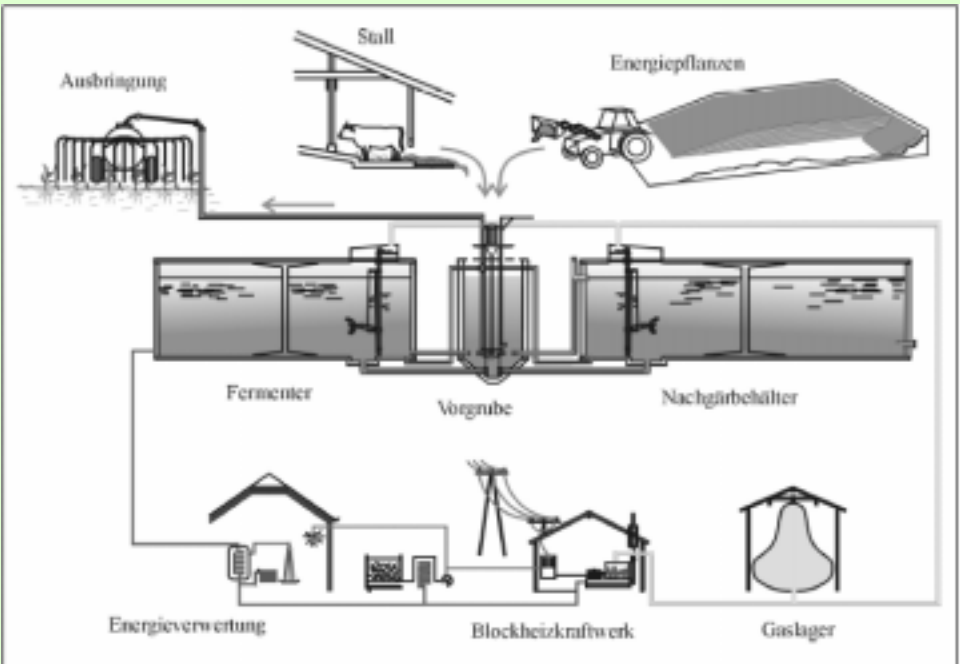


# Biowaste Recycling in Austria

Biowaste Recycling in Austria



## The Decentralised Solution



Florian Amlinger  
Compost - Consulting  
& Development



# Organic Waste treatment in Austria

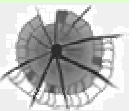
## ➤ 480 Composting Plants

- ✓ Source separated organic waste (green and kitchen waste)
- ✓ Capacity: ca. 1,1 Mio t
- ✓ Input: ca. 800.000 t

## ➤ Ca. 300 Biogas Plants

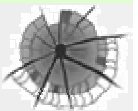
- ✓ **6** big co-fermentation plants for commercial waste and sludge → 10 to 20,000 t capacity / year
- ✓ **4** big biogas plants for municipal organic waste → 10 to 20,000 t → 10 to 20,000 t capacity / year
- ✓ Ca. **290** small scale plants → slurry & agricultural crops, partly co-fermentation of organic waste (e.g. rendered fat etc.)

**March 2004: only 150 biogas plants !**



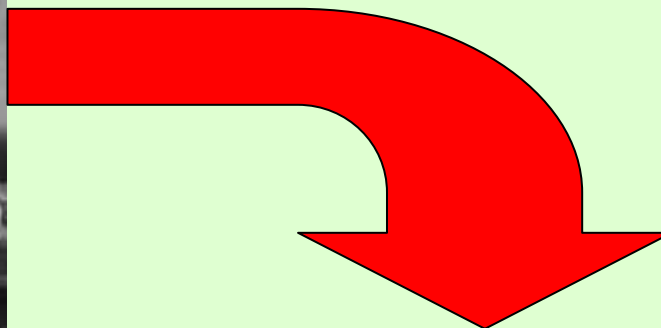
# The Austrian Biowaste / Compost Legislation

- ✓ Ordinance on the Separate Collection of Organic Waste 1992 → 1995
  - ✓ Separate collection of organic waste → mandatory
- Compost Ordinance .... Sept 2001  
The 1<sup>st</sup> END of WASTE Regulation !
  - ✓ Source materials
  - ✓ Quality requirements for compost
  - ✓ Product certification & labelling
- State of the Art o Composting Feb 2005  
Technical Guideline
  - ✓ Enviornmental requirements
  - ✓ Good practice

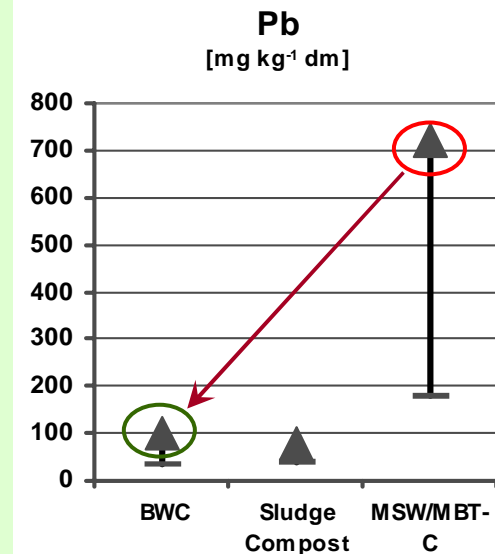
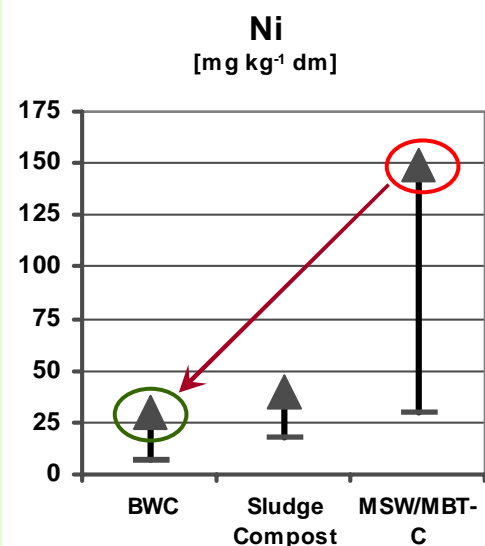
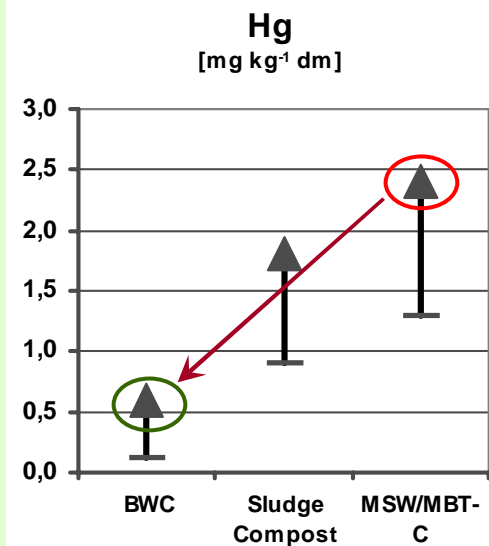
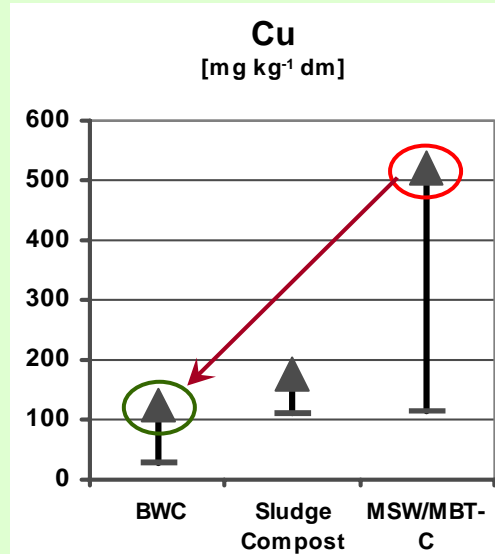
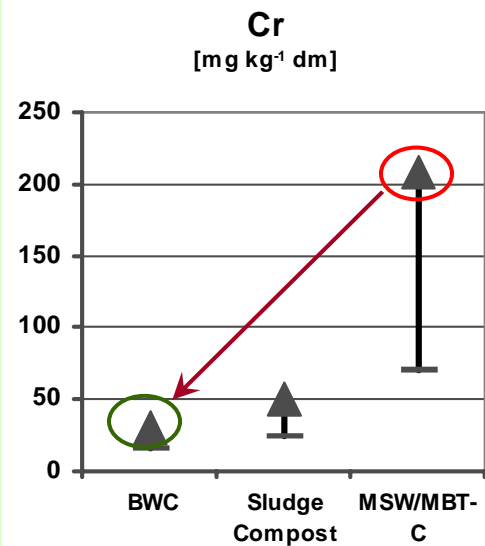
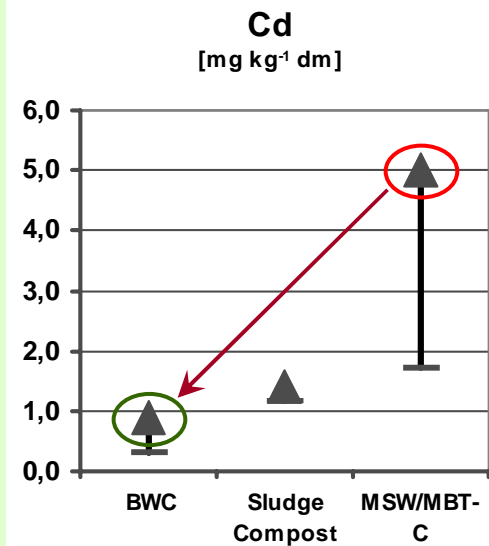


