



Regional Pilot Case Study Mostviertel - AT

Upcoming project phase

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Case study research questions

- **Impacts of climate change**, agricultural commodity price development and CAP reform on farm mitigation and adaptation?
- **Effects of land use policies** on climate change adaptation and mitigation?
- Potential of policies to minimize trade-offs between **farm production**, **biodiversity** conservation, **landscape** element preservation, and **nutrient** emissions?
- Impacts of climate change and CAP reform - accounting for adaptation responses - on regional production and **rural development**?



Methods and Data

Input

natural & socio-economic data

CAPRI

- input and output prices
- CAP
- production functions
- farm labor supply
- livestock - herd sizes
- observed land use
- spatially explicit field data
- landscape elements
- climate scenarios
- topography
- soil characteristics

Models

CropRota¹

EPIC²

FAMOS[space]³

Output

socio-economic & RD indicators

agri-environmental indicators

food production indicators

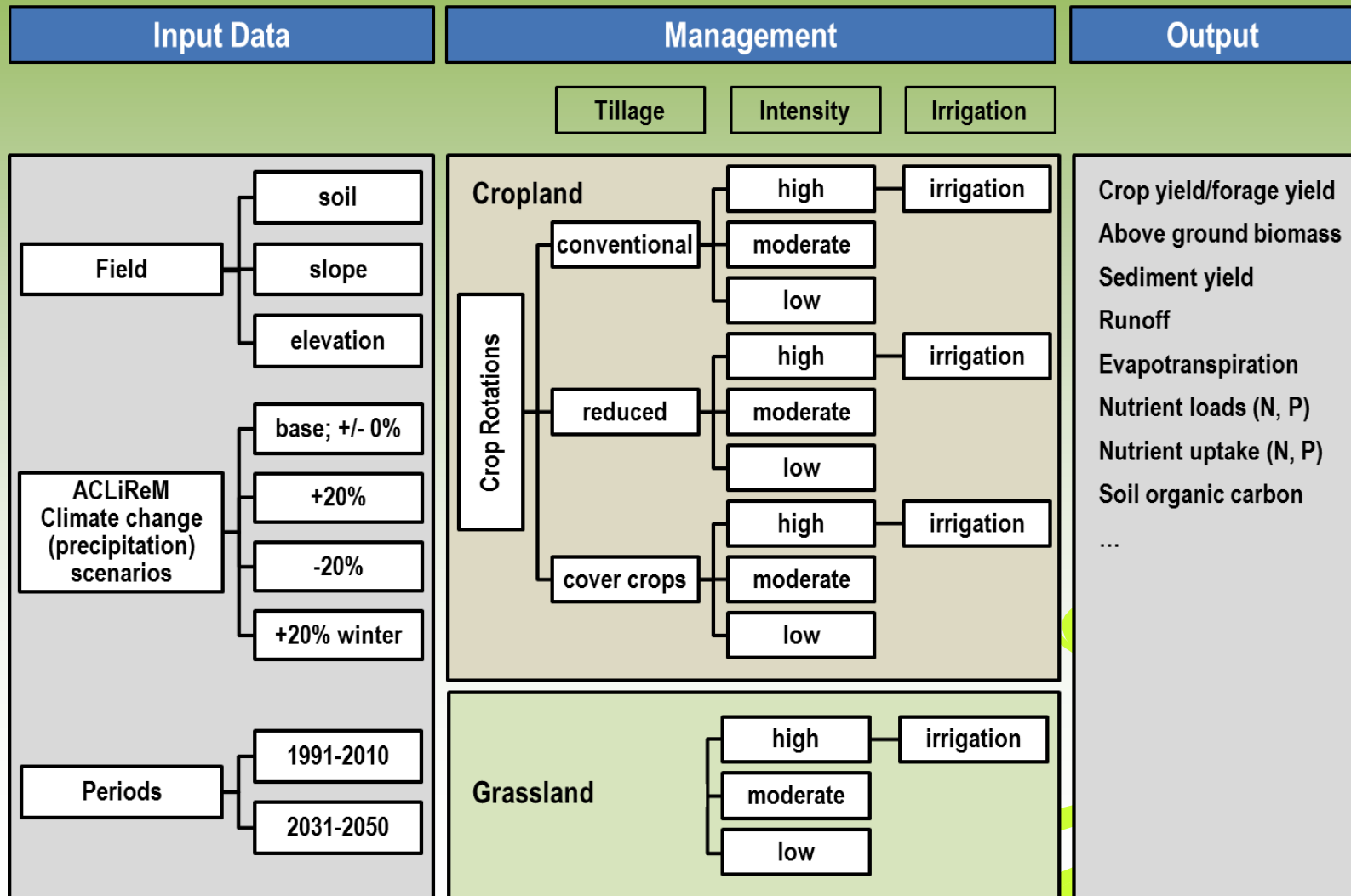
¹Schönhart et al. (2011). Eur J Agron 34, 263-277.

