National experiences: Austria

University of Natural Resources and Applied Life Sciences, Vienna
Department of Sustainable Agricultural Systems

Division of Agricultural Engineering
Dr. Barbara Amon

Austrian Emission Inventory - Methodology

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Department of Sustainable Agricultural Systems

In 2001 the Austrian Federal Environmental Agency assigned the

Division of Agricultural Engineering, Dep. of. Sust. Ag. Systems

and the

Austrian Research Centre Seibersdorf

to update the Austrian Ammonia and Greenhouse Gas Inventory for the years 1989 to 2002.

Aim:

- fulfil requirements on inventory preparation
- integrate Austrian specific data
- reduce uncertainties in emission estimates

Austrian NH_3 Emission Inventory - Methodology

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- EMEP/CORINAIR Atmospheric Emission Inventory Guidebook
  - Manure Management Regarding Nitrogen Compounds
- Simpler methodology
  - 100505 Sheep and goats
  - 100506 Horses, mules and asses
  - 100507/08/09 Laying hens, Broilers, Other poultry
  - 100511 Any other animals
- Detailed methodology
  - 100501 Dairy cows
  - 100502 Other cattle
  - 100503 Fattening pigs
  - 100504 Sows

Austrian Emission Inventory – Detailed methodology

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Austrian specific data on

- N excretion
- TAN content in excreta
- N excretion by manure management system

Austrian Emission Inventory – Open questions

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- Emission factors for straw based systems
- N excretion in organic and conventional systems
- **Activity Data !!!**

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Assessment of manure management systems in Austria and improvement of the emission inventory

Cooperation: Swiss College of Agriculture, Austrian Chamber of Agriculture, Austrian Environment Agency, Federal Research Centre for Agriculture in Alpine Regions, Statistics Austria

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Background

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- Countries must annually report emissions.
- Emission inventories must be transparent, consistent, comparable, complete and accurate.
- It is therefore necessary to estimate emissions by applying models that link activity data to emission factors to calculate net emissions. Those models should offer the possibility of showing the effect of mitigation measures.
- The knowledge on activity data is still insufficient in many countries.

Aims of the research project

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- Survey farm management techniques and practices
- Detailed overview of Austrian animal husbandry
- Improvement of the Austrian emission inventory

Farm survey and questionnaire

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- Questionnaire assesses relevant parameters in all stages of animal husbandry systems:
  - housing and exercise yard
  - grazing
  - waste and washing water
  - manure storage
  - manure application
  - animal feeding
  - mineral fertiliser application.
- Adaptation of the Swiss DYNAMO questionnaire to Austrian conditions.

