RECOMMENDATIONS
European Water Resilience Strategy

4 March 2025

Advancing water resilience with circular solutions: the role of biogases and digestate

Water is a finite resource essential to ecosystems, agriculture and industry, yet its management was never a priority. Policy frameworks have not ensured comprehensive data collection, water security across all EU sectors, or sufficient investment in water management. The increasing frequency of droughts, major floods and severe forest fires has highlighted significant disturbances to the water cycle, while concerns persist over the lack of improvement in the overall quality of Europe's waters. As climate change is expected to exacerbate these challenges further, water finally gained policy attention.

The European Biogas Association (EBA) welcomes the European Commission's initiative to develop a **Water Resilience[1] Strategy** (WRS) including a **Water Efficiency First principle**. This strategy represents an important step toward securing the competitiveness of the water, energy and agricultural sectors. Due to its cross-sectoral scope, the WRS may involve complex trade-offs, making it essential to ensure that policy decisions do not result in higher energy consumption, increased greenhouse gas emissions or negative effects on food security or biodiversity.

Biogases plants are closely connected to water in several ways. First, anaerobic digestion is an integrated step of urban and industrial wastewater treatment, helping to reduce sludge volumes while generating renewable energy. Second, all biogases plants, regardless of the feedstock used, require process water, for instance to adjust the dry matter content of the substrate mix before digestion or to cool down the process. Third, the co-product of anaerobic digestion, digestate, can be treated with specific technologies to produce clean water and its long-term application to soil can enhance water retention. Lastly, biogases producers are also often farmers, who rely heavily on water abstraction to sustain food production.

EBA wishes to present two recommendations to increase the impact of the Water Resilience Strategy:

1. Recognise the water efficiency of biogases systems and encourage voluntary practices that promote water sobriety and circularity
2. Acknowledge digestate's role in contributing to water retention and propose a renewed approach to address water pollution

[1] Water resilience has been defined as "the ability to adapt to, manage, and overcome various water-related challenges and their impacts on societies, economies and the environment" in the following report – *The EU Environmental Foresight System (FORENV) Final report of 2022-2023 annual cycle Emerging environmental issues possibly impacting our ability to achieve a water-resilient Europe by 2050*, Publications Office of the European Union, Luxembourg.

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1. Recognise the water efficiency of biogases systems and encourage voluntary practices that promote water sobriety and circularity

The **water-energy nexus** plays a critical role in the Water Resilience Strategy. It is widely recognised that accelerating the transition to renewable energy systems could result in higher national water demands for energy production, as certain net-zero technologies are water-intensive. For instance, conventional nuclear power requires significant water for cooling while hydrogen production relies heavily on water for its intrinsic processes. Therefore, it is essential to carefully consider local water scarcity when making decisions regarding clean energy technologies.

To produce 1 kg of hydrogen from electrolysis, 9 kg of water is required. In comparison, the biogas production process itself also requires a significant amount of water for the actual generation of biogas as water is used to maintain the right dry matter content in the digester for optimal mixing and microbial activity. However, many facilities operate **closed-loop systems**, where process water is continuously treated and recycled, significantly reducing the need for fresh water. In this context, the WRS should recognise the water efficiency of biogases systems, which operate as circular and water-efficient solutions.

Biogas and biomethane plants have implemented various measures to minimise water consumption. For instance, biogases plants can:

- Collect and utilise rainwater for non-potable purposes, such as cooling or cleaning, reducing reliance on external water sources.
- Optimise the process consisting in adjusting the moisture content of feedstocks with water before digestion, for example through water-efficient mixers or water reuse.
- **Treat the extracted water from digestate (which is often dewatered to concentrate nutrients/organic matter or to facilitate transport) and reintegrate it in the process.**

> **Focus on key innovation**
> In some biogases plants, advanced technologies such as membrane filtration and reverse osmosis are used to treat digestate, allowing for the separation and recovery of **clean water**. This water can then be reused within the plant, reintegrated into the natural water cycle, or repurposed for agricultural or industrial uses.
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> *Research and innovation should remain focused on improving these water purification technologies, particularly by enhancing energy efficiency and reducing costs. Additionally, dedicated funding is needed to support the scaling up of these solutions in the biogas sector.*

- Capture water condensed during the biogas cooling process, which can then be used for various operations within the plant.

