

Digestate and compost use in agriculture

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wrap



Good practice guidance for farmers, growers and advisers

Good practice guidance

Anaerobic digestate and compost can be considered renewable fertilisers, much like livestock slurry and farmyard manure.

This guide provides an introduction to compost and anaerobic digestate, how they should be integrated into farm nutrient planning, and how they should be applied to the field.

The guide is intended to complement rather than replace other statutory or good practice guidance for handling these materials. Separate guidance is available for agricultural contractors covering haulage and application at www.wrap.org.uk/using-renewable-fertilisers

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1.0 What are digestate and compost?

1.1 Digestate

Digestate (also known as 'anaerobic digestate' or 'biofertiliser') supplies readily available nitrogen that allows farmers to reduce their inputs of conventional fertiliser. It is one of the products of anaerobic digestion (AD), which is the controlled biological decomposition of biodegradable materials such as food wastes and animal manures in the absence of oxygen.

Digestate is normally produced 'whole' (a slurry with a dry matter content of around 5%), but this can be separated into fibre and liquor fractions.



Whole digestate

1.2 Compost

Compost is both a soil conditioner and a source of major plant nutrients, including readily available potash, made from the controlled biological decomposition of either solely green waste (e.g. lawn clippings, prunings, woody material) or from a mix of green waste and food waste, in the presence of oxygen.

Compost usually contains little readily available nitrogen, although soil nitrogen supply can be increased over the long term following its repeated use. Compost has a liming value, while repeated use over time can increase soil organic matter levels, improving workability and water retention properties.



Compost (image courtesy of Audrey Litterick)

2.0 Are all digestates and composts of the same quality?

2.1 Digestate and compost certification

Digestate or compost that is certified under the **Biofertiliser Certification Scheme**¹ and the **Compost Certification Scheme**² does not normally need an environmental permit or exemption to be in place for their application to land. In other words, waste-derived digestate and compost become products (i.e. they are no longer wastes) once certified under the relevant scheme.

A core requirement of each certification scheme is compliance with the baseline quality specifications, set by the British Standards Institution's:

- **Publicly Available Specification 110**³ (PAS110) for anaerobic digestate, and
- **Publicly Available Specification 100**⁴ (PAS100) for compost.

While each PAS specifies minimum quality criteria, they also allow customers to specify higher quality thresholds.

Users can specify digestate or compost quality that has a higher quality threshold than the PAS110 or PAS100 baselines, and this should be agreed in writing with the supplier.

2.2 What if I have doubts about the quality of the material supplied?

It is recommended that users request written confirmation from their supplier that the compost or digestate to be supplied meets requirements. If quality does not meet requirements, users can and should reject the material before it is applied to land. Compost can be checked visually for physical quality, while a sample of digestate can be decanted into a bucket and 'scooped' with a kitchen-type sieve to inspect for plastic or other undesirable material.

Details on how to submit a formal complaint about certified compost or digestate can be found on the **BCS**⁵ and **CCS**⁶ websites. If a pollution incident has taken place, alert the **EA**⁷, **NRW**⁸ or **SEPA**⁹.



Irrespective of whether they are classified as products or wastes under environmental regulation, digestate and compost derived from animal by-products such as food waste are subject to statutory requirements covering testing, storage, transport and use under the animal by-product regulations. Further information on these is provided in **Section 3**.

3.0 Do I need any kind of permit or licence to use renewable fertilisers?

A waste permit, exemption or licence is not normally required if the digestate or compost to be used is certified under the Biofertiliser or

Compost Certification Schemes. Always ask for a copy of the certification from the supplier, and check that it is valid.



Trailing hose bandspreader (image courtesy of Gask Farm)

3.1 What about using renewable fertilisers made from food waste?

If you use renewable fertilisers derived from inputs that include food waste (or other allowed animal by-products), you must always comply with **statutory requirements**¹⁰ that include:

- Preventing stock access to composts and digestates that are stored on farm before application to land;
- Adhering to the specified minimum grazing/harvest intervals following application of composts and digestates; and
- Keeping records to demonstrate that the grazing or harvest intervals have been observed.

