

NITROAUSTRIA

Nitrogen losses from Austrian agricultural soils – modelling to explore trade off effects

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NitroAustria Team



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NitroAustria Background

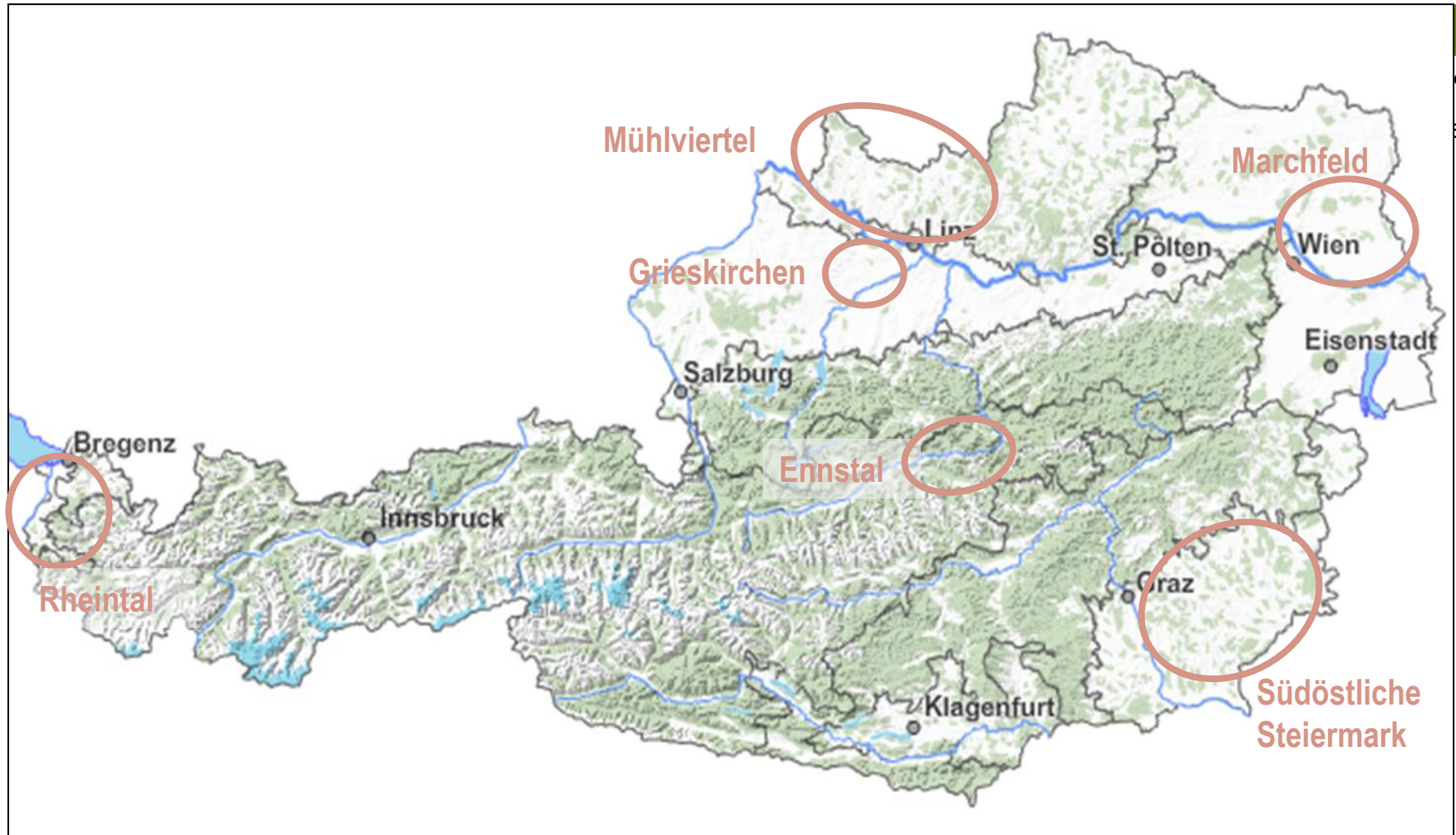


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The IPCC default emission factor is not able to reflect **region specific N_2O emissions** from Austrian arable soils. **Hot spots and hot moments** of N_2O emissions can not be identified. Hence no valid recommendations can be given on optimisation measures that would lead to a **reduction of soil N_2O emissions**.



