



Fachverband  
**BIOGAS**

German Biogas Association  
Association Allemande du Biogaz  
Asociación Alemana de Biogás  
[www.biogas.org](http://www.biogas.org)

# Developments in upgrading digestate – Pelletizing - Drying - Liquid separation

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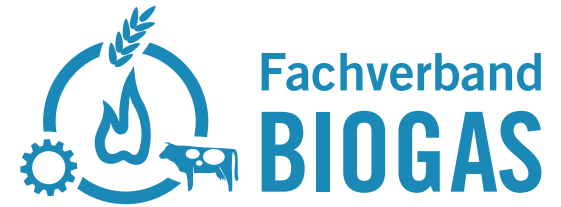
**Biogas  
can do it!**

# Agenda

- **German Biogas Association**
- Characteristics and application possibilities of digestate
- Technical options
- Summary



# Structure of the German Biogas Association



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# Nutrients of digestate

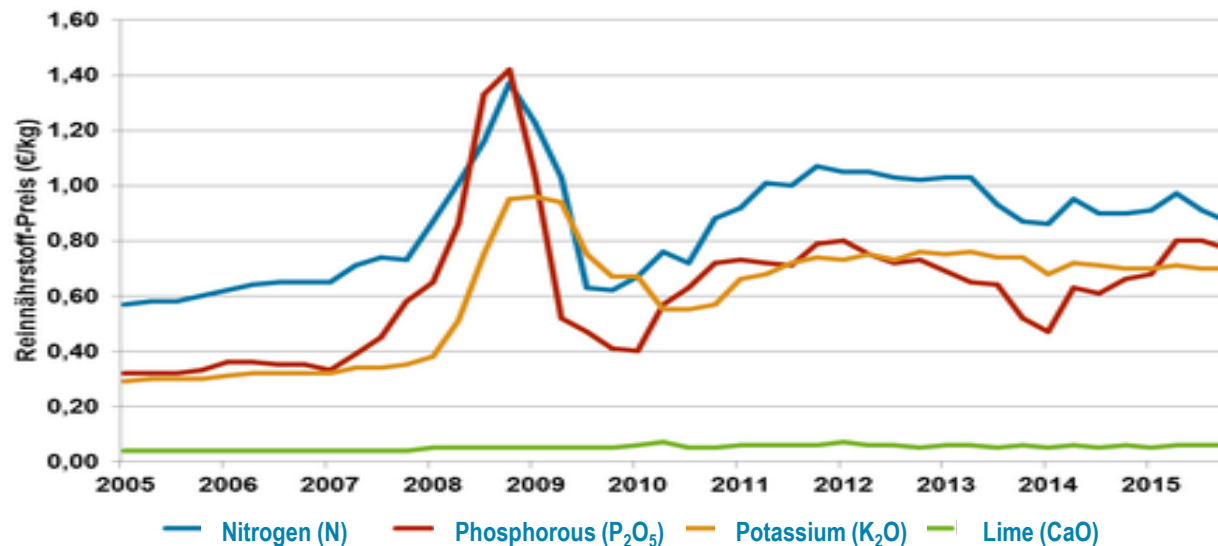
- AD produces two products: biogas and digestate – an fertilizer or soil improver
- All (micro-) nutrients which are feed into the digester will be in the digestate
- Application closes nutrient and humus cycles (e.g. nitrogen, phosphorus, carbon) and reduces waste amount by recycling organic matter

Type of digestate	DM [%]	N <sub>total</sub> [kg/m <sup>3</sup> ]	NH <sub>4</sub> [kg/m <sup>3</sup> ]	P <sub>2</sub> O <sub>5</sub> [kg/m <sup>3</sup> ]	K <sub>2</sub> O [kg/m <sup>3</sup> ]
Liquid digestate	6.5	5.1	3.2	2.3	5.5
Liquid separated fraction	5.7	4.9	3.1	2.0	5.4
Solid separated fraction	24.3	5.8	2.7	5.0	5.8

# Substitution von inorganic fertilizer

- Nitrogen (N): Energy demand approx. 600 kWhel/t N
- Phosphor (P), Potassium (K), Turf: Finite Resources with long distance transportation
- Phosphor (P): High Cadmium and Uranium content

Price of the pure nutrients in mineral fertilizer



Source: Verband der Humus- und Erdenwirtschaft e.V.

