Federal Ministry
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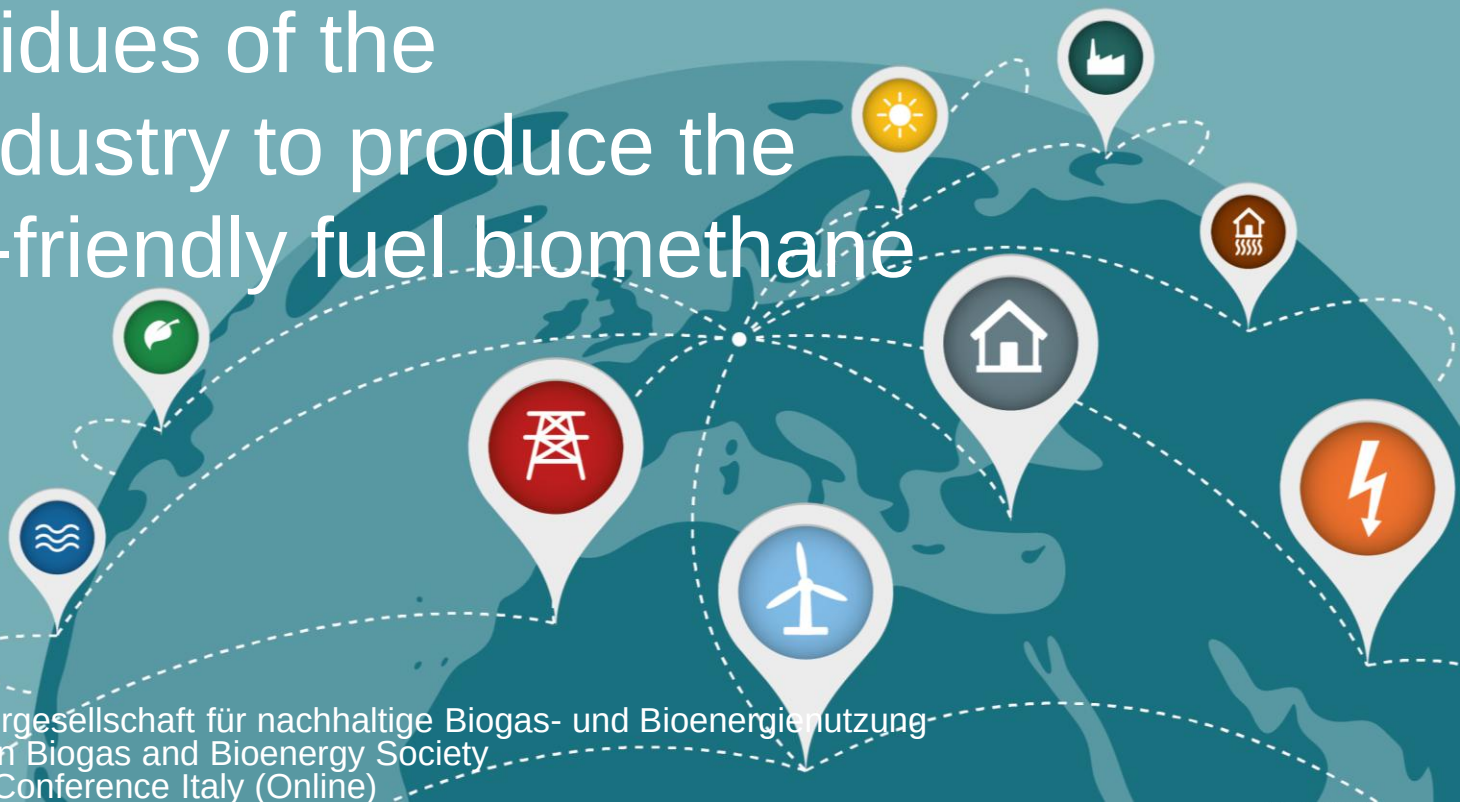
# Fermentation of Organic waste and residues of the Food industry to produce the climate-friendly fuel biomethane



