

Nitrogen from the air is 'fixed' by the Haber process to make ammonia/mineral nitrogen



This fertilises the soil which can be used to grow fodder for livestock



It is estimated roughly half of the protein in Humans was originally 'fixed' by the Haber process



**Fritz Haber**  
Nobel Prize, Chemistry 1918.  
Creator of the Haber process

Livestock produce a manure rich in heavy nitrogen ( $^{15}\text{N}$ ) due to trophic enrichment.



Soil fertilised with mineral nitrogen will have nitrogen ratios similar to air (0‰)



$$^{15}\text{N}/^{14}\text{N} = 0\text{‰}$$

Produce cultivated using organic fertilisers will have an enriched  $^{15}\text{N}$  signature



Produce cultivated with mineral fertiliser carries the low (often negative) nitrogen ratios of the fertiliser



The net result is that conventional produce can be differentiated from organic produce by investigating nitrogen ratios ( $^{15}\text{N}/^{14}\text{N}$ ). Product-specific databases can be used to enhance the focus of analysis and allow for greater differentiation between organic and conventional.

Of course, manure isn't the only organic fertiliser. There are dozens of varieties of organic fertilisers. However, as organic fertilisers tend to be plant-biomass based or animal-biomass based, determining the fertilisation of a crop by stable isotope analysis offers a powerful tool to discriminate between organic and conventional produce beyond pesticide analysis.