# Mixed Waste Composting ???

Biowaste Recycling in Austria

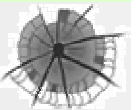
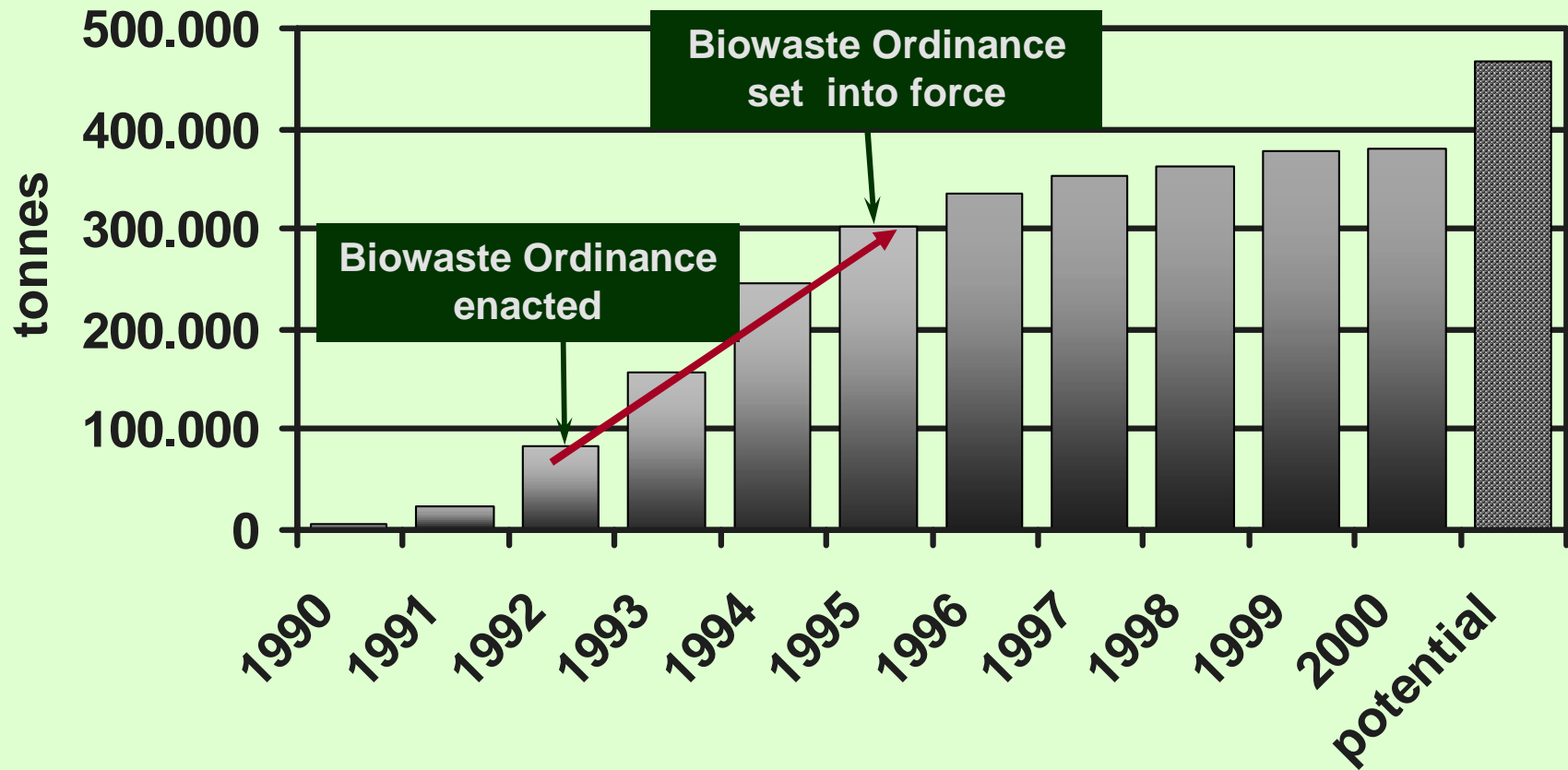


