European Union Network for the Implementation and Enforcement of Environmental Law

Sharing good practice for tackling nitrate pollution from farms & farmsteads 2

Does one measure fit all?

Date of report: 24 November 2016

Report number: 2016/11

Introduction to IMPEL

The European Union Network for the Implementation and Enforcement of Environmental Law (IMPEL) is an international non-profit association of the environmental authorities of the EU Member States, acceding and candidate countries of the European Union and EEA countries. The association is registered in Belgium and its legal seat is in Brussels, Belgium.

IMPEL was set up in 1992 as an informal Network of European regulators and authorities concerned with the implementation and enforcement of environmental law. The Network's objective is to create the necessary impetus in the European Community to make progress on ensuring a more effective application of environmental legislation. The core of the IMPEL activities concerns awareness raising, capacity building and exchange of information and experiences on implementation, enforcement and international enforcement collaboration as well as promoting and supporting the practicability and enforceability of European environmental legislation.

During the previous years IMPEL has developed into a considerable, widely known organisation, being mentioned in a number of EU legislative and policy documents, e.g. the 7th Environment Action Programme and the Recommendation on Minimum Criteria for Environmental Inspections.

The expertise and experience of the participants within IMPEL make the network uniquely qualified to work on both technical and regulatory aspects of EU environmental legislation.

Information on the IMPEL Network is also available through its website at: www.impel.eu

Title of the report: Sharing good practice for tackling nitrate pollution from farms & farmsteads 2 – Does one measure fit all?	**Number report:** 2016/11
Project Manager/Authors: Anette Dodensig Pedersen (Danish Environmental Protection Agency) Wibke Christel (Danish Environmental Protection Agency) Christian Schilling (Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management)	**Report adopted at IMPEL General Assembly Meeting**: Written procedure, March 2017 **Total number of pages: 10** Report: 10 Annex: power point presentations

Executive Summary

The Member States of the EU show a large variation in agricultural structure and practices, environmental conditions, institutional organisation and legal traditions. This diversity is reflected in the measures taken and their control within the framework of the relevant directives. When sharing experiences in IMPEL it is therefore important to cover a variety of situations.

A field visit took place in Austria in October 2016. The main aim of the visit was to explore how measures at different levels (national and regional) are used to tackle diffuse pollution as well as experience regional differences, as the Austrian landscape, and hence agricultural structure, varies considerably between different regions.

The attendants appreciated the opportunities offered by a field visit as a method of learning and sharing experiences in comparison to a written document. But in future projects it would be interesting to explore other ways of communicating and sharing good practice. Furthermore, discussions within this project have led to a new project proposal, which - if accommodated - should result in a visual guidance tool (video) on 2-3 different approaches to control manure storage capacity.

TABLE OF CONTENTS

1. Introduction

This project was a follow up on previous projects regarding nitrates diffuse pollution from agriculture running from 2013. The legislative drivers are the Water Framework Directive and Nitrates Directive. Information about the previous projects can be found at the IMPEL website:

http://www.impel.eu/projects/good-practice-for-tackling-nitrate-pollution-from-farms-and-farmsteads/

2. Background

The European Commission has highlighted nitrate pollution from agriculture as a crucial area for IMPEL to work on due to poor levels of compliance with the Water Framework Directive and the Nitrates Directive.

According to the project terms of references the intended outcome of the 2016 project was to expand the good practice document from the 2014 project with additional examples of how to control balanced fertilization by calculations simpler than the Danish method of fertilizer accounting already described in the document. However, when drafting the project's terms of references, the project team had not yet made arrangements with a host. After arranging with the Austrian host (Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management) the focus of the project was changed.

The new focus of the project, "Does one measure fit all", was inspired by the discussions of previous years' projects where attendants pointed out that, what is good or best practice in one country or region is not necessarily good or best practice elsewhere. The Member States of the EU show a large variation in agricultural structure and practices, environmental conditions, institutional organisation and legal traditions. This diversity is reflected in the measures taken and their control within the framework of the relevant directives. When sharing experiences in IMPEL it is therefore important to cover a variety of situations.

3. Project visit in Austria

A field visit took place in Austria 3rd – 5th October 2016. The visit was arranged by the project team of the Danish Environmental Protection Agency in cooperation with contacts at the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW).

The main aim of the visit was to explore - with Austria as a case study - how measures at different levels (national and regional) are used to tackle diffuse pollution as well as experience regional differences, as the Austrian landscape, and hence agricultural structure, varies considerably between different regions. Among the covered topics were: General instruments, governmental and regional initiatives as well as practical examples in different parts of Austria to tackle nutrient pollution to surface and ground water.

The field visit commenced at the federal ministry (BMLFUW) in Vienna with introductions to IMPEL in general, the programme of the excursions on day 2 and 3 and to Austrian agriculture, water protection, cross compliance administration etc. During the following two days there were excursions with visits to several places with presentations, discussions and outdoor site visits. The first day of excursions took place in the region of Upper Austria (Oberösterreich) and the second day in the region of Styria (Steiermark).

The attendants of the field visit were a mix of policy makers and inspectors from Austria, Belgium (Flanders), Cyprus, Denmark, Italy, Malta, Poland, Romania, Slovenia, Sweden and one policy officer from DG Environment, the European Commission. The total number of attendants was 20 people.

4. Activities of the field visit in Austria

Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW), Vienna

At the federal ministry a series of presentations were given, introducing the project, IMPEL in general, the programme of the excursions on day 2 and 3 and Austrian agriculture, water protection, cross compliance administration etc.

The following presentations were given:

- Introduction to the project and to IMPEL in general
- Structure of Agriculture in Austria
- Water Quality in Austria and measures for water protection with focus on nutrient emissions to surface waters and groundwater
- Water protection in the Austrian rural development programme 2015-2020
- Rural Development program 2014-2020 and agrienvironmental program ÖPUL
- Cross Compliance (controls)
- Activities by regional governments – Lower Austria (NÖ LRG)
- Groundwater protection in lower Austria
- Research activities (HBLFA Raumberg-Gumpenstein)

The presentations can be seen in the annex.

Federal Agency for Water Management – Institute for Land and Water Management Research (IKT)

The agency is an institution associated to the federal ministry (BMLFUW). It is a research institution for sustainable surface water and groundwater protection and has a strong collaboration with University of Technology Vienna (Doctoral programme).

A presentation was given about the role of and activities of the Institute for Land and Water Management. Afterwards there was a visit to a hydrological open air laboratory.

The presentation can be seen in annex.

St. Florian, College of Agriculture (HLBLA)

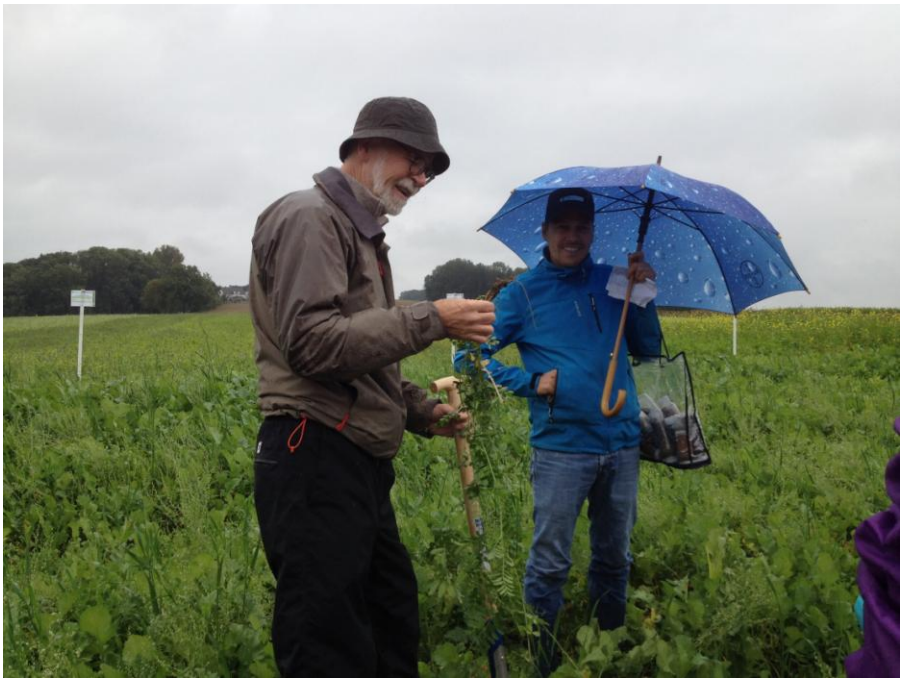
The college is associated to the federal ministry (BMLFUW).

Presentations were given about:

- Activities of Regional Government of Upper Austria – Water Resources Management
- Activities of Chamber of Agriculture of Upper Austria – regional activities of the Boden.Wasser.Schutz.Beratung

After presentations and discussions there were a visit to experimental plots for catch crops at the college and a visit to a local farm participating in the agri-environmental programme ÖPUL.

The presentations can be seen in the annex.



Visit to experimental plots for catch crops at St. Florian, College of Agriculture (HLBLA)

Visit to a local farm participating in the agri-environmental programme ÖPUL

Regional office of Maschinenring Steiermark

Meeting and discussion with people from the regional government of Styria (The Water Management Unit), Maschinenring Steiermark and Joanneum Research. Afterwards there was a visit to a lysimeter station, operated by Joanneum Research, and another visit to a shared slurry lagoon at Ratzenau with showcase sampling of manure by Maschinenring (service provision to farmers).

Presentations were given about:

- The regional groundwater protection program of the Regional Government of Styria
- The project “Nutrient Management” by Maschinenring Steiermark
- Research on influence of agricultural practices on nitrate leaching to groundwater

The presentations can be seen in the annex.

Visit to a shared slurry lagoon

5. Outcome and conclusions

As mentioned previously the focus of this project was partially changed from aiming at expanding the good practice document to experiencing regional differences in tackling nitrates diffuse pollution.

One major conclusion of the project is that probably other methods of sharing good practice would be more efficient than the good practice document. Large documents with much reading tend to be forgotten after being published, and the language barrier can be difficult to overcome when writing the document. In general the attendants appreciated the opportunities offered by a field visit as a method of learning and sharing experiences in comparison to a written document.

In future projects it would be interesting to explore other ways of communicating and sharing good practice. This has also been debated within the IMPEL Water and Land Expert Team after the field visit in Austria.

Another conclusion from this project is that in a future project it would be relevant to focus more narrowly on one basic and pivotal measure relevant to all member states, but taking into consideration the regional differences when giving examples of good practice for the control.

Controlling manure storage capacity was highlighted as such a measure. Having sufficient capacity for storing manure is a simple way to limit the risk of manure being spread on fields at unfavourable times of the year

when crops do not uptake much Nitrogen, thus resulting in nitrate leaching. At the IMPEL Water Conference in Florence 5-6 October manure storage capacity was pointed out by Claire McCamphill from DG Environment as a very important issue in protecting the aquatic environment from nitrate leaching.

The conclusions from this project has led to submitting a project proposal to the IMPEL General Assembly, as part of a proposal for continuing the SWETE project (http://www.impel.eu/projects/safeguarding-the-water-environment-throughout-europe-swete/).

If accommodated, the outcome of this part of the SWETE project should be a visual guidance tool (video) on 2-3 different approaches to control manure storage capacity.

Annex: Presentations from the field visit in Austria

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of Environmental Law

“Does one measure fit all?”

Minimizing diffuse nitrate pollution from farms in regions, varying in landscape and agricultural structure


Welcome to Austria!
Welcome to Vienna!

Vienna is not Austria!

”tour de table”

1) What is your name?
2) Which country are you from?
3) What do you work with in your ”daily life”?
4) **Why did you sign up for this IMPEL excursion?**
5) **What are your expectations for these 3 days?**

”Does one measure fit all?”

How to minimize diffuse nitrate pollution from farms?

- **in different regions, varying in:**
  - landscape
  - soil types
  - climate
  - …
- **Varying in terms of agricultural structure:**
  - size
  - number of employees
  - annual turnover
  - Farming practice (organic vs. conventional)
  - **…**

AIM OF THIS STUDY VISIT

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Introduction to

- Structure of Agriculture in Austria
- Water resources management and pressures from agricultural activity
- Measures at different levels to tackle diffuse pollution
  - National level
  - Regional level
  - Science and Innovation

- 1,5 days excursion to spot on regional differences and activities
  - Trip to Upper Austria – 4th October
  - Trip to Styria – 5th October

BMLFUW : STRUCTURE

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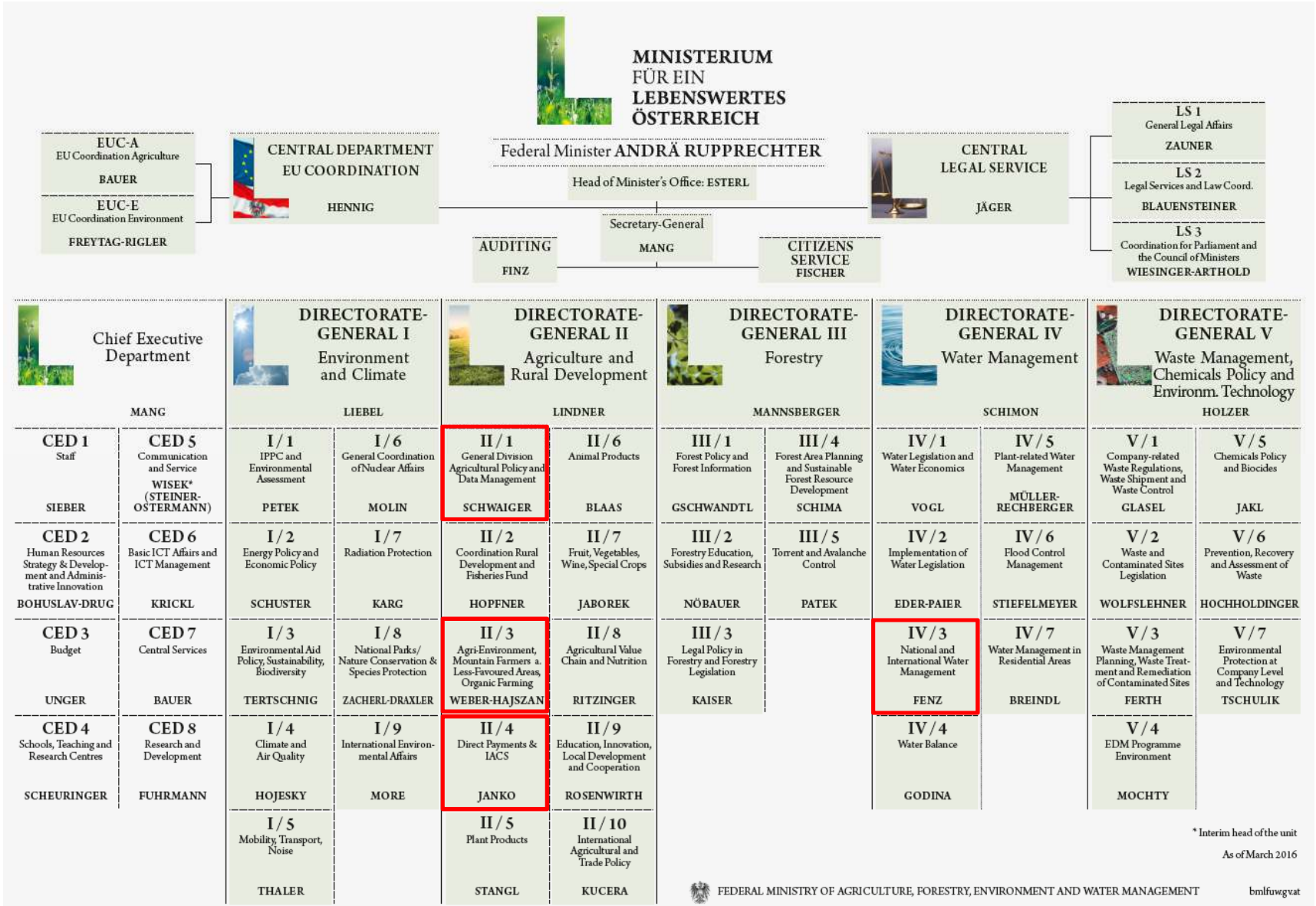

INSTITUTIONS ALLOCATED TO BMLFUW

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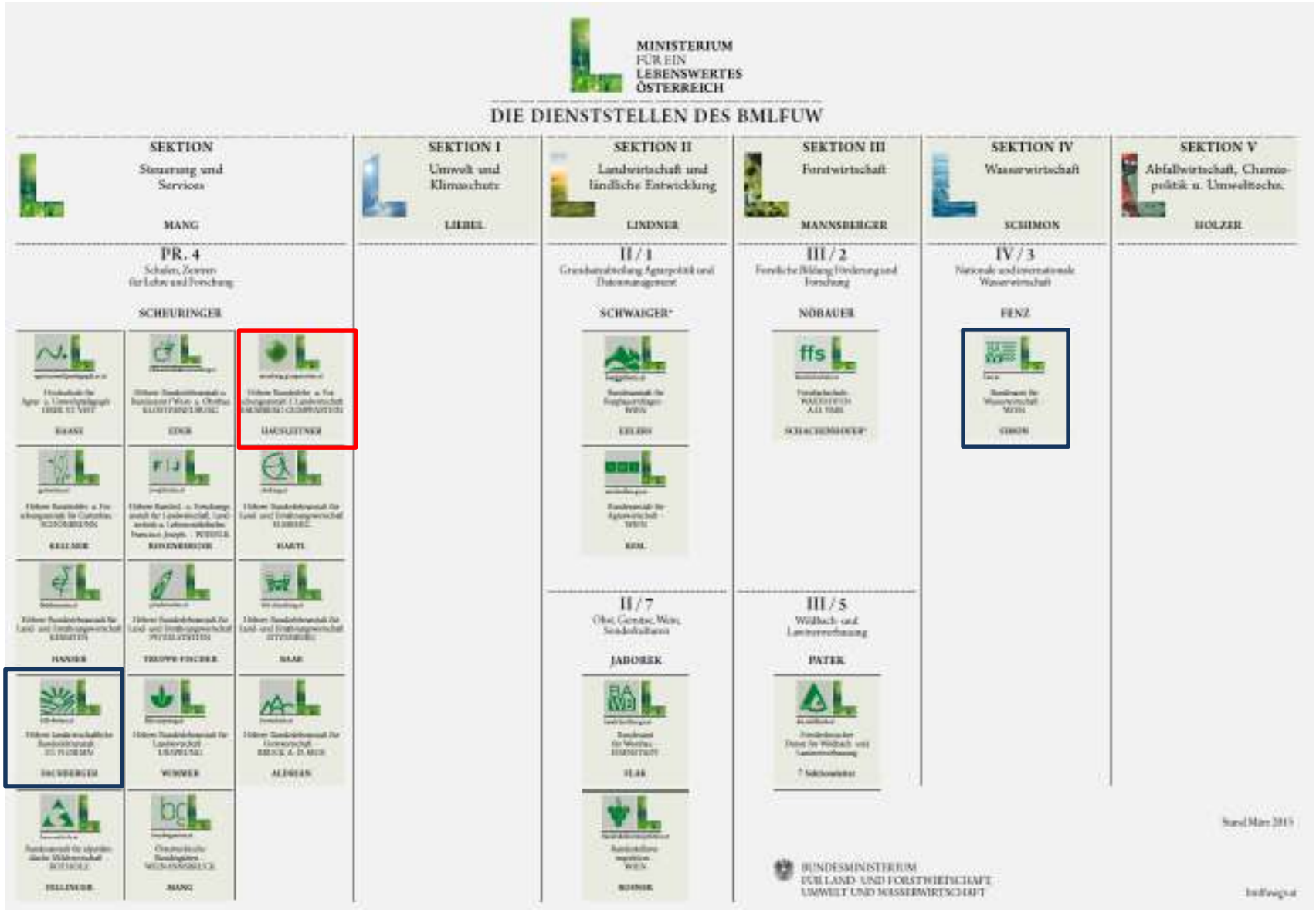

IMPEL and nitrate diffuse pollution projects

Anette Dodensig Pedersen
Danish Environmental Protection Agency

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About IMPEL

- **IMPEL:** The European Union Network for the Implementation and Enforcement of Environmental Law
- **International non-profit association** of the environmental authorities of the European Union Member States, acceding and candidate countries of the EU, EEA and EFTA countries
- **Informal network** of European regulators and authorities concerned with the implementation and enforcement of environmental law.
- **IMPEL's objective** is to create the necessary impetus in the European Union to make progress on ensuring a more effective application of environmental legislation.
- Website **impel.eu**

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Diffuse pollution projects

- **2012** The EU Commission had highlighted nitrate pollution from agriculture as a crucial area for IMPEL to work on
- **2013** IMPEL project: “Sharing good practice in tackling diffuse pollution and nitrate loss from farms and farmsteads”
  - Two field trips, in Denmark and Scotland
  - Fundamental ideas of which topics to work on in future projects
- **2014** IMPEL project: “Good practice in tackling nitrate pollution from farms and farmsteads”
  - Field trip in the Netherlands
  - Preparing first version of “Good practice document”
- **2015** No project this year
- **2016** IMPEL project: “Does one measure fit all?”

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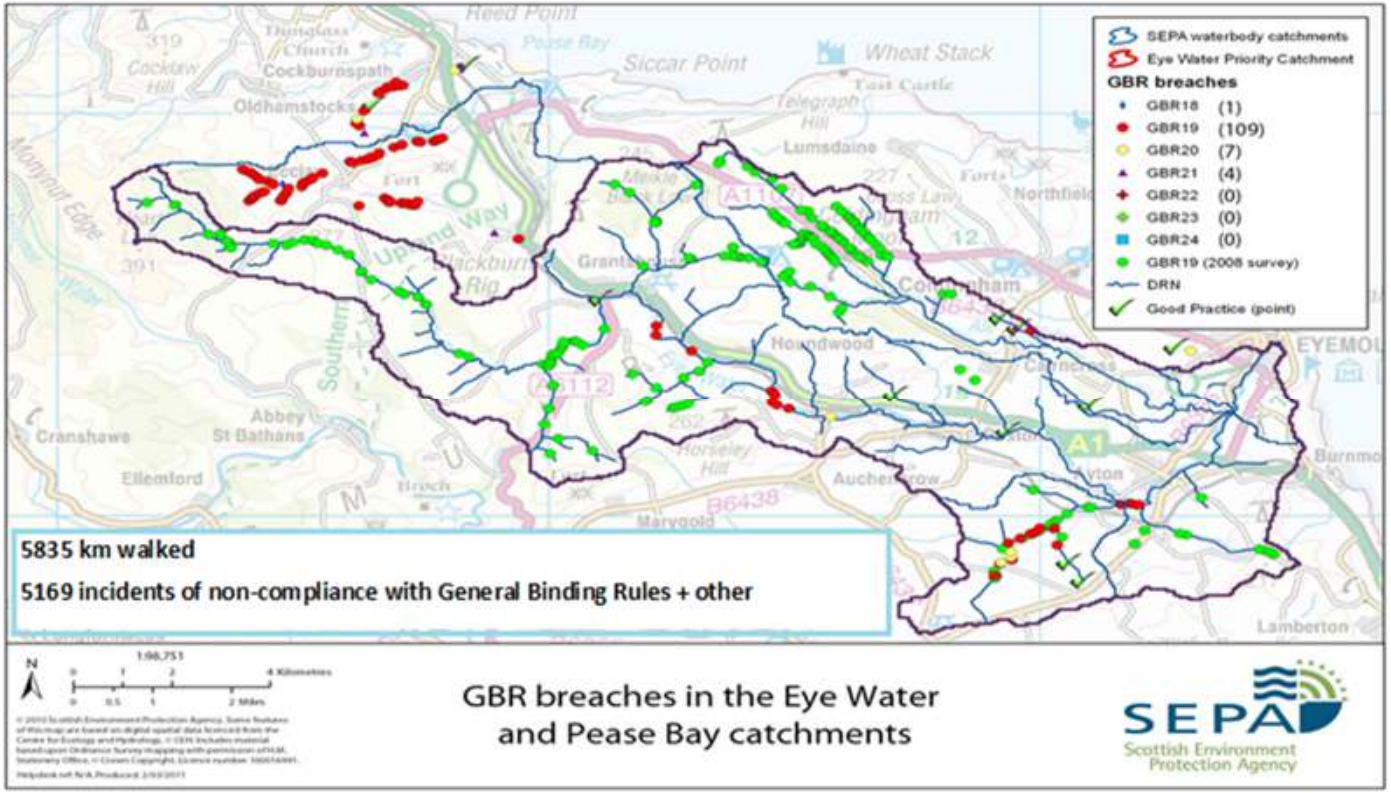
Field trip in Denmark – Inspection on cattle farm

European Union Network for the Implementation and Enforcement of Environmental Law

Field trip in Scotland – Catchment walks



IMPEL

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Field trip in the Netherlands – Biogas at ACRRES

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Field trip in the Netherlands – Exchanging experiences

European Union Network for the Implementation and Enforcement of Environmental Law

Introduction video about IMPEL

https://vimeo.com/172708248

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IMPEL EXKURSION 2016

AGRICULTURE IN AUSTRIA

FACTS AND FIGURES

MICHAELA SCHWAIGER

MINISTERIUM
FÜR EIN
LEBENSWERTES
ÖSTERREICH

AUSTRIA

- Area: 8,38 Mio. ha (83.879 km²)
- Borders: 2.706 km
- Inhabitants: 8,69 Mio.

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AGRICULTURE

Facts and Figures

149.090 agricultural holdings

5,2 % of total population

19,2 ha average farm size

2,87 mio. ha agricultural area

1,37 mio. ha arable land

3,88 mio. ha forestry

20.976 organic farms

550.000 ha total organic area

COMPARISON EU-AT

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Share of austrian agriculture on european agriculture 2014	
➢ agricultural used area	**2%**
➢ agricultural holdings	**1%**
➢ arable land	**1%**
➢ permanent pasture	**3%**
➢ forest area	**2%**

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AGRICULTURE

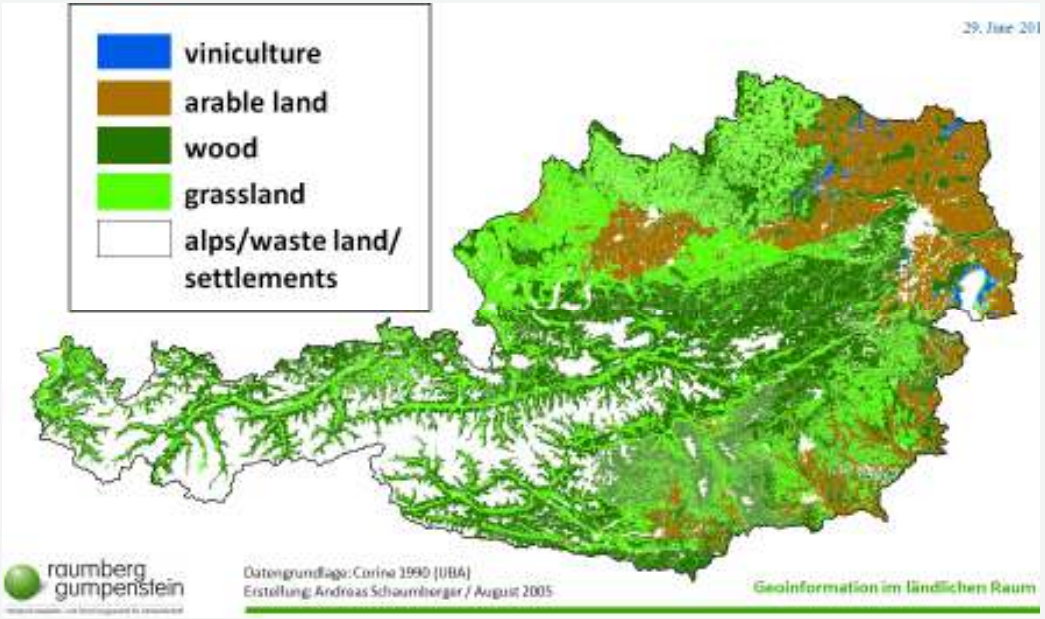
difficult conditions….

47% of total area is covered by forests

38% agricultural area

80% of total area is considered as less-favoured

75% of farms in these areas



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HOLDINGS AND AREAS OVER TIME[1)]

Year	Number of holdings	Total area	Cultivated area (CA)	Utilised agricultural area (UAA)	Average size of holdings by cultivated area	
					CA	UAA per holding
1951	432,848	8,135,744	7,068,862	4,080,266	17.8	9.4
1960	402,286	8,305,565	7,193,636	4,051,911	19.5	9.9
1970	367,738	7,727,379	6,757,443	3,696,453	21.0	10.5
1980	308,246	7,650,959	6,546,245	3,509,987	24.8	11.6
1990	281,910	7,554,815	6,761,005	3,521,570	26.8	13.5
1995	239,099	7,531,205	6,686,268	3,426,873	31.5	15.3
1999	217,508	7,518,615	6,650,206	3,389,905	30.6	16.8
2005 [2)]	189,591	7,569,254	6,578,163	3,267,833	34.7	18.8
2010	173,317	7,347,535	6,285,646	2,879,895	36.4	18.8
2013 [2)]	166,317	7,357,197	6,156,068	2,728,558	37.1	18.83

FULL-/PART-TIME FARMER IN AUSTRIA 2014

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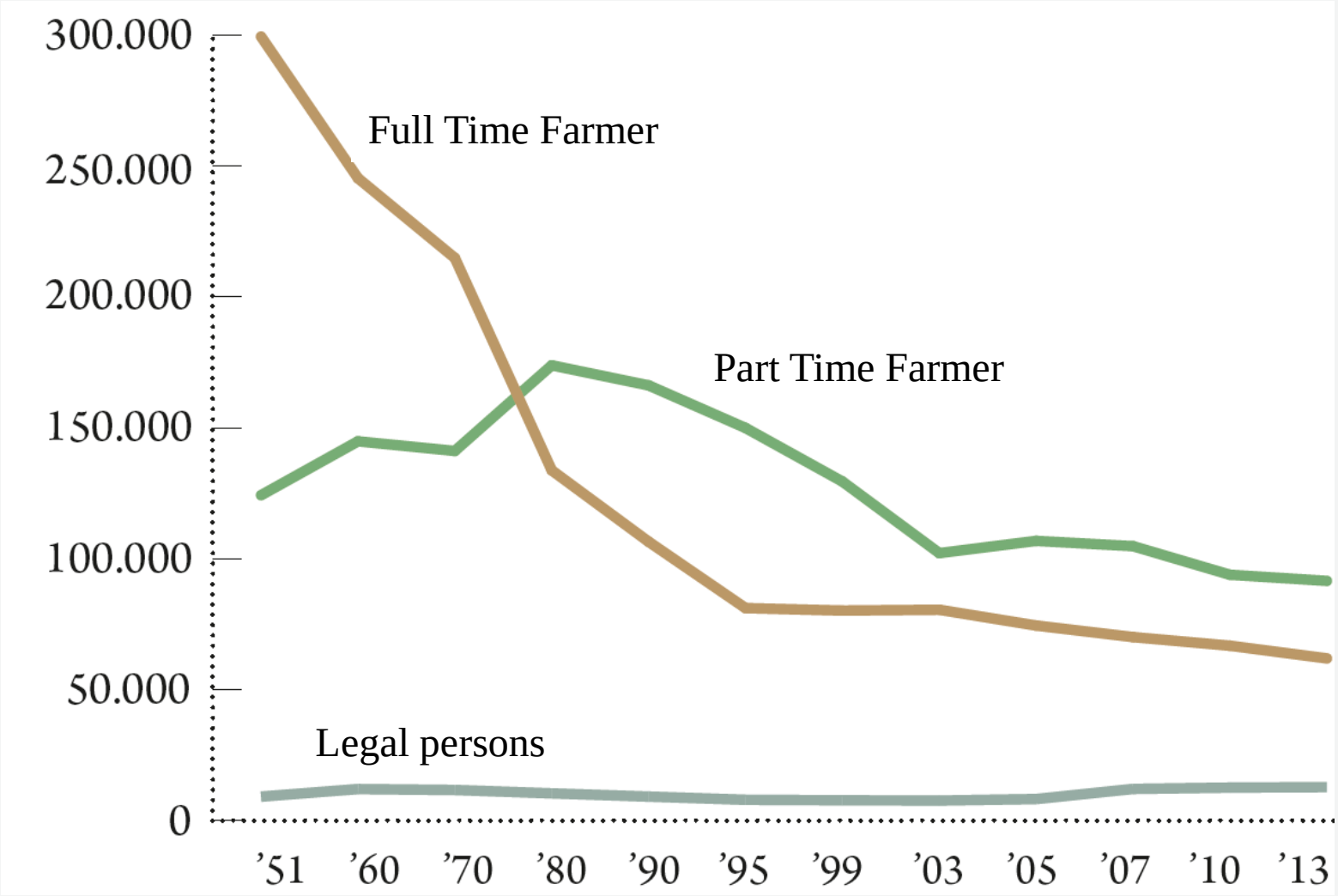

Source: Statistics Austria

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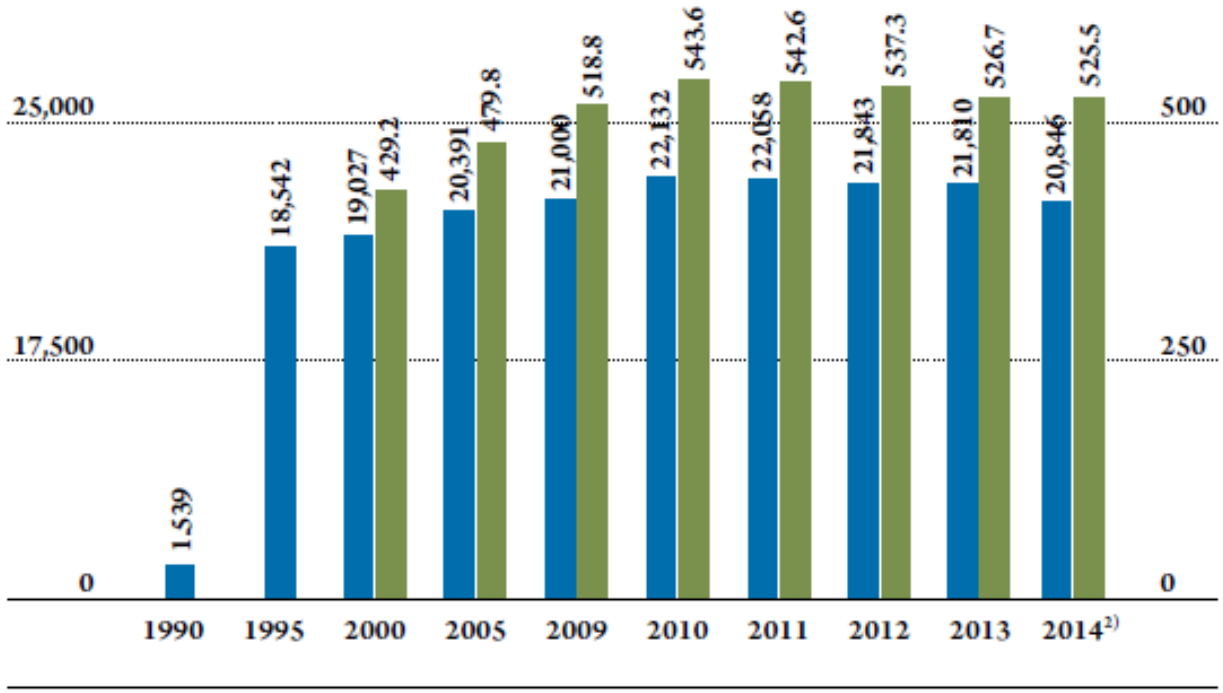
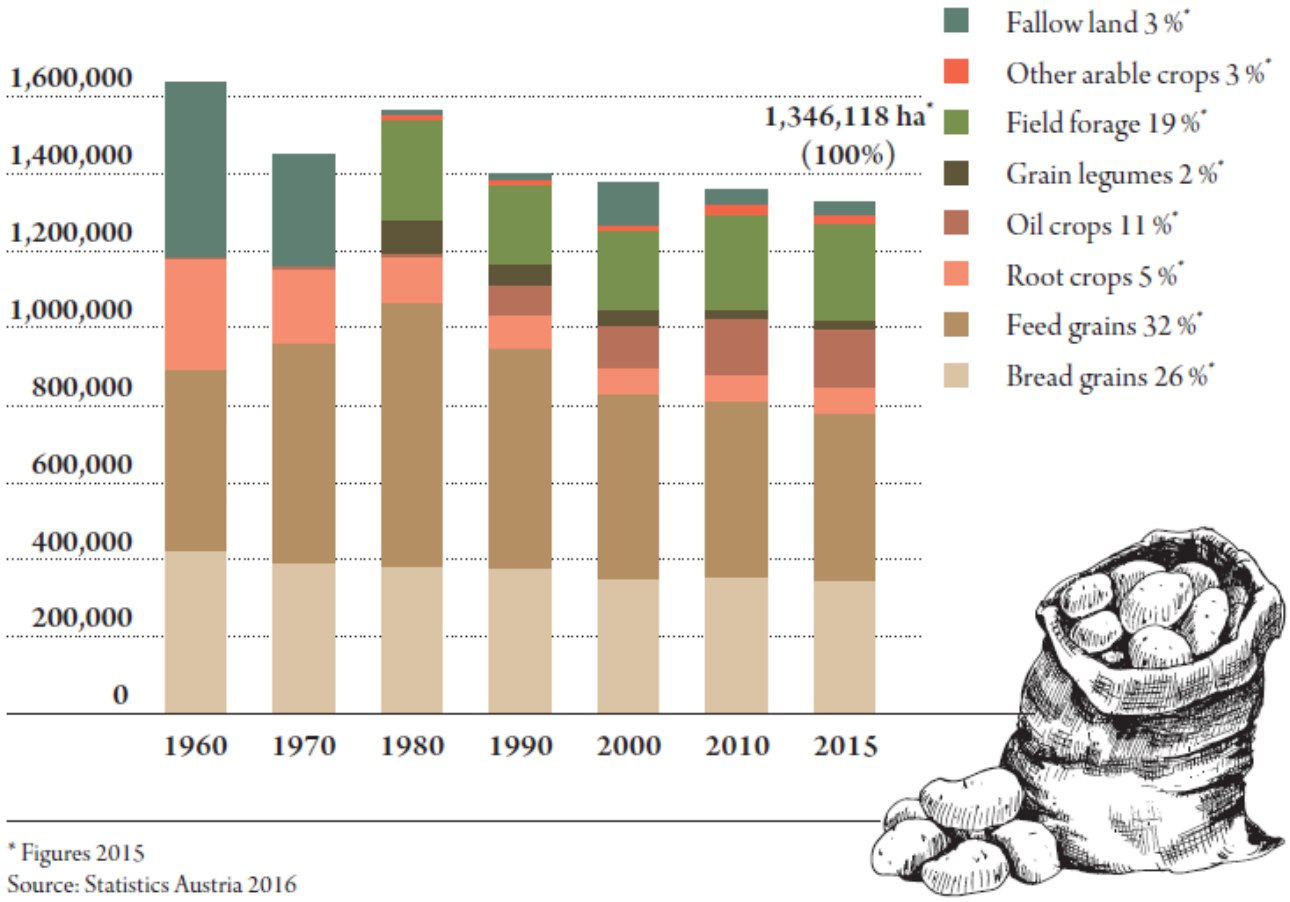
ORGANIC FARMS IN AUSTRIA



CULTIVATION ON ARABLE LAND FROM 1960 TO 2015



* Figures 2015
Source: Statistics Austria 2016

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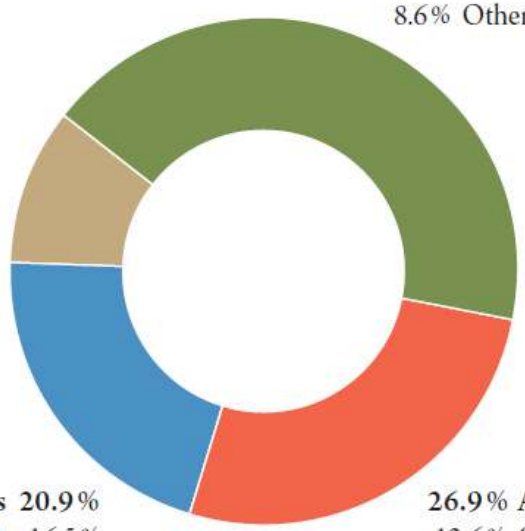
OUTPUT OF AGRICULTURAL ACTIVITY 2015[1)]

at producer prices

41.7 % Crop production
9.8 % Cereals
3.8 % Oilseeds and industrial crops
8.7 % Products from vegetable growing and horticulture
3.5 % Fruit
7.2 % Wine
8.6 % Other plant products

10.5 %
Agricultural services & inseparable non-agricultural secondary activities



Animal products 20.9 %
Milk 16.5 %
Eggs 3.5 %
Other animal products 0.9 %

26.9 % Animals
12.6 % Cattle and calves
10.7 % Pigs
2.8 % Poultry
0.7 % Other animals

1) as of July 2016
Source: Statistics Austria 2016

AGRICULTURAL PRODUCTION VALUE 2014

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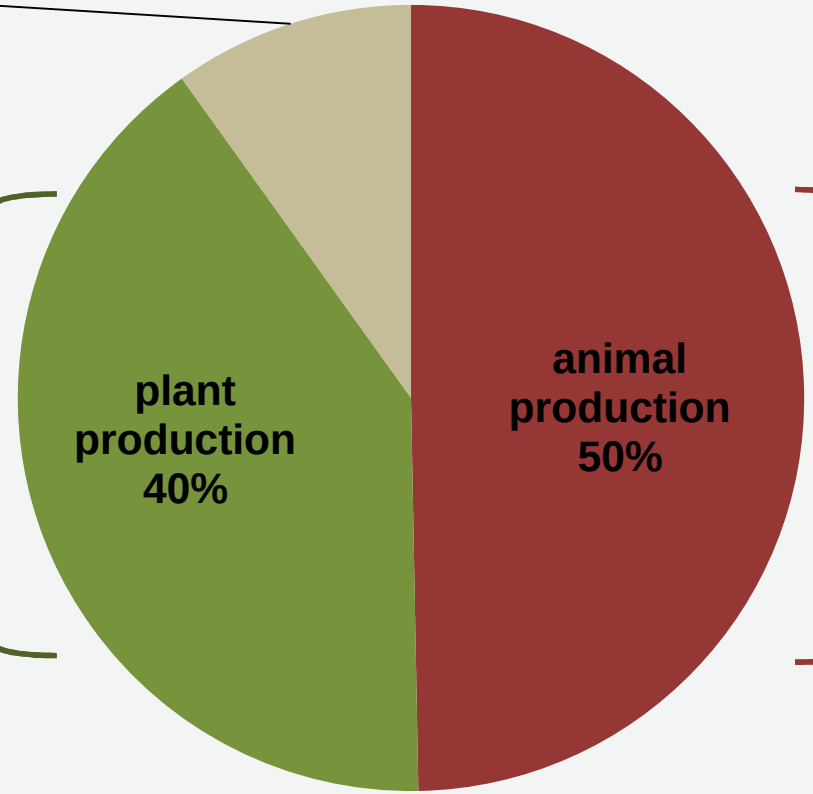
Agriculture ~ 7 billion €

secondary activities and services **10%**



Grain: **10%**
vegetables and horticulture: 9%
Fodderplants: 8%

Milk: **18%**
cattle: 13%
pigs: 12%

Source: Statistics Austria; July 2015

- agricultural share in Gross Domestic Product: 1,4 %

DEGREE OF SELF-SUFFICIENCY OF CHOSEN AGRICULTURAL PRODUCTS 2014

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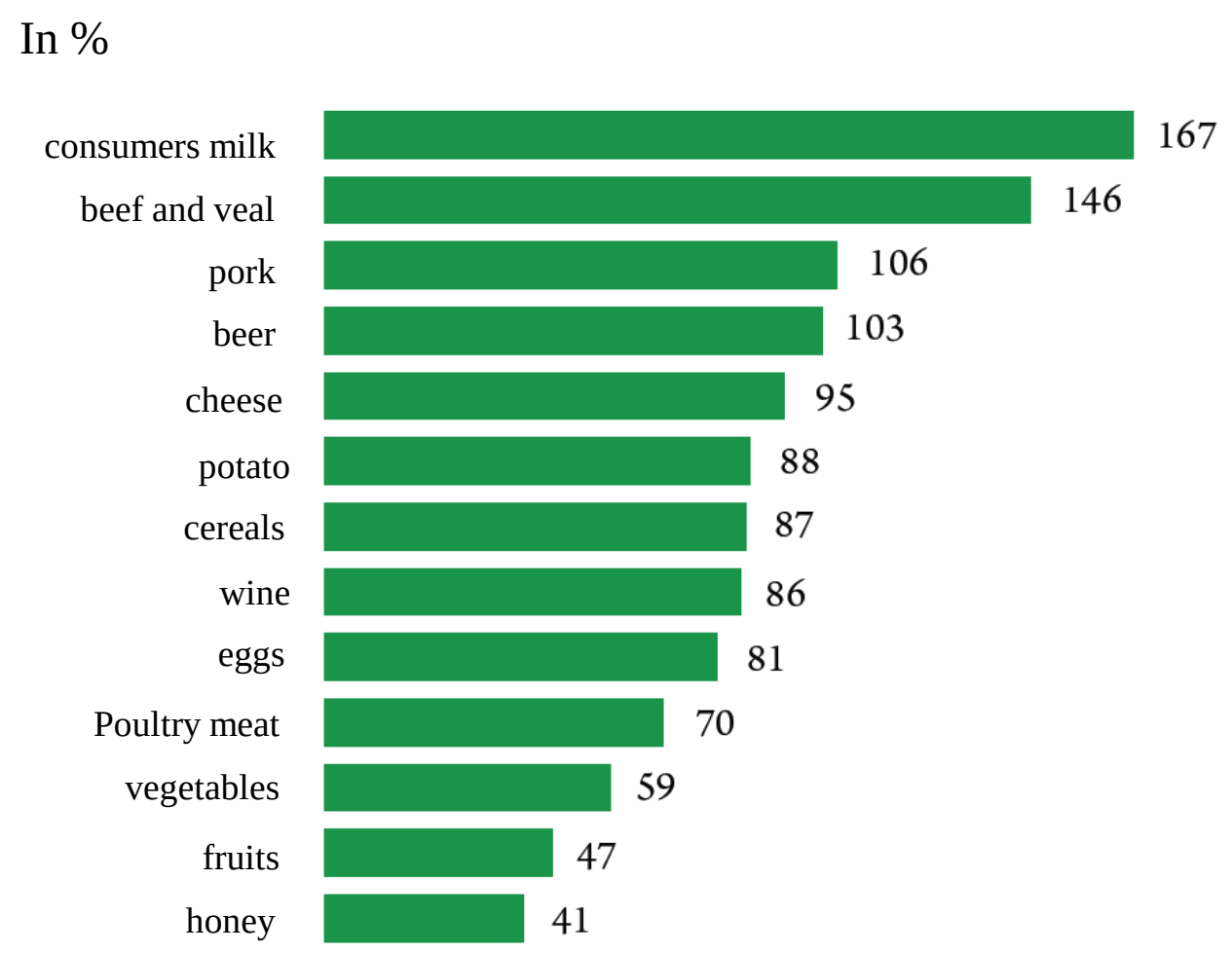

Source: Statistics Austria

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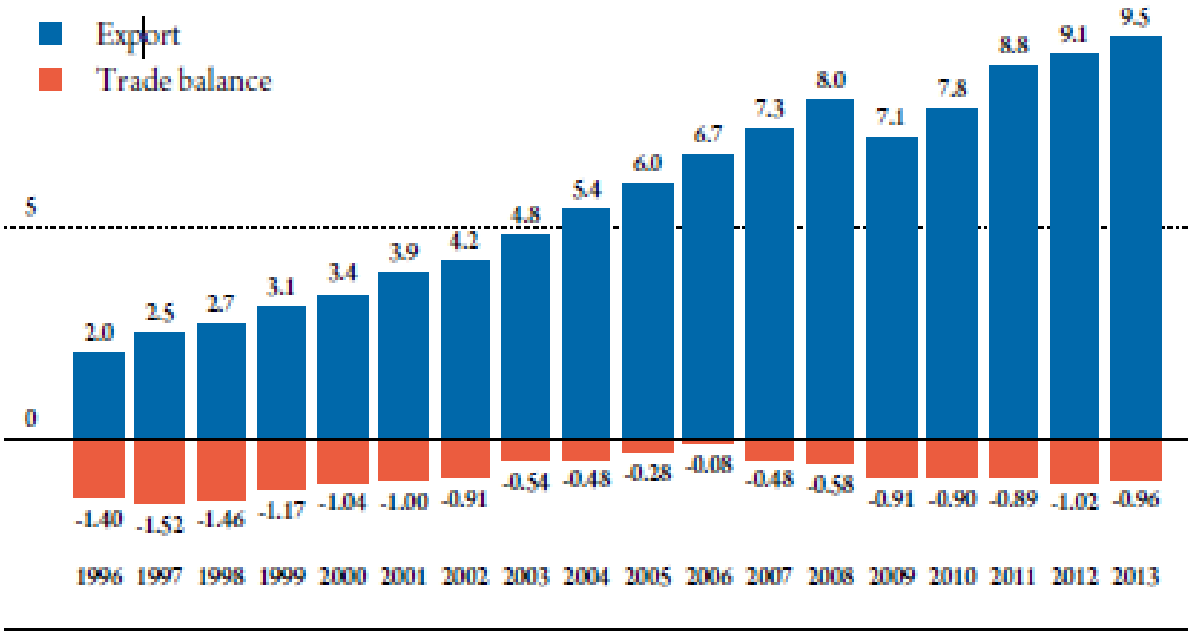
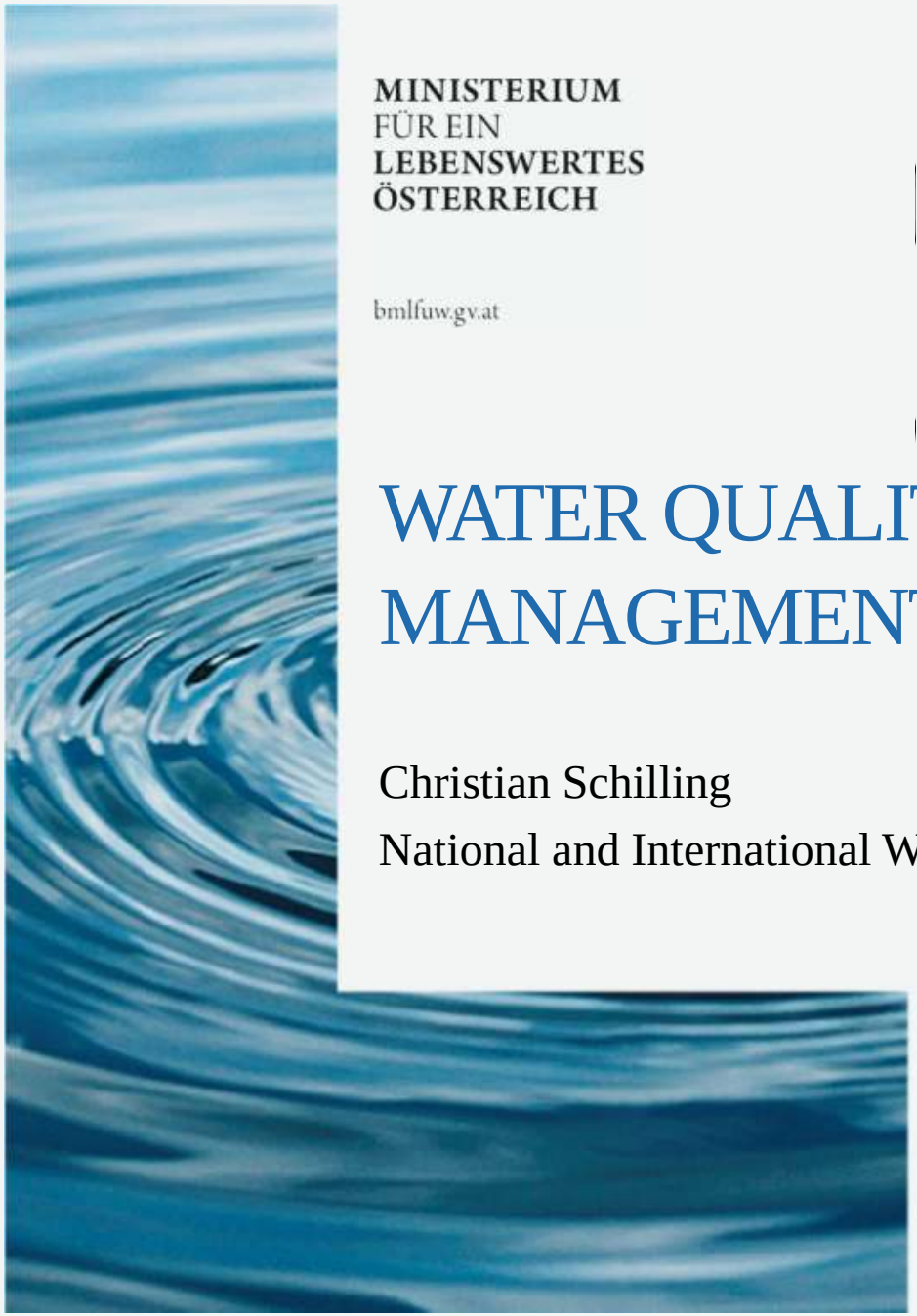
AUSTRIAN AGRICULTURAL EXPORTS 1996–2013

in billion euros (CN Chapters 1–24)





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WATER QUALITY AND NUTRIENT MANAGEMENT IN AUSTRIA

Christian Schilling
National and International Water Policy Unit

FACTS AND FIGURES ON AUSTRIA (1)

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AUSTRIA

Population: inhabitants	8.353.000
Area:	83.871 km²
Density:	100 inhabitants/km²
Capital	Vienna (1,68 mio inhab.)

