

# ORBIT 2009 CHINA

## Fostering Good Biogas Practice by the Public Administration in Styria (Austria)

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Styrian Provincial Government

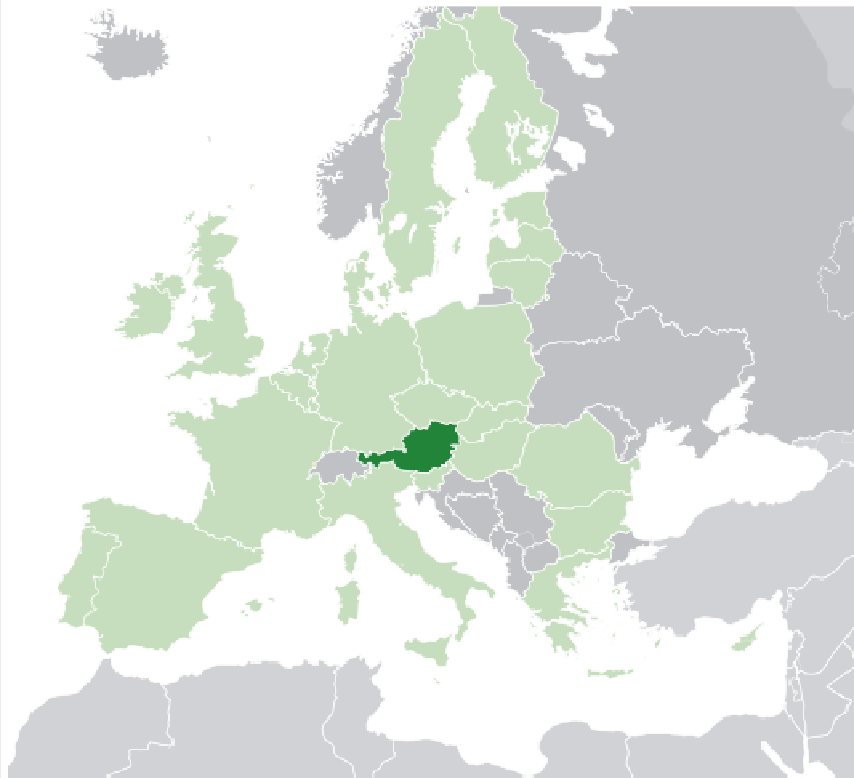
Specialized Division 19D – Waste and Material Flow Management

Graz, Austria



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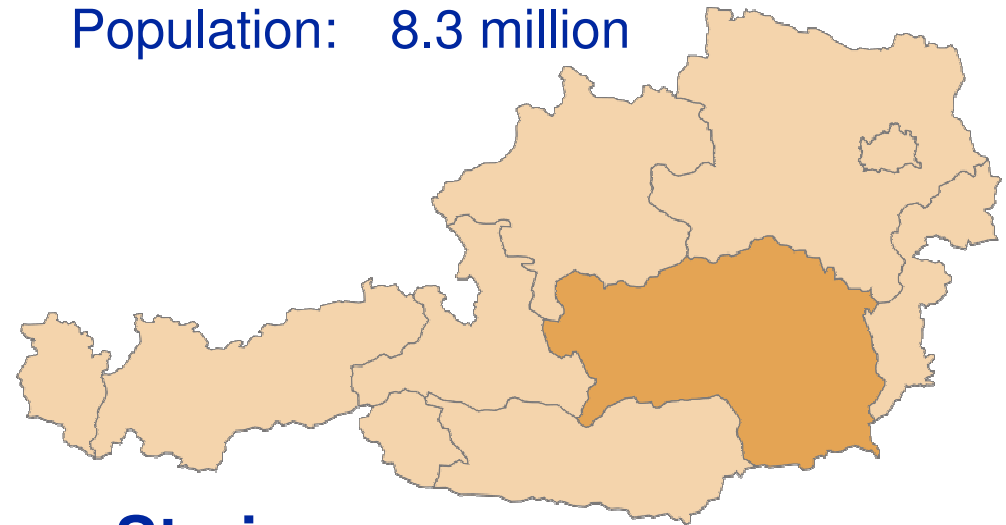
# Austria and the province Styria



