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Digestate & Compost in Agriculture, Bulletin 4 – October 2012

Answering farmers' questions on using digestate and compost

A programme of GB-wide events and lectures is underway to disseminate the latest results from the *Digestate and Compost in Agriculture* field experiments. Designed to inform farmers, advisers and students on how to maximise the potential of anaerobic digestate (biofertiliser) and compost to grow quality crops, the knowledge exchange activities have been enthusiastically received by over 1,500 people so far, and more training is planned as the four year project progresses.

More farmers have access to digestate and compost than ever before and there is increased interest in the benefits and challenges of using these products to grow quality crops. The *Digestate & Compost in Agriculture* project includes a knowledge exchange team that is delivering an extensive programme of farmer/adviser training events and student lectures across Britain. The project also produces a range of training and information materials, including a regular project bulletin of which this is the fourth issue.

Site visits attract farmers and advisers to events

The farmer/adviser training events are proving particularly popular, with over 850 attendees to date. The events combine presentations by project and industry experts, with the opportunity to see operational AD and composting facilities, or to visit the field experiments. So far there have been 27 farmer/adviser training events and with another 16 planned between now and March 2013.

In addition, over 600 students from agricultural colleges and universities in England, Scotland and Wales have attended lectures delivered by experts from the project. Teaching materials developed specifically for this purpose provide an introduction to the basics of organics recycling and in-depth coverage of the use of quality digestate and compost.

Event at the North Wyke trial site

The Q&A sessions that form part of these events give attendees an opportunity to grill the experts on the questions that interest them. Topics that come up regularly include questions on how much product to use, whether you can use less 'bagged' fertiliser as a result and whether these products are permitted under crop assurance schemes. According to the feedback received, these sessions are particularly helpful and so we wanted to share our answers to these and some of the other common questions raised.

Earthcare TECHNICAL · North Wyke Rothamsted Research · emr east malling research · Harper Adams University College · SAC · ADAS

Students from Shuttleworth College at Biogen's Westwood Facility

FAQs raised at events

Here are some of the questions asked most frequently at the training events and lectures

A key point to bear in mind is that digestate and compost are very different products. Digestate is produced by an anaerobic process (the microbes don't require oxygen), is typically very liquid and has a high available nitrogen content. Digestate can also come as separated liquor or separated fibre fractions, and these differences are explained below.

Compost is produced by an aerobic process (oxygen is required by the microbes) and is a relatively dry, stackable product. It is rich in organic matter and, although it normally has a low level of available nitrogen, it can be an excellent source of potash and phosphate.

Q: How do I calculate the financial value of the nutrients in digestate and compost?

A: Go to the WRAP website to find the Compost Calculator - www.wrap.org.uk/compostcalculator, which provides the financial value of the main nutrients (N, P and K) in digestate and compost. The financial values used are based on current market fertiliser rates and the typical nutrient content of each material.

Q: How do I find my closest producer of digestate or compost?

A: *To find BSI PAS 100 compost:*

Choose a product and enter your postcode at:

http://compostsuppliers.wrap.org.uk

To find BSI PAS 110 digestate:

Look up on the Biofertiliser Certification Scheme website:

http://www.biofertiliser.org.uk/members

Or use the interactive UK anaerobic digester map:

http://www.biogas-info.co.uk/index.php/ad-map.html

Q: How much compost should I use?

A: Compost is valued for its stable organic matter content and crop-available phosphate and potash supply. Its nitrogen is, however, only released slowly over time. Compost made from plant ('green') waste alone releases virtually no nitrogen to crops in the first season after application. Compost made from combinations of green waste and food waste releases around 5% of the total nitrogen to crops in the first season. Digestate and compost should be applied to meet crop need for nutrients and balanced with 'bag' fertiliser. Where applicable, Nitrate Vulnerable Zone (NVZ) rules should be followed too, as both digestate and compost are categorised as organic manures under NVZ rules.

Example: *The application of 'typical' green/food compost in the autumn ahead of a crop of winter wheat*

Each fresh tonne of green/food compost typically contains 11 kg total nitrogen (N). To ensure that the 250 kg N/ha individual field limit for total nitrogen (under NVZ rules and CoGAP, in England and Wales, and PEPFAA in Scotland) is not exceeded:

250 kg N/ha ÷ 11 kg N/t = 22.7 t/ha.