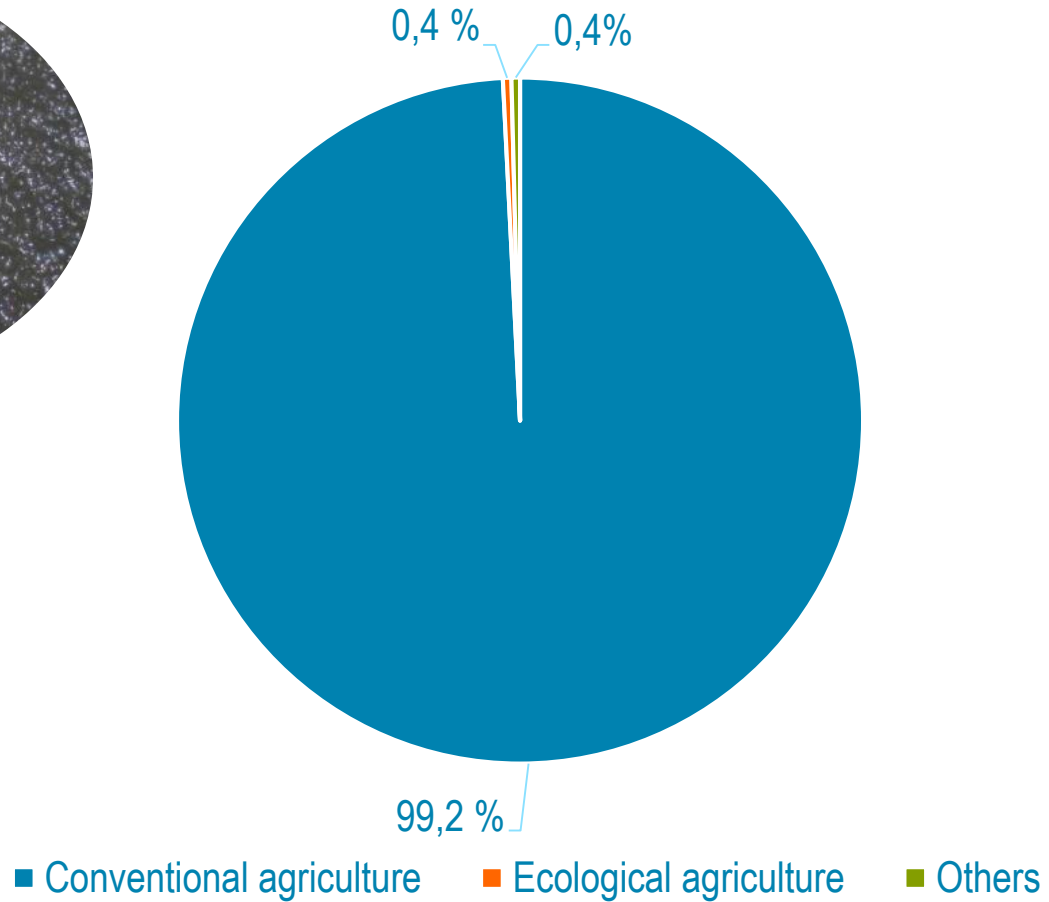
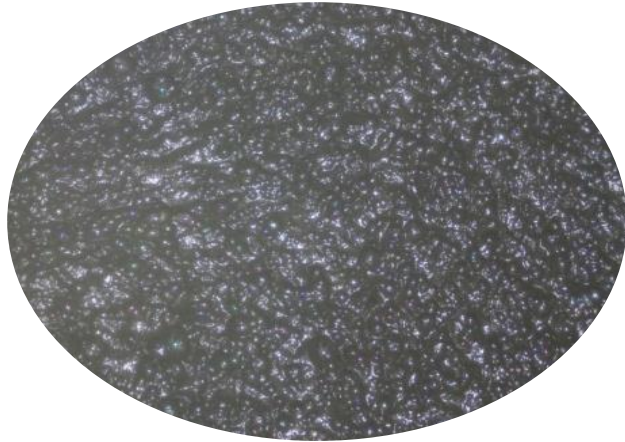
# Quality Assurance System (QAS)