Federal state with 9 provinces

Surrounded by 8 countries

FACTS AND FIGURES ON AUSTRIA (2)

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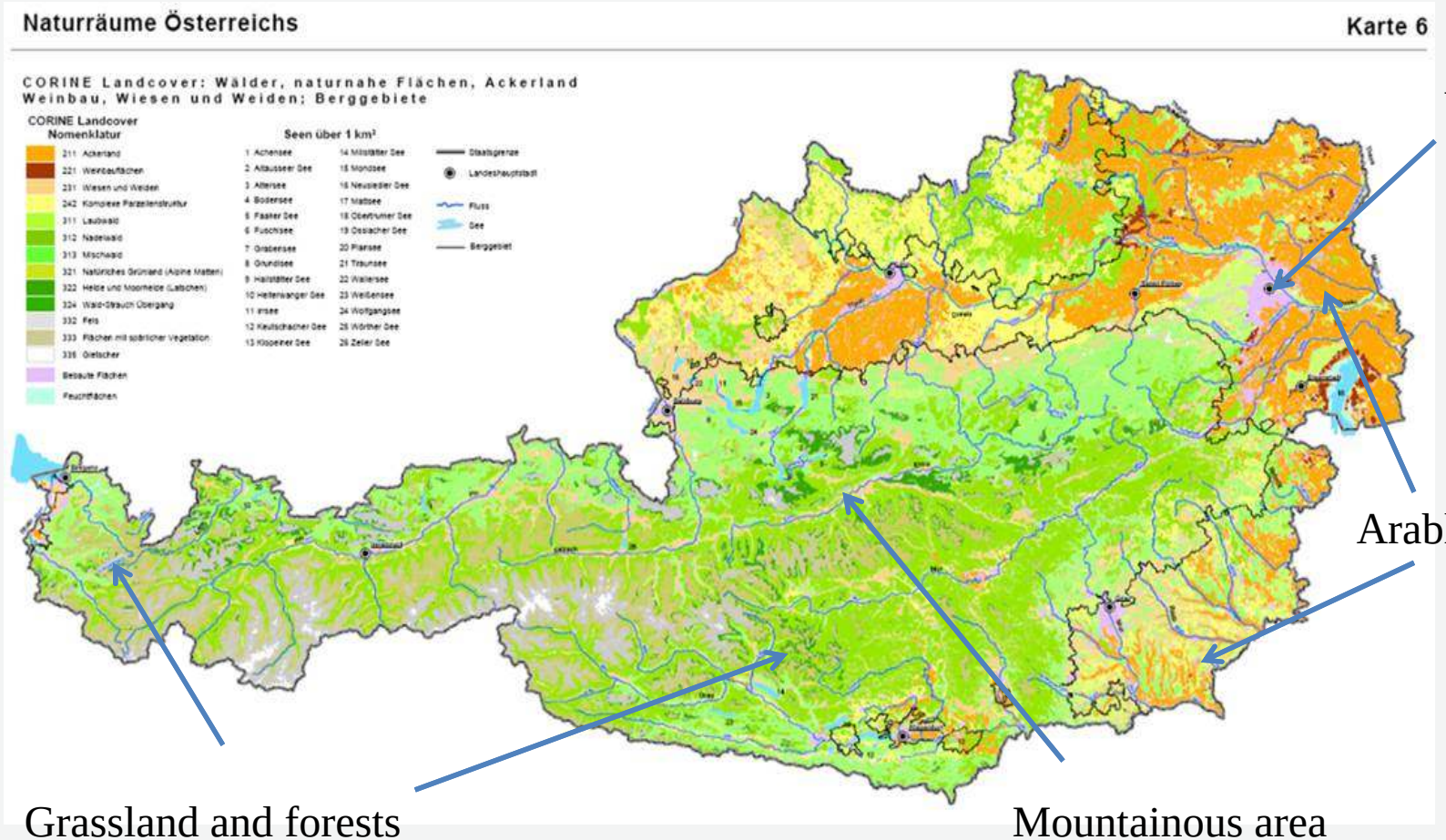
2/3 of Austria is mountainous (within dark lines)



FACTS AND FIGURES ON AUSTRIA (3)

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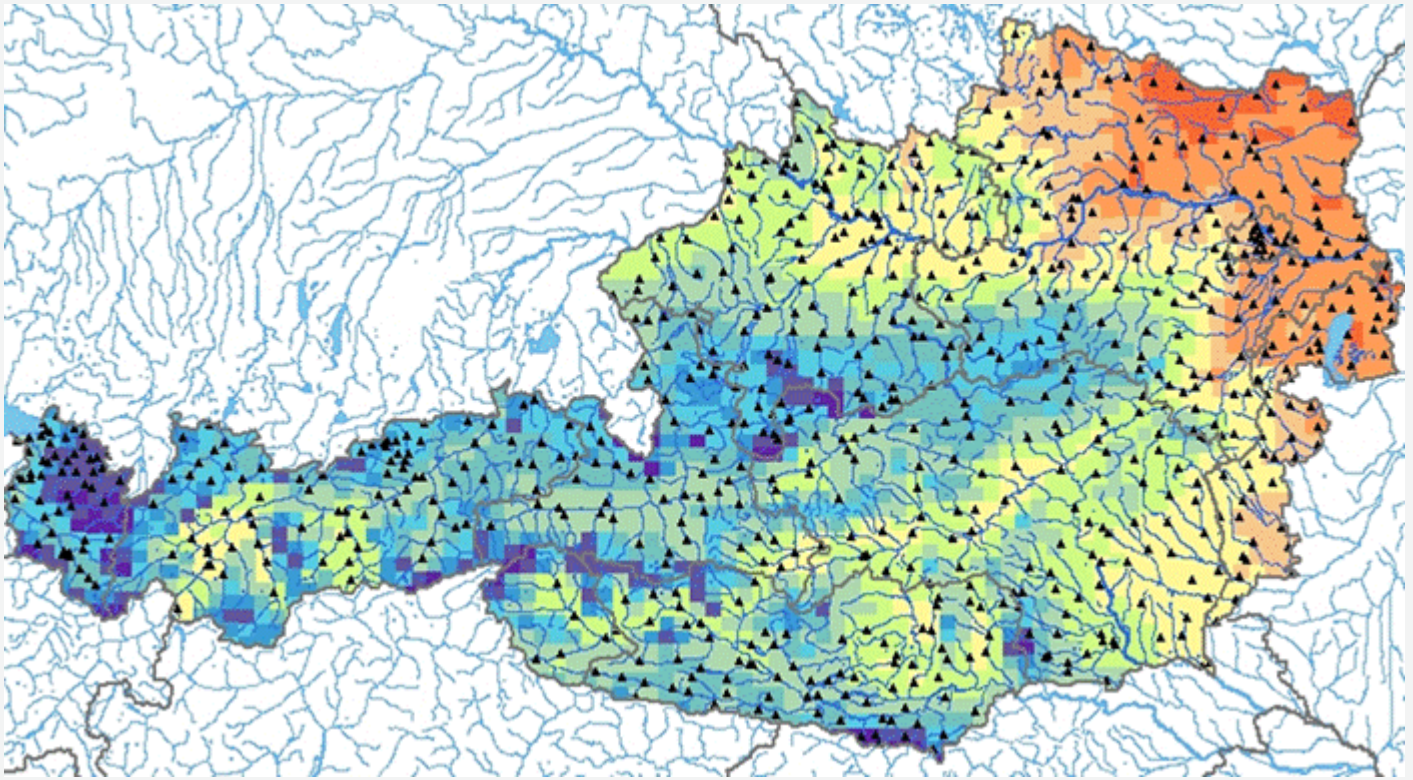
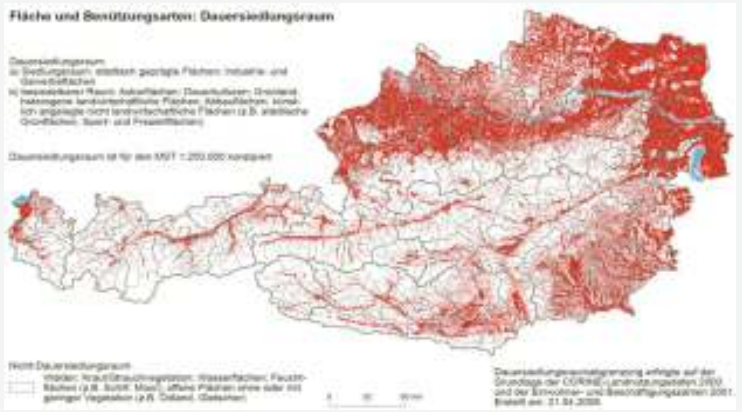
- Mean precipitation: 1.100 mm (from <500 mm up to >3.000 mm)
- **<4% of available resources are used!** Mountainous country with abundancy of water



Precipitation											
mm/a	< 500	- 600	- 700	- 850	- 1000	- 1250	- 1500	- 1750	- 2000	- 2500	-3500

DRAFT RBMP 2015



Status

- About 2/3 of Austrian rivers are not in a good status in terms of **hydromorphological** conditions
  - Numerous drivers, but **flood protection** and **hydropower use** during the last centuries were decisive for not meeting GES/GEP
  - Only 37% of Austrian territory available for permanent settlement and development (2/3 alpine area) – **unique situation in EU**
  - Potential high precipitation (see last slide)
- 22% of Austrian rivers are not in a good status in terms of **organic and nutrient** pollution
  - about 5% of rivers at risk due to **point source** pollution (4% due to general physico-chemical parameter (nutrients))
  - Majority of the few affected rivers at risk mainly due to low flow in combination with **diffuse pollution** in regions dominated by arable land

MEASURES - ACTION PROGRAM (NITRATES DIRECTIVE)

MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH

- Austria Member of EU since 1995
- First AP into force in 1999, current AP effective since 2012
- Austria applies its AP to whole territory:
  - Local groundwater protection in eastern parts of AT (areas with low precipitation, higher nitrate concentrations in groundwater)
  - Reduction of nutrient emissions to receiving seas (Black Sea, North Sea) originating mainly from western parts of AT (low concentrations, but considerable flows result in considerable loads)

  ➔ Does **not mean** that the whole territory is nitrate vulnerable (small share)

  ➔ Action program goes beyond minimum requirements of ND
- AP is **main legal instrument** for tackling diffuse nutrient pollution
- In addition measures are applied through protection areas (DW), **rural development program** or **regional (government) initiatives** tailored to regional situation/needs

ACTION PROGRAM (2)

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Main provisions

- Closed periods (§2): liquid manure, min. fertilizer, digestate:
  - Arable land: 15th Oct. – 15th Feb. (start 15th Nov. if crop is cultivated until 15th Oct.)
  - Grassland: 30th Nov. – 28th Feb.
  - 30th Nov. – 15th Feb. for solid manure/dried sewage sludge on all agric. land
- Additional provisions for cultivation on areas with slopes >10% (§3)
- Prohibition of fertilisation on frozen/saturated/flooded/snow covered soils (§4)
- Minimum distances to surface waters for fertiliser application (§5):
  - Rivers/Lakes with adjacent slopes <10%: 5m*/20m*
  - Rivers/Lakes with adjacent slopes >10%: 10m*/20m
  - * distance can be reduced by half, if injection is applied or buffer strips are cultivated (to promote implementation of respective measures)
- Minimum storage capacity (§6): 6 months

ACTION PROGRAM (3)

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Main provisions – cont.

- Fertiliser application (§7):
  - Limited to 60 kgN/ha
    - On arable land after harvest until beginning of closed period
    - On grassland between 1st October until beginning of closed period
  - Limited to 30 kgN/ha to enhance decomposition of straw ➔ prohibited from 2017 for maize straw
- Documentation (farm level):
  - Areas under agricultural use and amount of fertiliser applied
  - Amount of Manure (N) produced based on own farm stocks / provided to other farms / was taken over from other farms
  - Crop needs (N)
- Manure application limited to 170 kgN/ha (§8)
- Crop-specific fertilisation limits dependent on crop yield (low/middle/high)

NATIONAL MONITORING NETWORK

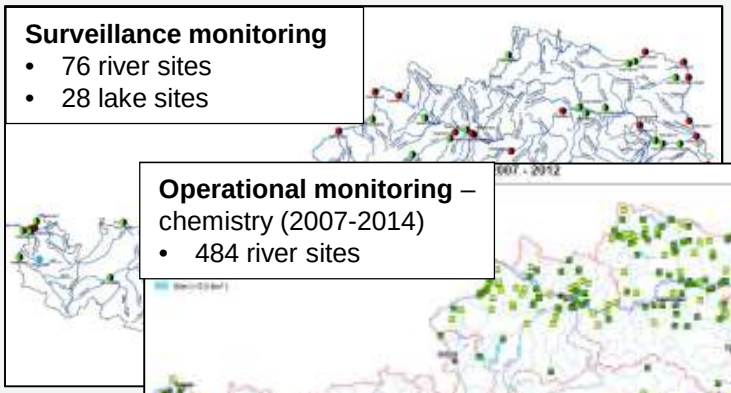
MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH

➔ Multi-purpose use: spot impacts and follow effectiveness of measures under WFD and ND

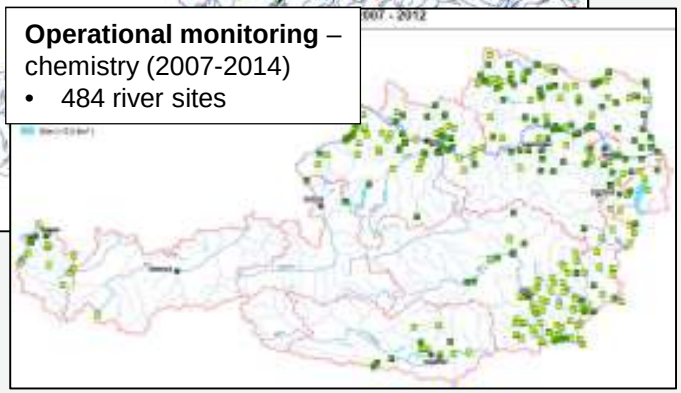
Quality:

Surface waters

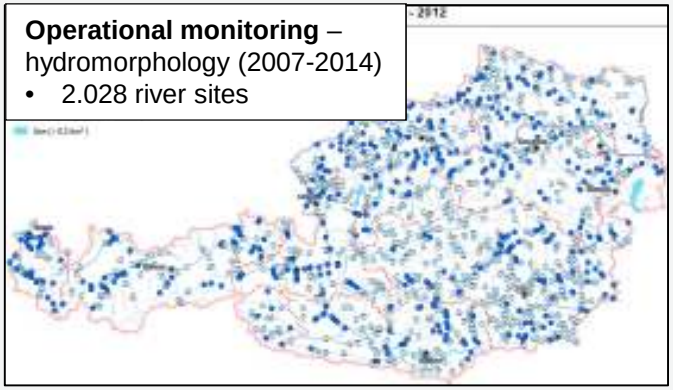
Surveillance monitoring
- 76 river sites
- 28 lake sites



Operational monitoring – chemistry (2007-2014)
- 484 river sites

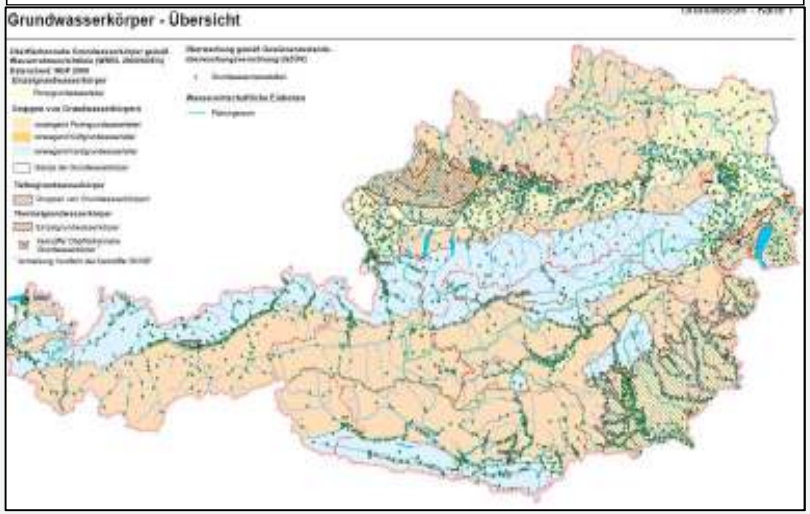


Operational monitoring – hydromorphology (2007-2014)
- 2.028 river sites



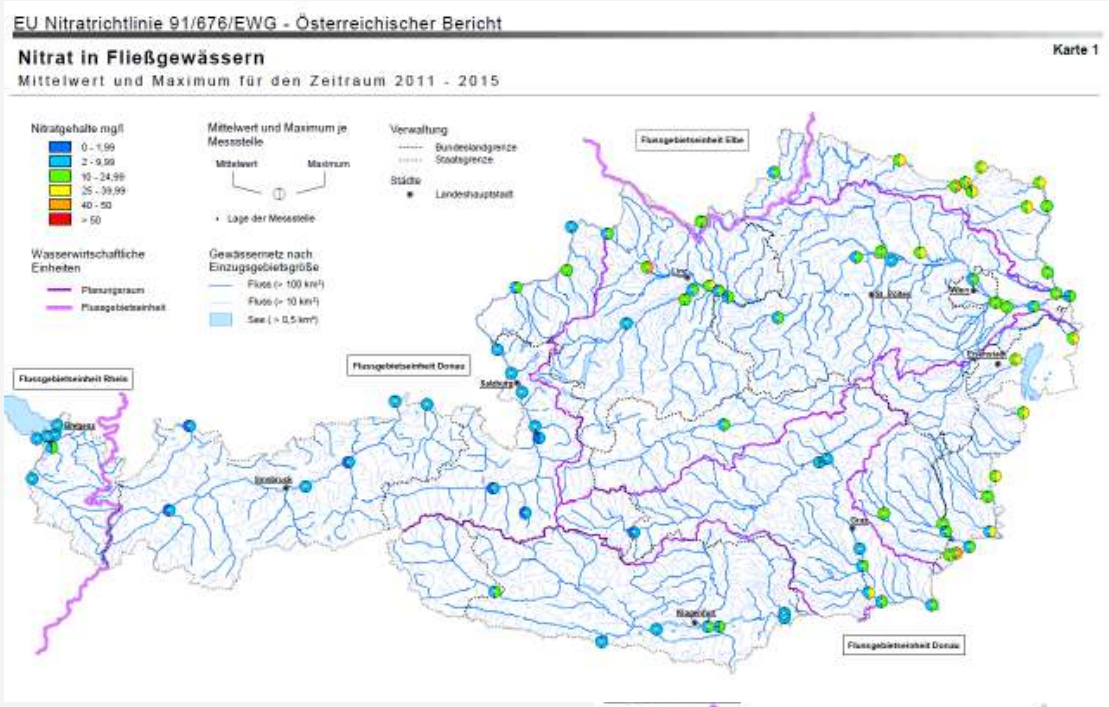
Groundwater

2000 Monitoring sites
- **Surveillance monitoring** in all aquifers with comprehensive parameter set – 1st year of cycle
- **Operational monitoring** in aquifers with risk of failing the GES – targeted parameter set and increased density of monitoring stations
  - Average site density for stations vulnerable to nitrate: 19 km²/site
  - Average site density with no vulnerability to nitrate: 45 km²/site



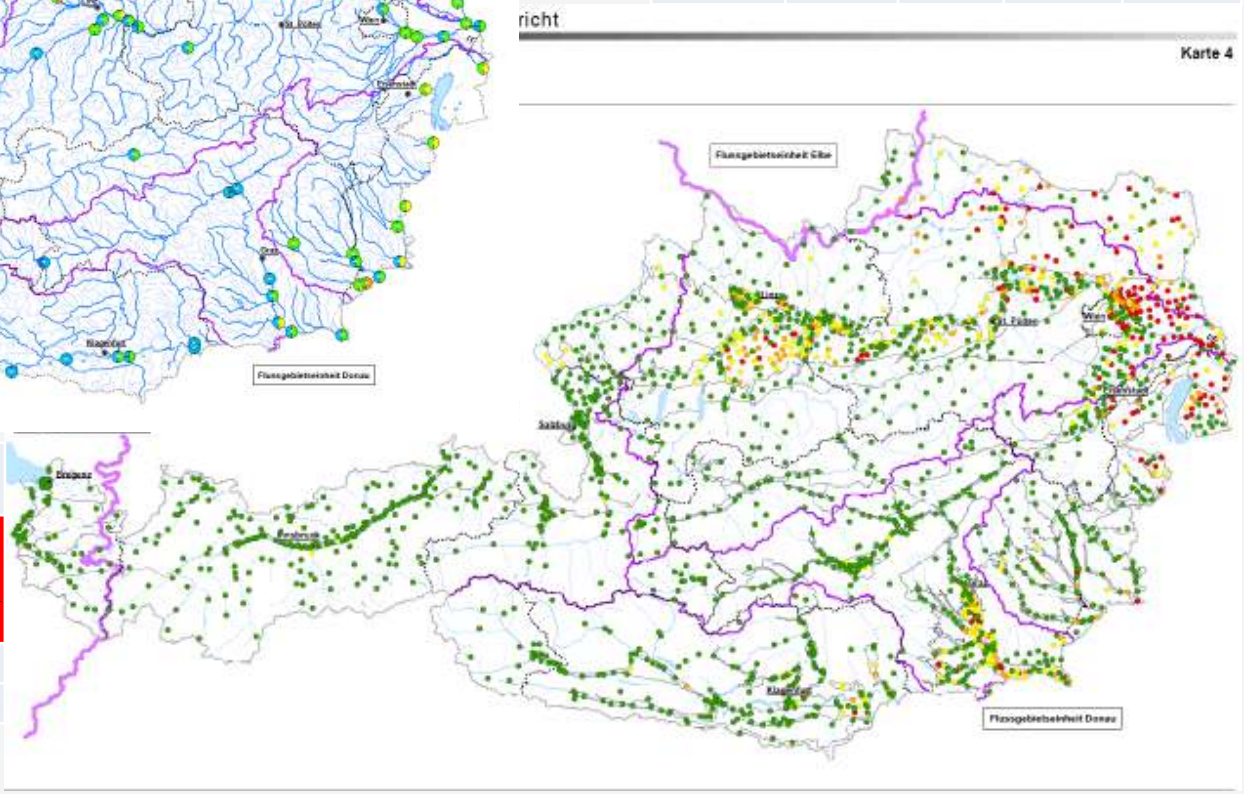
WATER QUALITY – NITRATES DIRECTIVE REPORT 2016

MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH



Rivers	Percentage stations with concentrations			
	< 25 mg/l NO_3	25-40 mg/l NO_3	40-50 mg/l NO_3	> 50 mg/l NO_3
Average	100	0	0	0
Maximum	77	19	4	0

Ground-water	Percentage stations with concentrations			
	< 25 mg/l NO_3	25-40 mg/l NO_3	40-50 mg/l NO_3	> 50 mg/l NO_3
Average	76	11	5	8
Maximum	65	14	7	14



SUMMARY – MESSAGES - OUTLOOK

MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH

- In general excellent water quality in most parts of Austria ➔ drinking water supply is met to 100% from groundwater and springs
- Groundwater and surface water is impacted by diffuse nutrient pollution in regions dominated by arable land use (eastern parts of Austria)
- Nitrate action program is the **basis** for measures tackling diffuse nutrient pollution from agriculture
    - Application of AP on the whole territory (different protection goals, no distortion of competitiveness within AT farmers)
    - Provisions address regional differences to a limited extent (e.g. closed periods)
- **in addition** measures are applied through protection areas (DW), **rural development program** as well as through **regional (government) initiatives** tailored to the regional situation (needs)
- Revision of AP was finished at technical level at the beginning of 2016

MINISTERIUM
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THANK YOU FOR YOUR KIND ATTENTION!

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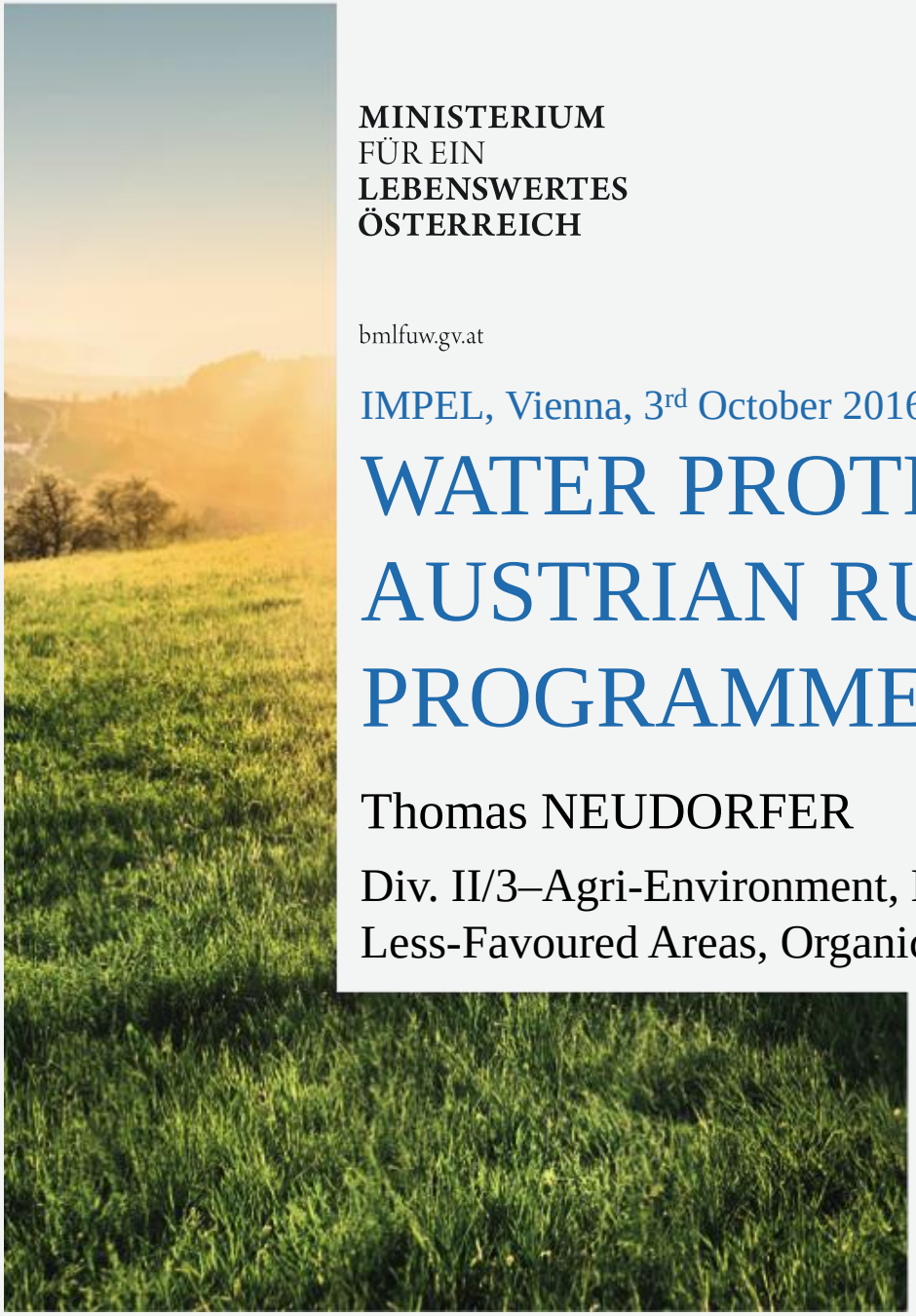

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IMPEL, Vienna, 3rd October 2016

WATER PROTECION IN THE AUSTRIAN RURAL DEVELOPMENT PROGRAMME 2015-20

Thomas NEUDORFER

Div. II/3–Agri-Environment, Mountain Farmers and Less-Favoured Areas, Organic Farming

STRUCTURE OF CAP

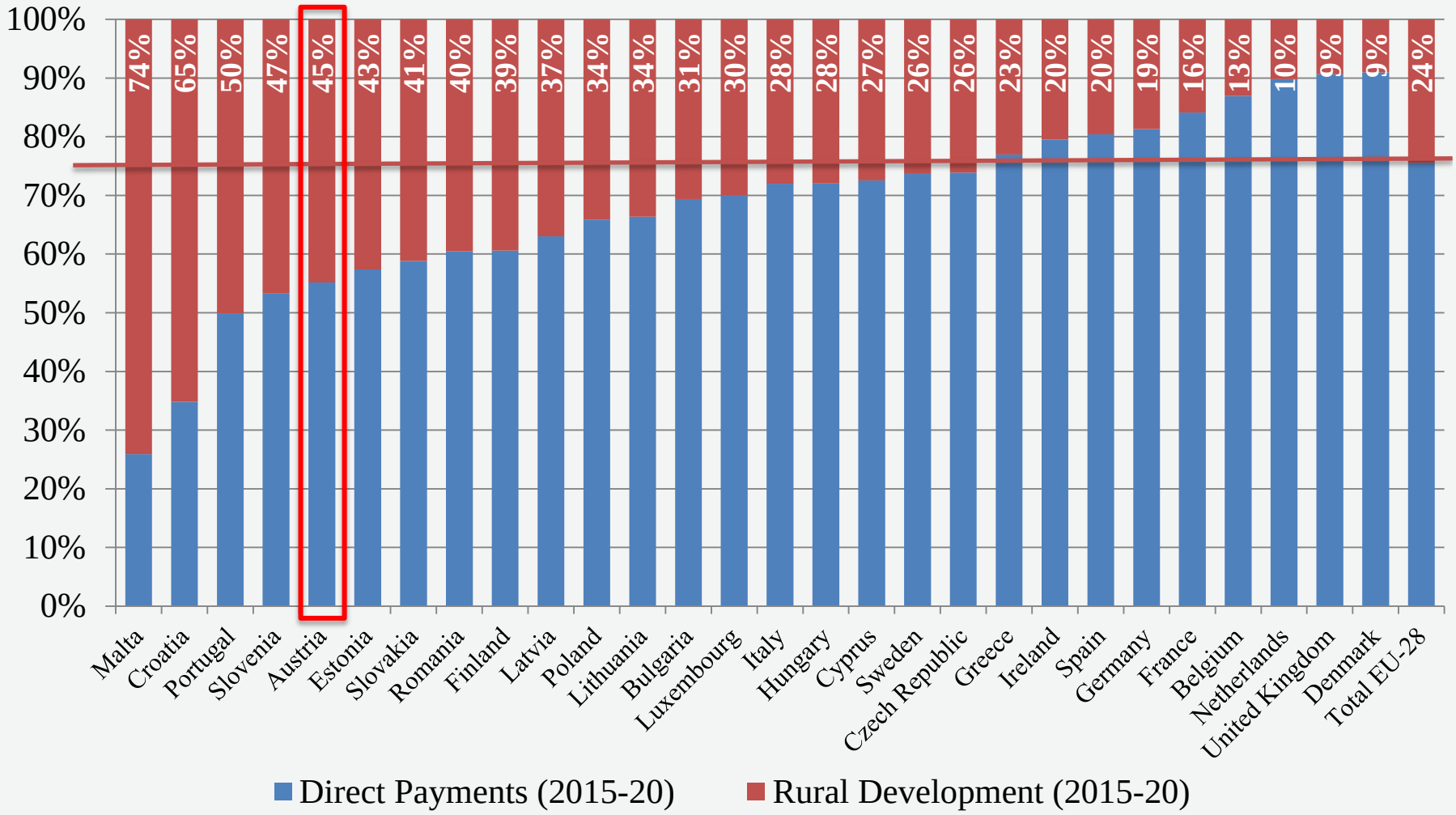
MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH

CAP 2015-20

Common Market Organization Direct Payments		Rural Development 2014-20
Common market **Intervention rules** **Export refunds** **Competition rules** **etc.**	**Direct payments** **Basic payment scheme** **Greening payment** **Payment for young farmers** **Voluntary coupled support** **Small farmers scheme** *Cross Compliance* *Greening*	**6 thematic priorities (= targets)** knowlege transfer and innovation, competiveness, food chain organisation, ecosystems, resource efficiency, economic development in rural areas **Implementaion of the priorites via measures**
100% EU-financed		**Financed by EU-funds and AT-funds**
European Agricultural Guarantee Fund (EAGF)		**European Agricultural Fund for Rural Development (EAFRD)**

SHARE OF RURAL-DEVLOPMENT-PAYMENTS ON EU-BUDGET

MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH



Source: European Commission (23.11.2015) http://ec.europa.eu/agriculture/cap-funding/budget/mff-2014-2020/mff-figures-and-cap_en.pdf

WATER PROTECTION IN CAP I

MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH

Cross-Compliance (Title VI Chaper I of EU-Regulation Nr. 1306/2013)

SMR 1: Nitrate-Directive	**Application of fertilizers, minimum storage capazity**, documentation, **max. 170kg/ha livestock manure**
GAEC 1: Pufferstrips	**No tillage** 10m to stagnant waters, 5m to streaming waters, **Maintain grassland** 20m to stagnant, 10m to streaming waters
GAEC 2: Irrigation	**Approval of withdrawal of water** beyond common use
GAEC 3: Groundwater	No disposal of **harmful substances**
GAEC 4: Minimum soil cover	**Greening** of not cultivated arable land and permanent crops
GAEC 5: Erosion-limitation	**Limitation of tillage** of frozen and water satturated soils
SMR 10: Plant protection	Usage of **plant protection products**

Greening (Article 43 of EU-Regulation Nr. 1307/2013)

Maintainance of grassland	**Maintainance of grassland on national level protection of environmentally valuable grasslands**
Crop diversification	Max. **share of crops** (e. g. max. 75% of one crop)
Ecological focus areas	Min. **5% ecological focus areas** on arable land

WATER PROTECTION IN CAP II

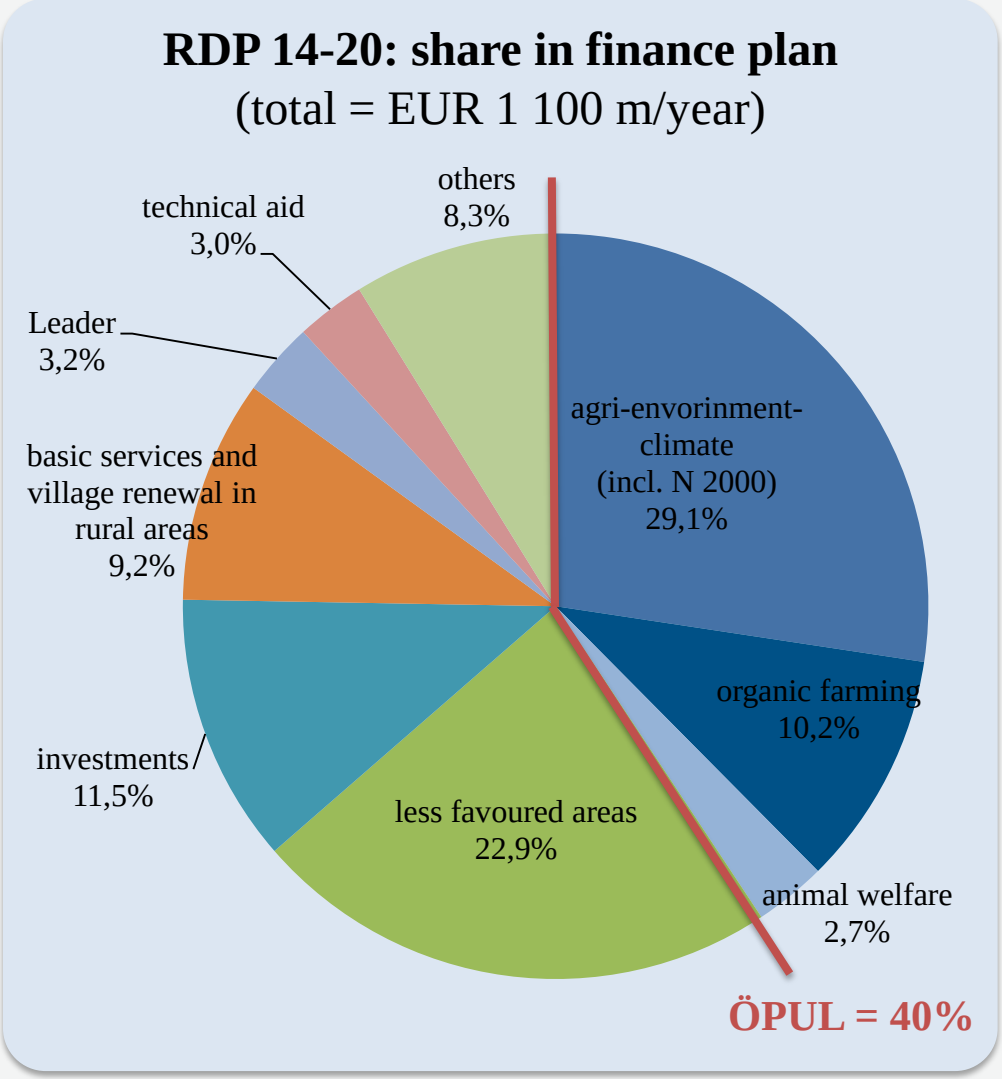
MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH

Area-related measures

- Agri-environment
- Organic farming
- Less favoured areas

Project-related measures

- Productive investments (e. g. slurry-storage)
- Non productive investments (water courses, landslide protection, ecological intrastructure)
- Advice, Eduction and training
- Plans and concepts, evaluation



AGRI-ENVIRONMENT-PROGRAMME ÖPUL 2015 (AECM, ORGANIC FARMING, ANIMAL WELFARE, NATURA 2000)

MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH

- **Legal framework**
  - Measures aim to **preserve and promote agricultural practices** that make a **positive contribution to environment and climate** (biodiversity, water-quality, soil-protection, climate protection and adaptation)
  - **Commitments shall be undertaken for a period of five to seven years**
  - payments cover only those c**ommitments going beyond the relevant mandatory standards** – no double funding!
  - Payments are granted annually and compensate beneficiaries for **additional costs and income foregone** resulting from the commitments made
- **Strategy in Austria**
  - **continuing and target-orientated evolution** of the existing program, keep high participation rates and a broad land-coverage
  - **prevention of environmental risks** through broad, preventive measures, **improve the environment situation** in regions with poor conditions
  - **clear requirements** for application, implementation and controls

TRENDS AND CHALLENGES

MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH

Intensification ⟷ Abandonment

agriculturally used land gets scarce and potential high yield land is intensified

low-productive areas are at risk of abandonment of agricultural usage

ÖPUL 2015 - MEASURES

MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH

Art. 28 Agri Environment Climate Measure						Art. 29 Organic Farming	Art. 33 Animal welfare	Art. 30 Natura 2000
General	**Arable land**		**Grassland**		**Permanent Crops**			
Environmentally friendly and biodiversity promoting management	Greening of arable land/ intermediate crops	Preventative groundwater protection (regional)	Mountain grazing and herding	Renouncement of silage	Erosion protection in vineyards, fruits and hops	Organic Farming	Animal welfare - Grazing of livestock	Natura 2000 - Agriculture
Nature conservation *	Greening of arable land/ system "Evergreen"	Preventative surface water protection on arable land (regional)	Cultivation of mowed mountain grassland	Maintenance of endangered livestock breeds	Pesticide renouncement in vineyards and hops		Animal welfare - stable	
Surface-near spreading of liquid farm manure	Direct seeding and seeding on mulch	Managment of arable areas particularly threatened by leaching			Use of beneficial organisms in greenhouses			
Limitation of yield increasing inputs *	Cultivation of rare agricultural plants	Renouncement of fungicides and groth regulators *	* Mandatory combination with measures "Environmentally friendly and biodiversity promoting management" ** Mandatory combination with measure "Environmentally friendly and biodiversity promoting management" or "Organic Farming"					

