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Digestate Biofertiliser - a Guide for Farmers

1. Biofertilisers

Biofertilisers are fertilisers derived from anaerobic digestion of biodegradable organic materials. Through the processing of industrial and domestic food wastes, along with crop co-products, biofertilisers provide a valuable source of nutrients that support plant growth and enhance soil health.

Across the world biofertilisers have been used extensively in agriculture and forestry for many years and within New Zealand the Digestate Biofertiliser Producer Accreditation Scheme has been established by the Bioenergy Association to ensure the production of safe, high quality, consistent biofertilisers that meet the legislative and high-performance requirements for fertilisers.

The Scheme has established criteria[1] that digestate sold as a biofertiliser must meet. Identification of the criteria was overseen by a technical Steering Group including leading industry representatives and biosecurity experts. The guidance of the Steering Group specialists ensured compliance of the Scheme with New Zealand regulations and international best practice. The Steering Group included:

- The Ministry for Primary Industries
- The New Zealand Fertiliser Quality Council
- Industry Experts
- The Bioenergy Association of New Zealand

[1] DBPAS 05 - Guidelines for the production of digestate biofertiliser for application to land

2. Properties of Digestate

The properties of digestate are dependent on the type of feedstocks fed into the anaerobic digestor. To have a consistent digestate which has known properties the producer must control the source of feedstocks. A well-managed facility with good feedstock control will produce a consistent known quality digestate. Table 1 shows typical ranges of NPK of digestates from different feedstocks.

Table 1 Fertilising components of typical digestate.

Form of Digestate	Total solids %	TAN(total ammoniacal nitrogen) (g/kg of total solids	Ptotal (g/kg of total solids	Ktotal (g/kg of total solids	NPK Ratio	Study reference
Solid (from food waste)	14.7	23.6	18.0	10.5	2:2:1	Banks, et al., (2018)
Liquid (from food waste)	5.84	65.1	46.1	11.5	5:4:1	Banks, et al., (2018)
From food waste	N/A	52-108	6-16	26-81	N/A	Lu, et al., (2021)
From food waste (wet basis)	7.52	81.7	0.76	1.05	107:1:1	(Sánchez- Rodríguez et al., 2018)
From food waste	1.21	1.15	0.46	0.38	3:1:1	(Jamison et al., 2021)

Where digestate is sold as a biofertiliser the fertilising components must be specified in the labelling.

3. All digestates are not the same

The digestate from an anaerobic digester facility will depend on the feedstocks and the facility processing equipment. A purchaser of digestate must ensure that the digestate they purchase is fit for purpose and has the fertilising characteristics that are suitable for the soils on which the digestate will be applied as a fertiliser.

To assist purchasers, the Bioenergy Association has established a Producer Accreditation Scheme. Producers selling digestate as quality fertiliser under the Scheme who are accredited provide a level of assurance that the product meets the criteria for safe effective fertiliser.

If the producer is not accredited then the purchaser must personally check that the digestate meets the requirements of the Regional Plan Rules for application of material to land.

4. Legislative Requirements

Under current New Zealand law, digestate is defined as an agricultural compound under the Agricultural Compounds and Veterinary Medicines (Exemptions and Prohibited Substances) Regulations 2011 (ACVM). As digestate meets the requirements of a fertiliser, the compound is exempt from registration under the ACVM Act 1997 but must carry nutrient information. Products marketed as compost, mulches, and soil conditioners (but

not those marketed as fertilisers) must comply with NZS 4554:2005 which sets out contaminant limits and testing procedures (New Zealand Standards, 2005).

5. Confidence in digestate as a fertiliser

To ensure that digestate used as a fertiliser has the properties a farmer wants the Bioenergy Association has specified that Accredited Producers must have quality assurance processes in place which include;

- Labelling that provides information on the fertilizing components of the digestate.
- Specified limits on the digestate components including potential contaminants
- a Risk Management Programme
- facility operation in line with the Risk Management Programme

The accreditation criteria is based upon the stringent and highly successful PAS110 standard developed within the UK and incorporates risk control measures specific to New Zealand using food industry product quality requirements, and MPI's Risk Management Program.

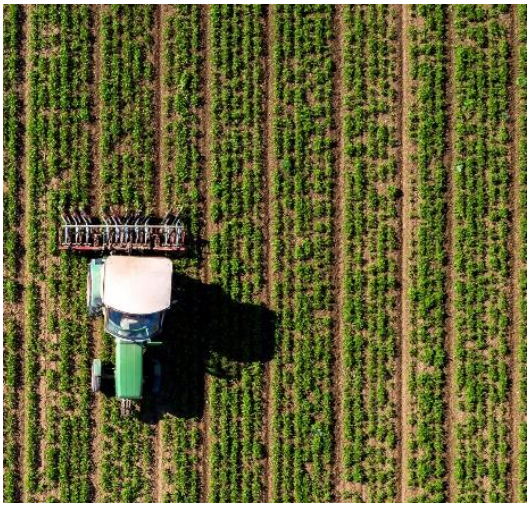
Accreditation of producers provides confidence to biofertiliser buyers that the product purchased meets the requirements of the Agricultural Compounds and Veterinary Medicines Act 1997 and complies with all applicable regulatory standards. To be accredited extensive product testing and validation is required along with annual performance monitoring.