Distribution of housing systems for cattle

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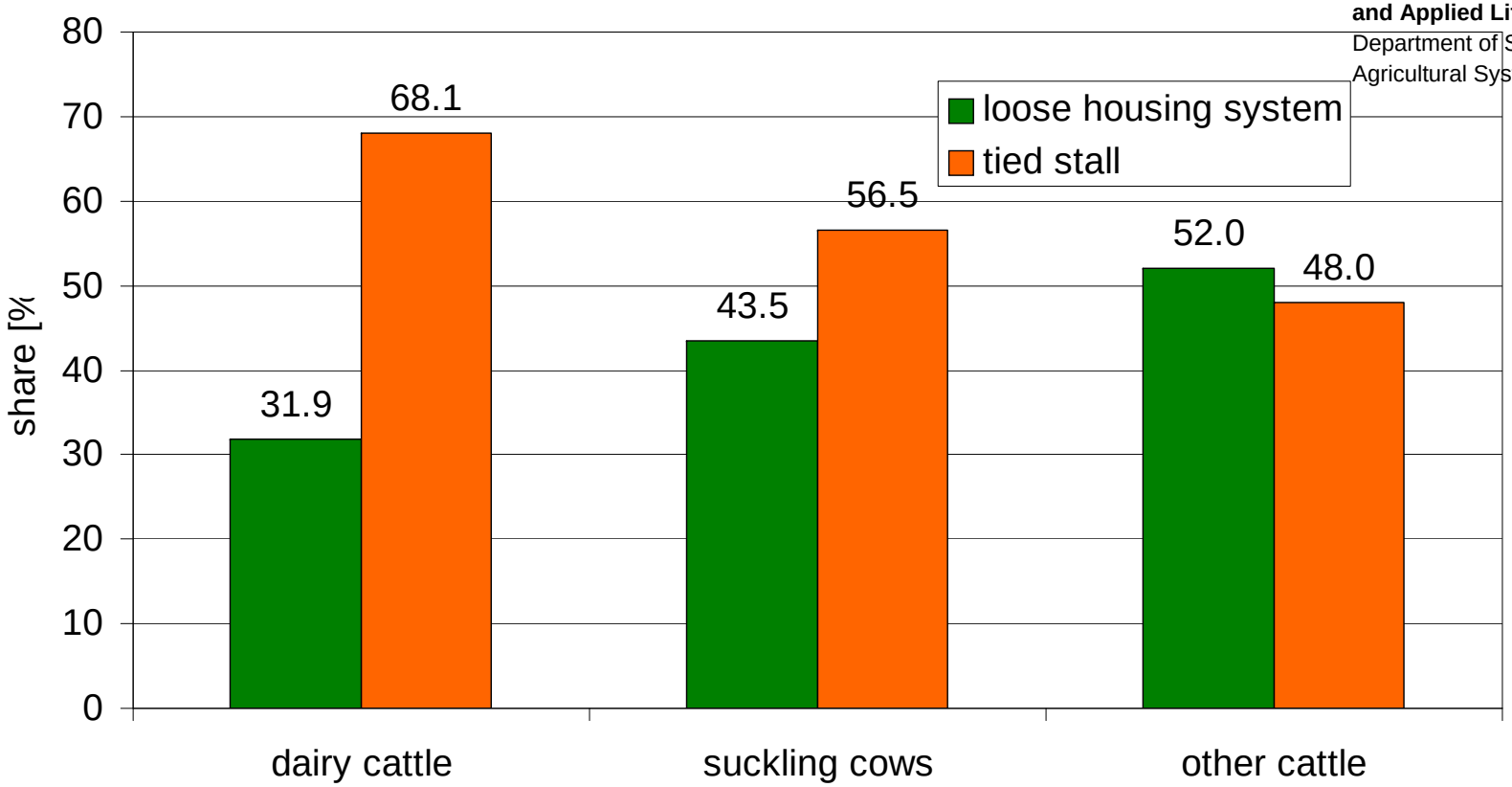

Distribution of manure systems for cattle

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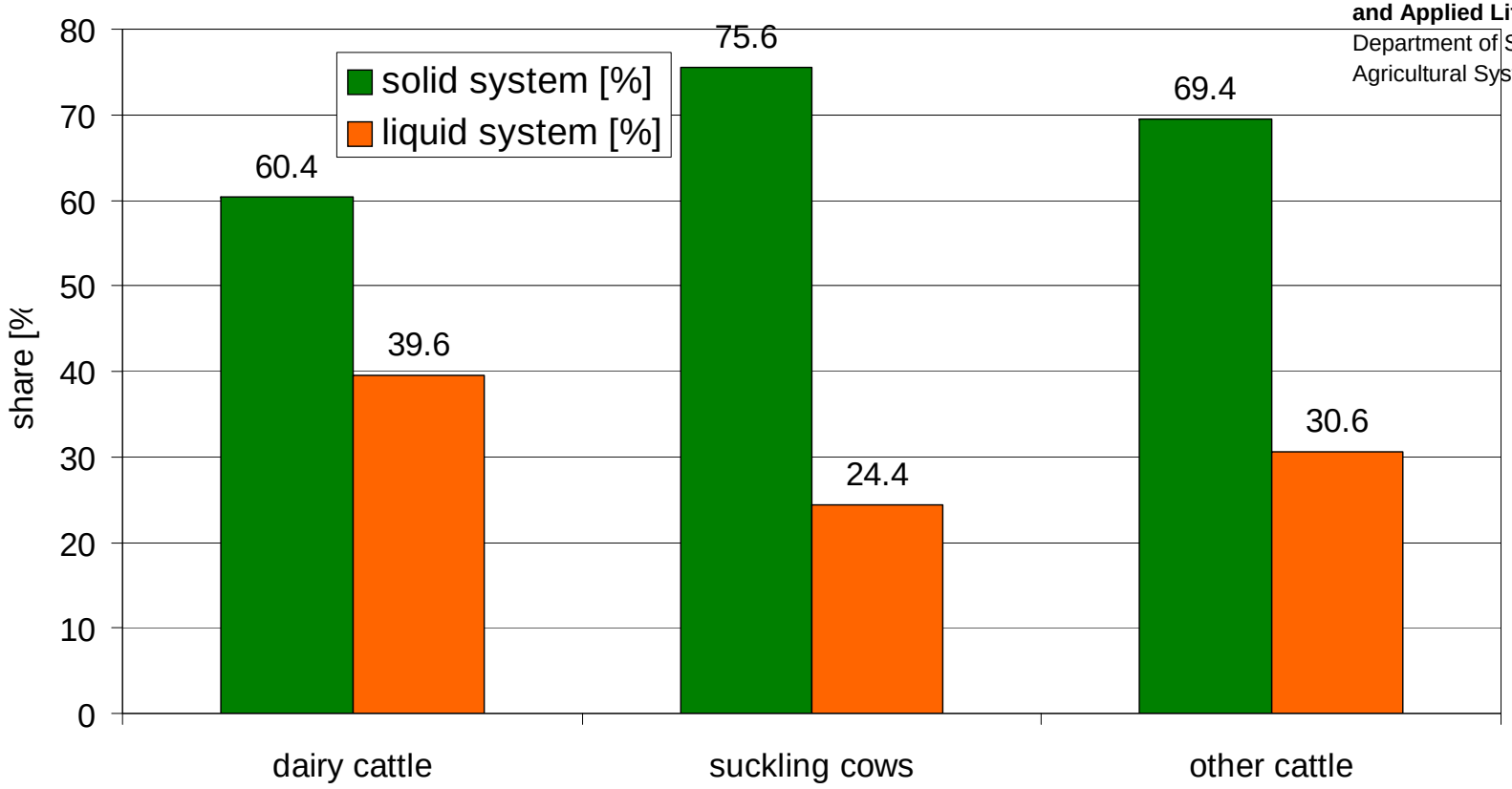