So the maximum application rate of typical green/food compost is 22.7 t/ha.

Note NVZ rule changes: It is proposed that the application rate limit for BSI PAS 100 green and green/food composts is changed to 1000 kg N/ha every four years, in specified circumstances when applied as mulch, and to 500 kg N/ha every two years when worked into the soil. If confirmed, these changes will come into effect on 1st January 2013.

Q: How much bag fertiliser should I apply to balance the available nutrients in compost?

A: The first step is to calculate crop nutrient requirement in the normal way by assessing the soil nutrient status, crop requirement and soil type. The Fertiliser Recommendations (RB209) and the nutrient planning software PLANET are both useful tools to help with these calculations.

The second step is to calculate how much of this crop requirement can be supplied by the nutrients available in compost, as shown in the example below.

In order to obtain most benefit, it is strongly recommend that users ask their compost supplier for an up-to-date nutrient analysis for each batch of compost supplied.

Example: *The application of 'typical' green/food compost in the autumn ahead of a crop of winter wheat*

The table on the next page shows the amounts of N, P and K supplied from an application of 22 t/ha of green/food compost.

In addition to N, the green/food compost in this example contains 3.8 kg/t of phosphate (P_2O_5) and 8.0 kg/t of potash (K_2O). Unlike the N, around half the phosphate is available to the crop in the first season after application, and nearly all of the potash is available.

Using these figures we can calculate the amount of N, P and K supplied by the compost to the wheat crop, and reduce the application of bag fertiliser to supply the balance of N, P and K required.

		N	P_2O_5	K_2O
		(kg/ha)		
Soil nutrient status	England and Wales (RB209)	SNS 1	Index 2*	Index 2*-
	Scotland (SAC)	Crop residue Group 1	Moderate	Moderate
Crop requirement: Winter wheat (8t/ha straw removed)		220	65	85
Total nutrients supplied by 22 t/ha of green/food compost		242	84	176
Balance required		208	0	0

Calculating how much green/food compost to apply to a crop of winter wheat

* Soils are at Index 2/Moderate and therefore the total nutrients supplied are taken into account within the recommendations. However, below index 2, assume the following availabilities in year 1 of application: 5% of total nitrogen, 50% of total phosphate and 80% total potash.

Q How and when should I apply digestate (biofertiliser)?

A: Digestate may be supplied either whole, or separated into a liquor fraction and a fibre fraction. Whole digestate and separated liquor are primarily a source of available nitrogen (N), and fibre is an excellent source of organic matter.

'Whole digestate'

'Separated liquor'

'Separated fibre'

The anaerobic digestion process converts organic forms of N into readily available N (mainly ammonium-N), which we can measure by analysis.

Do not confuse *readily available N* (RAN) with crop available N. Digestate is rich in RAN, but once applied to a field, some of this may be lost, for example – as ammonia gas or water soluble nitrate. The proportion of RAN which can be used by the crop, taking into account these losses, is called *crop available N* – spreading digestate, just like livestock manures, is not 100% efficient. We must estimate the crop available N value from how and when the digestate is applied, the soil on which it is used, and the crop growth stage.

Following simple guidance on the correct method and timing of digestate application will ensure that the growing crop maximises the crop available nitrogen, and that the losses are minimised.

Results from the first year of the *Digestate and Compost in Agriculture* field experiments have shown that applying digestate in the spring will ensure that crop uptake is maximised. Digestate should only be applied in the autumn if there is a requirement by the crop for N (oilseed rape would be an example of this). Also, using precision spreading equipment (e.g. band spreader, trailing shoe or shallow injection), may help to reduce ammonia emissions and minimise odour nuisance.

Q How much digestate should I use?

