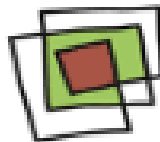




Schweizerische Eidgenossenschaft
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Ressource Boden

Nationales Forschungsprogramm NFP 68

Spatially explicit modelling of nutrient and trace element inputs to agricultural soils

Raniero Della Peruta, Armin Keller

Agroscope

Swiss Soil Monitoring Network

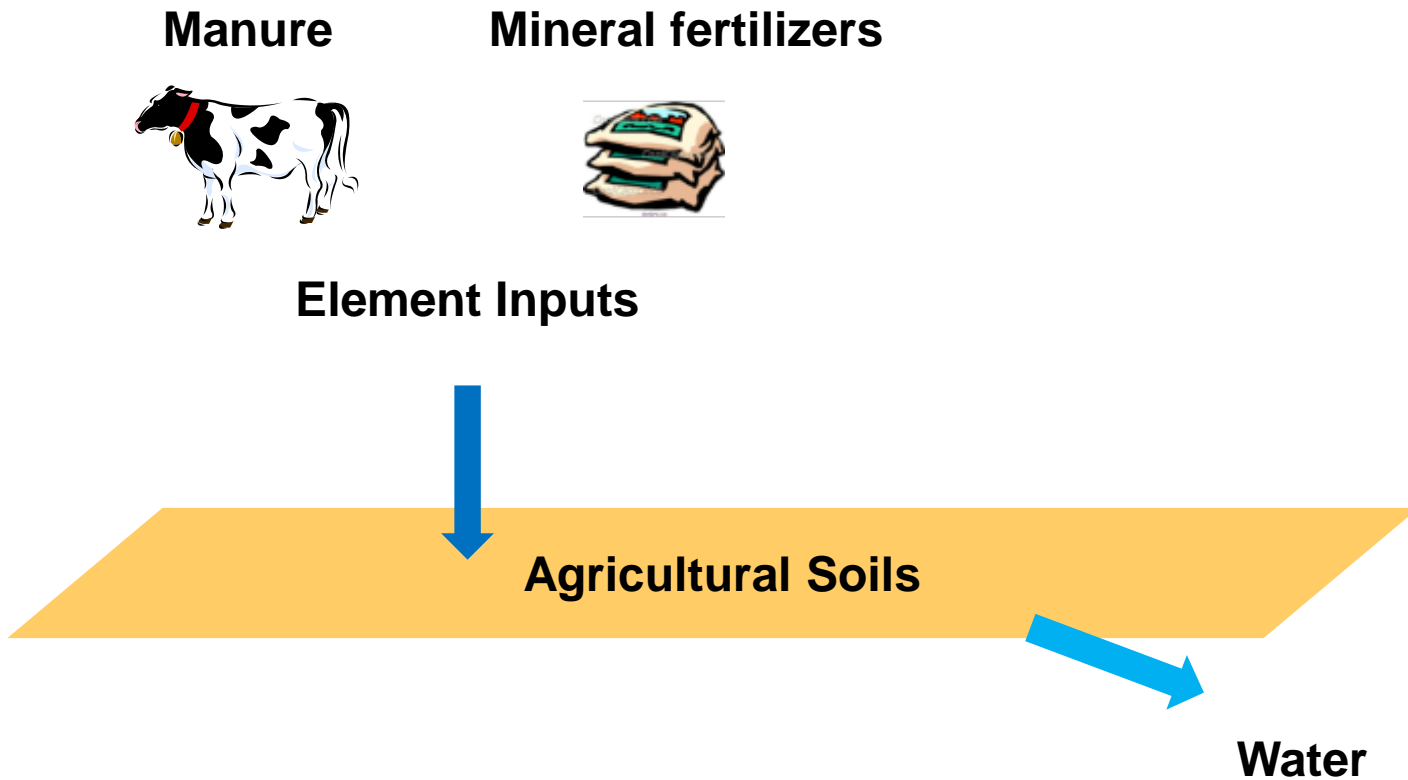
raniero.dellaperuta@agroscope.admin.ch



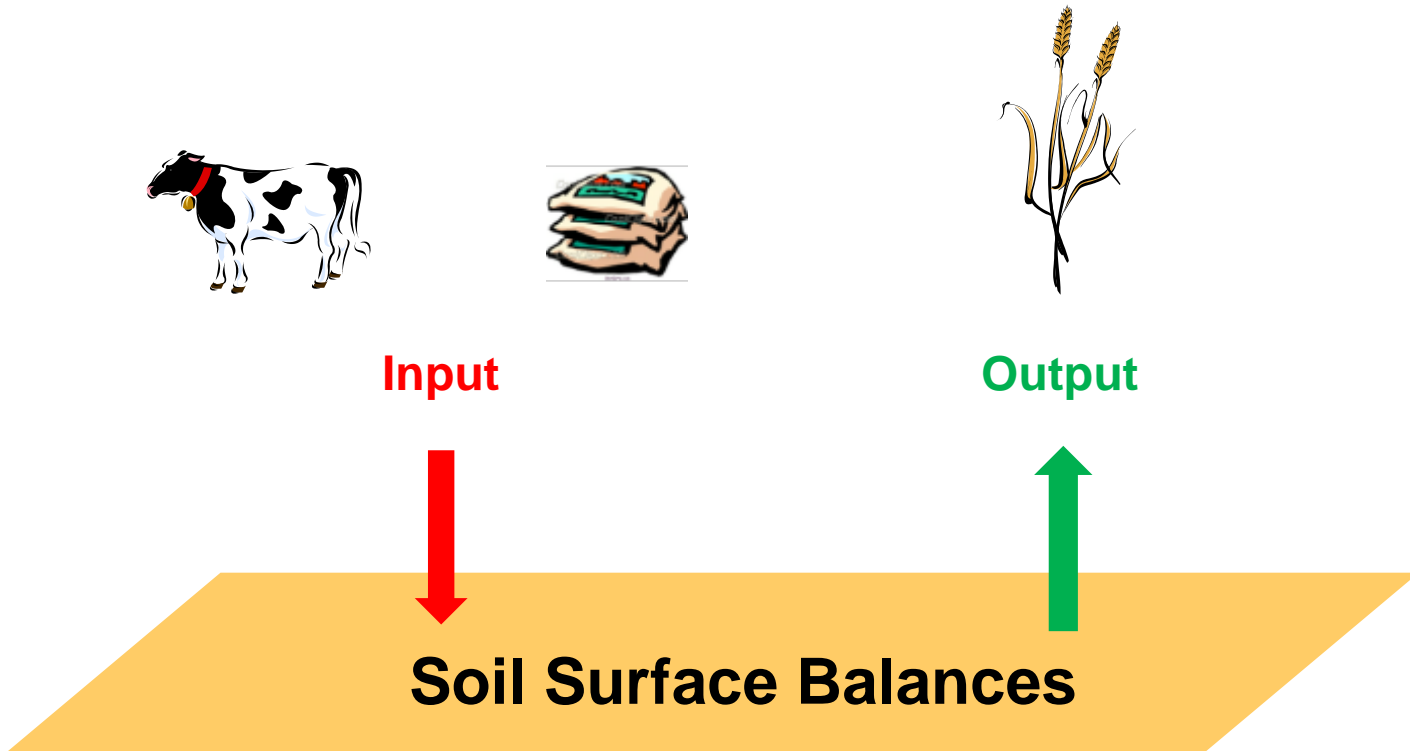
Nationale Bodenbeobachtung
Observatoire national des sols
Osservatorio nazionale dei suoli
Swiss Soil Monitoring Network