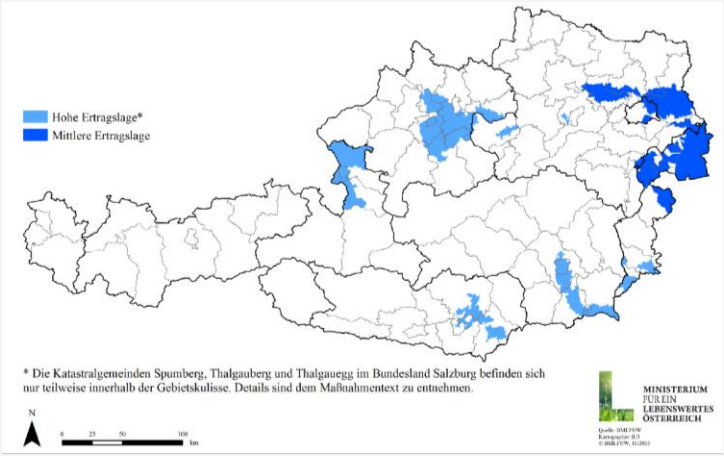
BROAD AECM-MEASURES

MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH

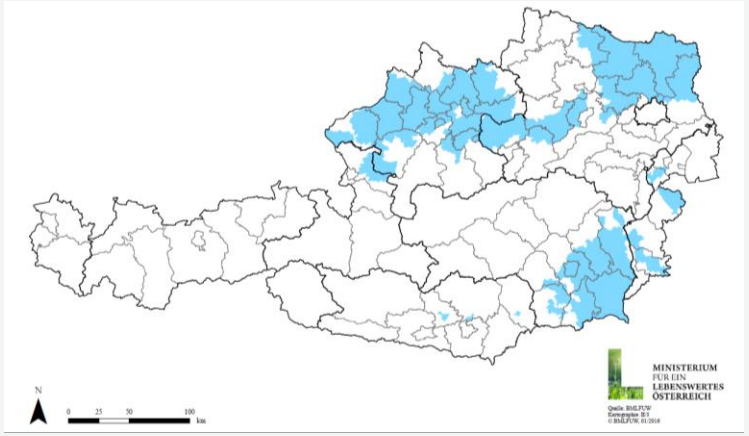
- **Organic farming** → ~ 230 €/ha
  - Renouncement of nitrogen fertilizers and pesticides
  - Maintainance of landscape elements and grassland
- **Greening of arable land - intermediate crops** → 120-200 €/ha catch crop
  - >10% of arable land with intermediate crops
  - Green cover between main crops (e. g. 31.07. – 15.10, 31.08. – 15.02.)
  - No mineral-fertilizers/pesticides, mixture of crops
- **Greening of arable land - „System evergreen“** → 80 €/ha arable land
  - Min. 85% with whole-year green-cover (ext. sowing, max. 50d)
  - No mineral-fertilizers/pesticides, documentation
- **Erosion protection of vineyards, fruits** → 100 – 800 €/ha
  - Whole year greening of machine tracks between cultures
  - vineyards <25% gradient at minimum from 1.11. to 30.04.
- **Direct seeding and seeding on mulch** → 60 €/ha crops with erosion risk
- **Env. friendly and biodiversity promoting management** → 45 €/ha
  - Min. 5% biodiversity areas on arable land, landscape elements and grassland

FOCUSSED AECM-MEASURES

- **Preventive groundwater protection** → 100 €/ha
  - Arable land
    - Reduced N-fertilization
    - Shortened periods for fertilization
    - Education, documentation
  - Grassland
    - Renouncement of grassland-conversation
    - Reduced N-fertilization
    - Education, documentation



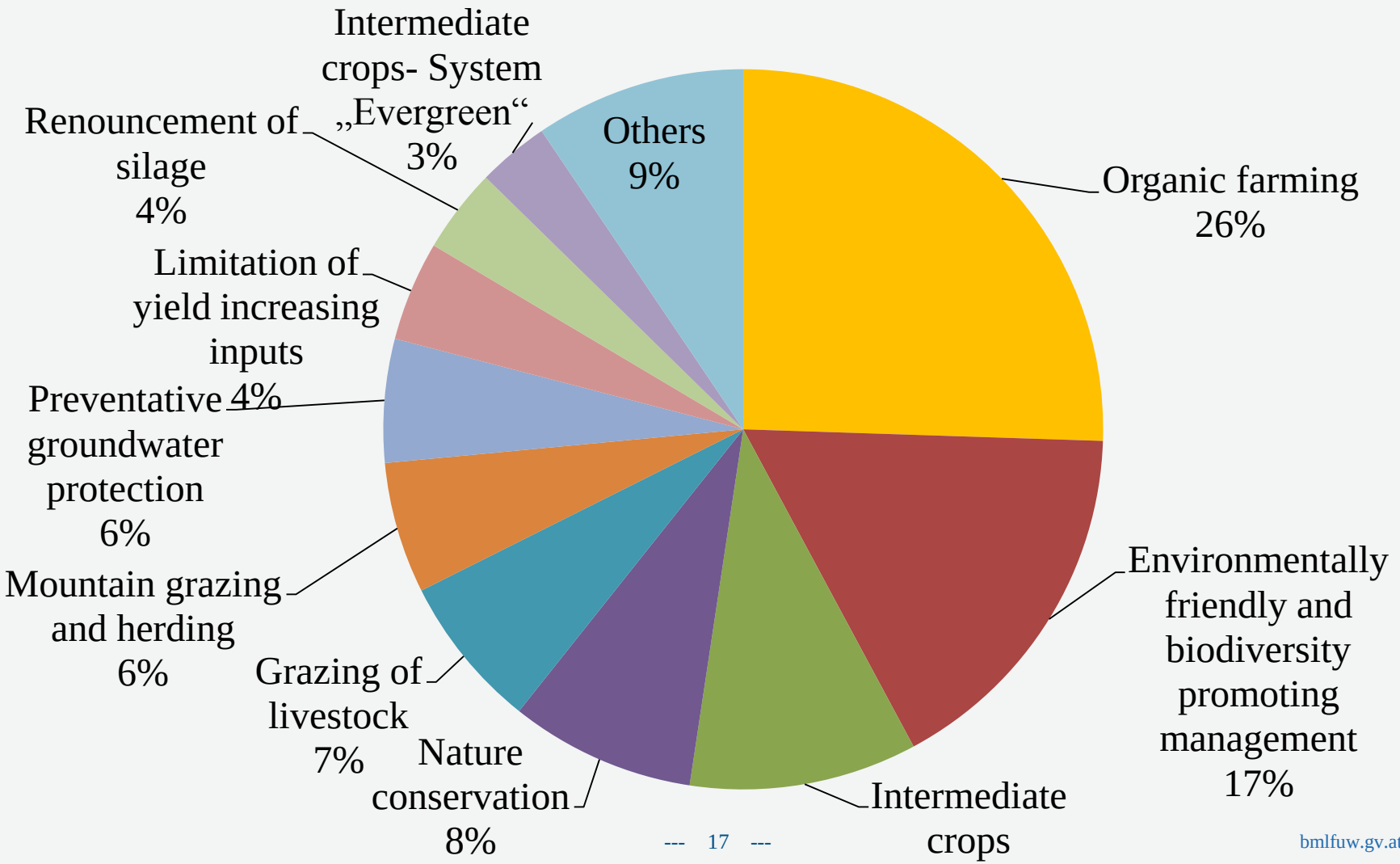
- **Managment of arable areas particularly threatened by leaching** → 450 €/ha
  - Establish a permanent green-cover on areas threatened by leaching
  - No fertilizers, no pesticides, no pasture
- **Preventative surface water protection on arable land** → 450 €/ha
  - Establish a permanent buffer strip next to flowing waters (min. 12m)
  - No fertilizers, no pesticides, no pasture



SHARE OF MEASURES ON ÖPUL 2015

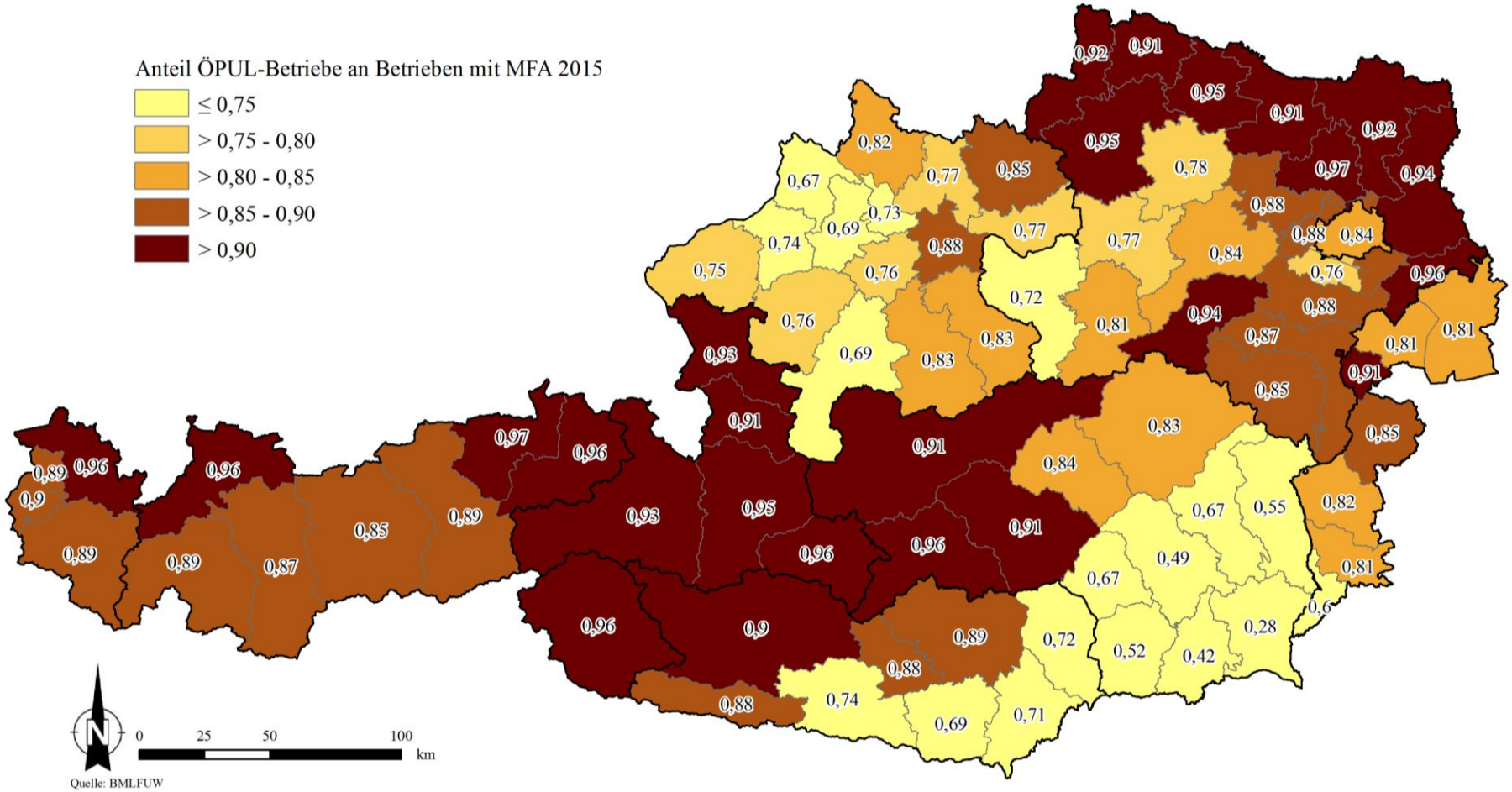
MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH

Payments total 382,7 Mio. Euro, ~4.200 Euro/farm, ~187 Euro/ha UAA



SHARE OF FARMS IN AECM-MEASURES

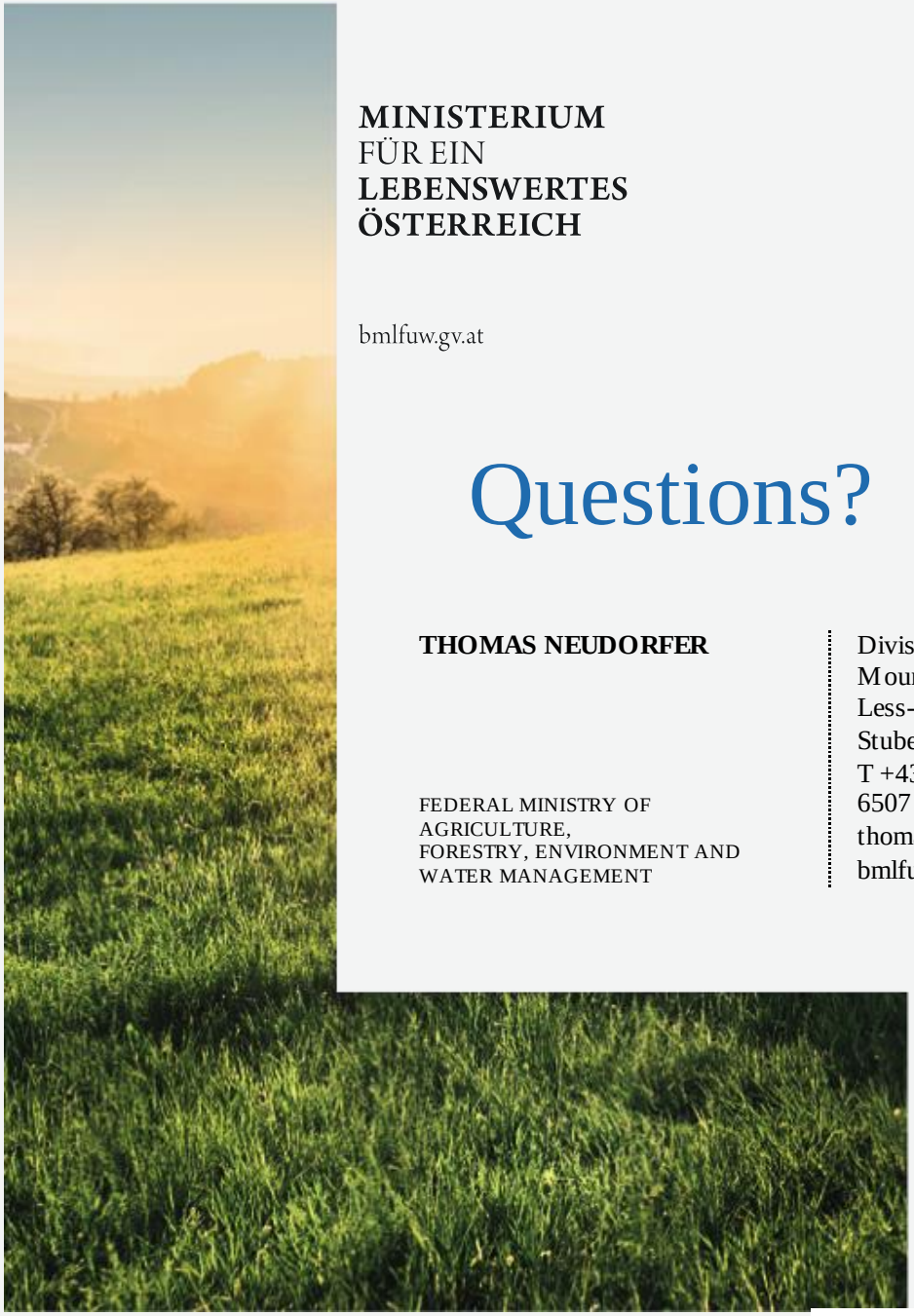
MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH



CONCLUSION AND OUTLOOK

MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH

- ÖPUL 2015 plays with a **participation rate over 80% of farms/area** an main role in preserve and promote agricultural practices that make a positive contribution to environment and climate
- **Broad measures** contribute to a broad environment effect all over Austria (e. g. organic farming, intermediate crops), **specific and focussed measures** for regions with environmental challenges are especially focussed on water protection and biodiversity
- **Higher legal requirements** and higher requirements in CAP I lower the possibilities for payments in CAP II
- participation rates in high productive areas are lower than in other regions –**challenge to include intensive farms and to minimize windfall gains**
- **Education trainings, awareness rising and specific project-measures** are important factors for a successful implementation, also to the implementation to new legal requirements



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Questions?

THOMAS NEUDORFER

FEDERAL MINISTRY OF
AGRICULTURE,
FORESTRY, ENVIRONMENT AND
WATER MANAGEMENT

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CROSS COMPLIANCE

IMPEL
Vienna, 03 October 2016
BMLFUW Ernst Semmelmeyer

STRUCTURE

MINISTERIUM
FÜR EIN
LEBENSWERTES
ÖSTERREICH

1. **ADMINISTRATION**

2. **CROSS COMPLIANCE**

ADMINISTRATION

MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH

INSTITUTIONS

Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW)

Agrarmarkt Austria (AMA)

Federal Provinces („Bundesländer“)

Chambers of Agriculture

ADMINISTRATION

MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH

TASKS

BMLFUW

- Legislative tasks
- Decisions of principle
- Representation at EU institutions
- Financing (Federal Budget)
- Supervisory

AMA

- Implementing authority for CMOs and rural development
- Price and market reporting
- Sales promotion

Federal Provinces

- Financing by the Federal Provinces (60/40 rule)
- Fundamental decisions
- Legislative tasks

Chambers of Agriculture

- Extension service
- Farmers
- Agricultural administration
- Participation in implementation of direct payments

ADMINISTRATION

MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH

Paying agency:

- Agrarmarkt Austria (AMA)

Control agencies:

- Agrarmarkt Austria (AMA)
- Federal Provinces (9)

Evaluation agencies:

- Agrarmarkt Austria (AMA)
- Federal Provinces (9)

CROSS COMPLIANCE - TASKS OF THE INSTITUTIONS II

MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH

The **Federal Provinces** control the following fields:

- **Food and Feed Safety** (Regulation 178/2002) (except for plant protection and biocides)
- **Animal welfare** (pigs, calves, farm animals)
- **Hormones Directive**
- **TSE Regulation** (Regulation 999/01; except for intra-Community trade in animals)
- **Notification of animal diseases** (only in the case of suspicion and outbreak)

CROSS COMPLIANCE - TASKS OF THE INSTITUTIONS III

MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH

AMA controls presently the following fields:

- **GAEC –** Good agricultural and ecological condition;
- **Nitrates Directive , Birds Directive, Habitats Directive,**
- **Cattle, pig, sheep and goat identification**
- **Food and feed safety** (Plant protection and biocides DOCUMENTATION Plant Protection Products/Biocides)

LIST OF STATUTORY REQUIREMENTS I

MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH

Statutory Management Requirements	
SMR 1	Protection of waters against pollution caused by nitrates
SMR 2	Conservation of wild birds (Birds Directive)
SMR 3	Conservation of natural habitats and of wild fauna and flora (Habitats Directive)
SMR 4	Principles and requirements of food law and food safety
SMR 5	Prohibition on the use in stockfarming of certain substances having a hormonal or thyrostatic action
SMR 6	Identification and registration of pigs

LIST OF STATUTORY REQUIREMENTS II

MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH

Statutory Management Requirements	
SMR 7	Identification and registration of bovine animals
SMR 8	Identification and registration of ovine and caprine animals
SMR 9	Prevention, control and eradication of certain transmissible spongiform enzephalopathies (TSE)
SMR 10	Placing of plant protection products on the market
SMR 11	Minimum standards for the protection of calves
SMR 12	Minimum standards for the protection of pigs
SMR 13	Minimum standards for animals kept for farming purposes

LIST OF GAEC STANDARDS

MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH

Good Agricultural and Environmental Condition	
GAEC 1	Establishment of buffer strips along water courses (Directive 91/676/EEC)
GAEC 2	Where use of water for irrigation is subject to authorisation, complicance with authorisation procedure
GAEC 3	Protection of ground water (Directive 80/68/EEC)
GAEC 4	Minimum soil cover
GAEC 5	Minimum land management
GAEC 6	Maintenance of soil organic matter level
GAEC 7	Landscape, minimum level of maintenance

MINISTERIUM
FÜR EIN
LEBENSWERTES
ÖSTERREICH

Thank you for your attention!

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1201 Wien

AgrarMarkt Austria

Cross Compliance (CC)
Nitrate

Study visit:
IMPEL, VIENNA 3.OCT 2016

AMA: Lidl

AgrarMarkt Austria

CC Control-System

Information for farmers

Identification of applicants for payments

Selection of the control sample

On the spot checks (Control Department) and administrative checks

Evaluation of the results of the on the spot checks

Reduction of payments in case of infringements

AgrarMarkt Austria

Headquarter-Vienna

- Specification of the content of the controls
- Content of the leaflet
- Definition of the control report
- Writing of the control handbook for the inspectors
- Coach the inspectors
- Evaluation of the different non-compliances

Control sample Nitrate 2015

About 1600 farmers selected

100 of them in areas with risk of high pollution

requirement:	**Number of infringement**
• Manure application	……23
• Crop-specific fertilisation limits	……14
• Storage for manure	……91
• Rules for temporary manure heaps	……77
• Periods of prohibition	……..3
• Prohibition concerning specific ground conditions	……2
• Rules for spreading on steeply sloping ground	……0
• Rules for spreading near water courses	……3

administrative check

administrative check for the requirement “Manure application: Limit of 170 kg N / hectare “

Database: area aid appplication of the previous year and database of bovine

- Calculation of the whole agriculturally used area
- Calculation of the Sum of N-content with deep straw
- Information letter to the farmers (provisional result)
- Feedback from the farmers (contract “transfer of manure”,…)
- recalculation Limit of 170 kg N / hectare
- Reduction of payments in case of infringements

administrative check

Results of the administrative check **2014**: “Limit of 170 kg N / hectare “

- Main unit: 102.000 claimants
- 574 Farmers received an information letter
  (provisional result > 170 kg N / hectare)
- Number of infringements after Feedback: 174

AgrarMarkt Austria

Control Department

Duties of an inspector:

- Investigate facts only
- Explain report, processing and findings
- Give no information about consequences
- No consulting
- Never turn a blind eye on something!

AgrarMarkt Austria

NITRATE

EU Legislation:
Directive 91/676/EWG

Austrian Legislation:
Nitrataktionsprogramm 2012
- no vulnerable zones designated
- applicable to the entire Austrian territory

Requirements:
9 requirements defined for the on-the-spot checks (9 since 1.4.2016, prior to that date 8 requirements)

NITRATE

1. **Requirement:**
   Manure application: Limit of 170 kg N / hectare

2. **Requirement:**
   Crop-specific fertilisation limits
   dependent on crop yield (low/middle/high)

3. **Requirement:**
   Storage for manure
   - Sufficient storage
   - for new storage a tightness certificate (constructed > 31.12.2004 or rebuilded > 5.12.2012)

NITRATE

4. **Requirement:**

Rules for temporary manure heaps

- the distance to surface waters > 25 m
- no entry of manure effluent into waters
- not on water-saturated or sandy soil
- for at least 3 months matured
- relocation after 8 or 12 month
- no temporary manure heaps of laying hen

NITRATE

5. Requirement:

Periods of prohibition

overview periods of prohibition		
period	type of fertilizer	affected area
15. October - 15. February	chemical fertilizer, slurry, liquid manure, sewage sludge	whole agriculturally used area without permanent pasture
30. November - 28. February		permanent pasture
30. November - 15. February	manure, compost, dewatered sewage sludge, sewage sludge compost	whole agriculturally used area

NITRATE

6. Requirement:
Prohibition concerning specific ground conditions

There is a prohibition to spreading

- water-saturated
- frozen
- flooded
- snow-covered ground

NITRATE

7. Requirement:
Rules for spreading on steeply sloping ground

Cultivation with maize, potato and/or sugar beet

- slope >10 % within de range of 20 meters to water courses
- parcel > 1 ha (within the alpine area)

– horizontal stripe seed

– a 20 m planted swath between watercourse and arable land

– cultivation across the slope

– planted during the winter

AgrarMarkt Austria

NITRATE

8. Requirement:

Rules for spreading near water courses

	slope	minimum distance		
		rule	All-season Overgrown stripe	Direkt injecting equipment
standing water	<= 10 %	20 m	10 m	10 m
	> 10 %	20 m	20 m	20 m
Streaming water	<= 10 %	5 m	2,5 m	2,5 m
	> 10 %	10 m	5 m	5 m

NITRATE

9. Requirement:

Dokumentation of the application of feritilizer (farm level)

- depending on agricultural area
- record the information of the previous year:
  - Areas under agricultural use and amount of firtilizer applied
  - Amount of Manure (N) produced based on own farm stocks
  - transfer of manure
  - Crop needs (N)

NITRATE

1. Requirement:

Control 170 kg N-limit/ha from manure

1. Calculation of the whole agriculturally used area

Example:

A farmer has an extent of areas in sum of 11,46 ha

1 Grassland, 4 uses, less than 40 % legume: 6,64 ha
2 Grassland, 4 uses, 40-80 % legume: 0,54 ha
3 Maize for silage fodder (FM): 4,28 ha

AgrarMarkt Austria

NITRATE

2. Calculation of the N-content of all animals on the farm

Example: A famer has

Animal species	no	System with deep straw – N-content, annex 4 of NAP	Sum of N-content with system with deep straw	System with slurry – N-content, annex 4 of NAP	Sum of N-content with system slurry
Calves – 6 month	4	10,4	41,6 kg N		
Cattles (6-12 month)	11	28,4	312,4 kg N		
Cattles (12-24 month)	7	37,5	262,5 kg N		
Cattles (12-24 month)	8			45,6	364,8 kg N
Heifers (>24 month)	2			58,9	117,8 kg N
Dairy cows (5000 kg milk)	17			74,4	1264,8 kg N
Sum 1			**616,5 kg N**		**1747,4 kg N**

AgrarMarkt Austria

NITRATE

3. Assessment of the transfer of manure

Example: There exist a contract that the famers sell 450kgN slurry of cattles:

Animal species	no	Sum of N-content with system with deep straw	Sum of N-content with system slurry
Sum 1		616,5 kg N	1747,4 kg N
Transfer of manure		---	- 450 kg N
Sum 2		**616,5 kg N**	**1297,40 kg N**

AgrarMarkt Austria

NITRATE

4. Calculation of the compliance with the 170-kg limit

Sum 3: 616,5 kg N + 1297,40 kg N = 1913,90 kg N

1913, 93 kg N / 11,46 ha = **167,007 kg N / ha → < 170 kg N-limit from manure**

→ therefore he is in compliance with the nitrate action programme

AgrarMarkt Austria

NITRATE

2. Requirement:

Crop-specific fertilisation limits dependent on crop yield

5. Calculation with the factors for loss during application

Animal species	no	Sum of N-content with system with deep straw	Sum of N-content with system slurry
Sum 2		616,5 kg N	1297,40 kg N
Loss for application: 13 % for slurry and 9 % for deep straw bedding manure		Minus 9 %	Minus 13 %
Sum 4		561,02 kg N	1128,74 kg N

AgrarMarkt Austria

NITRATE

6. Calculation of fertilizer used

If the farmer uses fertilizers than this can be controlled with invoices or documentations about every parcel he handles.

Example:

Name of fertilizer	Amount in kg	% of N-content	Used kg N
Linzer Star	2250	15 %	337,5 kg N

AgrarMarkt Austria

NITRATE

7 Calculation considering effectivity

Animal species	no	Sum of N-content with system with deep straw	Sum of N-content with system slurry
Sum 4		561,02 kg N	1128,74 kg N
Effectivity of N in one year: slurry 70%, deep straw 50 % (national limit)		Minus 50 %	Minus 30 %
Sum 5		280,51 kg N	790,12 kg N

Cattle deep straw bedding manure:
effectivity of N = 50 %: 561,02 x 0,5 = 280,51 kgN
Cattle slurry system: effectivity of N = 70 %: 1128,74 x 0,7 = 790,12 kgN
Fertilizer: effectivity of N =100 %: 337,5 kg N

In sum: 280,51 kg + 790,12 kg +337,5 kg N = 1408,13 kg N in one year

AgrarMarkt Austria

NITRATE

8. N-demand of the crops

Crops	ha	Yield	N-demand - annex 3 of the NAP (table 2 and 3)	Sum of maximum N-demand possible
Grassland, 4 uses, less than 40 % legume	6,64	Middle	200 kg N / ha	1328,00 kg N
Grassland, 4 uses, 40-80 5% legume	0,54	Middle	150 kg N / ha	81,00 kg N
Maize for silage fodder (FM)	4,28	middle	175 kg N / ha	749,00k Ng
sum				**2158,00 kg N**

AgrarMarkt Austria

NITRATE

9. Assessment and calculation N-content of preceding crops

If there would be any preceding crops (legume) than it is necessary to decrease the N-demand

Example with national limits:
crop residues of perennials legume (40 kg)
horse bean (20 kg), ….

10. Calculation of the N demand of the whole farm

Because in our example we have not the influence of preceding crops the N-demand of the whole farm is
2158,00 kg N (as calculated in point 8)

NITRATE

11. N-balance

N from manure and fertilizer:	1408,13 kg N
N-demand:	2158,00 kg N
N-balance:	-749,87 kg N

→ The farmer has given less N from manure and fertilizers as possible, therefore he is in compliance with the nitrate action programme.

NITRATE

3. Requirement:

Control of the Storage Capacity

Storage capacity: 6 month
Exception: 3 month when
- livestok unit smaller than 30 and (since 2015 less then 1800kg N)
- there is a temporary manure heap

Datebase:
Annex 1 of the nitrate action programme
Annex 2 of the nitrate action programme

AgrarMarkt Austria

NITRATE

Annex 1

Animal species	Livestock unit
Calve (- 6 month)	0,30
Cattle (6- 24 month)	0,60
Cattle (> 24 month)	1,00
Dairy cow (5000 kg)	1,00

AgrarMarkt Austria

NITRATE

Annex 2

Quantity of manure for 6 month in m^3 animal species	Slurry	System of solid/liquide manure		Deep straw bedding manure
		Solid manure	Liquid manure	
Calve (- 6 month)	1,3	0,8	0,7	1,7
Cattle (6- 12 month)	3,4	1,8	1,7	3,9
Cattle (12-24 month)	5,8	3,0	2,9	6,2
Heifers (> 24 month)	7,7	3,8	3,8	8,2
Dairy cow (5000 kg)	11,5	7,4	3,8	11,9

AgrarMarkt Austria

NITRATE

Example	Nr.	Quantity of manure for six month in m^3	Livestock unit
Calve (- 6 month)	4	Deep straw x 1,7 = 6,8	x 0,3 = 1,2
Cattle (6- 12 month)	11	Deep straw x 3,9 = 42,9	x 0,6 = 6,6
Cattle (12-24 month)	7	Deep straw x 6,2 = 43,4	x 0,6 = 4,2
Cattle (12-24 month)	8	Slurry x 5,8 = 46,4	x 0,6 =4,8
Heifers (> 24 month)	2	Slurry x 7,7 = 15,4	x 1 = 2
Dairy cow (5000 kg)	17	Slurry x 11,5 = 195,5	x 1 = 17

NITRATE

Evaluation of the whole quantity of manure and the livestock unit

Manure	Quantity of manure for six month in m^3	Livestock unit
Slurry	257,3 m^3	---
Deep straw bedding manure	93,10 m^3	---
Sum	---	35,8

NITRATE

Storage capacity for 6 month is necessary

1 Purchase or selling of manure
No reduction of the capacity, when selling only in summer

2 Capacity on farm for slurry: 307,1 m^3
307,1-257,3 = **+ 49,8**

3 Capacity on farm for deep straw bedding manure : 270 m^3
270-93,10 = **+176,9**

Dresdner Straße 70
Postfach 62
1201 Wien

AgrarMarkt Austria

Thank you!

Groundwater protection in Lower Austria

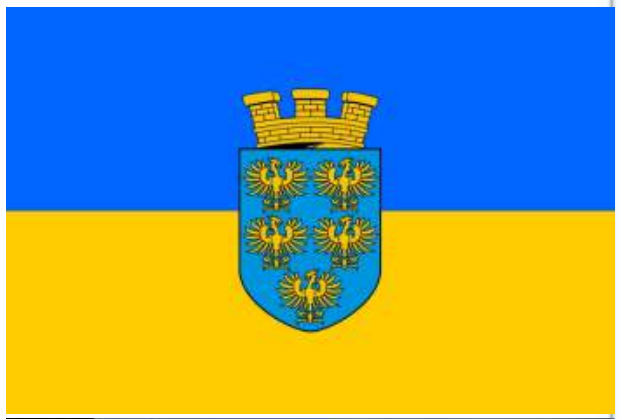
Stefan Rakaseder

03.10.2016

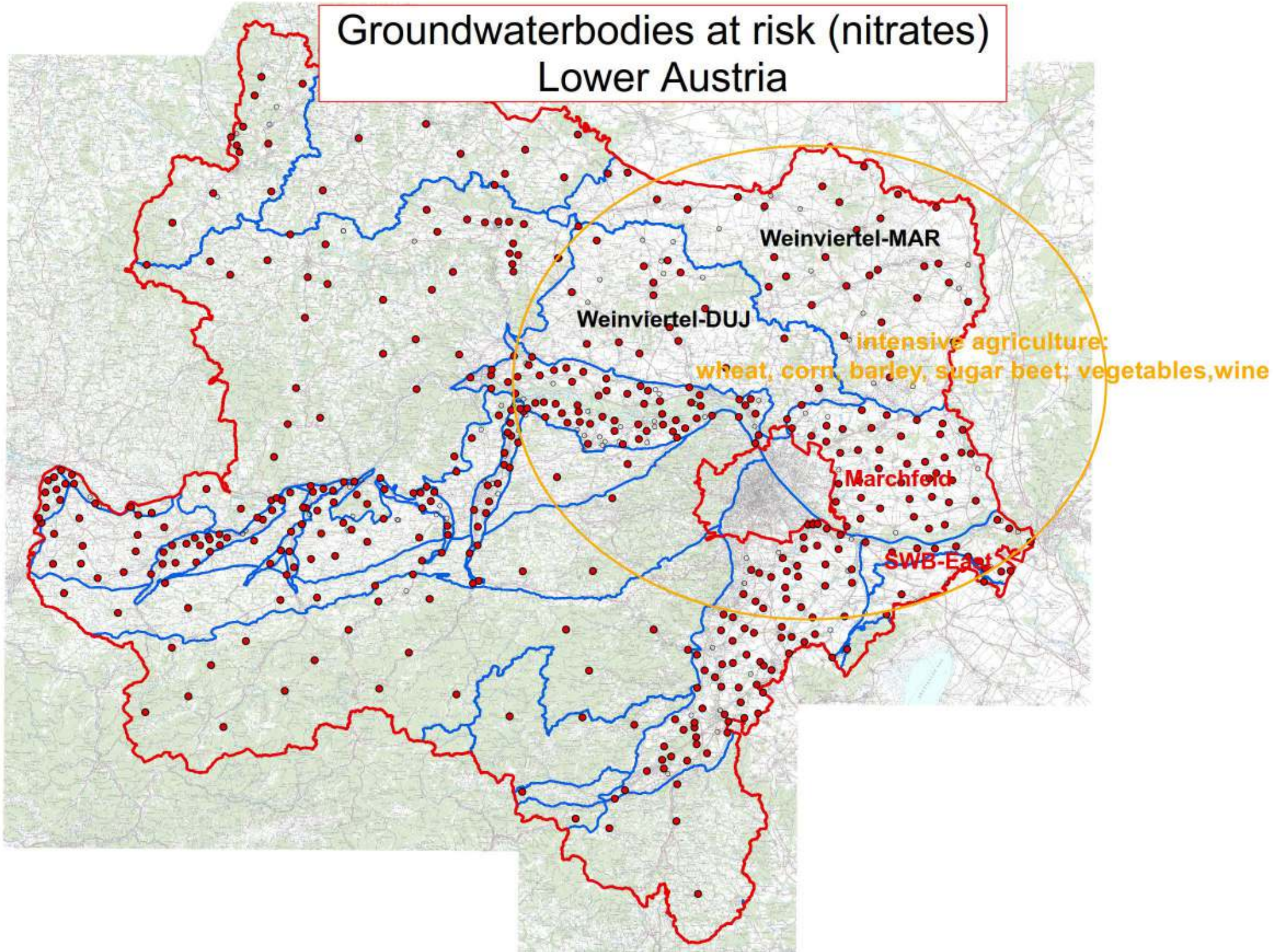
L0WER AUSTRIA

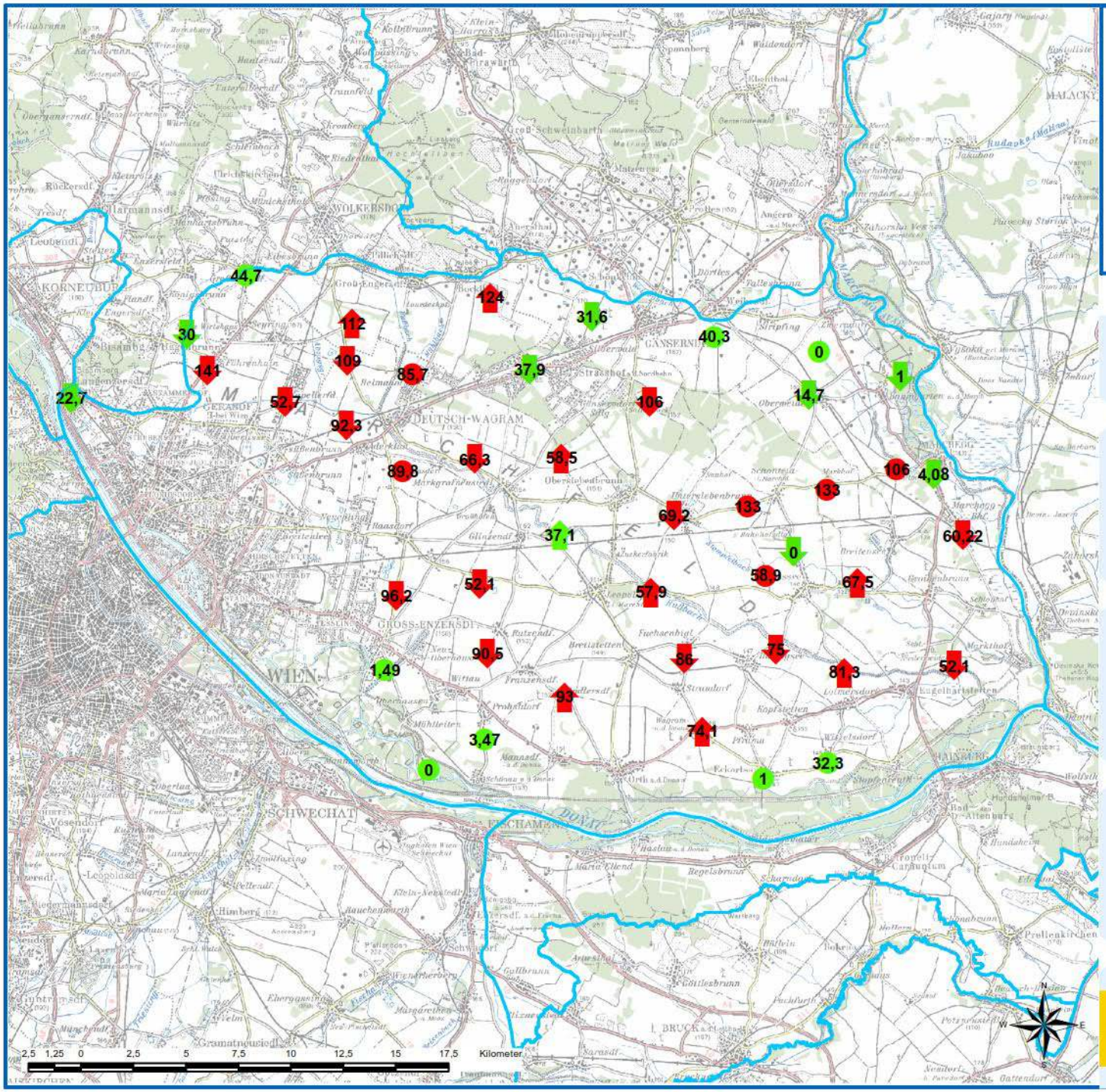
- 19.000 km^2
- 1,600,000 inh.

Capital: St. Pölten



www.**wasser**ist**leben**.at


Groundwaterbodies at risk (nitrates)
Lower Austria
Weinviertel-MAR
Weinviertel-DUJ
intensive agriculture:
wheat, corn, barley, sugar beet; vegetables,wine
Marchfeld
SWB-East



Legende

- weniger als 45 mg/l
- zwischen 45 und 50 mg/l
- mehr als 50 mg/l
- Trend fallend
- Trend steigend
- kein Trend
- zu wenige Werte
- Grundwasserkörper

Quellen: BEV, Gruppe L, 1080 Wien u. Amt d. NÖ Landesreg., 3109 St. Pölten

wasser niederösterreich
WA2 Wasserwirtschaft

Trendauswertung Nitrat

- Marchfeld [DUJ]

Beurteilungszeitraum:
1. Quartal 2010 bis 4. Quartal 2015

Zu Messstellen angezeigt:
Letzter Nitratwert

Dabei sind Werte mit „0“ kleiner als
- die Bestimmungsgrenze
- die Nachweisgrenze

Stand: März 2016
Bearbeiter: Manfred Schmidt

AMT DER NIEDERÖSTERREICHISCHEN LANDESREGIERUNG
Gruppe Wasser - Abteilung Wasserwirtschaft
A-3109 St. Pölten, Landhausplatz 1
Tel.: +43/2742/9005-14271, Fax: +43/2742/9005-14090
post.wa2@noel.gv.at www.wasseristleben.at

Regional groundwater protection examples Lower Austria

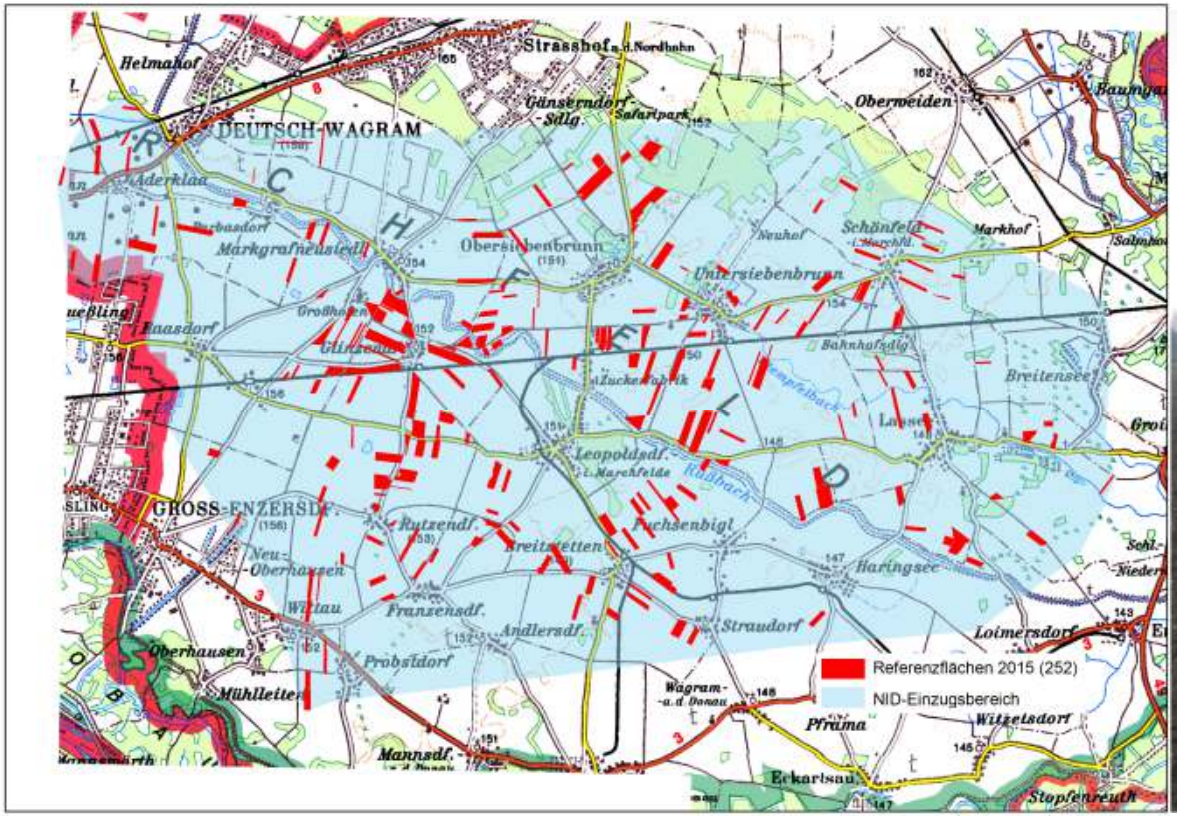
- Nitrate information service (www.nid.at)
- Monitoring of nitrogen fluxes in the Marchfeld
- Evaluation of agricultural measures regarding Nitrate-development in groundwater
- Cooperation water management - agriculture

Nitrate information service (NID)

- Project (2002): Department of Water Management, chamber of agriculture, evn water: greatest water supplier of Lower Austria; Burgenland
- Service to farmers to adapt nitrogen fertilization to actual levels of mineral nitrogen in soils focused on important areas of agricultural production (~groundwaterbodies at qualitative risk)
- Reduction of fertilizer application without any decline of harvest → reduction of nitrogen surplus → improvement groundwater quality

Nitrate information service (NID)

- Nmin soil analysis: 0-30, 30-60, 60-90 cm (february) on representative agricultural areas



Nitrate information service (NID)

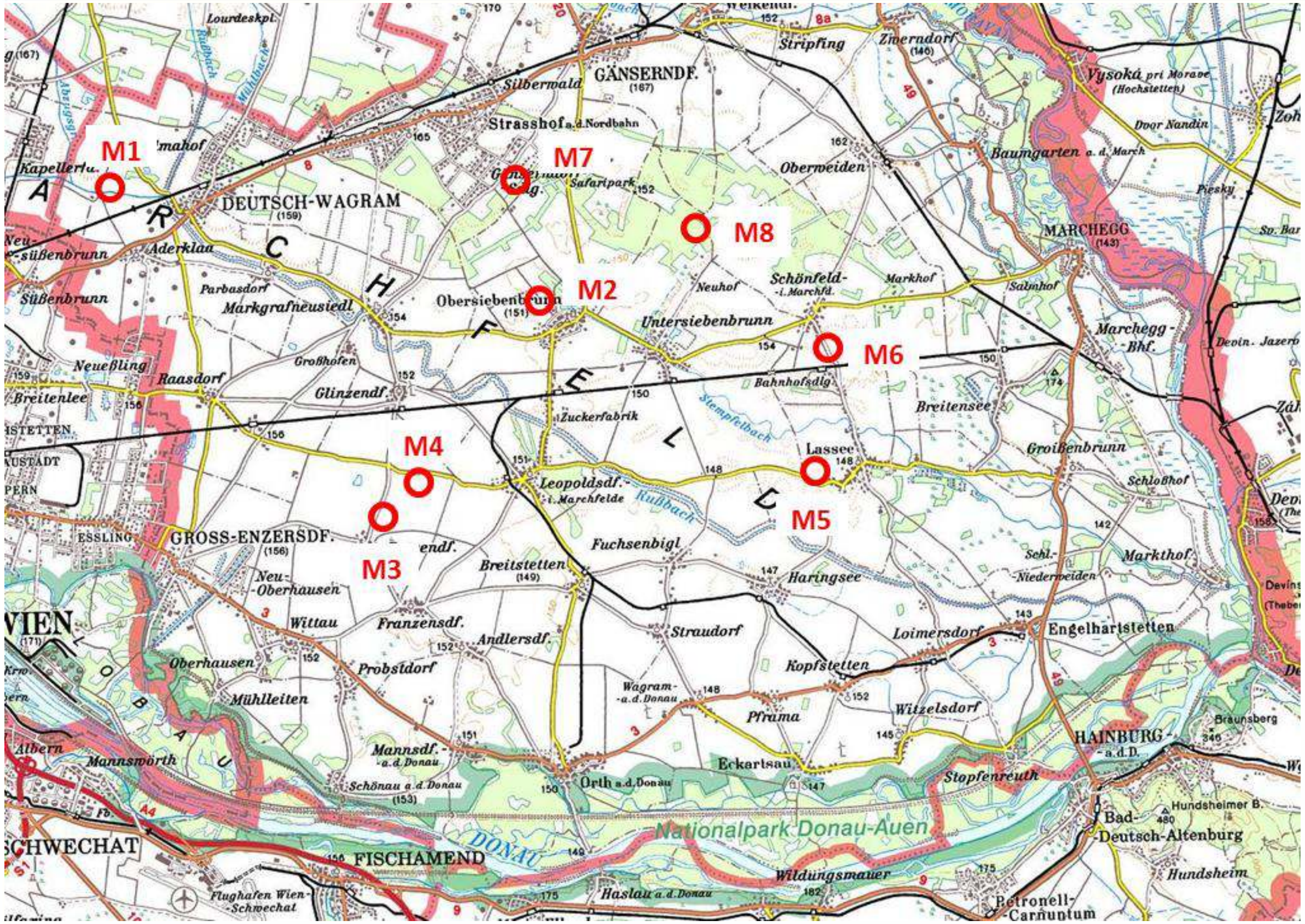
- Nmin+Informations of former fertilization and crops →
- Recommendation of amount of N-fertilizer for the most important regional crops: wheat, corn, barley, potato
- Example: general fertilization recommendation for wheat of 110 kg N/ha – Nmin (30 kg N/ha) = actual recommendation of 90 kg N/ha
- Win-win situation: less fertilizer - less costs - less groundwater contamination