Digestate or compost that is derived from animal by-products and destined for use in agriculture must be clearly labelled as such during transportation and prior to land spreading. The regulations impose strict 'lay off' periods, whereby pasture land cannot be used for livestock grazing, or harvested for forage, within 3 weeks of applying digestate or compost that is derived from animal by-products. The layoff period is two months for pigs.

The regulations require compliance with these restrictions to be demonstrated through record keeping on the part of the farmer. Further information can be found on the **gov.uk**¹¹ website. These restrictions apply regardless of whether digestate or compost are classified as products or wastes.

4.0 How should I plan applications?

4.1 Overview

Integrating digestate and compost into a farm’s nutrient management plan should aim to maximise the use of nutrients supplied. Adequately allowing for the nutrients supplied by renewable fertilisers will help farmers achieve good crop performance and avoid wasting money, as well as avoiding environmental harm.

The key steps are:

- 1. Identify the fields and crops that are available and will benefit most from renewable fertiliser application.** Digestate is best suited to crops with a high nitrogen demand, and compost is best suited to soils requiring organic matter and/or phosphate and potash. Take into account accessibility and likely soil conditions at the time of application, and the application equipment available.

- 2. Use a nutrient management recommendation system** (e.g. **The Fertiliser Manual (RB209)¹²**, **SRUC Technical Note 650¹³**, **MANNER-NPK** or **PLANET¹⁴**) to calculate the amount of crop available nitrogen, phosphate, potash and other nutrients supplied from each application in each field. Digestate does not yet feature in RB209, and whilst research to understand the nutrient supply properties of whole digestate is being undertaken through the **DC-Agri programme of field experiments¹⁵**, the advice is to use pig slurry as a proxy.
- 3. Calculate the nutrients supplied by the renewable fertiliser and deduct these from the requirement of the crop.** This will give the balance (if any) that needs to be supplied by manufactured fertiliser. An overview of ‘typical’ nutrient contents for renewable fertilisers is provided in the table below.

Table 4.1 Typical compost nutrient contents (kilograms/tonne fresh weight)

	Unit	Food-based digestate	Green compost	Green/food compost
Dry matter content	%	4	60	60
Total nutrients				
Nitrogen (N)	kg/t	5	7.5	11
Phosphate (as P ₂ O ₅)	“	0.5	3.0	3.8
Potash (as K ₂ O)	“	2.0	5.5	8.0
Magnesium (as MgO)	“	0.1	3.4	3.4
Sulphur (as SO ₃)	“	0.4	2.6	3.4
Readily available nitrogen				
Nitrogen (N)	kg/t	4	<0.2	0.6

Source: Defra Fertiliser Manual (RB209) and SRUC Technical Note 650.

4.0 How should I plan applications?

4.2 Digestate specifics

4.2.1 Nitrogen

Only apply digestate when there is a crop nitrogen requirement – for most crops this would mean early spring or summer.

Aim for digestate to supply no more than 50-60% of the total N requirement of the crop, and use manufactured fertiliser N to supply the remainder. Relying on digestate to supply the entire crop nitrogen requirement may compromise crop yields and quality – and is not good practice.

Food-based digestate is an effective renewable fertiliser supplying crop available nitrogen, of which a high proportion is ammonium. It is known that livestock slurries that contain a high proportion of ammonium-N may sometimes have a negative impact on earthworms, and this effect may also be seen sometimes following applications of food-based digestate.

It is recommended that ammonium-N loading rates are controlled by following normal good practice, as outlined in this guidance document, and that users adjust application rates using up-to-date digestate nutrient analysis data in order to reduce the possibility of any negative impacts. Rapid on-farm nitrogen meters (e.g. Agros and Quantofix) can be used to provide on-site measurements of digestate ammonium-N contents.

4.2.2 Phosphate and potash

- Where a response to phosphate or potash is expected (e.g. ADAS soil P/K Index 0/1; SRUC very low or low status) or where responsive crops (e.g. maize, potatoes and other field vegetables) are grown, assume that:
 - Around 50% of the phosphate and around 80% of potash in digestate will be available to the crop in the year of application.
- Where the soil is at or above the target soil P/K status and a crop response to phosphate and potash additions is not expected (i.e. ADAS Index 2 or above; SRUC moderate status or above):
 - use the total phosphate and potash content of the digestate in nutrient planning to avoid over-application of these nutrients and loss to the environment.