²e.g. Izaurrealde et al. (2006). Ecol Modell 192, 362-384.

³Schönhart et al. (2011). J Environ Plann Manage 54, 115-143.



EPIC - model run settings



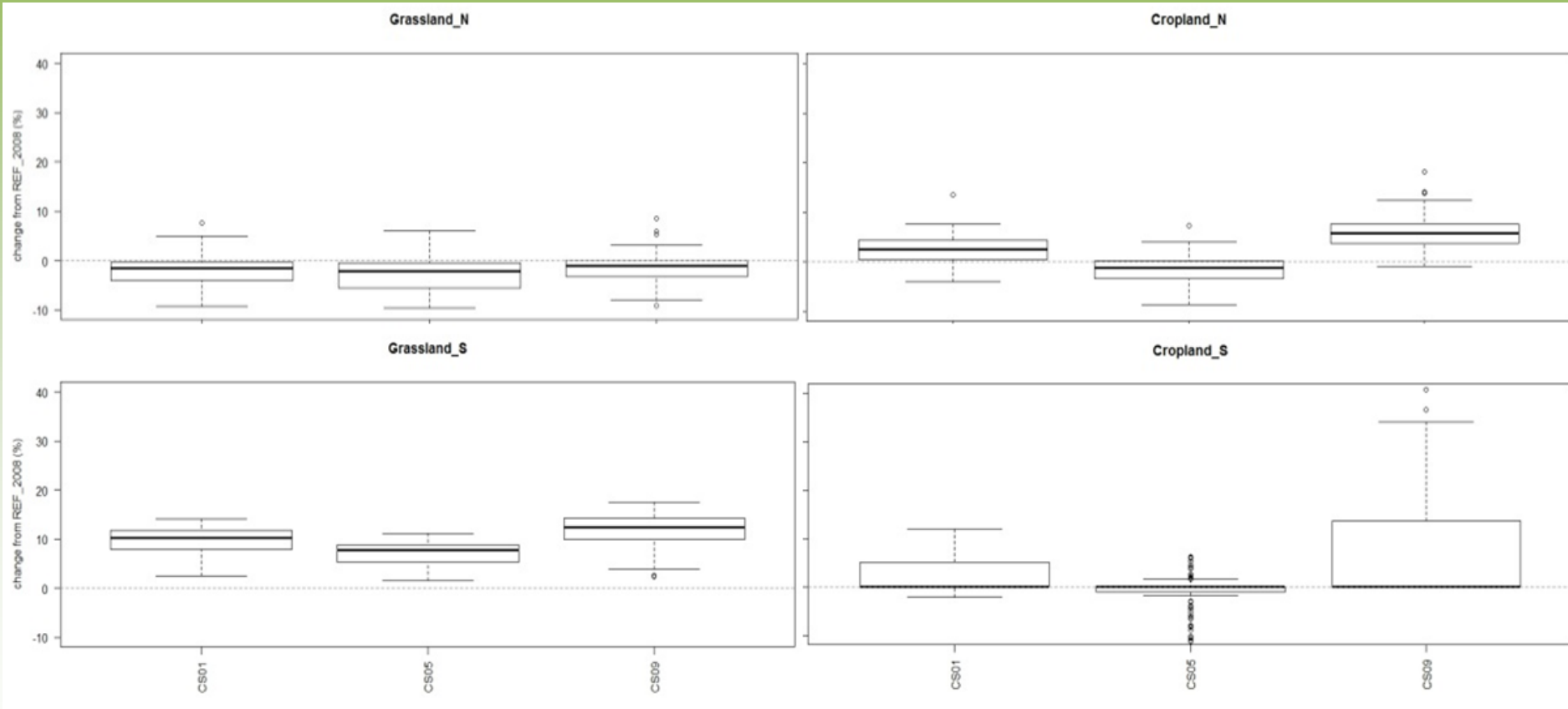


FAMOS[space] scenarios

	AEP	CAP reform	Climate change in 2040	
			Δ temperature (°C)	Δ precipitation (%)
REF_2008	no	no	0.0	0%
BAU_2008	yes	no	0.0	0%
REF_2040	no	yes	0.0	0%
BAU_2040	yes	yes	0.0	0%
CS01	yes	yes	+ 1.6	0%
CS05	yes	yes	+ 1.6	+20%
CS09	yes	yes	+ 1.6	-20%



