Utilization of Fermentation Products in Austria

Regulations, Qualification, Challenges

FLORIAN BRUNNER, AUSTRIAN COMPOST AND BIOGAS ASSOCIATION

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Agenda

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2. Biogas in Austria – Status Quo
3. Legal framework in Austria
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Austrian Compost and Biogas Association
Mission Statement

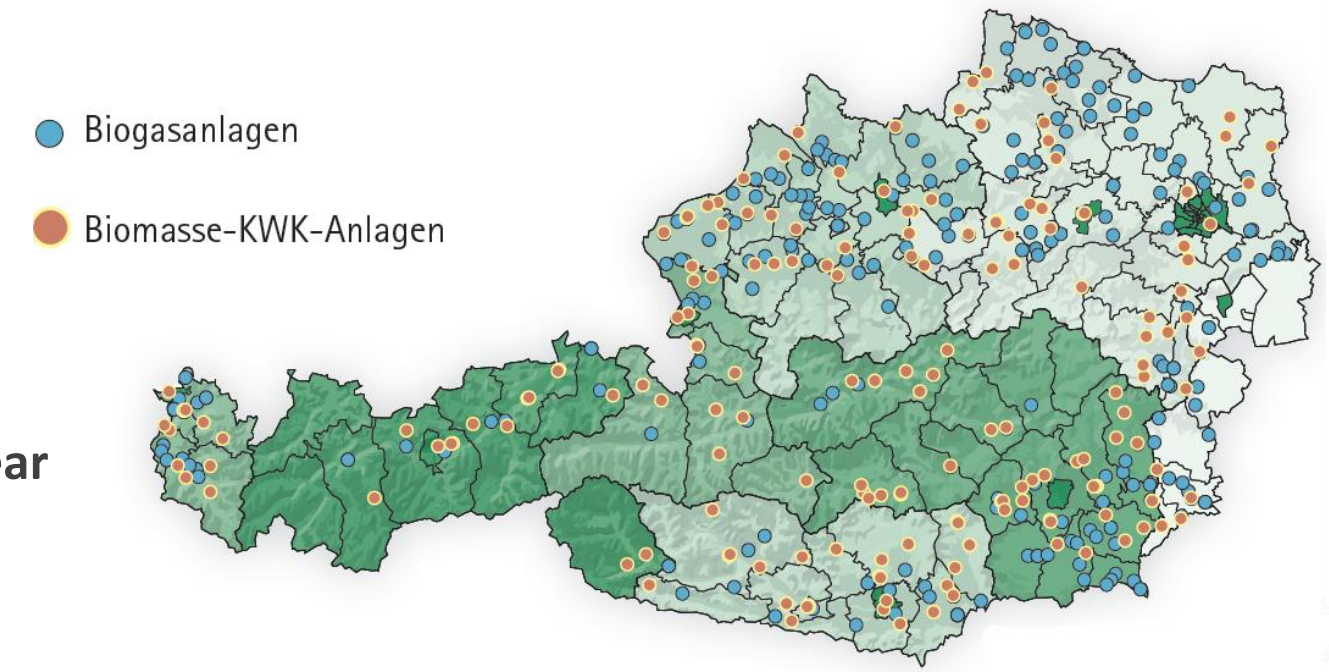
The Austrian Compost and Biogas Association stands for **organic recycling management**, which is technologically possible, ecologically necessary and economically sensible.

The **protection of soils and water, climate** protection and the **efforts in politics** to anchor a sustainable economy and lifestyle in society determine our field of activity. **Humus build-up, bioenergy and carbon sequestration** are the topics of our time.

In this sense, the Compost and Biogas Association Austria represents the interests of all and focuses on **information and education** to promote sustainable development.

Biogas in Austria – Status Quo

- ~270 total biogas/biomethane plants
  of these, 15 are biomethane plants*
  wwtp (~50), landfills (~15) and industry integrated plants exluded**
- biogas CHP
  - ~83 MW_{el}, ~520 GWh_{el}/year (2024)
  - ~430 GWh_{th}/year (2024)
- biomethane*
  - ~124 GWh/year (2024)
  - ~3.000 m^3/h biomethane
- **~1,5 Mio tonnes fermentation products/year**
- ~3.200 jobs
- ~110 Mio € domestic value creation