## Republic of Austria

Area: 83.879 km<sup>2</sup>

Population: 8.3 million



## Styria

Area: 16,401 km<sup>2</sup>

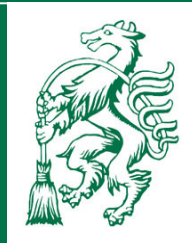
Population: 1.2 million

Source of maps: Wikipedia



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# Impressions



**Mountains in the north...**



**hills with vineyards  
in the south...**



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→ FA19D  
Abfall- und Stoffflusswirtschaft

# Impressions

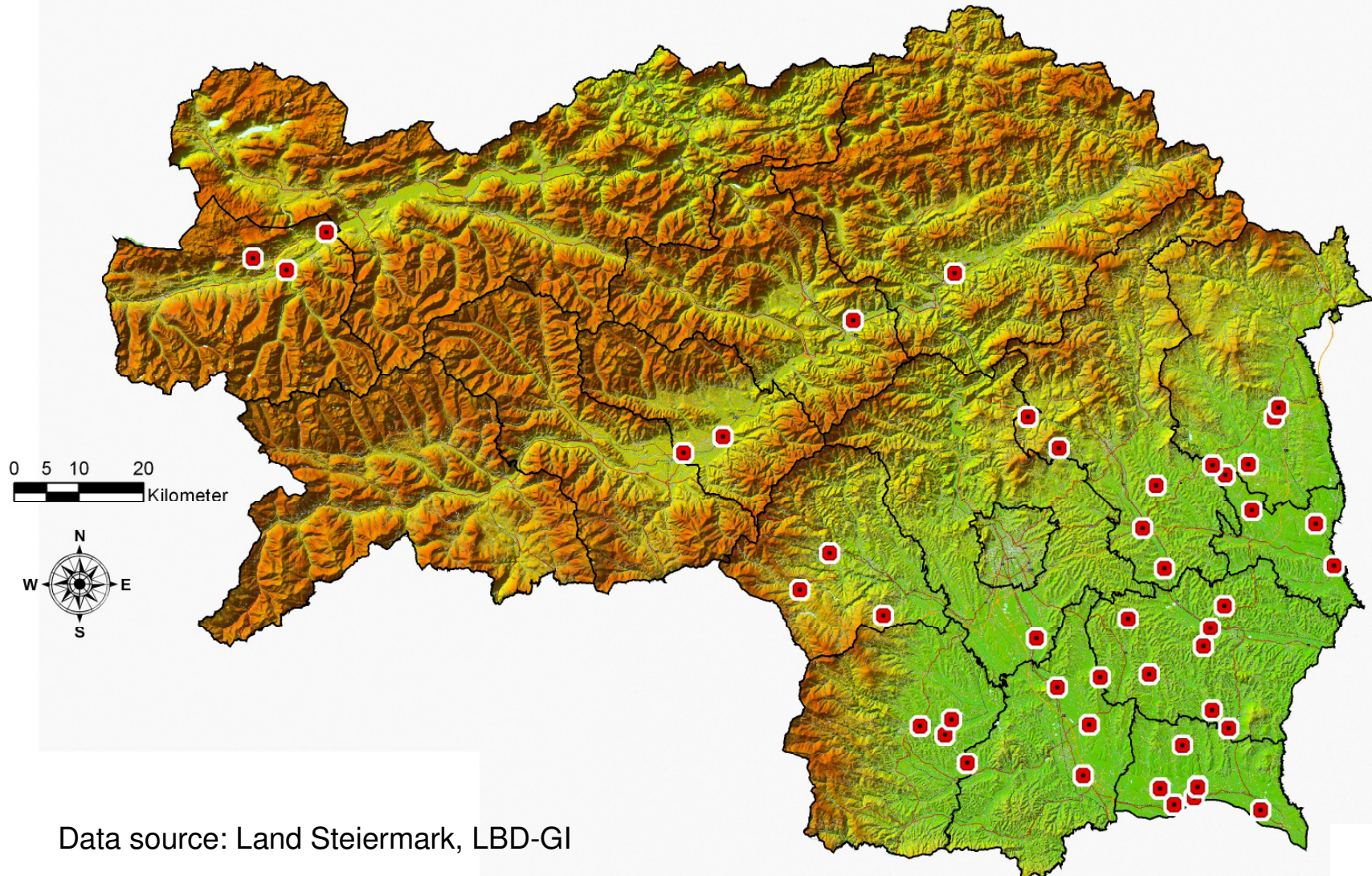


**... and  
agricultural  
land, where  
most biogas  
plants are  
located**



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# 45 Biogas Plants in Styria