Use of exercise yards in cattle housing

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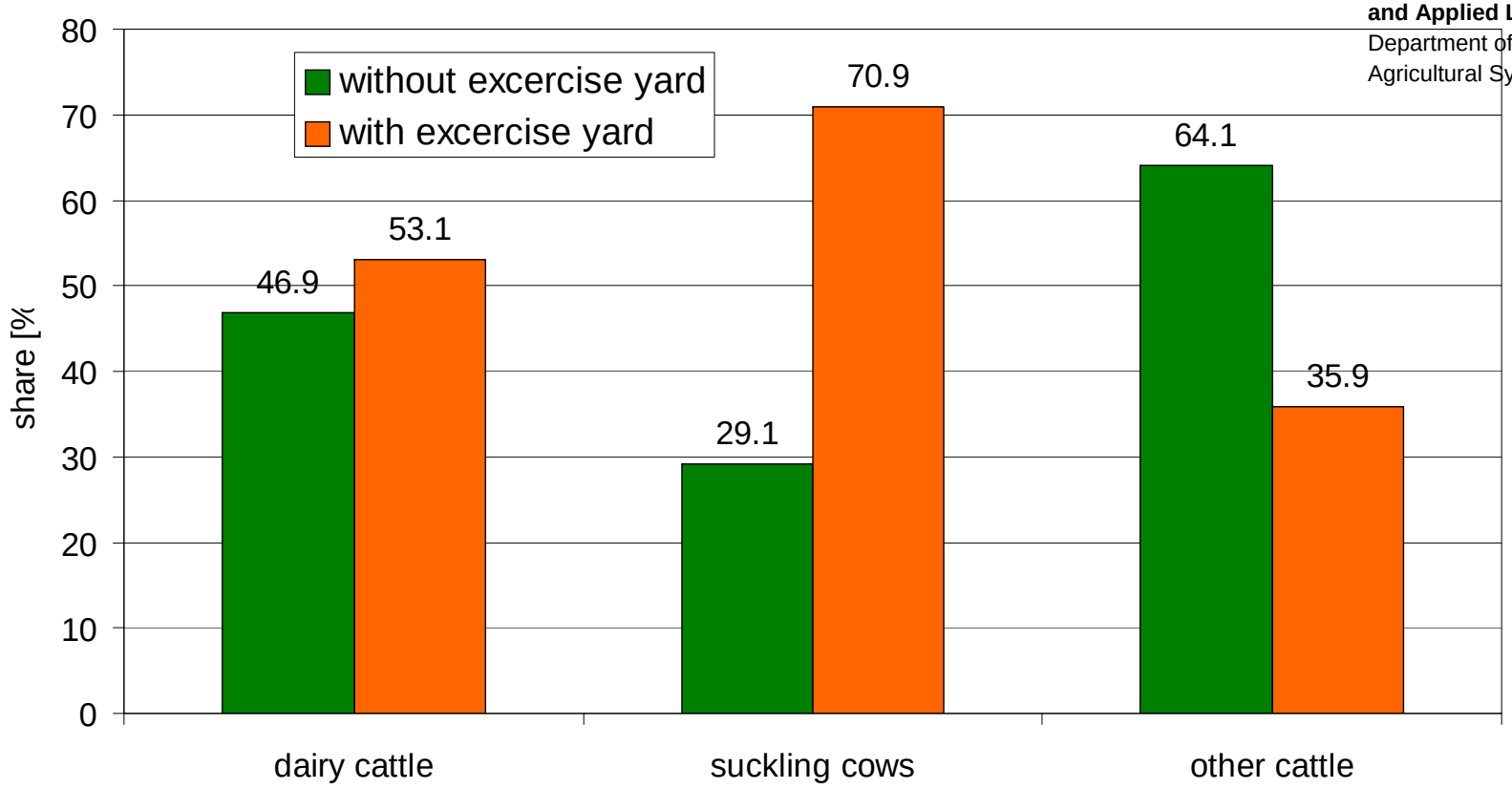

