FREQUENTLY ASKED QUESTIONS

BIOGAS

THIS DOCUMENT ADRESSES FREQUENTLY ASKED QUESTIONS IN MUNICIPALITY COUNCILS AND REGIONAL ENERGY MEETINGS

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BIOZE

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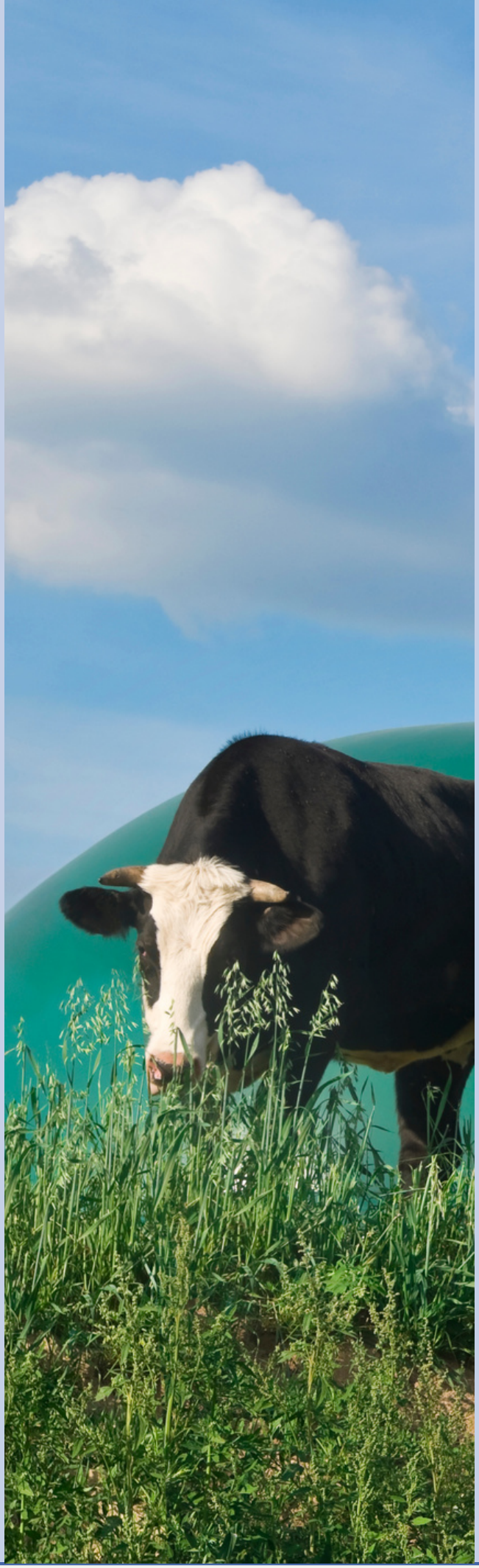

01

INTRODUCTION

Biogas is becoming increasingly important in Europe's energy transition. The EU aims to produce 35 billion m3 of biogas by 2030. However, there is still a large amount of wet organic waste that is unused, particularly manure. Anaerobic digestion (AD) raises many concerns about its potential environmental impacts.

This document addresses the most frequently asked questions in municipality councils and regional energy meetings regarding biogas production from agricultural waste. The document should not be considered as final as insights on the impact of anaerobic digestion are under continuous development.

There are many ways of producing energy from biomass. Another important route is combustion which is mainly used for dry and woody biomass. This subject is addressed in another FAQ-document.

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02 WHAT IS BIOGAS?

Biogas is a renewable energy gas that consists of approximately 60% methane (CH4) and 40% carbon dioxide (CO2). It is produced by anaerobic digestion of manure or other digestible organic material. The adjacent figure shows an anaerobic reactor, which is a closed tank filled with manure. Anaerobic bacterias present in the manure convert the digestible part of the feedstock into biogas at a temperature of 35 to 55 ºC. The manure remains typically 30 to 50 days in the reactor.

One way to enhance the production of biogas is to mix other organic substances with the feedstock. Sometimes, these additives can make up half of the input volume. The resulting material after digestion, called digestate, can be applied as a biofertilizer.

03 HOW CAN BIOGAS BE USED?

Biogas is primarily utilized for the following purposes:

1. **Combined heat and power** (CHP) production: This involves the simultaneous generation of **heat** and **electricity**.
2. **Biomethane**: This is an upgraded form of biogas, where the main modification is the **removal of CO2**. Biomethane, often referred to as green gas, can perform all the functions of natural gas, including **domestic and industrial heating** as well as **transportation**.

Both biogas and biomethane play a crucial role in providing flexibility within the energy system. They contribute to all energy outputs - electricity, heat, and transportation - and facilitate the integration of renewable energy sources into the overall energy system.

