Leibniz Centre for Agricultural Landscape Research (ZALF)
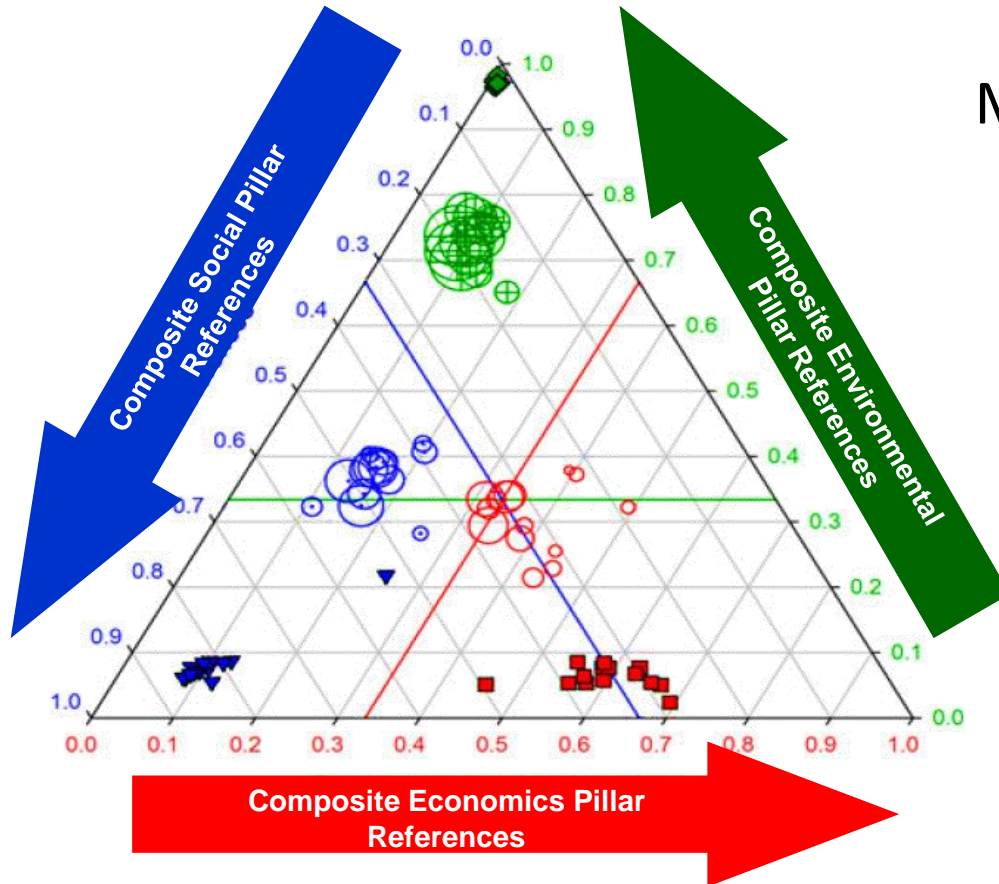
New land use arrangement that harmonize various ecosystem services of agricultural landscape

Sonoko Bellingrath-Kimura, , Nahleen Lemke, Cheng Chen, Ralf Bloch and Ioanna Mouratiadou

Date: 3.8.2022

More connections across classic disciplines are required to achieve sustainability

Interdisciplinarity of article dealing with sustainability

(Schoolman et al. 2011)