- Independent sampling, analysis and control system
- Official product certification (e.g. for package presentation)
- Confirmation of fulfilling adequate legal requirements
- Labelling nutrient contents and other ingredients
- Suggestions for best storage and application





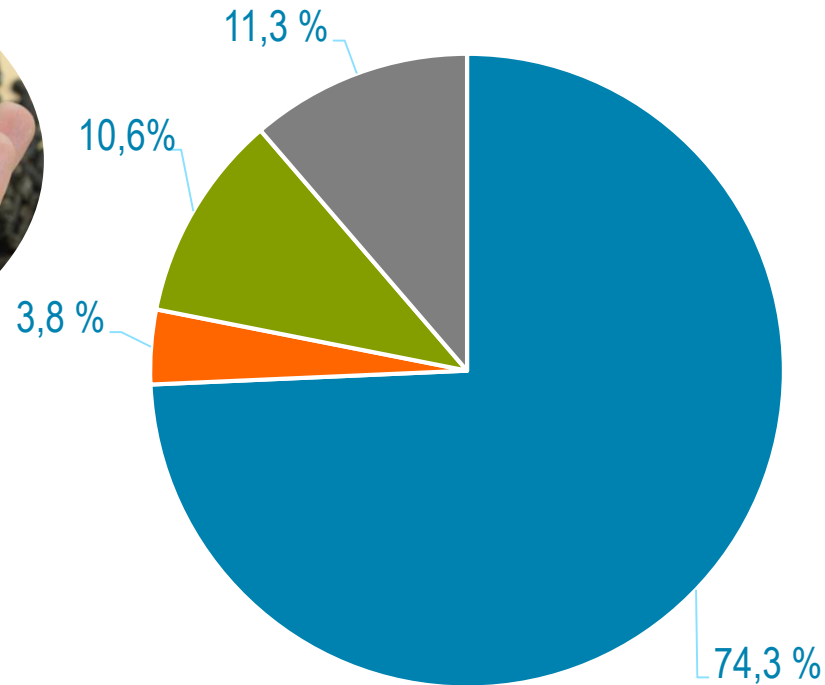
# Current marketing of liquid digestate



Source: data from RAL-Gütesicherung



# Current marketing of solid digestate



■ Conventional agriculture ■ Ecological agriculture ■ Gardening and landscaping ■ Others