# Typical Styrian Biogas Plants



# Background - Renewable Energy in Styria



- **Renewable energy: 25%\***) of final energy consumption  
(goal for Austria by 2020\*\*): 34% from renewable energy sources)
- **Possible increase of biomass use: 50 - 60%\*\*\*)**
- **105 companies in the fields of renewable energy and environmental technology**
- **Network “ECO WORLD STYRIA” is 2<sup>nd</sup> largest in Europe in this area**

\*) Source: ECO World Styria, [www.eco.at](http://www.eco.at)

\*\*) According to Austria’s “Renewable Energy Road Map”

\*\*\*) Source: Agricultural Chamber of Styria



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# Biogas Monitoring Project – Motivation



- **Economical challenges**

- Increasing prizes for energy crops
- Moderate renewable energy feed-in tariffs

- **Environmental challenges**

- Strict directives for using fermented biogas slurries as fertilizer
- Intensively used agricultural area: oversupply with nitrogen fertilizers

- **Challenges for operators**

- Plants partly without devices for monitoring process parameters
- No comparable data of the different plants, therefore benchmarking impossible



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# Biogas Monitoring Project – Details



- **Duration: 2 years (2007 – 2008)**
- **Project team:**
  - Styrian Provincial Government: **Stakeholder, project board**
  - Ing. Gerhard Agrinz GmbH (Leibnitz, Austria): **Project execution, data collection**
  - b.a.r.b.a Engineering, Consulting, Research & Service GmbH (Leoben, Austria): **sampling and chemical analyses**
  - Gieler EDV (Vienna, Austria): **database development**
  - Lokale Energieagentur-LEA GmbH (Feldbach, Austria) and ARGE Kompost & Biogas Steiermark (Graz, Austria): **support**
- **Analyzed biogas plants: 15**
  - Voluntary participation
  - Received analyses reports and suggestions for optimization



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# Project Objectives



- **Establish a quality management system for biogas plants**

- Improve yield of energy production from renewable resources
- Increase cost efficiency of biogas plants
- Identify optimization potentials of biogas plants
- Develop assessment and benchmarking database

- **Investigate material flows**

- Gain knowledge to support balanced feed and constant conditions
- Gain knowledge for development of alternative biogas slurry applications

