



Overview: Digestate Safety for Agriculture



EUROPE & SCOTLAND
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1 What is this document for?

This document provides a brief overview of the findings from a risk assessment procured by WRAP and Zero Waste Scotland that examines the safety of digestates when used on agricultural land. Background information on the regulatory controls governing compost and digestate production and use in Scotland is also provided. A more detailed summary of the risk assessment can be downloaded from the WRAP website¹.

¹<http://www.wrap.org.uk/content/digestate-quality-and-safety-agriculture>



2 What is digestate?



Digestate is one of the products of anaerobic digestion (AD), which is the controlled decomposition of biodegradable materials (such as food waste, animal manures and energy crops), in the absence of oxygen. Digestate is also known as 'anaerobic digestate' or 'biofertiliser'. It is normally produced as 'whole' (a slurry with a dry matter content of around 5%), but this can be separated into fibre and liquor fractions. Digestates supply readily available nitrogen and other plant nutrients. Fibre digestates are a source of organic matter and can act as soil conditioners.

3 Are there any regulations around digestate manufacture?

Yes – the process of digestate manufacture is considered a 'waste' activity, and needs an appropriate approval from SEPA.

Wastes accepted for processing must be source-segregated biodegradable wastes only, and be restricted to those listed in the SEPA approval.

Where food wastes are digested, then an additional approval is required from the Animal and Plant Health Agency (APHA). AD processes that accept wastes incorporate a pasteurisation step – typically 70°C for one hour and is a legal requirement where food wastes are digested, under the Animal By-Products Regulations (ABPR).



4 Delivering quality digestate

Where wastes are digested, the resulting digestate is normally considered a 'waste'. This 'waste' status can give the impression of poor quality, causing digestate to be under-valued as a resource. To help overcome this perception, the UK environmental regulators all recognise 'end of waste' approaches for digestate, delivered under the Biofertiliser Certification Scheme (BCS)².

The BCS requires all digestate to meet the requirements of PAS110³ which is a 'Publicly Available Specification' owned by the British

Standards Institution. The PAS110 specification provides a baseline for digestate quality on which customers can build and compliance is checked through annual audits by third parties. Compliant sites must operate a Quality Management System based on HACCP (Hazard Analysis and Critical Control Points) principles to ensure that the required quality is consistently delivered.

PAS110 provides baseline limits for key hazards known to be relevant in anaerobic digestion, including: potentially toxic elements (such as zinc and chromium); indicator pathogens (E. coli

and Salmonella); physical contaminants (such as metal and plastic). Certified digestates are no longer considered wastes, however ABPR controls on grazing and forage harvest intervals still apply to digestates made from food wastes.

²<http://www.biofertiliser.org.uk/>

³<http://www.biofertiliser.org.uk/pas110>



5 Confidence in digestate

Although the regulatory and BCS requirements are freely available, the lack of visibility around their supporting evidence has previously prompted questions from food-chain stakeholders. In response to this, a wide-ranging programme of evidence-gathering was funded by WRAP and then Zero Waste Scotland. This included a risk assessment for digestate quality examining risks to humans, livestock and crops.

This risk assessment was undertaken by a consortium of expert institutions, including: Cranfield University, the Animal & Plant Health Agency, ADAS and Earthcare Technical. At all stages, input was sought from food-chain stakeholders that included the UK Food Standards Agency (FSA), Food Standards Agency in Scotland (now Food Standards Scotland; FSS), farming unions, retailers and many others. The independent advisory committees⁴ coordinated by the FSA also provided scientific scrutiny.

⁴ The Committee on Toxicity (CoT) and Advisory Committee on the Microbiological Safety of Food (ACMSF)



6 Risk assessment overview

Where possible, quantitative risk assessments (QRA) were undertaken using a classic source-pathway-receptor model. Where published data were insufficient to populate full quantitative risk assessments, then qualitative assessments were made – for example, by comparing the ‘concentration’ of hazard in digestate with environmental backgrounds or the ‘concentration’ of the same hazard in other materials that are commonly applied to land, such as livestock manures. Based on stakeholder feedback, and following preliminary evidence reviews, six broad categories of hazardous agents were considered, as listed in Table 5-1.

The overall conclusion was that current statutory AD process requirements and (where appropriate) statutory grazing and forage harvest bans were sufficiently robust to ensure that risks to humans, livestock and crops were acceptably low. Where AD systems did not include a pasteurisation stage, it was recommended that the further testing for specific crop pests and diseases be undertaken on the resulting digestates before use. Taking account of the current evidence base and scientific opinion, Food Standards Scotland (FSS) concurs with existing advice that the risks from PAS-100 compliant composts and PAS-110 compliant anaerobic digestates used in agriculture are low and comparable with other materials used for this purpose. Businesses

intending to use composts and anaerobic digestates in food production should ensure that they are used appropriately i.e. that measures are taken in the food production process to control potential contamination arising from the soil, water and any fertilisers used⁵. Businesses should use such products in accordance with manufacturers’ instructions.