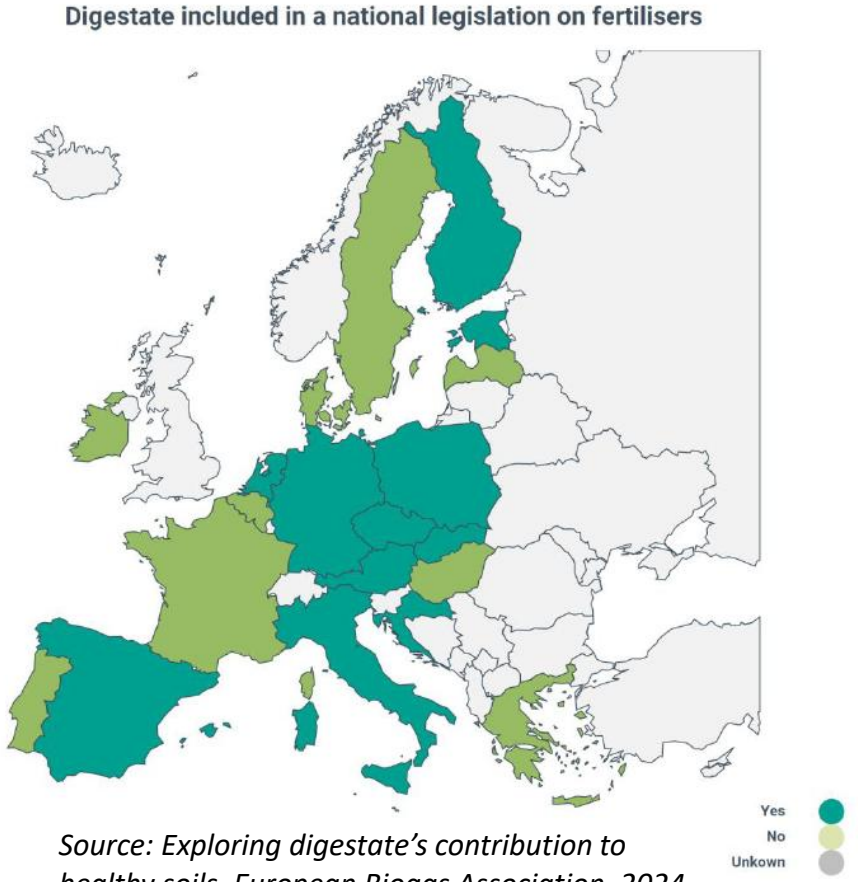


Source: Basisdaten Bioenergie 2025, Österreichischer Biomasseverband

* numbers do not inlude 4 newly built biomethane plants in 2025 (→ 220 GWh biomethane, 3.800 m3/h)
** no data available / plants not connected to public grids

National rules for placing fermentation products as fertilizer on the market

- The ***Fertilizer Act*** *(DMG 2021)* and the ***Fertilizer Ordinance*** *(DMV 2004)* regulate the marketing of fertilizers in Austria
  - Fertilizer type „**biogas slurry**“
  - Individual approval („**digestate**“)
- **End-of-waste-status:** fermentation residue from organic waste is considered waste under the ***Waste Management Act 2022*** until it is properly applied to the soil
  - No end-of-waste status according to a regulation (like e.g. for compost)
  - ***Soil Protection Acts*** of the federal states must be complied with
- Further laws, regulations and guidelines must be observed for application (e.g. ***Water Rights Act, Nitrate Action Programme Ordinance***, etc.)



Source: Exploring digestate's contribution to healthy soils, European Biogas Association, 2024

Placing on the market in accordance with Austrian *Fertilizer Act* and *Fertilizer Ordinance*

Austrian *Fertilizer Ordinance (DMV 2004)* defines different fertilizer types

Fertilizer products (excluding manure) may only be placed on the market if …

1. …they correspond to a type listed in the *Fertilizer Ordinance* (type approval)
2. … or are approved by a decision pursuant to §9 of the *Fertilizer Act* (individual approval)

Approval of fermentation products as fertilizer:

- Recognition as **Fertilizer Type 8 ("Organic Fertilizer")** or **9 ("Biogas Slurry")**
- … or by **individual approval** as according to *Fertilizer Act* (§9), **"Digestate"**
  - Individual approval confirms that the fertilizer product is subject to the provisions of the *Fertilizer Act*
  - Issuance of the decision by the Federal Office for Food Safety (BAES)
  - Individual approval is limited to a maximum of 10 years
  - All individual approvals must be listed in the national fertilizer register: Düngemittelregister - BAES