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GERBIO – German Biogas and Bioenergy Society
13.10.2020, AHK-Conference Italy (Online)

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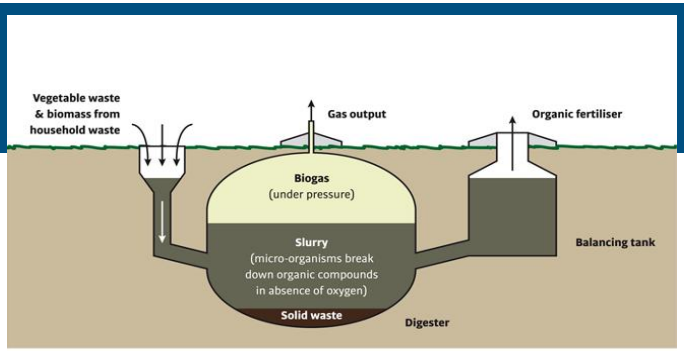
# Structure of the presentation




1. Introduction FnBB e.V. / IBBK
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4. Residues from beverage industry (using the example brewery)
5. Co-fermentation – Combined treatment of residues from livestock farming with various organic residues
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8. Summary

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Source of the graphic: www.hararenews.co.zw

# Fermentation of Organic waste and residues of the Food industry to produce biomethane *(Achim Kaiser – FnBB e.V.)*

## 1. Introduction of FnBB e.V. / IBBK

- Our non-profit recognized association FnBB e.V. has the international addition GERBIO, which stands for “German Biogas and Bioenergy Society”.
- Together with our 227 members (e.g. BINDER Engineering & Weber Entec) we promote the dissemination of sustainable and socially acceptable production and use of energy from biomass.
- GERBIO is committed to a climate- and environmentally friendly, as well as citizen-oriented and meaningful energy transition.

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Source of the graphic: IBBK Fachgruppe Biogas GmbH

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## 1. Introduction of FnBB e.V. / IBBK

- The company IBBK (International Biogas and Bioenergy Competence Center) is the closest cooperation partner of GERBIO.
- There is frequent and intensive cooperation on national and worldwide projects and events (e.g. conferences and trainings).
- The company promotes and supports developments in the biogas sector and facilitate the efficient application for a sustainable future.


Source of the graphic: www.ibbk-biogas.com

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## 2. Basics on biogas production – How is Biogas produced (I)

- Biogas production is a microbiological process in which the suitable biomass is decomposed partially under exclusion of air (anaerobic) with the aid of many different microorganisms.
- The achievable methane yields are influenced by the composition of the input substrate, the bacterial strains present and by the process technology.

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Source of the graphic: www.oekobit-biogas.com

# 2. Basics on biogas production – How is Biogas produced (II)

- The combustible gaseous product (biogas) consists mainly of methane (CH4) and carbon dioxide (CO2).
- Since the raw biogas is moist, dirty and mixed with other trace gases – e.g. O2, N2, H2S – it must first be cleaned for further use.

