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Contribution of anaerobic digestion to the European Circular Economy

Anaerobic digestion (AD) is an important pillar of the European circular economy: it mitigates GHG emissions, recycles nutrients in the form of organic fertilisers, prevents nitrogen leakage into groundwater and avoids the spread of harmful diseases through landfilling¹. Additionally, AD is a vital part of the European bio-economy tapping into leftovers of other industries and thereby improving European resource-efficiency. Through further scientific research and development, this kind of cascading use could be exploited even more.

Increased anaerobic digestion of biodegradable waste would create jobs and economic opportunities. At the moment, the anaerobic digestion sector employs over 70.000 people and there is potential for a lot more growth through adequate treatment of biowaste. In the case of municipalities and companies dealing with waste management, in addition to their fees for treating this material, they can increase their revenue by producing energy and fertilisers. Similarly, farmers treating their waste can either sell these products or use them for self-consumption.

Anaerobic digestion – a necessary step of a bio-based industry

Several streams of biomass are already the most important raw materials of a bio-based industry. Also further efforts to enhance the uptake of a circular economy will not change this but will increasingly lead to cascading use of biomass. Using nature as guidance, this cascading use should not lead to unused waste at the end. Anaerobic digestion is the only technique which can use those “leftovers” to produce energy and an organic fertiliser while closing the loop of a circular economy - avoiding unwanted “waste”. Although anaerobic digestion is already a well-developed technique, we need and can still expect further technological and biological leaps. **Therefore, the biogas technique should be included in different kinds of scientific tenders on circular economy.**

Digestate – an excellent bio-fertiliser with low or negative GHG emissions and excellent soil improving properties

In order to further reduce GHG emissions and improve energy self-sufficiency, organic fertilisers coming from digestate and compost streams - an excellent alternative to mineral fertilisers - should be increasingly deployed. They are far more sustainable than mineral fertilisers, as their production is **very low (or even negative) in terms of GHG emissions**, what should be acknowledged when calculating anaerobic digestion’s total GHG savings. Also, by using digestate as a fertiliser the carbon content of the soil increases through the remaining and very stable carbon content within digestate, improving soil fertility and field capacity. The latter helps us avoiding desertification. Moreover, plant growth naturally sequesters carbon, which can be stored

¹ Bayerische Landesanstalt für Landwirtschaft (2007, 1. Auflage): Biogastechnologie für Hygiene und Umwelt in wasserwirtschaftlich sensiblen Gebieten;
B. Fröschle et al (2012): Inactivation of salmonella in biogas processes – determination by conventional and QPCR methods

in the soil once this vegetation, its residues, and products made of it are digested and subsequently used as a fertiliser. In addition, the transport routes of organic fertilisers are short due to the decentralised deployment of biogas plants.

Compared to unprocessed organic effluents, **digestate has more available nitrogen and it minimises the presence of pathogens as well as invasive species inside it, making this substance a more effective and safer fertiliser.** Organic fertilisers from anaerobic digestion only cost a fraction of the price for mineral fertilisers and farmers can even produce these themselves, thereby cutting costs, increasing their revenues and creating jobs in rural areas.

For these reasons, integrating organic fertilisers within the EU's internal market through **common End-of-Waste criteria for digestate and revision of the Fertilisers regulation** with an explicit inclusion of digestate will have positive effects on Europe's future circular economy, as this measure supports the environment, society and economy. The product requirements of the revised Fertilisers regulation should take into account digestate's physical properties, setting realistic minimum nutrient requirements based on dry mass. The expected fast development of digestate treatment techniques should also be considered and stimulated by upcoming European legislation. Existing national legislations should however be considered by allowing flexibility and an appropriate transition period.

At the core of an efficient circular economy that uses its biomass resources sustainably, it is essential to have a strong article 5 of the **Waste Framework Directive** (by-products). In order to rightly apply the cascading principle to biomass utilisation, clear criteria have to be defined to ensure that valuable and safe biomass residues are not defined as "waste" but rather as "leftovers", thereby digestate from these leftovers does not become waste.

Furthermore, EBA calls on the Commission to **legally exempt digestate from the registration effort under REACH Regulation (No 1907/2006) by amending the Annex V point 12 in a way that the exemption applies, beside compost and biogas, also to digestate.**

Importance of ambitious waste management targets

Landfilling of biodegradable waste causes huge amounts of CO_{2 eq.} emissions and nutrient and carbon leakage into soil and groundwater. In contrast, anaerobic digestion of biodegradable waste helps to reduce massive amounts of CO_{2 eq.} emissions, produce valuable renewable energy and recover nutrients:

Even more than 110 million tonnes of CO_{2 eq.} could be mitigated yearly if all biodegradable waste that is still landfilled (over 78 million tonnes in the EU²) would not be landfilled anymore.

² According to EBA's extrapolated estimations, based on EU Member States reports on the implementation of Landfill Directive 199/31/EC, 78.113.240 tonnes of biodegradable waste were landfilled in the EU in 2012. According to the data of Lorenz Strimitzer from BOKU Vienna (Ökobilanz der In-Situ Aerobisierung einer Altablagerung, 2011), landfilling of 1 tonne of food and kitchen waste (fresh matter) would emit 1,24 tonnes CO_{2 eq.} and landfilling of 1 tonne of garden and park waste (fresh matter) would emit 1,49 tonnes of CO_{2 eq.} Provided that the streams of biodegradable waste were all over Europe similar to Germany – 31,4% food and kitchen waste; 68,6 % garden and park waste (Source: Umweltbundesamt) – more than 110 million tonnes of CO_{2 eq.} could be avoided EU-wide.