Land use and Water Quality LuWQ - Vienna, 21-24 September 2015

Introduction



Objective



Nitrogen, Phosphorus
Copper, Zinc, Cadmium

Land Management Model LMM

Annual farm census

1998 - 2014 (AGIS)



Land use map

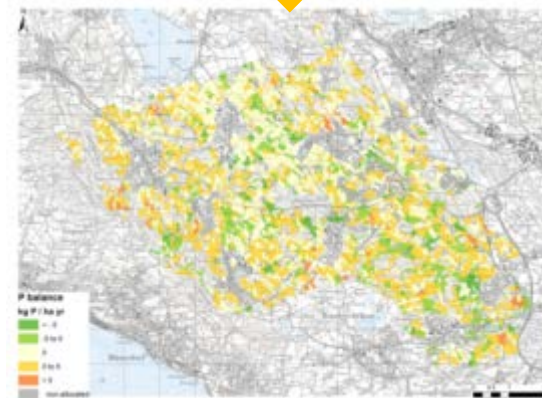
(Remote sensing)



Auxiliary information

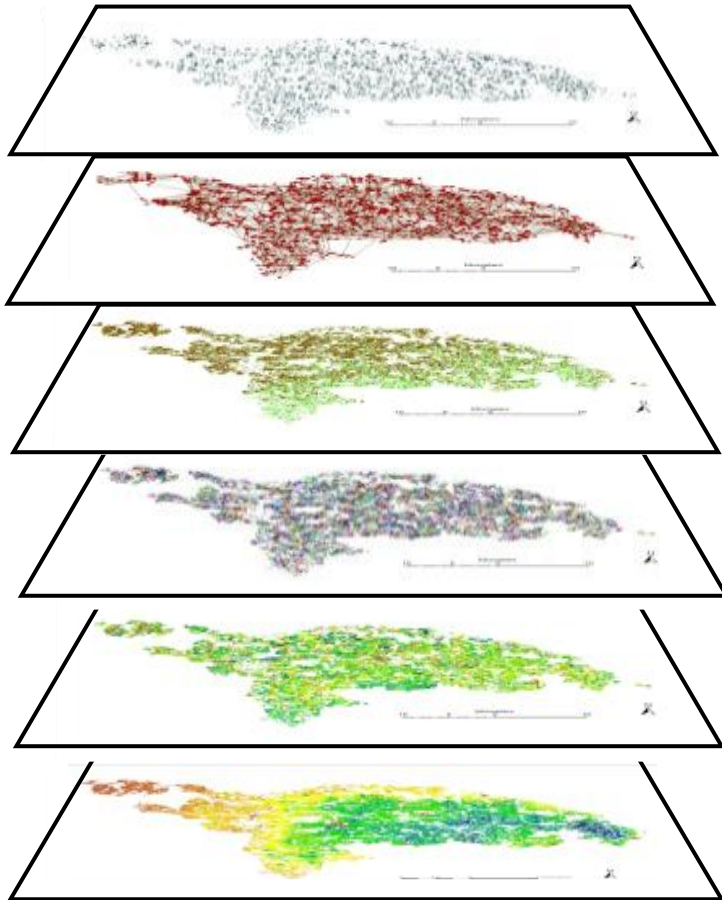
Element concentrations
Fertilization guidelines
Fertilization practices

Downscaling Approach



Spatially explicit
element balances

LMM steps



Step 1: Land use classification
(remote sensing)

Step 2: Allocate agricultural land to
farms

Step 3: Calculate nutrient balances
at farm level (crop needs/manure)

Step 4: Trading of excess manure
between the farms

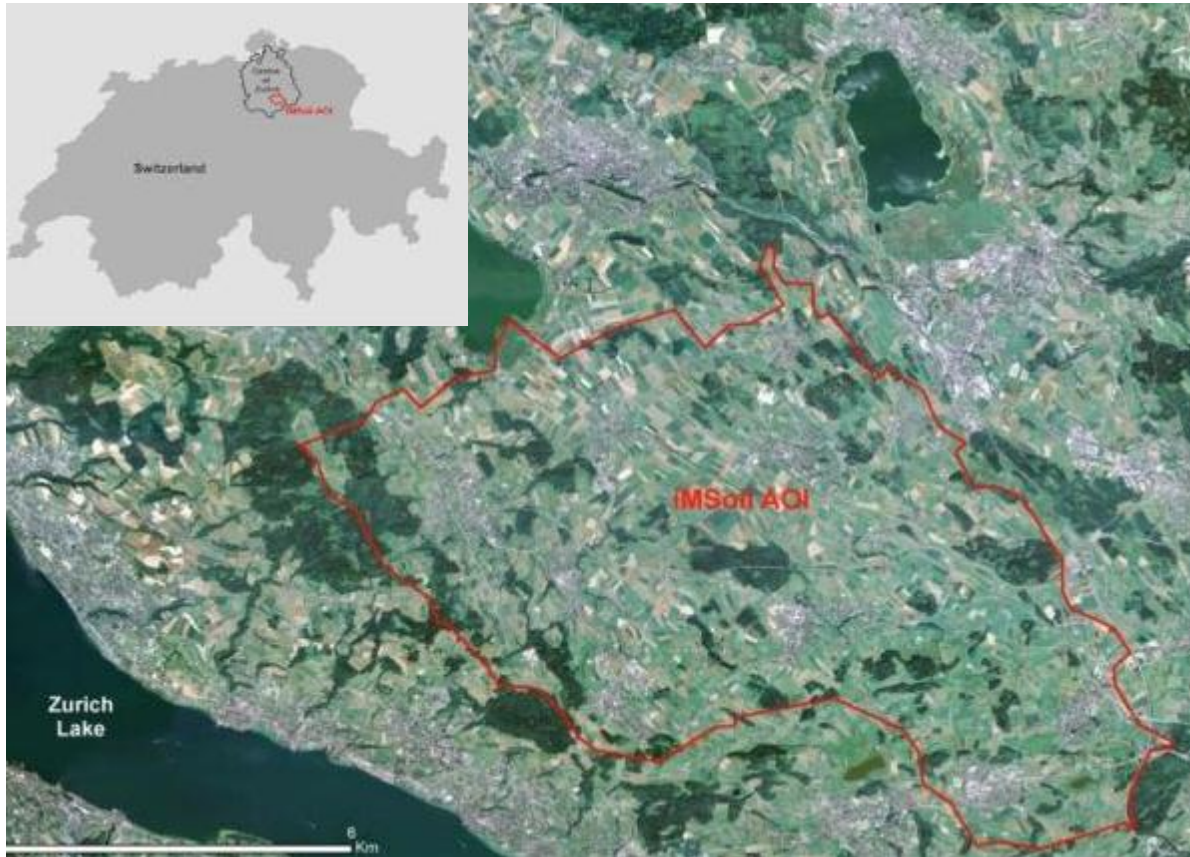
Step 5: Distribute manure &
fertilizers to the fields (fertilization
strategy)