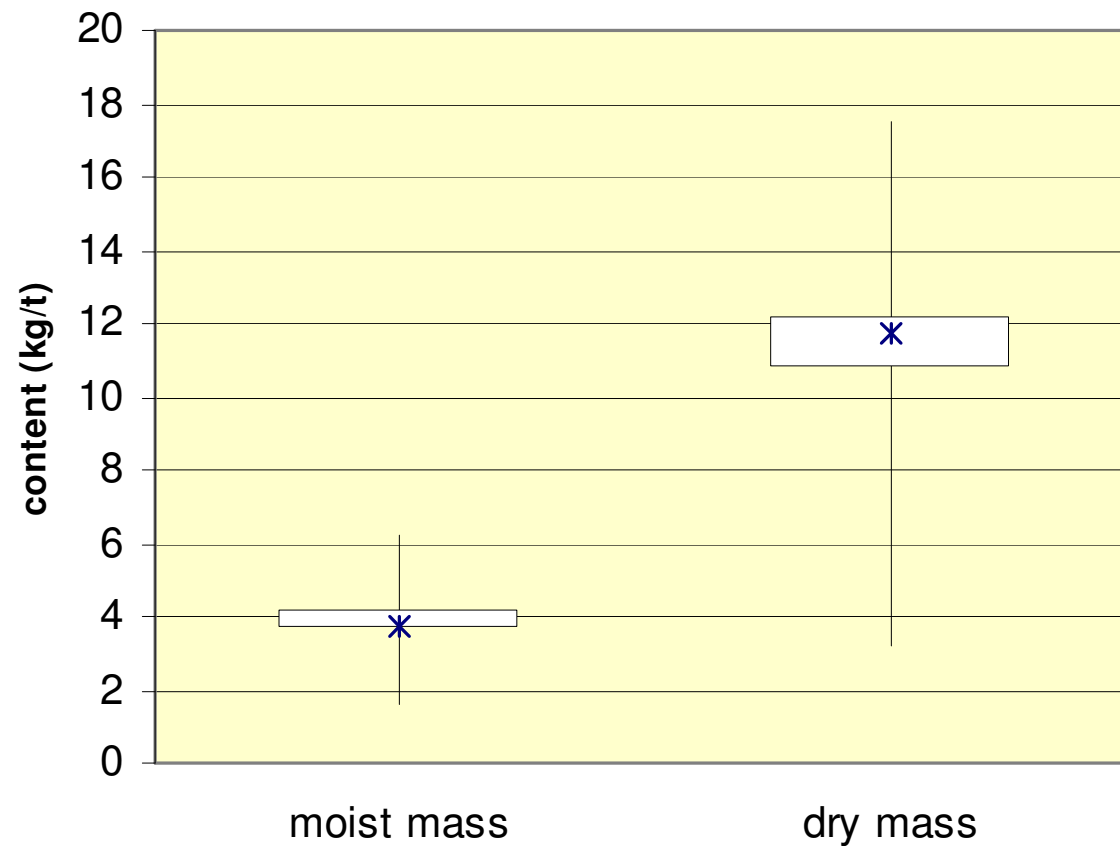


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# Results – Nitrogen-Content of Feedstock



Nitrogen Content in Maize Silage (n = 15)

