SYSTEMIC
Fact sheet
Recovery of nutrients and resources from digestate
2021

Market opportunities for advanced bio-refinery products from digestate

Fertilisers with tailor-made nutrient content

Extract from D 3.4 Market study for biobased fertilising products from digestate within a European context

Crop farmers and horticultural producers

The composition of the different recycled nutrient fertilisers is determined by the technologies for nutrient recovery and their efficiency, but mainly also the composition of the digestate and thus the original waste streams and/or manure from which they are produced.

This makes that the composition of digestate or (dried) solid fraction of digestate rarely represents an optimal concentration and ratio between N-P-K and other nutrients in relation of the targeted crop requirements. Because of this, there will always be a 'limiting element' which determines how much you can supply as based on fertiliser regulations. This in turn will require the farmer to add the missing amounts of other nutrients to the specific crop demand or nutrient application limits. For this, farmers uses preferably highly concentrated, single nutrient mineral fertilisers, because of their ease of application, known composition and nutrient use efficiency.

If biobased fertilisers could be adaptable to serve variable crop requirements more directly at the source, being able to supply several nutrients at once in desired ratio, they would become more valuable to end-users who would otherwise need to blend and amend products to meet their specific crop requirements.

Most of the digestate derivatives are less suited for use in substrate cultivation, because it is crucial that the application of nutrients is aligned with the plant uptake and water quality. In a system with nutrient solutions and re-use of drainage water, there is a need for flexible fertilisers that dissolve quickly and contain only a small number of organic matter particles (ARBOR Project 2015; Dodde 2012).

Also, it should comply with the quality requirements for water uptake, amount of air, pH, EC and nutrients. Certain certification labels (e.g. RHP) guarantee these quality requirements are met, which will also limit the risks for the crops.

In the long run, it would certainly be possible to use mineral concentrates from animal manure if both producer and user are willing to adapt and compromise. Odour could however remain an issue.

The producer must refine the fertiliser to make it more suitable for greenhouse horticulture.

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The following example explains a successful technology cascade that produces a nutrient solution for substrate cultivation.

In the past seven years, the Dutch company Van der Knaap and partners Opure, Triqua International and Forteco Services, have been developing a fertiliser solution derived from digestate. The technique has been patented, and together with Wageningen University and Research trials have been done on cucumber cultivation.
The technology cascade looks as follows:

- Digested pig slurry is separated in a solid and liquid fraction.
- From the liquid fraction calcium and Magnesium -phosphorus salts are precipitated after addition of Mg and Ca.
- Biological nitrification converts ammonium to nitrate
- Potassium carbonate is added, forming potassium nitrate, which is concentrated together with humic acids by means of membrane filtration
- With nanofiltration the fulvic acids are extracted
- By means of RO an NPK fertiliser solution is obtained, next to permeate rich in salts.

(Van der Knaap 2019; Van der Knaap et al. 2018, Groenten Nieuws/Van der Knaap, 2020)

Garden owners

There are several types of home garden products, granular multi-purpose organic fertilisers often containing dried poultry or cattle manure. Most garden fertilisers are commercially available as pellets or granules in boxes or bags of between 1-2 kg and they are odourless (Rigby and Smith 2011).
Therefore, thermally dried digestate products (blends), could fulfil the same role as currently available granular multi-purpose fertilisers (WRAP, 2011).

In practice, it would be ideal to mix the compost (55% DM) with a solid nitrogen rich product, avoiding the water content of the compost to be altered. Ammonium nitrate or ammonium sulphate solutions added during composting would largely volatize the ammonia again, which has to be cleaned out of the air, resulting in a zero operation. Crystallized ammonium sulphate could prove useful here but is not yet produced at AD plants.
Mineral concentrates or blends of recovered nutrient products could reach the required nutrient ratios of certain garden fertilisers (Table) concentrated and dried to eliminate odours.

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Table 1. Average nutrient content of some gardening fertilisers (Rigby and Smith 2011).

		N	P	K
Multi-purpose garden fertilisers	Some of them are made from organic constituents	5,5	3,3 (1,5 soluble)	4,4
Slow-release and organic fertilisers	Slow release nutrient source for fruit and vegetables	5,5	3,1 (0,5 soluble)	7,5
Ericaceous plant foods	Organic-based and a slow release product	7,8	5,8 (3,5 soluble)	3,5
Root booster' fertilisers	From sterilised ground bone. slow release to encourage root development	3,8	7,8 (0,9 soluble)	0
Rose and shrub feeds	Some are organic	2,5	2,4	17,5
Liquid tomato feed		3,8	1,6 (1,6 soluble)	4,6

References

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