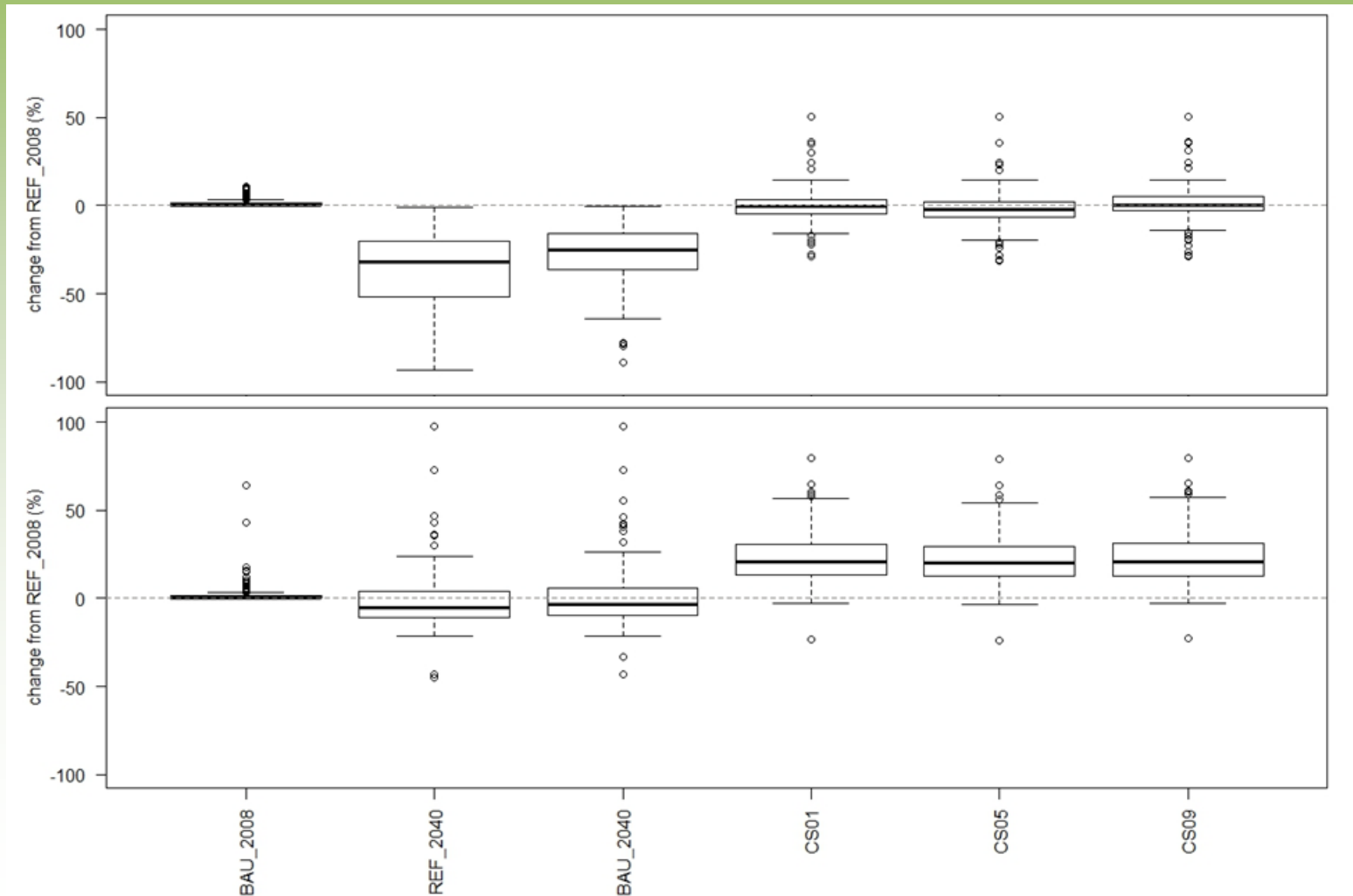
prelim. results - yield changes 1991-2010/2031-2050