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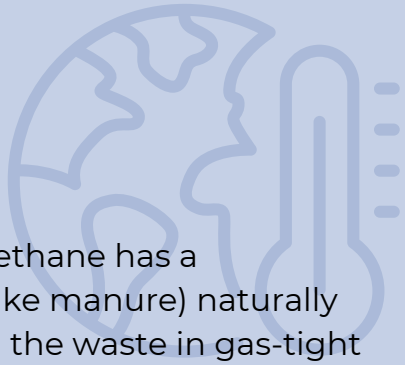
04 DOES BIOGAS STIMULATE INTENSIVE FARMING?

No, biogas production promotes responsible manure management and leads to reduced emissions of methane. However, currently, only a small portion of available manure is used in biogas plants. Even with agricultural transitions and reduced manure, there will be enough for a significant green gas transition.

On the other hand, biogas supports the profitability of participating farms and does not specifically promote agricultural transition. It's important to note that biogas units are not exclusively associated with intensive livestock farming and can be implemented in both intensive and extensive farms, regardless of the size of livestock involved. This is particularly true when farms collaborate in collective initiatives.

A biogas plant with a digestate processing unit can help address regional manure surpluses. This could be seen as a solution for intensive livestock farming. However, regulations on animal welfare and environmental protection limit the expansion of intensive farming, potentially leading to fewer animals in some areas due to these regulations and the shift toward sustainable food practices.

05 IS BIOGAS GOOD FOR THE CLIMATE?



Yes, biogas production has a positive impact on the CO2 balance. Methane has a greenhouse effect 28 times stronger than CO2, and organic waste (like manure) naturally emits methane during fermentation. However, promptly processing the waste in gas-tight digestion reactors effectively prevents this methane from bei released into the air. However, the plants should have robust biogas leak management plans to mitigate any impact on the overall CO2 balance.

Furthermore, biogas acts as a substitute for fossil fuels, resulting in a significant reduction of greenhouse gas emissions, typically between 60 to 80%. It also decreases the use of fossil natural gas, reducing CO2 emissions during extraction and combustion. Although some CO2 is produced during harvesting and transport, the overall amount in the biogas production process is comparable to other renewable energy sources, ranging from 20 to 50 gCO2/kWh. The quantity depends on the type and amount of waste utilized.

Additionally, recovering nutrients from manure reduces reliance on fossil fertilizers, replacing a substantial amount of natural gas used in fertilizer production and consequently reducing CO2 emissions.

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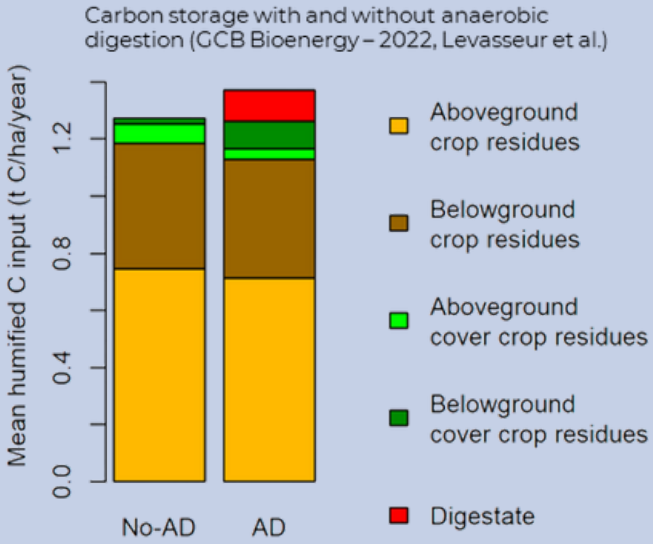
06 DO BIOGAS INDUCE A DECREASE IN CARBON SOIL LEVELS?

The impact of manure digestion on soil carbon levels is minimal, and there is even potential for improvement through the use of cover crops. The key factor to consider is the non-degradable organic material, which remains undigested after a year. In a biogas plant, bacteria break down the easily biodegradable organic matter, which would have otherwise been decomposed by soil organisms. This process largely converts the material into methane and CO2. Long-term experiments conducted with digestate have shown no adverse effects.



The overall impact on soil carbon levels depends on various factors, including the type of feedstock used, management practices, and land use changes. Applying biofertilizer from digestate, preferably in combination with cover crops, can actually improve carbon soil levels. Crops with strong root development are particularly effective as they not only increase carbon levels through stems and roots but also reduce erosion and enhance fertility.

07 IS THERE AN INCREASE IN TRANSPORTATION ACTIVITY?

For an anaerobic digestion plant that manages its own manure, there won't be a significant difference in transport movements. However, in the case of a "neighborhood biogas plant," it's important to consider an average of one truck per day per participating farmer and a few trucks per week for digestate removal. The exact number depends on the processing method and the extent to which farmers intend to utilize the digestate themselves.