Step 6: Calculate surface balances
at field level

Calibration / Validation

Gärtner, D., Keller, A., Schulin, R. 2013: A simple regional downscaling approach for spatially distributing land use types for agricultural land. Agric. Syst. 120, 10-19.

RESULTS - Study region Zürich-Oberland

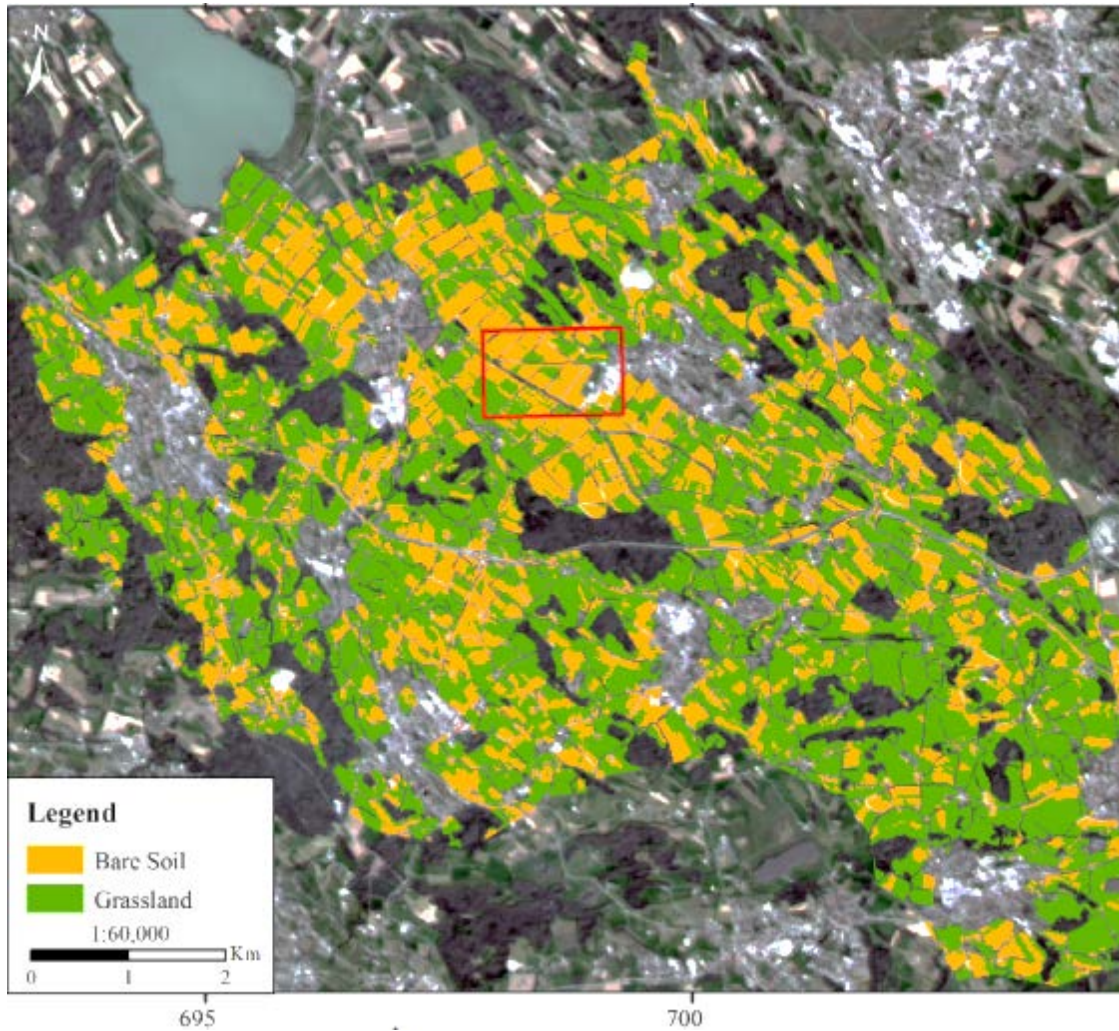


Total area: 61km²

Agricultural area: 41 km² (60% Grassland, 39% Arable land)