Changes from REF_2008 on the farms ($N_{north}=113$, $N_{south}=118$) for grassland (left) and cropland (right) for the northern (N, above) and southern (S, below) case study landscape.



prelim. results - changes in total gross margins 1991-2010/2031-2050

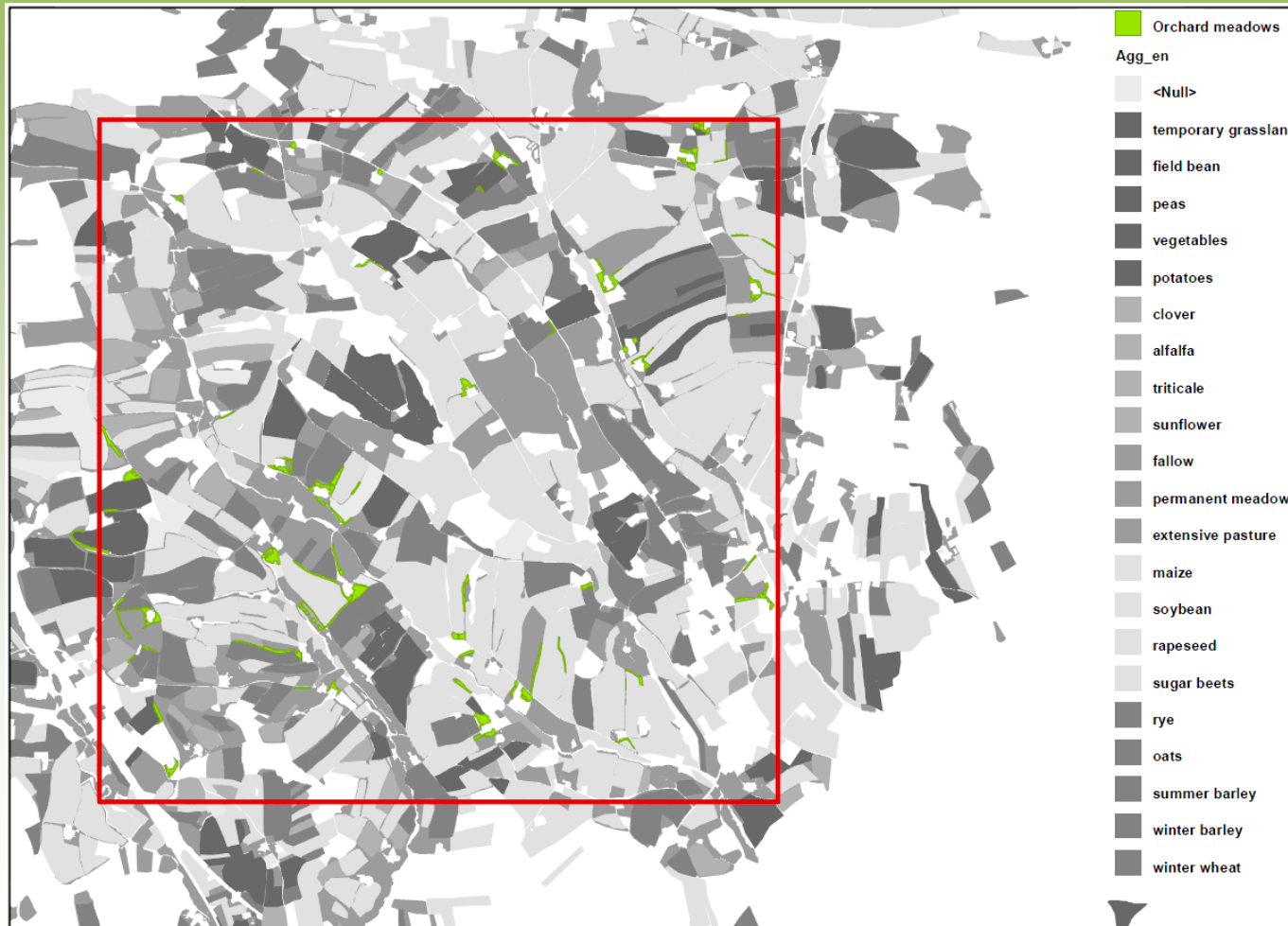


Changes in total farm gross margin from REF_2008 for three socio-economic and three climate scenarios (upper graph: N_{north}=113, lower graph: N_{south}=118; scenario)