NitroAustria selected regions



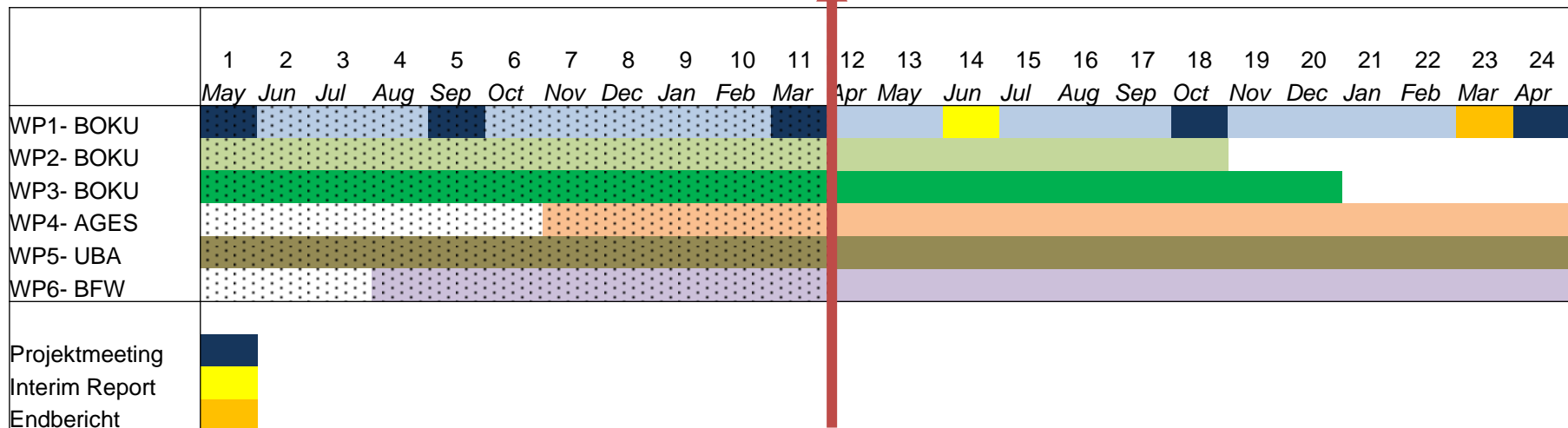
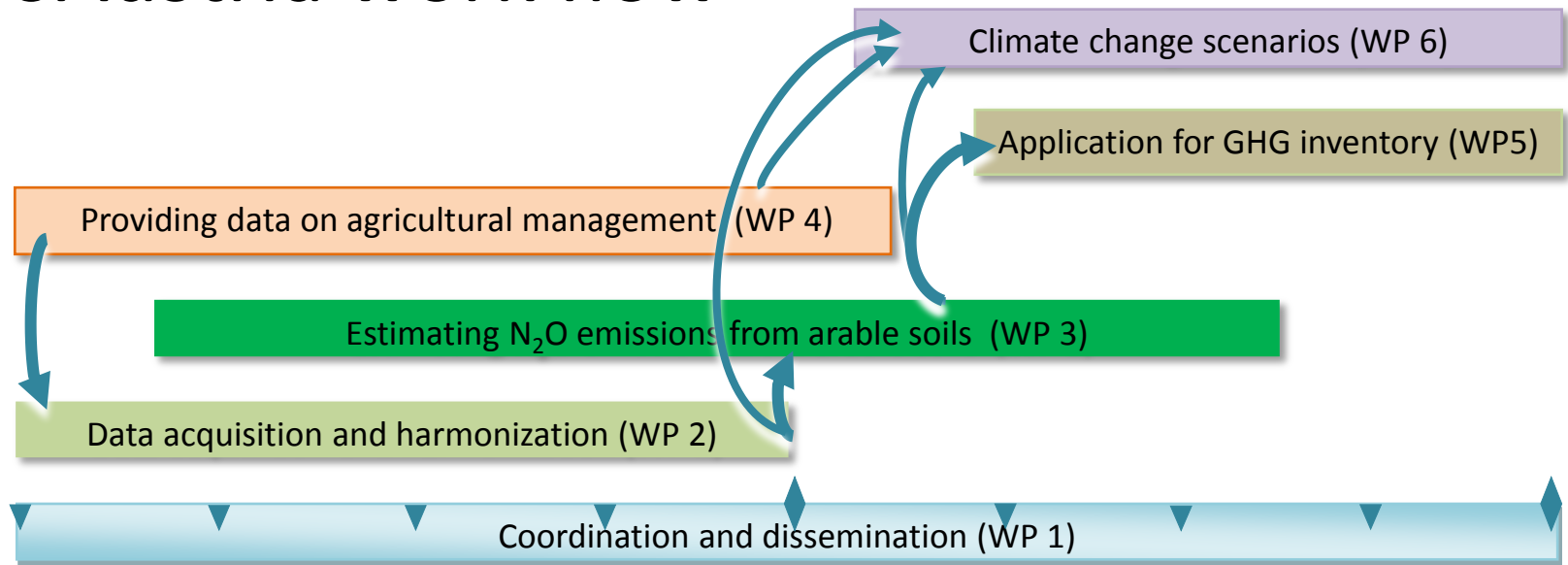
NitroAustria objectives