4.3 Compost specifics

4.3.1 Nitrogen

Typically, green compost supplies only very small amounts of crop available nitrogen, whilst green/food compost supplies around 5% of its total nitrogen to the next crop grown (irrespective of application timing). However, soil nitrogen supply can be increased over the long term following the repeated use of green and green/food compost.

4.0 How should I plan applications?

4.3.2 Phosphate and potash

In general, around 50% of the phosphate and around 80% of the potash in compost will be available to the crop in the year of application.

There are no data on supply of sulphur and magnesium in compost to the next crop grown, so inputs of these nutrients should largely be regarded as contributing to the maintenance of soil reserves.

4.3.3 Liming value of compost

Compost has a liming value that can balance the acidifying effects of fertiliser nitrogen additions to soils. It is recommended that users ask their compost supplier to determine the neutralising value of their product; in some composts this can exceed 15% of the liming value of ground limestone.

To maximise the agronomic benefits of renewable fertilisers it is recommended that users obtain an up-to-date analysis for the consignments of material to be used. This can be obtained by:

- Asking for a copy of a recent laboratory analysis from the supplier; or
- Sending a sample to be analysed at an accredited laboratory e.g. a member of the **Professional Agricultural Analysis User Group**¹⁶

For digestates, 'rapid' on-site analysis is recommended to quantify the readily available nitrogen content, using a nitrogen meter e.g. Agros or Quantofix.



5.0 Are there any restrictions on using digestate or compost?

Digestate and compost are compatible with all crops, but should only be used in line with the requirements of the Renewable Fertiliser Matrix ([Section 7.0](#)).

Whilst digestate and compost are explicitly allowed by the major UK farm assurance schemes, users should always check their acceptability with customers before use. The Renewable Fertiliser Matrix is based on digestate and compost that are certified by the Biofertiliser and Compost Certification schemes.



5.1 Use of digestate and compost on organic holdings

The [governing EU regulation for organic farming](#)¹⁷ lists the types of compost and digestate that are considered acceptable for use by organic farmers and growers. Questions about material selection should be directed to the farmer's organic certifying body.

5.2 Use of digestate and compost in Nitrate Vulnerable Zones (NVZs)

Digestate and compost can be used in NVZs and guidance should be followed on their [use](#)¹⁸ and [storage](#)¹⁹. Attention is particularly drawn to the following aspects:

- **Field N limit** – which is based on total nitrogen in organic manures (including digestate and compost). There are specific exemptions for certified composts;
 - **N max** – which is based on crop available nitrogen in organic manures; and
 - **Soil incorporation** – liquid digestate applied to bare soil or stubble must be worked into the soil within 24 hours unless it is applied with precision application equipment (such as a bandspreader or shallow injector).
- **Application near surface water** – a specific exemption applies to digestate applied with precision application equipment on less than six metres from the surface water.
 - **Closed spreading periods** – as the readily available nitrogen content of liquid digestates (and some fibre digestates) exceeds 30% of their total N content, applications are subject to mandatory closed spreading periods during autumn/winter. In addition, from the end of the closed period until the end of February, restrictions apply to liquid digestate application rates.

6.0 How should digestate and compost be applied to the field?



Image courtesy of ADAS

Similar to livestock slurries, liquid digestates can pollute surface water if applications are not managed carefully. In particular, digestate and compost should not be spread on frozen, snow-covered or waterlogged ground, or within 10 metres of a watercourse. Additional good practice guidance for the application of livestock manures and slurries should be followed when applying compost

and digestate. Detailed information can be found in:

- the **Code of Good Agricultural Practice**²⁰ in England;
- the **Code of Good Agricultural Practice for Wales**²¹; and
- the **Prevention of Environmental Pollution from Agricultural Activity**²² in Scotland.

- Liquid digestate should be applied using precision application equipment such as band spreaders or shallow injectors or, where appropriate, be incorporated rapidly into the soil. This will significantly increase the amount of nitrogen available for crop uptake and reduce the amount lost as ammonia.
- Broadcasting digestate with a splash-plate is not recommended.
- Compost and fibre digestate can be spread with most conventional muck spreaders.
- All equipment should be well maintained and calibrated for the type of material being applied.

Rates of application should be based on the farm's nutrient management plan, and can be calculated using the guidance provided in **Section 4.0**.