prelim. results - land use change



Land use resulting from scenarios REF_2008 and CS05 in landscape North



Discussion - Results

- Agri-environmental program (AEP) is effective; slightly increases gross margins, but some farms gain considerably (wind fall profits)
- Regionally diverse climate change impact despite proximity of both landscapes
- Small difference among climate scenario impacts
- Climate change impacts are in the range of CAP reform impacts
- Adaptation moderates climate impacts (compare southern and northern landscape biophysical impacts)
- Increasing productivity on average increases intensification pressures
 - threat for permanent grassland, extensive land use and landscape elements
 - challenges future AEP design



Discussion - Methods



High spatial resolution of integrated assessment framework

Abiotic and biotic environmental indicators

Rich in crop and livestock management variants

Detailed representation of agricultural policies

Covers two case study landscapes only

No interactions among farms so far

High data and computational demand





Planned contribution to MACSUR overall objectives

- Food security: implemented by output indicators on calorie/protein provision to reveal policy trade-offs and climate change impacts
- Rural Development: Integration of Austrian rural development program in the socio-economic scenarios: effects on farm welfare and the environment



Planned CropM/LiveM interaction

- Comparison and integration of statistical grassland model data
- Integration of mitigation module covering land use and livestock
- Integration of model results into landscape and biodiversity indicators



Next steps

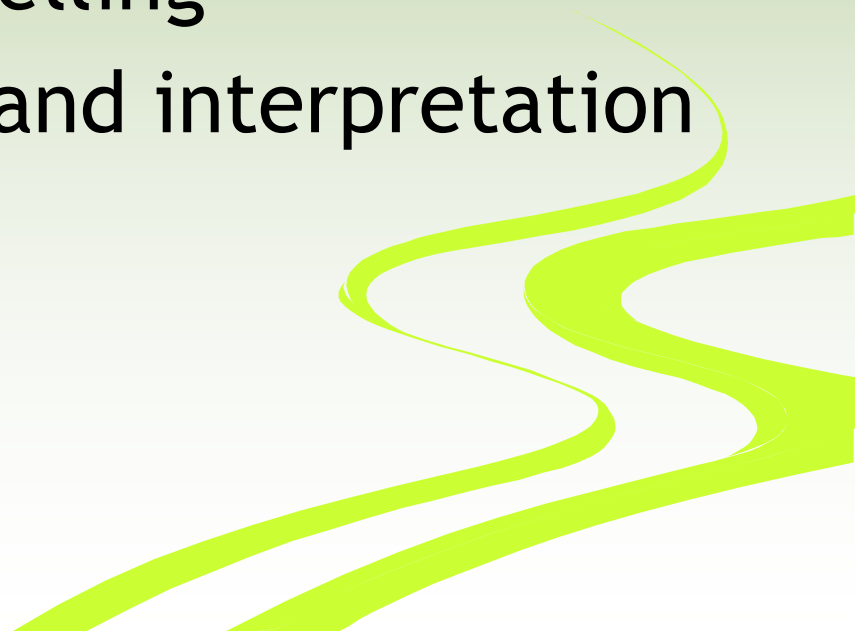
- Integration of CAPRI baseline
- Integration of further climate change scenarios to be proven (extreme weather events)
- Further adaptation of model structure to the case study requirements (e.g. farm interaction)
- Upscaling of results (quantitative/qualitative)
- Integration of stakeholder perspectives
- Uncertainty analysis

Prioritization of model improvement steps



Uncertainty ...

- ... climate projections (scenarios)
- ... bio-physical impact modelling
- ... economic land use modelling
- ... results communication and interpretation





Uncertainty management and analysis

- Management options
 - Further climate change scenarios
 - Integration of results from the grassland model comparison
 - Representation of further adaptation options (e.g. afforestation, irrigation, alternative crop species)
- Analysis options
 - comparison of model behavior to observations
 - sensitivity analysis (Monte Carlo simulations)



Expert Survey

- Survey on observed and expected climate change impacts and adaptation measures
- Dec-Feb 2014
- 17 experts (extension services, administration, farmers, policy makers)
- Respondents: 8
- Supports definition of adaptation measures



To conclude

There's a lot to do!





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