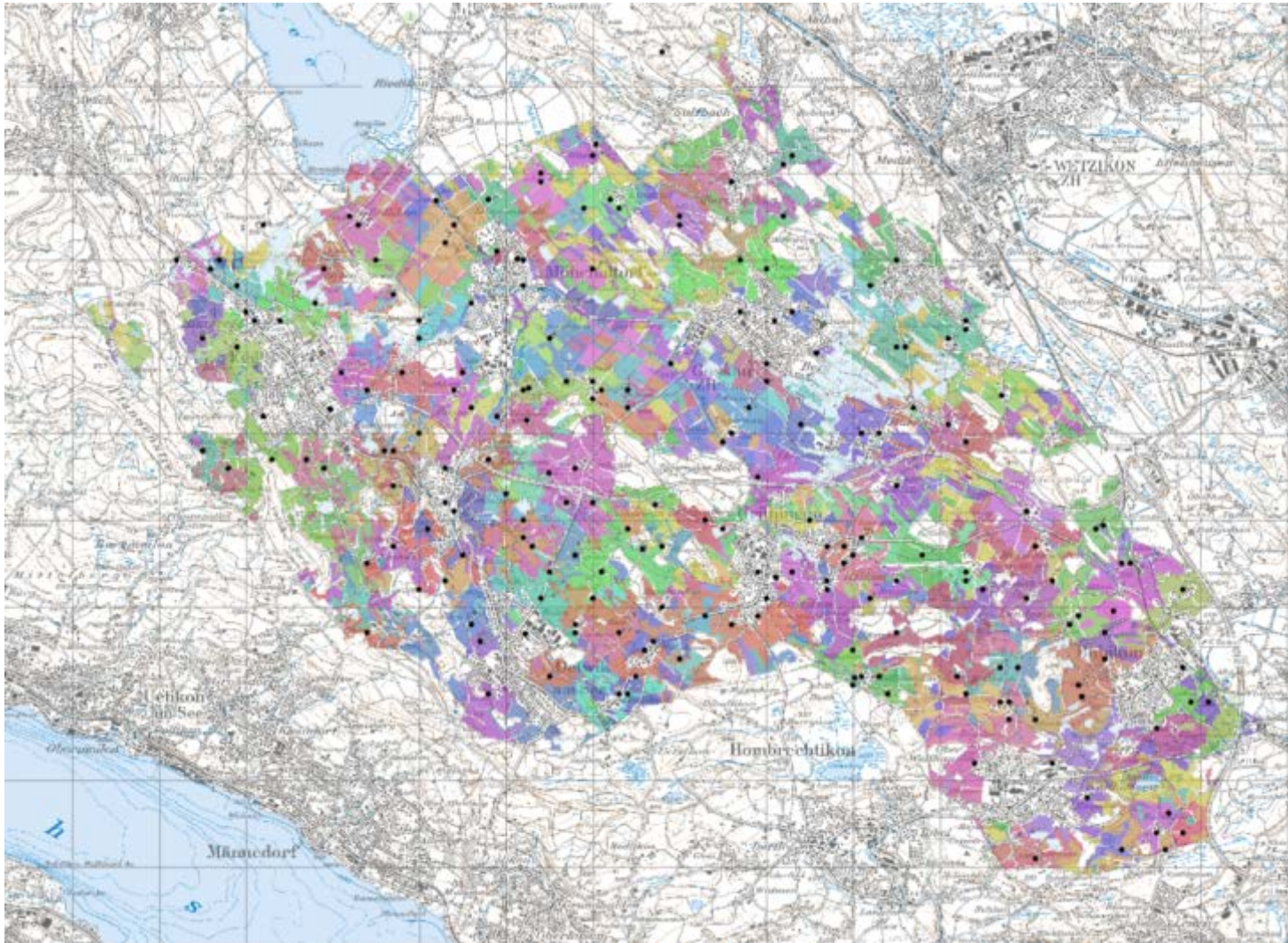
ca. 250 Farms (mainly dairy & mixed farming)