Image courtesy of SRUC

7.0 The Renewable Fertiliser Matrix

		BSI PAS 110 digestate				BSI PAS 100 compost			
Cropping category		Pasteurised ¹		Non-pasteurised		Green		Green/food	
Fresh produce	Group one	✓	Before drilling or planting ²	✗	NOT within 12 months of harvest and also at least six months before drilling or planting ²	✓	Before drilling or planting ²	✓	Before drilling or planting ²
	Group two	✓	Before drilling or planting ²	✗	NOT within 12 months of harvest and also at least six months before drilling or planting ²	✓	Before drilling or planting ^{2,3}	✓	Before drilling or planting ^{2,3}
	Group three	✓	Before drilling or planting ²	✓	Before drilling or planting ²	✓	Before drilling or planting ^{2,3}	✓	Before drilling or planting ²
Combinable and animal feed crops		✓	May be applied before and after drilling or planting ⁵	✓	May be applied before and after drilling or planting ⁵	✓	May be applied before and after drilling or planting ⁵	✓	May be applied before and after drilling or planting ⁵
Grassland and forage – grazed		✓	Statutory no-graze intervals apply ⁴	✓	Three week no grazing period applies	✓	Three week no grazing period applies	✓	Statutory no-graze intervals apply ⁴
Grassland and forage – harvested		✓	Statutory no-harvest intervals apply ⁴	✓	Three week no harvest period applies	✓	Three week no grazing period applies	✓	Statutory no-graze intervals apply ⁴

Notes

1. Derived from feedstocks that include Animal By-Products (ABPs), according to the requirements of the European Animal By-Products Regulations (Regulation (EC) No. 1069/2009 and Commission Regulation (EU) No. 142/2011, as implemented by the nations of the UK and Northern Ireland). Pasteurised digestates also include those derived from inputs that have undergone prior processes equivalent to pasteurisation.

2. Target of zero and absolute limit of <0.1% (m/m dry weight) glass must be achieved.

3. May be applied as mulch.

4. In accordance with the Animal By-Products Regulations (see above). These currently stipulate intervals of two months for pigs and three weeks for other livestock.

5. No specific additional risk-management approaches are required for this cropping category, as regulatory and good practice requirements apply to this (and all other) categories.

7.0 The Renewable Fertiliser Matrix

7.1 Cropping categories

*Note that this group also includes non-edible ornamental crops.

Fresh produce	Group one	Crops that the customer can eat raw and which do not have a protective skin that is removed before eating; they may also have a significant risk or history of pathogen contamination:	Whole head Lettuce, Leafy Salads (including any vegetable leaf you can eat raw), Celery, Salad Onions, Radish, Fresh and Frozen Herbs, etc.
	Group two	Crops that the customer can eat raw and which either have a protective skin or grow clear of the ground, or that have no history of pathogen contamination:	Apple, Beetroot, Blackcurrant, Blueberry, Broad Bean, Broccoli, Cabbage, Carrot, Capsicum, Cauliflower, Celeriac, Cherry, Courgette, Cucumber, Garlic, Green Beans (other than runner beans), Melon, Mushroom, Onion (red and white), Pea, Pear, Peach, Plum, Raspberry, Strawberry, Sugar Snap Peas, Sweet Corn, Tomato and Tree Nuts, etc.
	Group three*	Crops that the customer always cooks:	Artichoke, Runner Bean, Leek, Marrow, Parsnip, Potato, Pumpkin, Squash, Swede, Turnip, etc.
Combinable and animal feed crops		Wheat, Barley, Oats, Rye, Triticale, Field peas, Field beans, Linseed/flax, Oilseed rape, Sugar beet, Sunflower, Borage.	
Grassland and forage - grazed		Grass, Forage swedes and turnips, Fodder mangolds, Fodder beet, Fodder kale, Forage rye and triticale, Turf.	
Grassland and forage - harvested		Grass silage, Forage maize, Haylage, Hay, Herbage seeds.	

