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Field experiments show clear benefits for farmers from regular compost use

Soil structure and workability, increased microbial activity and improved soil nitrogen supply have all been proven to result from the repeated use of compost, as evidenced by results from the *DC-Agri* field experiments. Within an arable rotation where livestock manures were absent, the medium to long-term use of compost was particularly beneficial.

Applications of green compost over nine years at two experimental sites increased soil organic matter levels by over 20% and reduced soil 'shear strength' by 5%. This indicates that compost applications will make cultivations easier to perform, delivering potential savings on fuel costs. A 15% increase in soil microbial population following nine years of compost use, and a 50% increase in the potentially mineralisable nitrogen, an important source of nitrogen (N) for crop uptake, can now be attributed to long-term compost use.

Improved soil structure and workability

In the fully replicated *DC-Agri* field experiments, the effects on soil quality of compost, whole digestate and standard manufactured fertiliser applications were compared at seven sites across Britain.

The intensive use of farm machinery can degrade soil structure and cause compaction. This can result in less effective tillage as well as fewer suitable days to work the soil and lower yields. Associated environmental consequences include an increased risk of soil erosion and losses of nutrients and agro-chemicals to the wider environment.

Photo 1. *Poor soil structure resulting in a loss of valuable topsoil and nutrients, as well as environmental pollution*

Timely cultivations and minimising compaction can help to improve soil structure, and the addition of organic matter (such as compost and livestock manures) can help to bind soil mineral particles together to create better structure. Applications of organic matter will also improve nutrient supply and retention, as well as soil water management.

The longer-term benefits of adding compost to soils are widely documented. Results from the *DC-Agri* field experiments show a direct link between the amount of organic matter added by compost (whether green or green/food compost) and improved soil condition. Notably, at two *DC-Agri* arable sites (Terrington in Lincolnshire, with a medium soil, and Harper Adams in Shropshire with a light sandy soil) where applications of green compost had been made for six years prior to the start of the *DC-Agri* project, as well as for three years during the project, soil organic matter levels increased by over 20% (Figure 1).

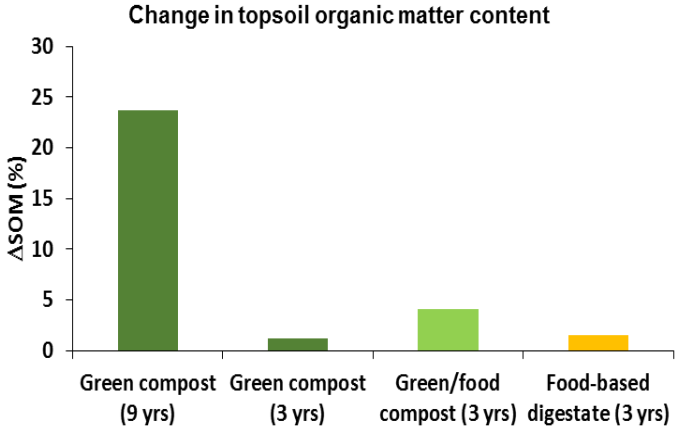

Figure 1. Change in soil organic matter content relative to the 'control' fertiliser only treatment (ΔSOM) averaged over all sites

After three years of green compost applications, soil shear strength, a measure of the density and level of force required to work the soil, was decreased by a small amount across all sites. After nine years it was reduced by 5%, indicating that compost applications will make cultivations easier to perform and reduce associated fuel costs and machinery wear.

A decrease in bulk density (the weight per unit volume of the soil) indicates an improvement in soil aeration and porosity, enabling crop roots to explore the soil and access nutrients and water. Soil bulk density decreased by around 2% across all sites following three years of green and green/food compost applications, and by around 5% following nine years of repeated green compost applications.

Increased microbial activity and soil nitrogen supply

The soil 'microbial biomass' comprises mainly bacteria and fungi, together with a range of larger microbes such as protozoa. This living component of the soil helps to break down organic matter and release nutrients such as nitrogen and phosphorus for crop uptake.

DC-Agri results show that at the sites where compost had been used for three years, microbial biomass increased by approximately 3%. At those sites that had received nine years of compost applications, a 15% increase was recorded. This is in comparison with soils that received only fertilisers (Figure 2). The results also show how repeat compost applications significantly increase the levels of soil nitrogen that can be supplied to crops (Figure 3).

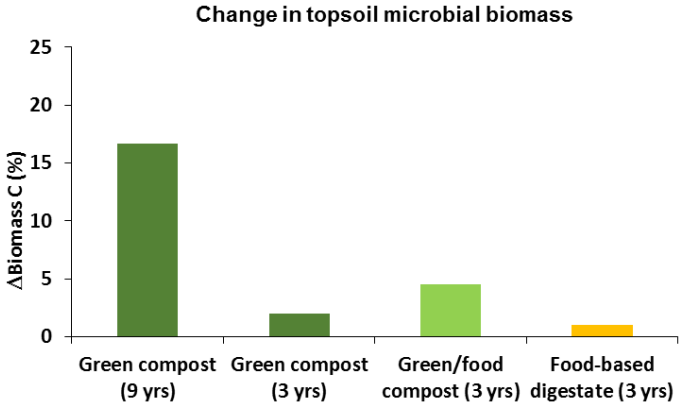

Figure 2. Changes in topsoil microbial biomass carbon (C) relative to the 'control' fertiliser only treatment (Δ Biomass C) averaged over all sites.

These results indicate an increase in the soil's capacity to supply N through the mineralisation of soil organic N reserves, which in time will lead to a reduced need for manufactured N fertilisers.

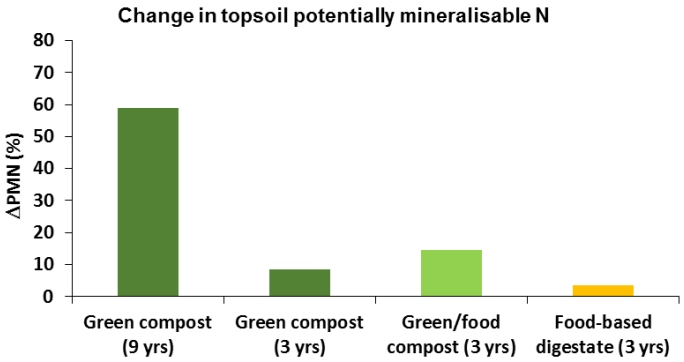

Figure 3. Change in potentially mineralisable nitrogen relative to the 'control' (fertiliser only) (ΔPMN) averaged over all sites

The recorded increases in potentially mineralisable nitrogen reflect anecdotal evidence from farmers who have invested in repeat applications of compost over the medium to long term, and who are then able to reduce applications of bagged fertiliser. This is a result of the soil's increased ability to release and provide crop available nitrogen through the natural process of mineralisation of soil organic N reserves.

Good news for farmers

The results reported in this bulletin show clearly the value of medium and longer-term use of compost and other organic materials in improving the quality and fertility of soils.

Focus on Digestate use

A short video to help farmers use digestate as a renewable fertiliser, produced as part of the *DC-Agri* project, can now be viewed at:

www.wrap.org.uk/digestatevideo

Copies of this and previous bulletins can be downloaded from the project website at: www.wrap.org.uk/dc-agri

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