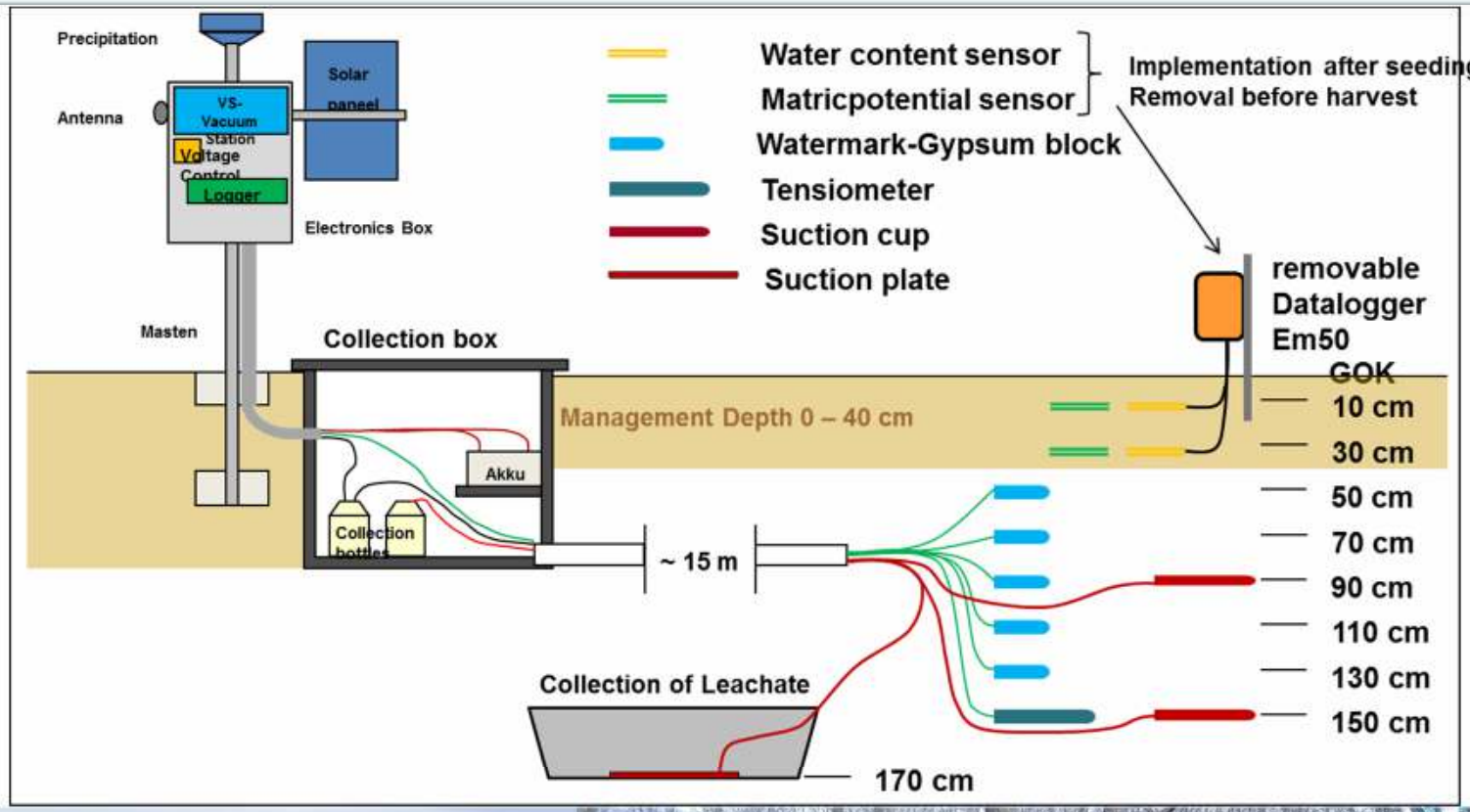
Nitrate information service (NID)

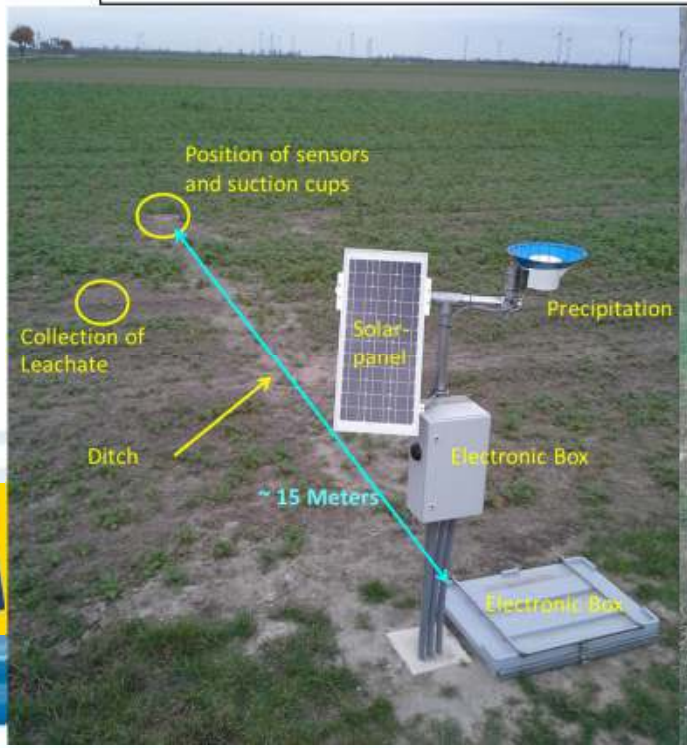
- NID also includes recommendations of later N-fertilization based on chlorophyll testing of leaves (wheat, barley)
- www.nid.at; sms; publications of the chamber of agriculture; obligatory agricultural training events

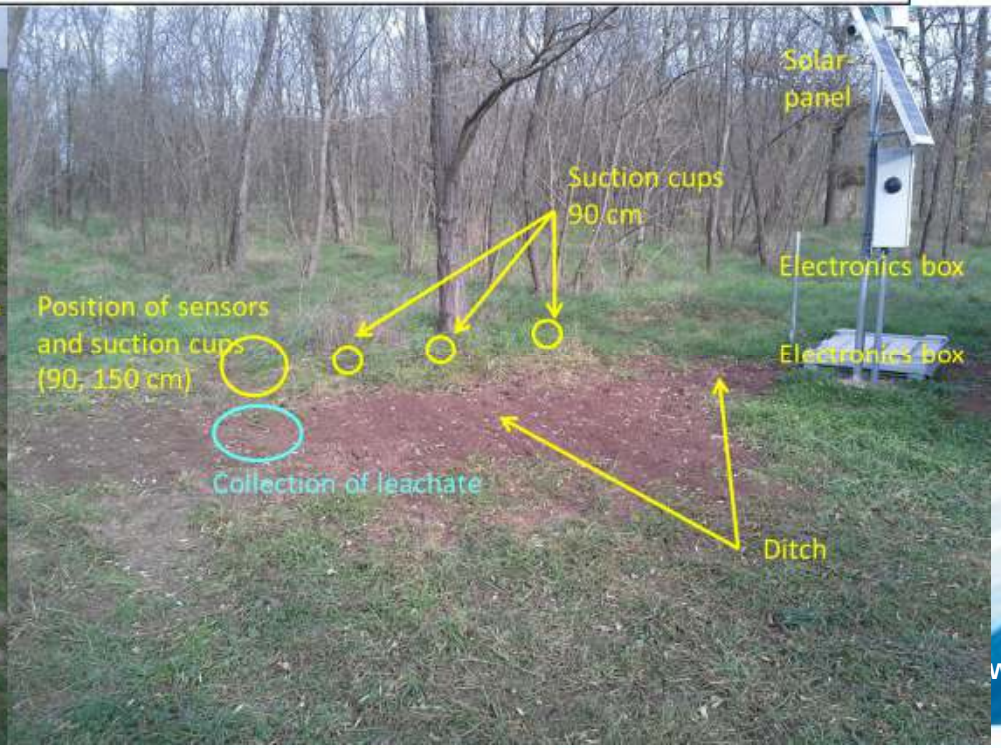
Monitoring of nitrogen fluxes in the Marchfeld region

- Dept. of Water Management (LA), Chamber of agriculture (LA), BMLFUW; 2015-2019
- Identification of potential agricultural management measures to reduce nitrate concentrations in groundwater
- Status quo: collection of soil water leachate + full documentation of agrarian management + monitoring of plant growth, yields and nutrient contents


M1
M2
M3
M4
M5
M6
M7
M8
GÄNSERNDF.
Strasshof a.d.Nordbahn
DEUTSCH-WAGRAM
MARCHFELD
GROSS-ENZERSDF.
WIEN
SCHWECHAT
FISCHAMEND
Nationalpark Donau-Auen
DONAU
MARCHEGG
HAINBURG
Leopoldsdf.
Untersiebenbrunn
Obersiebenbrunn
Lassee
Breitstetten
Orth a.d.Donau
Eckartsau
Engelhartstetten
Deutsch-Altenburg
Petronell-Carnuntum
Markgrafneusiedl
Glinzendf.
Raasdorf
Aderklaa
Süßenbrunn
Haringsee
Straudorf
Franzensdf.
Andlersdf.
Probstdorf
Wittau
Mühlleiten
Mannsdf.
Witzelsdorf
Stopfenreuth
Pframa
Kopfstetten
Loimersdorf
Breitensee
Schönfeld
Oberweiden
Baumgarten a.d. March
Zwerndorf
Stripfing
Silberwald
Groißenbrunn
Schloßhof
Markthof
Fuchsenbigl
Zuckerfabrik
Wildungsmauer
Haslau a.d.Donau
Flughafen Wien-Schwechat


Precipitation
Antenna
VS-Vacuum Station
Voltage Control
Logger
Solar panel
Electronics Box
Masten
Collection box
Akku
Collection bottles
~ 15 m
Collection of Leachate
170 cm
Water content sensor
Matricpotential sensor
Watermark-Gypsum block
Tensiometer
Suction cup
Suction plate
Implementation after seeding
Removal before harvest
removable Datalogger Em50
GOK
Management Depth 0 – 40 cm
10 cm
30 cm
50 cm
70 cm
90 cm
110 cm
130 cm
150 cm


Position of sensors and suction cups
Collection of Leachate
Ditch
Solar-panel
Precipitation
Electronic Box
~ 15 Meters
Electronic Box

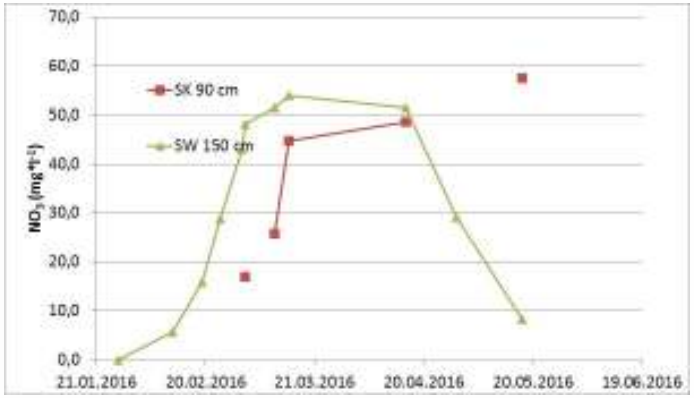

Solar-panel
Suction cups 90 cm
Electronics box
Electronics box
Position of sensors and suction cups (90, 150 cm)
Collection of leachate
Ditch

FIRST RESULTS

Nitrate concentrations

M1 Aderklaa; Arable- shallow soil

M2 Obersiebenbrunn; Arable deep soil



M6 Schönfeld; Bio – vegetable – shallow soil.

M5 Lassee; Bio - vegetable deep soil

Catch Crop 2015 M3

Beans 2015 M6

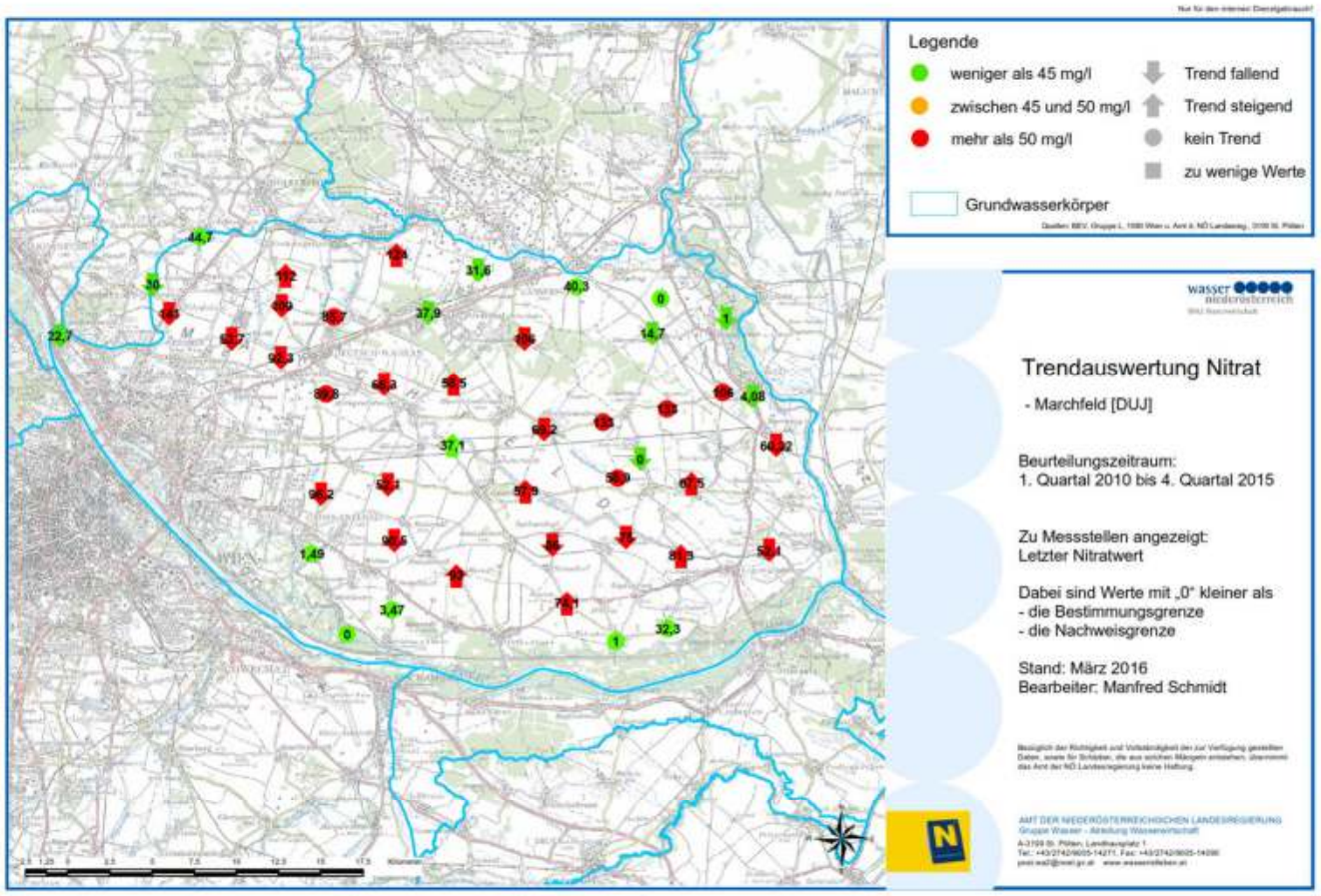
Survey of agricultural management

- **Type of crop, breed**, time of planting, harvesting, yield
- **Mineral fertilization**, Date, Amount, Type, Nutrient contents
- **Organic fertilization**, Date, Amount, Type, Nutrient contents
- **Soil Management**, Date, Type, Depth
- **Irrigation**, Date, Amount(mm), Nutrient Content

Next steps

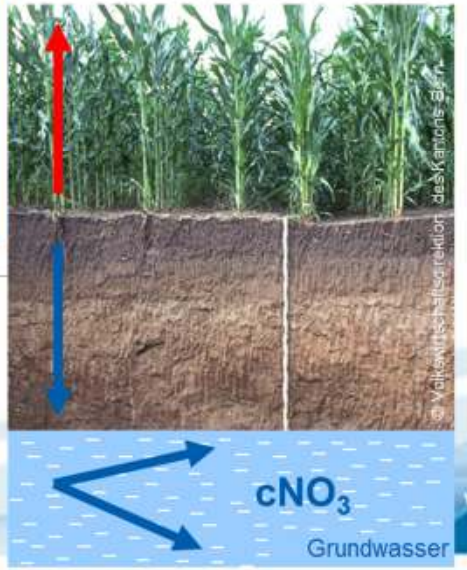
- Expert panel elaborates based on the obtained (2015-2016) data effective and really implementable agricultural measures in order to reduce N-input into groundwater
- Testing of measures on fields and necessary changes of measures
- Presentation of effective measures as best practice examples
- Basis for revision of national (ÖPUL) and regional measures

Evaluation of agricultural measures regarding Nitrate development



Groundwater model Marchfeld:

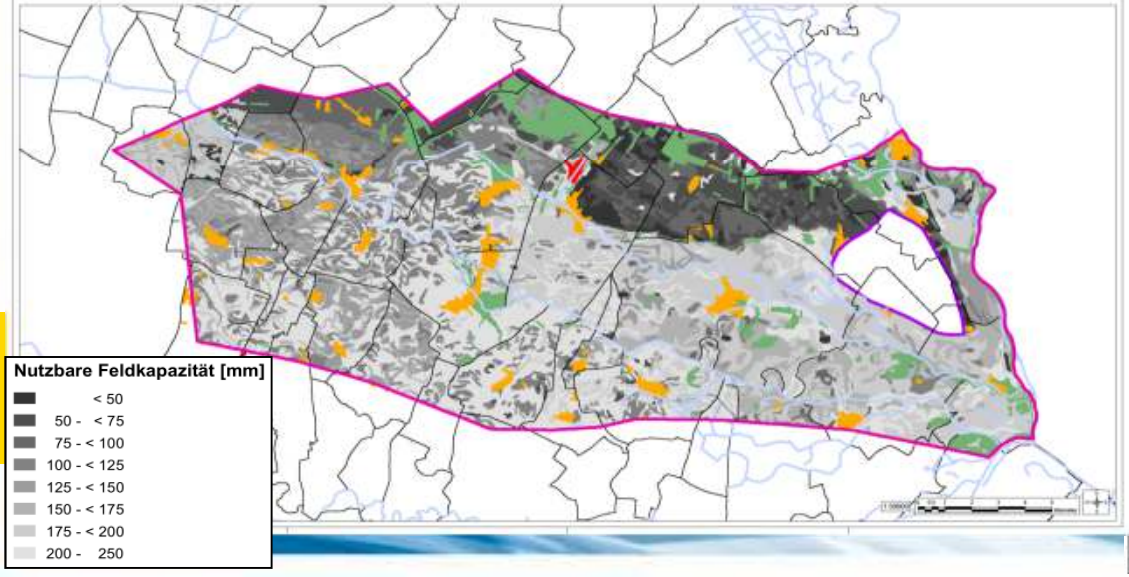
Soil water movement and nitrogen leaching model SIMWASSER/STOTRASIM +2D FEFLOW groundwater



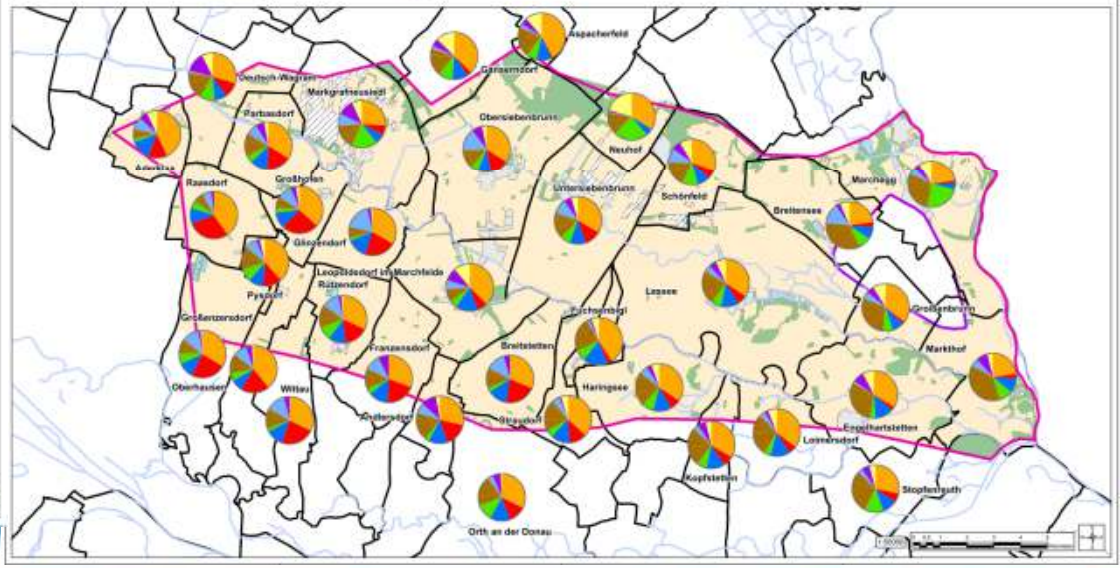
Model parameters

- Meteorological and hydrological parameters
- Soil types, landuse, crop distribution and rotation, irrigation
- Scenarios: extensification, minimum tillage, maximum greening, reduction of fertilizer

Soil types (available water capacity) and landuse



Agriculture (crop distribution)



Landwirtschaftliche Maßnahmen Marchfeld

Karte:
Differenz Variante 4 zu IST-Zustand
Ungesättigte Zone - Stickstoffaustrag

AMT DER NIEDERÖSTERREICHISCHEN LANDESREGIERUNG
Gruppe Wasser - Abteilungen Wasserwirtschaft und Hydrologie
Landhausplatz 1, 3109 St. Pölten
Abteilung Wasserwirtschaft - Tel.: +43/2742/9005-14271
Abteilung Hydrologie - Tel.: +43/2742/9005-12685
post.wa2@noel.gv.at bzw. post.wa5@noel.gv.at

Projektbearbeitung:
JOANNEUM RESEARCH Forschungsgesellschaft mbH
RESOURCES - Institut für Wasser, Energie und Nachhaltigkeit
Elisabethstrasse 18/II, 8010 Graz
Projektleitung: Univ.-Doz. DI Dr. Hans Kupfensberger
2013

Kartenlegende:
- Modellgebiet
- Katastralgemeinden
- Schlesshofer Platte

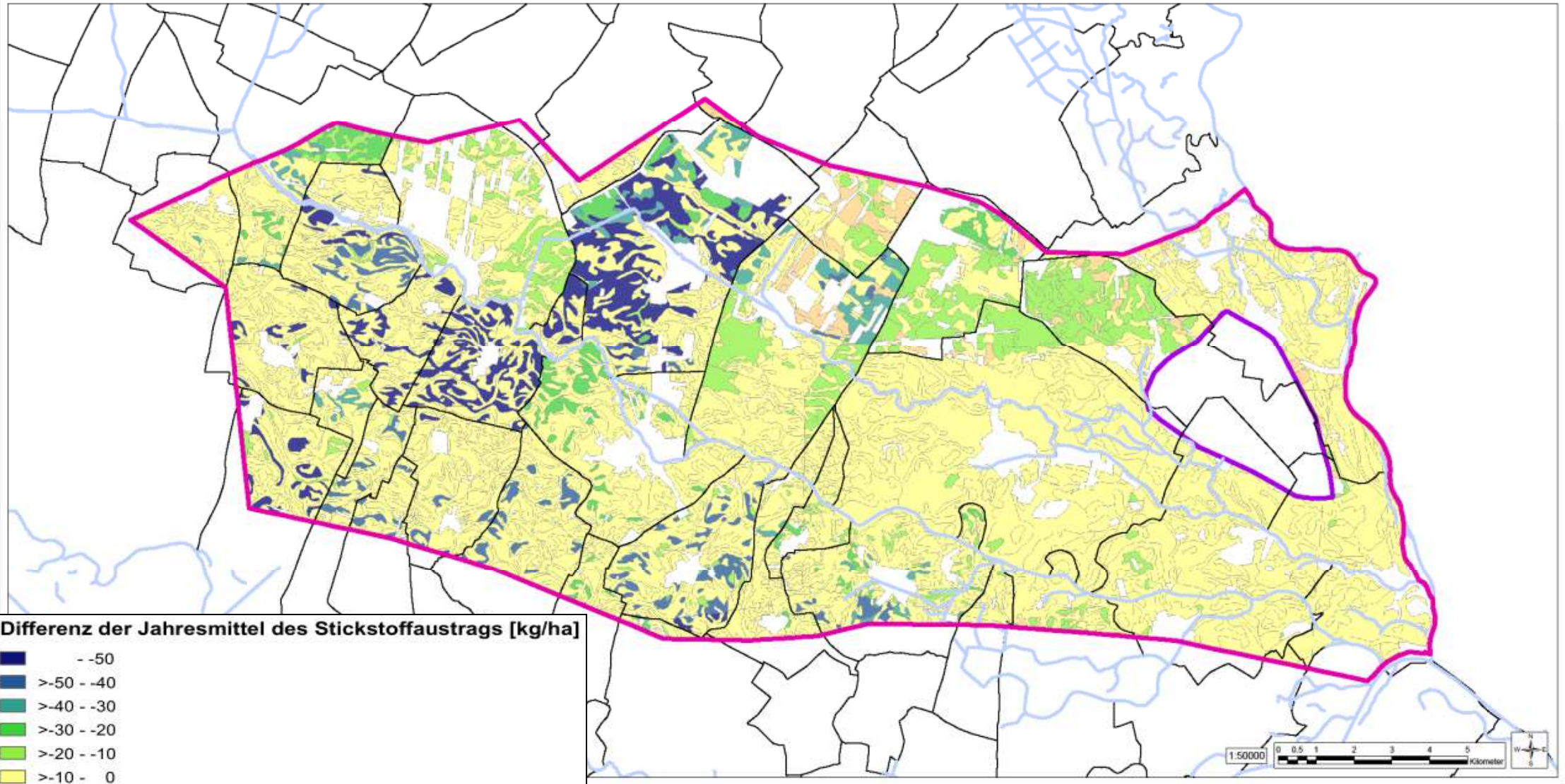
Differenz Variante 4 zu IST-Zustand
Differenz der Jahresmittel des Stickstoffaustrags [kg/ha]
- -68 bis -50
- -50 bis -40
- > -40 bis -30
- > -30 bis -20
- > -20 bis -10
- > -10 bis 0
- > 0 bis 4

Topographische Kartengrundlage: BUNDESAMT FÜR EICH- UND VERMESSUNGSWESEN
Digitales Höhenmodell 5 x 5 m: AMT DER NIEDERÖSTERREICHISCHEN LANDESREGIERUNG

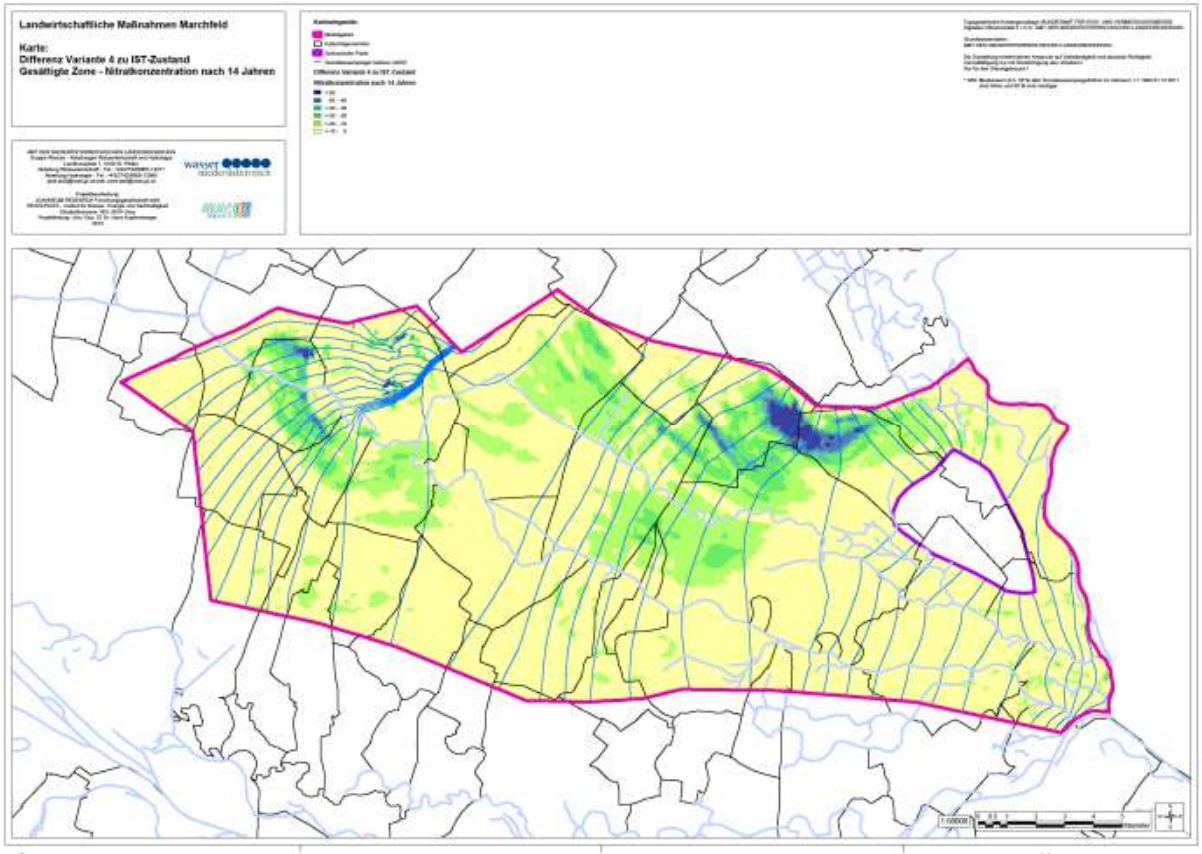
Grundwasserdaten:
AMT DER NIEDERÖSTERREICHISCHEN LANDESREGIERUNG

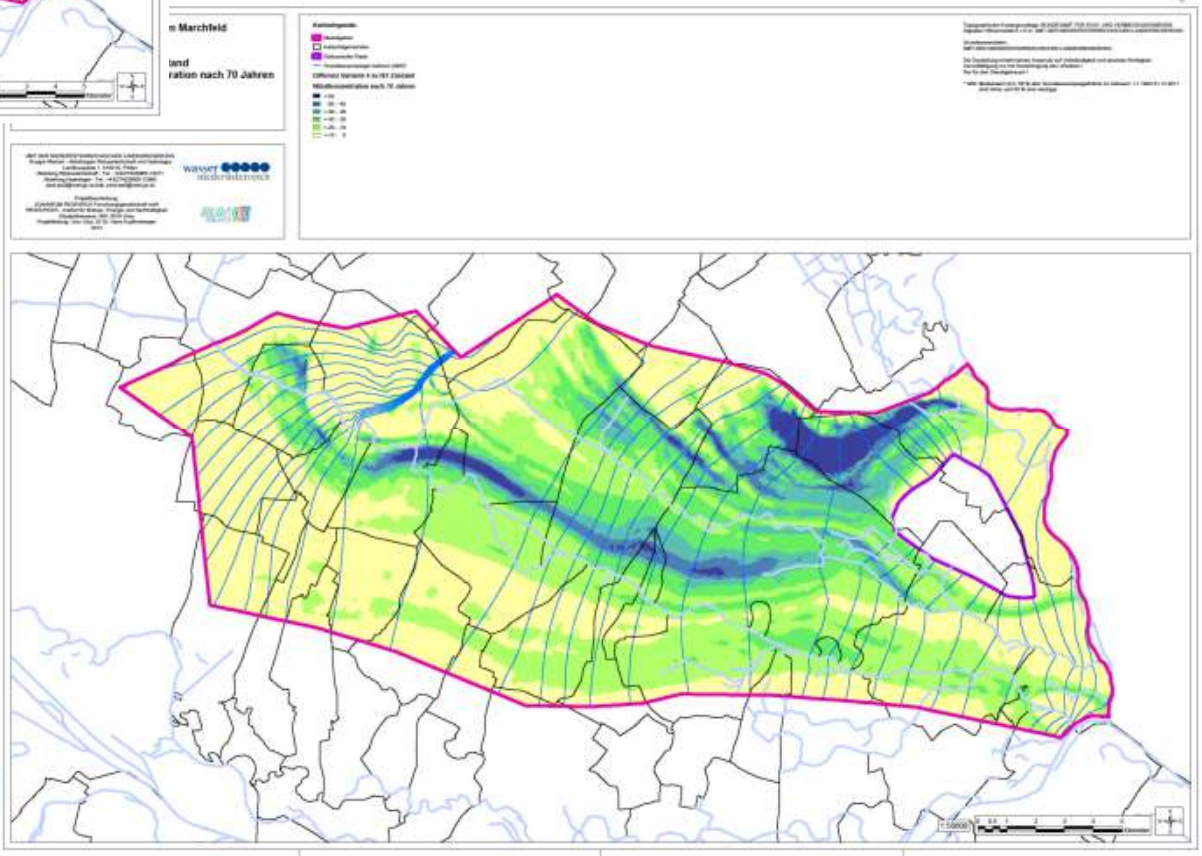
* Q50: Medianwert (d.h. 50 % aller Grundwasserspiegelhöhen im Zeitraum 1.1.1993-31.12.2011 sind höher und 50 % sind niedriger.

Maximum Greening: difference (-kg/ha) of N-discharge to status quo



Nitrate distribution in groundwater after 14 and 70 y with the scenario maximum greening; difference (-mg/l) to status quo evolution





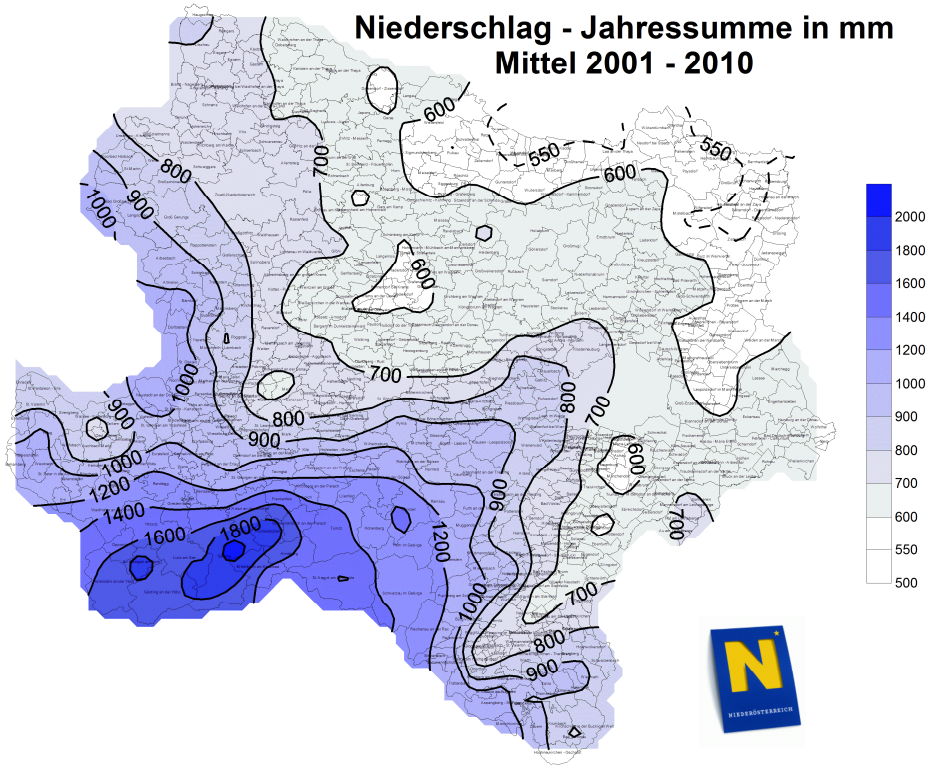
Results:

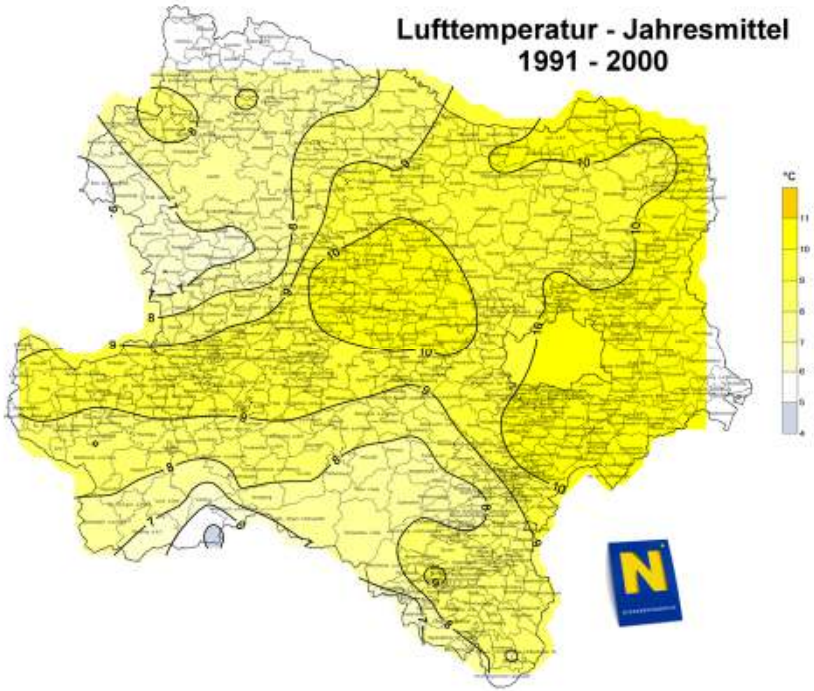
- **Extensification** (areas >25 kg N/ha discharge; ~19% of total area) most effective method to reduce nitrate concentration in groundwater
- **Maximum greening** (wherever in crop rotation possible) and **reduction of fertilizer** (AP Nitrate: recommendation from high earnings to average earnings) are less effective.
- **Minimum tillage** has no significant influence on the N-discharge
- Results as basis for revision of national (ÖPUL) and regional measures to reduce N-input into groundwater

Cooperation water managment - agriculture

- Project partner
- Mutual awareness raising
- Program of education (theory and practice!) for the farmers (seminars, field days, agricultural publications,..)

Thank you


Niederschlag - Jahressumme in mm
Mittel 2001 - 2010
500
550
600
700
800
900
1000
1200
1400
1600
1800
2000


Lufttemperatur - Jahresmittel
1991 - 2000
°C

Erich M. Pötsch

AREC Raumberg-Gumpenstein &

University of natural resources and life sciences, Vienna

Research activities at

AREC Raumberg-Gumpenstein

-from forage plant breeding to climate change experiments

IMPEL-meeting

Vienna, October 2016

Basic data/facts about AREC Raumberg-Gumpenstein

Federal Research Institute & Federal Agricultural College

- annual budget of ~18 Mio. €
- ~330 employees (including 55 teachers and educators for 450 students)
- 320 ha agriculturally used land
- ~35 ha experimental fields
- livestock: 240 cattle (100 dairy cows),
  320 sheep and goats,
  250 pigs

Institute of Livestock Research

Dep. Animal nutrition

- nutrient mobilization of dairy cows
- feed intake, digestibility (in vivo) and degradability (in situ and in vitro) of feed stuff
- influence of protein and energy supply on milk yield, rumen and blood parameters of dairy cows

⇒ excretion rate and nutrient concentration of manure (EU-nitrate directive, Austrian action programme, national fertilization guidelines)

Dep. Alternative cattle production systems and herd management

- extensively managed beef suckler cows
- ecological and economic effects of extensive grassland management systems

Dep. Sheep and goats

- economic parameters of sheep and goat breeding
- sheep and goats for meat production

Institute of Animal Welfare and Animal Health

Dep. Stable climate and animal welfare

- Development and evaluation of ventilation systems
- analysis of stable climate
- reduction of NH_3-emissions from stable houses

Dep. Agricultural engineering

- testing grassland management techniques
- reduction of NH_3-emissions from agriculture during manure storage and application

Dep. Animal husbandry

- animal-friendly housing systems
- assessment of farm animal welfare
- interactions between housing systems & animal health

Institute of Organic Farming and Biodiversity

- **Dep. Organic grassland management and livestock research**
- **Dep. Organic arable farming**
- **Dep. Preventive animal health**
- **Dep. Biodiversity of livestock**
- **Dep. Legislative activities in organic farming (Austria and EU)**




Institute of Plant Production and Cultural Landscape

Dep. Environmental ecology

- plant physiology and root morphology
- soil nutrient budget, soil aggregate stability
- quantity and quality of leachate via lysimeter experiments

suction cups

leachate collectors

gravitation lysimeter

weighable monolith lysimeter

Institute of Plant Production and Cultural Landscape

Dep. Grassland management and cultural landscape

field experiments, field studies:

- **fertilisation & utilisation**
- **forage conservation**

Fertilisation & utilisation experiments

- **mineral and organic fertilizers, sewage sludge, biogas slurry, plant ash ….**
- **in combination with different cutting frequency (1-6 cuts/year)**
- **well documented long-term experiments (yield, forage quality, floristic diversity, soil)**

⇒ N-efficiency of manure on permanent grassland (slurry, liquid slurry, solid farm manure, composted farm manure)
⇒ short term and long term effects on water, soil, soil fertility and botany

⇒ long-term Experimentes are still/again of interest in terms of climate change (retrospective view), long-term effects of fertilizers and different treatments (compared to unfertilized reference plots) and for other specific investigations, e.g.