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- NitroAustria analyses **N₂O**, NO, CH₄ and CO₂ emissions as well as **NO₃-leaching** from arable soils in Austria with **process based ecosystem modelling**.
- **N and GHG budgets** will be produced. Hot spots, hot moments and **management optimisation measures** will be assessed based on simulation calculations, and **region specific emission factors** will be derived.
- NitroAustria includes Austrian specific data on agricultural management and integrates climate change scenarios. Results will be evaluated for integration into the **national emission inventory**

NitroAustria work flow



17th Climate Day in Graz

WP 2: Data acquisition and harmonization



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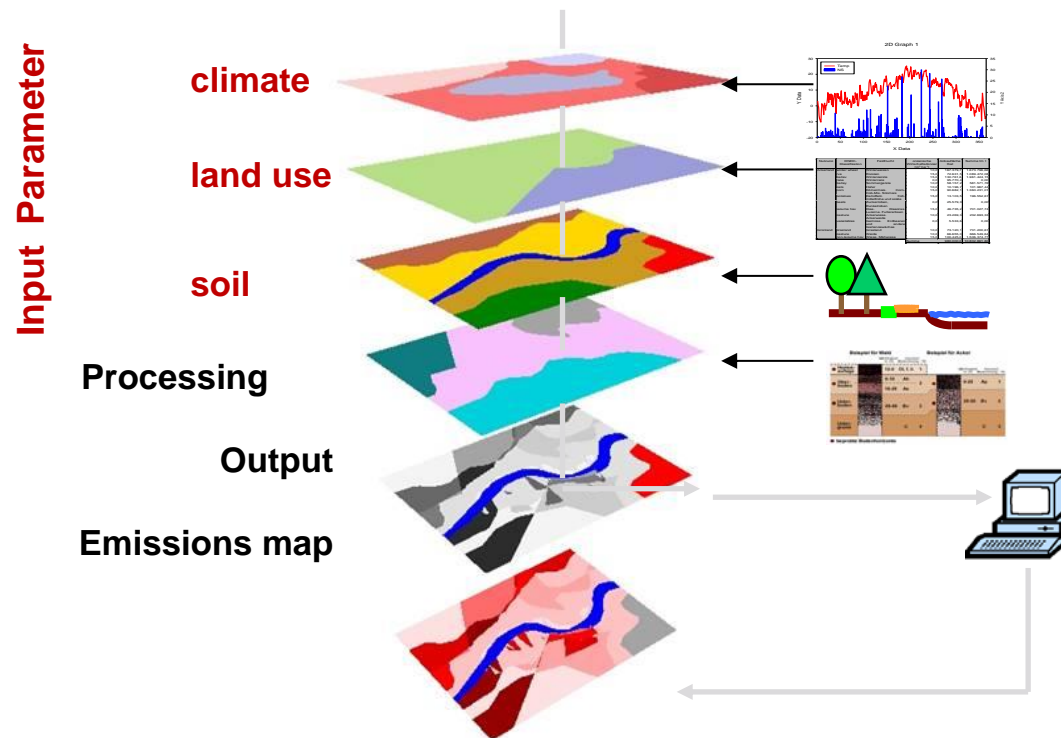
Objectives	Deliverables
Generating and providing data pool for WP 2 at site/regional/national scale	
Compilation of relevant spatial input data at regional/national scale	D1: Database with input parameters for LDNDC (18)



LDNDC modelling of N processes

Assessment of NO_3^- leaching and gaseous N and C losses by LDNDC from the selected regions.

- **Input parameters like soil properties, climate, N-input and land use, validated up to average expected yields in the specific regions**