Source: data from RAL-Gütesicherung

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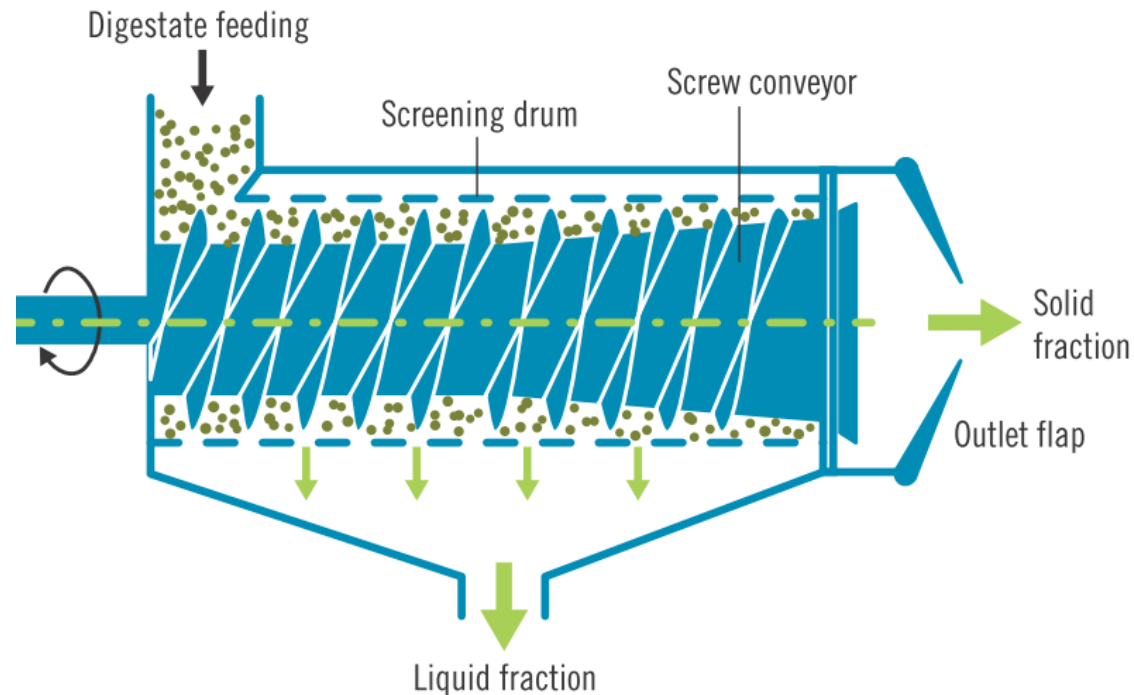
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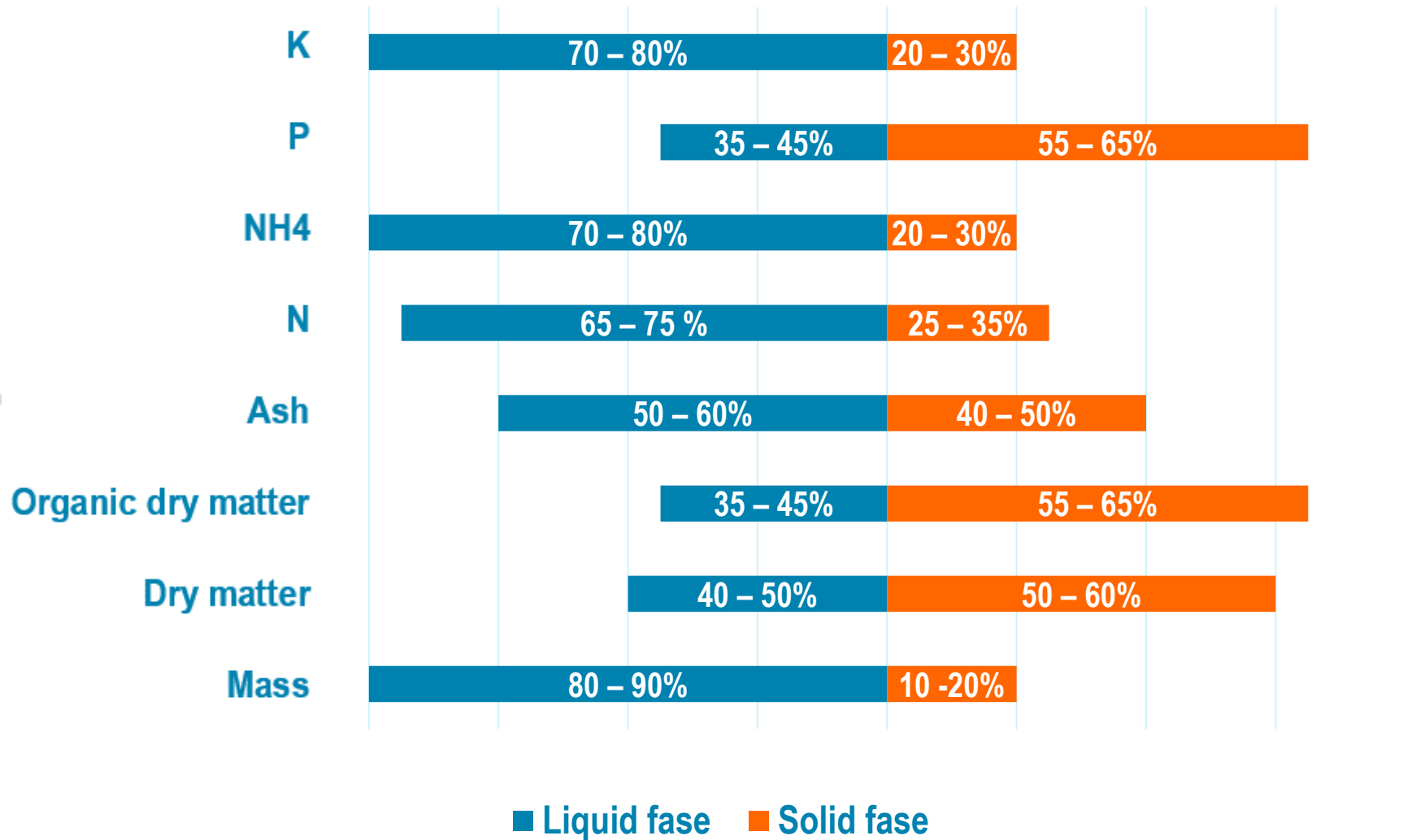
# Separation