Fertilizer Ordinance – Fertilizer type „biogas slurry“

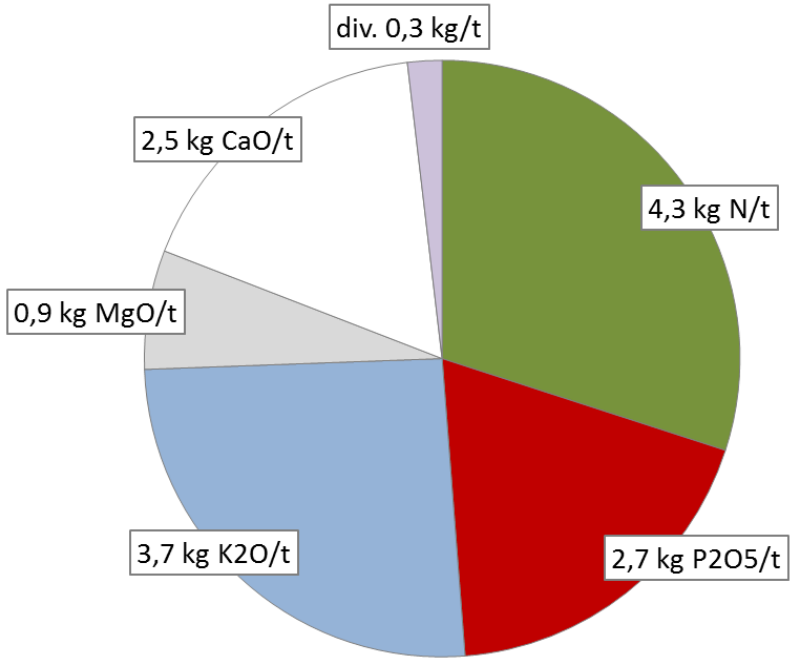
- According to the *Fertilizer Ordinance 2004*, Biogas slurry is the **fermented substrate from farm manure and the following raw materials**:
  - Plant products from primary agricultural production, including crop residues and silage;
  - Animal feed, including overstocked animal feed and feed residues;
  - Spoiled or overstocked untreated seed;
  - Pits, peelings and fallen fruit as well as vegetables (residues);
  - By-products from the processing of foodstuffs and animal feed, in particular products from dairies, breweries (lees) and oil mills as well as vinasse, beet pulp, beet tails, beet leaves and molasses

≈ manure and plants/plant-based materials and by-products

Fertilizer Ordinance – Fertilizer type „biogas slurry“

Requirements for fertilizer type 9 „biogas slurry“

- **min. 50% organic dry matter** -> Ø 69% organic dry matter
- **minimum nutrient levels:**
  - 2 kg N/t fresh matter
  - 1 kg P_2O_5/t fresh matter
  - 3 kg K_2O/t fresh matter
- **Special provisions**, including:
  - no more than 3 viable seeds per liter
  - free of worm eggs
  - specific labelling
  - etc.



Average nutrient content of digestates (n=137)

- **Limit values for pollutants** (e.g. heavy metals, organic pollutants, hygiene parameters and other contaminants) in the annexes of the *Fertilizer Ordinance 2004*

Fertilizer Act – Individual approval

Fertilizer Act 2021: Possibility of an individual approval as a fertilizer product

- Upon application by the fertilizer manufacturer
- "**Digestate**": fermentation products from **biogenic waste materials**, that cannot be classified as type 9 "biogas slurry" → requires approval according to § 9 *Fertilizer Act* (individual approval)
- Additionally for **animal-by-products**: requirements of Regulation (EU) 1069/2009 must be compiled with (sanitization!)
- Application for approval shall be granted by the authority if:
  - Compliance with regulations issued on the basis of the *Fertilizer Act*, e.g. concerning (limit values for) pollutants (if enacted)
  - Compliance with the labeling and packaging requirements
  - …