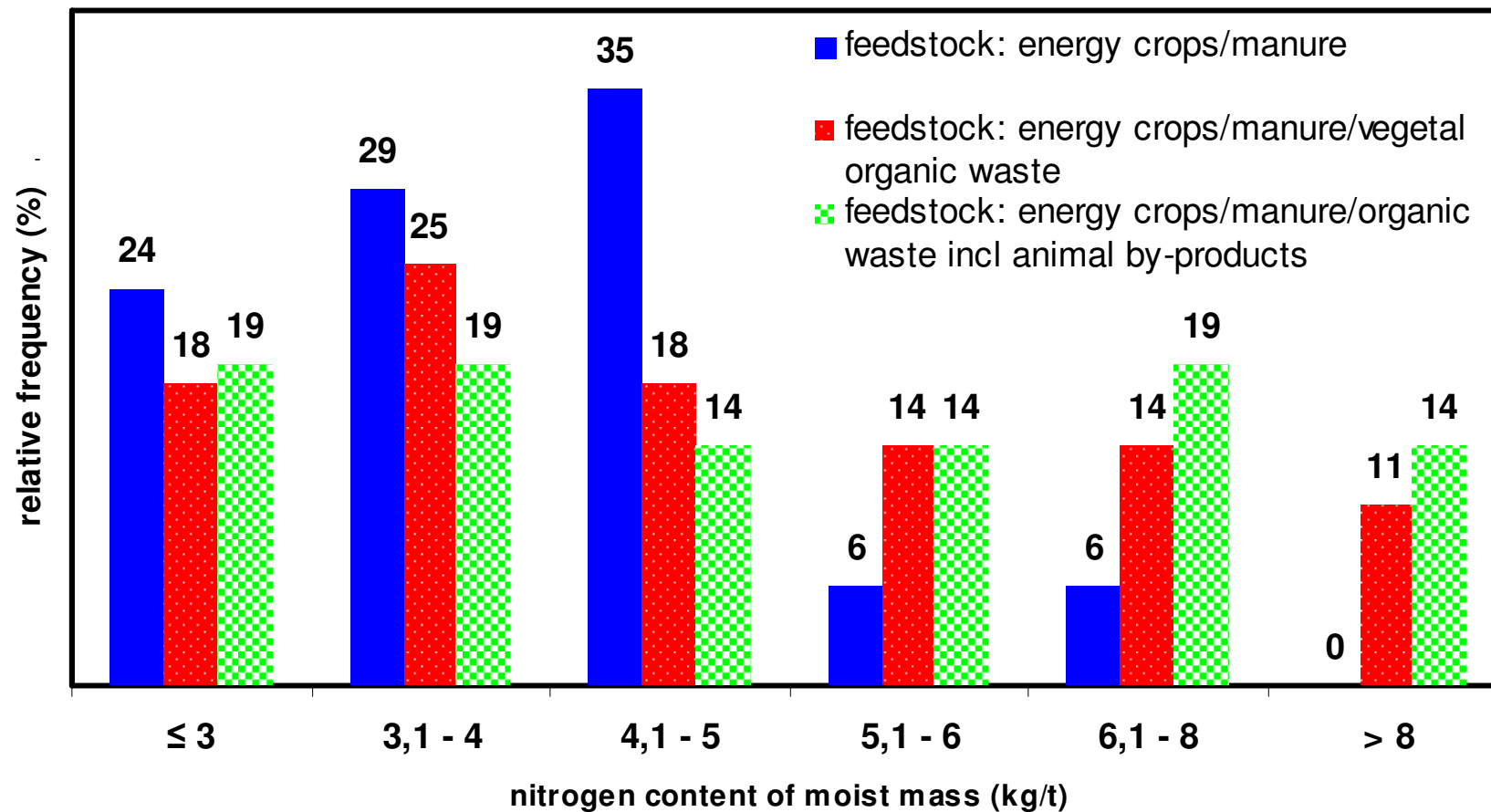


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# Results – Nitrogen-Content in Fermented Slurry



N-Content of Fermented Biogas Slurry



# Results – More Results of Sample Analyses



- **Heavy metals content of fermented slurry**

Zinc and copper might occur in relevant concentrations and should be monitored

- **Microbiological assessment of fermented slurry**

36% of fermented slurry samples carried germs with at least minor infection potential