## Screw press

- Mechanical separation of the digestate into a liquid and solid fraction
- Stackable solid fraction has a dry-matter content of 20-40%
- Solid fraction is cost-efficient in terms of transportation and can be upgraded further
- Liquid fraction with a dry-matter content of 1-8% can easily drip off the plant and enter the soil



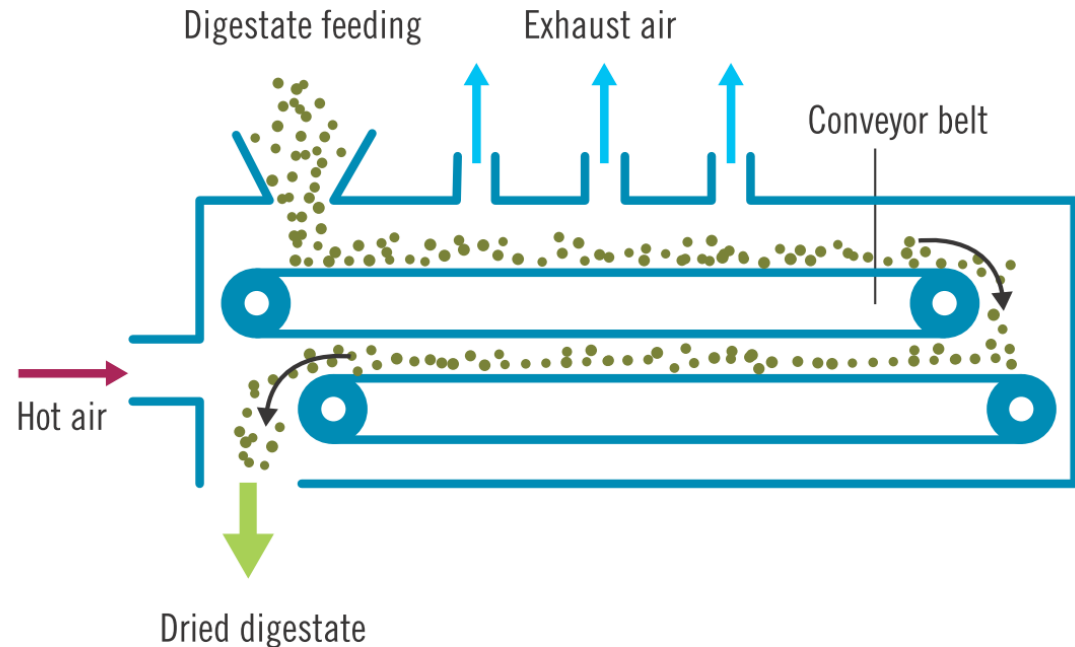
# Splitting of nutrients with separation



