

Digestate

Plant-based anaerobic digestion (AD) is not a new concept but in combination with organic stockfree farming and using it to enhance and recycle the fertility created on-farm it is a new and fascinating idea. It is also different from AD systems on organic farms where livestock manure is used. The term ‘vegan AD’ was coined in analogy to a vegan diet in which the digester is only fed with plant material from organic stockfree farms. This ‘digester diet’ is certainly very different from AD systems on intensive conventional livestock systems where the digester is mainly a means to getting rid of the large amount of waste (and smell) created by the intensive livestock units of cattle, pigs, chickens and other farm animals.

Currently there are more than 100 ADs on organic farms in Germany and about a dozen of them in the UK. Almost all of them are based on livestock (primarily meat, dairy and eggs). However, there is a ‘vegan AD’ co-operative in Germany near Augsburg. This is an ancient fertile plain and many farms are stockfree because the cattle have ‘migrated’ to the nearby mountains. The digester runs exclusively on grass and clover from local organic farms. Besides the owner co-operative of five organic farms, another 20 organic farms deliver grass/clover from up to 40 km away. The farmers supply their grass/clover for free in return for the digestate produced after the digestion process has finished.

This digestate is an additional N-fertilizer because AD removes only methane (CH₄) and CO₂. Its use can be targeted at times when the nitrogen needs of crops are at their highest. In addition, after cutting and removing, grass/clover biomass is more effective at returning nutrients to the soil than mulching (higher N-fixation), and results in reduced ammonia losses.

Theoretically grass/clover biomass yearly releases between 200 and 300 kg N per hectare. Most of it turns up in the harvested product, but a sizable part is also left behind in the stubble. If all of it is sold, 175 kg N, 54 kg P₂O₅ and 200 kg K₂O will be removed. However, when using the digestate much more N, P and K will stay at the disposal of the home farm.

Because all the farms are stockfree, they grow about 25% of grass/clover in the rotation. The targeted use of the digestate on crops like potatoes and cereals can increase the yield and quality of organic produce by 15% or more. Therefore, no charge is necessary for the grass/clover of supplying farms because they have seen the economic benefits of the digestate for themselves. The owner co-operative has the additional benefit of return on its investment through the electricity sales from the AD and solar energy panels and the drying services (for instance, wood chips and grains) offered with the processed heat.

In contrast to solar energy, AD is not a ‘fit and forget’ technology. It requires a ‘green thumb’ just like growing crops. For a future renewable energy mix in which all electricity comes from renewables (solar, wind and water power), the 365-day gas supply of AD plants can provide the base load of the electric grid just like coal and gas-powered plants do today. Another future use is biogas injection into the local gas grid where it is used for domestic heating.

Other important advantages of ‘vegan AD’ are no bad smells, which should help with planning admissions in a densely populated area, and the possibility to use any other grass-based biomass. The biomass could come from biodiversity areas in national parks or landscapes where livestock grazing is unwanted for environmental reasons or from a lack of demand for animal-derived products in the future.