BIOGASES: BEYOND ENERGY

As part of a balanced, forward-looking renewable energy mix, biogases are set to play a pivotal role in delivering Europe's long-term energy security and climate mitigation objectives. The benefits of biogases go far beyond the reduction of greenhouse gas (GHG) emissions. This series of six factsheets will explore the multiple solutions that biogases are already providing in the development of a European bioeconomy.

2. Regenerative agriculture

About regenerative agriculture

Agriculture is dependent on weather, land, water and natural resources, making it particularly susceptible to climate change. Issues such as erosion and degradation of the soil, more frequent and more severe droughts, water pollution, and biodiversity losses pose a significant challenge: if the agricultural sector does not find ways to address them, adverse conditions such as these will increasingly lead to consumer price volatility and impact severely on the affordability of food items.

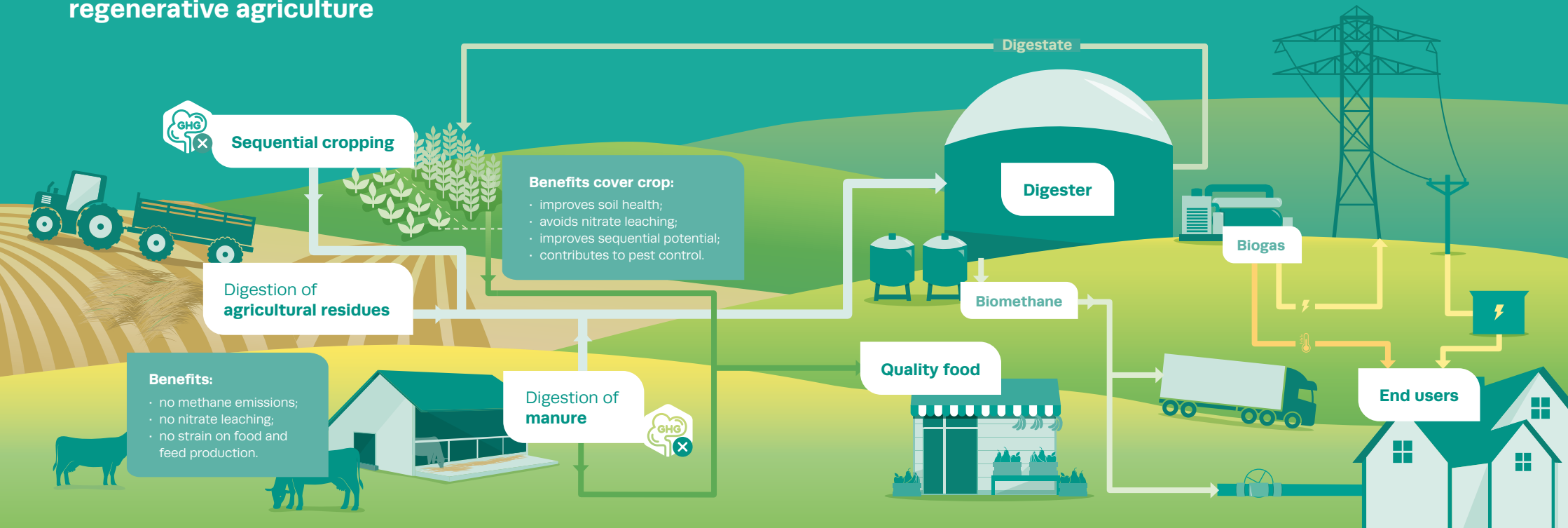
Regenerative agriculture is vital to the development of an adaptive, sustainable food system. It has a positive impact on climate, soil health, resource use efficiency, biodiversity and ultimately prosperity. The regenerative approach promotes agronomic practices such as the adoption of alternatives to synthetic fertilisers, the reduced use of pesticides and/or tillage (preparation of the soil by mechanical agitation), and the provision of soil cover through cover crops, including sequential crops. These practices increase carbon sequestration potential, improve the health and fertility of the soil, facilitate the recycling of nutrients needed by plants for growth, enhance water retention capacity and help protect natural habitats.

How do biogas systems complement regenerative agriculture?

Biogas systems are circular economy hubs, providing multiple benefits in line with the principles of regenerative agriculture (see also the infographic below):

1. **Using manure or agricultural residues as feedstocks for anaerobic digestion** (AD) mitigates greenhouse gas (GHG) emissions and nitrate leaching. Additionally, if we combine the use of sequential cropping with biogas production, the second crop grown – a cover or catch crop with multiple environmental benefits – is often not suitable for food or feed and can therefore be better valorised through AD.
2. **AD converts feedstocks into two valuable assets: renewable energy and digestate.** When spread on fields, digestate is an organic fertiliser which improves soil health, allows carbon sequestration and promotes plant disease resistance. The use of digestate also reduces GHG emissions by replacing the use of synthetic fertilisers.
3. Both the main crop harvest and livestock farming **provide consumers with quality food**.