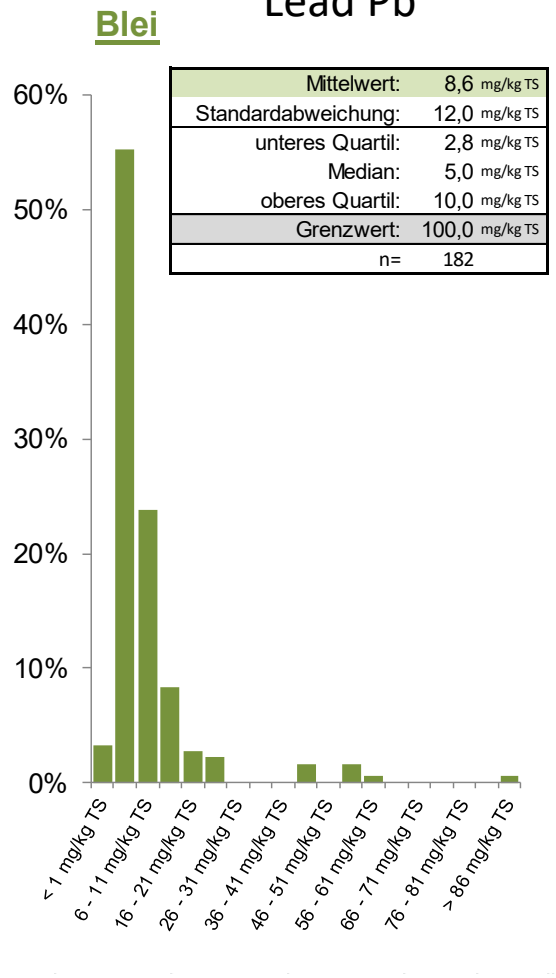
Fertilizer Ordinance – Limit values for Fertilizers

Heavy metals (Annex II)

Lead Pb	100 mg/kg DM*
Cadmium Cd	3 mg/kg DM
Chromium Cr	2 mg (Cr-VI)/kg DM
Copper Cu	700 g/ha in 2 years
Nickel Ni	100 mg/kg DM
Mercury Hg	1 mg/kg DM
Zinc Zn	3.000 g/ha in 2 years

* DM = dry matter

Lead Pb



Results for Austrian fermentation products

Average, standard deviation and number of exceedances of relevant limit values for heavy metals (DM = dry matter) (Stürmer et al. 2020)

Heavy metals	n	Unit	Average	Standard deviation	Number above limit value
Cd	182	mg/kg DM	0.44	0.66	3 (>1.5 mg/kg DM) 2 (>2.0 mg/kg DM)
Cr total	192	mg/kg DM	14.35	13.01	
Cr VI	–		–	–	
Hg	174	mg/kg DM	0.07	0.07	0 (>1.0 mg/kg DM)
Ni	191	mg/kg DM	16.18	18.27	12 (>50 mg/kg DM)
Pb	183	mg/kg DM	8.38	12.18	0 (>120 mg/kg DM)

Fertilizer Ordinance – Limit values for Fertilizers

Hygienic parameters (Annex II)

E-Coli O157:H7	n.d. in 50g sample
Salmonella	n.d. in 50g sample
Campylobacter	n.d. in 50g sample
Listeria monocytogenes	n.d. in 50g sample

n.d. = not detectable

Contaminants (Annex II)

Sum of glass, metals and plastics > 2mm	0,4 wt% DM
Plastics > 2mm	0,1 wt% DM
Metals > 2mm	0,2 wt% DM
Glass > 2mm	0,2 wt% DM

wt% = weight-percent

Proportions of plastics > 2 mm in digestate (wt% DM), results from Austrian waste processing AD plants (Pfundtner E., AGES GmbH)

Fertilizer Ordinance – Labelling for Fertilizers

Name des Produkts	Biogasgülle
Hersteller / Inverkehrbringer	
Anschrift des Herstellers	
Düngemitteltyp	9. Biogasgülle

Wertbestimmende Inhaltsstoffe

Organische Substanz		Gew% Trockenmasse (TM)
Gesamtstickstoff (N)		Gew% Frischmasse (FM)
Gesamt-Phosphat (P_2O_5)		Gew% FM
Gesamt-Kaliumoxid (K_2O)		Gew% FM

Bezeichnung der Ausgangsstoffe

	Wirtschaftsdünger
	Pflanzliche Erzeugnisse aus der lw. Urproduktion (Mais, Grünschnitt-roggen, usw.) inkl. Ernterückstände und Silagen
	Futtermittel(reste)
	Ungebeiztes Saatgut
	Kerne, Schalen, Fallobst, Gemüse(reste)
	Nebenprodukte aus der Verarbeitung von Lebens. Und Futtermitteln (Erzeugnisse aus Molkerein, Brauereien, Ölmühlen u. Zuckerindustrie, etc.)