WP 3: Estimating N₂O emissions

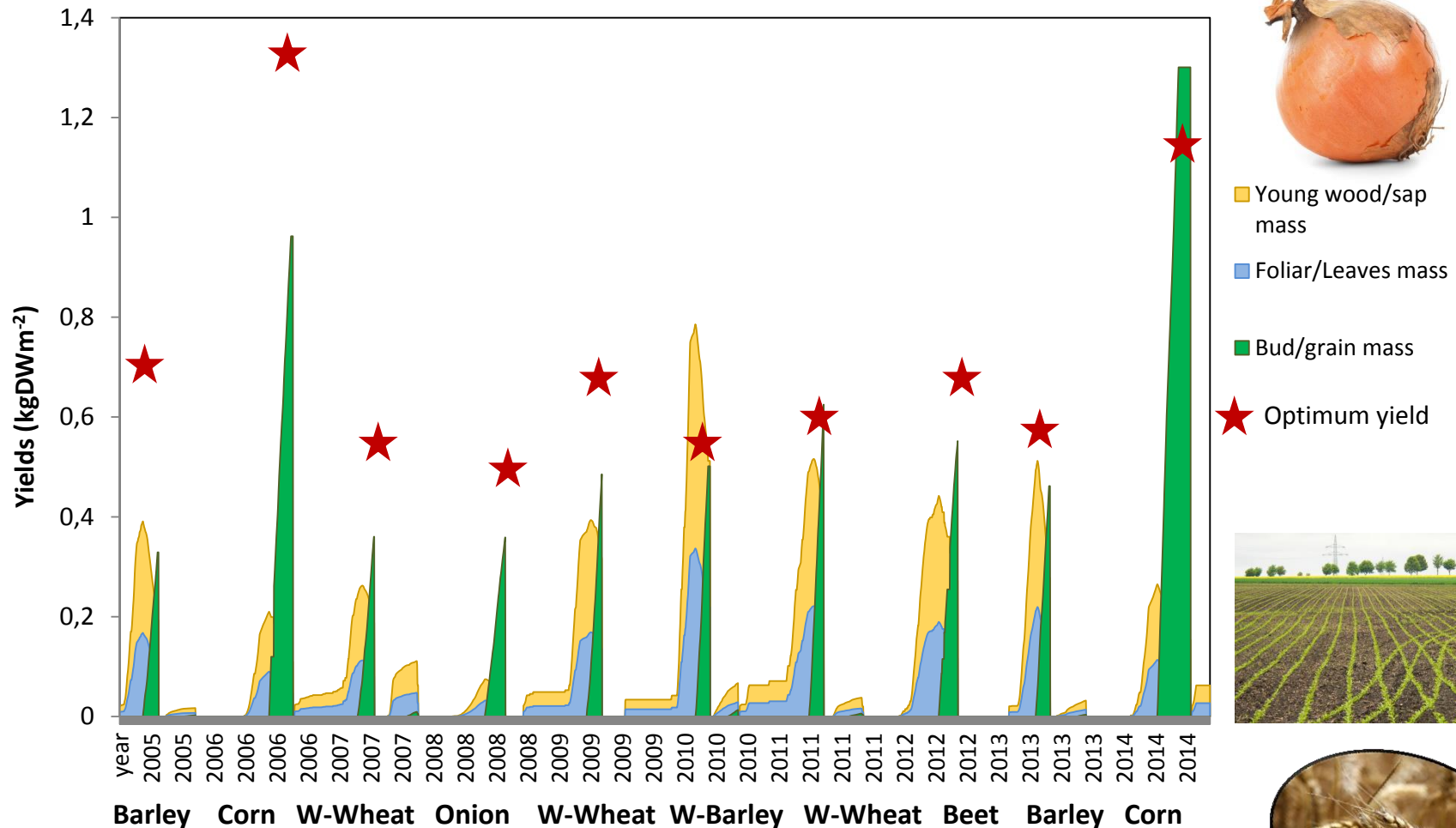


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Objectives	Deliverables
Evaluation and adaptation of the LDNDC model	D1 Data base fed with consistent model input (12) D2: Validated LDNDC model (20)
Assessment of N and OC losses and generation maps on N ₂ O emissions from selected regions	D3: Regional C and N budgets including N ₂ O emissions and nitrate leaching (18)
National inventory on N ₂ O emissions	
Determination of influencing factors , assessment of mitigation potentials and comparing the emissions with the IPCC default emissions factor	D5: Evaluation of GHG mitigation potential (20) D4: Scientific paper



