

Beat rising cost of fertiliser and extreme weather by using digestate and compost

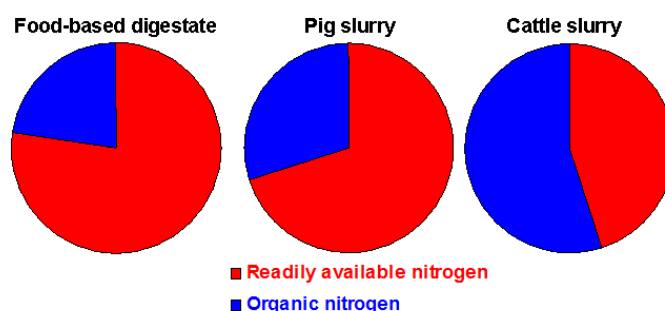
The British climate presents farmers with challenges throughout the growing season and sustainable soil organic matter management is fundamental to mitigating the impact of extreme weather and maintaining optimum yields. Farmers and growers can also help to lessen the impact of rising fertiliser prices by using quality digestate and compost. In Bulletin 2, we discuss the evidence in support of using these materials to enhance soil nutrient supply and organic matter levels.

New evidence from field experiments

Recent data from the Digestate & Compost in Agriculture field experiments is substantiating the claim that the fertiliser replacement value of digestate and compost can make a significant contribution to reducing costs, particularly when compared with other commonly applied organic materials. Digestate is a particularly valuable source of readily available nitrogen whereas compost, in addition to the already proven benefits which the organic matter brings to soils, provides phosphorus and potassium. All organic materials used for the Digestate & Compost in Agriculture field experiments have been fully analysed and the data collated. This analysis will form the basis of a data library on the nutrient content of digestate and compost, which will be an invaluable reference and resource.

The table below summarises the nutrient content of 15 digestate samples analysed as part of the field experiments, (with the range in values found indicated in brackets), as well as giving typical values for green and green/food compost:

Readily available nitrogen



Analysis has shown that an impressive 80% of the total N in food-based digestate is present as readily available nitrogen, compared with around 70% for pig slurry and 45% for cattle slurry. This high level of availability means that digestate can be used as a direct replacement for 'bagged' nitrogen fertiliser. Current guidance is that 60% of this readily available nitrogen may become available to the crop in the year of application, assuming spring band spread application (using pig slurry as a proxy).

	Nitrogen (N)(kg/t)		Phosphate (P ₂ O ₅) (kg/t)		Potash (K ₂ O) (kg/t)	
	Total	Readily Available	Total	Crop Available	Total	Crop Available
Whole Digestate	5.0 (3.5 - 6.0)	4.0 (80%)	0.5 (0.25 - 1.5)	0.25	2.0 (1.5 - 2.5)	1.6
Green Compost ⁺	7.5	<0.2 (<2%)	3.0	1.5	5.5	4.4
Green/Food Compost ⁺	11	0.6 (5%)	3.8	1.9	8.0	6.4

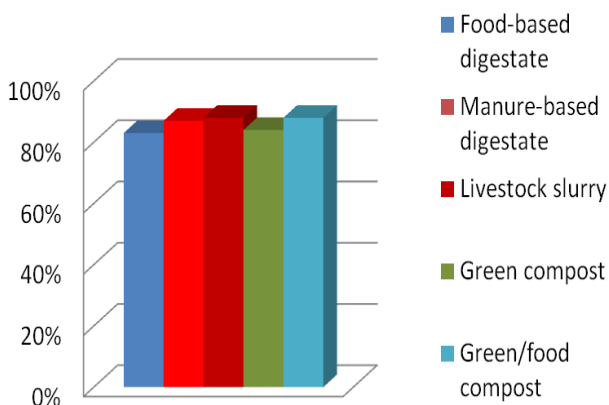
⁺ Source Defra "Fertiliser Manual (RB209)"

In contrast, compost has the majority of its nitrogen present in an organic form ($\geq 95\%$), which will slowly become available over a period of months or years.

Phosphate (P2O5) and Potash (K2O)

The Digestate & Compost in Agriculture field experiments have confirmed that 80% of the total potash from a range of digestates and composts can be considered crop available. As a general rule, 50% of the total phosphate in compost is crop available.

Extractable potash at % of total potash



Calculate the potential savings

For a quick way to calculate the financial value of the N, P and K in compost, visit www.wrap.org.uk/compostcalculator

The online calculator uses current market prices for fertilisers and typical nutrient content figures for compost and digestate. Based on fertiliser replacement values alone*, for the farmer, these materials are worth:

- c.£5.50/tonne of green compost;
- c.£8.00/tonne of green/food compost;
- and typically, whole digestate is worth c.£4.50/m³

Note* - taking into account nutrients lost during spreading. The percentage lost is based on the RB209 figures for pig slurry (2% dry matter), although the field experiments will be generating accurate figures for digestates

Soil organic matter focus

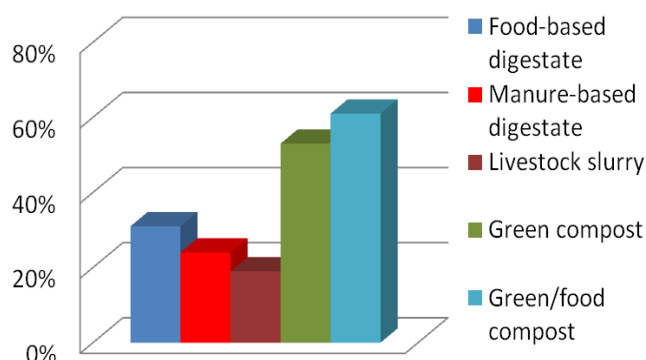
This spring was the second driest across England and Wales since 1910, and the driest since 1990, with just 86.9mm of rain (45% of the long-term average). In contrast, parts of the north and west of Scotland have had to cope with a wet season, with Argyllshire recording 578mm of rain, well above the long-term average of 422mm.