Digesting these 78 million tonnes of biodegradable waste would additionally generate:

- 150 PJ of renewable energy in form of biogas or biomethane with 11 million tonnes CO₂ eq. savings by replacing fossil fuel (oil)
- Organic fertiliser with approximately:
 - 400 000 tonnes nitrogen (N)
 - 120 000 tonnes phosphorus (P₂O₅)
 - 450 000 tonnes potassium (K₂O)
 - 3 000 000 tonnes of carbon

Due to the usually high water content of biodegradable waste, incineration cannot generate the full energy potential out of it. Additionally, nutrients of biodegradable waste will be lost if it incinerated.

Therefore, in order to improve waste management, EBA calls for a ban of landfilling and a ban of incineration of biodegradable waste combined with obligatory separate collection measures of biowaste. Public authorities should be held accountable for their efforts to fulfil their specific targets and should be sanctioned in the case of clear breaches.

Anaerobic digestion – clearly a recycling method under waste hierarchy

Article 4 of the **Waste Framework Directive (2008/98/EC)** sets out a clear waste hierarchy in respect to environmental and resource needs. In some Member States, anaerobic digestion of biodegradable waste is still not recognised within the waste hierarchy as a recycling process. This is so, despite the fact that biogas plants across Europe are currently transforming millions of tonnes of organic waste into two valuable products: energy in the form of biogas and biomethane; digestate which recycles all valuable nutrients necessary for plant growing.

Taking into account that anaerobic digestion is a natural and sustainable process that recovers all nutrients in organic waste material in a very similar way to composting (which is recognised as recycling in the waste hierarchy), **EBA requests the European Commission to include anaerobic digestion of biodegradable waste in the Annex II ('recovery operations') of the Waste Framework Directive (2008/98/EC) under the point 'R3'. This would incentivise Member States to produce renewable energy and organic fertilisers in a sustainable manner.**

Removal of manure's waste status if digested

Animal by-products subject to Animal by-product regulation (ABPR, No 1069/2009) are generally excluded from the scope of the current Waste Framework Directive (WFD), Art. 2, paragraph 2 (b) except those which are destined for incineration, landfilling or use in a biogas or composting plant. Therefore, manure as animal by-product is not subject to WFD as long as it is used directly as fertiliser. On the contrary, once manure is destined for the use in biogas plants, it falls under the scope of the WFD and in some member states the product digestate then is seen as waste. Classifying farmers as waste producers, once manure will be treated in biogas plants, is not understandable and generates the strange impression that the treatment of manure in biogas plants is not positive and leads to unwanted products which are not useful. 80% of European biogas plants (altogether over 14.000 in 2013) use manure as feedstock in the same way as energy

crops, “straw and other natural non-hazardous agricultural or forestry material” (Article 2 paragraph 1 letter f WFD) with the intention to produce energy and fertiliser. The latter product is used as a full compound organic fertiliser for plant nutrition and soil improving.

For the purpose of recycling nutrients and producing renewable energy from agricultural by-products, it is vital that there is a clear difference made between landfilling and/or incineration, having the purpose of discarding wastes, and the use of by-products, e.g. manure, in composting or biogas plants with the purpose of creating new products like biogas, digestate and compost, which, in turn, are used as organic fertilisers and renewable energy. Furthermore, in comparison to untreated manure, **anaerobic digestion of manure brings along multiple additional benefits like decreasing methane emissions by 90% and odour potential as well as increasing the hygienic status and nutrient availability.**

The environmentally friendly operation of biogas plants is ensured under the existing European environmental legislation and national laws without manure being classified as waste.

Manure destined for the use in biogas or composting plants shall not be subject to WFD if the produced digestate and compost are used as a fertiliser in the same manner as raw manure. EBA thus asks the Commission to remove this illogical discrimination towards manure’s treatment in biogas plants within Article 2 paragraph 2 letter b.

Conclusion

To summarise, EBA prompts EU policy-makers to:

- **Include biogas technique in scientific tenders on circular economy**
- **Take into account savings from substitution of mineral fertilisers by digestate in anaerobic digestion’s total GHG savings calculation**
- **Introduce a Regulation on End-of-Waste criteria for digestate**
- **Strengthen article 5 of WFD on by-products to promote the cascading use of biomass and set criteria for “leftovers” which are clearly not waste**
- **Revise the EU’s fertiliser legislation by incorporating organic fertilisers into the scope, have realistic minimum nutrient values for organic fertilisers measured from dry matter and take into account further development of digestate treatment techniques**
- **Exempt digestate from the registration requirements under the REACH Regulation by amending the Annex V point 12**
- **Ban landfilling of biodegradable waste EU-wide**
- **Ban incineration of biodegradable waste EU-wide**
- **Introduce EU-wide obligatory separate collection of biodegradable waste**
- **Recognise anaerobic digestion of biodegradable waste as recycling method EU-wide by explicitly including it in the Annex II of the Waste Framework Directive under the point ‘R3’**
- **Remove the waste status of manure destined for the use in biogas plants from Article 2 paragraph 2 (b) of the Waste Framework Directive**