Validation of LDNDC input parameters



Loamy silt in Marchfeld; Climate Station Gaenserndorf; Crop rotation 1



Preliminary Outputs

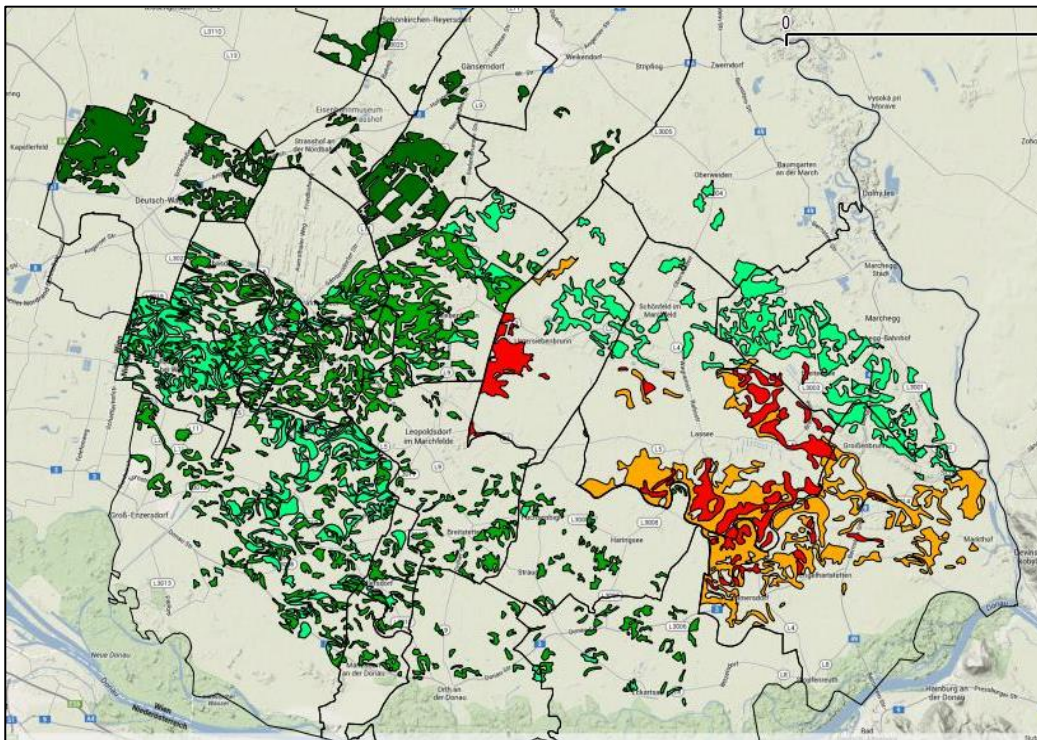


Objective: Generating maps on N₂O emissions from the selected regions



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N₂O flux in Marchfeld





We expect a strong dependency of N₂O emissions on soil types, organic C content and assume to find hotspots in areas with heavy soils.



WP 4: Providing data on agricultural management



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Objectives	Deliverables
Provision agricultural management data 	
Crop rotation scenarios from different arable regions	D1 Forwarding of the scenarios for crop rotations in 4 different arable (12) and 2 grassland regions (18)
Scenarios of different agro-environmental measures from selected regions 	D3 Generating and forwarding of the scenarios for two scenarios in three arable regions (20) D4 Assessment of results and practical recommendations (24) D5 Scientific paper (24)

WP 4: Providing data on agricultural management



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D1 Generating and forwarding of the scenarios for crop rotations in 4 different arable regions (12)