Remote Sensing - Land use classification



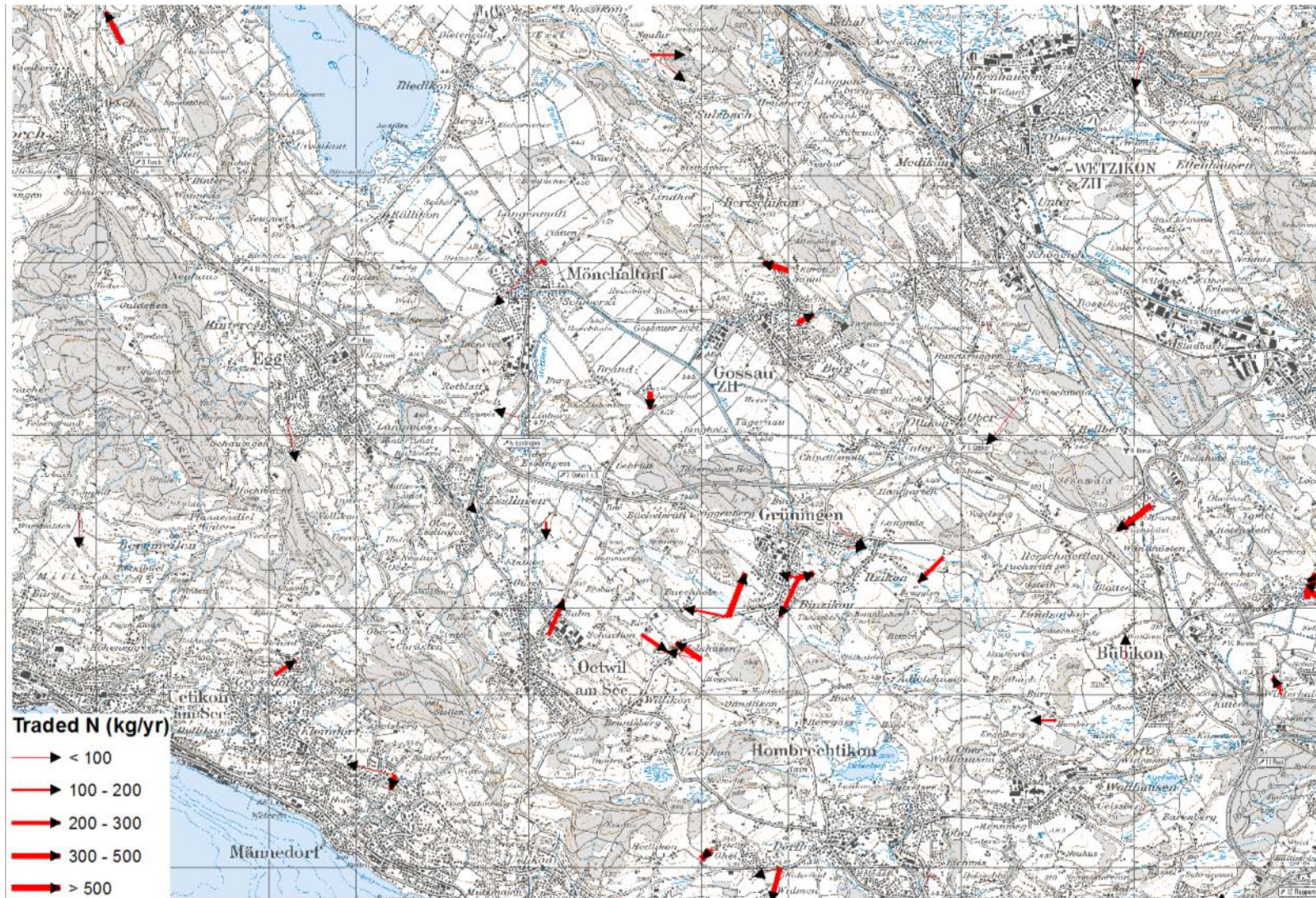


Land allocation



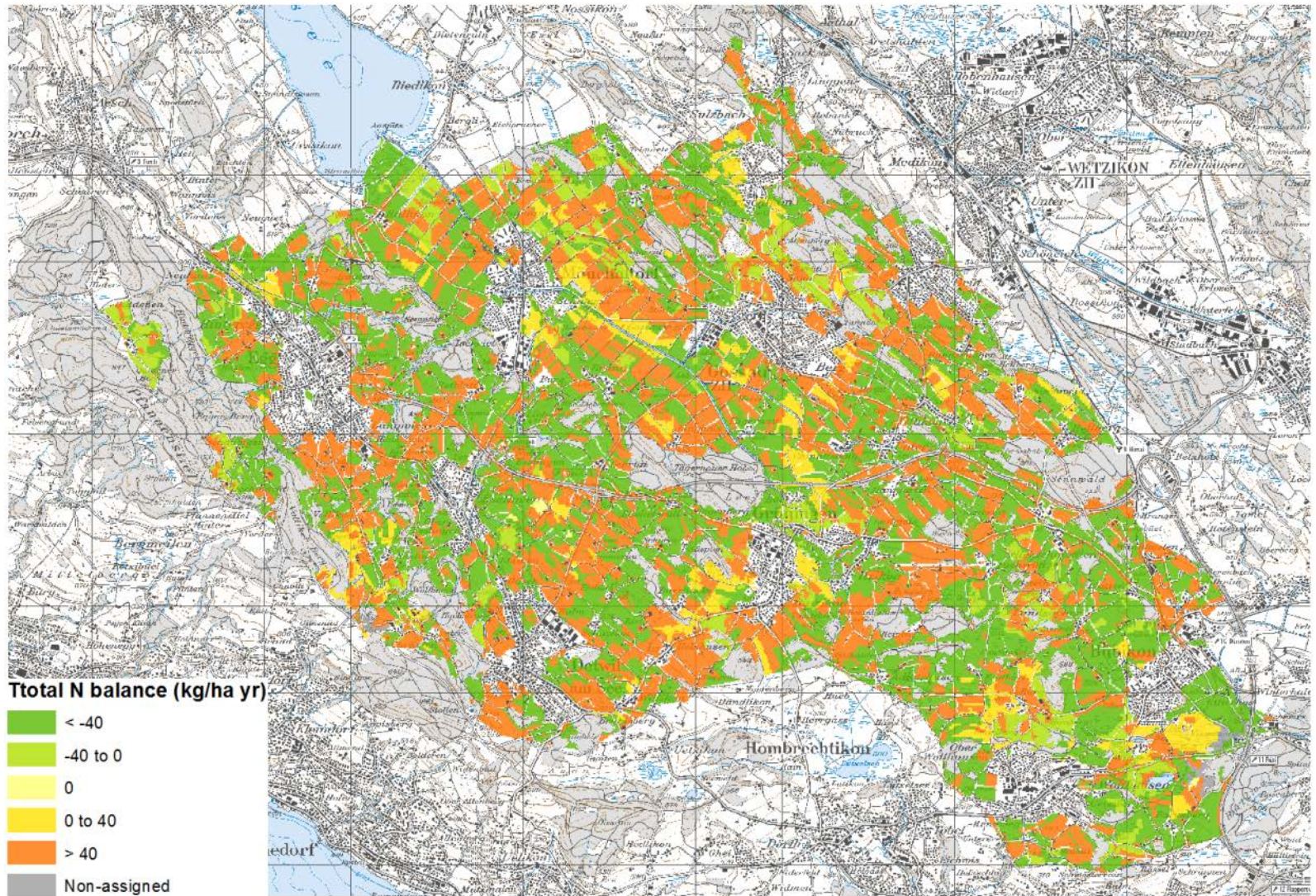


Manure trading



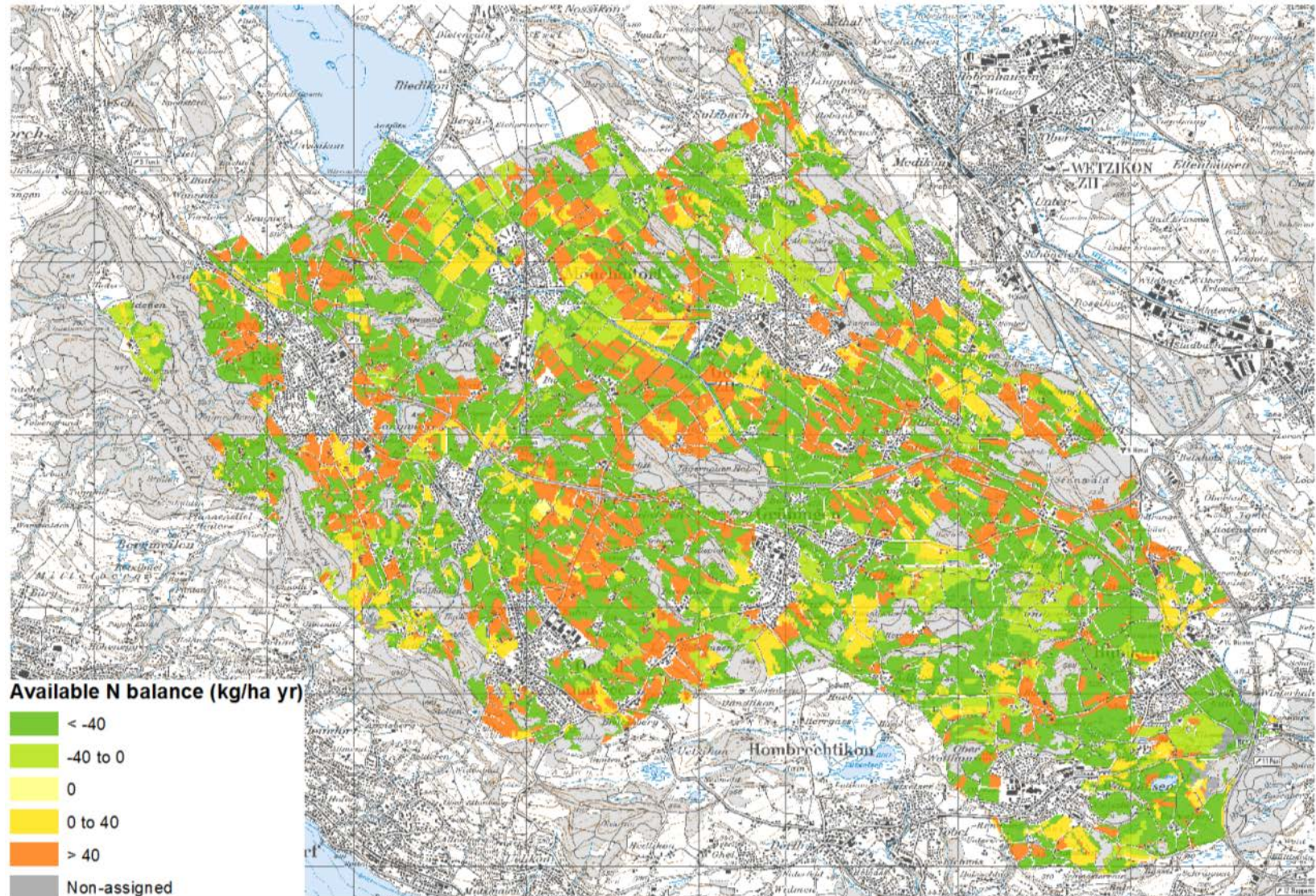


N Balance (Total N)