# Quality as a Result of Source Separation - a Clear Picture -

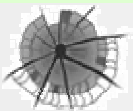
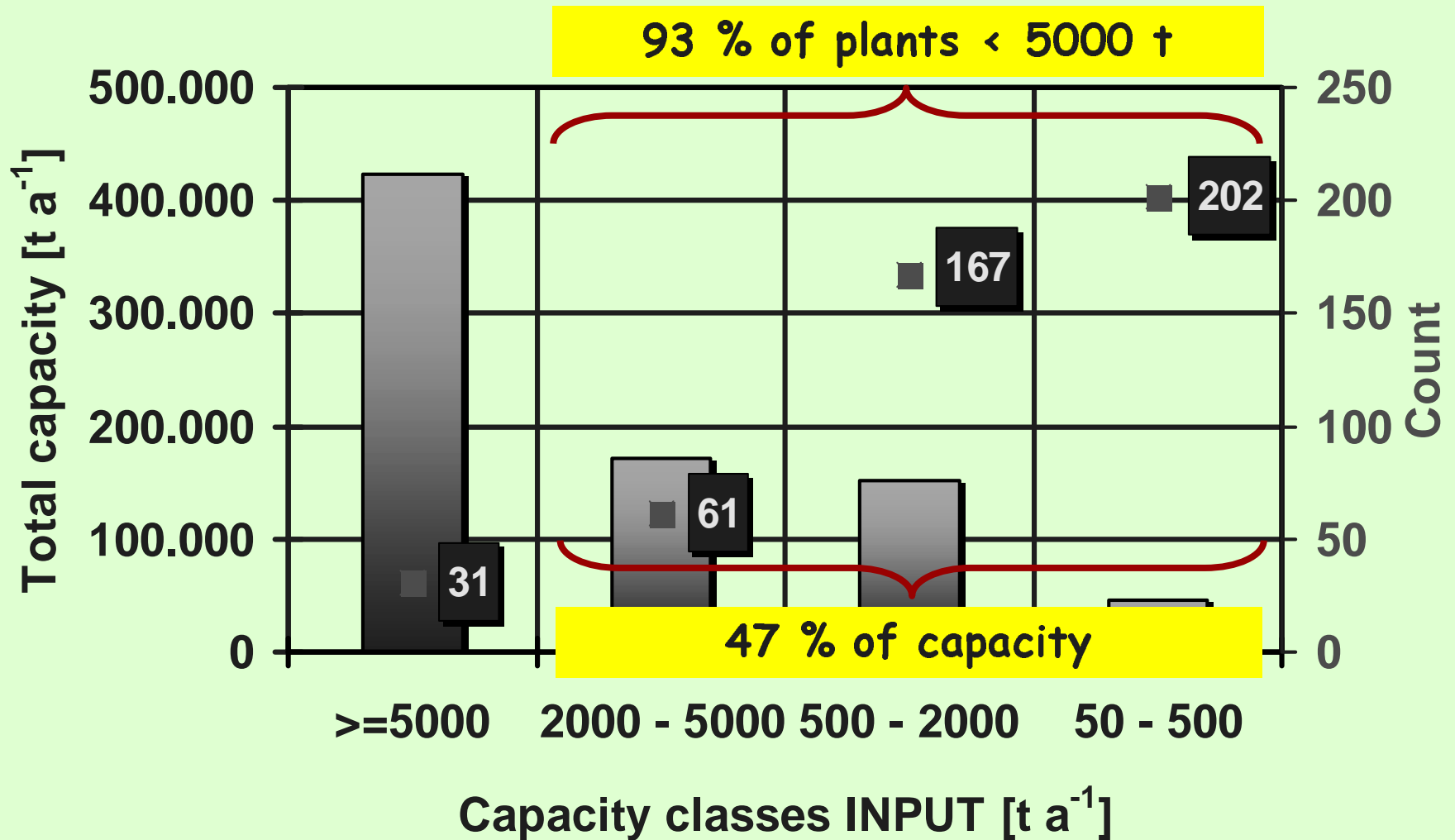


