

# Science for Environment Policy

## Effects of chemical fertiliser and animal manure on soil health compared

**Fertilising crops** with cattle manure can lead to better soil quality than when synthetic fertiliser is used, recent research indicates. The use of cattle manure in the study led to greater soil fertility by encouraging higher microbial activity, and the researchers suggest that it could potentially improve soil's ability to cope with periods of difficult growing conditions.

**The complex community of microbes** living in soil is important to most major soil processes, including the natural cycling of nutrients. Therefore, maintaining good agricultural soils may depend on maintaining a healthy microbial ecosystem.

The research focused on an [agricultural research](#) site in Darmstadt, Germany, with predominantly sandy soil. During 29 years of study, different fields have undergone the same crop cycles, but have been fertilised in one of three different ways: with synthetic fertiliser, with cattle manure, or with a method that uses manure in addition to a 'biodynamic agriculture' fertilising technique, which also applies specific mixtures of herbs and minerals. All three fertility treatments were compared for their effects on soil biology, as well as on soil carbon, nitrogen, and acidity.

The study assessed the diversity of the microbial functioning, rather than the variety of soil microorganisms. Samples of soil from the study site were exposed to 17 substrates - substances that microbes use as carbon sources, such as fluids released by roots. Emitted CO<sub>2</sub> was used as an indicator of microbial catabolic activity (i.e. to show how microbes mineralise the substrates). The diversity of 'physiological action' (i.e. the microbes' use of different substrates) resulting from the three farming fertility treatments was calculated, and relationships between the soil samples and respiration rates, substrates, pH, organic carbon and nitrogen fertilisation levels were identified. Other functions of soil microbes, such as nitrogen fixation and photosynthesis, were not assessed.

The functional diversity index of soil microbes was higher after use of cattle manure than after mineral fertiliser. This was considered likely to be a result of a greater number and diversity of soil microbes and organic carbon content, which probably increase the soil fertility.

No statistically significant difference in functional diversity was found between the biodynamic and non-biodynamic manure treatments. However, the greatest differences were between the biodynamic and synthetic fertiliser treatments.

The study suggests that organic farming, through its use of manures, supports the development of microbial communities that are more complex than those that result from the use of synthetic fertiliser. It also cites separate research which found that manured crops grow much better during poor growing conditions, than synthetically fertilised crops.



6 June 2013

Issue 331

**Subscribe to free  
weekly News Alert**

**Source:** Sradnick, A., Murugan, R., Oltmanns, M., Raupp, J., Joergensen, R.G. (2013). Changes in functional diversity of the soil microbial community in a heterogeneous sandy soil after long-term fertilization with cattle manure and mineral fertilizer. *Applied Soil Ecology*. 63: 23-28.

**Contact:**  
[andre.sradnick@uni-kassel.de](mailto:andre.sradnick@uni-kassel.de)

**Read more about:**  
[Agriculture,](#)  
[Soil](#)

The contents and views included in Science for Environment Policy are based on independent, peer-reviewed research and do not necessarily reflect the position of the European Commission.

**To cite this article/service:** "Science for Environment Policy": European Commission DG Environment News Alert Service, edited by SCU, The University of the West of England, Bristol.