Cattle grazing

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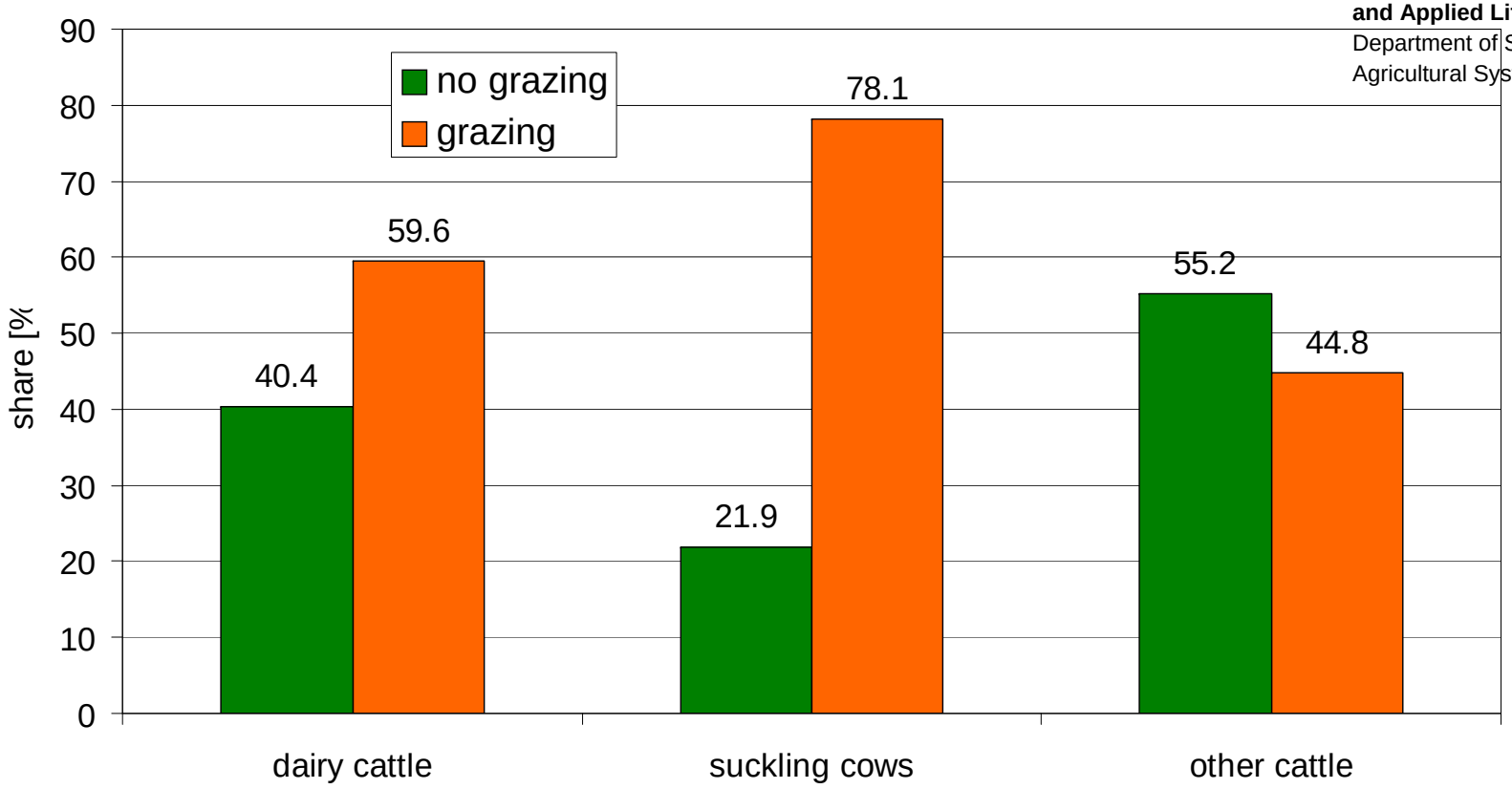