# Development of Separately Collected Biowaste

Biowaste Recycling in Austria



# Capacity and Number of Composting Plants 1999/2000



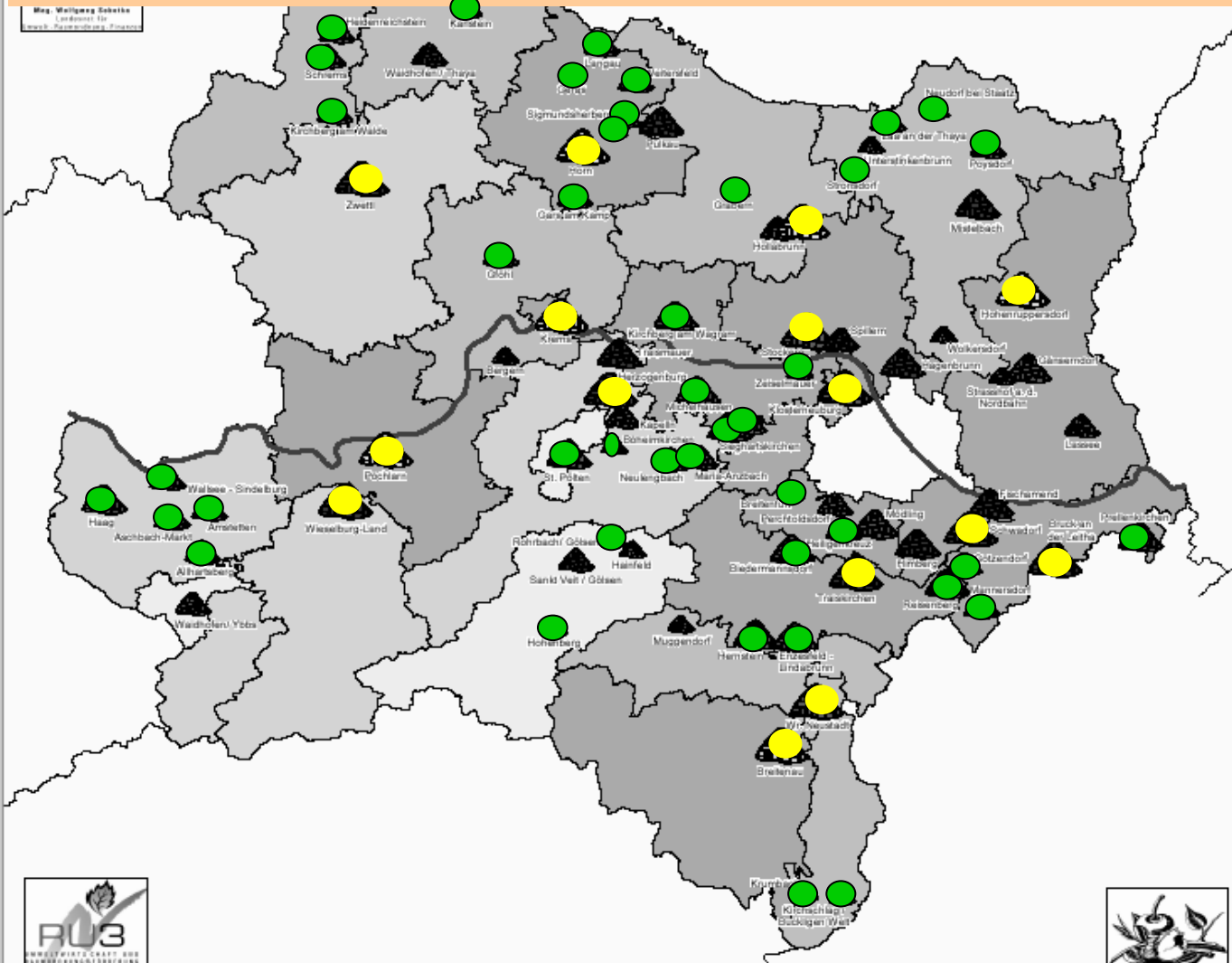
# Composting Plants in Niederösterreich

1.5 Mio Inhabitants → 625,000 households

81 Composting Plants → 18,500 Inh./plant

→ 2,200 t Cap /plant

Biowaste Recycling in Austria



AMT DER NÖ LANDESREGIERUNG

## NÖ Abfallwirtschaftskonzept: BIOABFALL - KOMPOSTANLAGEN IN NIEDERÖSTREICH 2002

### Betreiber

- Kommune
- Landwirt
- Gewerbe
- NÖ Umweltschutzanstalt (NUA)
- Breitenau

### Kapazitäten

- bis 500 Mg(t)/a
- 501 - 2000 Mg(t)/a
- 2001-5000 Mg(t)/a
- mehr als 5001 Mg(t)/a

### Sammelmenen Biogener Abfälle (kg/EW)

- < 39
- 40 - 59
- 60 - 79
- > 80

Anmerkung:  
Neunkirchen betreibt ein eigenes Sammelsystem  
(Trennung Nass, Trockenmüll)



Maßstab 1: 650 000



Datum: 22. Juli 2003  
 Inhalt: Dr. S. Szlovak, Hofbauer - RUB  
 GIS/Kartographie: Reisinger, Abt. Vermessung - NÖGIS  
 Information im WWW: <http://www.noe.gv.at>

Vervielfältigung nur mit Genehmigung des Urhabers © NÖGIS, 2003

Comp  
Dipl.



# The hierarchy of decentral biowaste management = the logical follow-up of the waste hierarchy

## Priority I

As much individual  
composting as possible  
(home composting)



## Priority II

Separate collection  
only  
complimentary



## Priority III

Favouring  
Agricultural  
Composting



# How to define an Agricultural Composting Plant ?

Limitation of organic waste treatment for an Agricultural Composting Plant	
Agricultural land	20 ha
Max. kg N / ha	175 / 350
% N (d.m.)	1.6
Max. tons f.m. / ha	17.5 / 35
Max. tons input	1,000 / 2,000



# Compost Associations in Austria

## ➤ Industrial Composting Plants



300,000 +

15 plants

8 quality seals

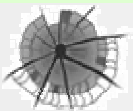
## ➤ Agricultural Composting Plants



276,000 +

281 Comp. pl.

52 Biogas pl.



# QAS of the Agricultural Composting Association

Initial one week and regular courses

2 - 4 Inspections per Year

## ➤ CONTROLLING

- ✓ Obligations of the Austrian Compost Ordinance
- ✓ 1 - 4 Sampling and Analyses
- ✓ Compost Quality & Use
- ✓ Check of Records
  - o Licence, Materials, Quantities, Process Control, Marketing
- ✓ Changes of Management & Process

## ➤ ADVISE

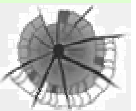
- ✓ Technical Equipment
- ✓ Process Control
- ✓ Quality Management
- ✓ Interpretation of analytical results
- ✓ Declaration and labelling
- ✓ Recommendations for Compost Use (legal limitations & options)



# The Example of Freistadt a District in Upper Austria

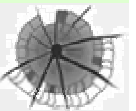
## Basic Data

Total inhabitants:	64,000
Number of municipalities	27
Population structure:	
Freistadt	ca. 8.000 inh.
Pregarten	ca. 5.000 inh.
All other 25 municipalities:	600 - 3.500 inh.



# The important steps and key elements of the concept

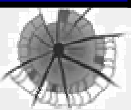
- 1991: foundation of a WASTE MANAGEMENT ASSOCIATION ( 27 municipalities)
- 1992: separate collection of organic waste became mandatory!
- Establishment of 24 Recycling Centres with 40 different waste types. Today they are used by 95% of the population.
- 1991 - 1995: Establishment of the Agricultural Composting system with 20 composting plants



# Collection System with Farmers in Freistadt / OÖ

Information events personally addressed to every household	<ul style="list-style-type: none"> <li>➤ create identification and high participation</li> </ul>
Small buckets per household (7 l, 23 l or 46 l)	<ul style="list-style-type: none"> <li>➤ easy to handle</li> <li>➤ Keeps most of the garden waste in the garden</li> </ul>
Every bucket with name and address	<ul style="list-style-type: none"> <li>➤ No anonymity</li> <li>➤ Direct feedback if impurities are too high on</li> <li>➤ education effect → 99.9 % Purity</li> </ul>
Weekly emptying	<ul style="list-style-type: none"> <li>➤ no nuisance by odours or flies</li> </ul>
Collection is done by farmers	<ul style="list-style-type: none"> <li>➤ Additional Income for farmers</li> <li>➤ Simple collection system → cheaper</li> </ul>
General waste fee per HH No additional fee for biowaste collection	<ul style="list-style-type: none"> <li>➤ 70,- €</li> <li>➤ solidarity principle "we all are responsible for a cost effective waste management in the district"</li> </ul>

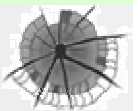
**Cost optimisation is gained by maximum reduction of residual waste for disposal which is the most expensive option**



# Investments ... €

1991 - 2001	total	per ton <u>12 yrs</u>
20 Plants	700,000.— = 35,000.- / plant	13.79
Machinery	448,400.— = 22,400.- / plant	8.84
<b>Total</b>	<b>1,148,000.—</b> <b>= 67,400.- / plant</b>	<b>22.63</b>

2005	total	per ton <u>10 yrs</u>
Enlargement / packaging / screening	700,000.— = 35,000 / plant	8.75





Kompostgemeinschaft Freistadt

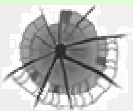


# Don't waste Compost - SELL IT -

## Market prices for compost

Quality	Open / m <sup>3</sup>	per 40 l bags
Kompost	25 mm	----
	15 mm	4.50 €
Compost blend	50 €/m <sup>3</sup>	5 €
Turf soil	40 €/m <sup>3</sup>	----

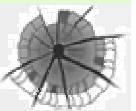
82 % would favour a regional product



# The rural employment argument

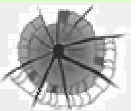
- Creation of an new income for farmers
- Strengthening employment and social stability in a rural district

Total biowaste (03)	7.832 t
kg/Inhabitant * yr	122 kg
<p>650 t biowaste or 2000 households                  create <u>1 full working place</u>                  = 12 working places in total</p>	