Source of the graphic: www.oekobit-biogas.com

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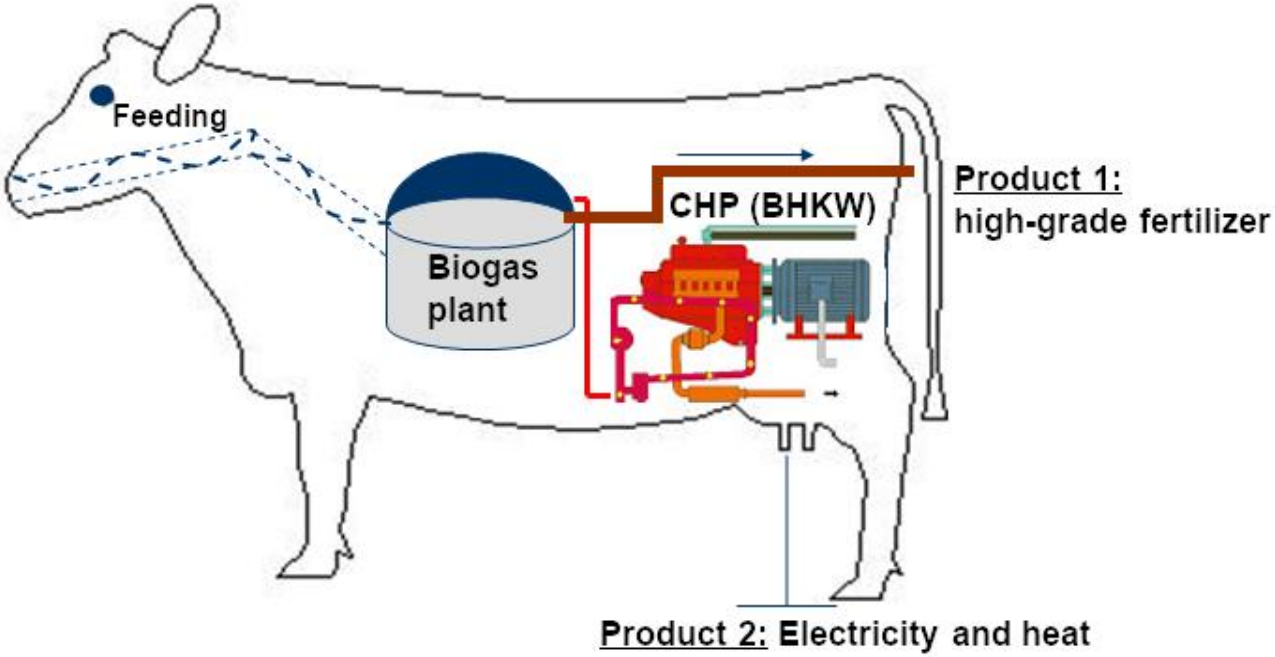
## 2. Basics on biogas production (III)

– The biogas process is very similar to the digestion process in the rumen of a cow.

– **But there is a very big difference:** The cow stops eating when she is no longer hungry – unlike to some plant operators…




Source of the graphic: EBA-Zentrum (Triesdorf-Weidenbach)

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## 3. Fermentation of food waste

- They're mostly getting by: canteen kitchens, gastronomy, hospitals
- The input material is very inhomogen
- Dry substance matter (DM): 10-30 %
- Non biodegradable contaminations (dishes, cutlery, plastic bags, bones, egg- and seashells, glass, etc) can cause damage to the installation engineering and must be eliminated
- **The cleaner the waste, the better!**

Source of the graphics: Finsterwalder Umwelttechnik GmbH & Co. KG

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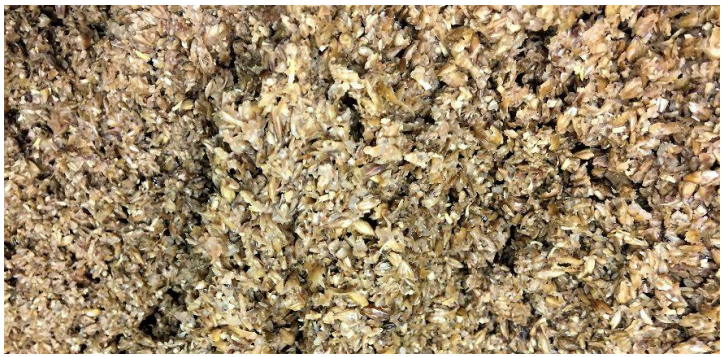
## 4. Residues from beverage industry (using the example brewery) I



- The production of beer generates two waste streams: **a.)** heavily polluted biological and chemical waste water – **b.)** spent grains (residues of the brewer's malt).
- Because the anaerobic treatment of the waste water takes place without the addition of oxygen, electricity consumption is considerably lower.
- Spent grains have a high protein content.
- It is mainly used as feed for cattle.