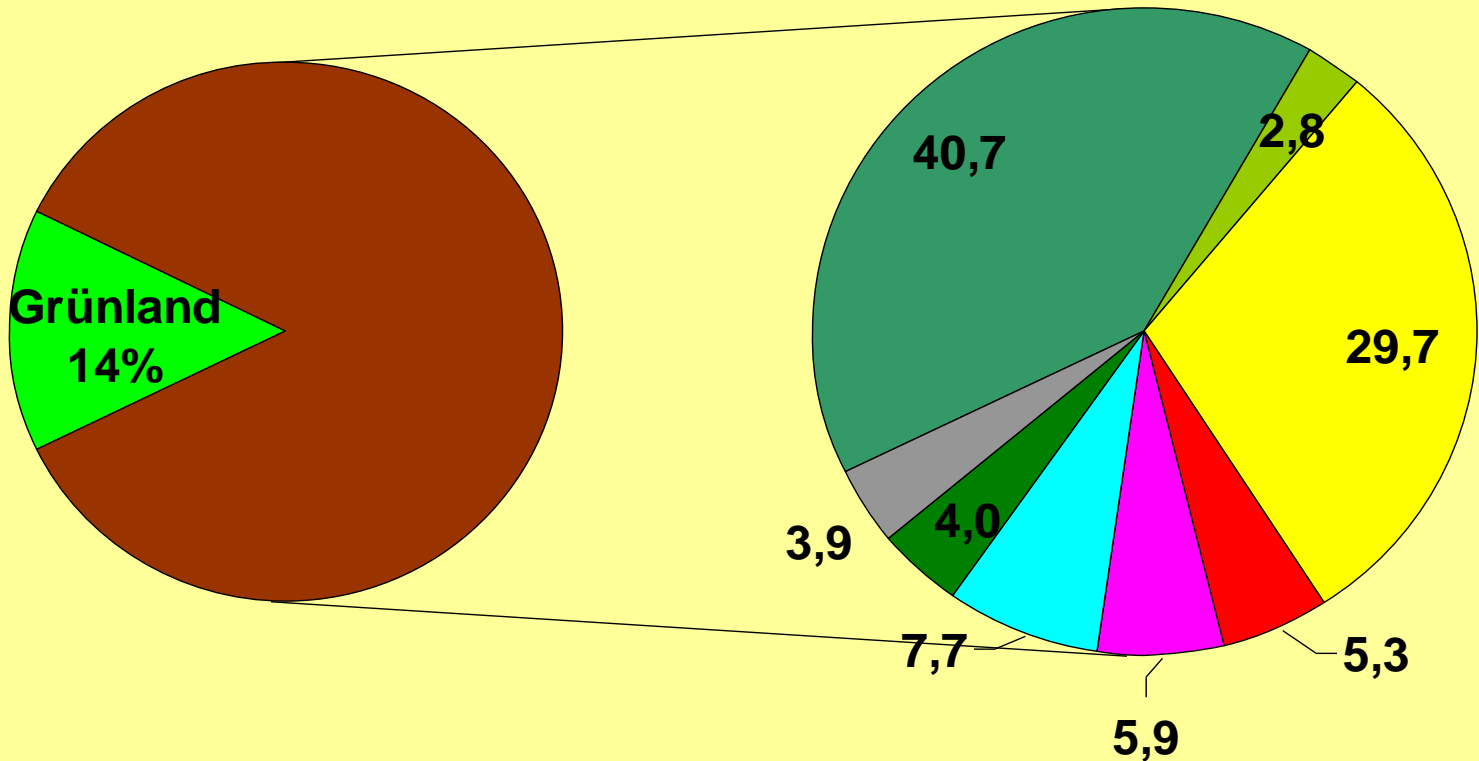
Marchfeld crop rotation 1

2005		barley★			mustard	
2006		★	corn	★		w-wheat
2007		★	★	★	mustard	
2008		★	onion			w-wheat
2009		★	★	★		w-barley
2010		★	★		mustard	w-wheat
2011		★	★	★	mustard	
2012		★	beet			
2013		barley★			mustard	
2014		★	corn	★		w-wheat

★ = fertilisation event


💧 = irrigation event

OÖ Zentralraum, Grieskirchen 162.000 ha LN



- | | |
|-------------------------------|----------------------------|
| ■ Grünland | ■ W-Getreide |
| ■ S-Getreide | ■ Mais |
| ■ Rübe, Kartoffel, Feldgemüse | ■ Ölfrüchte (ohne Soja) |
| ■ Körnerleg. incl. Soja | ■ Feldfutter, Wechselwiese |
| ■ Brache, Sonst. | |

WP5: Application of results and use for the GHG inventory

Objectives	Milestone / To dos	Deliverables
Input data for uncertainty analyses	M1: Comparison of the different N ₂ O modelling approaches (month 12) + Boku 	D4: Scientific paper on N ₂ O emission factor models, influences and results (24) + Boku
Evaluation of model results as input data for the NIR	M2: Evaluation of model results for GHG inventory use (18) M3: Trade-offs between GHG-emissions (month 24)	D1: Comparison and Discussion of the model outcome with NIR conception (18) D2: Discussion and trade-offs between GHG emissions (20) + Boku, AGES
Policy framework on climate friendly farming	Proposed framework of climate friendly agricultural action programme	D3: Proposals for a policy framework towards climate friendly farming (24) + AGES

WP 6: Climate change scenarios and statistical analysis of modelling results

Temperature increase and precipitation change will impact crop yields and N losses!

- We want to address climate change impacts on N₂O fluxes from Austrian agricultural soils.
- We want to find the main driving factors for N₂O losses now (2004-2014) and in near future (2030-2040).

scenarios (2030-2040)			
temperature	daily precipitation		
average	-20%	+20%	0%
maximum	+20%	0%	-20%
minimum	0%	-20%	+20%

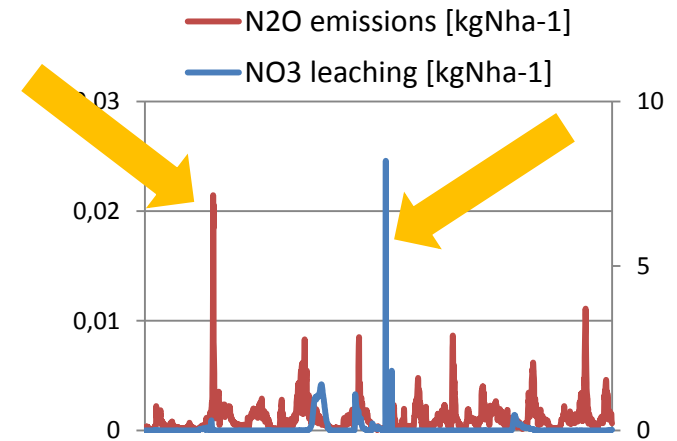
Strauss, F., Formayer, H. and Schmid, E. (2013). High resolution climate data for Austria in the period 2008-2040 from a statistical climate change model. International Journal of Climatology : DOI 10.1002/joc.3434

Outlook



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- **New regional N₂O emission factors** will reflect Austrian heterogenic conditions.
- Identification of **hot spots and hot moments** of GHG emissions and NO₃⁻ leaching and pointing out **mitigation options**:
 - enables farmers to reduce N losses and still **maintaining yields** by an optimization of the agricultural management
 - and makes it possible to develop a policy framework for a **climate friendly agricultural action program**.