- **Process stability**

25% of samples from fermenter revealing process instabilities

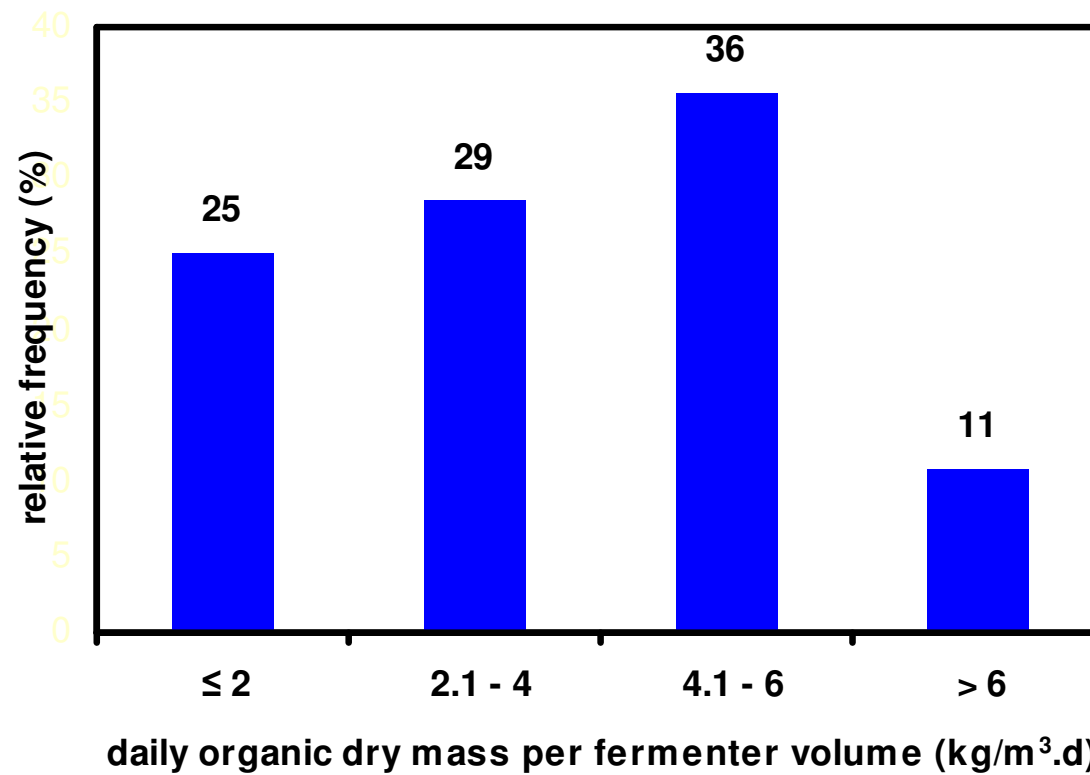


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# Results – Operating Data



### Fermenter Volume Load

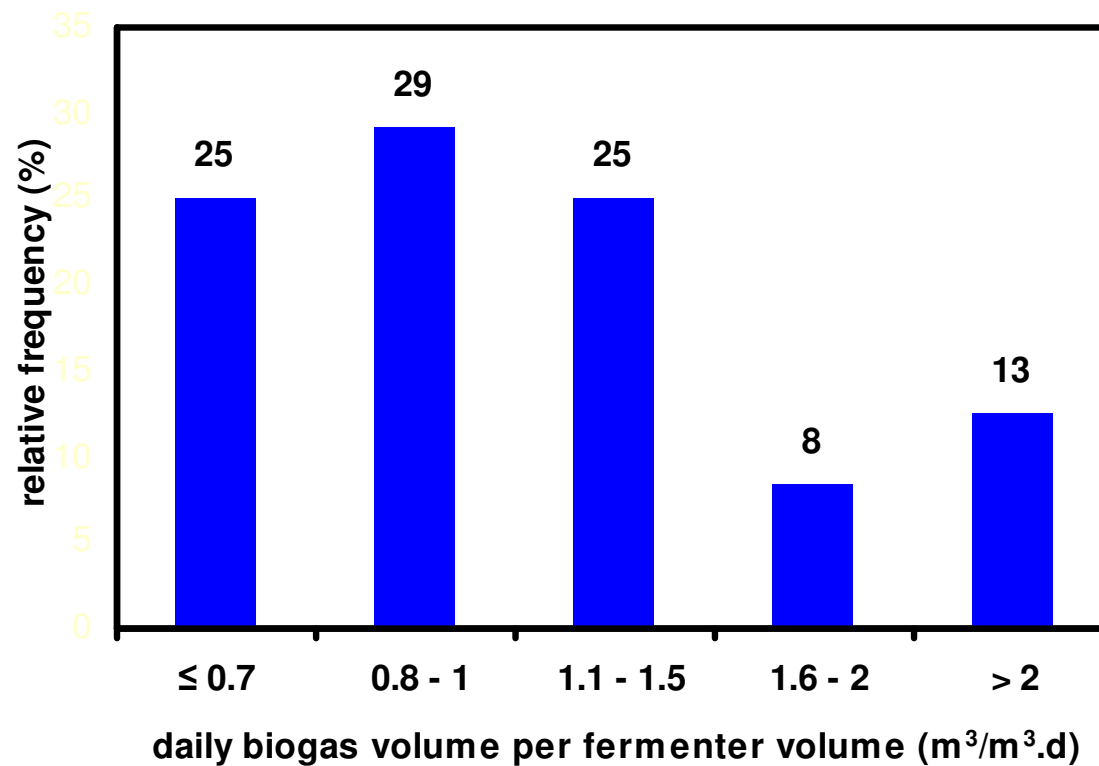


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# Results – Operating Data



### Biogas Output per Fermenter Volume



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# Results – More Operating Data



- **Full load hours per year**

- <6,000 hours: 26% of the plants
- >8,000 hours: 35% of the plants

- **41% of plants exhibited a total energy efficiency <60%**

- True for old plants with minor heat use
- Current Austrian Green Electricity Act: 60% minimum requirement for receiving agreed price for green electricity



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# Benchmarking Database



- **Available at**

- [www.biogas.steiermark.at](http://www.biogas.steiermark.at)

- **Benchmark function includes**

- Key parameters regarding the production and use of heat and electricity
  - Produced biogas per fermenter volume and per feedstock
  - Fermenter volume load
  - Expenses
  - Investment costs



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# Benchmarking Database - Screenshot



[↑ Betreiber-Daten](#)
[ANLAGEN-ÜBERSICHT](#)
[↓ Inputdaten](#)
[↓ Anlagenkenndaten](#)
[↓ Wirtschaftsdaten](#)
[↓ Erhebungsdaten](#)
[↓ Benchmark-Einstellung](#)