EBA supports the European Commission's plan to integrate the Water Efficiency First principle into the WRS. This principle should encourage voluntary practices that promote water sobriety and circularity across all sectors in the EU, including the energy sector.

2. Acknowledge digestate's role in contributing to water retention and propose a renewed approach to address water pollution

Agriculture is one of the sectors most at risk of water stress, accounting for 29% of water abstraction in the EU. It is important to recognise that farmers are particularly vulnerable to climate change and water-related shocks, which risk impacting on food security. The WRS should prioritise providing practical solutions that help farmers adapt to climate change, improve water usage and reduce pollution, while supporting the transition to sustainable farming practices.

The role of digestate as a nature-based solution able to retain water should be further acknowledged in the WRS. Green water, which refers to the water stored in soil and available to plants, is essential for the resilience of the agricultural sector. In this context, EU policies should further incentivise agronomic practices that positively impact water retention. Digestate also contains **stable organic matter** which is particularly recalcitrant to biodegradation[2]. This stable organic matter in the digestate contains stable organic carbon which, unlike mineral fertilisers, contributes to restoring or increasing soil organic carbon when applied to the soil[3]. The stable organic matter in the digestate also contains **strong humus precursors** such as lignin which lead digestate to build up humus in the topsoil[4]. Soils rich in organic matter, through increased water holding capacity, are key to enhancing water resilience[5] and the application of digestate could help alleviate water stress, reduce the need for extra irrigation and minimise the risk of flooding. Additionally, implementing sequential or intercropping systems — also suitable for biogas production without compromising food security — further contributes to improved water retention[6].

- ⇨ The Common Agricultural Policy should increase support for digestate adoption through **eco-schemes and agri-environment-climate commitments**, rewarding its use not only for its fertiliser and soil improvement benefits but also for its positive impact on water retention.
- ⇨ We also recommend including a **European nutrient recycling target** in the new Bioeconomy Strategy, which would set a minimum percentage of recycled nutrients to be incorporated into fertilisers sold/used across the EU. It could be introduced as an incremental target, gradually increasing every five years, allowing fertiliser producers time to adapt their production processes without jeopardising fertiliser availability for farmers and crop productivity.

A new approach is required to fully unlock the benefits of digestate — improved soil health, enhanced water retention capacity, and sustained productivity — without contributing to water pollution (from contaminants or nutrients). It is crucial that digestate is of high quality and applied using the best available practices.

- ⇨ The Nitrates Directive should be revised to propose a new approach, replacing the inefficient 170 kg of nitrogen per hectare per year, with **fixed thresholds for nitrogen surplus**. This would optimise nitrogen management and reduce environmental losses. The nitrogen surplus is defined as the difference between total nitrogen inputs (from mineral and organic fertilisers, adjusted for emissions during application, nitrogen deposition and nitrogen fixation) and nitrogen output through crop harvest. This approach would directly address the root cause of nitrate leaching: the excess nitrogen not absorbed by crops, regardless of its source.
  Additionally, the Nitrates Directive should provide further **guidance on the best available practices for the application of digestate** which include following the 4Rs rule (right time, right dose, right application method, right fertiliser), using an injector with a trailing shoes system for