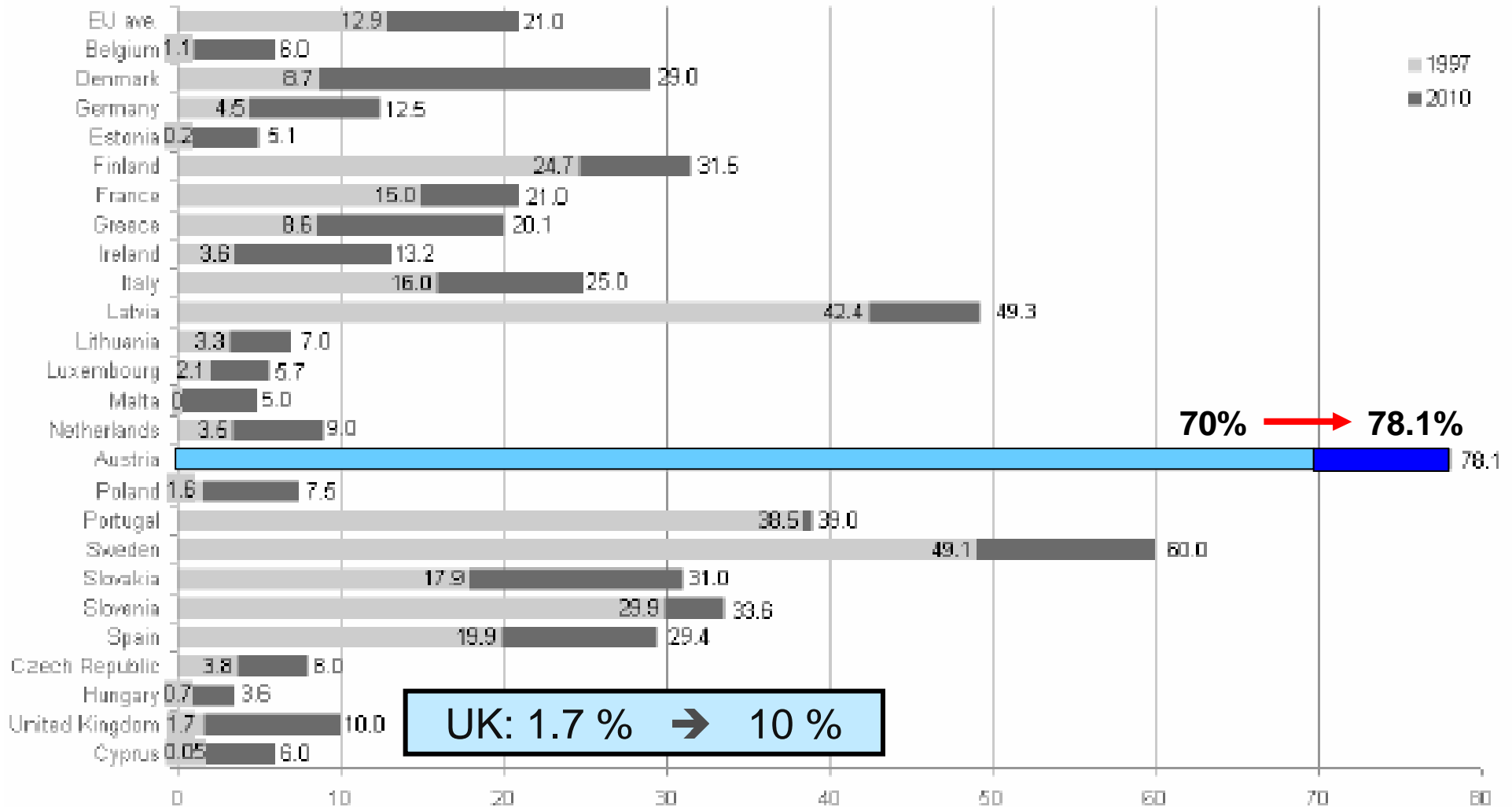


# The Austrian Biowaste / Biogas Legislation

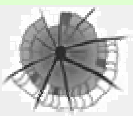
- **Directive 2001/77/EC**  
...Indicative **Renewable Energy Source (RES)** targets for all Member States: EU25 → increase from **12.9% to 21%**.
- **Green Electricity Act, BGBl I, No. 149/2002**  
... new Support system for RES on a uniform federal basis (national injection tariffs and surcharges)
- **Injection Tariff Order, BGBl II No.508/2002**  
... guarantees fixed injection tariffs for a period of 13 years
- **Decree on the Acknowledgement of Biogas Plants (2003)**  
... Certification by the Chancellor of the provinces as „Green Electricity Plant“ depending on the use of defined renewable organic materials
- **State of the Art of Anaerobic Digestion ... in prep. (2005)**  
**Technical Guideline**



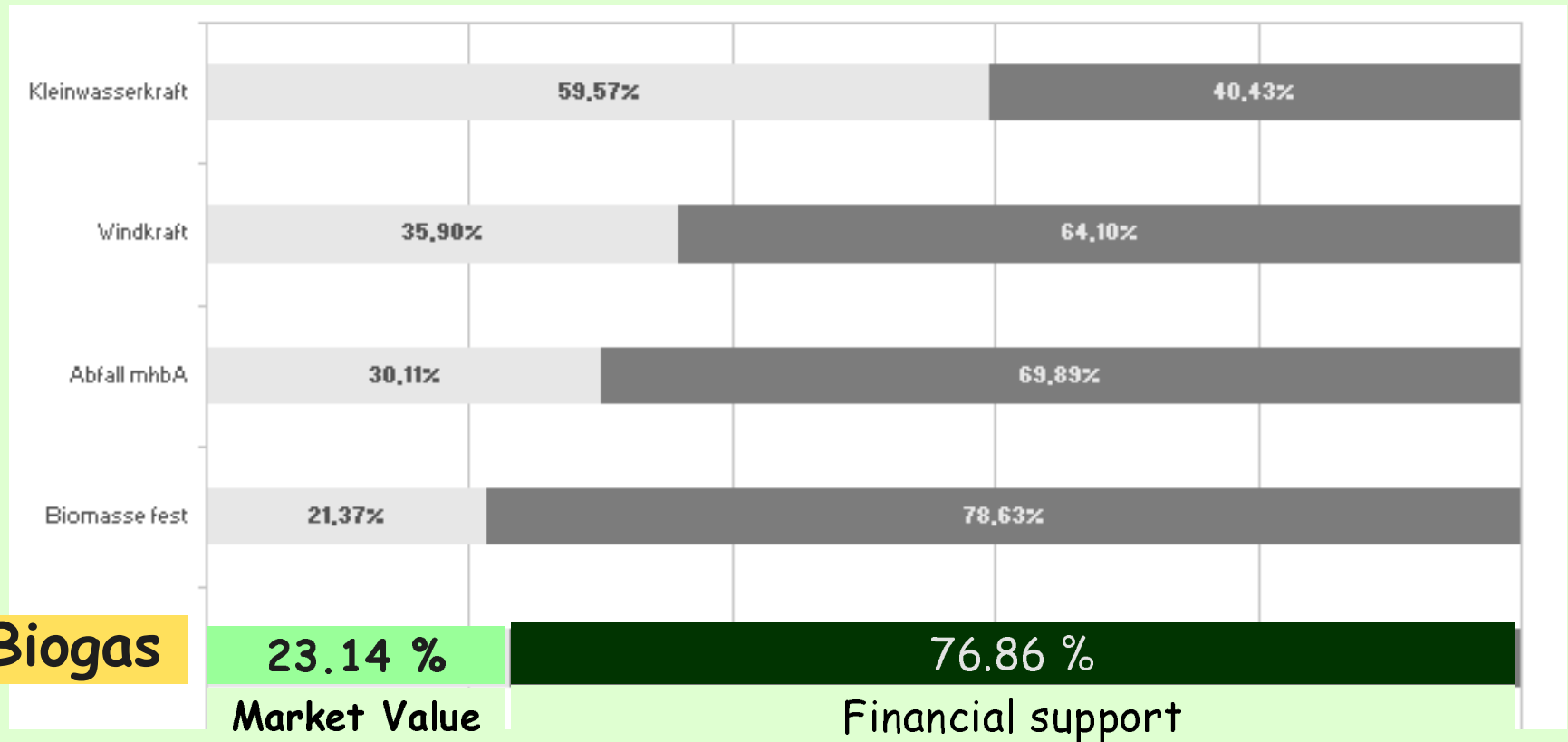
# %age targets for electricity produced from RES under DIR 2001/77/EC ... 1997 → 2010