<b>Anlage (Name):</b>		DEMO - Anlage				
<b>Anlagenbetreiber:</b>		Demobetreiber				
<b>Adresse (Standort):</b>						
Straße:		DemoStandort		Hausnr.: 17		
PLZ: 8010		Ort: Graz, 01. Bez.: Innere Stadt				
<b>Telefonnr.:</b>		DemoTel Anlagen		<b>E-Mail:</b> demo@maystorm.at		
<b>Mobil.:</b>		DemoMobil Anlagen		<b>Fax-Nr.:</b> DemoFax Anlagen		
<b>Grundstücke:</b>						
Gesamt:		- ha	KG:	Nr.:	Größe:	Eigentümer:
			xxxxxxxx	0.20	- ha	DemoEigentümer
			-	-	- ha	-
			-	-	- ha	-
			-	-	- ha	-
			-	-	- ha	-
			-	-	- ha	-

Entfernungen	Anmerkung		Anmerkung	
nächster Anrainer:	100	m -	Trafo:	25 m -
nächster Wohnanrainer:	-	m -	Wärmeabnehmer:	200 m Wäscherei

<b>Allgemeine Angaben</b>	
Rechtsform:	GmbH
genehmigt nach:	GewO

# Benchmarking Database - Screenshot



Messdaten 1. Halbjahr 2007

← zurück

INPUTANALYSE ↓ Fermenteranalyse ↓ Gärrestbewertung Nr. 1 - 3 ↓ Gärrestbewertung Nr. 4 - 6 ↓ Hygiene ↓ Messdateien

**i** Das einem Zahlenwert vorangestellte "u.B.g.v." bedeutet, dass der Wert die untere Bestimmungsgrenze unterschreitet.

Inputliste	Nr. 1		Nr. 2		Nr. 3		Nr. 4	
<b>Rohstoffart:</b>	Silomais		CCM		Gras		Gülle	
<b>Kategorie:</b>	Pflanzliche Erzeugnisse		Pflanzliche Erzeugnisse		Pflanzliche Erzeugnisse		Wirtschaftsdünger	
<b>Herkunft:</b>	Zukauf		Zukauf		Zukauf		Zukauf:	
Trockensubstanz TS:	36,0 %FM		65,0 %FM		- %FM		2,0 %FM	
pH-Wert (Caliumchlorid):	3,5		3,8		-		8,0	
Organische Trockensubstanz als Glühverlust oTS:	32,40 %FM	90,00 %TS	59,80 %FM	92,00 %TS	⚡ %FM	- %TS	1,20 %FM	60,00 %TS
Ammonium-Stickstoff NH <sub>4</sub> <sup>+</sup> -N:	0,300 kgtFM	0,833 kgtTS	0,400 kgtFM	0,615 kgtTS	- kgtFM	⚡ kgtTS	2,200 kgtFM	110,000 kgtTS
Stickstoff gesamt N <sub>ges</sub> :	5,500 kgtFM	15,278 kgtTS	2,300 kgtFM	3,538 kgtTS	- kgtFM	⚡ kgtTS	2,500 kgtFM	125,000 kgtTS
Phosphor gesamt P <sub>ges</sub> :	0,800 kgtFM	2,222 kgtTS	1,700 kgtFM	2,615 kgtTS	- kgtFM	⚡ kgtTS	0,400 kgtFM	20,000 kgtTS

# Conclusions



- **Improvement potentials at all participating plants**
- **Improvements achieved during project**
  - 40% of instable fermenters stabilized
  - 40% decrease of germ carrying fermented slurry
- **Suggestions made to operators**
  - Use of cheaper feedstock instead of expensive energy crops (maize)
  - Increasing total energy efficiency to values >60%
  - Increasing the full hours and efficiency of CHPs
  - Documentation of amount/quality of feedstock and fermented slurry
  - Measurement and documentation of relevant process parameters
- **Monitoring on a regular basis is necessary**



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# Current Actions beyond the Project



- **Assessment and benchmarking database** provided for free beyond the project
- **Obligatory use of assessment database** as prerequisite for subsidies is currently negotiated
- **Targeted communication** that nitrogen content of fermented slurry must be analyzed prior to use
- **Alternatives to direct agricultural slurry use** are being explored



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# Contact Details



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**www.biogas.steiermark.at**



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