SUSTAINABLE DEVELOPMENT GOALS

Production of Food, Feed, Fibre and Fuel
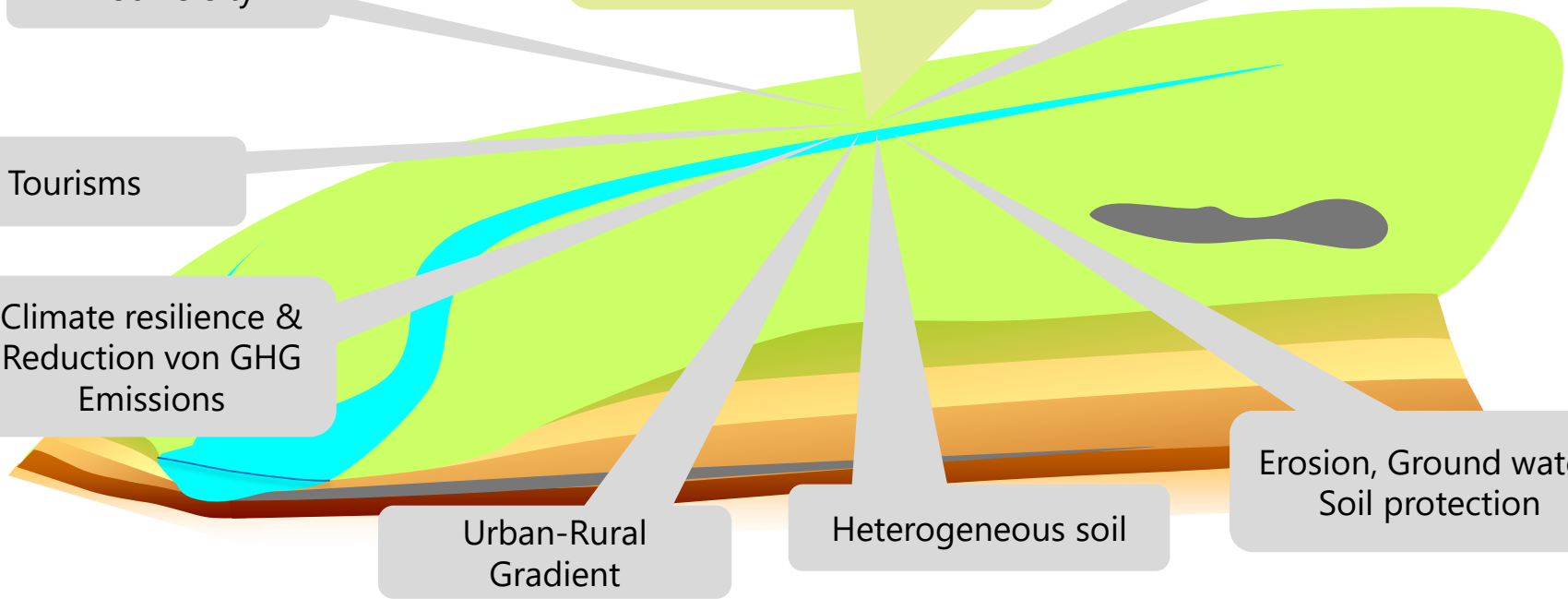
Resource: Land, Soil, Water