**UK: 1.7 % → 10 %**



# Financial support for green EL. Production



➤ Green electricity production from biogas costs 3 to 4 times more than from conventional energy sources



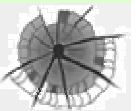
# Injection tariffs for green power (biogas plants)

Capacity	Cent/kWh
< 100 kW	16.50
100 kW - 500 kW	14.50
500 kW - 1 MW	12.50
> 1 MW	10.30
Co-fermentation with waste	minus 25 %

Guaranteed over 13 years

Pre-requisite:

- All permits: until 31 12 2004
- In Operation: from 30 June 2006

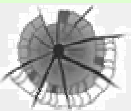


# Capacity of Agric. Biogas Plants is driven by the Guaranteed Injection Tariff

## Injection tariff

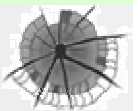
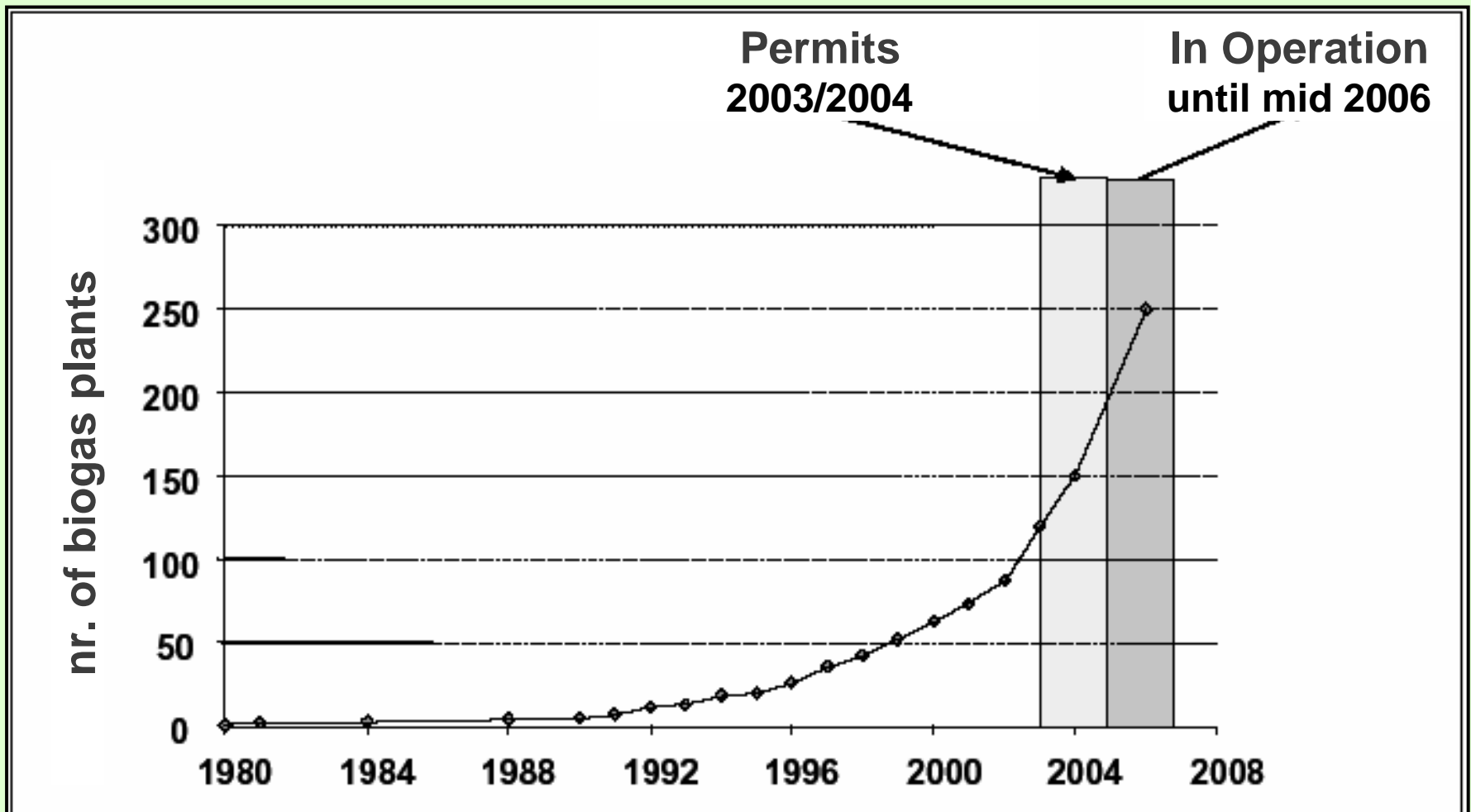
Capacity-el	Cent/kWh	nr. of plants	proportion %
< 100 kW	16.5	76	92,7
100 bis 500 kW	14.5	6	7,3
500 bis 1000 kW	12,5	0	0
> 1000 kW	10,3	0	0

Quelle: AMON, Th. et al. (2001)



# Development of agricultural Biogas Plants

R. RESCH, E. M. PÖTSCH und E. PFUNDTNER (2004)





# Biogas Production in Austria - Contribution of Agricultural Plants -

Source	Nr. of Plants	Mio m <sup>3</sup> Biogas per year	average ( % )
Landfills	62	45 - 100	25%
sewage sludge	134	75 - 100	30%
<b>Agriculture incl. co-fermentation</b>	<b>290</b>	90 -137	<b>39%</b>
Industrial waste (water)	25	9 -14	4%
Biowaste	4	5 - 6	2%
<b>TOTAL</b>	<b>515</b>	<b>224 - 357</b>	<b>100%</b>

Kirchmayr, 2005



# Green Power Capacity Building Agricultural Biogas Potential

Agricultural Biogas Potential	Electricity GWh/yr	Heat GWh/yr	Percentage
Manure	1350	1850	27.5
Agr. energy crops	3550	4850	72.5
<b>Total</b>	<b>4900</b>	<b>6700</b>	<b>100</b>