Distribution of manure systems for pigs

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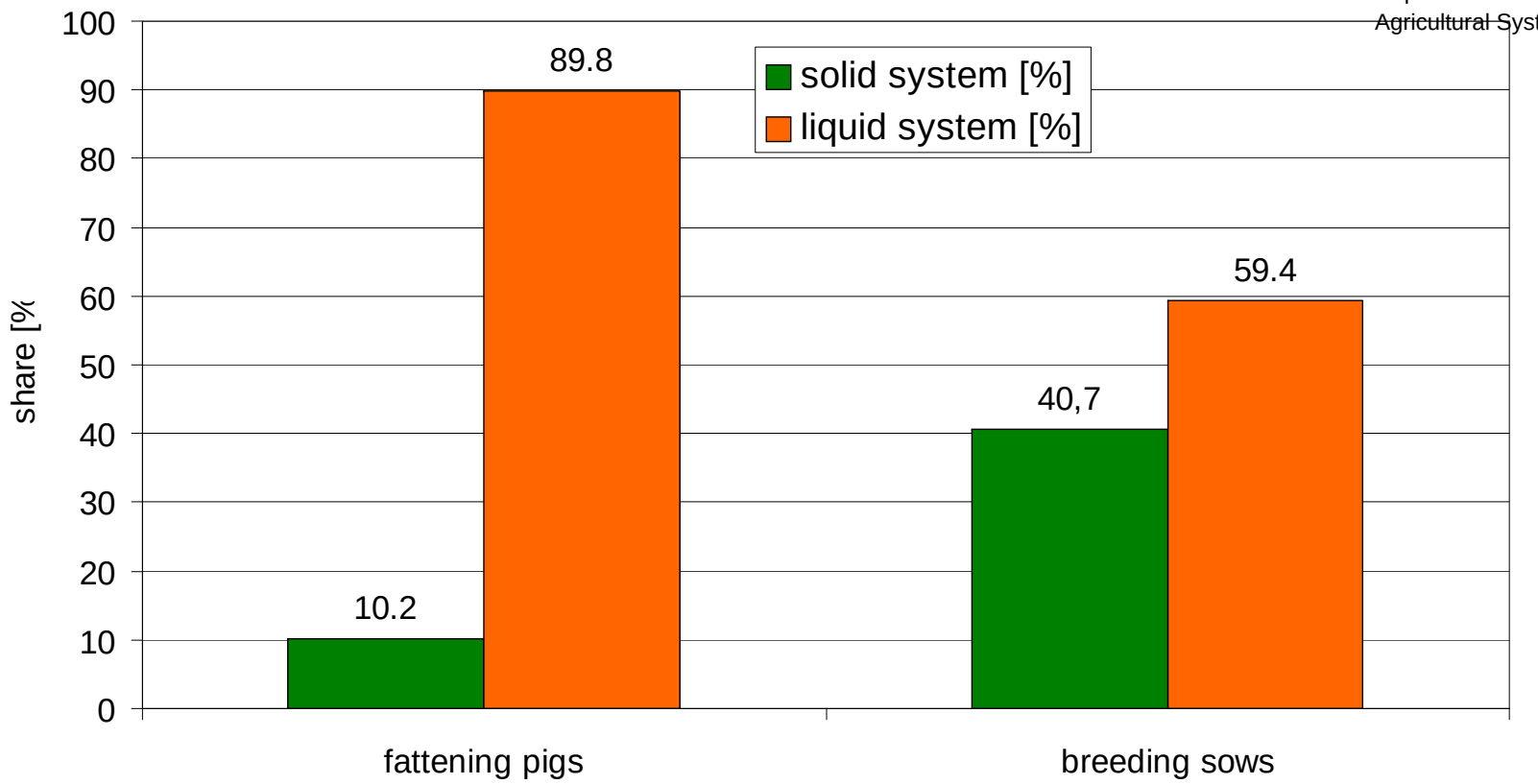