The contribution of biogases to regenerative agriculture



Facts

How do biogas and biomethane plants contribute to the mitigation of farming emissions?

A: Specific emissions associated with agriculture include those generated during the production and use of synthetic fertilisers and those attributable to manure. Digestate offers a sustainable alternative to synthetic fertilisers; its use helps avoid the GHG emissions associated with their production and application. In addition, digestate use recycles organic materials and returns them to the soil, sequestrating carbon and thus reducing atmospheric CO2. Due to its exceptional fertilising properties, digestate is much less likely than raw organic materials to be disposed of inappropriately (in landfill or open storage, for example). This significantly reduces the risk of water, soil, and air pollution.

Emissions are further avoided by the containment of methane emitted from organic matter, such as manure and biowaste, within the closed and controlled environment of AD plants. In a biogas facility, methane is captured and utilised instead of being released into the atmosphere.

What are the benefits of digestate for nutrient recycling?

A: After AD, the mineral part of the initial feedstock is almost entirely retained in the digestate. Recycling the digestate back into the soil helps to close the cycles of nutrients such as nitrogen (N), phosphorus (P) and potassium (K), resulting in a more efficient growth of crops. It optimises the use of resources, providing mineral balance within a circular economy approach. The percentage of readily available minerals is greater in the digestate than in the initial feedstocks, meaning the AD process enhances the potential for nutrient recycling. Alongside nitrogen, phosphorus and potassium, digestate contains other macro- and microelements, such as magnesium, which increase its economic and agronomic value.

How does digestate improve soil health?

A: Digestate contains significant amounts of stable organic carbon compounds with high humification potential, which increases the humus content of the soil, improving fertility and facilitating carbon sequestration. This increases the capacity of the soil to retain water and nutrients such as ammonium, and thus reduces nitrate leaching. In contrast to the exclusive use of conventional synthetic fertilisers, long-term fertilisation with digestate enhances soil structure, soil aeration and water storage capacity. In addition, a number of studies also show that soil microbiota is not damaged and can even improved by the application of digestate.

What are the economic benefits of biogas production for the farmer?

A: Biogas farming provides the farmer with a safe, long-term source of revenue through the valorisation of residues to produce biogas/biomethane. The availability of digestate on-site, especially in rural areas, helps avoid the costs associated with the use and transport of synthetic fertilisers. As the market for digestate as an organic fertiliser develops, its commercialisation will also generate additional income for farmers. Adopting regenerative agriculture practices boosts soil health, improving crops yields and supporting farm activities. If, in the future, biogas farmers are financially rewarded for the capture and storage of carbon in the soil, that would constitute a further source of revenue.

Biogas farming significantly reduces the environmental impact of agricultural systems, helping the farming sector adapt to climate change and a enabling a more stable, safer and higher-quality agricultural production. Furthermore, growth in the biogas and biomethane sector creates new job opportunities and encourages rural development.

Case studies

Biogasdoneright® plant in the Po river valley

The biogas plant is located in the Po river valley in Italy and produces 8.5 GWh of electricity per year.

The farm makes extensive use of double-cropping: traditional crops are grown to supply the existing food/feed markets and the second crop (or double-crop) is grown, harvested, ensiled, and then fed to the digesters to enable year-round operation. Digesters are also fed with animal manure and other waste and residues from the farm. The fertilisation needs of the farm are almost entirely met by nutrient cycling via digestate.

Regenerative agriculture practices on the farm also include drip irrigation, the use of perennial nitrogen fixing crops, increased crop rotation and the avoidance of tillage.

Chavigny Farm in Deux-Sèvres

The Chavigny farm is located in the Deux-Sèvres department in France. Leguminous cover crops (e.g. fava beans, vetch) are grown in rotation on selected plots and have helped to improve overall yield and reduce the need for plant protection products. These cover crops are then digested and the digestate is used throughout the farm, greatly reducing dependence on synthetic fertilisers. Corn has been replaced by sorghum as one of the main crops: grown in rotation with the above-mentioned cover crops, sorghum requires very little weed control and is less demanding than corn in terms of fertiliser and water.

Most of the crops on the farm are now sown using semi-direct seeding with no tillage. Overall GHG emissions have decreased and the farm has also benefited from access to carbon credits thanks to the carbon sequestration associated with the increased plant cover.

Recommendations

Recognise the multiple environmental and climate benefits of biogas production, and acknowledge the role of biogas farms as circular economy hubs supporting the transition to sustainable agrifood systems.

Provide adequate financial and training support to biogas farmers adopting regenerative agricultural practices (e.g. to encourage the introduction of intermediate crops in crop rotations).

Recognise activities of pilot projects such as Biogasdoneright® and Nutri2Cycle as carbon farming practices.

Promote the value of digestate for soil regeneration and nutrient recycling.

Ensure that current and future legislative frameworks enable a broader uptake of digestate as an organic fertiliser able to replace synthetic fertilisers.

Incentivise the adoption of sequential cropping in biogas farming models to facilitate their upscaling at EU level.

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