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[2] Esnouf, A., Brockmann, D., & Cresson, R. (2021). Analyse du Cycle de Vie du biométhane issu de ressources agricoles-Rapport d'ACV. INRAE Transfert, 50-62.
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[3] Greenberg, I., Kaiser, M., Gunina, A., Ledesma, P., Polifka, S., Wiedner, K., ... & Ludwig, B. (2019). Substitution of mineral fertilizers with biogas digestate plus biochar increases physically stabilized soil carbon but not crop biomass in a field trial. Science of the Total Environment, 680, 181-189.
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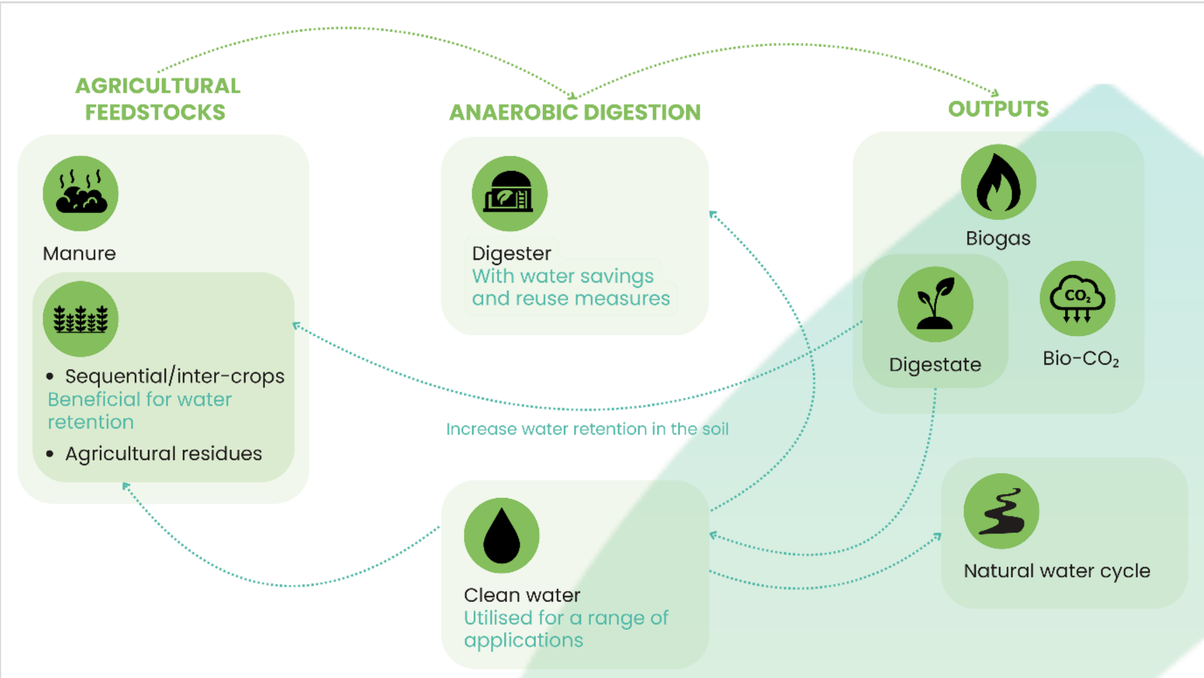
Bezzi, G., Maggioni, L., & Pieroni, C. Biogasdoneright® Model: Soil Carbon Sequestration and Efficiency in Agriculture.
[4] Kovačić, Đ., Lončarić, Z., Jović, J., Samac, D., Popović, B., & Tišma, M. (2022). Digestate Management and Processing Practices: A Review. Applied Sciences, 12(18), 9216.
Gasser, A. A., Diel, J., Nielsen, K., Mewes, P., Engels, C., & Franko, U. (2022). A model ensemble approach to determine the humus building efficiency of organic amendments in incubation experiments. Soil Use and Management, 38(1), 179-190.
[5] Lal, R. (2020). Soil organic matter and water retention. Agronomy Journal, 112(5), 3265-3277.
[6] Pandey, S. (2024). Crop rotation and intercropping techniques. Zenodo, April 2024.
Rehman, S. ur, Ijaz, S. S., Ud Din, A. M., Al-Dosary, M. A., Ansar, M., Fatima, S., Siddiqa, A., Ashraf, M. N., Haider, I., Junaid, M. B., Raza, M. A., & Yang, H. (2025). Combined effects of reduced tillage and strip intercropping on soil carbon sequestration in semi-arid environment. Journal of Soil Science and Plant Nutrition, 25, Article 23.

application, incorporating cover crops and hedges to prevent runoff, acidifying the digestate and more.

⇨ The Common Agricultural Policy should increase support for **equipment designed to reduce nutrient pollution**. Additionally, it should provide funding for **digital decision support tools** that integrate data from soil tests, weather forecasts and crop growth models, helping farmers make more informed decisions about when and how much nitrogen to apply.



Water circularity in biogases systems

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About the European Biogas Association (EBA)
EBA fully believes in the future potential of renewable gas in Europe. Founded in 2009, the association is committed to the deployment of sustainable biogas and biomethane production and use throughout the continent. EBA counts today on a well-established network of over 300 national associations and other organisations covering the whole biogas and biomethane value chain across Europe and beyond. EBA is a member of the Water Resilience Coalition.