= 10 % of national demand



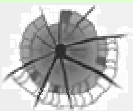
## RES / Biogas Organisations

- **Energy Control LTD (Energie Control GmbH)**
  - ✓ Controlling and implementation of the federal targets and measures under the Green Electricity Act
  - ✓ Reporting to the Minister of Economics and Labour and the Electricity Advisory Board



- **klima:aktiv programme**
  - ✓ Dissemination of knowledge; training for practitioners
  - ✓ Network for: practice - research - technicians - policy makers - authorities
  - ✓ Public relations and awareness raising
  - ✓ Managed by ARGE Kompost & Biogas Österreich

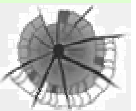
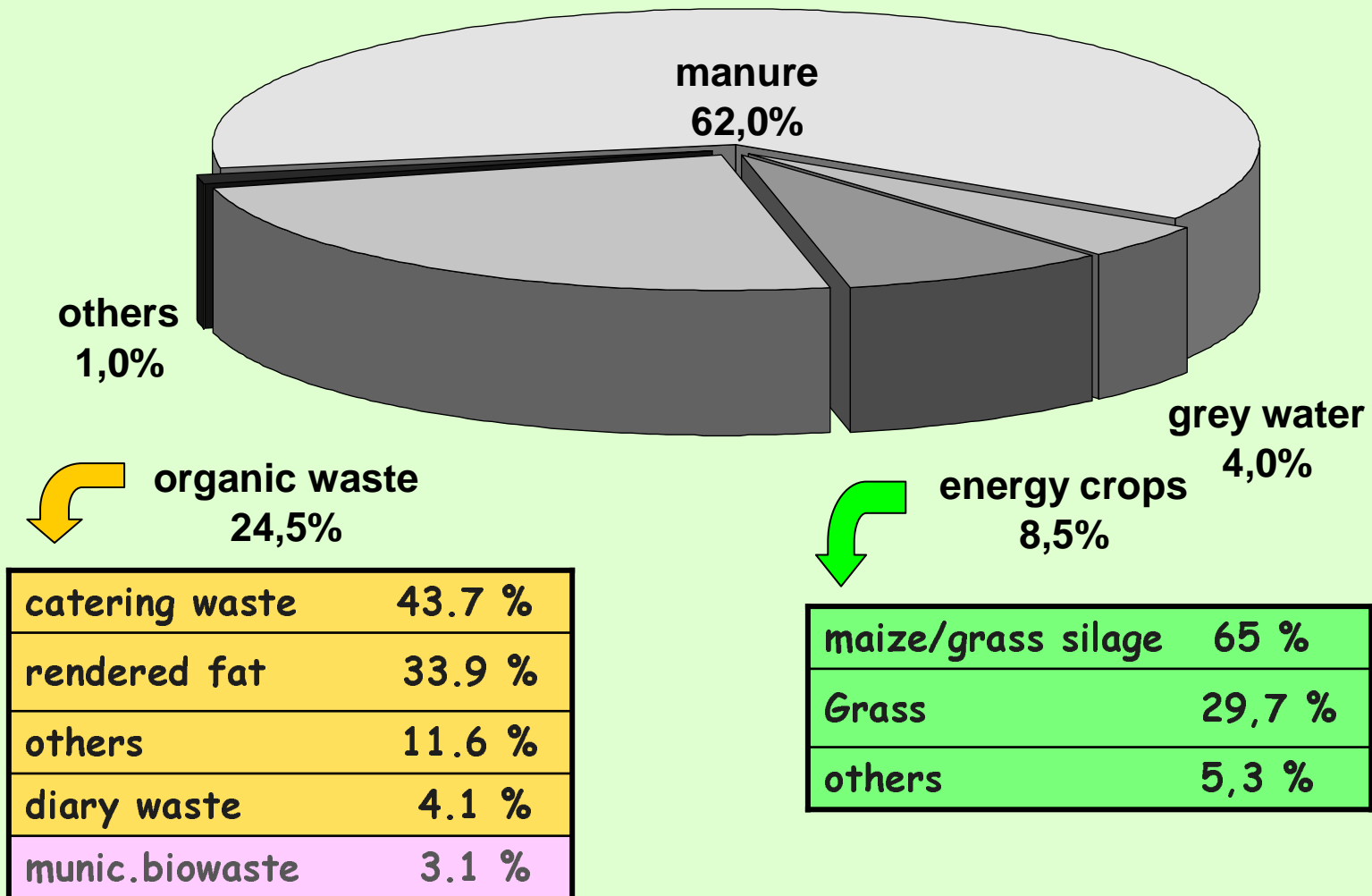
**klima:aktiv**





# Input Materials in Agricultural Biogas Plants

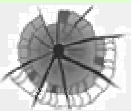
R. RESCH, E. M. PÖTSCH und E. PFUNDTNER (2004)



## General strategy for CATERING WASTE FROM CENTRAL KITCHENS

- Liquious, sludge-like catering waste should be treated in biogas plants
- Following a positive ecological assessment in rural areas catering waste from restaurants can also be treated in composting plants
- Additional requirements for open windrow composting plants when treating separately delivered catering waste.

- immediate mixing and processing after delivery for proper rotting
- coverage of heaps with shredder or compost layer and/or compost fleece until thermic hygienisation is completed
- special attention to expose the entire material to the necessary temperature
- cleaning of traffic areas, black (tipping area pre-rotting) and white zones (maturation and product storage)



# Animal By-Products in Biogas and Composting Plants

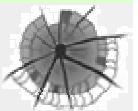
Cat.	A B P	Hygienisation Requirements
1	TSE suspected; pet / zoo animals; SRM; catering waste from international transport	Prohibited in Compost & Biogas Plants
2	Manure, digestive tract content, sperated from digestive tract, milk colostrum	No treatment required in line with national rules
	Carcasses, dead animals or parts not intended for human consumption (screenings from slaughter houses > 6mm) etc.	133 °C, 20 min, 3 bars in saturated steam
3	Materials fit or unfit for human consumption (no signs of transmissible diseases) blood, hides and skins, hooves, etc. Former foodstuff etc.	Plant approved in accordance with Art. 15; 70 °C, 12mm, 1 h
	<b>Catering waste = <u>waste food, used cooking oil, central &amp; household kitchens</u></b>	<b>... in accordance with national law</b>



# Hygienisation of ABP in Biogas and Composting Plants

## - the Austrian Solution -

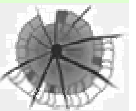
	A B P	Hygienisation Requirements
A	Manure, digestive tract content, milk	No pre-treatment required
	Diary by- products	
	Source separated BIOWASTE „kitchens of household size“	
B	Catering waste, <u>used cooking oil</u> , <u>central kitchens &amp; restaurants</u>	Treatment following national law
C	Other Cat. 3 Material (blood, hides and skins, hooves, former foodstuff etc.)	Treatment following Annex VI chapter II C; 70 °C, 12mm, 1 h
D	Other Cat. 2 Material (screenings from slaughter houses > 6mm)	133 °C, 20 min, 3 bars 50mm, in saturated steam





