

# Chicken manure in the biogas plant to reduce greenhouse gas emissions

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## Intro to Good Practice

Climate neutrality – a topic that is currently on everyone’s lips - means that we are not negatively contributing to climate change, namely emitting greenhouse gas emissions. According to the Kyoto Protocol greenhouse gases comprise carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), fluorinated greenhouse gases (F-gases) and dust particles. The emission gases in agriculture are N<sub>2</sub>O and CH<sub>4</sub>.

Important sources of methane emissions are liquid manure and the storage of manure. Nitrous oxide is mainly produced by spreading nitrogen-containing mineral fertilizers and manure. Transferring broiler manure to a biogas plant, rather than storing it, is one way to reduce these emissions and thus improve the sustainability of keeping and production of broiler chicken.



A biogas plant

## Background & challenges

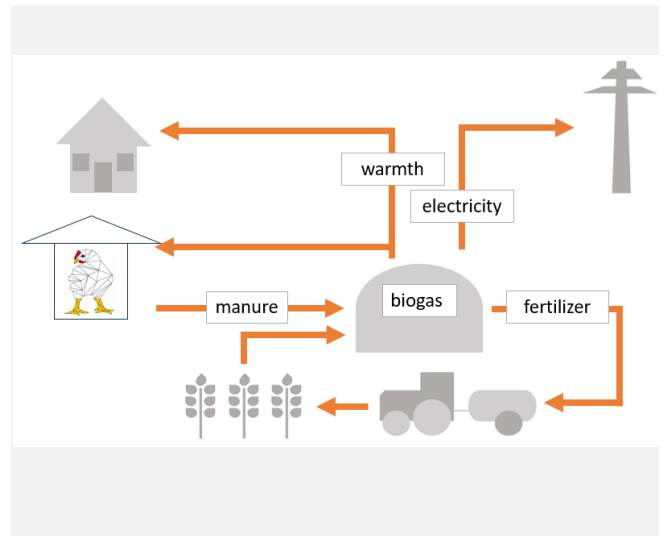
- Instead of storing manure, which can release 90% more CH<sub>4</sub>, it is sent into a biogas plant for processing. Here, the manure is fermented by bacteria in an anaerobic environment to generate electricity and heat. Chicken manure in particular has a high energy potential.
- Currently around 30% of the manure produced in Germany (all kinds of livestock) is used in biogas plants.
- For chicken manure the upper biological limit in a biogas plant is around 30%.
- Roughly, 1t of chicken manure can replace 1t of silage maize (same gas yield), which also results in the minimum value of chicken manure (depending on the price of silage maize in the regions between 35 and 65€/t)



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## Additional information

- Fermentation in the so-called fermenter takes place anaerobically (i.e. without oxygen) because the microorganisms that produce biogas cannot tolerate oxygen. The fermentation process and the gas yield depend on several influencing factors:
  - The higher the proportion of easily degradable substances such as starch and fat, the higher the gas yield.
  - Short straw bedding and a high dry matter content also have a positive effect on the gas output.
  - $\text{NH}_3$  is formed from substrates with a high protein content and inhibits microorganisms even in low concentrations.



## Further benefits

- **Avoiding unpleasant odors:** When manure is spread on the fields, a certain degree of unpleasant odors is often released. During fermentation in a biogas plant, the underlying components are broken down or are not created at all, making the fermented material practically odorless.
- **Lower CO<sub>2</sub> pollution:** By using biogas, the need for fossil energy to generate electricity can be reduced.
- **Energy:** Fermentation produces energy which can be used for heating (broiler houses, residential buildings) but also for electricity (on-farm or selling to the public network).
- **Improving fertilizer value:** The resulting substrate has a more uniform composition than manure, the availability of nutrients to plants is improved, which leads to lower contamination of the groundwater with nitrate.

## Additional information

- The fermentation of manure in a biogas plant has a double benefit: compared to storage in open containers, over 90% of methane emissions are prevented, and on the other hand it creates a flexible energy source that saves costs for the company.
- The high ammonia concentrations in chicken manure pose a significant challenge for fermentation due to their toxic effect on the anaerobes. Fermentation in combination with other raw materials, such as maize silage, is therefore an option.
- The liquid fraction can be viewed as a challenge due to transportation issues.

The fermentation of manure in a biogas plant has a double advantage: compared to storage in open containers, over 90% of methane emissions are avoided, and on the other hand it creates a flexible energy source. See a short video about biogas production in Germany here: <https://www.youtube.com/watch?v=7z9Bn44P9OY>

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