Long-term Experiments – projects & publications

„Natural ^{15}N abundance of plants and soils under different management practices in a montane grassland” (WATZKA ET AL., 2006)

„Langzeitversuche im Grünland - mehr als nur ressourcenzehrende Nostalgie?“ (PÖTSCH ET AL., 2015)

„Soil microbial carbon use efficiency and biomass turnover in a long-term fertilization experiment in a temperate Grasland“ (SPOHN ET AL., 2016)

„Influence of nitrogen ferilization on the crude protein fractions of grassland forage“ (GIERUS ET AL., 2016)

„Effect of different N, P, K fertilization on plant species composition and species richness in an alluvial meadow“ (PAVLU ET AL., 2016)

„Variability, manipulation and prediction of ecosystem services in European long-term grassland experiments in relation to functional diversity“ (AREC & UNIVERSITY OF BONN)

„Functional analysis of non-symbiotic N-fixing microbes under contrasting environments“ (WOEBKEN ET AL., IN PRINT)

Forage conservation experiments

- **>60 silage experiments at AREC Raumberg-Gumpenstein since 1962 (small scaled tower silos – 250l, barrels – 60l preserving jars – 1l)**
- **main focus on:**

  silage additives (salts, acids, enzymes, bacteria), vegetation stage, cutting height, compaction level, chopping length, forage contamination, silage systems …)
- **Austrian-wide monitoring (> 3,700 silage samples) to evaluate silage and hay quality (chemical analysis, microbial status, sensorial evaluation)**
- **identification of problematic areas on farms – feedback – knowledge transfer**
- **increase of forage quality!**

Climate change experiments (I)

ClimGrassEco

“Impact of future climate conditions on biogeochemistry of grassland ecosystems”

- **worldwide unique, innovative combination of four technical systems:**

monolithe lysimeters

+

infrared heaters

+

mini FACE

+

rainout shelters

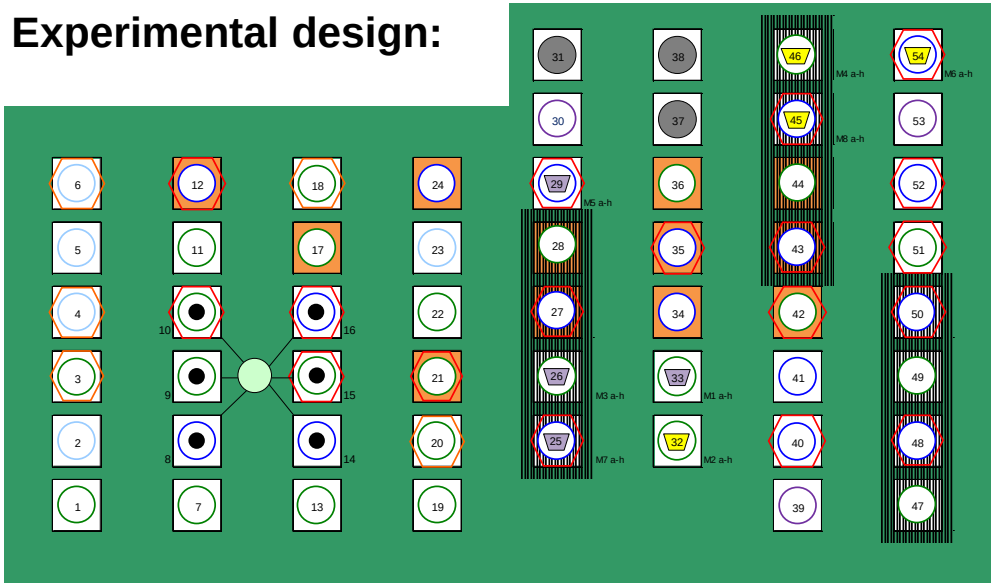
Multi-factorial outdoor experiment on grassland with a variation and combination of:

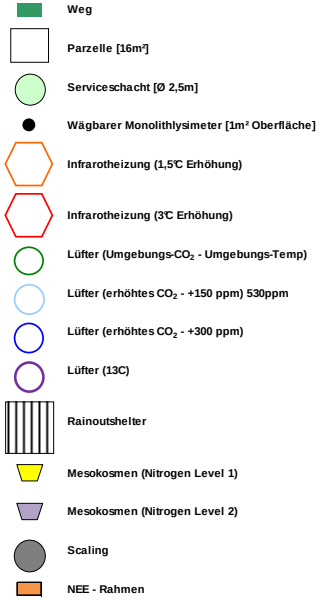
- **temperature (ambient, + 1.5℃, +3.0℃)**
- **CO_2-concentration (ambient, + 150 ppm, + 300 ppm)**
- **precipitation (simulation of heatwaves/drought periods)**
- **N-level (by mesocosm-experiments on selected plots)**

Climate change experiments (II)

ClimGrassEco

Experimental design:





54 plots

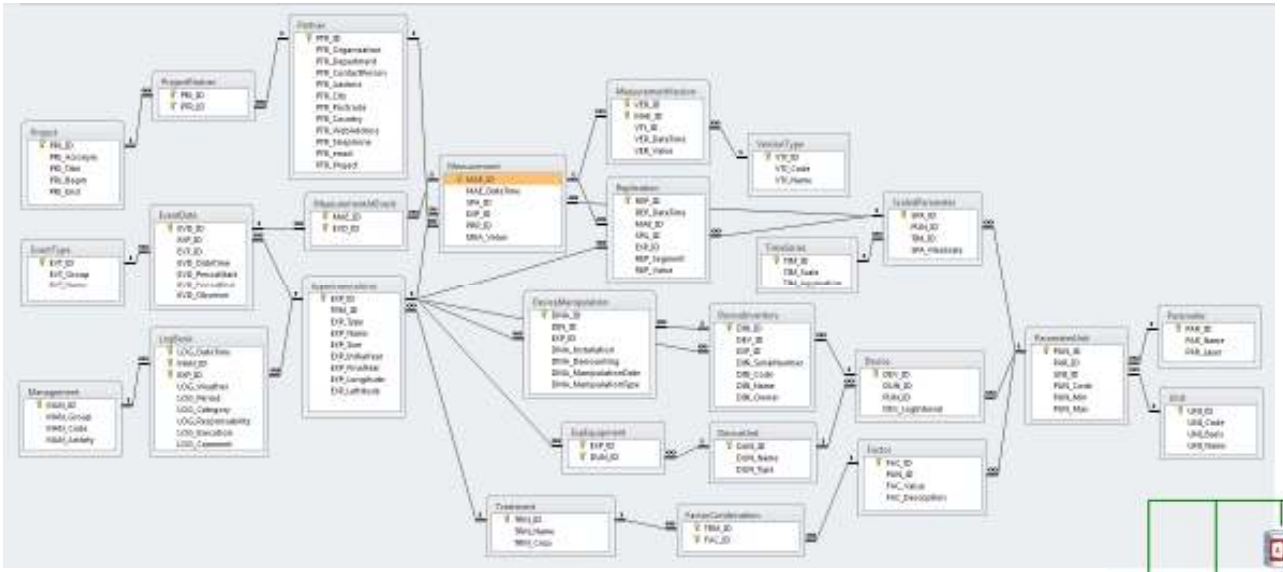
plot size: 16 m²

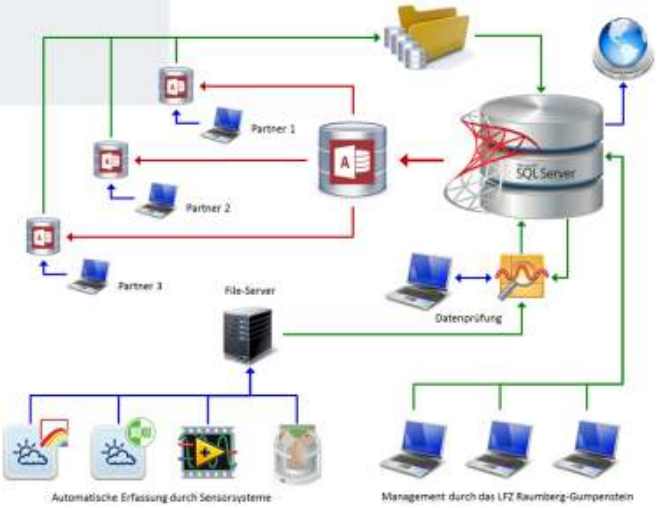
- **all plots are individually controlled** *(LabView/National Instruments)*
- **the regulation of temperature and CO_2-concentration is based on a subset of reference plots**
- **dimmers and CO_2-controllers switch in intervals of 5 ms**
- **technique is placed in a field container**

Climate change experiments (III)

ClimGrassEco

Data management:





- **complex data base system**
- **automated sensor data transfer (lysimeters, weather stations, microsensor ..) ≈40,000 data/day**
- **+ data from invasive and non-invasive analysis, surveys**
- **raw data are tested for plausibility, consistancy and completeness**
- **data analysis, visualisation**

Climate change experiments (IV)

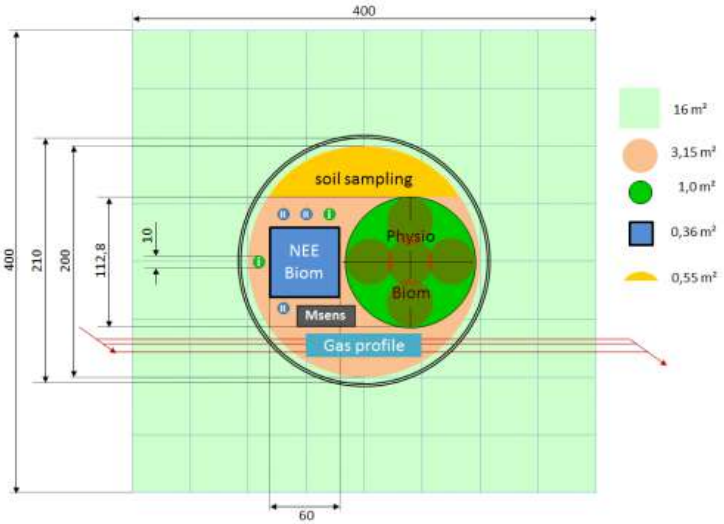
plant surveys

leaf area index

vegetation stage

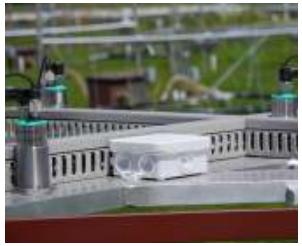
soil and plant respiration

ultrasonic technique



gas profile in soil

invasive harvest



respiration chamber

non-invasive analysis by field spectroscopy

IMPEL – EXCURSION

MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH

FIRST DAY - 4th OCTOBER

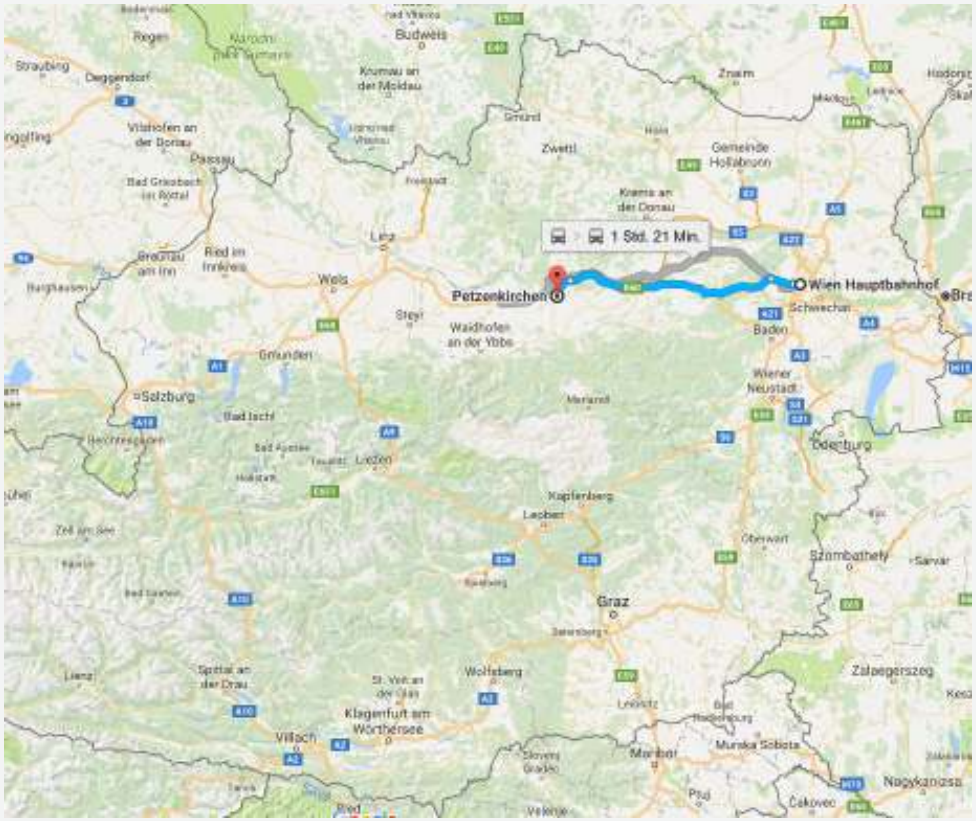
Departure from Hotel by Bus at **7:30 a.m.**

- Bus will wait in front of the Hotel from 7:15 on

1st Station (9-11 a.m.):

Federal Agency for Water Management – Institute for Land and Water Management Research (IKT)

- Institution associated to BMLFUW
- Research institution for sustainable surface water and groundwater protection
- Strong collaboration with University of Technology Vienna (Doctoral programme)



IMPEL – EXCURSION

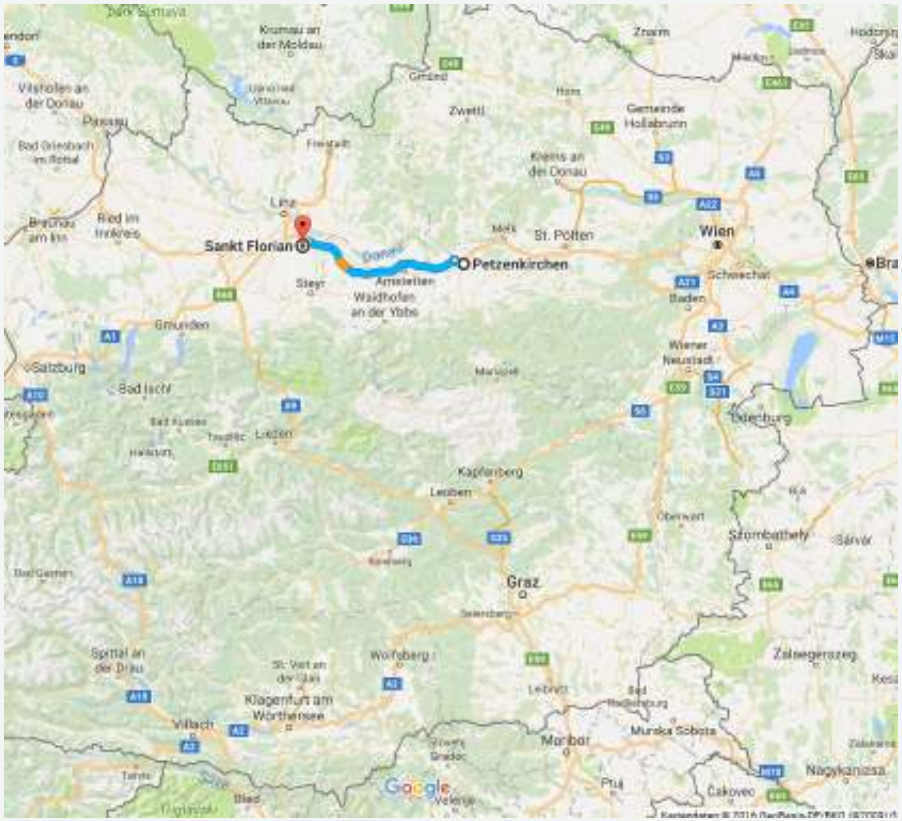
MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH

FIRST DAY - 4th OCTOBER

2nd Station (12- 4 p.m.):

HLBLA St. Florian (College of Agriculture) - associated to BMLFUW

- *Lunch*
- Meeting with colleagues of
  - **Regional government of Upper Austria** – Water Management Unit
  - **Chamber of Agriculture Upper Austria** – Boden.Wasser.Schutz.Beratung
- Site visit to experimental plot (catch crop cultivation)
- Visit to farm nearby HLBLA (participating agro-env. program ÖPUL)



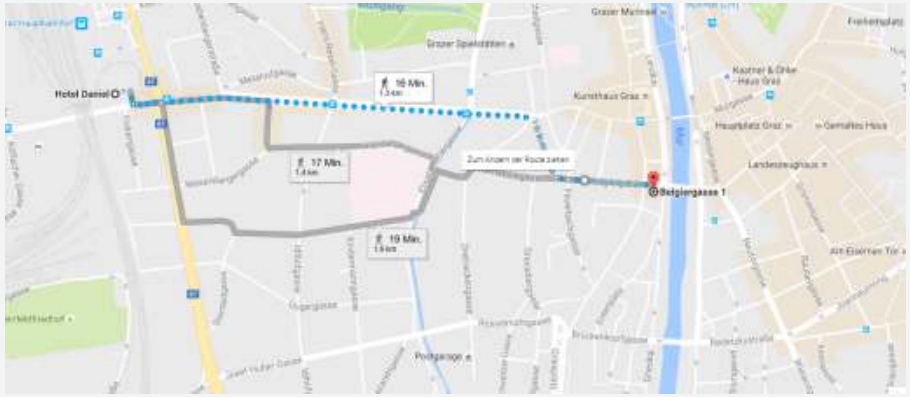
IMPEL – EXCURSION

MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH

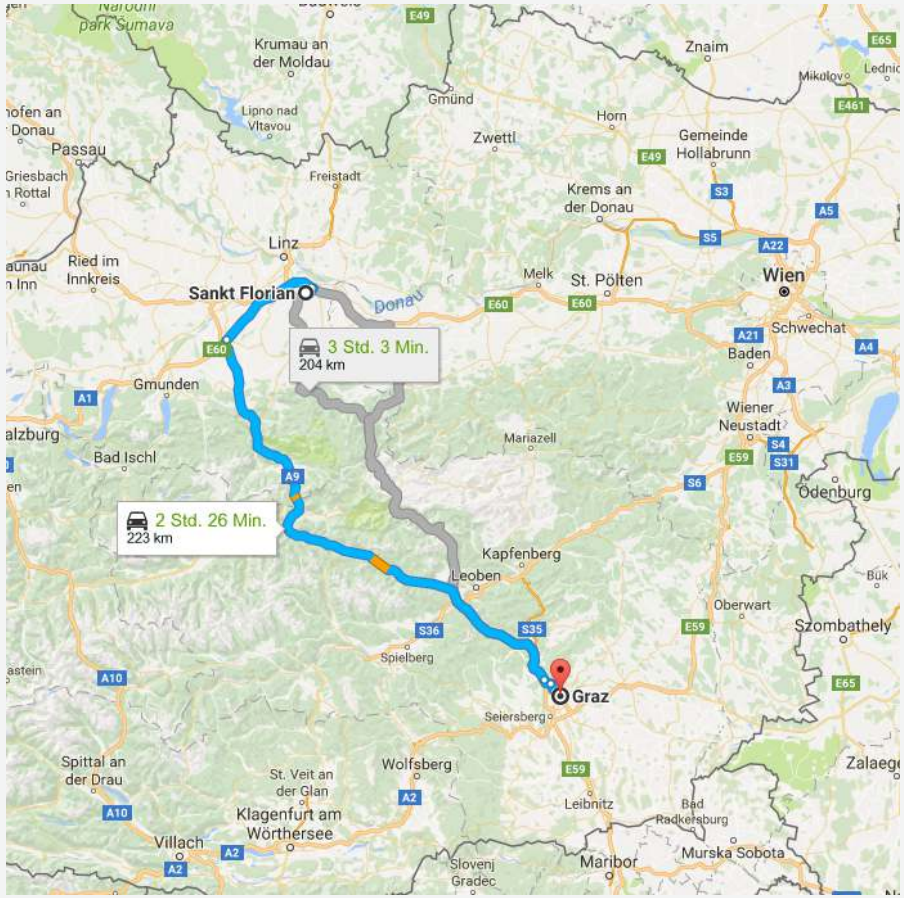
FIRST DAY - 4th OCTOBER

Bus travel to Graz (4-7. p.m.)

Expected arrival at Hotel Daniel in Graz at 7 p.m.



Joint Dinner at **8 p.m.**
Restaurant „Der Steirer“
Address: Belgiergasse 1



IMPEL – EXCURSION

MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH

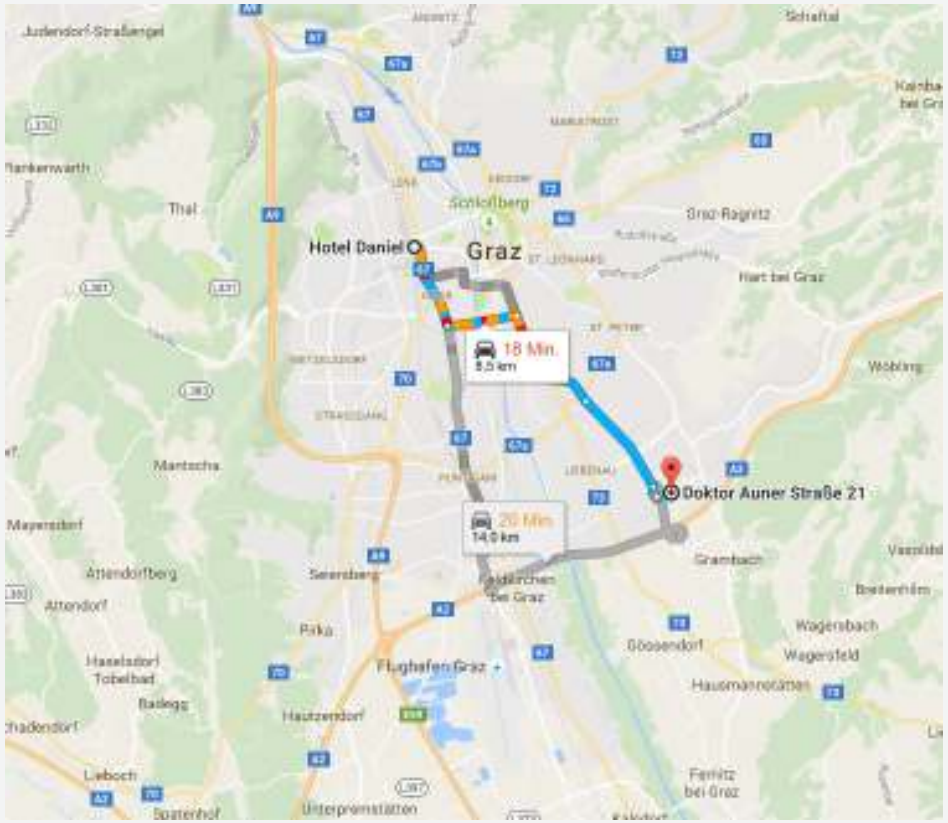
SECOND DAY - 5th OCTOBER

Departure from Hotel at **8 a.m.**

1st Station (8:45-10 a.m.):

Regional Office of Maschinenring Steiermark

- Meeting and Discussion with colleagues from
  - **Regional government of Styria** – Water Management Unit
  - **Maschinenring Steiermark**
  - **Joanneum Research**



IMPEL – EXCURSION

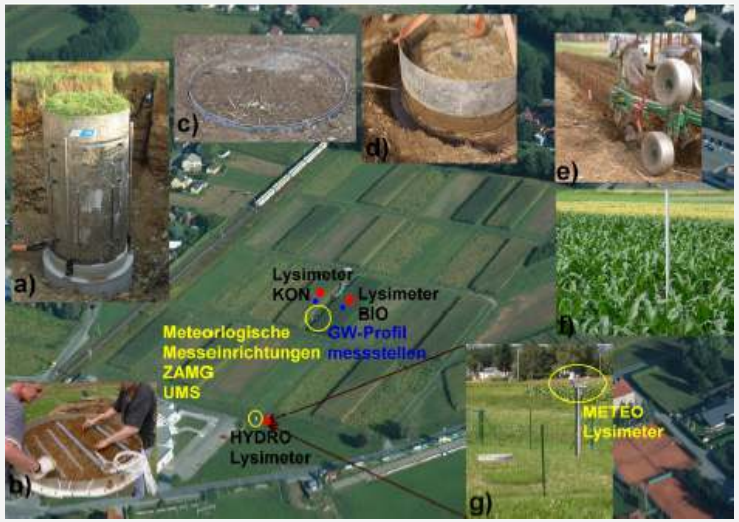
MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH

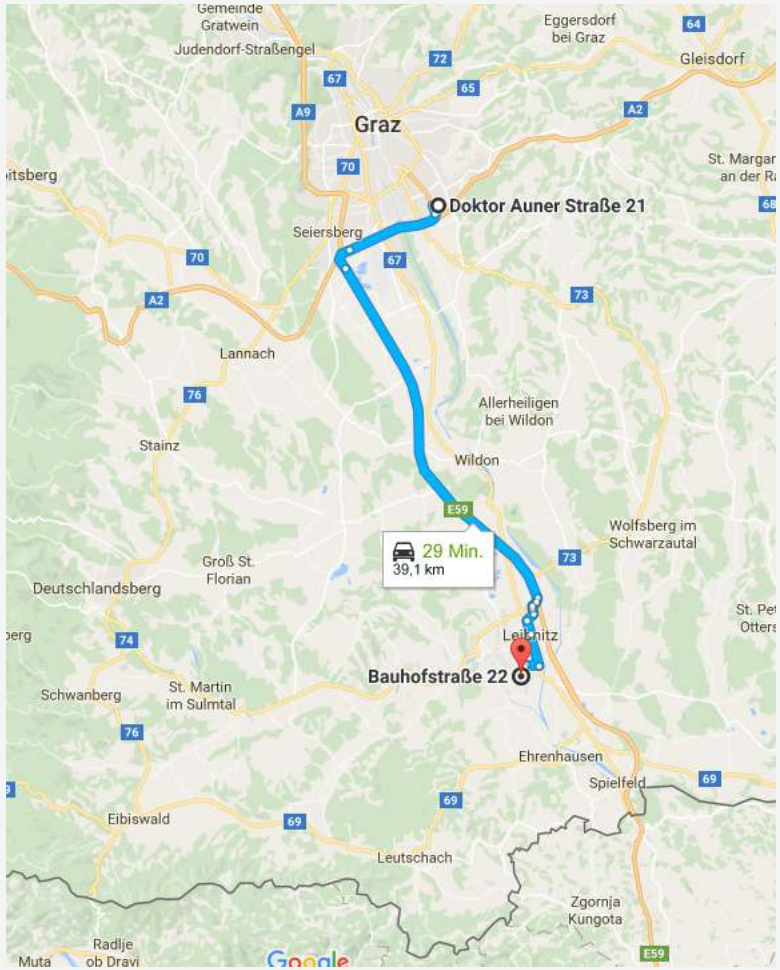
SECOND DAY - 5th OCTOBER

2nd Station (10:30-11:30 a.m.):

Lysimeter station Wagna

- Research station operated by Joanneum research
- Research on influence of agricultural practises on nitrate leaching to groundwater





IMPEL – EXCURSION

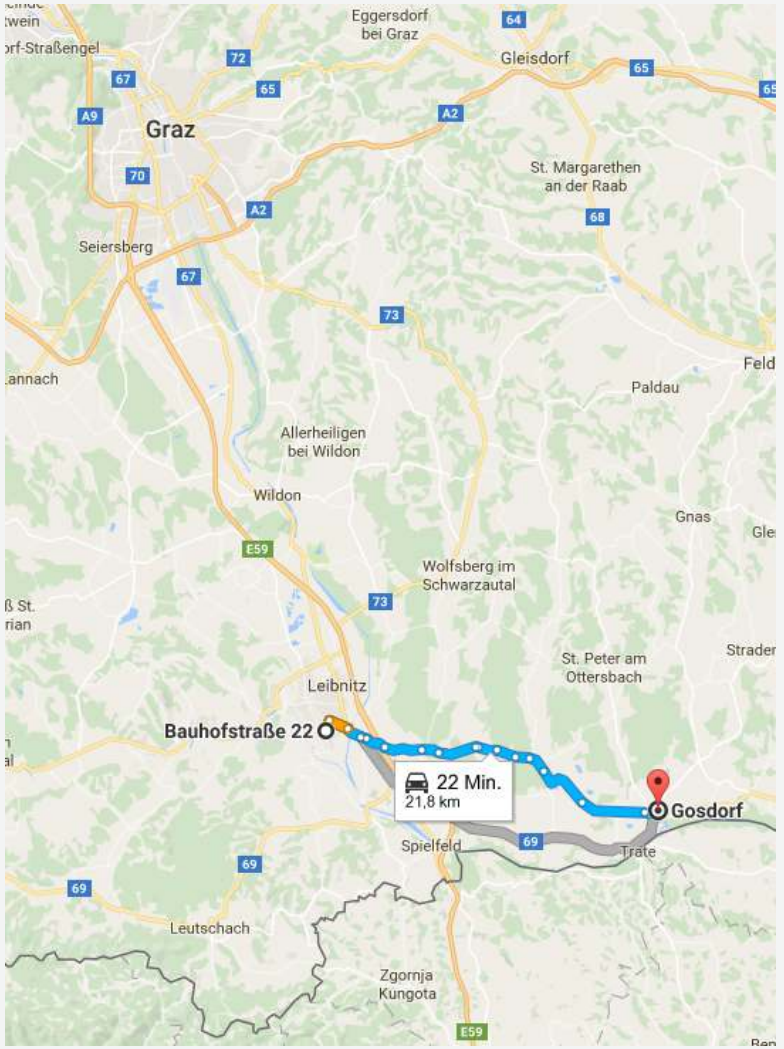
MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH

SECOND DAY - 5th OCTOBER

3rd Station (12-12:45 p.m.):

Gosdorf/ Ratzenau

- Visit to shared slurry laggon
- Showcase sampling of manure by Maschinenring (service provision to farmers)



IMPEL – EXCURSION

MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH

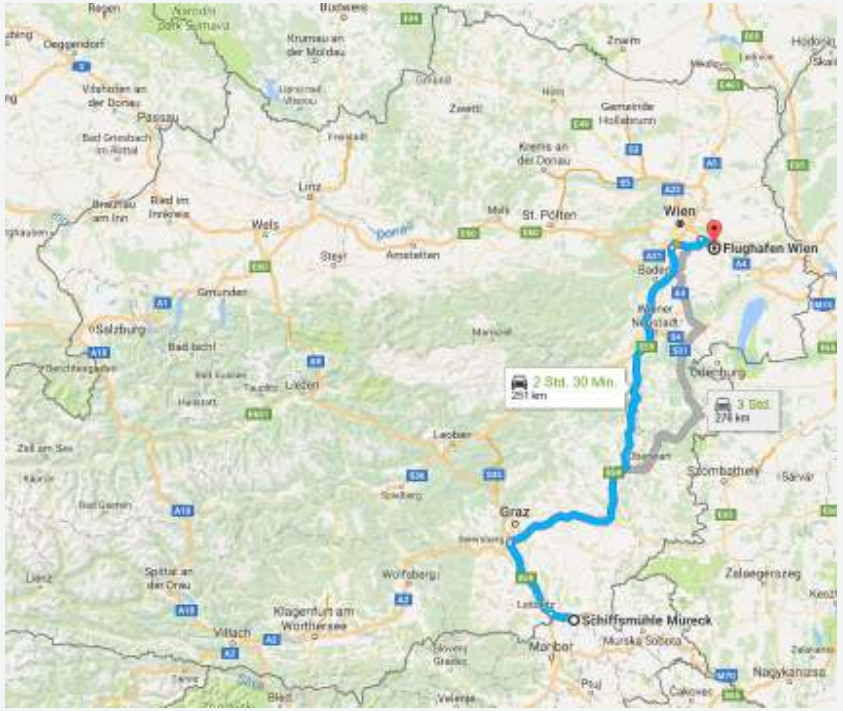
SECOND DAY - 5th OCTOBER

Lunch (1-2:30 p.m.):

Schiffsmühle Mureck

Departure (2:30 p.m.) to

- Graz Airport (3:30 p.m.)
- Vienna Airport (6.30 p.m.)
- Main railway station Vienna (7-7:30 p.m.)



LAND OBERÖSTERREICH

AUWR

IMPEL

nitrates diffuse pollution from agriculture

Water Resources Management by the State Government of Upper Austria

LAND OBERÖSTERREICH

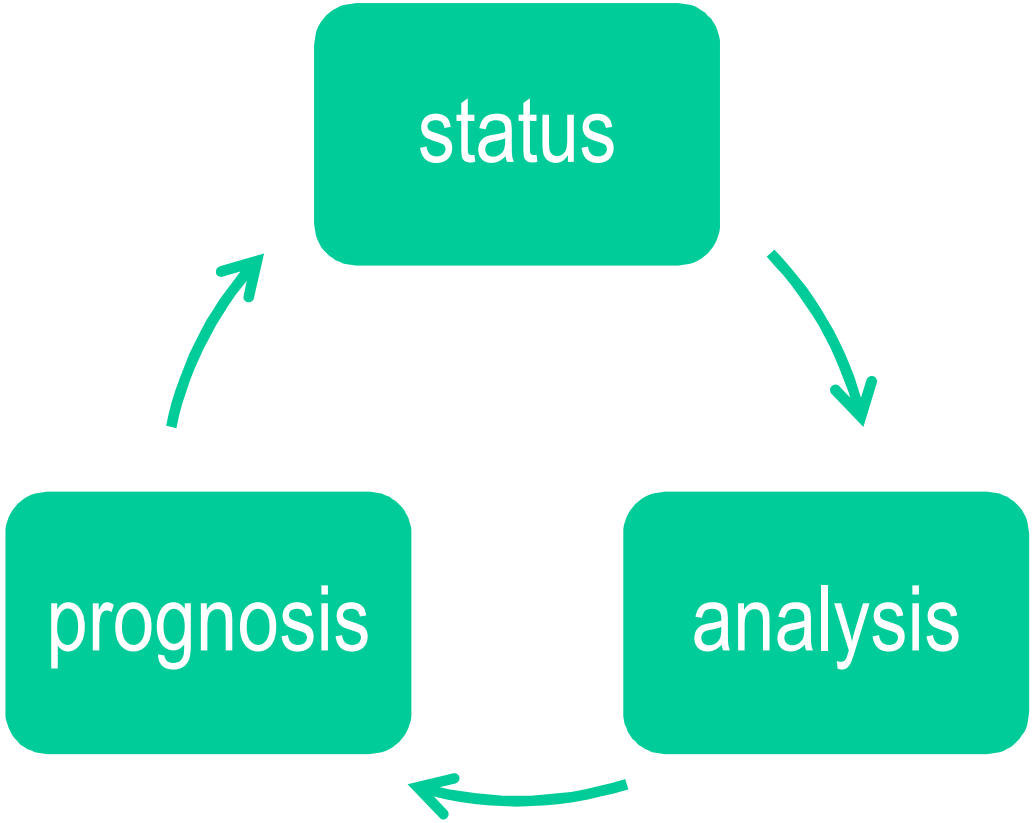
Water management planning in Upper Austria

- representing the interests of water management planning in any proceedings designated by the Water Law
- strategic planning and coordination of water-related issues
- monitoring development relating to water management

AUWR

LAND OBERÖSTERREICH

Monitoring and prognosis of the development of the nutrient situation in Upper Austria



AUWR

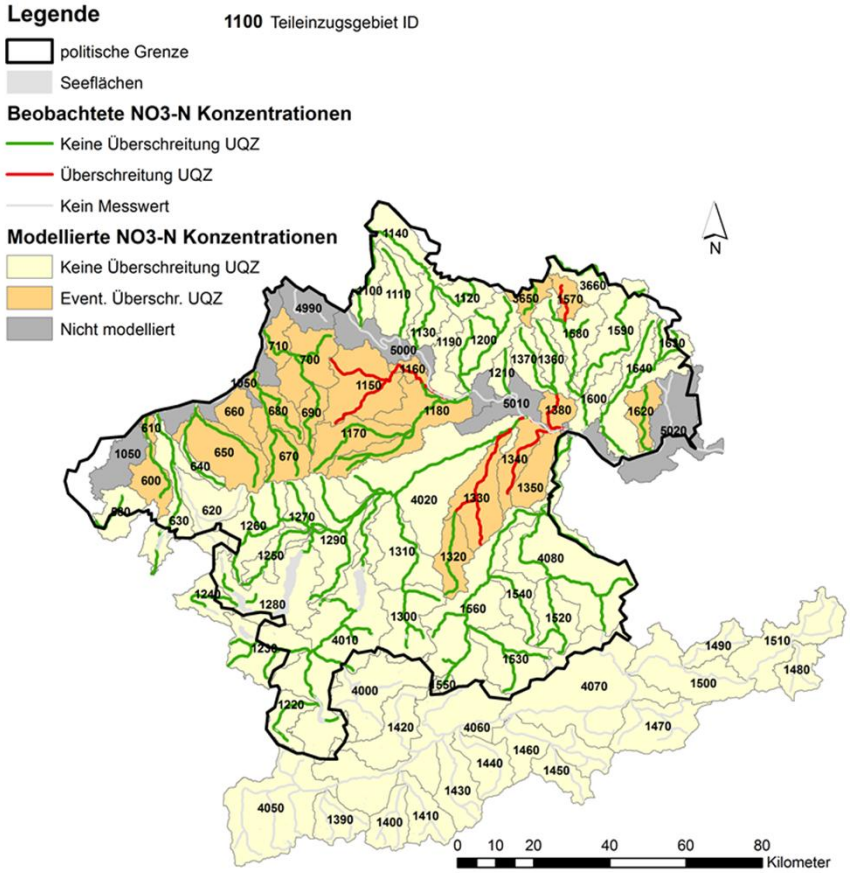
Direktion Umwelt und Wasserwirtschaft - Abteilung Anlagen-, Umwelt- und Wasserrecht

LAND OBERÖSTERREICH

Status detection

In Upper Austria about 30% of local rivers are endangered of not reaching good status because of nutrient-pollution

- ✓ measuring
- ✓ modelling



AUWR

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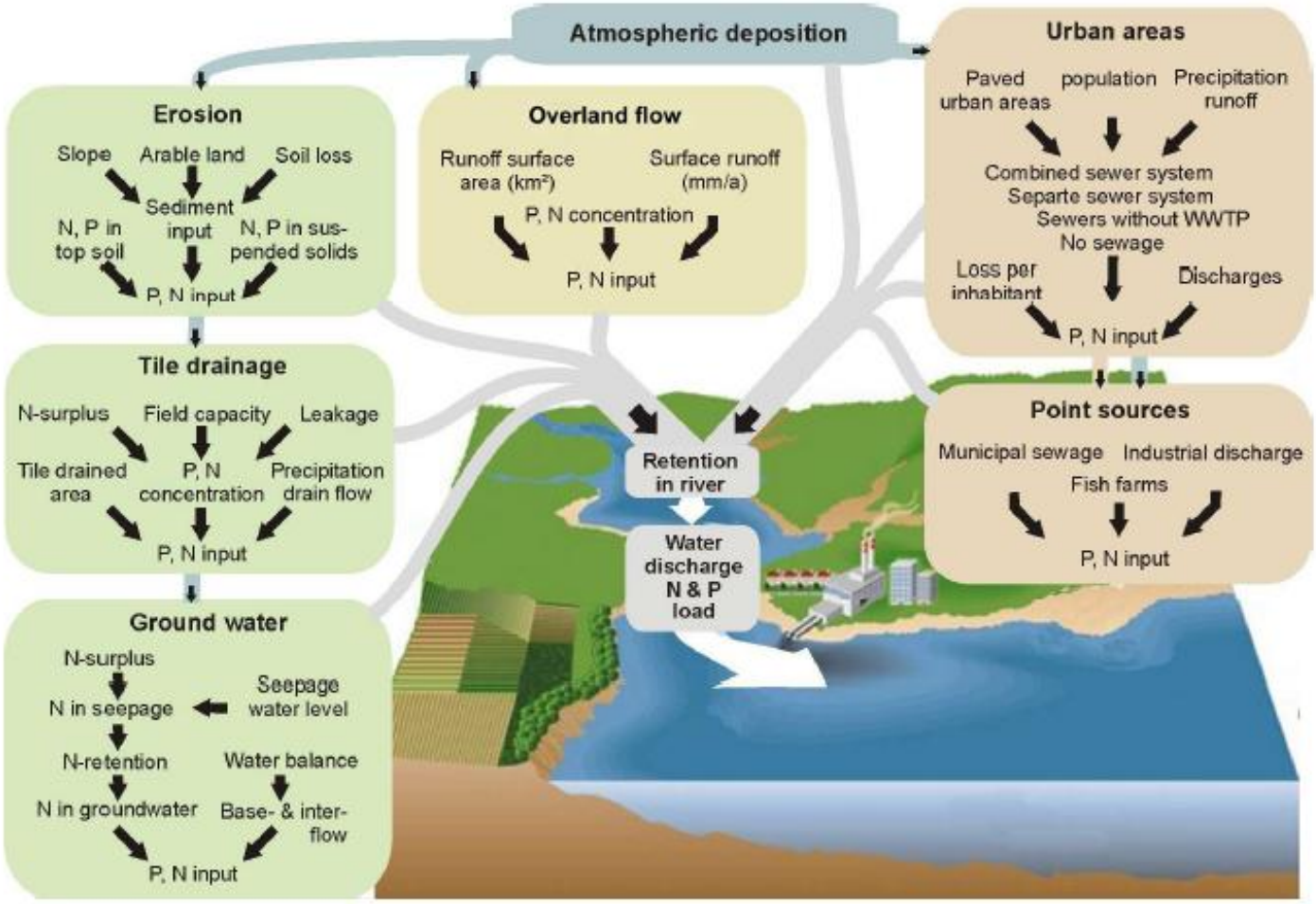
MONERIS

MOdelling Nutrient Emissions in RIver Systems



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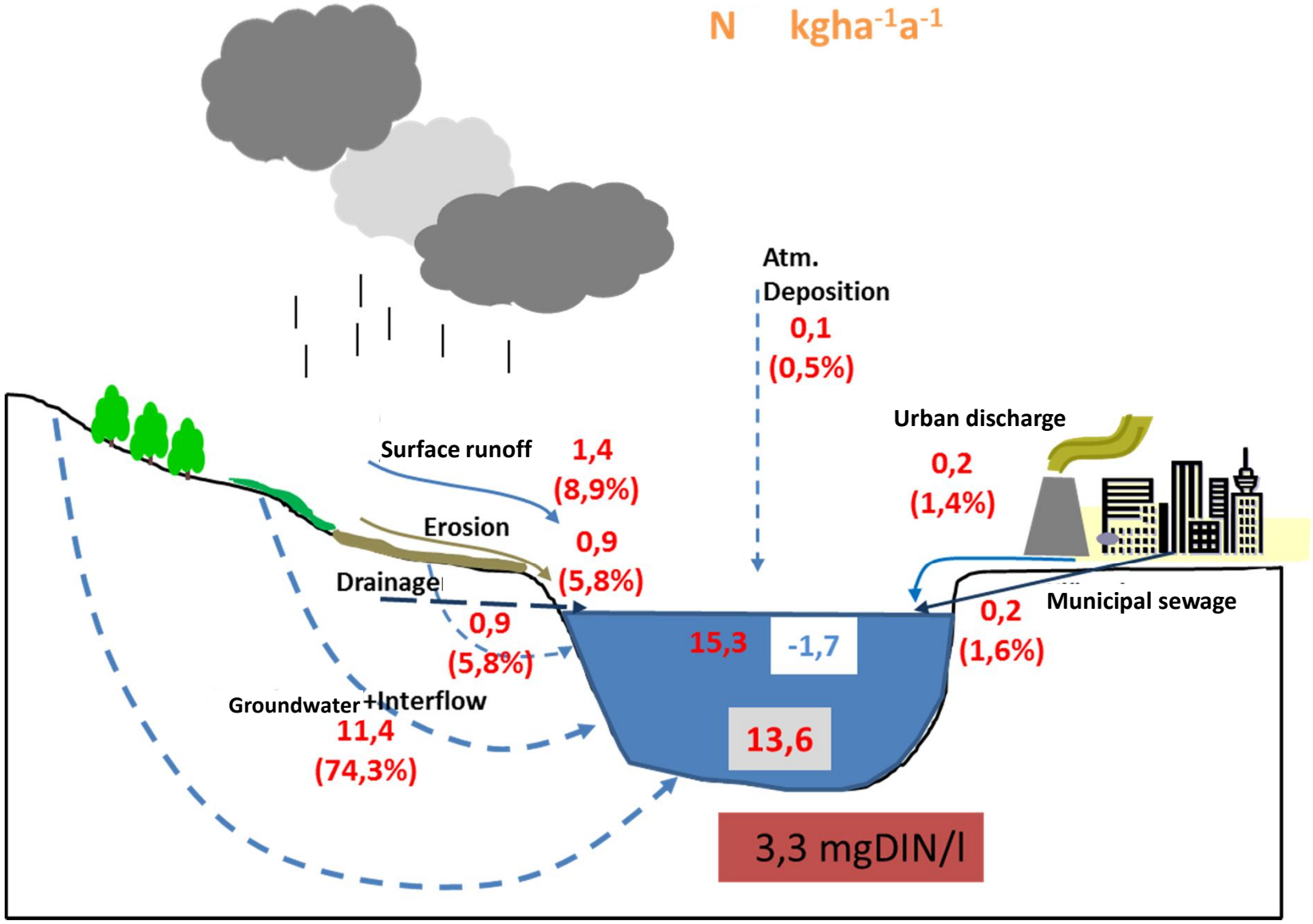

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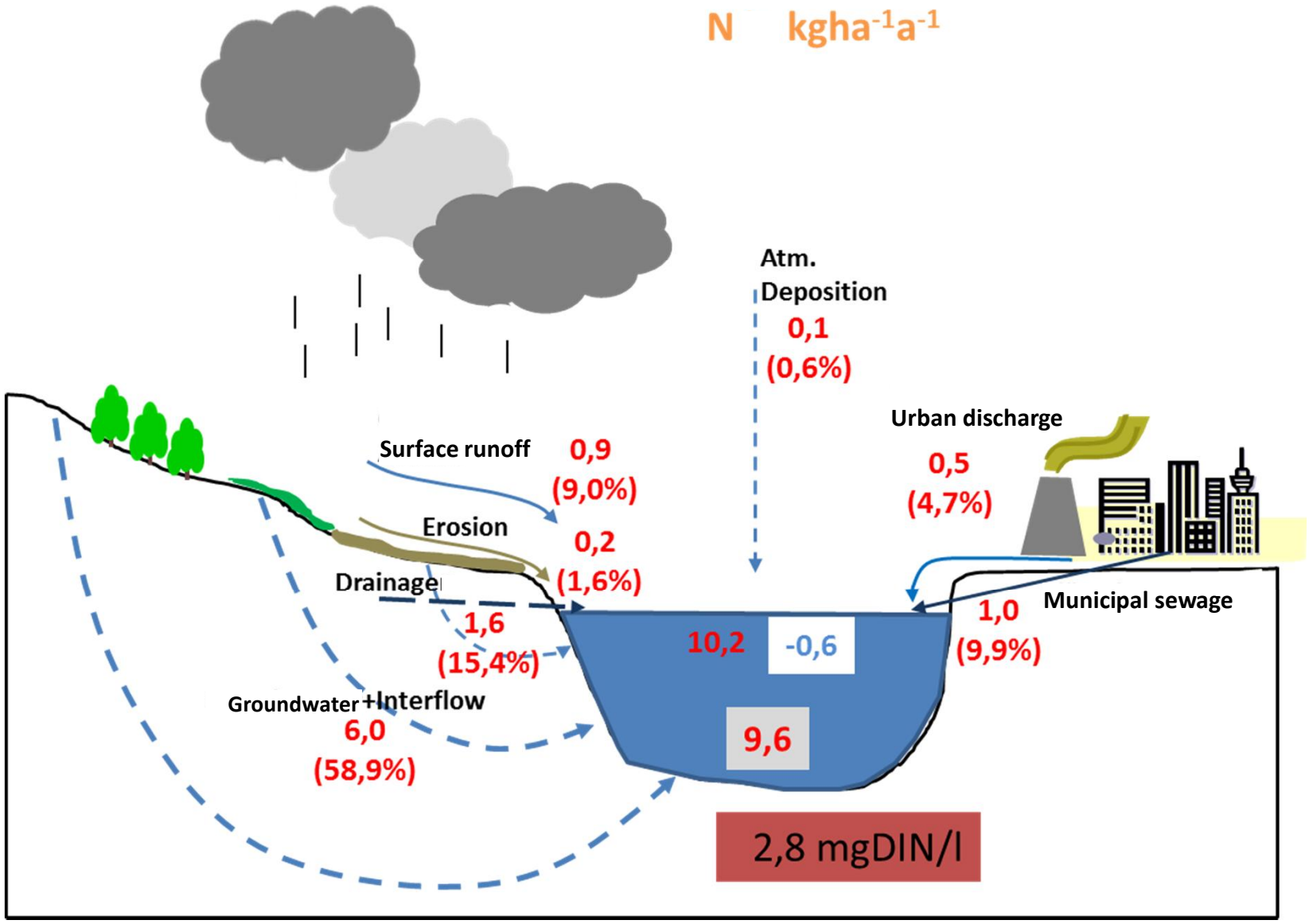

AUWR

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Analysis and prognosis of development

- compare status at different times
- analyse of development in the past
- estimate the contribution of different measures
- estimate the future development (scenarios)
  - where is it likely to achieve the objectives?
  - show different cost-benefit-ratios of a measure for different regions
- define cost-efficient measures for actions

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impact of measures

Technical potential of effectiveness

- Effectiveness on field scale
- Potential for implementation and relevance under the specific regional circumstances

Participation

- Participation quota
- Implementation on decisive (sensitive) areas

Quality of implementation

- Appreciation of measure,
- Capability
- Personal identification

➢ **Conception**

➢ **Attractiveness**

➢ **Advertisement**

➢ **Regulation**

➢ **Consulting**

➢ **Training**

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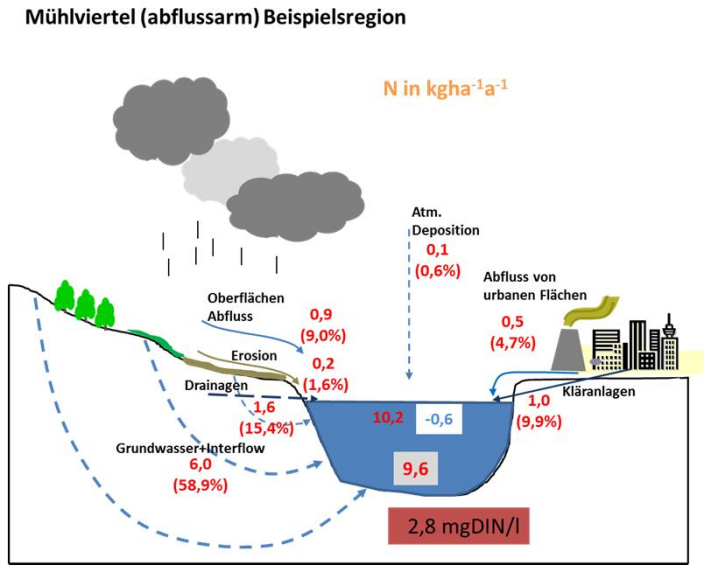
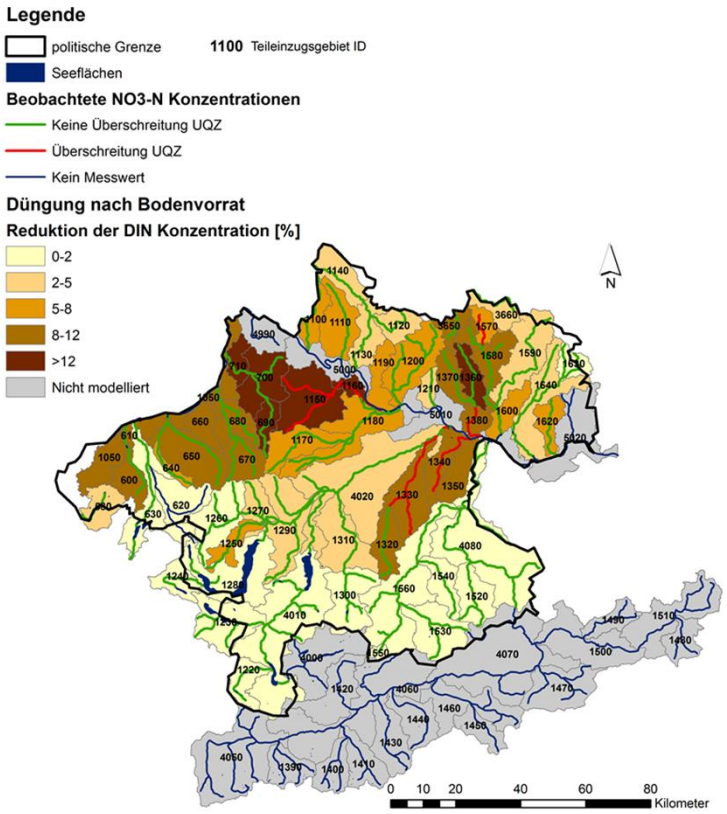
Summary

- measure + model
- NOT "one measure fits all"
- illustrate + visualize





AUWR

Direktion Umwelt und Wasserwirtschaft - Abteilung Anlagen-, Umwelt- und Wasserrecht

LAND OBERÖSTERREICH

AUWR

Thank you for your attention!