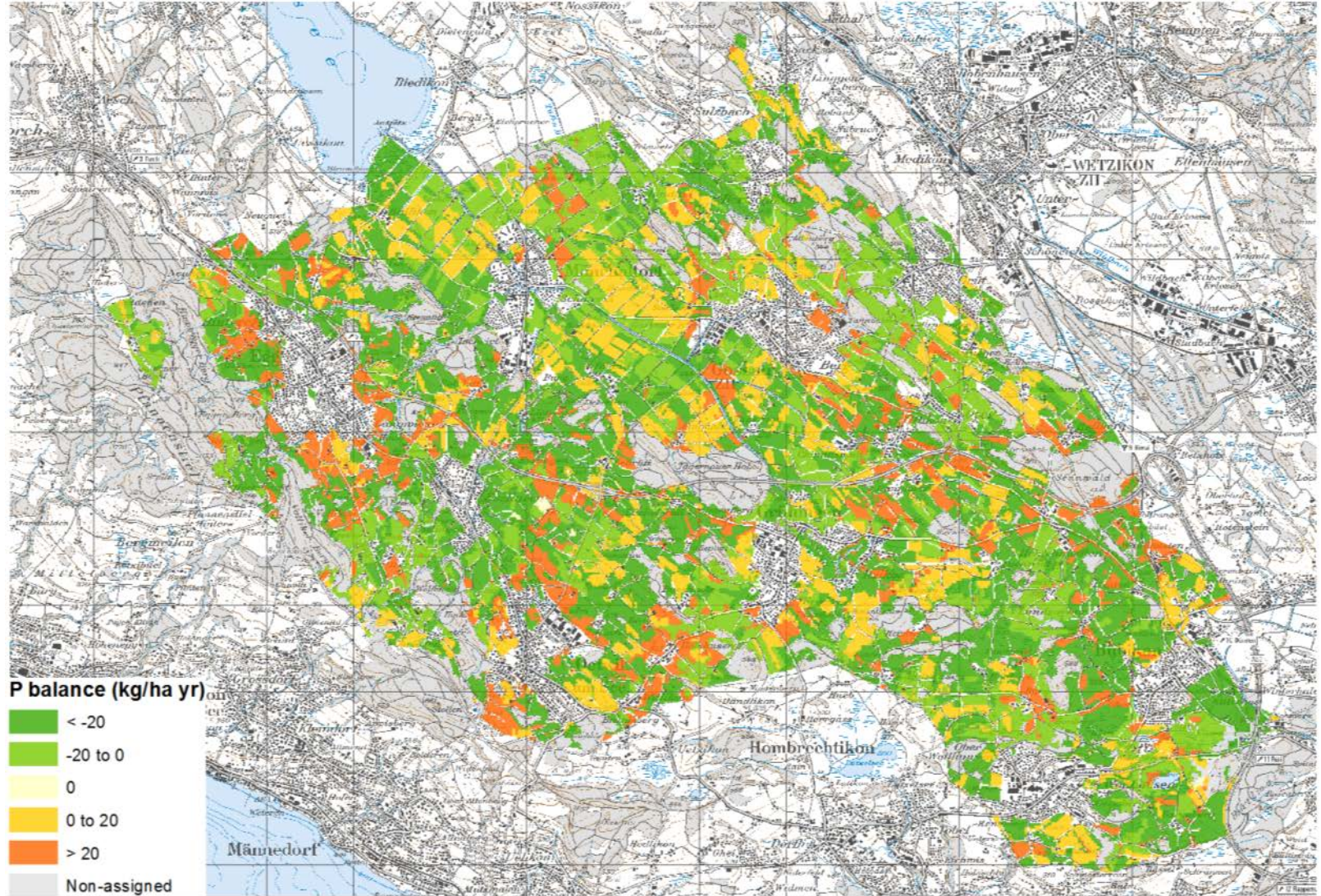


N Balance (Available N)