In the case of a regional biogas plant, a considerable amount of transport is involved. The supply phase may require up to 10 trucks per day. Thus, having convenient logistical access becomes crucial. Truck schedules and routes can be adjusted to avoid peak hours and congested areas. Outgoing transport is generally lower due to separation and dewatering processes.

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08 IS NOISE POLLUTION TO BE EXPECTED?

An anaerobic digestion plant generates noise, primarily stemming from the following sources:

1. Pumps, mixers, and compressors
2. Engines (during electricity generation)
3. Fans (used to extract air from an air washing installation)
4. Trucks and wheel loaders

To ensure compliance with environmental standards, the plant's operations are subject to regulations outlined in the environmental permit. These regulations specify acceptable noise levels and may include requirements for maintaining a minimum distance between the plant and nearby residential areas. Additionally, rules regarding transport times may be included.

The noise levels expected from an anaerobic digestion plant are comparable to those found in a dairy farm. However, measures can be implemented to to minimize noise pollution, such as utilizing soundproofing enclosures and employing noise-reducing equipment. These steps help to mitigate any potential adverse impacts on the surrounding environment and nearby residents.

09 DO ANAEROBIC PLANTS SMELL?

Overall, a biogas plant reduces odors compared to regular manure, as the fermented manure (digestate) has a less strong smell. The plant itself is airtight, resulting in an odorless process since it operates in the absence of oxygen. However, odors can be released during biomass unloading and feeding stages.

To reduce odors, the plant can have a closed digestion system, ventilation, or odor control mechanisms like biofilters. Pre-treating the organic material also helps minimize volatile compounds. Proper plant operation and maintenance further minimize odors. In larger installations, an unloading hall with air extraction and washing systems reduces odor emissions.

Occasional odor nuisance may arise during maintenance work when the digester is opened, although this typically occurs less than once a year.

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WHY ARE THERE SO MANY DIFFERENT OPINIONS ON ANAEROBIC DIGESTION?

As perspectives on anaerobic digestion vary, even among scientists, different priorities come into play. Some individuals are primarily concerned about climate change, while others prioritize agricultural transition. There are those who strongly advocate for regulation, while others approach it with skepticism. Additionally, some emphasize local solutions and biodiversity. The diagram below illustrates the most prevalent opinions. It is crucial to acknowledge these diverse viewpoints when engaging in discussions about intensive biomass utilization.

OVERVIEW OF OPINIONS IN THE BIOGAS PUBLIC DEBATE

PERSPECTIVES	CLIMATE	STRICTLY RENEWABLE	RENEWABLE FEEDSTOCKS	ECOLOGY	SUSTAINABLE DEVELOPMENT
Objective	Immediate reduction of greenhouse gases to reduce temperature rise within 1,5 degrees	Renewable energy system on basis of solar, wind and green hydrogen	Regeneration of feedstocks with circular and biobased economy	Life within closed borders (e.g. circular agriculture)	Fair mondial trade with improvement of local communities
Source of inspiration	**IPCC**	**Rocky Mountains Institute**	**Ellen MacArthur Foundation**	**WWF Living planet; Rockström, Planetary Boundaries**	**VN Sustainable development goals**
Realisation	All options to be used. Technology neutral. Carbon pricing required.	Careful selection of technologies. Government incentives. Local initiatives.	Government to stimulate closing of supply chains and innovation.	Policy directed at preserving habitats and biodiversity. Change of induvidual lifestyle.	Fair trade. International cooperation. Certification.
Role of anaerobe digestion and biogas	Biogas required for climate goals. Methane reduction essential (strong greenhouse gas).	Biogas from locally produced manure and organic waste. Only as intermediate solution.	Biogas to be used for high value applications (chemistry and materials). Use of nutrients from manure as substitute for fertiliser from fossil sources.	Biogas only from locally produced manure as part of cirular agriculture. No co-digestion or industrial systems.	Highly productive agricultural sector important to feed world population. International trade of biomethan. Certification important to protect environment.

Source: MSG Strategies, adapted by BTG, 2023

BIOZE PROJECT

BIOZE is a small-scale project funded by the Interreg North Sea programme, scheduled to run from 2022 to 2024 for a duration of 18 months. Operating at the local level, this project aims to enhance the governance of biomass utilization for promoting a sustainable transition. It seeks to strengthen the capabilities of local authorities to effectively engage and collaborate with citizens and stakeholders in the bioenergy sector.

THE PARTNERS

- AILE (France) - Lead Partner
- 3N (Germany)
- BEON (Netherlands)
- EM Normandie (France)
- Innovatum Science Park (Sweden)
- University of Twente (Netherlands)

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