Biodiversity

Tourisms

Climate resilience & Reduction von GHG Emissions

Urban-Rural Gradient

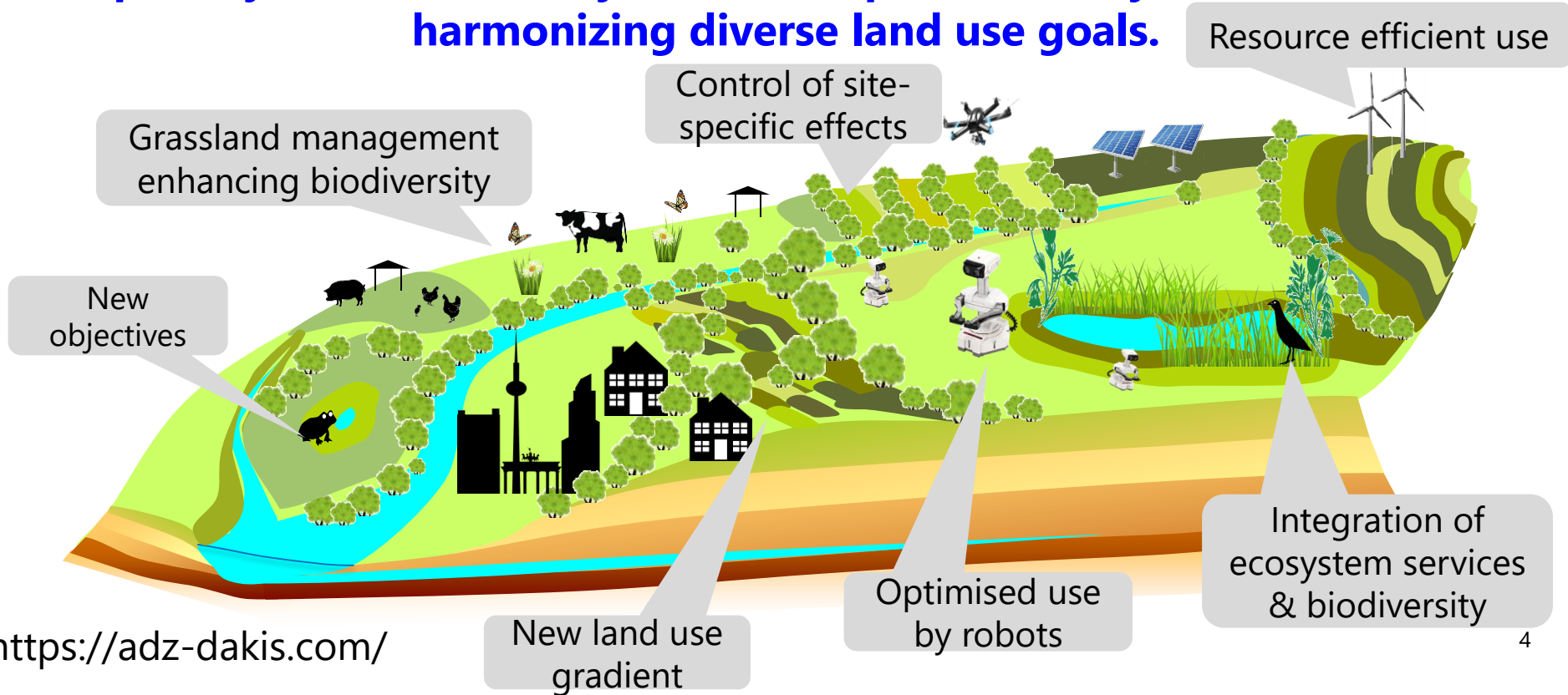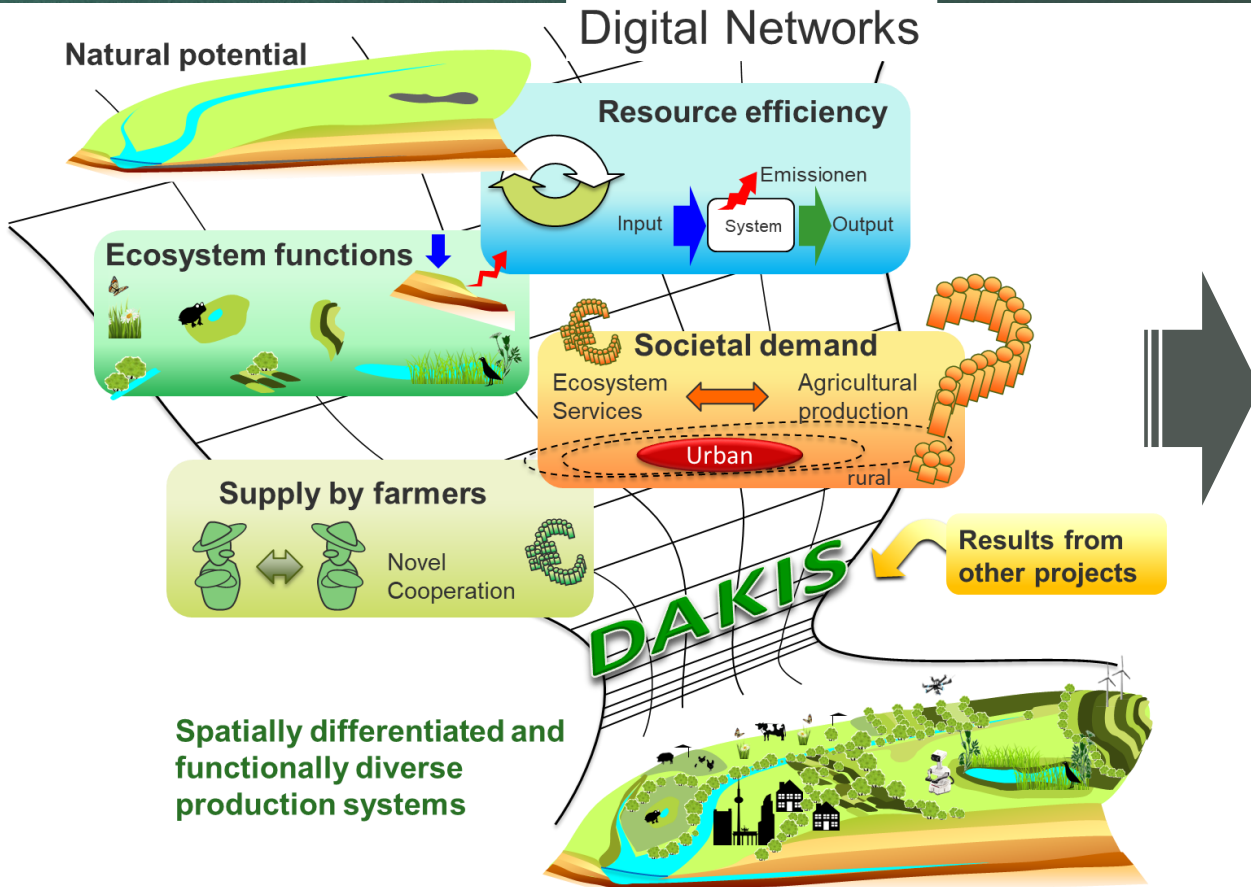Heterogeneous soil