Presentation BWSB

04.10.2016, HLBLA St. Florian

Sebastian Friedl, Boden.Wasser.Schutz.Beratung, LK OÖ

BODEN.WASSER.SCHUTZ
BERATUNG
Im Auftrag des Landes OÖ

Landwirtschaftskammer
Oberösterreich

Content of the Presentation

- The counsel for soil- and waterprotection
- erosion
- catch crops
- pesticides

Aims of the Boden.Wasser.Schutz.Beratung

- sustainable soil protection
- securing a sustainable supply of drinking water
- reduction of
  - nitrate pollution in the ground water
  - nutrient pollution in the surface water
  - substances in the surface water caused by erosion
  - pesticide contamination in suface and ground water

lk landwirtschaftskammer oberösterreich

bw BODEN.WASSER.SCHUTZ BERATUNG Im Auftrag des Landes OÖ


Bodenschutz


Oberflächengewässerschutz


Grundwasserschutz


Gewässerschonender Pflanzenschutz

Boden.Wasser.Schutz.Beratung
Auf der Gugl 3, 4021 Linz
Tel. 050 6902 - 1426
Fax 050 6902 - 91426
Mail bwsb@lk-ooe.at
www.bwsb.at

History BWSB

- early 90ies: Consulting for soilprotection; at the Chamber of Agriculture
- since 2001: Upper austrian consulting for waterprotection; located at the provincial goverment
- 2013: Consolidation
  - located at the Chamber of Agriculture
  - financed by the Province of Upper Austria
- Homepage: **www.bwsb.at**
- Newsletter (monthly); registration on the Homepage
- „Boden.Wasser.Schutz.Blatt“ – soil- and waterprotection journal
  - quarterly, 8 pages supplement of „Der Bauer“
  - Journal: Chamber of Agriculture (UA) - Circulation 40.000

main focus: soilprotection

- catch crops
- liming
- humus management
- crop rotation
- erosion
- recultivation
- tillage
- soil compaction

main focus: waterprotection

- implementation of the Upper Austrian Pesticide strategy
- consulting for contaminated water suppliers
- fertilizer management
- integrated pest management
- distance requirements near surface waters
- reduction of the phosphate and sediments input

Consulting

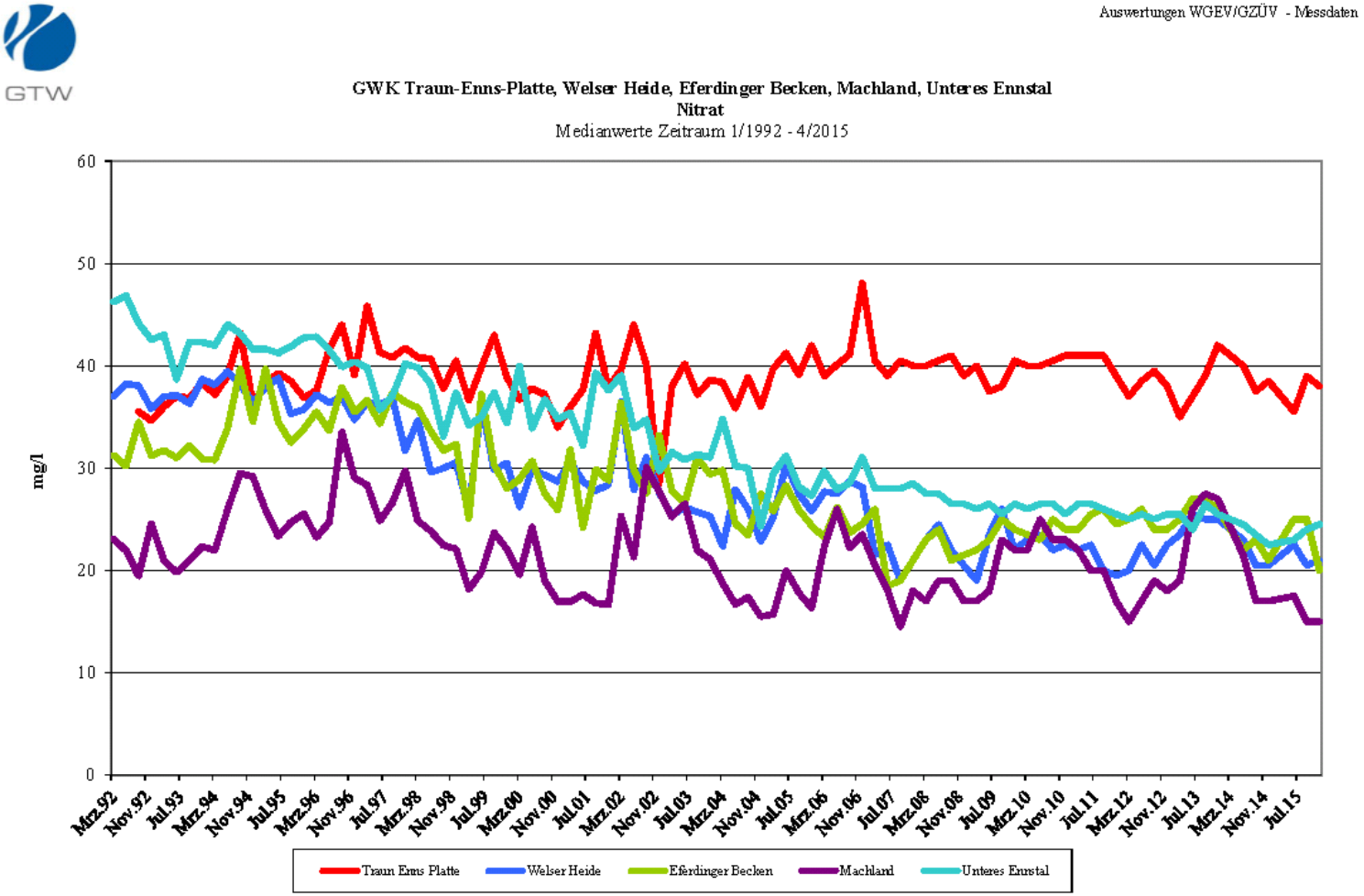
- **working groups for soil- and waterprotection:**
  55 wg‘s, 45 „Wasserbauern“ – heads of the wg‘s, 2.142 members

- three-stages approach:
  - **Consultor**
  - **Wasserbauer**
  - **Working group member**

Consultation

- **personal**
  - meeting at the Chamber o. A.
  - at the farmhouse
  - phone, e-m@il
- **events, conferences**
  - Boden.Wasser.Schutz.Tagung
  - field demonstrations, fairs
  - working groups
  - meetings of local farming communities
  - courses
  - …

Nitrate: Main bodies of groundwater in Upper Austria



benefits of catch crops
(cover crops, forage crops)

- humification
  - glomalin, mykorrhiza
- biological retention of nitrogen residual
- erosion protection
  - between 2 main crops
  - subsequent crop (mulch layer)
- food for the life in the soil
- Nitrogen through legumes
- insect habitat
- weed suppression

advantages of mixed catch crops

- better root penetration of different soil layers – deep and shallow roots
- higher biomass yield
- better suppression of volunteer grain
- less problems in crop rotation
- longer vegetation period on the field

field trials with catch crops

8,5 kg/ha buckwheat
1,0 kg/ha white radish
4,5 kg/ha oil radish
3,5 kg/ha phacelia
0,5 kg/ha yellow mustard
2,0 kg/ha sunflower

„Einsaaten“

- sowing of the catch crop before the harvest of the main crop

winterwheat 2013

„Mähdruscheinsaat“ - sowing of the catch crop at the harvest of the main crop

BODEN.WASSER.SCHUTZ BERATUNG
Im Auftrag des Landes OÖ

„Mähdruscheinsaat“ 2015 – winter wheat

BODEN.WASSER.SCHUTZ BERATUNG Im Auftrag des Landes OÖ

Successful despite a very dry summer!

Landwirtschaftskammer Oberösterreich

„Mähdruscheinsaat 2016“ - rapeseed

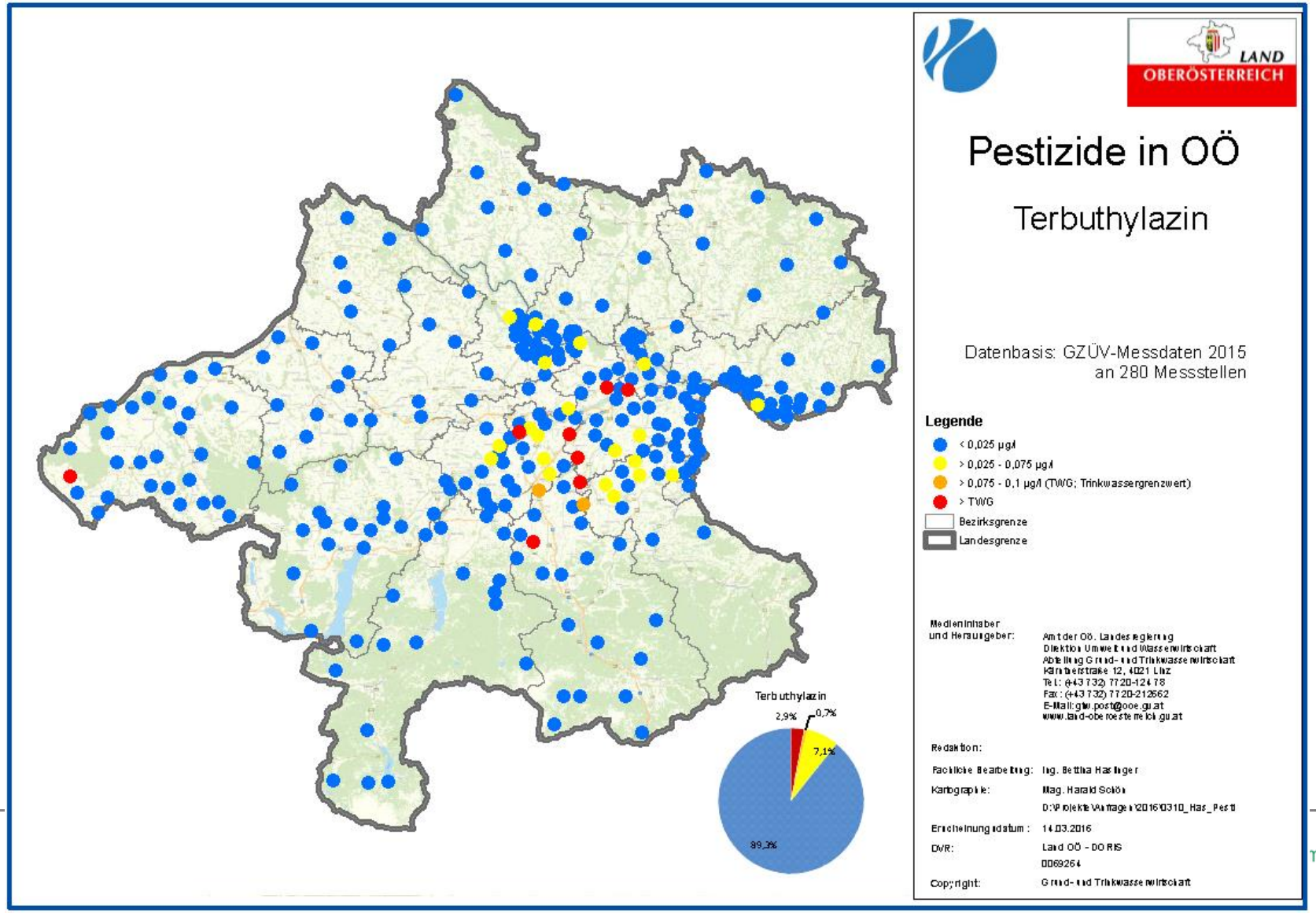
„Mähdruscheinsaat“ 2016 – winter barley

erosion 2016

erosion protection in practice 2013-2016

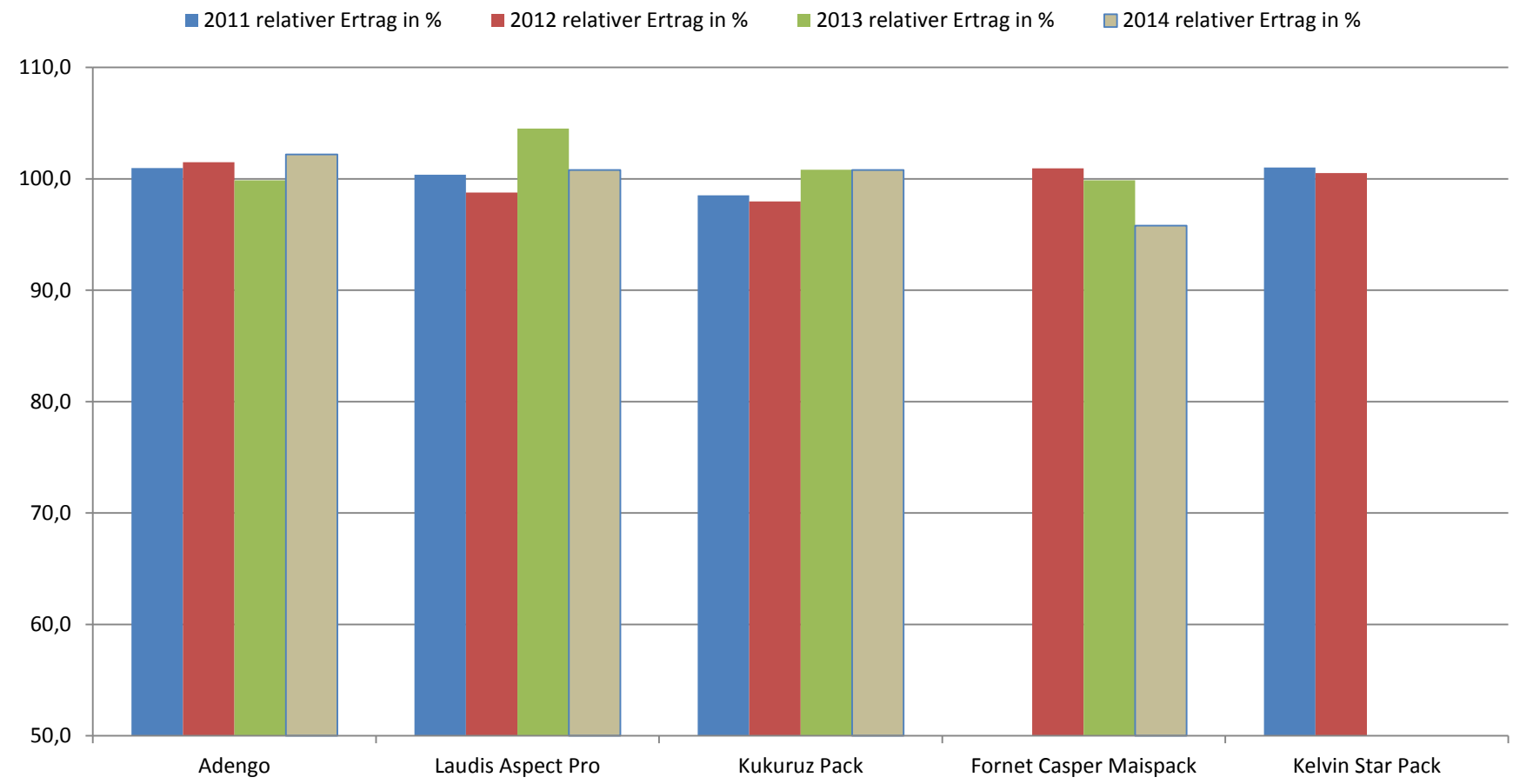
- project together with farmers
- plate with information about the measures
- information for other farmers and the public

pesticides in groundwater
e.g. Terbuthylazin



field trial: maize herbicides – alternatives for terbuthylazin

field trials: maize herbicides 2011 bis 2014 (14 sites)



problems in the practice

Information is important!

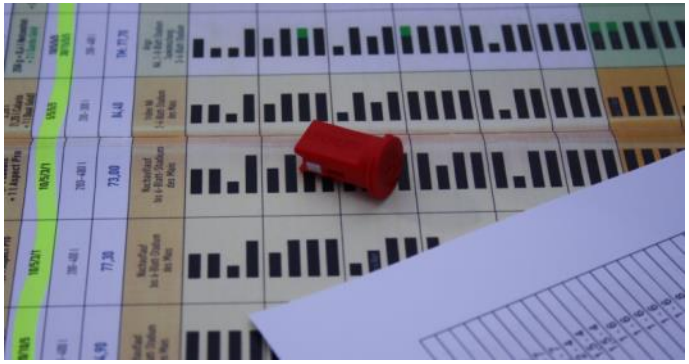
BODEN.WASSER.SCHUTZ BERATUNG Im Auftrag des Landes OÖ

Conference about „water-friendly“ plant protection

Landwirtschaftskammer Oberösterreich

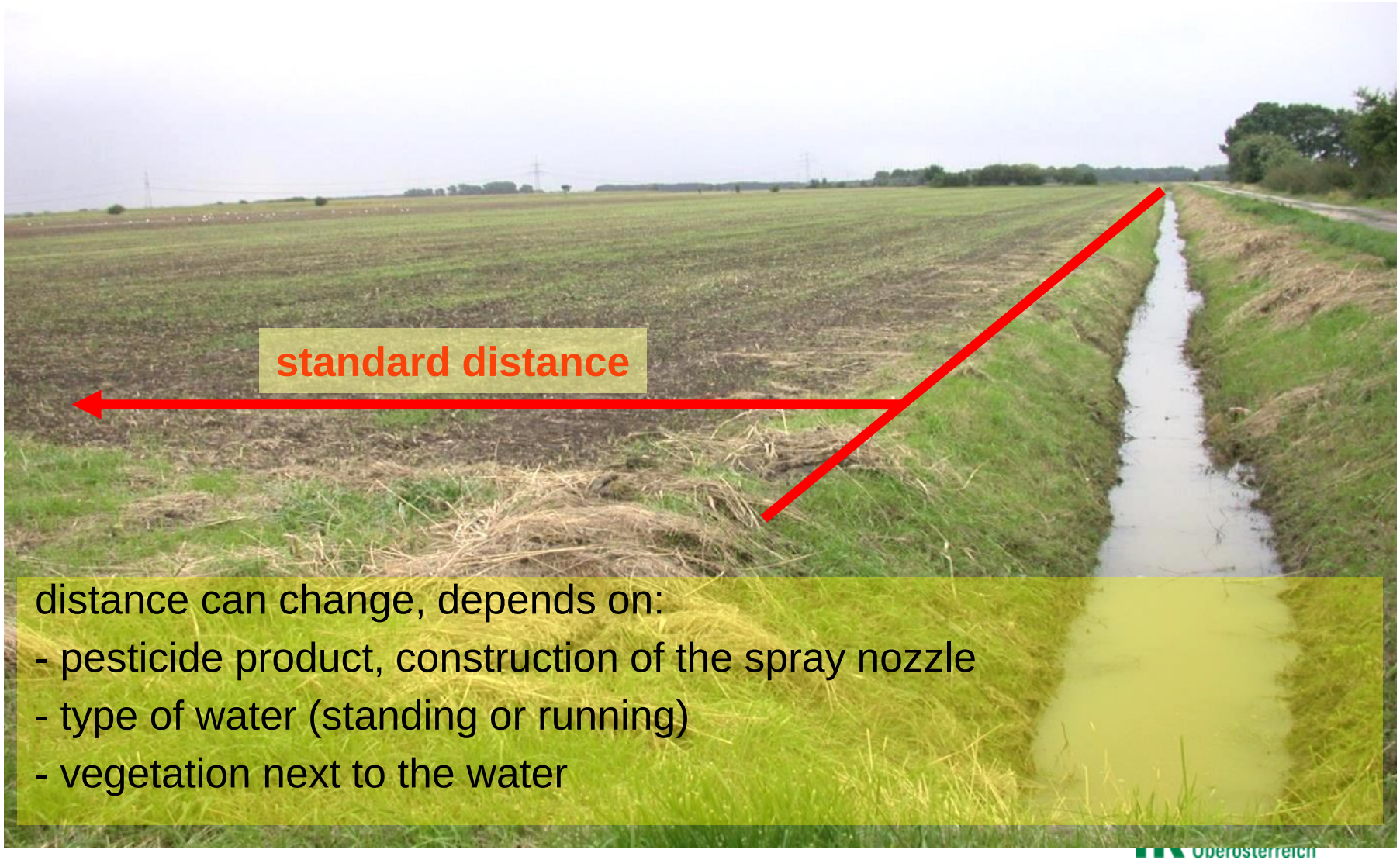
Information about the newest technique

BODEN.WASSER.SCHUTZ BERATUNG
Im Auftrag des Landes OÖ



Landwirtschaftskammer Oberösterreich

distance requirements near surface waters



distance can change, depends on:

- pesticide product, construction of the spray nozzle
- type of water (standing or running)
- vegetation next to the water

Thank you for your attention!

Sebastian Friedl
Auf der Gugl 3, 4021 Linz
050/6902-1562
bwsb@lk-ooe.at
www.bwsb.at

BODEN.WASSER.SCHUTZ
BERATUNG
Im Auftrag des Landes OÖ

Landwirtschaftskammer Oberösterreich

JR-AquaConSol
a JOANNEUM RESEARCH company

„Does one measure fit all?“
IMPEL Water and Land Team project

Groundwater Protection in the Murtal-valley (Graz – Bad Radkersburg)

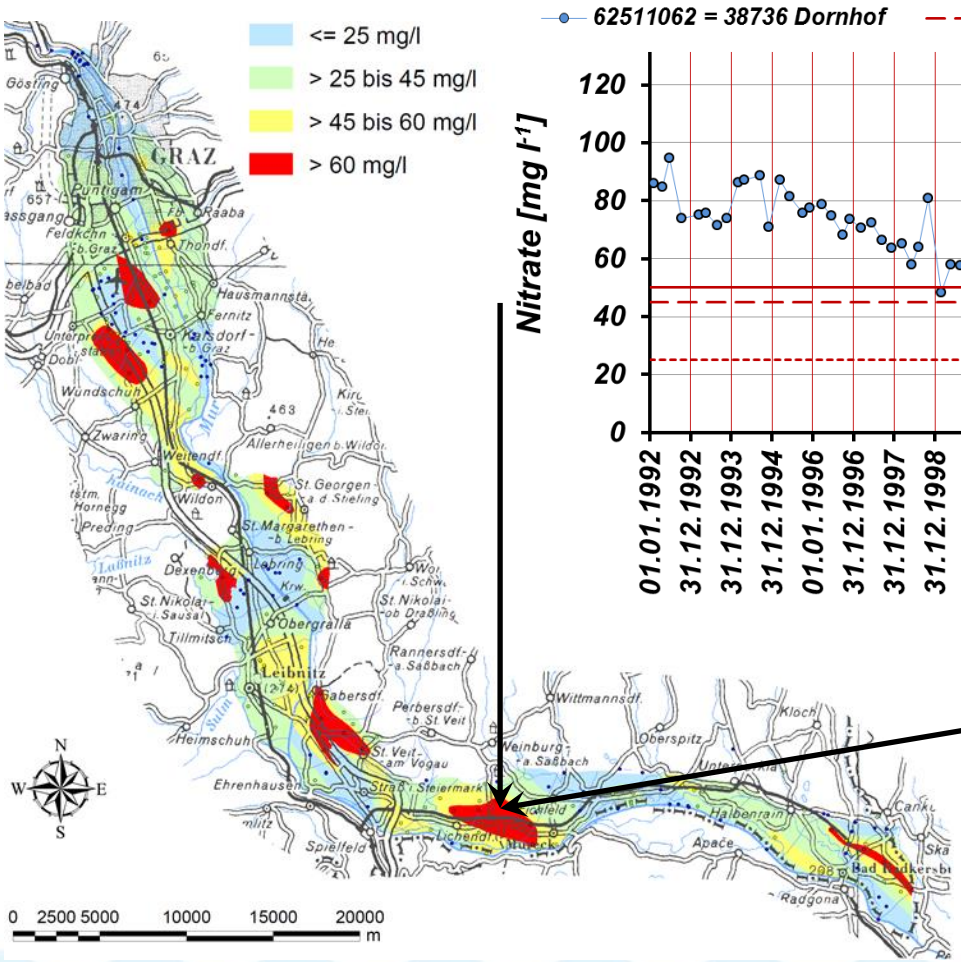
A regional scaled programm

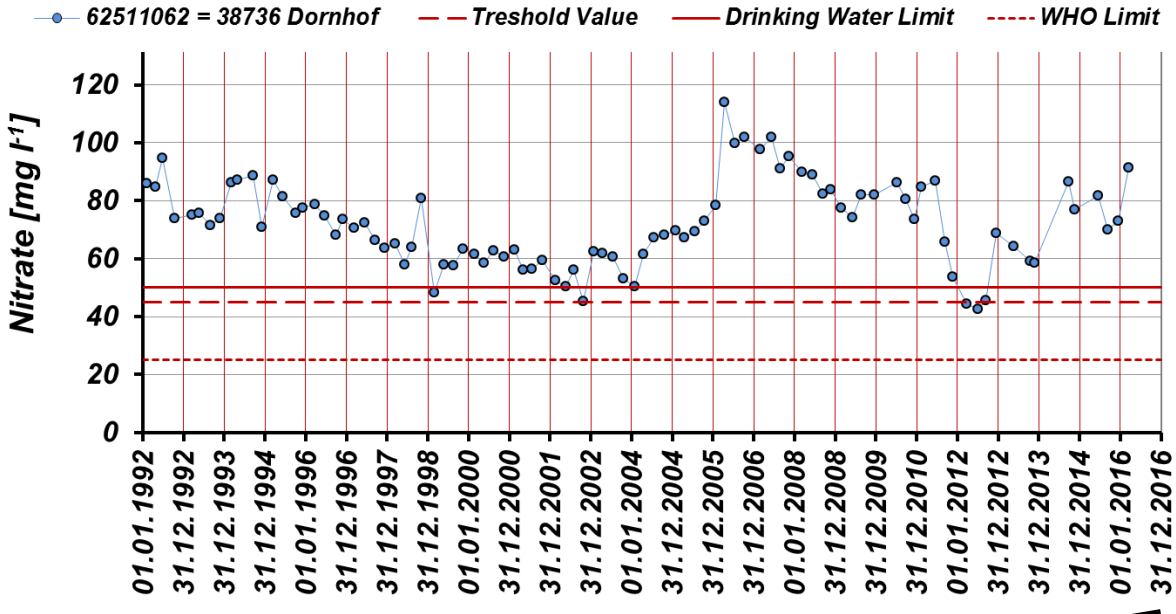
Johann Fank

Raaba, 10/05/2016

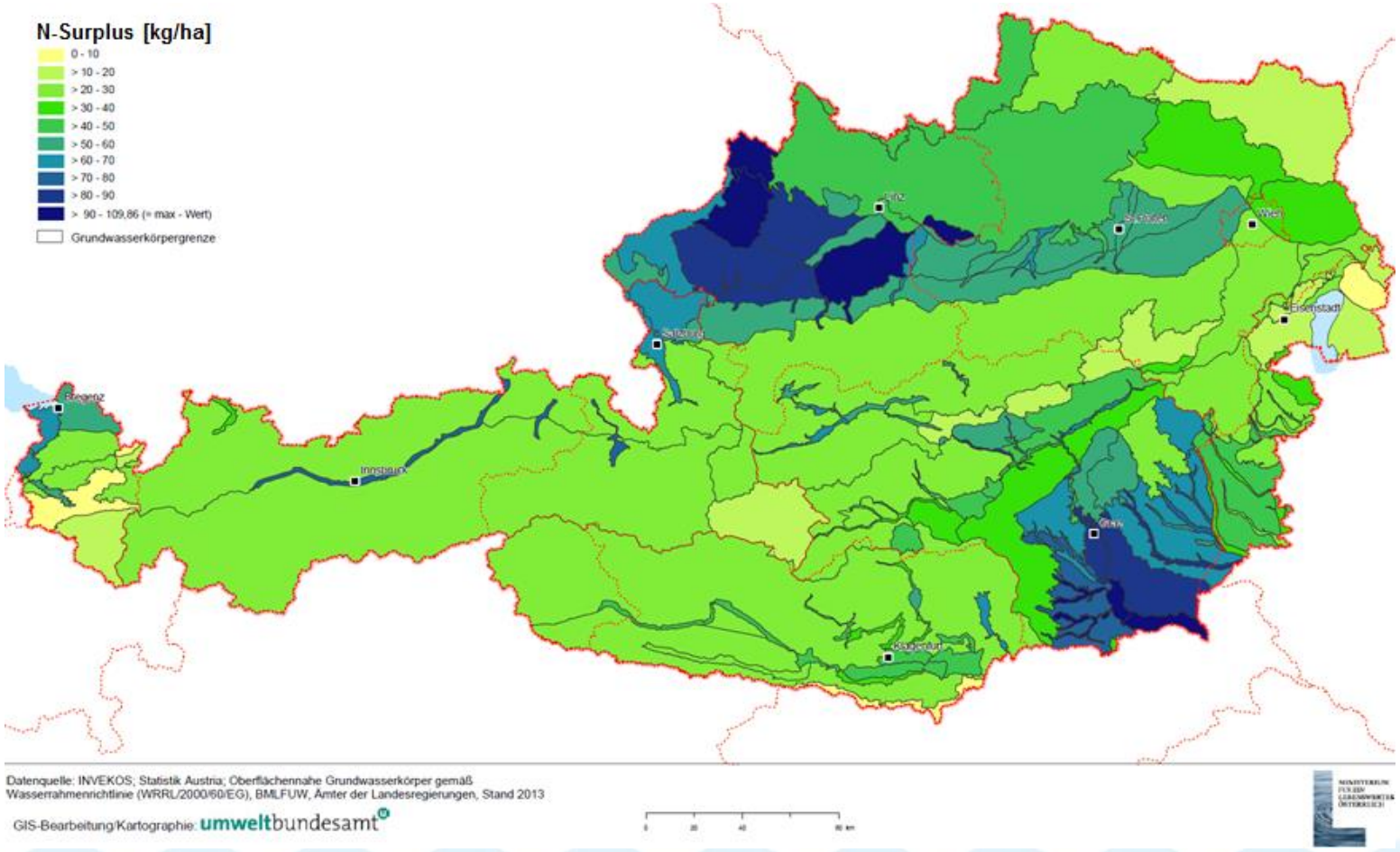
JR-AquaConSol
a JOANNEUM RESEARCH company

Nitrate Concentration in Groundwater

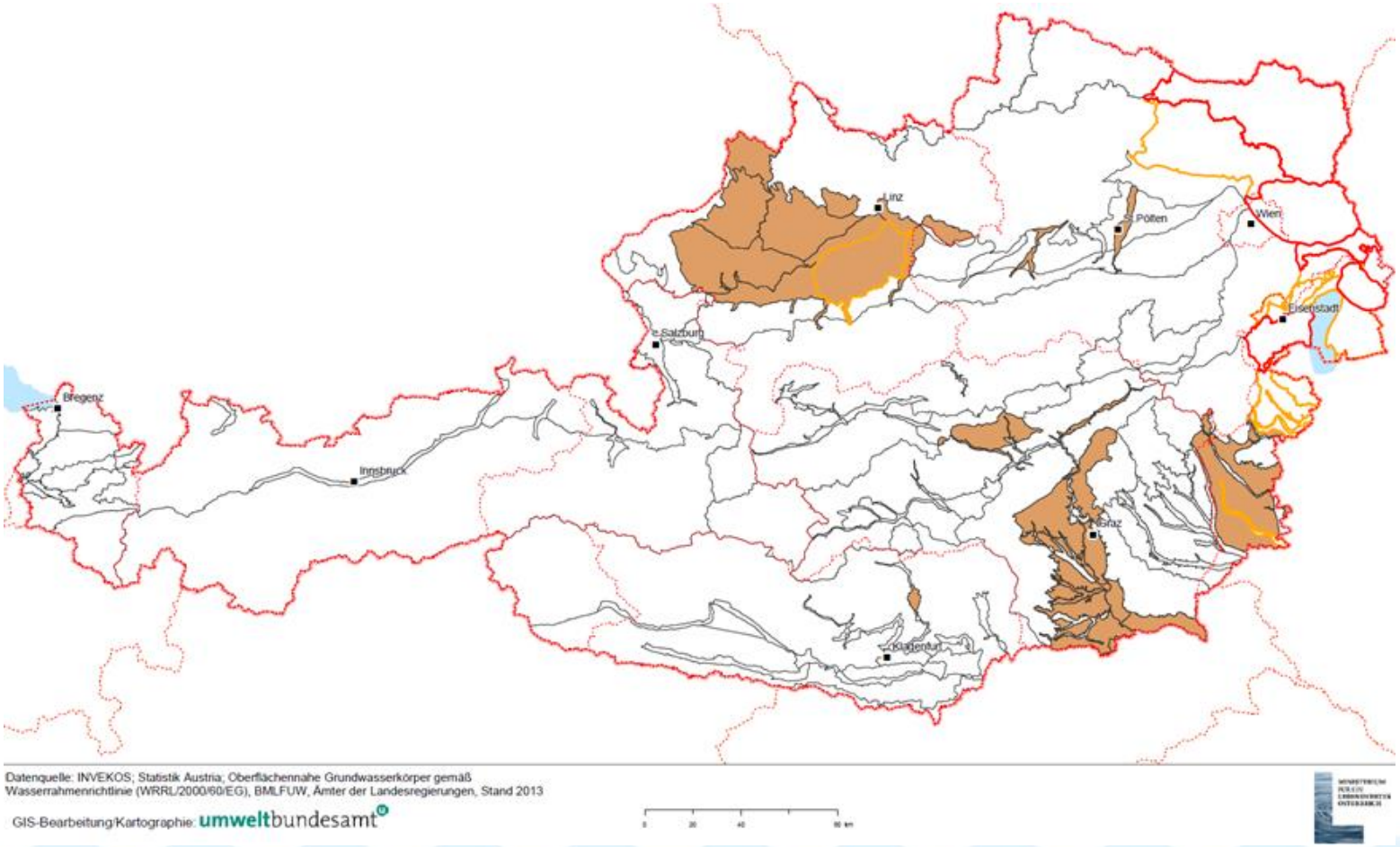




N – Balance for groundwater bodies (2010)



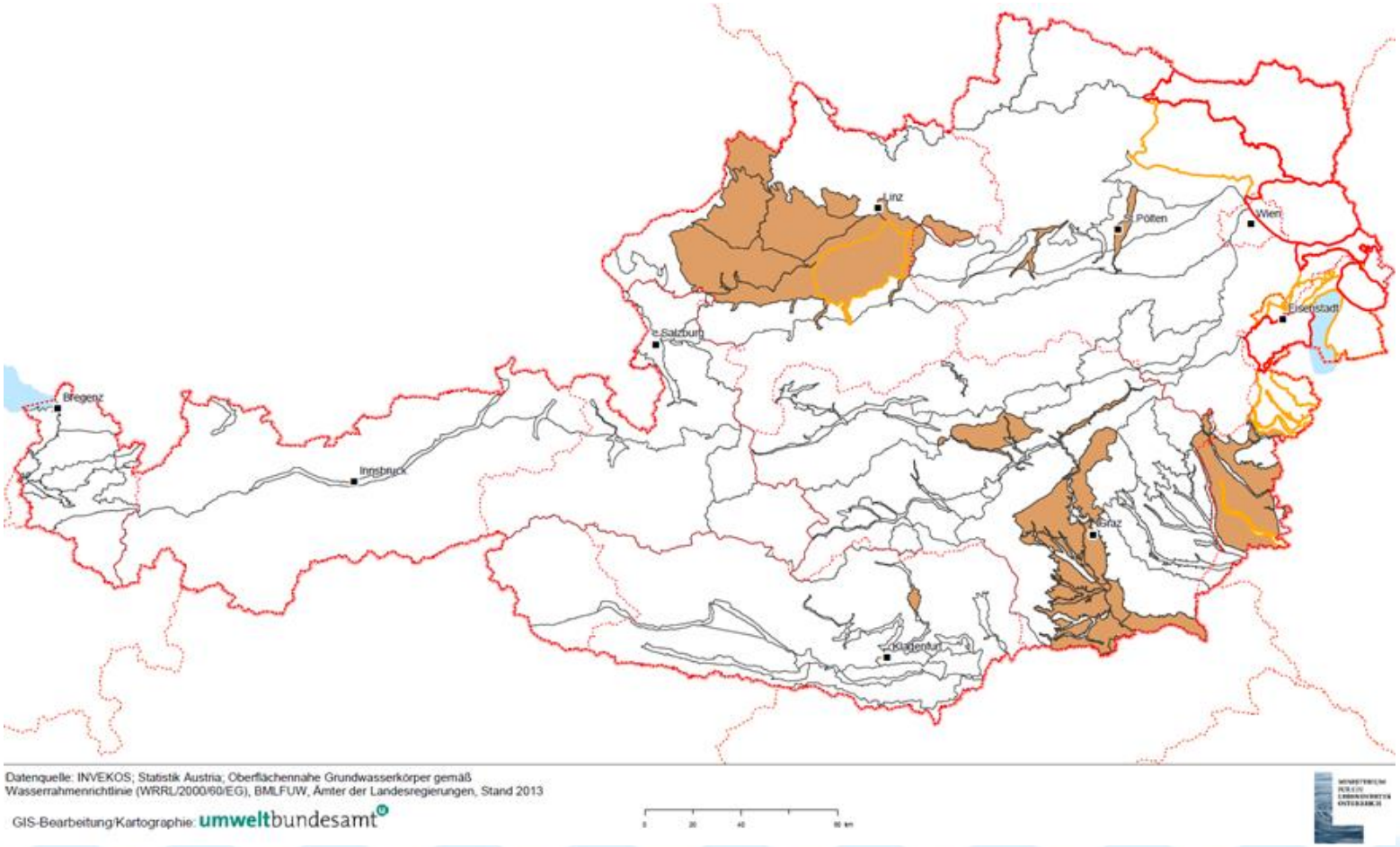
N – Fertilization on expected „high“ yield



Datenquelle: INVEKOS; Statistik Austria; Oberflächennahe Grundwasserkörper gemäß Wasserrahmenrichtlinie (WRRL/2000/60/EG), BMLFUW, Ämter der Landesregierungen, Stand 2013

GIS-Bearbeitung/Kartographie: umweltbundesamt

Relation: N-Surplus – „high yield“ Fertilization



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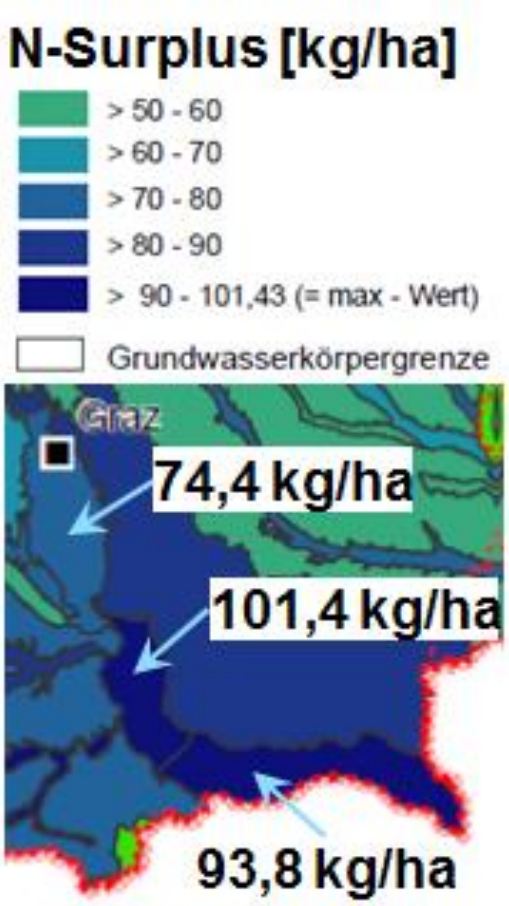
GIS-Bearbeitung/Kartographie: umweltbundesamt

N-Balance (2009-2012) in the Murtal valley



- **Assumptions**
  - On a long term scale N-Surplus is transported to the groundwater
  - Amount of seepage water is well known
    - measurement
    - water balance evaluation
    - numerical modeling
- Nitrate impact on groundwater from agriculture is calculated:

  c NO_3 [mg/l] = N-Surplus [kg/ha] / Recharge rate [mm] * 443

Groundwater body	N-Surplus [kg/ha]	cNO_3 (Recharge rate = 250 mm)	cNO_3 (Recharge rate = 300 mm)	cNO_3 (Recharge rate = 350 mm)
Grazer Feld	74	132	110	94
Leibnitzer Feld	101	180	150	128
Unteres Murtal	94	166	139	119

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Styrian Government (4 Departments)

Agronomic Measures to achieve Groundwater compatible Farming in the Murtal Valley (Graz to Bad Radkersburg)

- **JOANNEUM RESEARCH**,
  Institute of Water Resources Management – Hydrogeology und Geophysics
- **Federal Agency for Water Management,**
  Institute for Land and Water Management Research
- **AGES - Austrian Agency for Health and Food Safety Ltd.**,
- **Experimental Department of the Styrian Agricultural Schools**

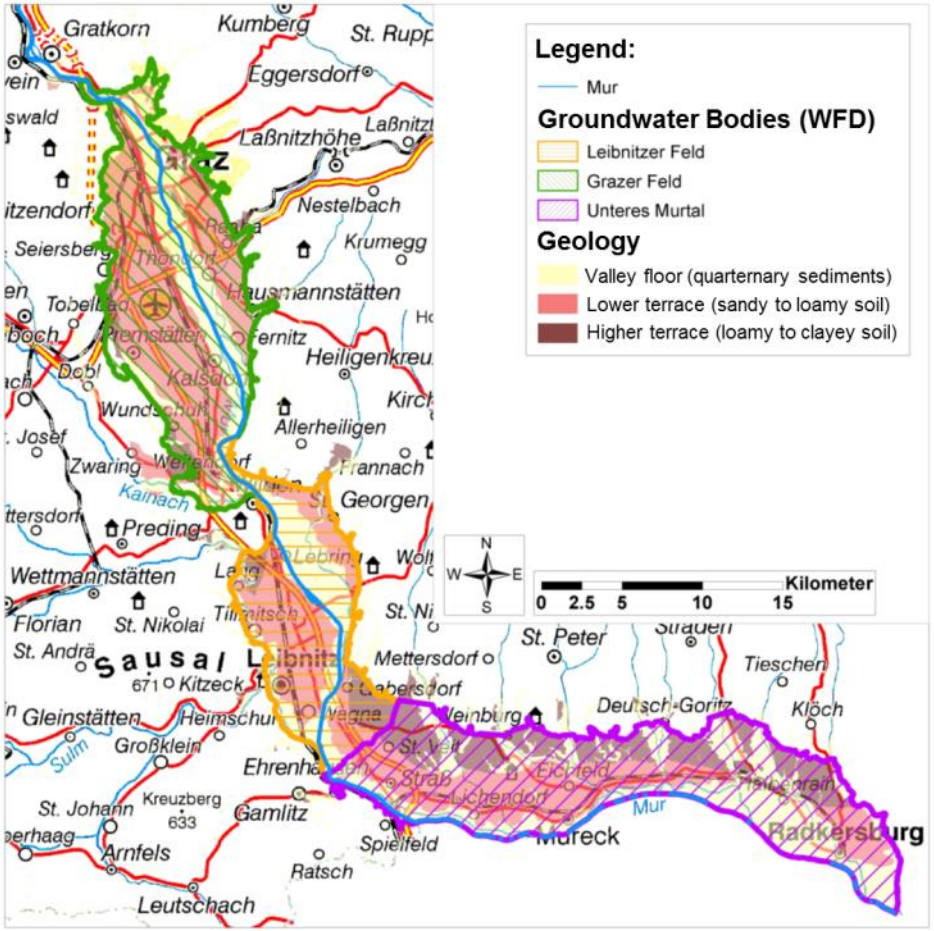
JOANNEUM RESEARCH

BUNDESAMT FÜR WASSERWIRTSCHAFT

AGES Österreichische Agentur für Gesundheit und Ernährungssicherheit GmbH

VERSUCHSREFERAT STEIERMARK

Basics



- Water balance
  - Precipitation 800 – 900 mm/a
  - Groundwater recharge (agriculture) 250 – 350 mm/a
- Agriculture and land use
  - 90 % arable land
  - 70 % Maize (corn) production (increasing trend)
  - Oil pumpking (increasing trend)
  - vegetable production (Graz)
- Livestock breeding (pork)
  - Economic concentration
  - Farm fertilizer distribution
- ÖPUL partizipation
  - Fertilizer reduction
  - greening
  - In general only minor partizipation

Agricultural Test Field „Wagna“

Long Term Investigation (1987-2015) at the „Large Parcels Test Field“ Wagna at sandy to loamy soil (typical for the lower terrace) showed

- Maize yield is about 10 000 kg/ha/a (N-Fertilisation between 120 - 145 kg/ha/a); **Water availability** is a very important controling parameter
- An N-Input/Output-Balancing on different scales (lysimeter, parcel, test field) showed, that – at correct estimation of the expected yield – **N-fertilisation based on the „Guidelines on proper Fertilisation“ is groundwater quality compatible**
- Measured data are suitable for calibration, validation and application of **numerical models** on water movement and solute transport in the unsaturated zone

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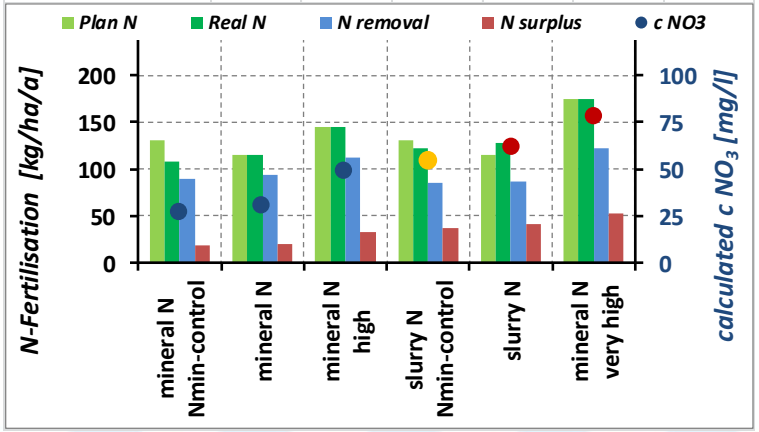
Experiments with increasing N-Fertilisation