Digestate that is not produced by an Accredited Producer may not have been externally audited and purchasers will have to do their own quality assurance enquiries. *(For more information, please see Section 4 of Characterisation of Food Waste Derived Biofertiliser)*

6. Agricultural Benefits of biofertilisers

Biofertiliser have been used for many years within Europe and research has shown they provide many benefits to soil health, increasing yields and work well both alone and in conjunction with synthetic fertilisers.

- In the United Kingdom, the Waste and Resources Action Programme (WRAP) commissioned 22 field experiments utilising biofertiliser across three growing seasons that demonstrated increased yields (winter growing wheat) with no adverse effects on crop quality or the environment.
- In Canada, incorporating biogas production in tandem with traditional farming is becoming more commonplace. Farmers can use on site feedstock and top up with food waste to produce biogas, which can then be injected into mains gas. On site videos of how this works are available at https://farmingbiogas.ca/farming-biogas-in-action/#videos



Biofertilisers work alongside soils, supporting microbial activity and are able to:

- Improve the organic carbon content of soils
- Increase key mineral concentrations in soils
- Enhances soil structure, especially in soils with naturally poor structure
- Improve water retention in soils with poor structure
- Increased accessibility to ammonium within the soil
- Provide rapid and long-term release of nitrogen for uptake by plants in the form of nitrate (converted from ammonium) and organic nitrogen.
- Improvement in crop yields compared to no fertiliser and synthetic fertiliser alone

Incorporation of Biofertiliser into Farm Plans

, It is recommended that digestate biofertilisers are included in nutrient budgets within farm plans to reduce the risk of adverse environmental effects.

(*For more information, please see Sections 3 and 5.4 of Characterisation of Food Waste Derived Biofertiliser (2024)*

7. Storage and Practical Application of Biofertiliser

Methods for storing and applying biofertiliser are discussed in Sections 5 of *Characterisation of Food Waste Derived Biofertiliser (2024)*[2].

The application methods for biofertiliser can be very different from traditional methods for applying manure directly to land. Using the recommended methods for biofertiliser will ensure that the maximum fertilising benefits, and that optimal environmental benefits, are obtained.

Cost effective application of biofertiliser to land will be achieve if the following rules are followed:

- Do not apply liquid biofertiliser during high winds or rain.
- Do not apply biofertiliser when the soil is waterlogged.
- Do not apply biofertiliser within 50m of a water supply
- Do not apply biofertiliser within 10m of surface water
- Do not apply biofertiliser on steep slopes.
- Soil testing should be completed to determine
- Withholding period of 3 weeks before grazing.
- Work the soil evenly before application.

Examples of recommended storage and application of digestate are shown in Figure 1.

[2] www.biogas.org.nz/resource/characterisation-of-food-waste-derived-biofertiliser

Figure 1: Methods for storage and application of biofertiliser

Form of Digestate	Storage Example	Application	Application Example
Liquid: **a)** In a tank with a gas membrane[3] or	**b)** 	By **a)** dribble bar[4] or	**b)** 
b) in an open air tank with a crusting surface[5].		**b)** direct injection.[6] (Splash plates are not recommended due to the high risk of ammonia volatilisation.)	
Solid: Covered to protect from weather and off natural ground[7]		By typical manure spreaders[8]	

8. Key biofertiliser take aways

The use of digestate biofertilisers reframes the status of digestate from a waste to a high value product, diverting it from landfill. The application of biofertiliser from organic waste closes the nitrogen cycle and helps reduce the reliance on synthetic fertilisers.

Biofertilisrs manufactured by accredited producers provide end users with confidence that they meet strict quality controls and are compliant with all applicable regulations. The accreditation scheme has been developed

[3] Gase membrane tank:www.bbc.com/news/uk-england-hereford-worcester-62966984)

[4] Dribble bar equipment: www.farmchief.co.nz/product_range/drag-hose-systems/

[5] Open air tank: https://nutriman.net/farmer-platform/technology/id_263

[6] Direct Injection Equipment: Orzi, V, Riza, C., Scaglia, B., D'Imporzano, G., Tambone, F., Adani, F. (2018) Anaerobic digestion coupled with digestate injection reduced odor emissions from soil during manure distribution.

[7] Solid digestate shed: CDM Smith (2015) Anaerobic Digestion and Biogas, pp.12

[8] Typical manure spreader: Kuhn.com

using international research and incorporates stringent controls originating within the food industry together with MPI Risk Management practices to guarantee product safety and quality.

Biofertilisers offer a wide range of benefits to both soils and crops, ranging from improved carbon content and the slow release of nitrogen to supplementing soil mineral concentrations. Offering a new product that focuses on sustainability and soil health, the scheme ensures the production of high quality biofertilisers.

9. Further Information

Additional information on biofertilisers and the fertilising properties of biofertiliser are available from www.biogas.org.nz/biofertiliser and Information Sheet 67: Digestate as a Biofertiliser