Erosion, Ground water, Soil protection

3

Spatially and functionally diversified production systems will allow harmonizing diverse land use goals.

Resource efficient use

Control of site-specific effects

Grassland management enhancing biodiversity

New objectives

Integration of ecosystem services & biodiversity

New land use gradient

Optimised use by robots

https://adz-dakis.com/
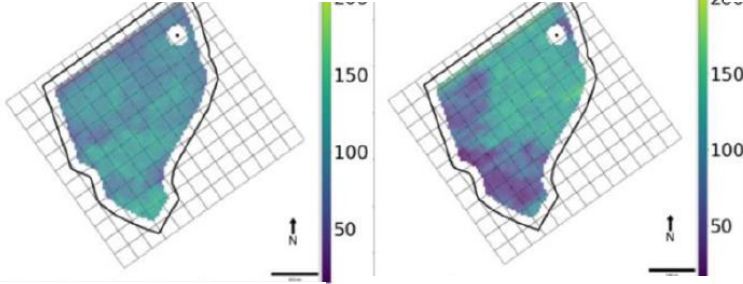
Aim of this presentation:
How can we make complex decision that is spatially and functionally diversified and how can we manage such a system?

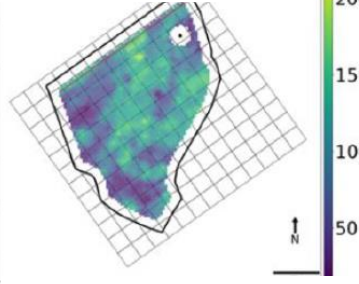**Analyse heterogeneity on target ESS**
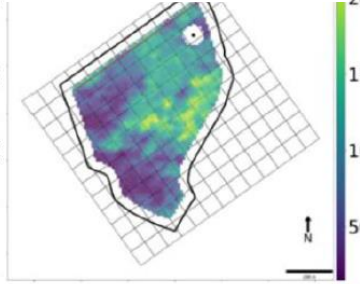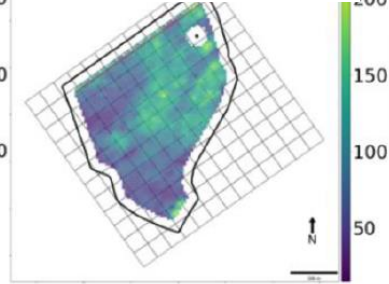- Yield
- Erosion
- (Biodiversity)