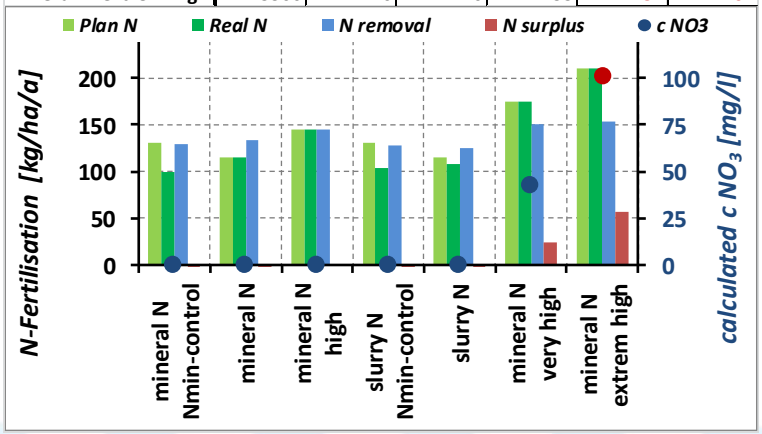
Wagna (low terrace):
sandy to loamy soils (low depth)

Wagna 2008-2015	Maize yield [kg/ha/a]	Plan N-Fertilisation [kg/ha/a]	real N-Fertilisation [kg/ha/a]	N-removal [kg/ha/a]	N-Surplus [kg/ha/a]	c NO_3 [mg/l]
mineral N $N_{min\text{-}control}$	9000	130	108	90	18	27
mineral N	9200	115	115	94	21	31
mineral N high	10200	145	145	112	33	49
slurry N $N_{min\text{-}control}$	8500	130	122	85	37	55
slurry N	8633	115	128	86	42	62
mineral N very high	10500	175	175	122	53	78

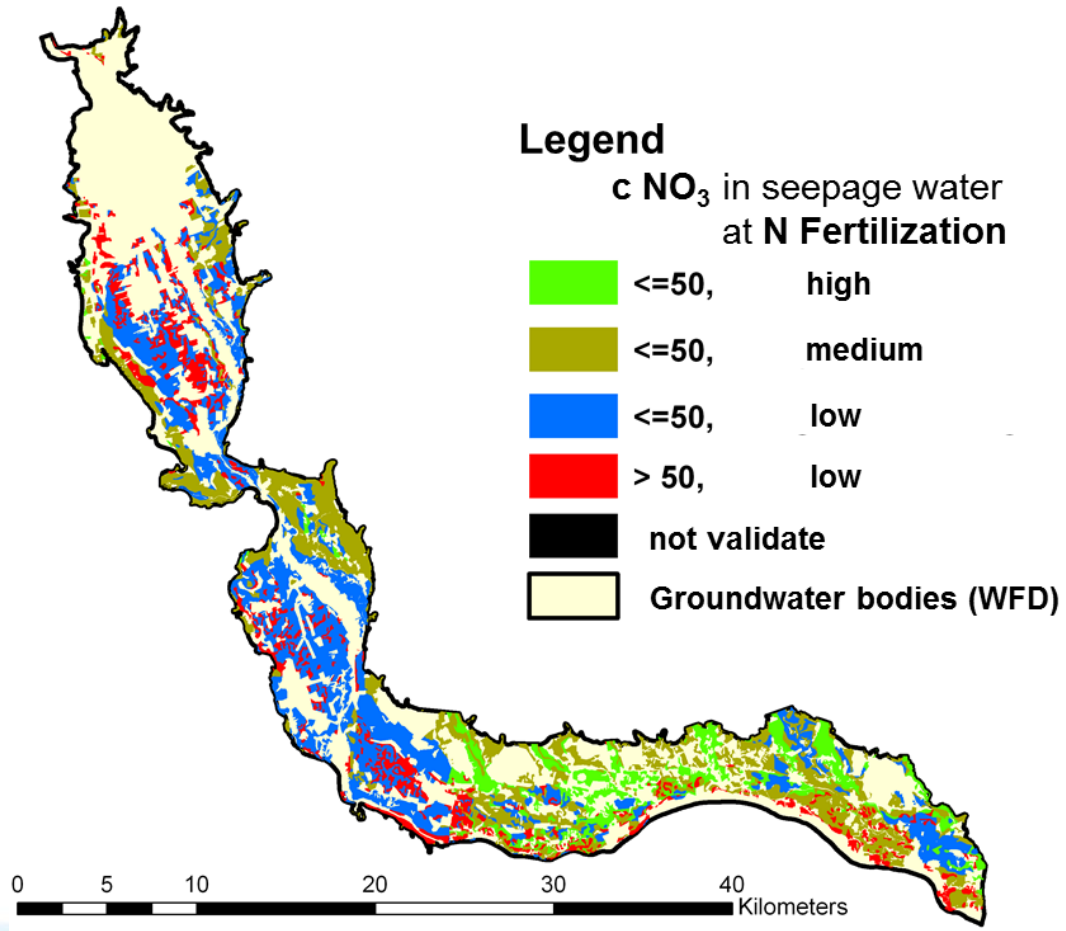


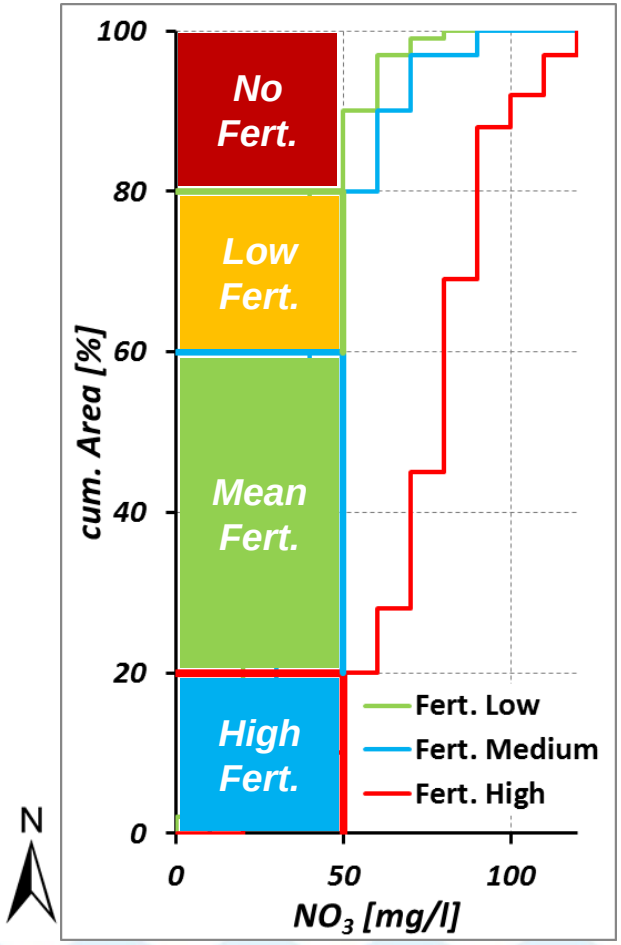
Wagendorf (higher terrace):
loamy to clayey soils (high depth)

Wagendorf 2009-2015	Maize yield [kg/ha/a]	Plan N-Fertilisation [kg/ha/a]	real N-Fertilisation [kg/ha/a]	N-removal [kg/ha/a]	N-Surplus [kg/ha/a]	c NO_3 [mg/l]
mineral N $N_{min\text{-}control}$	12500	130	99	129	-30	0
mineral N	13067	115	115	133	-18	0
mineral N high	13400	145	145	145	0	0
slurry N $N_{min\text{-}control}$	12800	130	104	128	-24	0
slurry N	12667	115	108	125	-17	0
mineral N very high	13700	175	175	151	24	43
mineral N extrem high	13500	210	210	153	57	101



Numerical Simulation of N-leachate

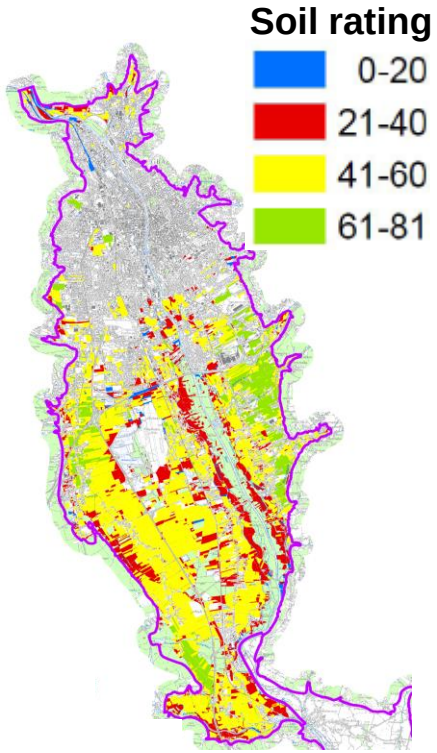


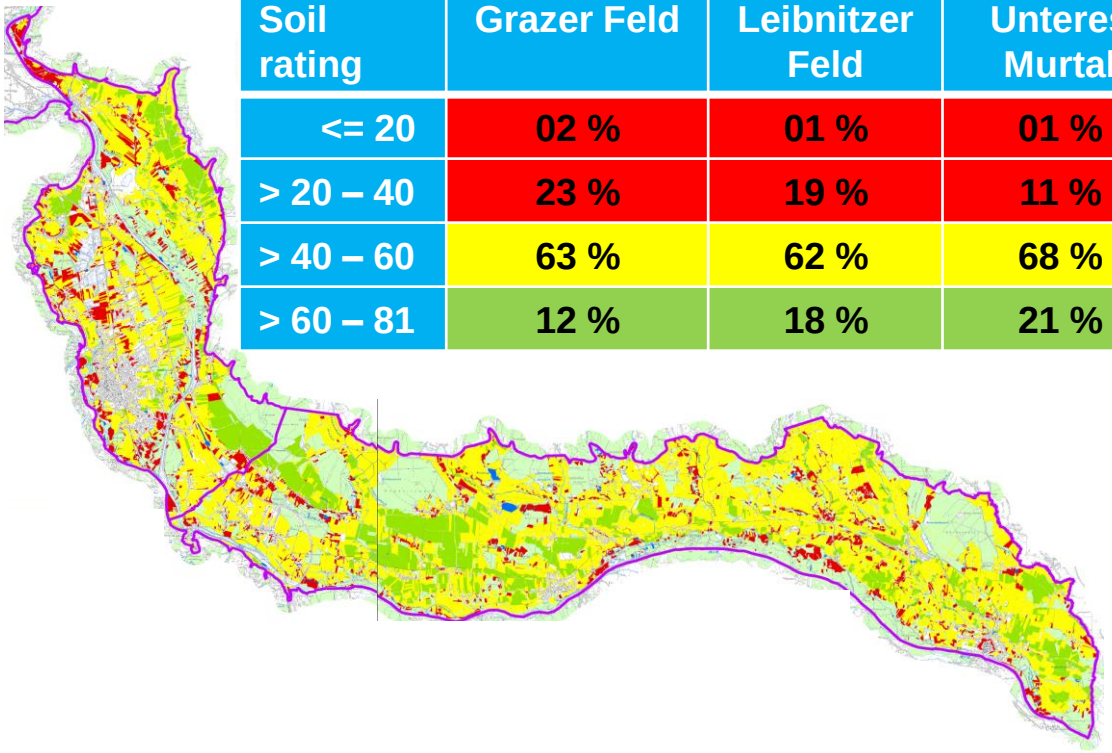


Main results and their implementation in the groundwater protection regulation

- Winter greening for the whole area
- N-Fertilization based on the „Guidelines on proper Fertilisation“ – mean expected yield
- Record requirement
  - Yield, N-content in crops, N-fertilization
  - to solve N-balance equation on field scale to hold the equation: N-Import – N-Export <= 25 kg N ha^{-1} a^{-1}
- No N-fertilization (slurry) in autumn
- N-fertilization short before crop growing
- N-Fertilization crop dependent fixed for some periods

Soil Rating for Yield Power





Soil rating	Grazer Feld	Leibnitzer Feld	Unteres Murtal
<= 20	02 %	01 %	01 %
> 20 – 40	23 %	19 %	11 %
> 40 – 60	63 %	62 %	68 %
> 60 – 81	12 %	18 %	21 %

Status

- Groundwater Protection Regulation for the Murtal is effective from 01.01.2016
- Actual Discussion
  - Monitoring of the groundwater protection regulation
  - Attendent evaluation of the impact of measures on groundwater
  - Management of record recommandation in databases and GIS
  - Management of slurry
    - Storage capacity
    - Distribution management
  - Shifting of soil rating boundaries

Soil rating	Grazer Feld	Leibnitzer Feld	Unteres Murtal
<= 20	02 %	01 %	01 %
> 20 – 30	03 %	04 %	01 %
> 40 – 50	63 %	48 %	40 %
> 50 – 81	32 %	47 %	58 %

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Thank You for Your Attention

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Hydrological Concepts and Solutions

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Austria

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fax: +43 316 876 6010
mail: office@JR-AquaConSol.at
URL: www.JR-AquaConSol.at

Maschinenring

Manure & soil nutrients management

IMPEL - European Union Network for the Implementation and Enforcement of Environmental Law

Does one measure fit all?

October 5, 2016
Raaba, Graz

Maschinenring Cluster zur Förderung der agrarischen Kooperation

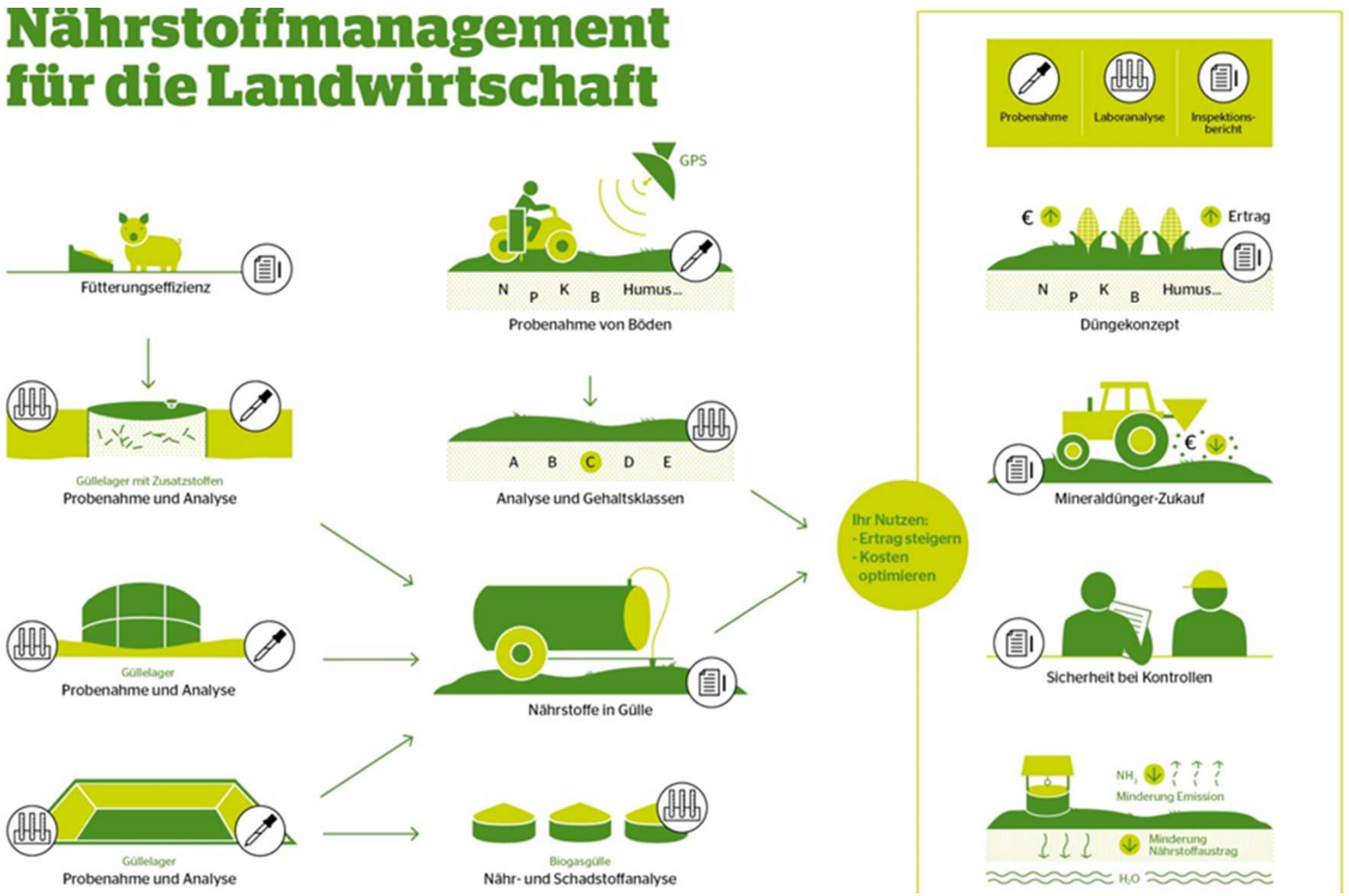
Cluster

MIT UNTERSTÜTZUNG VON BUND, LÄNDERN UND EUROPÄISCHER UNION

MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH

LE 14-20
Entwicklung für den Ländlichen Raum

Europäischer Landwirtschaftsfonds für die Entwicklung des ländlichen Raums: Hier investiert Europa in die ländlichen Gebiete

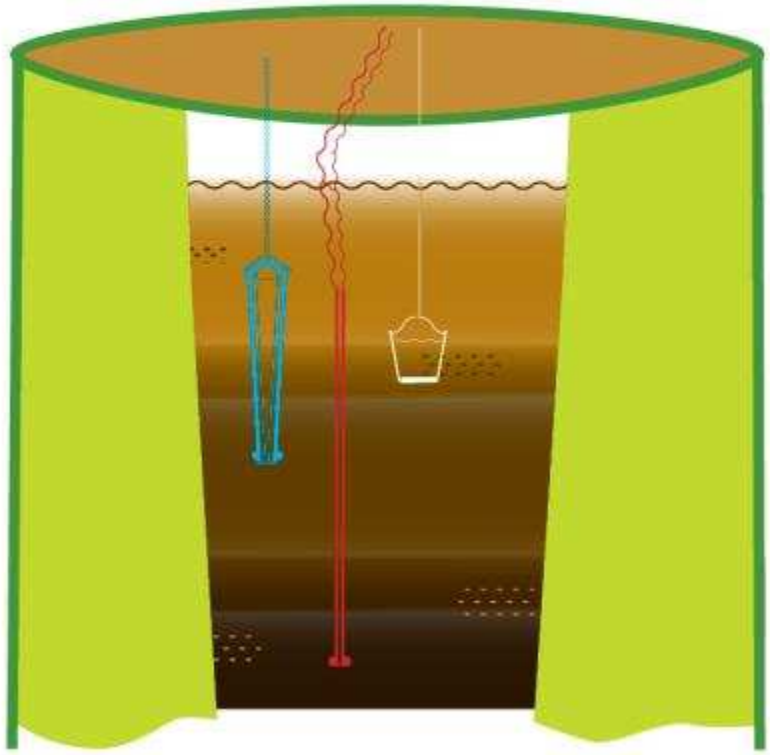

Nährstoffmanagement
für die Landwirtschaft
Fütterungseffizienz
GPS
N P K B Humus...
Probenahme von Böden
Güllelager mit Zusatzstoffen
Probenahme und Analyse
A B C D E
Analyse und Gehaltsklassen
Güllelager
Probenahme und Analyse
Nährstoffe in Gülle
Güllelager
Probenahme und Analyse
Biogasgülle
Nähr- und Schadstoffanalyse
Ihr Nutzen:
- Ertrag steigern
- Kosten optimieren
Probenahme
Laboranalyse
Inspektions-bericht
€
Ertrag
N P K B Humus...
Düngekonzept
€
Mineraldünger-Zukauf
Sicherheit bei Kontrollen
NH3
Minderung Emission
Minderung Nährstoffaustrag
H2O

Range of activities within the field of inspections

Scope of work, object of inspection: slurry

- 165 (2014)
  203 (2015)
  Inspection orders according to EN ISO/IEC 17020:2012
- 190 (2014)
  225 (2015)
  sampled slurry pits in accordance with EN ISO 5667-13:2011
- 165.803 m^3 (2014)
  252.193 m^3 (2015)
  present in the slurry pits, at the time of sampling

Sampling from pits, tanks and reservoirs

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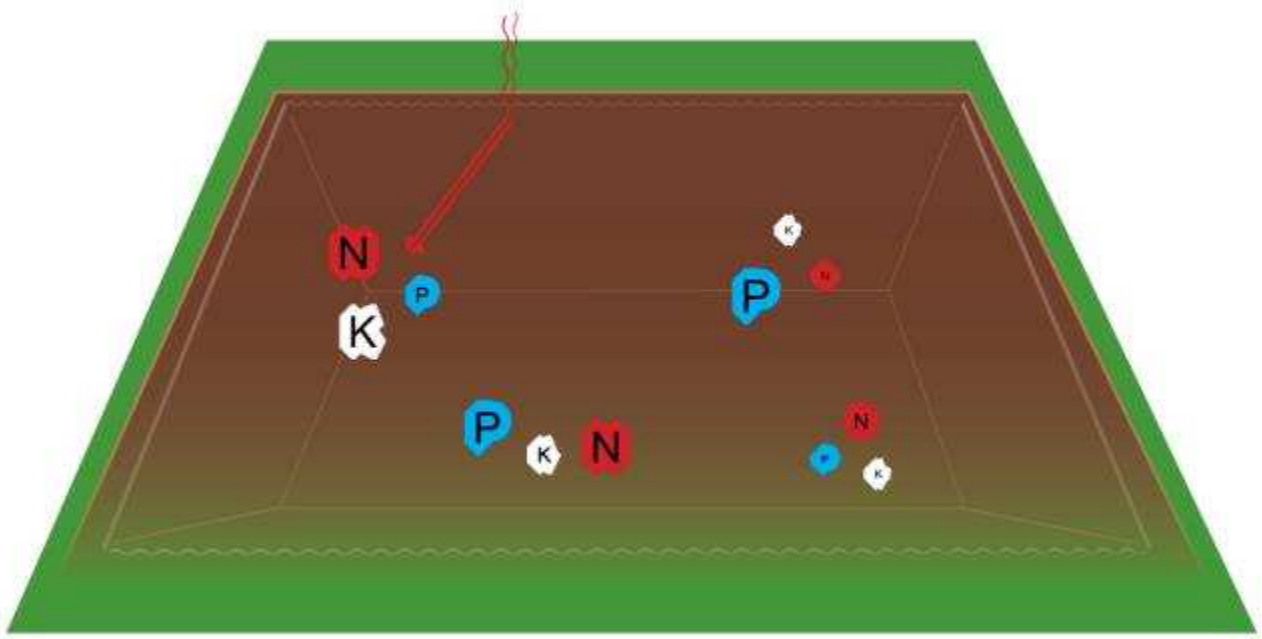
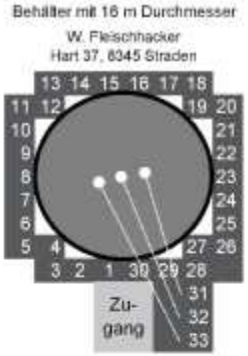
Sampling from pits, tanks and reservoirs



Minimum number of samples according to *EN ISO 5667-13*

Bestimmung der notwendigen Mindestanzahl von Einzelproben zur Erstellung einer Mischprobe lt. Pkt. 6.1.4.2 ÖNORM EN ISO 5667-13

Probennummer			pH	Temp. in °C	% Trocken-substanz	NH_4-N kg/m³ Messung Nr. 1	NH_4-N kg/m³ Messung Nr. 2	NH_4-N kg/m³ Mittelwert	Phosphor kg/m³	Kalium kg/m³
2978776	1	13.08.12	7,39	23,6	3,13	1,55	1,50	1,53	0,72	1,10
2978776	2	13.08.12	7,41	23,3	3,72	1,55	1,60	1,58	0,94	1,12
2978776	3	13.08.12	7,47	23,4	3,68	1,60	1,50	1,55	0,87	1,11
2978776	4	13.08.12	7,56	23,6	2,01	1,50	1,50	1,50	0,34	1,24
2978776	5	13.08.12	7,54	23,5	3,50	1,60	1,55	1,58	0,90	1,08
2978776	6	13.08.12	7,55	23,3	3,40	1,60	1,60	1,60	0,82	1,16
2978776	7	13.08.12	7,52	23,3	4,20	1,60	1,60	1,60	1,20	1,20
2978776	8	13.08.12	7,57	23,3	4,35	1,70	1,75	1,73	1,28	1,26
2978776	9	13.08.12	7,49	23,8	4,65	1,75	1,80	1,78	1,36	1,21
2978776	10	13.08.12	7,54	23,6	3,32	1,70	1,75	1,73	0,90	1,25
2978776	11	13.08.12	7,55	23,5	3,78	1,70	1,70	1,70	1,11	1,30
2978776	12	13.08.12	7,52	23,7	4,00	1,75	1,85	1,80	1,26	1,27
2978776	13	13.08.12	7,55	24,1	2,93	1,70	1,70	1,70	0,80	1,23
2978776	14	13.08.12	7,56	23,9	2,84	1,70	1,70	1,70	0,83	1,25
2978776	15	13.08.12	7,55	24,0	2,78	1,60	1,70	1,65	0,79	1,26
2978776	16	13.08.12	7,60	24,1	2,89	1,70	1,70	1,70	0,87	1,30
2978776	17	13.08.12	7,56	24,3	4,33	1,75	1,70	1,73	1,41	1,29
2978776	18	13.08.12	7,58	22,9	3,57	1,70	1,70	1,70	1,05	1,23
2978776	19	13.08.12	7,55	23,6	3,63	1,65	1,65	1,65	1,06	1,30
2978776	20	13.08.12	7,57	24,0	3,61	1,70	1,75	1,73	1,04	1,23
2978776	21	13.08.12	7,56	24,5	4,10	1,70	1,70	1,70	1,16	1,11
2978776	22	13.08.12	7,55	24,1	4,28	1,75	1,80	1,78	1,26	1,19
2978776	23	13.08.12	7,55	24,1	3,80	1,60	1,60	1,60	1,05	1,17
2978776	24	13.08.12	7,53	24,2	6,79	1,70	1,70	1,70	2,02	1,24
2978776	25	13.08.12	7,54	24,7	2,82	1,50	1,50	1,50	0,68	1,67
2978776	26	13.08.12	7,60	24,7	1,82	1,45	1,50	1,48	0,34	1,68
2978776	27	13.08.12	7,54	25,0	2,07	1,50	1,40	1,45	0,44	1,13
2978776	28	13.08.12	7,48	24,9	3,56	1,60	1,75	1,68	0,84	1,16
2978776	29	13.08.12	7,51	24,4	2,84	1,50	1,45	1,48	0,69	1,25
2978776	30	13.08.12	7,55	24,3	2,29	1,60	1,60	1,60	0,56	1,22
2978776	31	13.08.12	7,46	24,6	1,90	1,45	1,45	1,45	0,42	1,26
2978776	32	13.08.12	7,47	24,3	2,02	1,50	1,60	1,55	0,32	1,21
2978776	33	13.08.12	7,44	24,7	3,85	1,70	1,70	1,70	1,10	1,19
z-Wert 95%-Bereich Normalverteilung						1,96		1,96	1,96	1,96
Standardabweichung s in kg/m³						0,10		0,10	0,36	0,13
Maximal zulässiger Fehler (laut eigenen Vorgaben) E in kg/m³						0,12		0,12	0,45	0,15
Mindestanzahl von Einzelproben zur Erstellung einer Mischprobe						2,91		2,74	2,45	2,81
						3		3	3	3



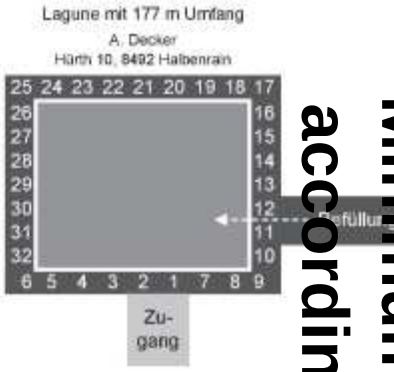
Maschinenring

Maschinenring Cluster zur Förderung der agrarischen Kooperation

Minimum number of samples according to *EN ISO 5667-13*

Bestimmung der notwendigen Mindestanzahl von Einzelproben zur Erstellung einer Mischprobe lt. Pkt. 6.1.4.2 ÖNORM EN ISO 5667-13

Probennummer			pH	Temp. in °C	% Trocken-substanz	NH_4-N kg/m³ Messung Nr. 1	NH_4-N kg/m³ Messung Nr. 2	NH_4-N kg/m³ Mittelwert	Phosphor kg/m³	Kalium kg/m³
2932261	1	08.08.12	7,74	24,5	3,26	2,30	2,30	2,30	1,08	1,86
2932261	2	08.08.12	7,66	24,3	4,46	2,20	2,30	2,25	1,21	1,69
2932261	3	08.08.12	7,70	24,3	4,02	2,10	2,10	2,10	0,93	1,63
2932261	4	08.08.12	7,70	24,2	5,19	2,20	2,20	2,20	1,29	1,51
2932261	5	08.08.12	7,71	24,4	5,12	2,30	2,25	2,28	1,30	1,76
2932261	6	08.08.12	7,72	24,3	4,95	2,25	2,20	2,23	1,21	1,70
2932261	7	08.08.12	7,73	24,4	4,10	2,60	2,50	2,55	1,68	1,83
2932261	8	08.08.12	7,66	24,5	5,65	2,90	2,90	2,90	2,43	1,80
2932261	9	08.08.12	7,72	24,5	4,78	2,85	2,80	2,83	2,09	1,79
2932261	10	08.08.12	7,66	24,3	5,88	3,10	3,15	3,13	2,57	1,76
2932261	11	08.08.12	7,72	24,2	4,29	2,70	2,55	2,63	1,81	1,90
2932261	12	08.08.12	7,70	24,4	4,99	2,85	2,90	2,88	2,13	1,77
2932261	13	08.08.12	7,69	24,5	4,56	2,65	2,65	2,65	1,90	1,83
2932261	14	08.08.12	7,58	25,4	5,57	2,80	2,80	2,80	2,44	1,78
2932261	15	08.08.12	7,62	25,0	5,56	2,90	2,90	2,90	2,48	1,77
2932261	16	08.08.12	7,58	25,3	5,64	2,90	2,90	2,90	2,52	1,72
2932261	17	08.08.12	7,62	25,1	5,18	2,80	2,80	2,80	2,32	1,91
2932261	18	08.08.12	7,70	25,2	3,59	2,50	2,50	2,50	1,53	1,88
2932261	19	08.08.12	7,65	24,9	5,03	2,80	2,80	2,80	2,12	1,75
2932261	20	08.08.12	7,64	24,8	5,59	2,90	3,00	2,95	2,63	1,88
2932261	21	08.08.12	7,70	25,0	4,23	2,65	2,65	2,65	1,74	1,93
2932261	22	08.08.12	7,66	25,4	4,04	2,60	2,50	2,55	1,43	1,85
2932261	23	08.08.12	7,68	24,7	4,31	2,50	2,60	2,55	1,72	2,03
2932261	24	08.08.12	7,69	25,1	4,41	2,65	2,50	2,58	1,82	1,84
2932261	25	08.08.12	7,67	25,5	4,29	2,50	2,50	2,50	1,63	1,84
2932261	26	08.08.12	7,68	25,6	3,54	2,40	2,40	2,40	1,24	1,78
2932261	27	08.08.12	7,67	25,3	4,20	2,50	2,50	2,50	1,28	1,81
2932261	28	08.08.12	7,68	25,3	5,01	2,30	2,30	2,30	1,36	1,74
2932261	29	08.08.12	7,70	25,5	3,91	1,95	2,05	2,00	0,94	1,84
2932261	30	08.08.12	7,68	25,8	4,93	2,20	2,20	2,20	1,34	1,79
2932261	31	08.08.12	7,60	25,5	6,55	2,30	2,30	2,30	1,92	1,69
2932261	32	08.08.12	7,70	25,7	2,73	1,90	2,00	1,95	0,54	1,83
z-Wert 95%-Bereich Normalverteilung						1,96		1,96	1,96	1,96
Standardabweichung s in kg/m³						0,30		0,30	0,55	0,10
Maximal zulässiger Fehler (laut eigenen Vorgaben) E in kg/m³						0,21		0,21	0,40	0,07
Mindestanzahl von Einzelproben zur Erstellung einer Mischprobe						7,95		7,98	7,32	7,18
						8		8	8	8

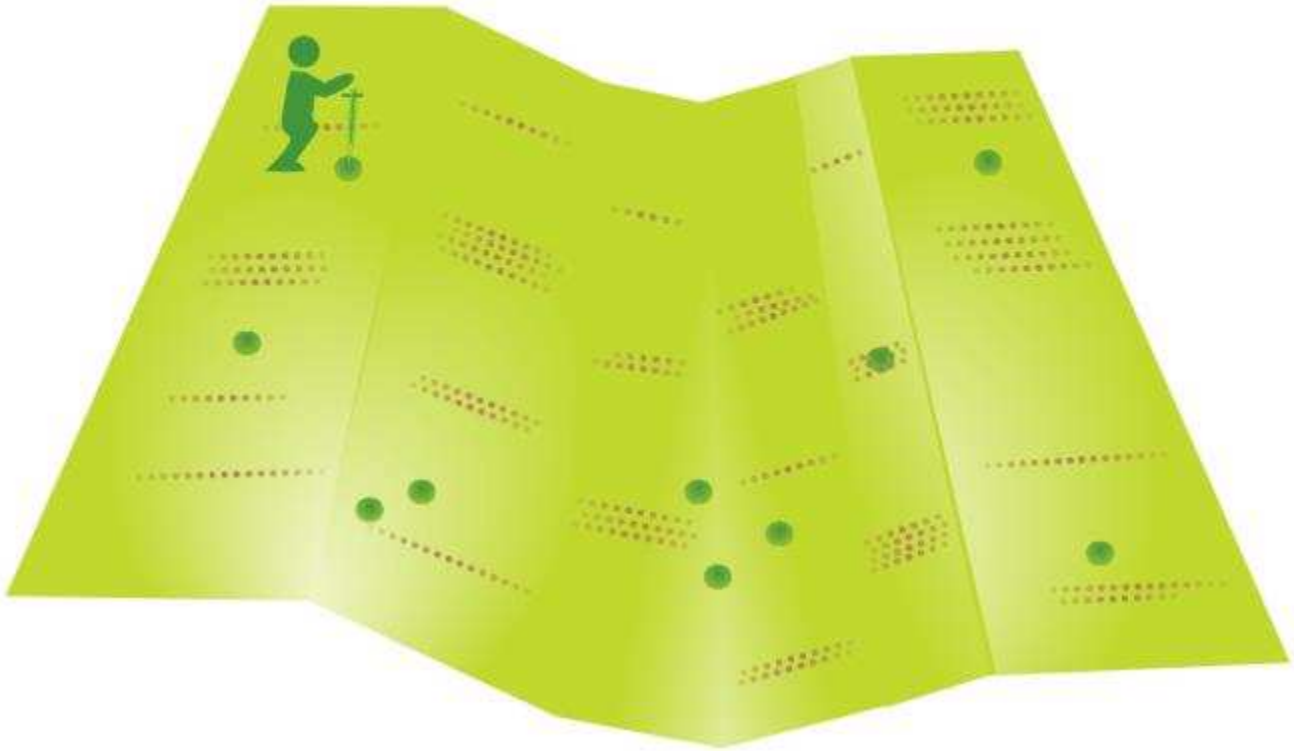


Range of activities within the field of inspections

Scope of work, object of inspection: soil

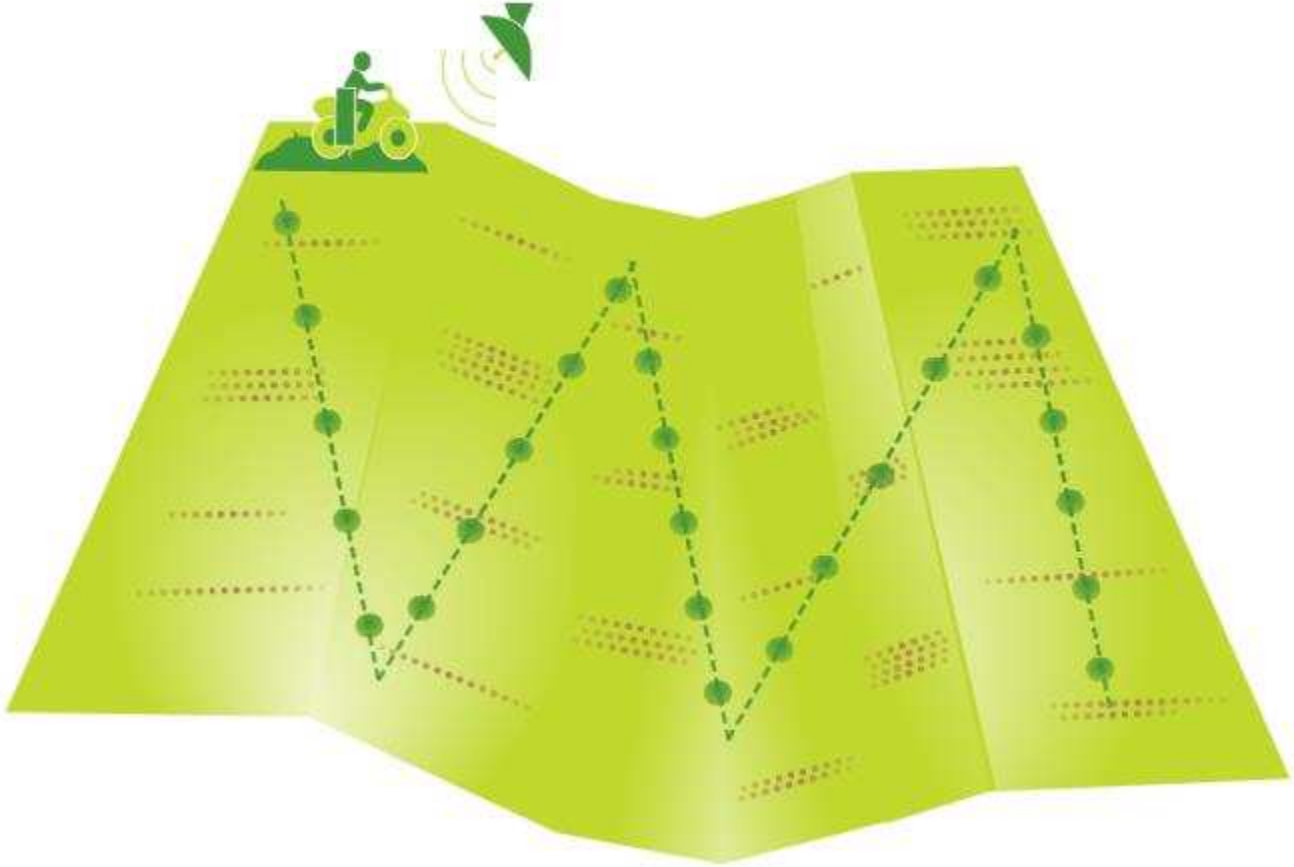
- 127 (2014)
  221 (2015)
  Inspection orders according to EN ISO/IEC 17020:2012
- 1.501 (2014)
  2.802 (2015)
  Soil samples in accordance with ÖNORMEN L 1055, 1057 or 1056
- 1.396 (2014) **2.384 (2015)** agriculture (ÖNORM L 1055)
  102 (2014) **361 (2015)** arbori-, viniculture (ÖNORM L 1057)
  3 (2014) **57 (2015)** pasture (ÖNORM L 1056)

Typical sampling procedure, carried out by farmers



Standalone sampling framework for farmers

Sampling Procedure, utilizing IACS (INVEKOS-GIS)

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New sampling equipment, mineralized nitrogen

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Maschinenring Steiermark

Dr. Auner Straße 21a, A-8074 Raaba

Identifikationsnummer / *ID-number*: **0343**

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Typ A-Inspektionsstelle / *Typ A-Inspection Body*
gemäß / *according to* EN ISO/IEC 17020:2012

Datum der Erstakkreditierung / *Initial date of accreditation*: **01.03.2013**

Standort/Organisationseinheit / site/unit
Nährstoffmanagement, Halbenrain 52/2, A-8492 Halbenrain

Informationen zum Akkreditierungsumfang und zu Akkreditierung Austria / *Information about the accreditation scope and Akkreditierung Austria* http://www.bmwfw.gv.at/akkreditierung

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11.02.2016
Datum / *Date*

Dipl.-Ing. Dr. Norman Brunner
Leiter Akkreditierung Austria / *Head Akkreditierung Austria*

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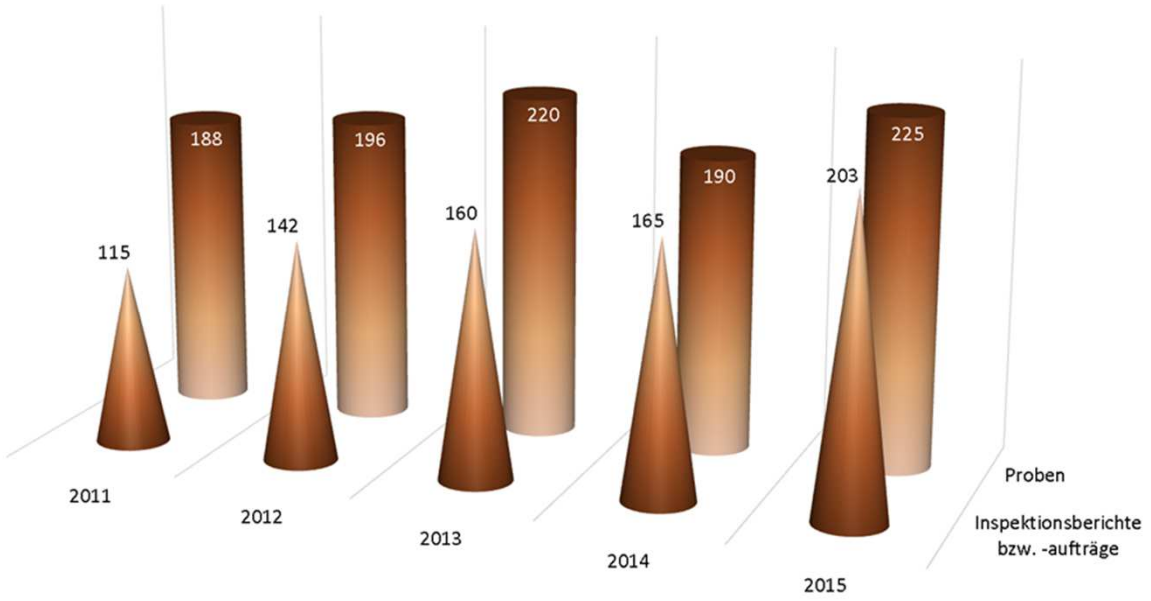
Beilage zum Bescheid GZ: BMWFW-92.251/0048-I/12/2016 Nährstoffmanagement_17020

Akkreditierungsumfang der Inspektionsstelle (EN ISO/IEC 17020:2012)
Maschinenring Steiermark
Nährstoffmanagement / (Ident.Nr.: 0343)

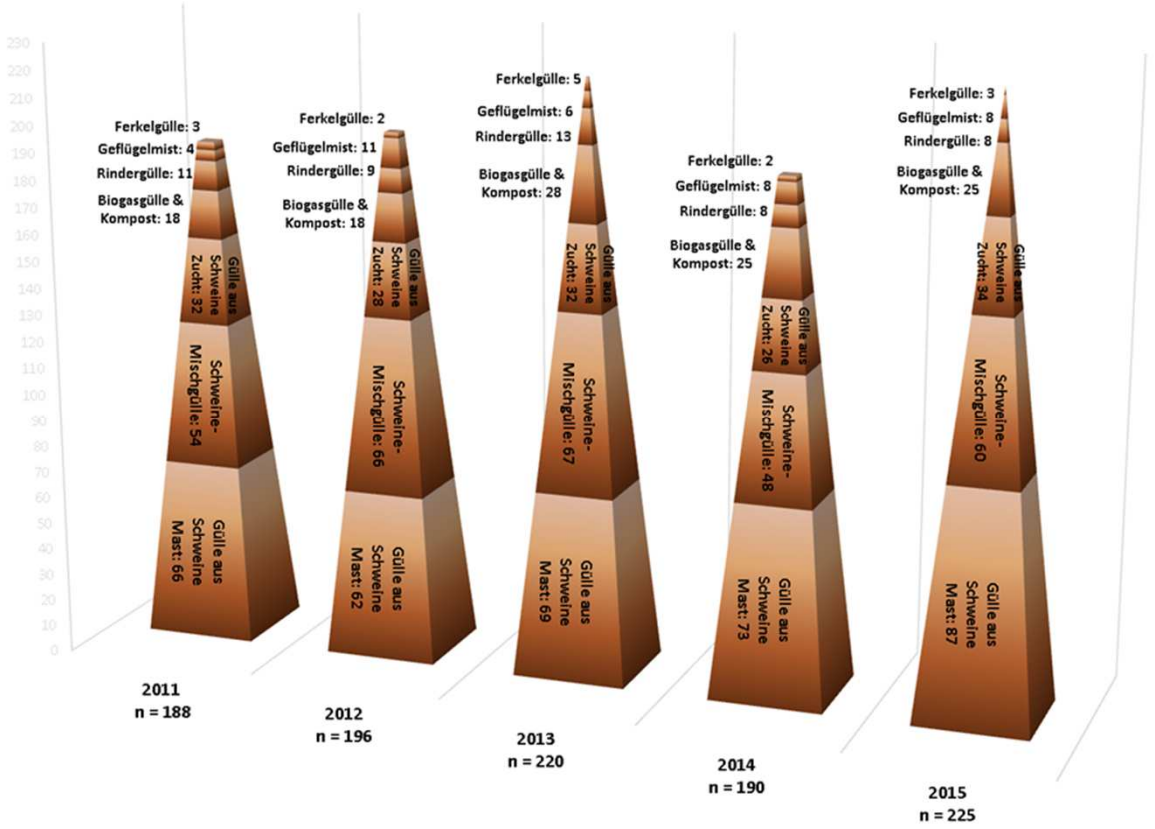
gültig ab: 01.02.2016

Nr.	Dokumentnummer der Norm bzw. SOP	Ausgabe	Titel der Norm bzw. SOP	Produkt/-gruppe (Bemerkungen)	Konformitätsbewertungs-verfahren / Modul
1	BMLFUW-Richtlinien für die sachgerechte Düngung	2006-09	Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft - Richtlinien für die sachgerechte Düngung, 6. Auflage 2006	Boden	Inspektion zur Erstellung eines Düngeplanes
2	BMLFUW-Richtlinien für die sachgerechte Düngung im Garten- und Feldgemüsebau	2008-07	Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft - Richtlinien für die sachgerechte Düngung im Garten- und Feldgemüsebau, 3. Auflage mit Kulturdatenblätter 2008	Boden	Inspektion zur Beurteilung des Düngebedarfs gemäß Kapitel 4 und 7
3	BMLFUW-Richtlinien für die sachgerechte Düngung im Obstbau	2009-02	Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft - Richtlinien für die sachgerechte Düngung im Obstbau	Boden	Inspektion zur Beurteilung des Düngebedarfs im Obstbau gemäß Kapitel 3
4	BMLFUW-Richtlinien für die sachgerechte Düngung im Weinbau	2014-01	Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft - Richtlinien für die sachgerechte Düngung im Weinbau, 2. Auflage 2014	Boden	Inspektion zur Interpretation der Bodenanalyse und Düngung gemäß Kapitel 3 und 4
5	ÖNORM EN ISO 5667-13	2011-10	Wasserbeschaffenheit - Probenahme - Teil 13: Anleitung zur Probenahme von Schlämmen (ISO 5667-13:2011)	Eingeschränkt auf Wirtschaftsdünger (Gülle und Festmist)	
6	ÖNORM L 1053	2012-04	Bodenuntersuchungen - Allgemeine Grundlagen	eingeschränkt auf die Probenahme	
7	ÖNORM L 1054	2004-07	Probenahme von Böden - Allgemeines, Terminologie		
8	ÖNORM L 1055	2004-07	Probenahme von ackerbaulich genutzten Böden		
	ÖNORM L 1056	2004-07	Probenahme von Dauergrünland (inklusive Parkanlagen, sowie Zier- und Sportrasen)		
	ÖNORM L 1057	2004-07	Probenahme von wein- und obstbaulich genutzten Böden und Böden von Baumschulen		
	ÖNORM S 2123-4	2003-11	Probenahmepläne für Abfälle - Teil 4: Beprobung flüssiger bzw. pastoser Abfälle	Eingeschränkt auf Wirtschaftsdünger (Gülle und Festmist)	
	Richtlinie Gülleanalyse	2013-02	Richtlinie zur Probenentnahme, chemisch-physikalischen Untersuchung und Anwendungsplanung von Gülle(n) als landwirtschaftliche Wirtschaftsdünger, Maschinenring Steiermark, Version 04 vom 01.02.2013	ohne analytische Prüfungen	Richtlinien für die sachgerechte Düngung, 6. Auflage 2006 Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft

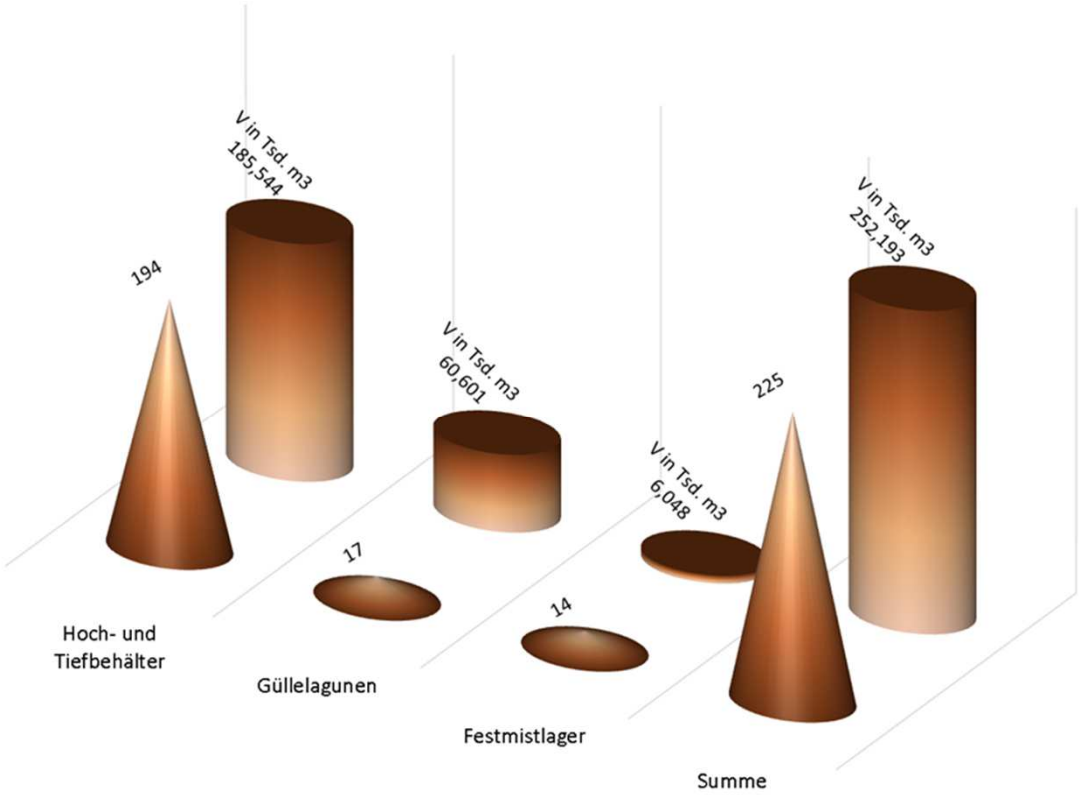
Inspection orders and samples of manure



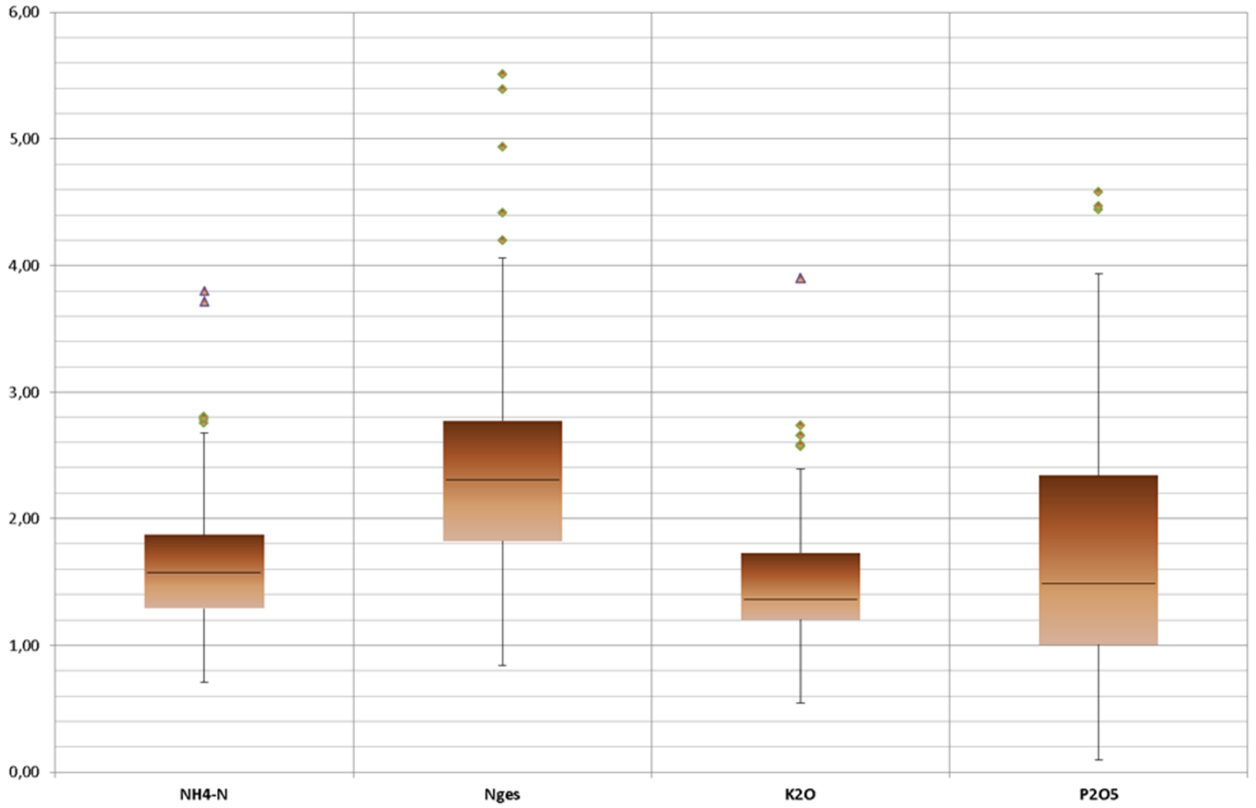
Type and origin of inspected manure samples



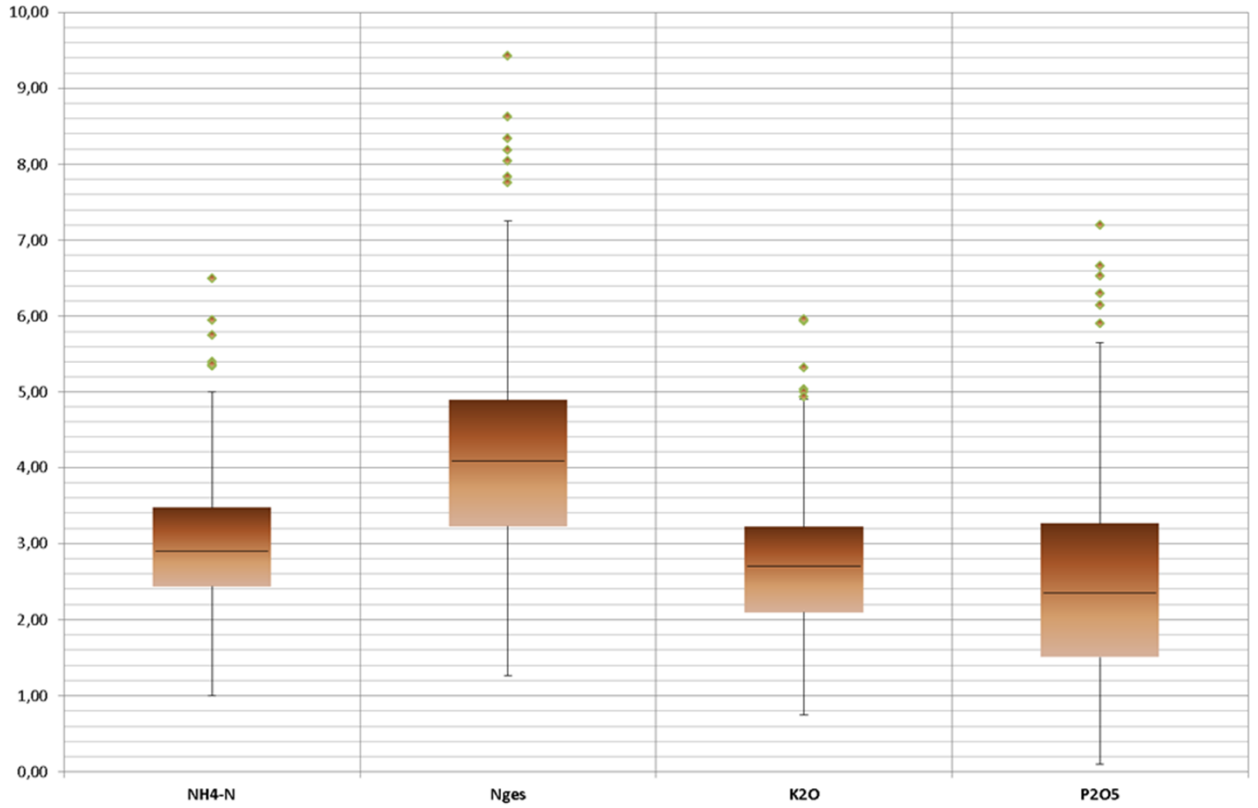
Sampled slurry pits, tanks and reservoirs 2015



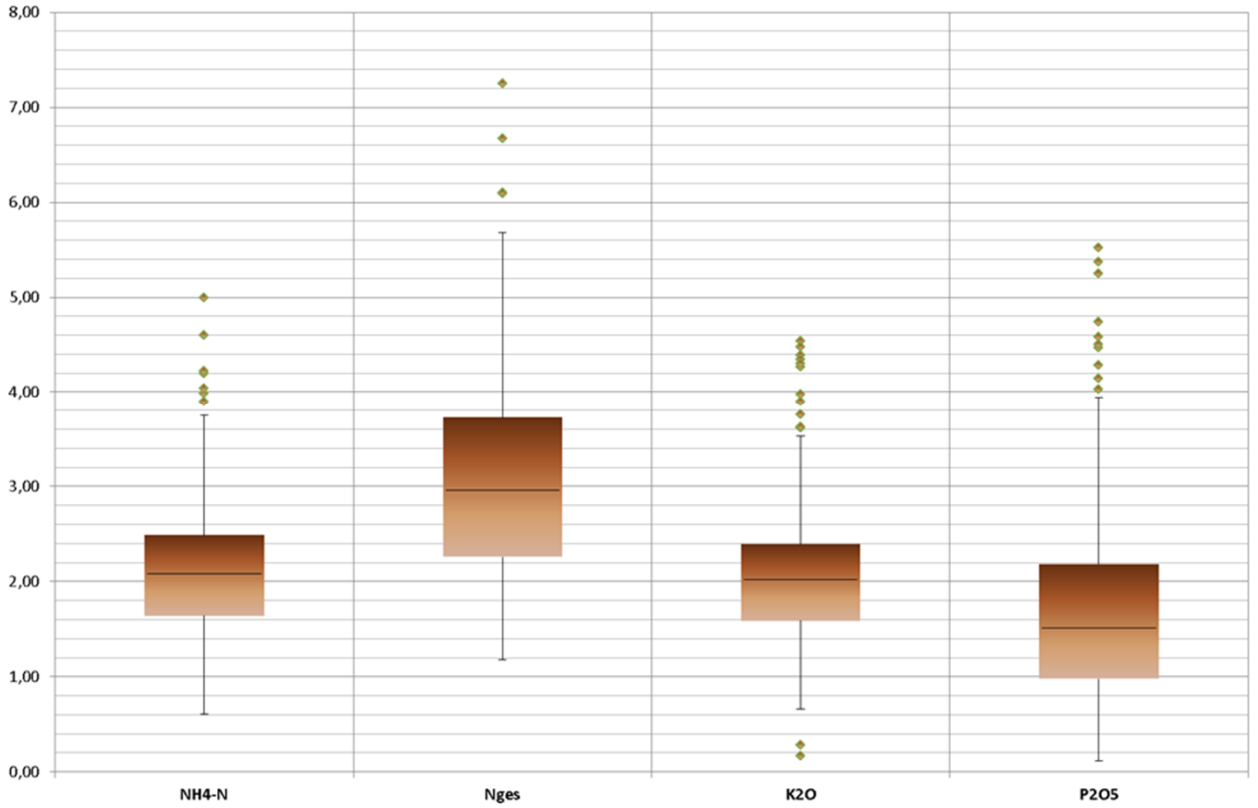
152 manure samples, breeding pigs origin



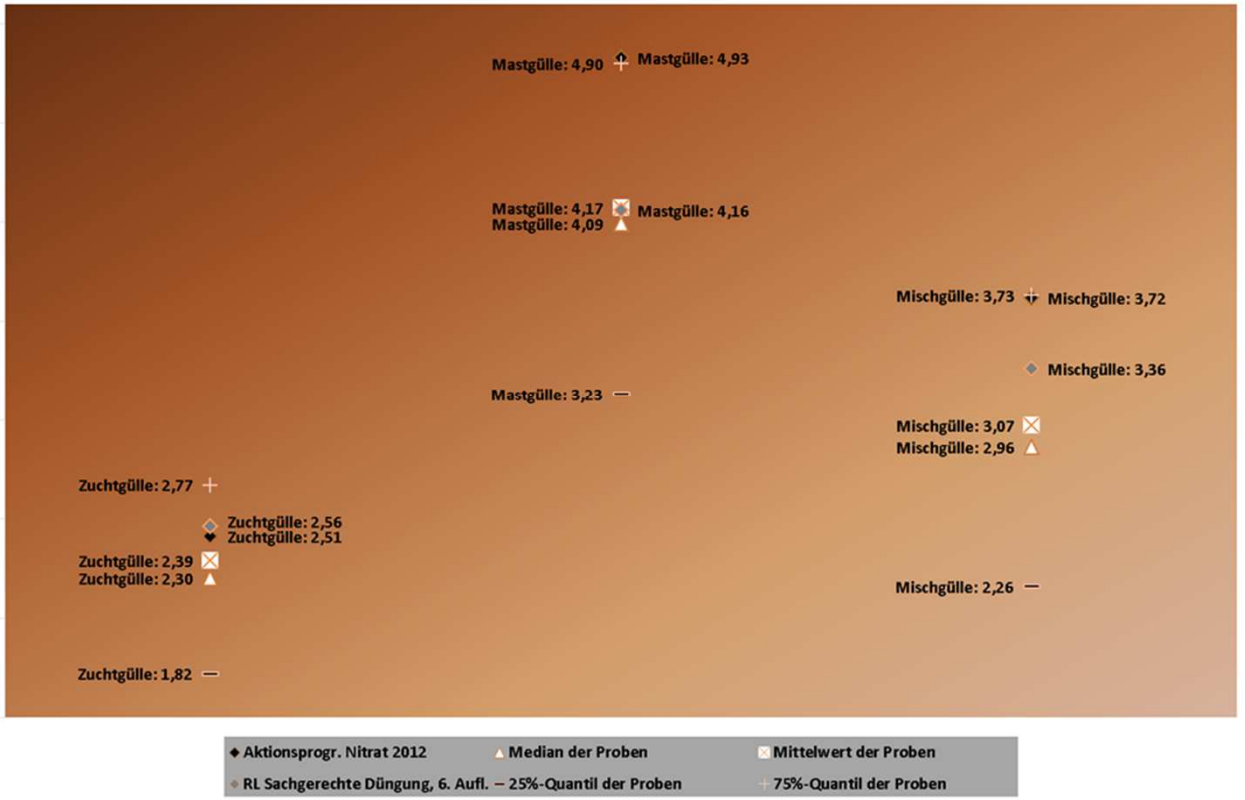
357 manure samples, porkers origin



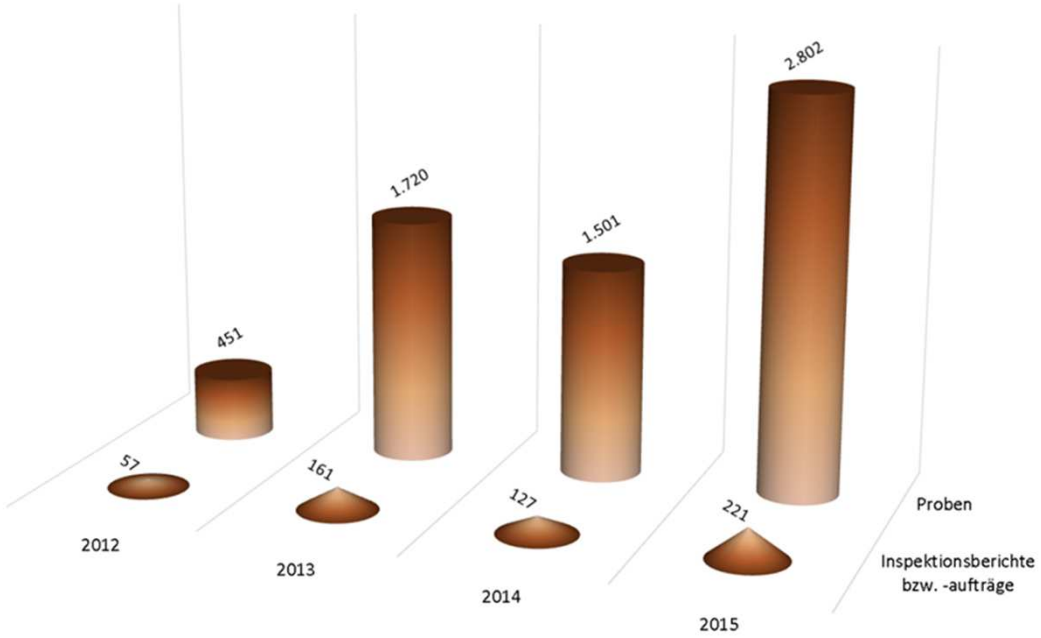
295 manure samples, mixed pig husbandry



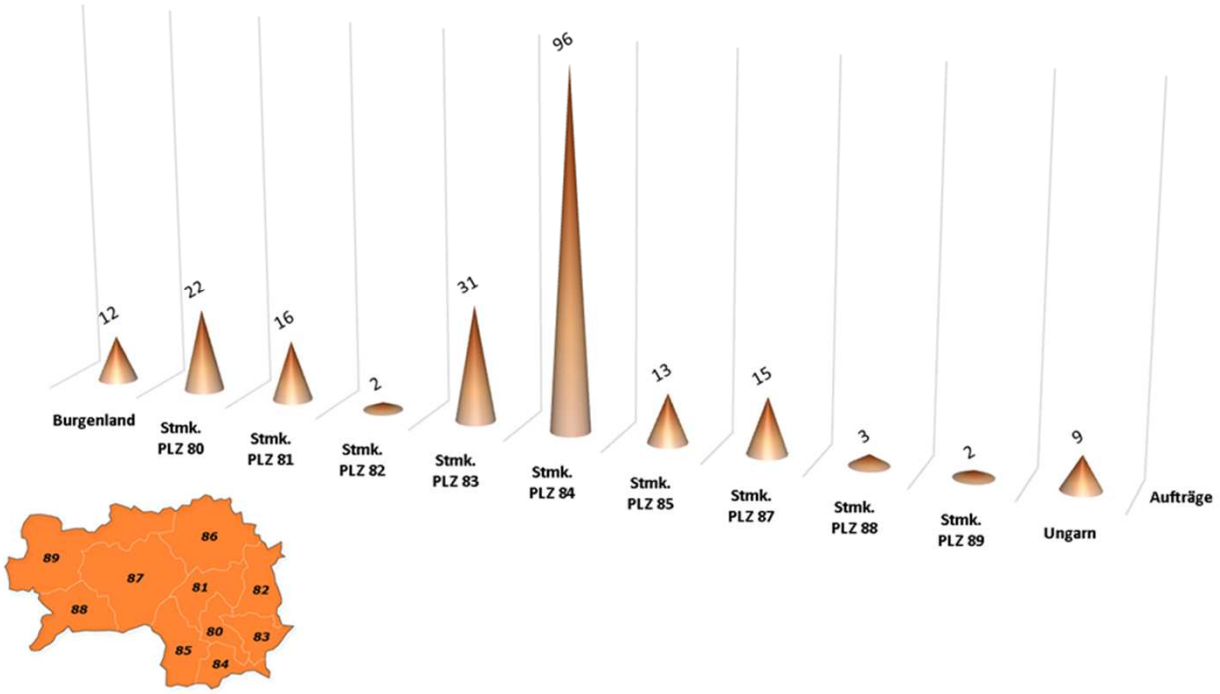
Ø-Values of samples compared to AUT-standards



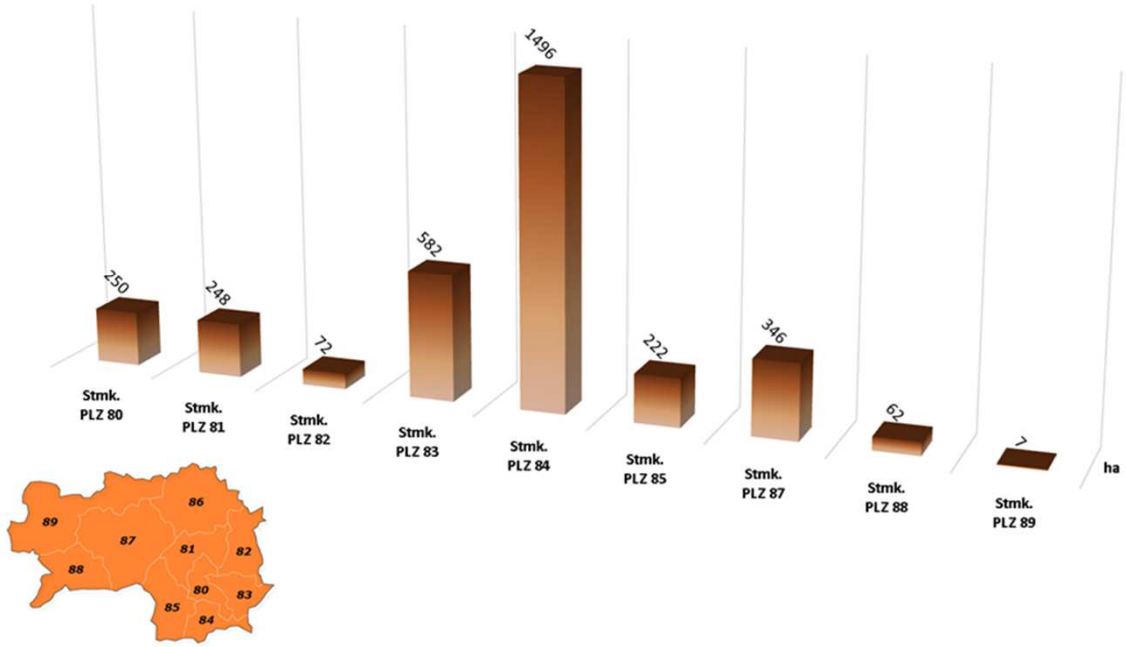
Inspection orders and soil samples



Local distribution, inspection orders, Styria 2015

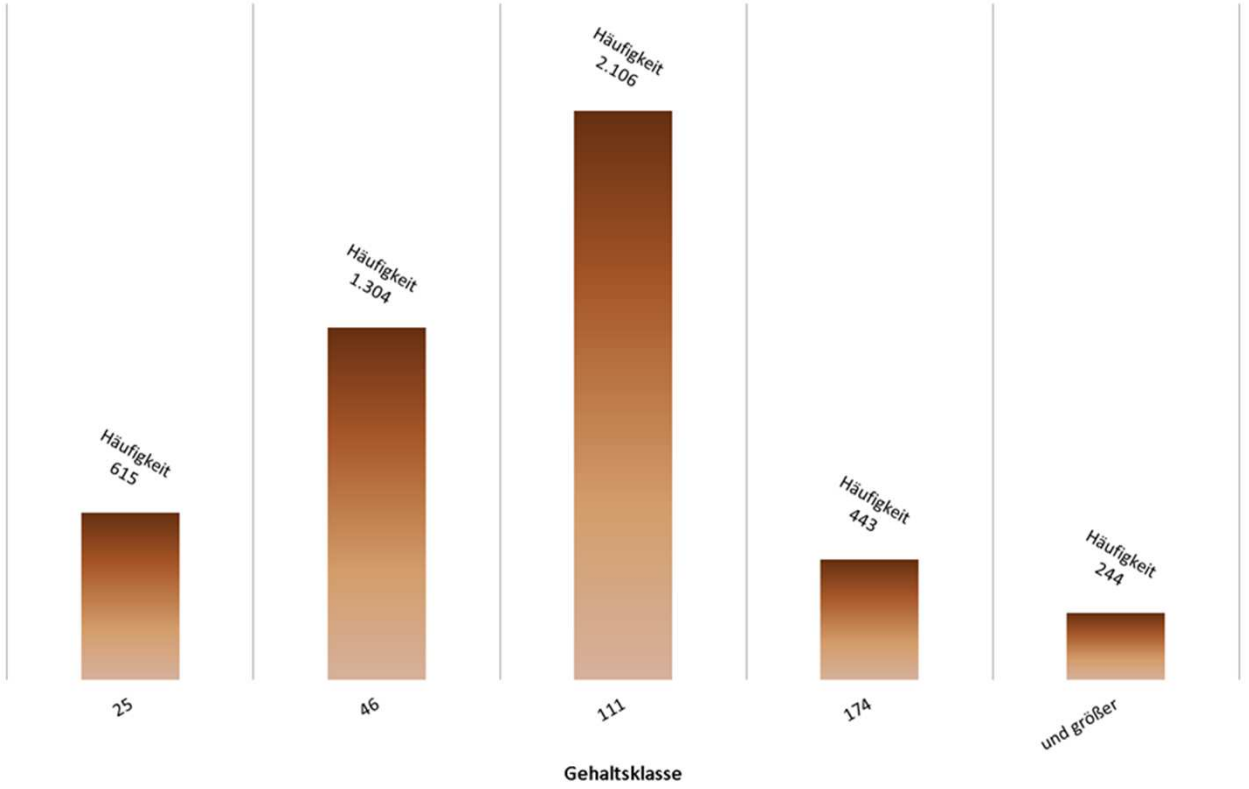


Agricultural areas, soil samples, Styria 2015

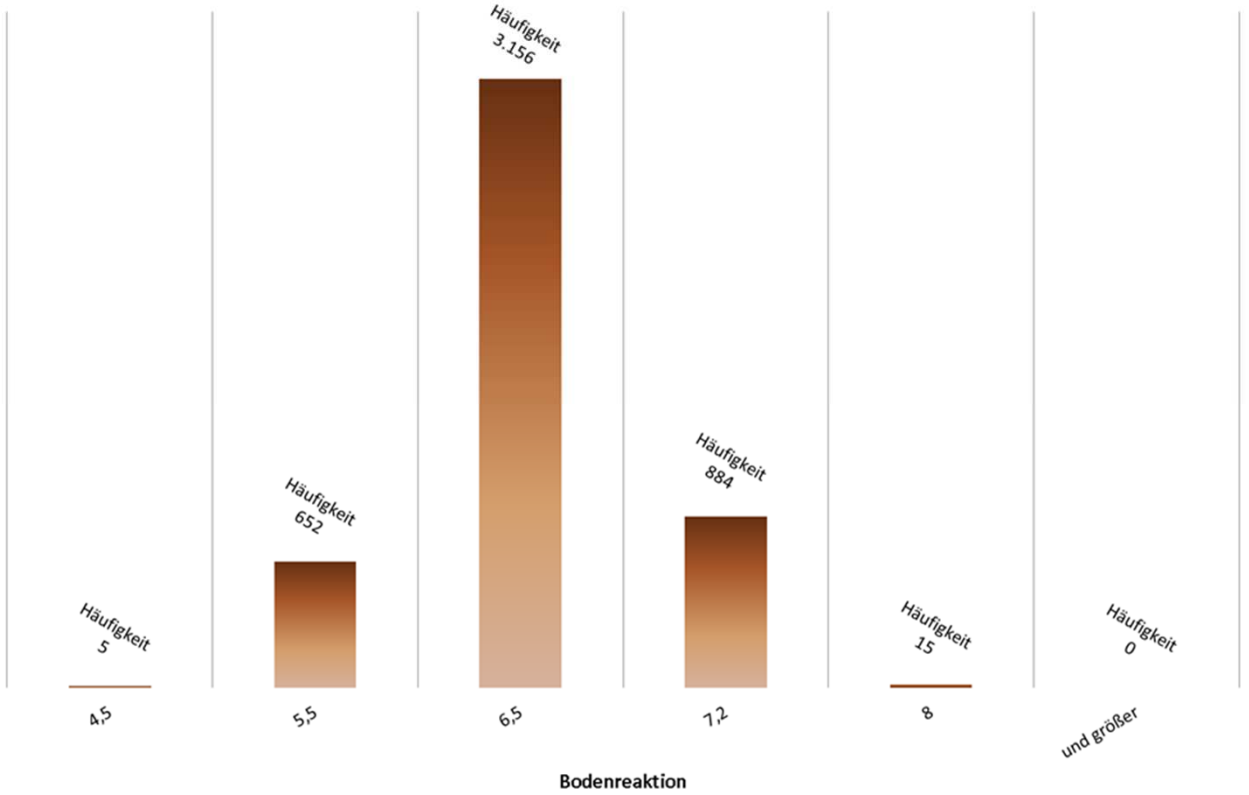


Type of use, sampled areas, Styria 2015

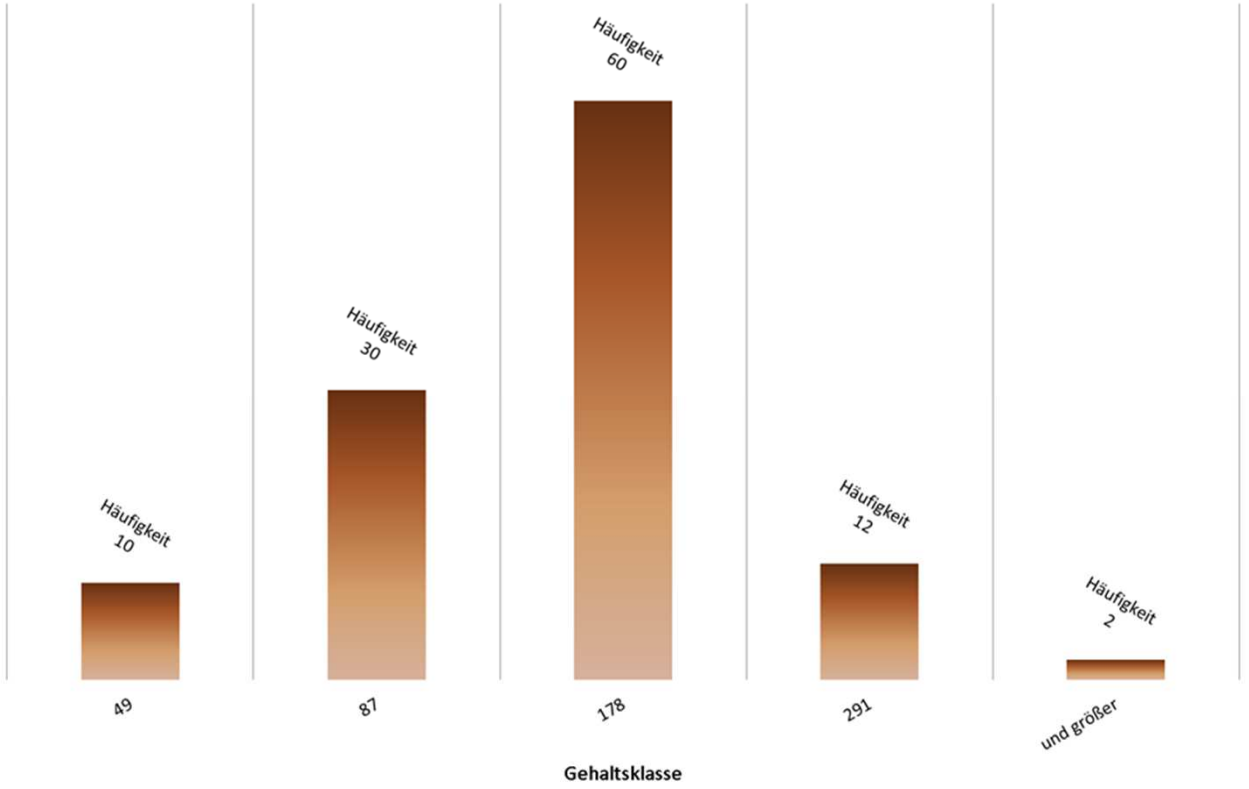
Phosphorus content, agricultural soils



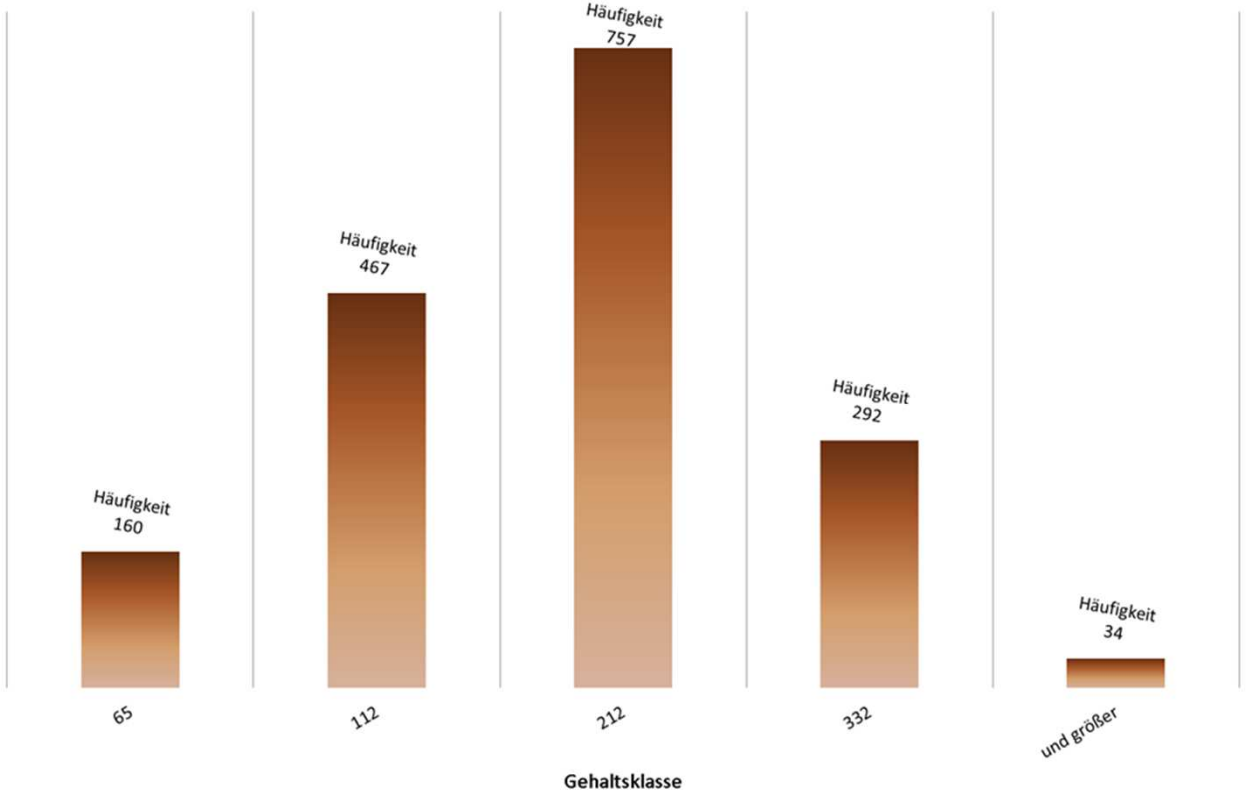
Soil pH-reaction, agricultural soils



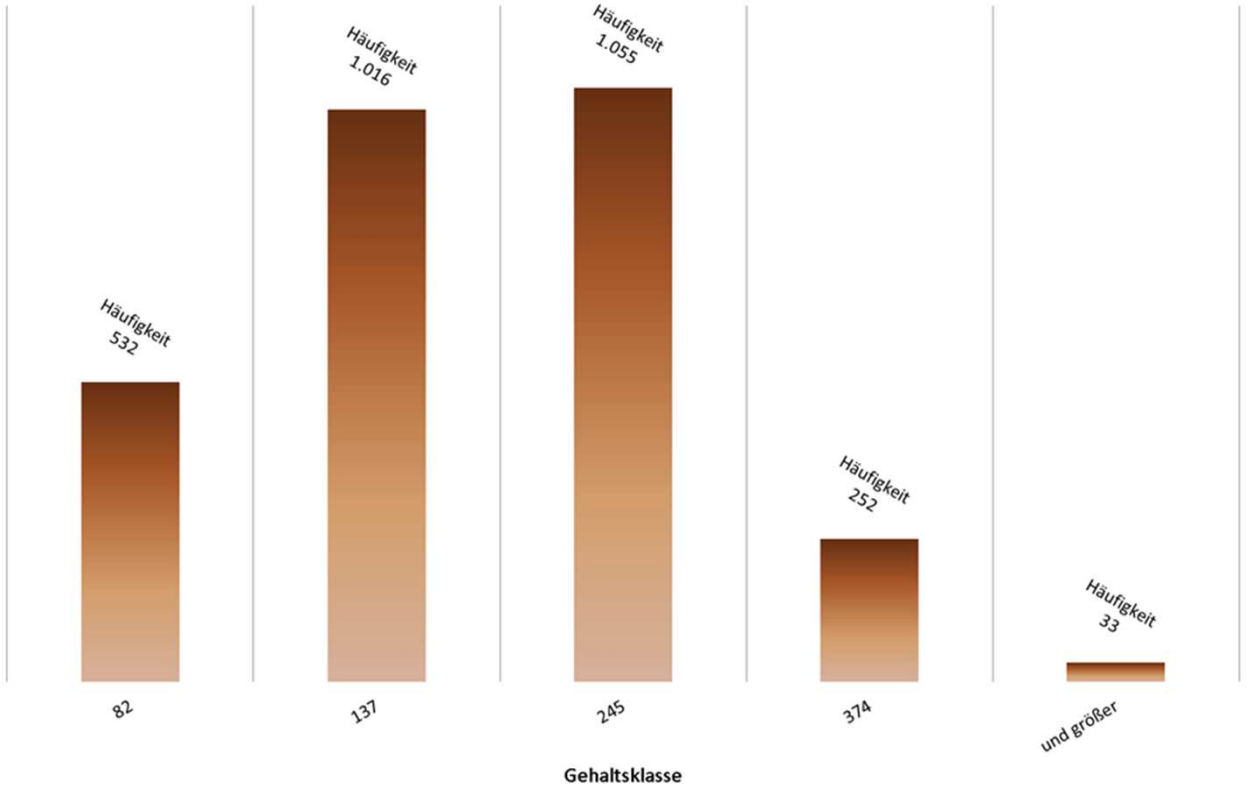
Potassium content, light agricultural soils



Potassium content, medium agricultural soils



Potassium content, claggy agricultural soils

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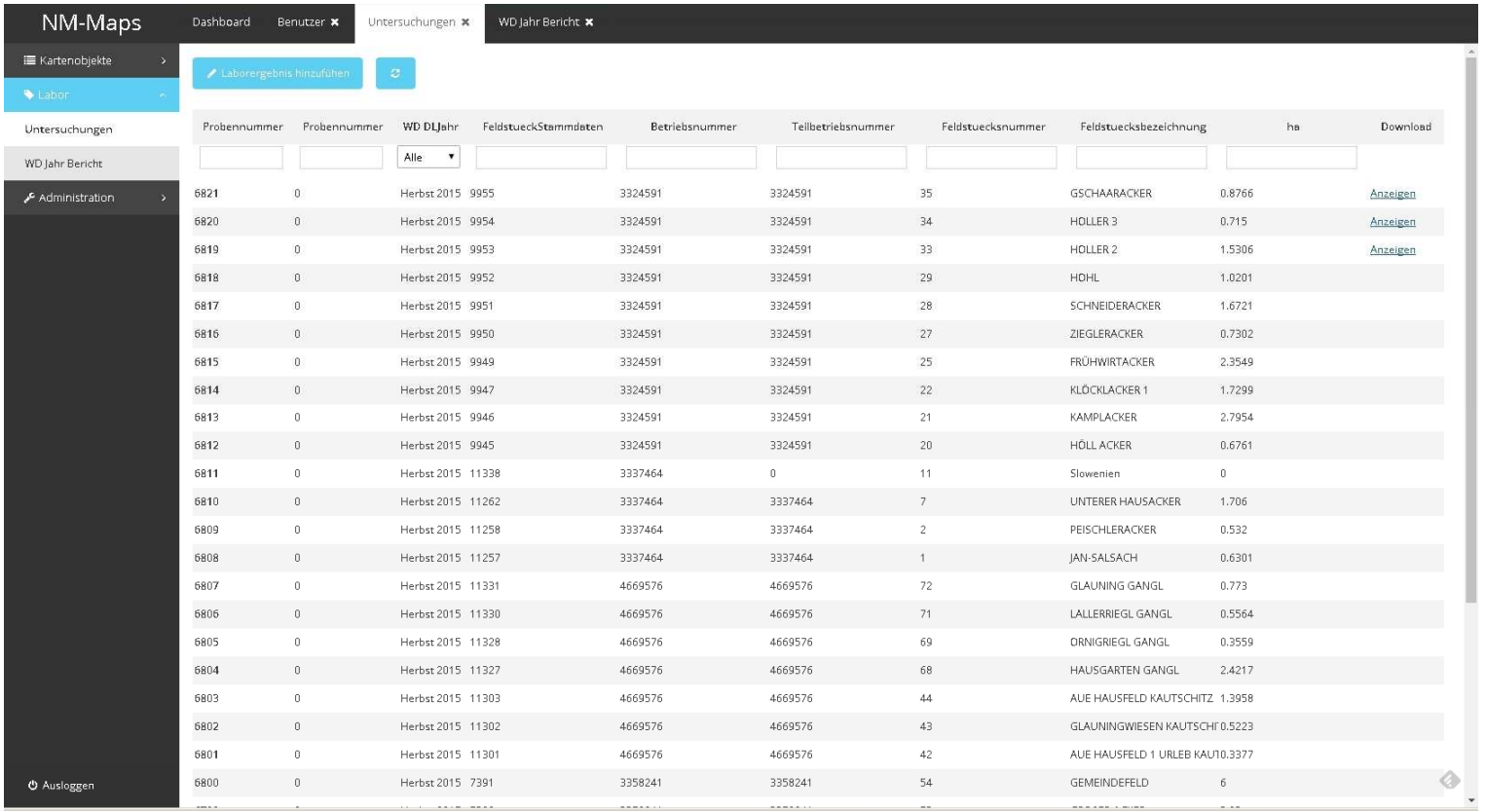
Internal database



Probennummer	Probennummer	WD DLJahr	FeldstueckStammdaten	Betriebsnummer	Teilbetriebsnummer	Feldstuecksnummer	Feldstuecksbezeichnung	ha	Download
		Alle							
6821	0	Herbst 2015	9955	3324591	3324591	35	GSCHAARACKER	0.8766	Anzeigen
6820	0	Herbst 2015	9954	3324591	3324591	34	HOLLER 3	0.715	Anzeigen
6819	0	Herbst 2015	9953	3324591	3324591	33	HOLLER 2	1.5306	Anzeigen
6818	0	Herbst 2015	9952	3324591	3324591	29	HOHL	1.0201	
6817	0	Herbst 2015	9951	3324591	3324591	28	SCHNEIDERACKER	1.6721	
6816	0	Herbst 2015	9950	3324591	3324591	27	ZIEGLERACKER	0.7302	
6815	0	Herbst 2015	9949	3324591	3324591	25	FRÜHWIRTACKER	2.3549	
6814	0	Herbst 2015	9947	3324591	3324591	22	KLÖCKLACKER 1	1.7299	
6813	0	Herbst 2015	9946	3324591	3324591	21	KAMPLACKER	2.7954	
6812	0	Herbst 2015	9945	3324591	3324591	20	HÖLL ACKER	0.6761	
6811	0	Herbst 2015	11338	3337464	0	11	Slowenien	0	
6810	0	Herbst 2015	11262	3337464	3337464	7	UNTERER HAUSACKER	1.706	
6809	0	Herbst 2015	11258	3337464	3337464	2	PEISCHLERACKER	0.532	
6808	0	Herbst 2015	11257	3337464	3337464	1	JAN-SALSACH	0.6301	
6807	0	Herbst 2015	11331	4669576	4669576	72	GLAUNING GANGL	0.773	
6806	0	Herbst 2015	11330	4669576	4669576	71	LALLERRIEGL GANGL	0.5564	
6805	0	Herbst 2015	11328	4669576	4669576	69	ORNIGRIEGL GANGL	0.3559	
6804	0	Herbst 2015	11327	4669576	4669576	68	HAUSGARTEN GANGL	2.4217	
6803	0	Herbst 2015	11303	4669576	4669576	44	AUE HAUSFELD KAUTSCHITZ	1.3958	
6802	0	Herbst 2015	11302	4669576	4669576	43	GLAUNINGWIESEN KAUTSCHI	0.5223	
6801	0	Herbst 2015	11301	4669576	4669576	42	AUE HAUSFELD 1 URLEB KAU	0.3377	
6800	0	Herbst 2015	7391	3358241	3358241	54	GEMEINDEFELD	6	

Customer web portal, visualization of datasets