# Drying

## Belt dryer

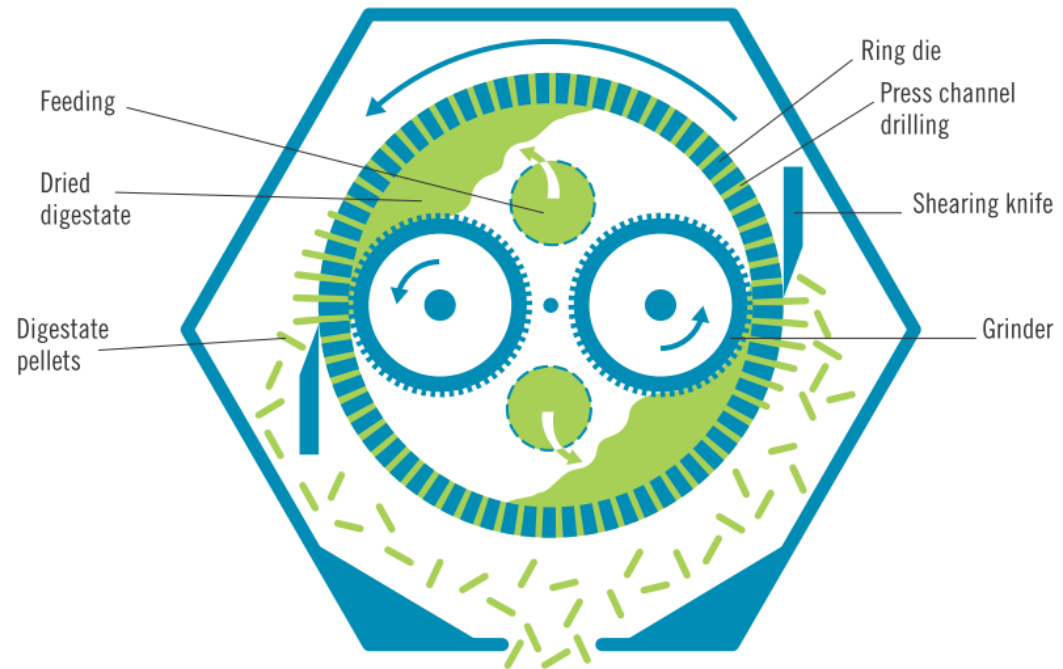
- Goal is to produce dried digestate by evaporation and enter new sales areas such as gardening
- The desired dry-matter content can be set via drying time and temperature
- Exhaust air should be cleaned
- Production of ammonium sulphate solution by using an acid scrubber
- Various marketing possibilities for the dried digestate



# Pelletising

## Pelletising

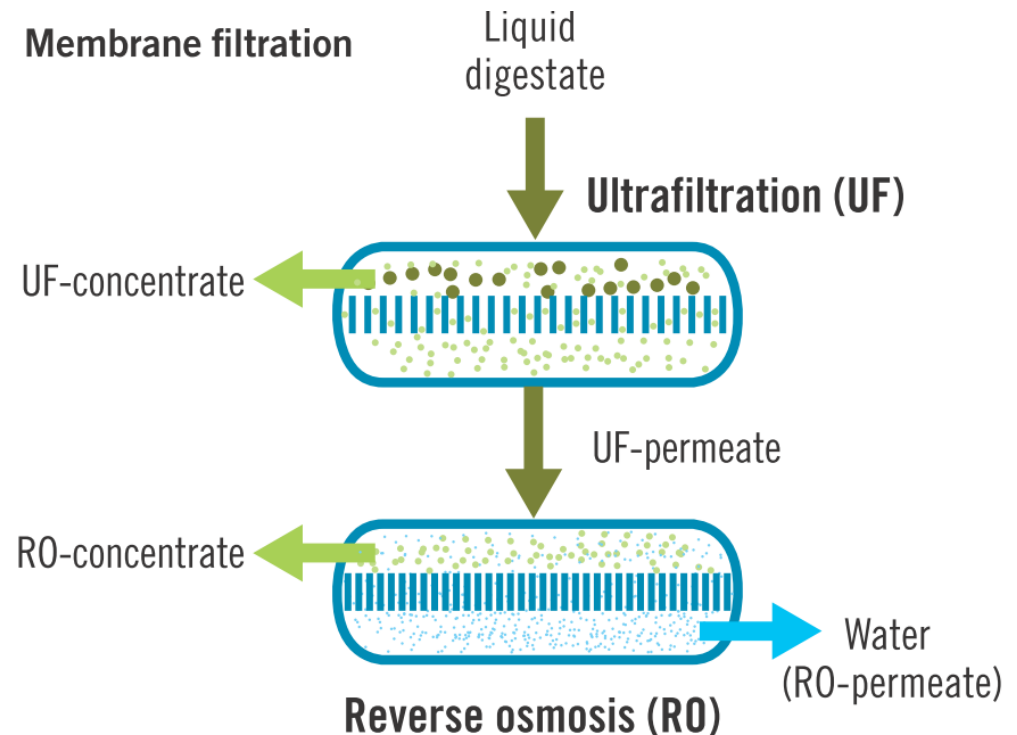
- Further upgrading of the dried digestate
- Required dry-matter content of the digestate of 85-90%
- High bulk density ( $\sim 700 \text{ kg/m}^3$ ) which decreases transport costs
- Optimal for marketing in small packages
- Pellets are easy to use for end customers because of their cleanliness