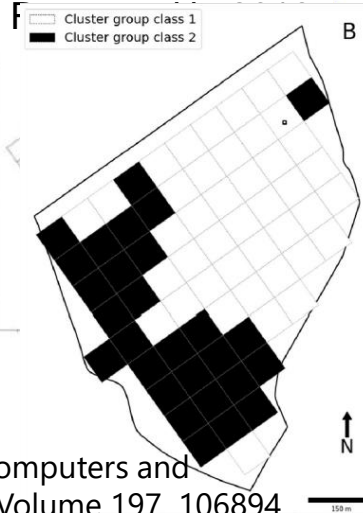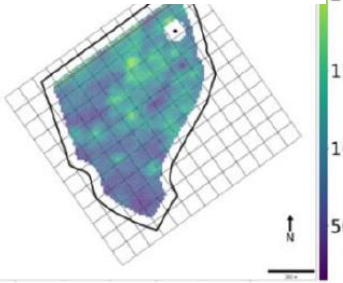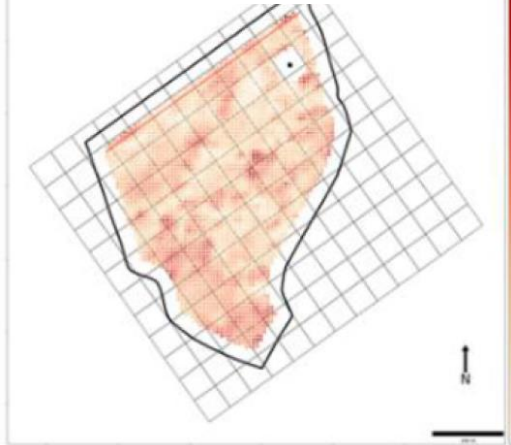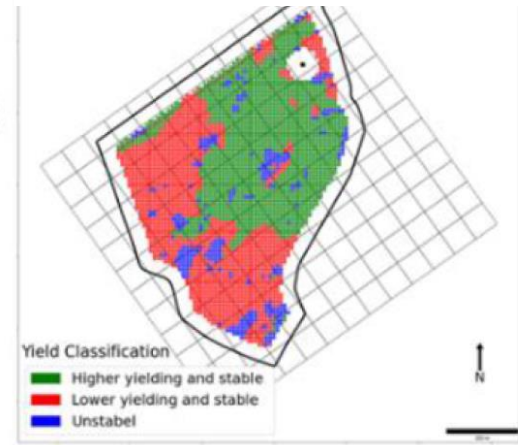Winter rye in 2010   Winter rye in 2011   Winter rye in 2013   Rapeseed in 2015   Winter rye in 2016

Winter rye in 2017   Temporal stability   Classified management map

Yield Classification
Higher yielding and stable
Lower yielding and stable
Unstabel

Donat, M. et al. (2022): : Computers and Electronics in Agriculture. Volume 197. 106894
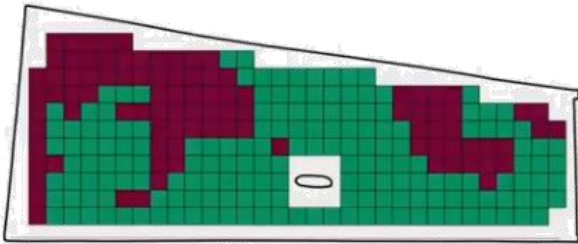
Heterogeneity: sensing

Heterogeneity: yield (harvester)
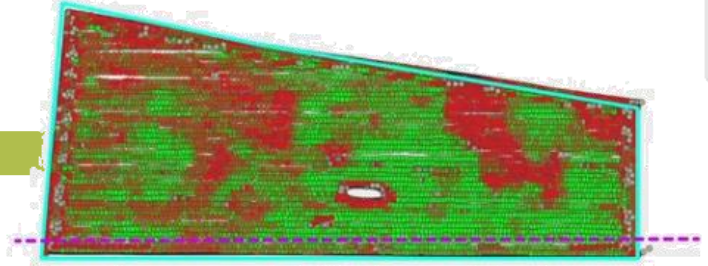
Create patches based on the working width