Dissemination



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Publications:

Kasper, M. et al. (2016; to be submitted): „Calculating regional N₂O emissions from soils regarding region specific conditions with respect to crops and climate in selected regions in Austria”

In progress:

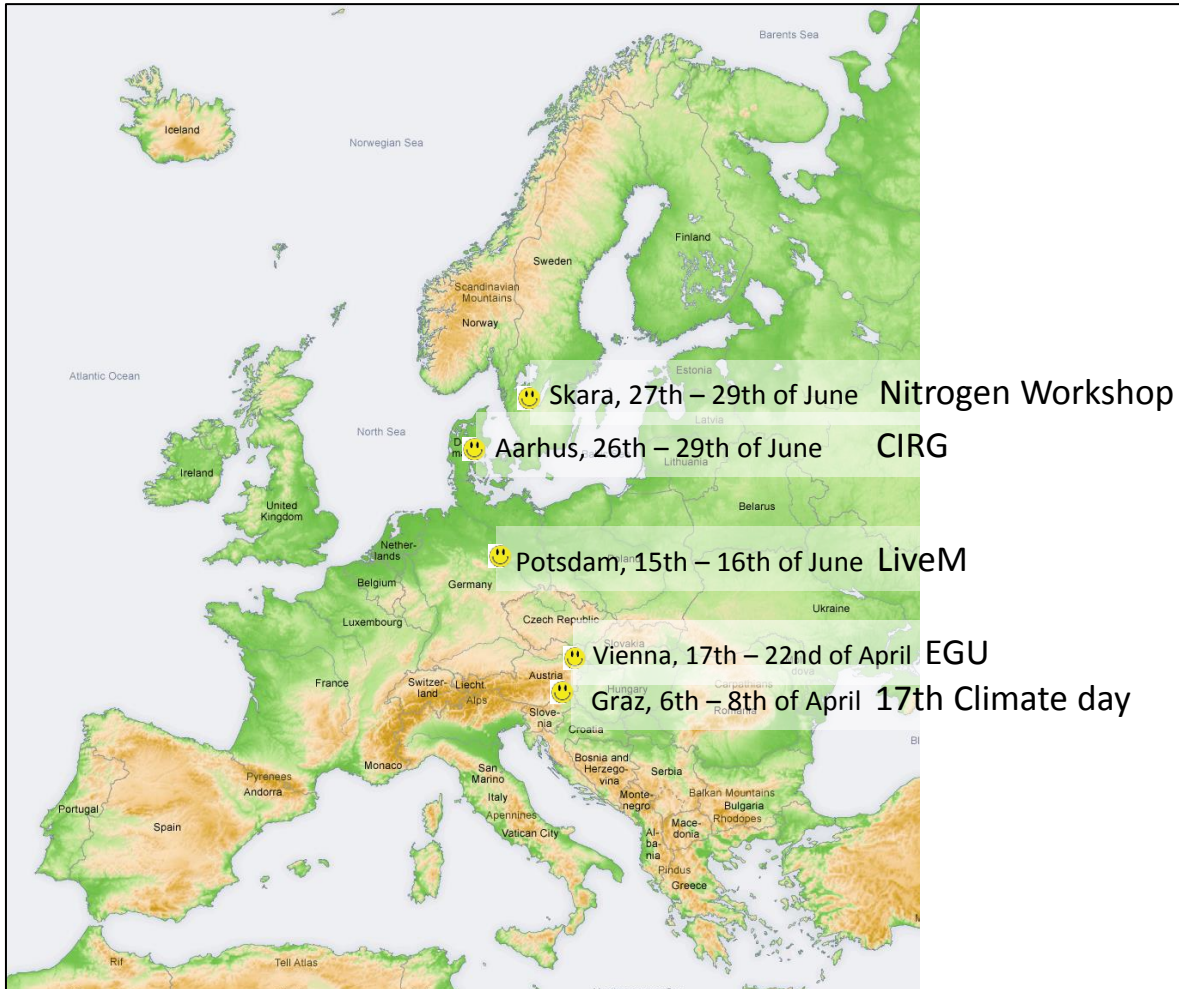
“Assessing the effects of management, soil type, and climate on N₂O emissions from Austrian agricultural soils”