# Liquid upgrading

## Membrane filtration

- Goal of liquid upgrading is the volume reduction by separating the water
- Membrane filtration uses different membranes with decreasing pore sizes to separate the minerals from the water fraction
- Aim is to produce dischargeable water





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# Summary of possibilities of upgrading of the digestate



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## Reducing costs for storage, transport and application

- Sufficient storage capacity during the winter
- Application seasonal restricted (nutritional requirement of the plant)
- Reducing water content and increasing nutrient content



## Establishing new markets

- Replacing growing media, potting soil, peat, etc.
- Marketing in garden centre, home improvement store, retail market
- Use for landscaping, winegrowing, standing cultures etc.

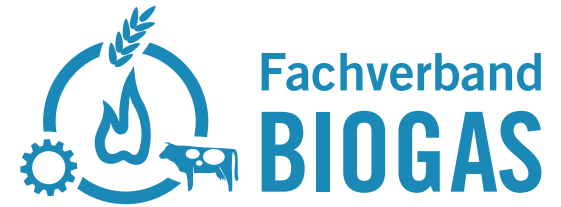


## Adding value

- Producing fertiliser demand-oriented (adjust nutrient content)
- Reducing losses of nutrients (nitrate losses)



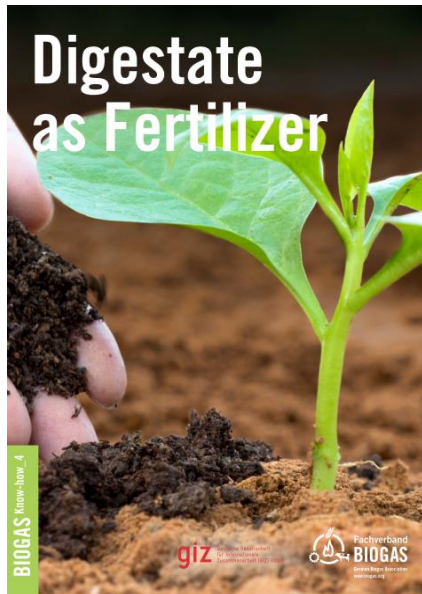
# Conclusion



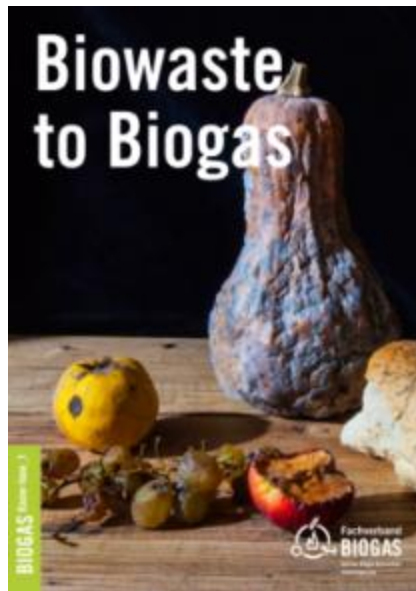
- Digestate is an important product of AD, which can be used as valuable fertilizer
- Application and marketing of digestate closes circles and reduces waste amount
- Establishing new markets e.g. with upgraded digestate (Interest strongly increasing)
- Best technology depending on size, situation and location, improvement necessary

# Publications

[www.digestate-as-fertilizer.com](http://www.digestate-as-fertilizer.com)



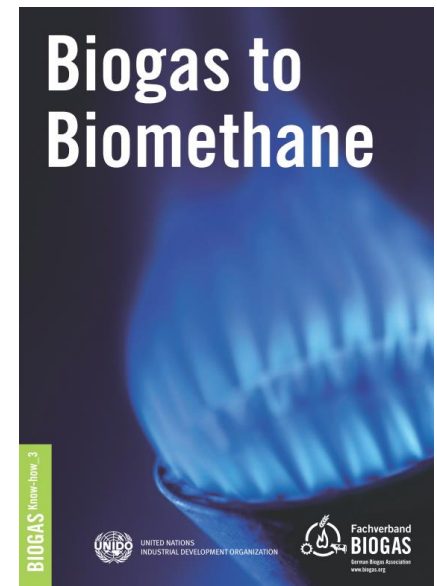
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Best Practice  
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