A: The decision on how much digestate to use must be based primarily on crop need for N. This should be calculated, as with normal fertiliser planning, on the basis of: soil nutrient status, crop requirement and soil type. Then the amount of crop available nitrogen supplied from digestate is estimated based on the field soil type, local rainfall, planned timing and method of application. Do not exceed the 250 kg N/ha individual field limit for total nitrogen, which is stipulated in the NVZ rules, and also under CoGAP and PEPFAA, but also be aware that whole digestate, digestate liquor and some digestate fibres have a high available N content (>30%), and will be subject to closed periods, just like cattle and pig slurry.

The Fertiliser Recommendations (RB209) and the nutrient planning software PLANET are both useful tools to help with these calculations. MANNER software helps to do this calculation on a field by field basis. Enter the analysis of the digestate, but for the time being select pig slurry as the organic manure type, as digestate is not yet included within the list of materials. MANNER is free and can be ordered on line. Follow the link:

www.adas.co.uk/MANNER/tabid/270/Default.aspx or call ADAS on 01623 844 331.

Note: The new version of MANNER (MANNER-*NPK*) will be launched this winter and will include digestate as an organic manure type.

Example: *The application of 'typical' digestate in spring to a crop of winter wheat*

The typical total N content of digestate is 5 kg/t (this is the best estimate to date based on the analysis of 15 digestate samples) and 80% (4 kg) of this is 'readily available' N. If the digestate is applied in spring to a crop of winter wheat, MANNER predicts that around 60% will be 'crop available nitrogen' (this equates to 3 kg per tonne). So for example an application of 20t/ha of digestate would typically supply around 60 kg/ha of crop available nitrogen.

The nutrient content of digestate is directly related to the materials fed into the digester, so always use an up to date analysis of the digestate you have been supplied.

Q Digestate and compost provide P & K - how do we take them into consideration?

A: Phosphate (P) and potash (K) content should also be taken into account in nutrient management planning. Phosphorus is an essential nutrient in plant and animal nutrition, but losses from agricultural soils can pollute water bodies and cause eutrophication. It is therefore advisable to keep soil P status no higher than Index 3 ('High' status in Scotland). So when calculating crop P and K requirements, if soils are at Index 2 (moderate) or above, use total nutrient content, and take into account what will be removed by crops within the rotation, unless there is still a requirement above Index 3 because a responsive crop such as potatoes is being grown. Below Index 2, compost can be a very cost-effective way of building soil P and K levels.

Q Are compost and digestate safe to use?

A: WRAP works closely with crop quality assurance schemes across the UK to help them adapt their scheme rules to accept the use of digestate and compost. Although the production and use of these materials is regulated (quality assured compost and digestate are independently accredited to defined specifications, in addition to complying with regulatory requirements), these schemes have understandably asked for reassurance that these products are safe to use on crops destined for consumption by both livestock and humans. WRAP has carried out several comprehensive risk assessments to address this. This work has provided the platform of scientific evidence required to support change, and the schemes have now started to amend their rules. For example, the Red Tractor Assurance scheme already allows the use of food-based digestates and composts. If you are in any doubt, it is recommended that you consult your buyer to confirm that digestate and compost are accepted.

Results update

Work at the experimental sites is peaking just as this bulletin goes to press. The four grassland sites were harvested under the challenging weather conditions this spring. Harvest has completed across GB on the seven soil quality experiments and we have also been monitoring ammonia and nitrous oxide emissions, as well as nitrate and phosphorus leaching following digestate and compost applications. The interim results from all of these experiments, along with data from the second year nitrogen use efficiency experiments, will be released this winter in Bulletin 5.

Harvesting a grass experiment with a Haldrup plot combine

Dates for your diary

The series of events being run by the Digestate & Compost in Agriculture project team across Britain have been well received and generated plenty of lively discussion. Here are future opportunities to catch up with the project team:

- *24 Oct 2012 –Quality digestate and compost in agriculture Coleg Llysfasi & Fre-Energy, Wrexham*
- *20 Nov 2012 - Quality digestate and compost in agriculture with NAAC, HUAC, Newport, Shropshire*
- *6 Dec 2012 - Quality digestate and compost in agriculture with FACTS, Stoneleigh, Warwickshire*

We will also be going back to college this spring to deliver a series of lectures to the "farmers of tomorrow".

If you would like details of these and future events contact: enquiries@earthcaretechnical.co.uk

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

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