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Sources of the graphics : IBBK Fachgruppe Biogas GmbH (top) – www.bayerisches-bier.de (down)

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## 4. Residues from beverage industry (using the example brewery) II

- As spent grains have a high water content (about 75%) this substrat cannot be stored (due to the poor ensilling properties).
- They cannot be transported over long distances due to their rather low energy density.
- The biogas process can cover a considerable part of the electricity and heat demand of a brewery.
- Due to the microbiological quality controls, know-how in anaerobic technology is already available in breweries.

Source of the graphics: www.goesser.at

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## 5. Co-fermentation – Combined treatment of residues from livestock farming with various organic residues

- Although such biogas plants are often still anchored in agriculture, they are already related to waste legislation.
- The Plant Operator must be very active in substrate acquisition in his region – or rather their regions.
- Seriousness and transparency at work are important (e.g. waste management company).

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Source of the graphic: IBBK Fachgruppe Biogas GmbH

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## 6. Opportunities through biogas for use in mobility (CNG & LNG)

- CNG vehicles emit around 25 % less CO2 than gasoline vehicles, around 90 % less nitrogen oxide (NOx) than diesel vehicles, and virtually no particulate matter.
- By cooling down to -161 to -164 °C (112 to 109 K) natural gas (or biomethane) liquefies and becomes so-called LNG (liquefied natural gas) resp. Bio-LNG.
- LNG has only 1/600th of the volume of gaseous natural gas and is interesting for heavy-duty traffic due to its high energy density.

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Source of the graphics: Uli Oester Apex AG (top) – www.transport-online.de (down)

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## 7. Practical example Switzerland: Biogas mobility and climate protection through small scale stations I

- There are currently about 600 biogas plants in operation in Switzerland – are majority owned by farmers – with an average installed electrical power of 250 kW (range from 16 to 1,000 kW).
- The majority of these are certified and state-funded climate protection projects (financed by the national **CO2 tax**, among others).
- The focus of the biomethane strategy of the Association of Swiss Agricultural Biogas Plants is on feeding biomethane into the natural gas grid and Biomethane use in the mobility sector.
- **Biogas mobility in Switzerland contributes to climate protection in two ways:**

ökostrom schweiz

Source of the graphic: Genossenschaft Ökostrom Schweiz

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## 7. Practical example Switzerland: Biogas mobility and climate protection through small scale stations II

- **1st Impact Path:** Reduction of agricultural methane emissions from the storage of manure and solid manure.
- **2nd Impact Path:** Postitive climate impact through substitution of fossil fuels.
- Against this background, **three agricultural pilot projects (I – II – III) "Small farm biogas Filling station"** have already been developed.
- All three are equipped with relatively simple treatment technology (single or multi-stage membrane technology).

I

II

III

Source of the graphics: Genossenschaft Ökostrom Schweiz

# 7. Practical example Switzerland: Biogas mobility and climate protection through small scale stations III

- **Project I** (Canton Lucerne): Biomethane treatment capacity **6 Nm3/h –** 1-stage membrane treatment (BlueBONSAI system) **–** Use for own company and private vehicles **–** Planned biomethane use around **8,000 kg/a**.
- ***Project II*** *(Canton Geneva): Biomethane treatment capacity* ***12 Nm3/h –*** *3-stage membrane treatment* ***–*** *Use for own company and private vehicles (incl. vans and trucks)* ***–*** *Planned biomethane use around* ***12,000 kg/a****.*
- **Project III** (Canton Jura): Biomethane treatment capacity **12 Nm3/h –** Public filling station and use for own company and private vehicles **–** 3-stage membrane treatment **–** Planned biomethane use around **40,000 kg/a**.