Table 5-1 Categories of hazards considered, with examples. A full list of hazards considered can be found at in the detailed risk assessment summary⁶

⁵ as defined in Regulation (EC) 852/2004; Annex 1; Part A(II); 3(a)
⁶ <http://www.wrap.org.uk/content/digestate-quality-and-safety-agri-culture>

Toxic compounds present in plants considered
Ragwort (<i>Senecio jacobaea</i>)
Organic compound contaminants
PAHs (Polycyclic Aromatic Hydrocarbons); PCBs (Polychlorinated biphenyls); and PCDD/Fs (Polychlorobenzodioxins and Polychlorodibenzofurans)
Potentially Toxic Elements
Zn (Zinc); Cu (Copper); Ni (Nickel); Cd (Cadmium); Pb (Lead); Hg (Mercury); Cr (Chromium)
Pathogens and other organisms of relevance to animal health
Classical Swine Fever Virus (CSFV); Foot and Mouth Disease Virus (FMDV); Scrapie; Mycobacterium paratuberculosis; Liver and Rumen flukes; Neospora caninum; Sarcocystis; Bovine Cysticercosis; Toxoplasma
Pathogens and other organisms of relevance to human health
Enterobacteriaceae (<i>E. coli</i> O157); Salmonella spp.; Campylobacter spp.; Listeria spp.; Cryptosporidium parvum; Tapeworm (<i>Taenia saginata</i>); Legionella; Aspergillus
Pathogens and other organisms of relevance to crop health*
Potato cyst nematodes (PCN); Free-living nematodes (such as stubby root nematodes); Clubroot of brassicas; Fusarium; Potato pathogens such as Powdery and common scab, Rhizoctonia, Ring rot, Brown rot and Phytophthora.

*Digestate risk assessment only +Compost risk assessment only

7 Quality controls for materials applied to land



Although the risk assessment showed that the underlying regulatory requirements were robust, the regulations do not provide guidance on best practice that could reduce risks even further. Such best practice guidance is already in place for other materials, such as:

- Managing Farm Manures for Food Safety (published by the Food Standards Agency)
- The Safe Sludge Matrix (published by ADAS and Water UK)

Consequently, the findings of the risk assessment and wider research programme were used as the basis for a 'Renewable Fertiliser Matrix', which covers anaerobic digestate and compost. The digestate requirements are presented in Table 6-1. Versions of this matrix have now been embedded into the requirements of farm assurance schemes such as Quality Meat Scotland and Red Tractor Assurance. The statutory ABPR controls are a key risk management barrier, allowing for the attenuation of residual pathogens in compost before livestock can access the material – either directly or indirectly. This same principle is applied to fresh produce, where crops are harvested several weeks after compost is applied, minimising potential exposure of humans to residual pathogens.

Table 6-1 The renewable fertiliser matrix (digestates content only)

		PAS110 digestates	
Cropping category		Pasteurised ¹	Non-pasteurised
Fresh produce	Group 1	✓ Before drilling or planting ²	✗ NOT within 12 months of harvest and also at least six months before drilling or planting ²
	Group 2	✓ Before drilling or planting ²	✗ NOT within 12 months of harvest and also at least six months before drilling or planting ²
	Group 3	✓ Before drilling or planting ²	✓ Before drilling or planting ²
	Combinable and animal feed crops	✓ May be applied before and after drilling or planting ³	✓ May be applied before and after drilling or planting ³
	Grassland and forage – grazed	✓ Statutory no-graze intervals apply ⁴	✓ Three week no grazing period applies
	Grassland and forage – harvested	✓ Statutory no-harvest intervals apply ⁴	✓ Three week no harvest period applies

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 $\leq 0.1\%$ (m/m dry weight) glass must be achieved.
3. 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.
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.

The cropping categories used in Table 6-1 combine those previously adopted by Red Tractor Assurance for fresh produce with those used in the Safe Sludge Matrix (Table 6-2).

Table 6-2 Categories used in the Renewable Fertiliser Matrix (updated to be in line with Red Tractor amendments)

Fresh produce	Group 1	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, Strawberries, Chicory etc.
	Group 2	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 (including runner beans), Melon, Mushroom, Onion (red and white), Pea, Pear, Peach, Plum, Raspberry, , Sugar Snap Peas, Sweet Corn, Tomato and Tree Nuts, etc.
	Group 3	Crops that the customer always cooks:	Artichoke, Aubergine, Brussels Sprouts, Hops, Horseradish, Kohl Rabi, Leek, Marrow, Parsley root, 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.	

8 Additional Resources

Farmer's guide to sourcing and using digestate and compost

https://www.zerowastescotland.org.uk/sites/default/files/Farmers_guidance_document.PDF

Digestate and compost good practice guidance

<http://www.wrap.org.uk/content/digestate-and-compost-good-practice-guidance>

Compost quality and safety for agriculture risk assessment summary

<http://www.wrap.org.uk/content/digestate-and-compost-good-practice-guidance>

PAS 110

<http://www.biofertiliser.org.uk/pas110>

SEPA position statement on regulation of outputs from Anaerobic Digestion processes

<https://www.sepa.org.uk/media/219842/wst-ps-016-regulation-of-outputs-from-anaerobic-digestion-processes.pdf>



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