Compost is an excellent source of organic matter. Using it will improve soil organic matter (OM) levels, help retain water during dry spells and improve infiltration during periods of heavy rainfall. Application rates for BSI PAS 100 compost will vary according to the total nitrogen content, but a typical green/food compost application at around 20t/ha (to comply

with NVZ requirements) will supply 5t/ha of OM. Green compost tends to have lower nitrogen contents and typically can be applied at 30t/ha. This means that, although it usually has a lower OM content, it will still supply between 4 and 5t/ha of OM.

The organic matter supplied by compost contains high levels of lignin, which is a more stable, long-lasting form. The figure below shows the analysis results of the range of materials being used in the field experiments and demonstrates that BSI PAS 100 green/food and green compost contain more lignin than other materials, including farmyard manure. This will result in a more long-lasting improvement to soil structure, whilst providing an important carbon store which can assist in mitigating climate change.

Lignin carbon as% of total carbon



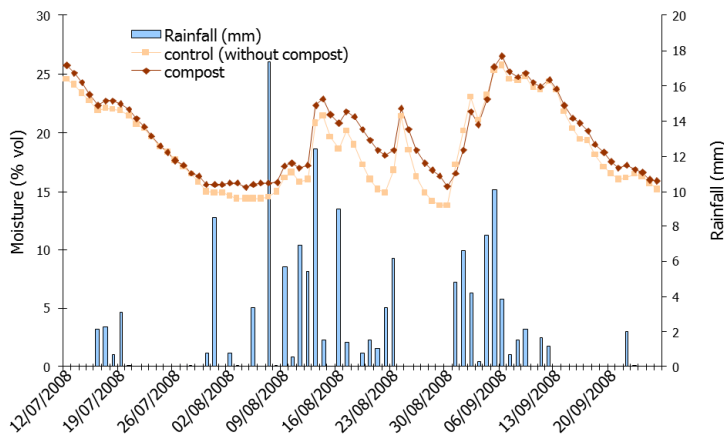
Using compost to improve drought tolerance

A number of recent field trials¹ have evaluated the benefits of regularly applying BSI PAS 100 compost to agricultural land. Results show that repeated applications of quality compost over a 2 to 10 year period increased soil organic matter levels by an average of 12%, when compared with soils receiving no compost. The current Digestate & Compost in Agriculture project is monitoring new sites, as well as continuing with sites from previous studies (i.e. Terrington and Harper Adams, formerly 'Soil-QC' experiment sites) to continue to measure longer-term effects.

Previous trials also demonstrated increases in plant available water capacity (AWC) across the different projects of between 1-13% following regular incorporation of compost, with an average increase of 5%. This will improve the ability of crops to withstand short periods of drought and reduce irrigation requirements. Warwick HRI monitored soil moisture in trials with cauliflowers and, as the following graph shows, found an improvement in soil moisture content in the plots treated with compost, with the greatest difference observed in the critical drier periods.

¹ WRAP-funded soil health trials (project OAV023-010 (Wallace, 2009)
Defra-funded SOIL-QC studies (project SP0530 (Bhogal et al., 2009)
ADAS composting research project (Bhogal & Chambers, 2009)

Average soil moisture content from plots with and without compost



The Digestate & Compost in Agriculture experiments continue to assess the impact of using quality digestate and compost on key soil physical properties, including soil organic matter and AWC.

Results Update

The next edition of this bulletin will provide an analysis of harvest 2011 results from the field experiments. A copy of Bulletin 1 (March 2011), which provides an introduction to the Digestate & Compost in Agriculture field experiments, can be downloaded from the project website at:

www.wrap.org.uk/dc-agri

Dates for your diary

As part of the Digestate & Compost in Agriculture project, events for farmers and advisers are taking place at knowledge exchange hubs across Britain, centred on agricultural colleges and university departments.

Taking the form of a morning seminar with 3-4 speakers, followed by an afternoon visit to either an AD facility, field experiment site, or composting facility, these events are free to attend for farmers, growers, agronomists and students. Events planned this season are:

- 30 November – RAC, Cirencester, Gloucestershire
- 12 December – Nottingham Trent University, Southwell, Nottinghamshire
- 13 December – Abernethy, Perthshire, Scotland

Details of these and future events will be promoted widely – look out for an event in your area, or contact anna@earthcaretechnical.co.uk

Field experiments delivery partners



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**Waste & Resources
Action Programme**

The Old Academy
21 Horse Fair
Banbury, Oxon
OX16 0AH

Tel: 01295 819 900
Fax: 01295 819 911
E-mail: info@wrap.org.uk

Helpline freephone
0808 100 2040

www.wrap.org.uk/dc-agri