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## 8. Summary I (economical factors)

- The specific costs of biogas/biomethane from waste are 1-3 ct/kWh lower than for energy crops – but the potential is (regionally) limited.
- Since the operating and capital costs of a large-scale biomethane upgrading units are almost 60 % lower than those of micro plants, innovations are inhibited.
- For economic reasons, the current focus is therefore on larger biogas plants or the combination of several plants in order to achieve a minimum raw gas volume of 250 m3/h per biomethane upgrading plant.

Source of the graphic: IBBK Fachgruppe Biogas GmbH

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## 8. Summary II (Climate protection and sustainability)

- Biogas plants promote a sustainable recycling economy („close the loop“) that brings ecological & economical benefits.
- With biogas you are able to make your energy supply independent and environmentally friendly – without fossil fuels.
- A functioning biogas project is able to connect different groups of people with each other and influence rural areas positively.

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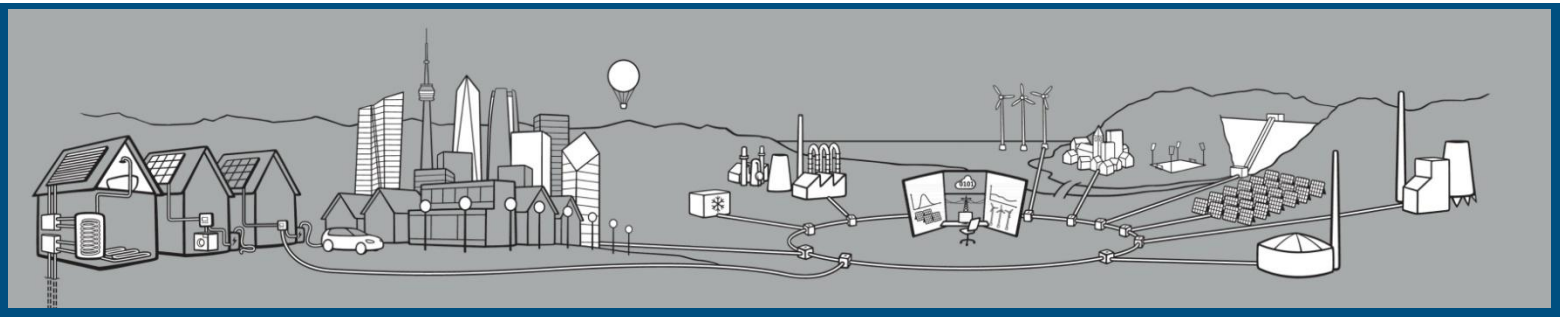
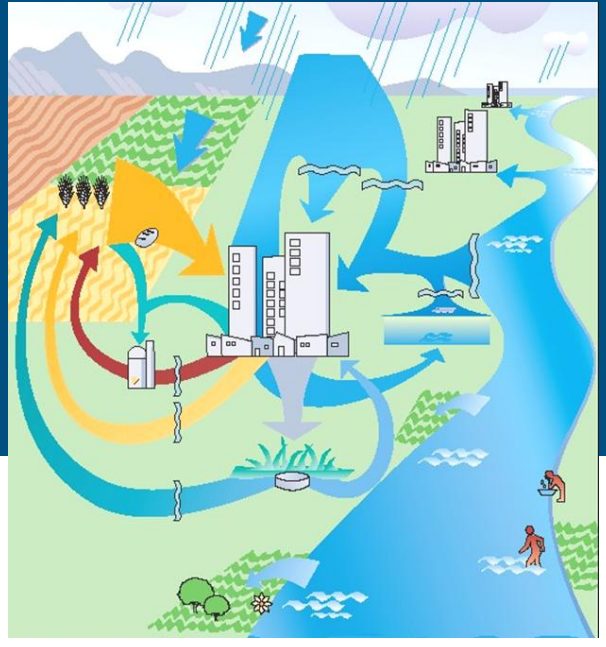
Source of the graphic: www.bmwi.de (top) – www.oekobit-biogas.com (down)



# Thank you for your attention!

Stay curious…



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