Slurry store covers

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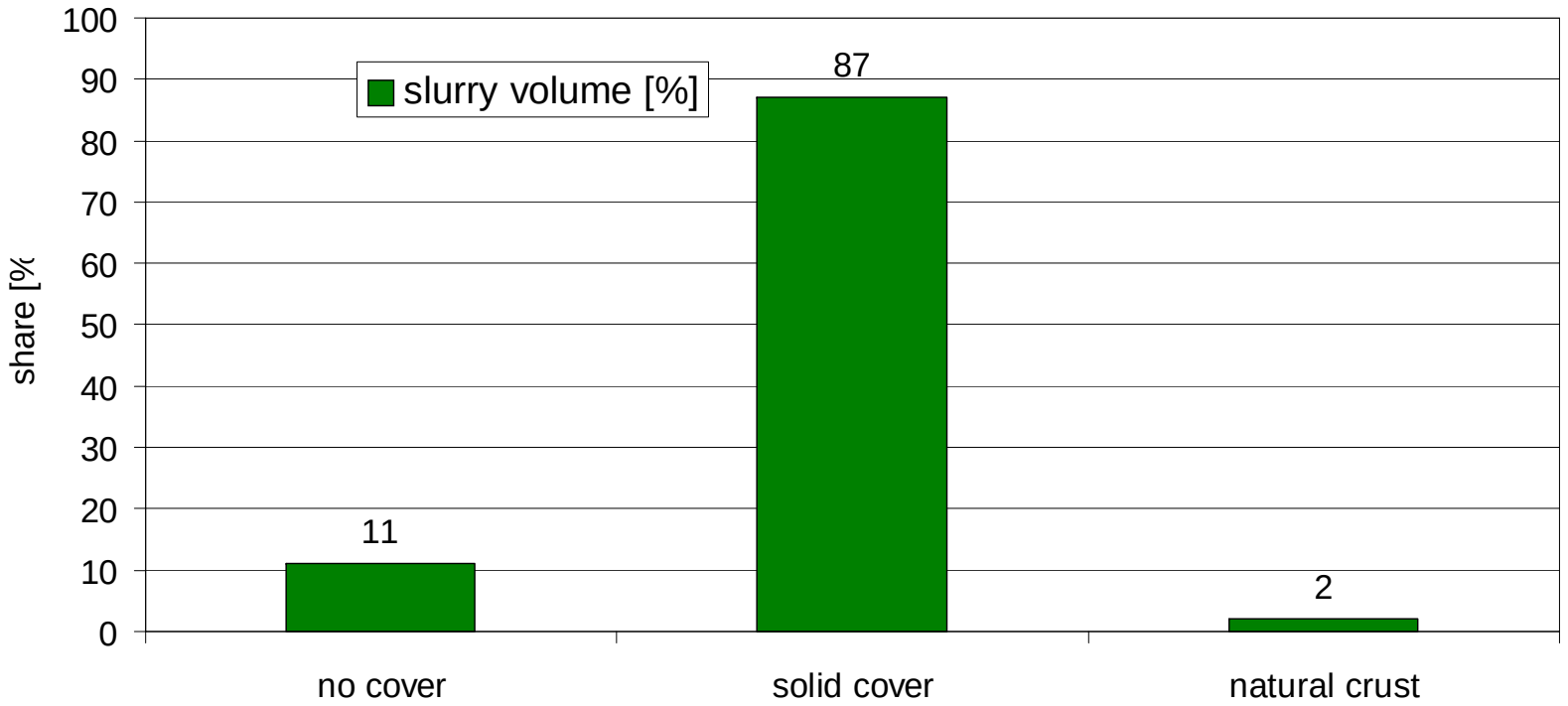