“N₂O- emissions in different regions of arable crop production in Austria: Calculations according to IPCC emission factors vs. LDNDC model results. ”

“Current and future N losses from agricultural soil in Austria”

Dissemination

Scheduled conferences 2016:



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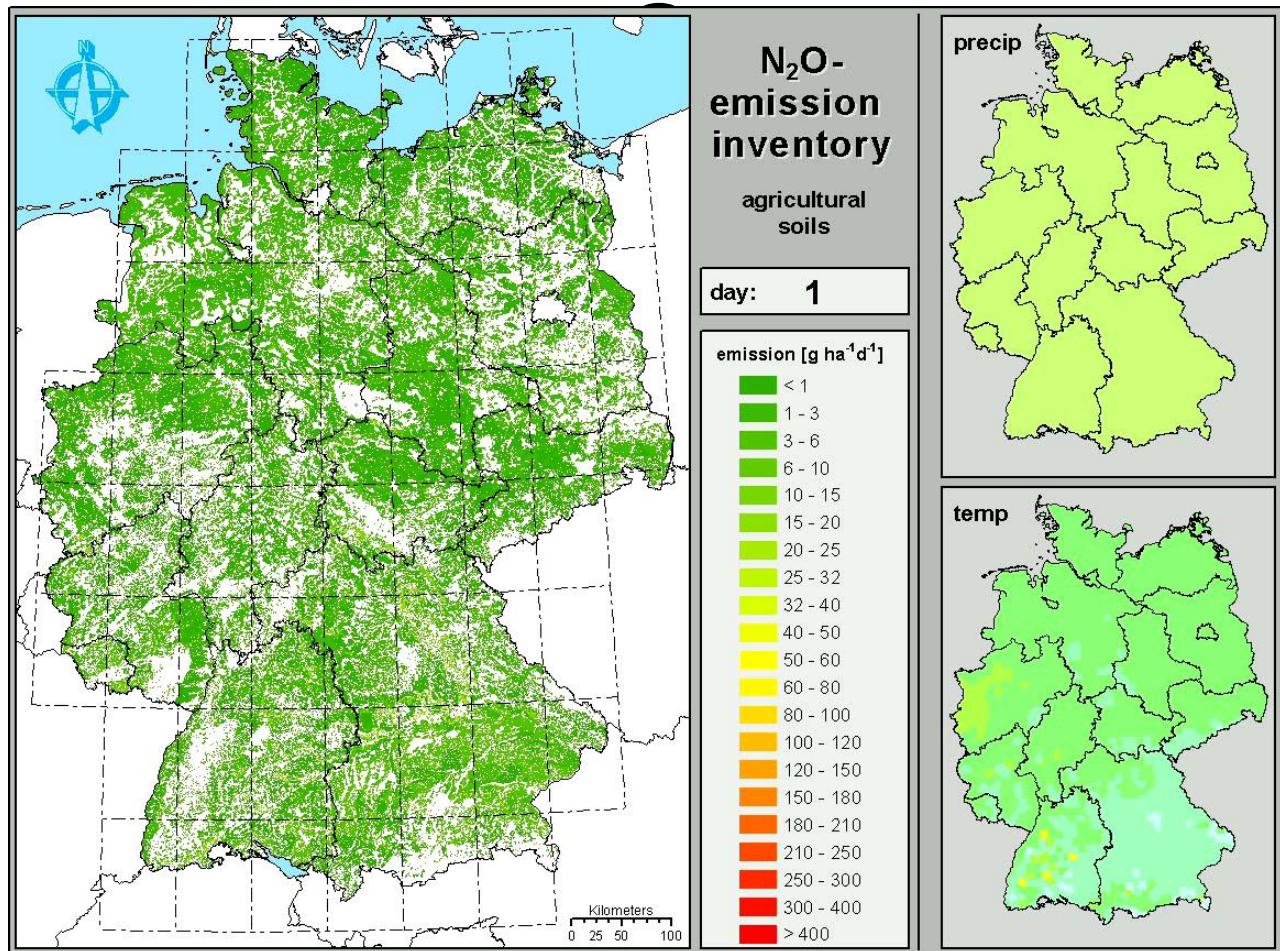
Planned activities:

2016 :

- 😊 Begleitgruppe Klimawandel, Klimaschutz und Luftreinhaltung
- 😊 Seminars for farmers by AGES

2017:

- 😊 Wintertagung
- 😊 EGU
- 😊 ÖBG Tagung
- 😊 ALVA Tagung.....



Quelle: Christian Werner, IMK-FZK

A scenic landscape featuring a winding dirt road that curves through a green field. In the background, there is a dense forest of tall trees and distant mountains under a cloudy sky. The foreground shows some dry grass and a small patch of corn plants on the right.

Thank you for your attention!