Checklist for sourcing and using digestate and compost

1	<p>Do you know what the material is (compost or digestate) and what facility it will come from?</p> <p>The supplier should be able to provide this information – including contact details for the production facility.</p>	Y / N	5	<p>Do you have an up-to-date analysis of the material?</p> <p>To ensure that the right amount of material is applied, include compost and digestate applications in nutrient planning, using up-to-date information on the characteristics of the material intended for use. If you are in any doubt about how to do this, consult an agronomist with specific expertise in handling organic materials.</p>	Y / N
2	<p>Do your buyers or farm assurance schemes have a position on the use of these products?</p> <p>Some buyers and assurance schemes may not allow their use or have specific restrictions in place, so this should be checked before entering into discussions with suppliers.</p>	Y / N	6	<p>Do you want to request higher quality requirements?</p> <p>Products certified under the Biofertiliser and Compost Certification Schemes are required to meet appropriate quality specifications. However, it is important that you are happy with the quality that will be supplied, and you can insist that it meets higher specifications and that the supplier provides analytical evidence to demonstrate that it meets your requirements.</p>	Y / N
3	<p>Do you know what the material is made from?</p> <p>The supplier should be able to provide a list of input materials. If the material is made from inputs that include Animal By-Products (ABP), it is safe to use them, but the statutory requirements must be followed, preventing stock access to the material before and after it is spread on the field. The supplier should provide guidance on these requirements.</p>	Y / N	7	<p>Are you happy with the compost or digestate that has been delivered?</p> <p>It is important that you are happy with the material that has been supplied. You should be satisfied that you know enough about the material and that any questions you may have about it have been answered satisfactorily. If you do not believe that it is of the quality specified, you should refuse to accept it.</p>	Y / N
4	<p>Is the material certified under the Biofertiliser Certification Scheme or Compost Certification Scheme?</p> <p>The supplier should be able to provide a copy of the certification document(s). Be sure that they are in date.</p>	Y / N			

General good practice

- Get to know your supplier and their product; you may want to visit their site to see the process for yourself.
- Speak to other farmers and growers about their experience of using these products. If you don't know anyone who has used the products, ask your supplier to put you in touch with other customers.
- Ask for an up-to-date analysis of the material. Ideally this should be an analysis of the consignment that will be supplied for your use. Useful agronomic analyses include pH, dry matter, total nitrogen, readily available nitrogen, phosphate, potash, magnesium, sulphur and liming value. Useful quality analyses include physical contaminants and potentially toxic elements (PTEs).
- Try to be in the field when the first loads arrive to ensure that you are happy with the quality. If you believe that it does not meet your requirements, you should refuse to take it.



Notes and references

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| 1 http://www.biofertiliser.org.uk/ | 9 http://www.sepa.org.uk/about_us/dealing_with_us/contacting_us.aspx | 15 http://www.wrap.org.uk/content/digestate-compost-agriculture |
| 2 http://www.qualitycompost.org.uk/ | 10 https://www.gov.uk/government/publications/controls-on-animal-by-products | 16 http://www.nutrientmanagement.org/library/soil-testing-find-a-laboratory/ |
| 3 http://www.wrap.org.uk/content/bsi-pas-110-specification-digestate | 11 https://www.gov.uk/government/publications/controls-on-animal-by-products | 17 See Annex I of Commission Regulation (EC) No 889/2008 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:250:0001:0084:EN:PDF |
| 4 http://www.wrap.org.uk/content/bsi-pas-100-compost-specification-1 | 12 http://www.ahdb.org.uk/projects/CropNutrition.aspx | 18 https://www.gov.uk/guidance/using-nitrogen-fertilisers-in-nitrate-vulnerable-zones |
| 5 http://www.biofertiliser.org.uk/contact | 13 http://www.sruc.ac.uk/downloads/download/560/tn650_optimising_the_application_of_bulky_organic_fertilisers | 19 https://www.gov.uk/guidance/storing-organic-manures-in-nitrate-vulnerable-zones |
| 6 http://www.qualitycompost.org.uk/product-complaints | 14 http://www.planet4farmers.co.uk/ | 20 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69344/pb13558-cogap-090202.pdf |
| 7 https://www.gov.uk/report-an-environmental-incident | | 21 http://wales.gov.uk/docs/drah/publications/110420cogapwales2011introen.pdf |
| 8 http://naturalresourceswales.gov.uk/about-us/how-to-contact-us/228102/?lang=en | | 22 http://www.scotland.gov.uk/Resource/Doc/37428/0014235.pdf |

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