36m x 36m

72m x 72m
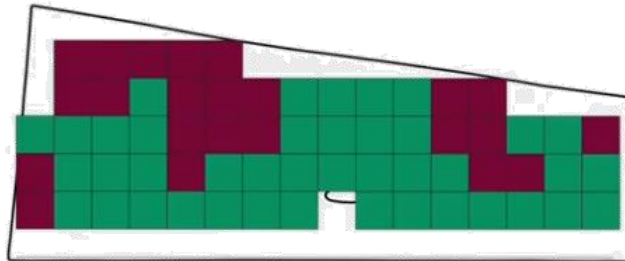
108m x 108m
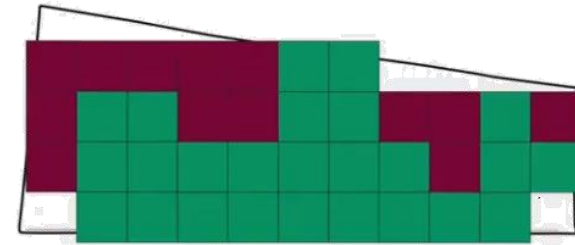
1. Analysis of the effects of site-specific, diversified land use and management practices on the resilience of the production system
2. Promoting biodiversity through small and diverse land use patterns, crop rotations, crop species and landscape elements
3. Minimize the use of chemical synthetic pesticides by promoting the spatial and temporal diversification within the agricultural landscape
4. Long-term reduction in the application of mineral fertilizers through improved resource use efficiency
5. Using automated and sensor-controlled technology for site-specific crop arrangements to reduce labor costs and use of big machinery

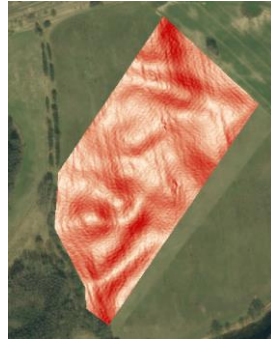https://comm.zalf.de/sites/patchcrop/SitePages/Homepage.aspx

patchCROP

LANDSCHAFTSLABOR »patchCROP«

DER VERSUCH IM VIDEO

Video zum aktuellen
Versuchsaufbau:

STANDORTINFORMATIONEN

• 2 Bodentypen: 90 % Braunerde-Fahlerden und Fahlerden, 10 % Braunerden
• Jahresniederschlag: 560 mm (1996–2008)
• Jahresmitteltemperatur: 9,6 °C

LEGENDE

⬤ Wetterstation
☐ Blühstreifen

FRUCHTARTEN IN DEN PATCHES (2020)