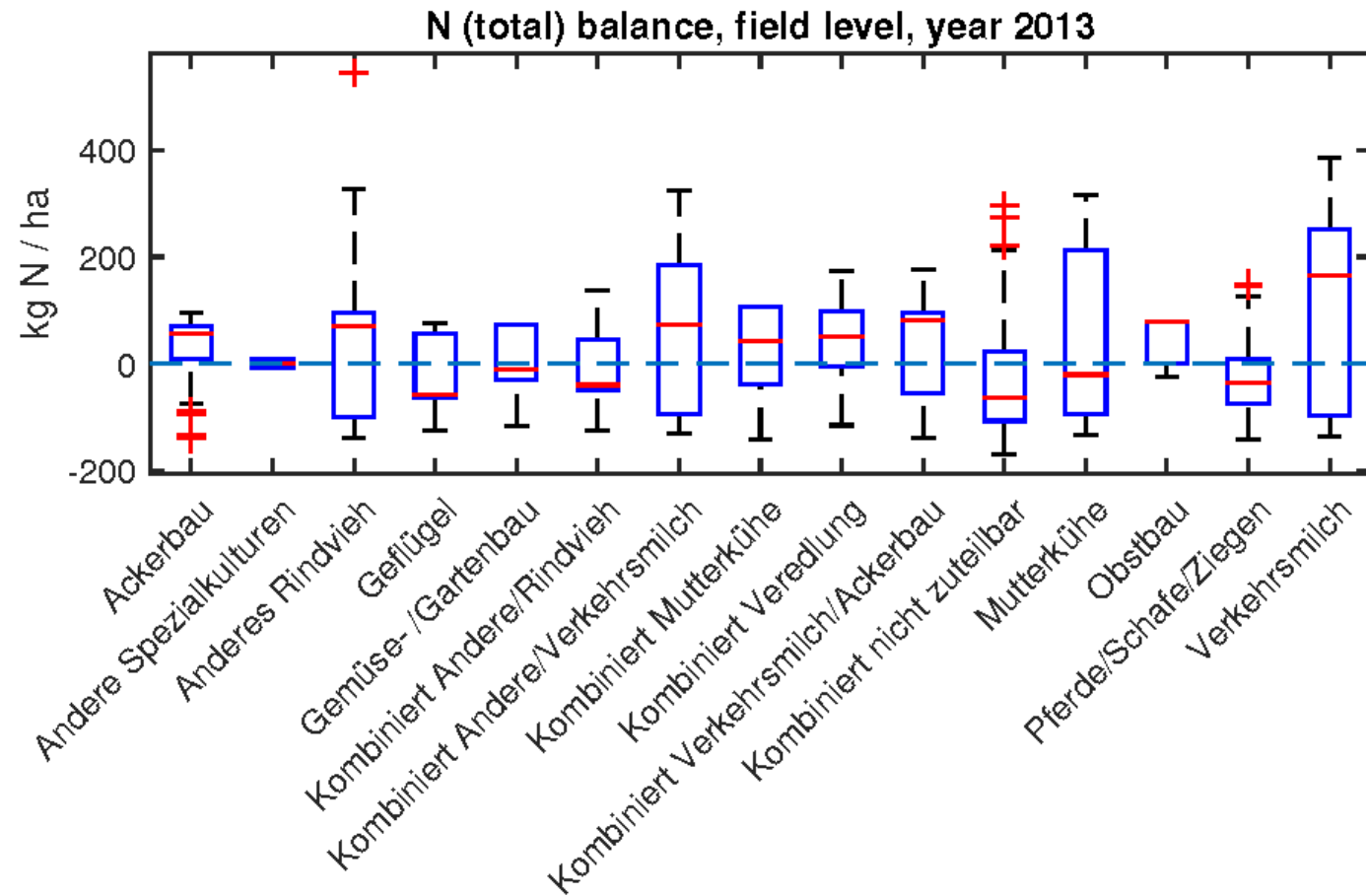


P balance



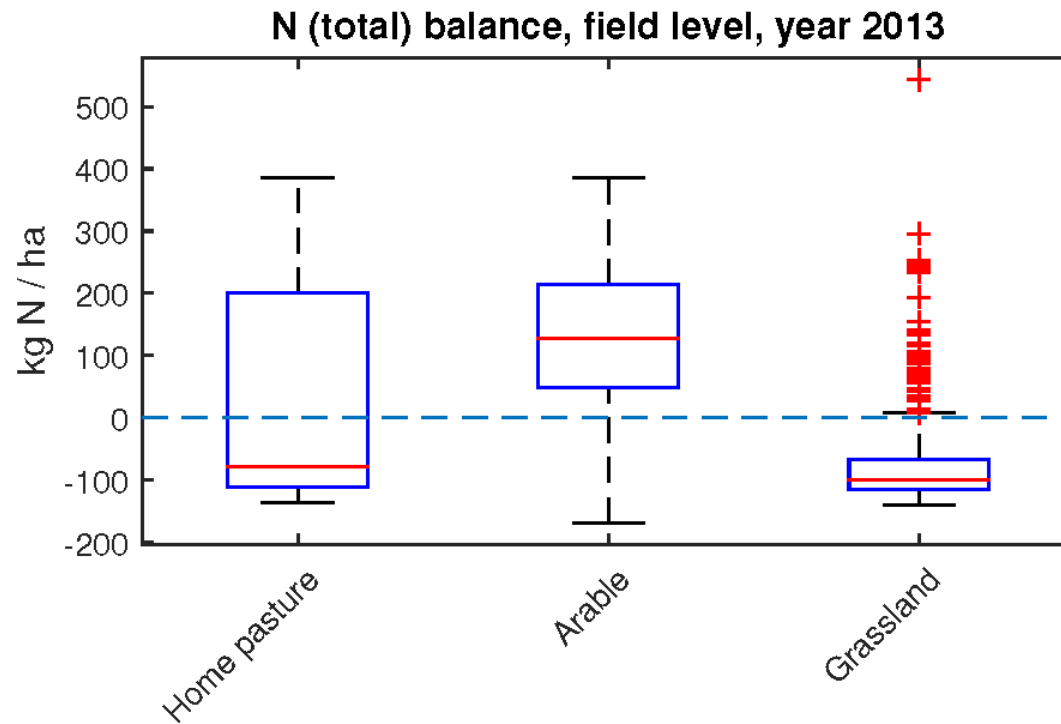


Total N balance



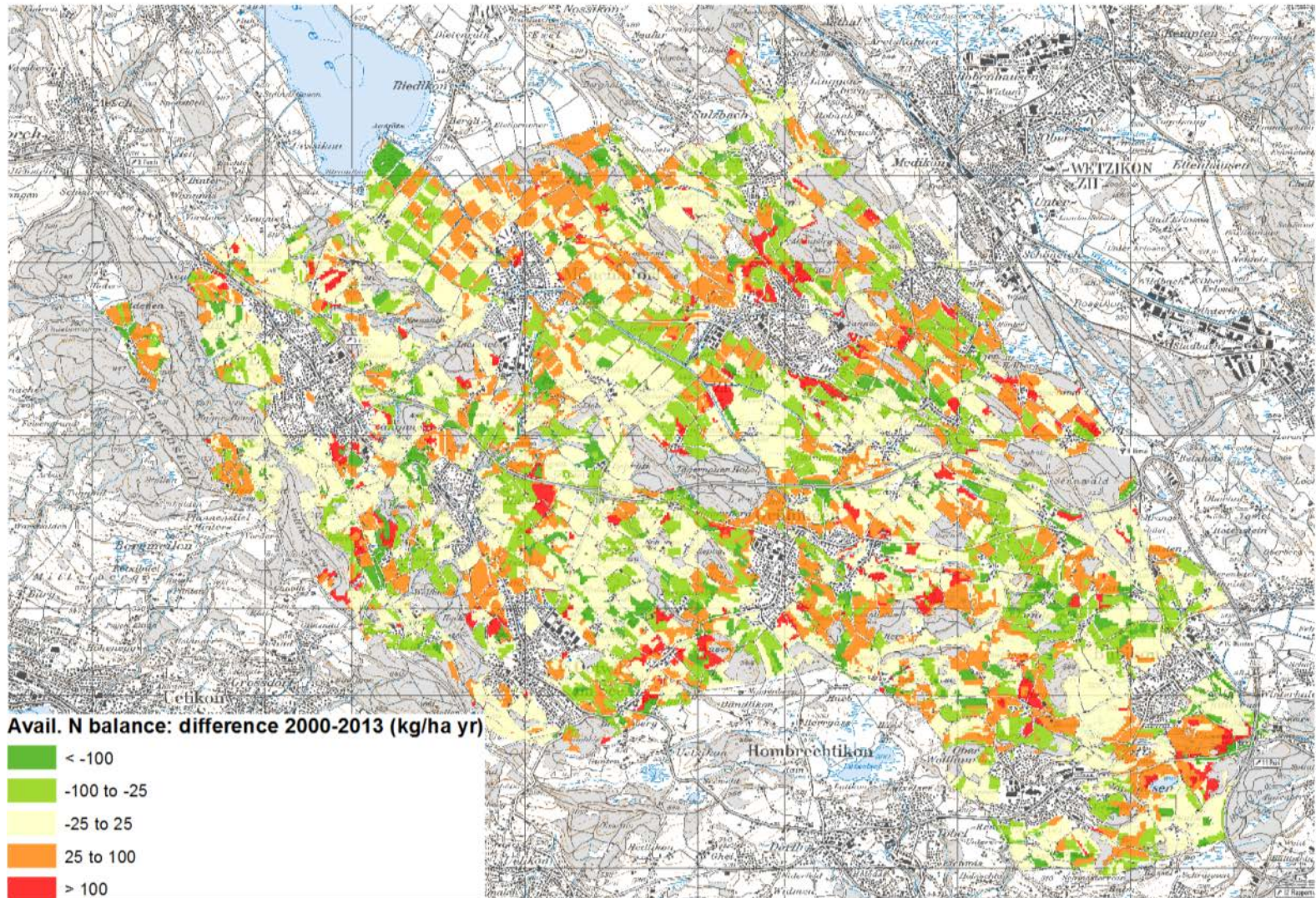


Total N balance





Available N balance: difference 2000-2013





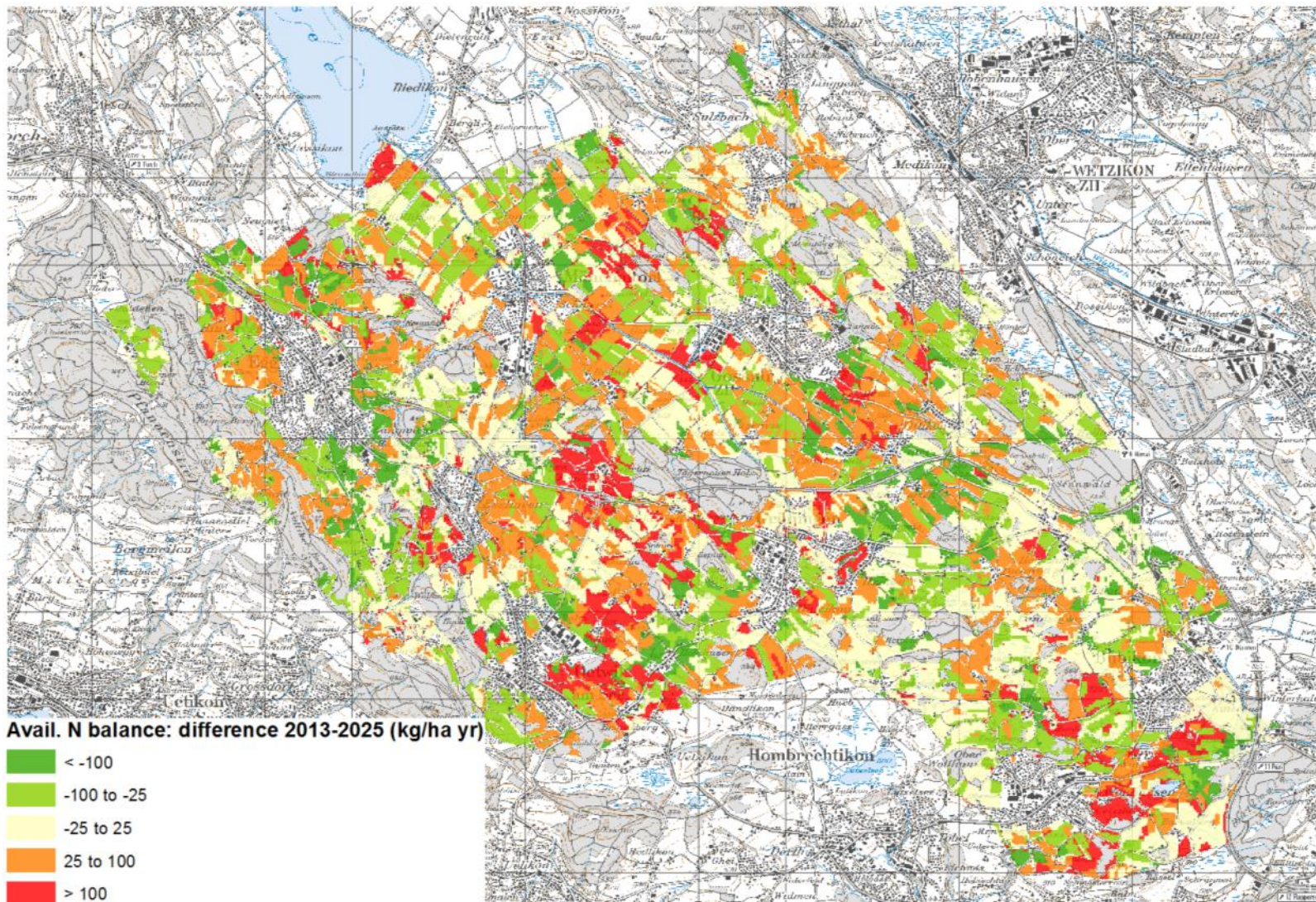
Socio-economic scenarios 2015-2025 (provided by the model SWISSLand)

	Name	Scenario
1	Status Quo	Political and economic conditions unchanged
2	Energy	Increase of fuel and electricity costs
3	Fertilizers	Increase of fertilizer costs
4	Feedstuff	Increase of feedstuff costs
5	Products	Reduction of product prices on the world market



Available N balance: difference 2013-2025

Scenario 5 (Reduction of product prices)





Conclusions & Outlook

- LMM captures spatial patterns of element balances: critical areas are identified.
- Patterns change over time.
- Patterns are sensitive to socio-economic boundaries.

Scenarios will be tested at regional level:

- Changes in agricultural policies (subsidies, restrictions)
- Optimization of manure exchange
- Use of waste-derived fertilizers
- ...



THANK YOU

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Gärtner, D., Keller, A., Schulin, R. 2013: A simple regional downscaling approach for spatially distributing land use types for agricultural land. Agric. Syst. 120, 10-19.