Nettovolumen (gesamte Lieferung) m³

Hinweise zum Transport, zur Lagerung und zur Anwendung

- Lagerung nur in flüssigkeitsdichten und medienbeständigen Lagern erlaubt!
- Auf ausreichenden Druckausgleich zwischen Behältnissen und Umgebung ist zu achten
- Der Zugang (Beweidung, Futtergewinnung) für Nutztiere zu den behandelten Flächen während eines Zeitraumes von mindestens 21 Tage nach der Ausbringung ist verboten!
- für Kinder und Haustiere unerreichbar aufbewahren
- Nicht zur Kopfdüngung im Gemüse-, Heilkräuter- und Beerenobstbau verwenden!
- Die Richtlinien zur sachgerechten Düngung für die Ausbringung im Ackerland und Grünland sind einzuhalten.
- die Ausbringmenge von XX t/ha entspricht ca. 100 kg N, ca. XX kg P2O5 und ca. XX kg K2O pro ha

„Warenbegleitpapier“ = delivery note

- Labelling according to §5 *Fertilizer Ordinance*
  - Manufacturer information
  - Fertilizer type
  - Key components: nutrient levels, organic dry matter
  - Raw materials
  - Net volume
  - Transport, storage and usage instructions
  - …

Legal framework – Additional requirements*

*selected examples

- ***Soil protection acts*** (e.g. Lower Austria)
  - **Grazing ban of 21 days** from the date of application of fermentation products with animal b-products
  - **Maximum amount of 170 kg nitrogen/ha/year** from fermentation products, provided that **animal excrement** is (partially) processed
- ***Nitrate Action Program Ordinance*** (implements *EU-Nitrates Directive*)
  - Includes specifications for the application of nitrogen-containing fertilizers on agricultural land
  - **Periods during which N-fertilizers cannot be applied to agricultural land** (→ indirectly obliges biogas plants to a minimum storage capacity of 6 months for fermentation residues)
  - Local restrictions, methods for spreading, limits on the amount of nitrogen applied per type of crop, …
- ***Ammonia Reduction Ordinance***
  - Systems or containers for the storage of liquid fermentation products with a total operational capacity of 240 m^3 be equipped with a permanently effective, full-surface cover

ÖPUL measure: low-emission spreading of fermentation products

ÖPUL = Austrian agri-environmental scheme within the CAP (Common Agricultural Policy) framework → voluntary measure, additional to basic CAP conditionality

- **Support for low-emission spreading of** liquid manures and biogas **fermentation products** on arable land and grassland
  - Payments per m³ of low-emission applied liquid manure/fermentation product (rate depends on technique)
- **Eligible techniques**: Trailing hose/shoe systems, injection systems, …
- **Objectives**:
  - Reduction of ammonia and greenhouse gas emissions from organic fertilizers
  - Improved nitrogen use efficiency and reduced nutrient losses to water
  - Contribution to meeting national air-quality and climate targets
- Documentation and annual reporting required

Drag hose: -40% NH_3 emissions compared to wide spreader (Source: Bachmaier, 2021; Picture: Hummel)

Slurry injector: Soil cultivation within 1 hour leads to -85% NH_3 emissions comp. to wide spreader (Source: Bachmaier, 2021; Picture: Prieler)

Challenges for utilisation of fermentation products in Austria

- **Trade-Off: Nutrient Recovery vs. Contaminant Risks**
  - = core conflict in circular economy
  - Utilizing nutrients from wastes and residues vs. spreading contained contaminants (microplastics, PFAS, etc.)
  - e.g. sewage sludge has to be incinerated from 2033 on (*Abfallverbrennungsverordnung*)
- **Farmer awareness and acceptance**
  - Skepticism among farmers (especially first-time users)
  - Doubts on fertilizer efficacy, handling complexity, and contaminant risks – amplified when waste materials are used as biogas substrate
  - Targeted education and demonstration projects needed
- **Lack of economic incentives**
  - Low market value: fermentation products generate minimal revenues compared to mineral fertilizers, despite superior nutrient equivalence based on analyses (N, P, K availability)
  - Cost burden on operators: Biogas plant operators often cover transport and application costs, eroding profitability
  - Barrier to innovation: No strong incentive to upgrade digestate into "advanced fertilizers" with enhanced effects

Florian Brunner
Department Biogas at
Austrian Compost and Biogas Association
brunner@kompost-biogas.info
+43 664 3907900

We close the loops: ecologically – efficiently – sustainably

Thank you for your attention!

Questions? Let‘s discuss!