## Need a More Differentiated Process Control on Hygienisation

- Thermal hygienisation
  - ✓ Temperature Records during thermophilic phase ( $> 55^{\circ}$ )
- Biochemical Stabilisation during maturing of compost
  - ✓ Degradation of microbiological biomass
  - ✓ Withdrawal nutrition basis for pathogens
  - ✓ Microbial equilibrium is shifted in favour of soil organisms
- Further Records (as part of the QM)
  - ✓ watering, turning, aeration, material additions, screening, storing under controlled conditions



## Flexible time temperature regime for the different composting systems

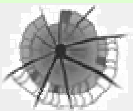
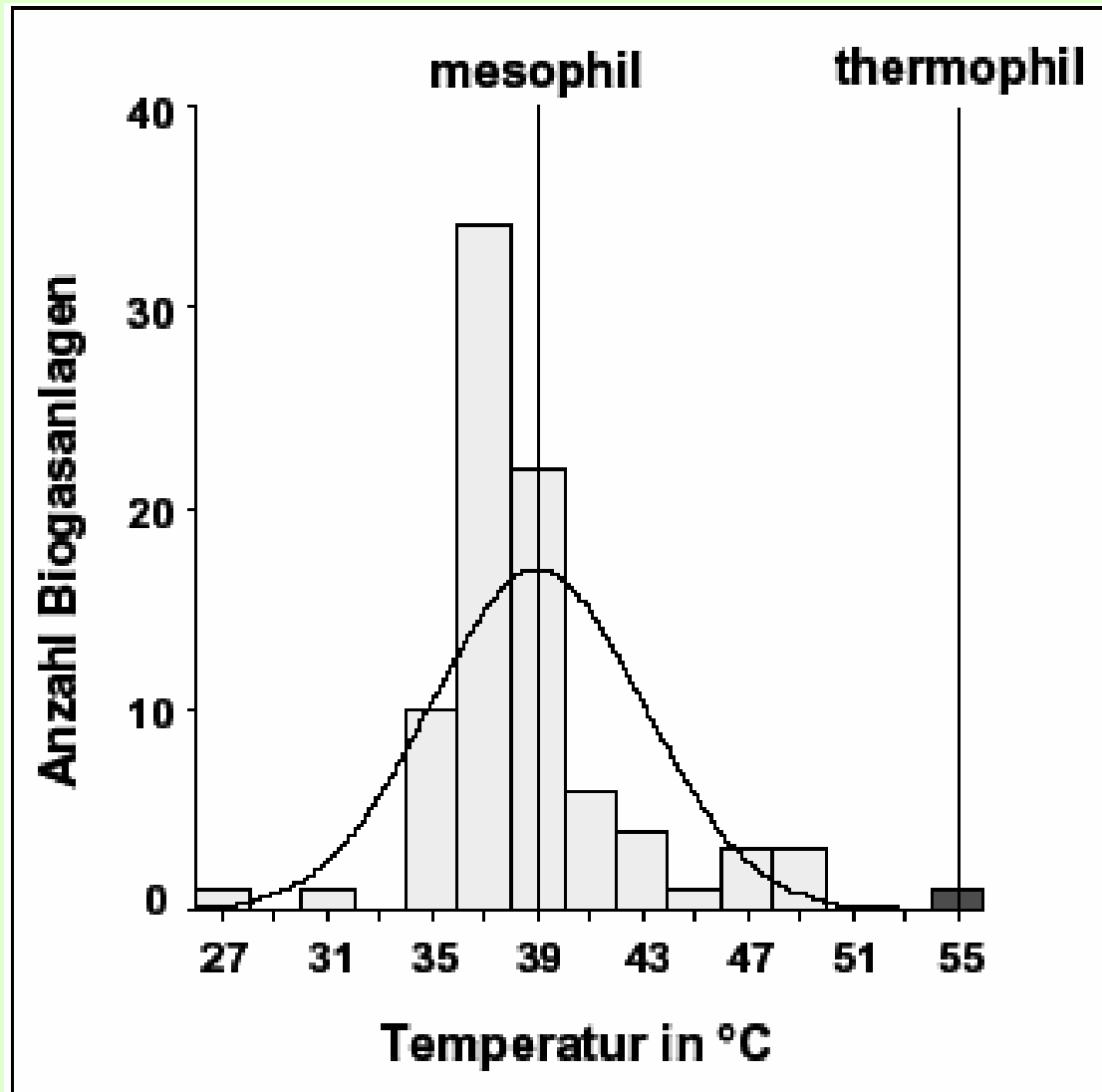
Minimum Temperature	Duration - Records
Open Windrows +/- forced aeration	
55 °C	4 hours + after each of 5 turnings; continuous records
55 °C	Records once on working days + 5 turnings within 10 days
60 °C	3 x 3 days + 2 turnings connected within 2 weeks; Records once on working days
65 °C	2 x 3 days + 2 turning within 2 weeks; Records once on working days
Enclosed and in-vessel systems with forced aeration	
55 °C	4 days within 10 days; continuous records
65 °C	3 days within 10 days; continuous records

# Specific Requirements for Biogas Plants - biowaste from households and central kitchens -

A	<p>Manure, digestive tract content, dairy by- products, household kitchen waste (biowaste)</p> <p>No pre-treatment required - Mesophilic fermentation = o.k.</p>
B	<p>Catering waste, <u>central &amp; kitchens and restaurants</u></p> <p>1) Thermophilic fermentation <math>\geq 55^{\circ}\text{C}</math>, hydraulic retention time = 20 d Minimum retention = 24 h, Particle size <math>\leq 12</math> mm ... OR ...</p> <p>2) Individual approval of sufficient reduction of pathogens ... PLUS ...</p> <ul style="list-style-type: none"> <li>✓ immediate processing of materials</li> <li>✓ pest control measures,</li> <li>✓ cleaning and disinfection of transport containaers,</li> <li>✓ separation of animal keeping &amp; of feeding stuff/beddings storage</li> <li>✓ separate storage of final products ...</li> </ul>



# Fermentation System in Agricultural Biogas Plants



## To conclude .....

- **Mind the structural prioritisation of Biowaste recycling pursuant to the Waste Hierarchy**
  1. Home Composting ... → prevention of 50%
  2. Separate collection ... → full recycling
  3. favouring on-farm composting ... → quality assurance, proximity, social sustainability
  
- **Catering waste from central kitchens**
  - ✓ should preferably treated in biogas plants
  - ✓ But then need a separate collection system (UK ... Also for kitchen waste from households)
  - ✓ But can also be composted if specific frame conditions are observed (coverage, securing 55 °C, black/white areas)
  
- **Agricultural Biogasplants**
  - ✓ Need thorough planning
  - ✓ Need political, administration and long term **FINANCIAL** support to survive under the actual energy market condition (75% of production costs ; 170 to 210 m € estimated for 2007)

## To conclude .....

- **Decentralised Agricultural Composting**
  - ✓ Saves money, transport, energy .....
  - ✓ Increases transparency, identification, rural income and social stability
  - ✓ Is therefore a consistent contribution to a sustainable development
  - ✓ Keeps farmers in the play as active partners of the waste ↔ soil strategy