Slurry application

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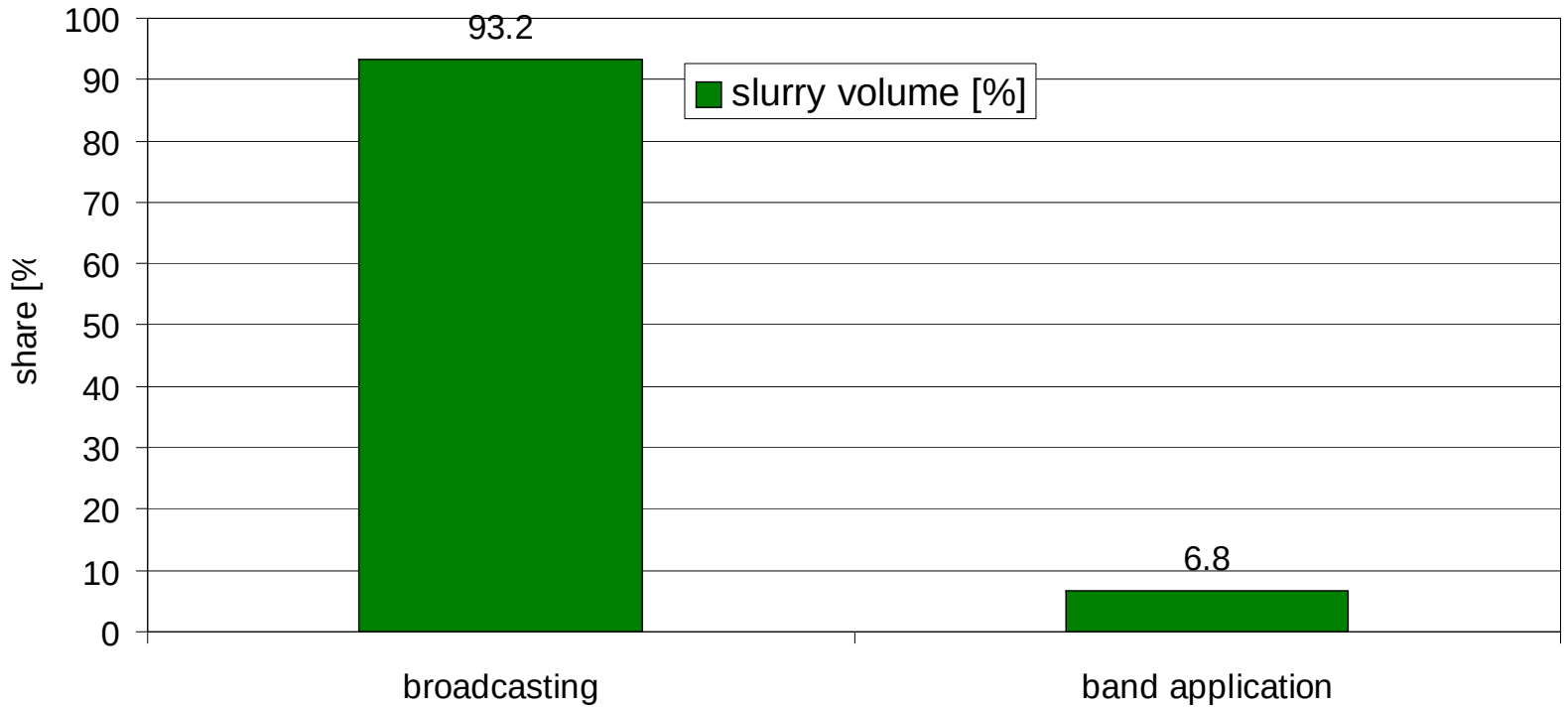

Contribution of manure management stages to total NH_3-N-Emissions

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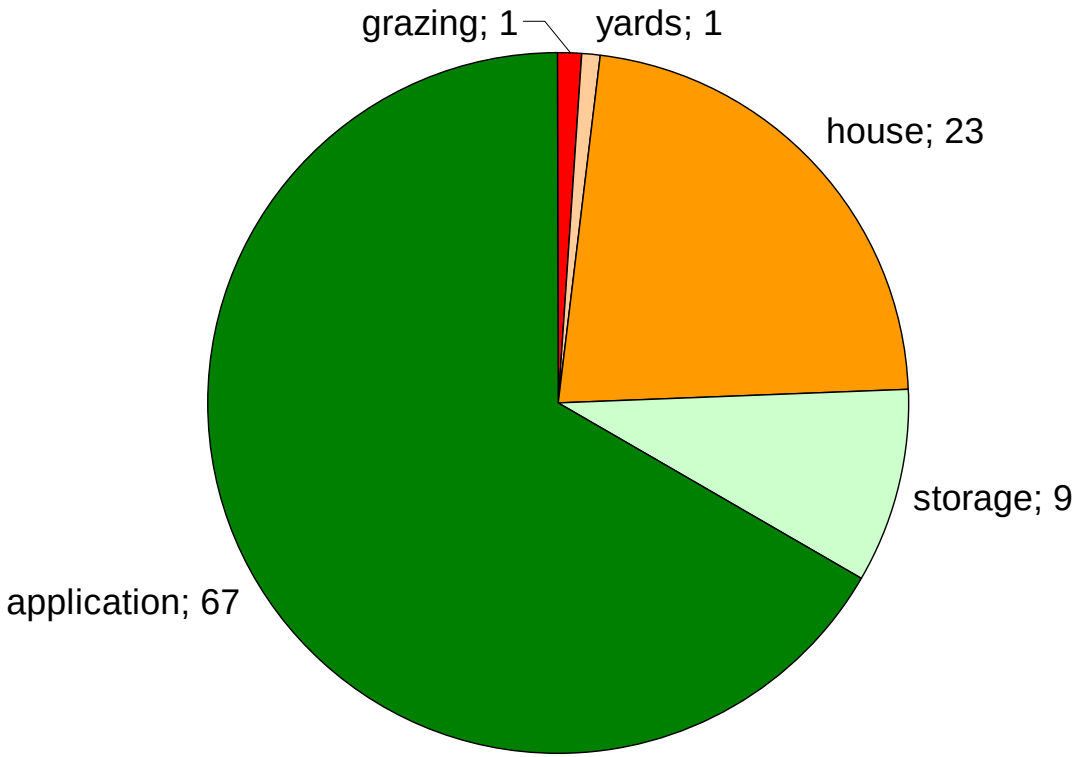

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Austrian Ammonia Inventory – next steps

Austrian ammonia emission inventory – next stepy

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- Integration of new manure management system distribution data into the ammonia inventory
- Methodology: CORINAIR 2006
- Still no N flow approach
- Recalculate time series from 1990 to 2007
- Assess uncertainties

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Universität für Bodenkultur Wien
University of Applied Life Sciences and Natural Resources

Department of Sustainable Agricultural Systems
Division of Agricultural Engineering

Peter Jordan-Strasse 82, A-1190 Wien
Tel.: +43 1 47654-3502, Fax: +43 1 47654-3527
barbara.amon@boku.ac.at , www.boku.ac.at

Austrian Emission Inventory – Detailed methodology

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Austrian specific data on

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Austrian Emission Inventory – Manure managemant system distribution

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nable

Livestock category	*Liquid/Slurry [%]*	*Solid Stor-age [%]*	*Grazing [%]*
dairy cattle summer	16.7	62.0	21.3
dairy cattle winter	21.2	78.8	---
suckling cows summer	16.7	62.0	21.3
suckling cows winter	21.2	78.8	---
cattle 1 –2 years summer	7.7	39.9	52.4
cattle 1 –2 years winter	16.2	83.8	---
cattle < 1 year	28.75	71.25	---
non dairy cattle > 2 years	48.6	51.4	---
breeding sows	70	30	---
fattening pigs	71.9	28.1	---
nursery and growing pigs	81.38	18.62	---

Konrad, S. (1995): Die Rinder-, Schweine- und Legehennenhaltung in Österreich aus ethologischer Sicht, WUV Universitätsverlag, Wien

Austrian Emission Inventory – Emission factors - housing

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Manure management system	*Emission factor [kg NH_3 (kg N excreted)$^{-1}$]*
Dairy cattle, tied systems, slurry	0.040[1]
Dairy cattle, tied systems, farmyard manure	0.039[1]
Other cattle, loose houses, slurry	0.118[1]
Other cattle, loose houses, farmyard manure	0.118[1]
Fattening pigs, slurry	0.15[2]
Fattening pigs, farmyard manure	15 % of total N + 30 % of the remaining TAN[2]
Sows plus litter, slurry	0.167[1]
Sows plus litter, farmyard manure	0.167[1]

[1]…DÖHLER ET AL., 2001
[2]…EIDGENÖSSISCHE FORSCHUNGSANSTALT, 1997

Austrian Emission Inventory – Emission factors – storage

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Manure storage system	*Emission factor[1] [kg NH_3 (kg TAN)$^{-1}$]*
Cattle, slurry	0.15
Cattle, farmyard manure	0.30
Pigs, slurry	0.12
Pigs, farmyard manure	0.30

[1]…EIDGENÖSSISCHE FORSCHUNGSANSTALT, 1997

Austrian Emission Inventory – Emission factors – manure application

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Manure storage system	*Emission factor*[1] *[% of TAN]*
Cattle, slurry, application to grassland	60
Cattle, farmyard manure	90
Pigs, slurry, application to arable land	25
Pigs, farmyard manure	90

[1]…DÖHLER ET AL. 2001