☐ Lupine
☐ Mais
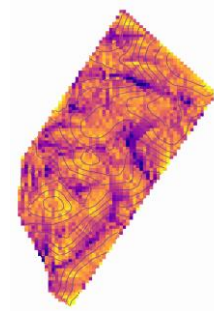☐ Phacelia
☐ Sonnenblume
☐ Sommerhafer
☐ Soja
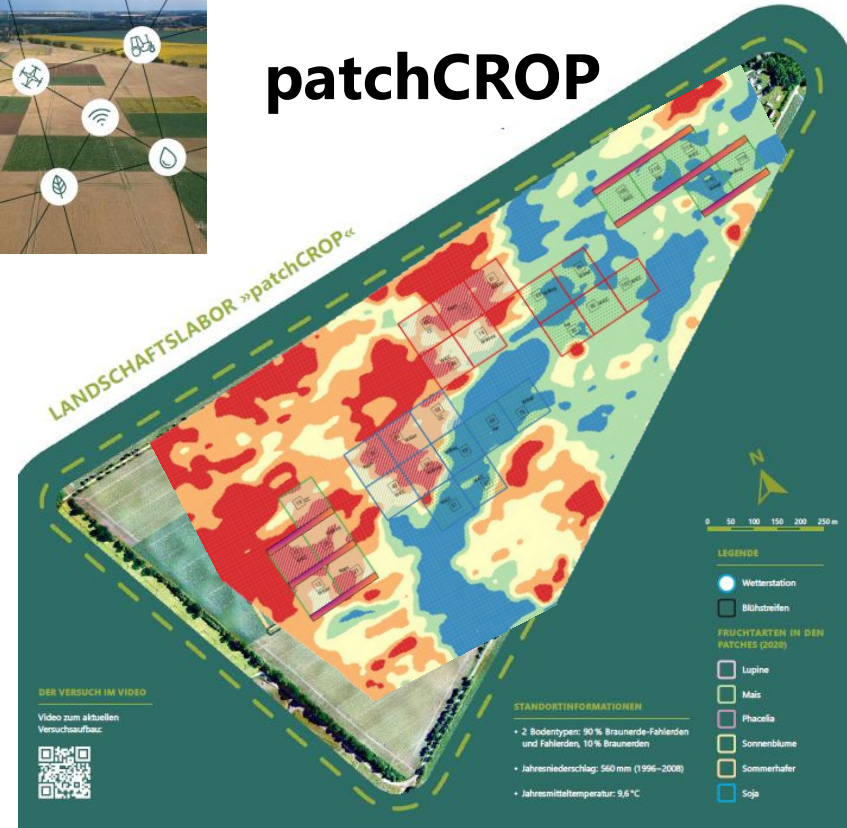
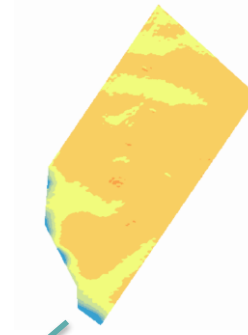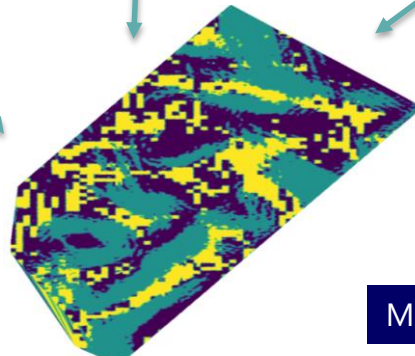*Marco Donat, Ralf Bloch (ZALF; HNEE)*

Soil points
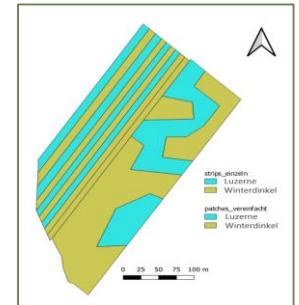

Slope angle

Soil humidity

Solar radiation

Identification of biomass potentials at subfield level at the Dahmsdorf site

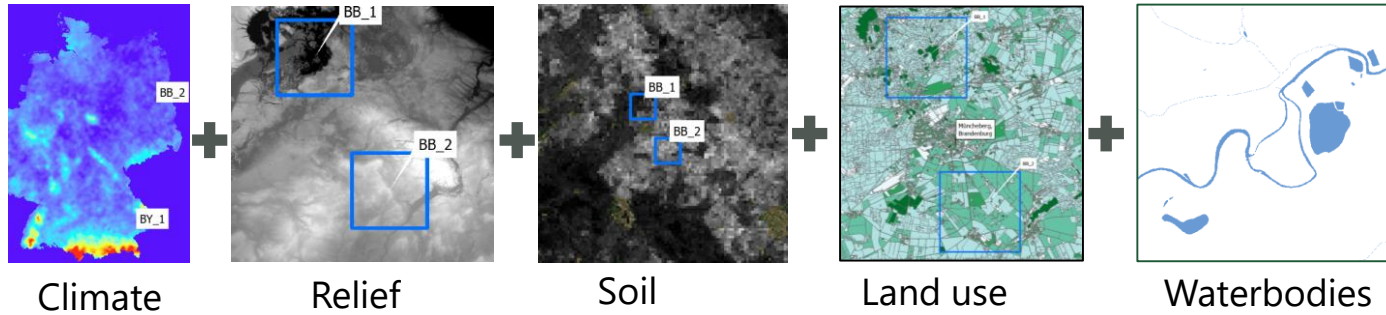High soil quality

Moderate soil quality

Moderate soil quality at slope

9

Climate + Relief + Soil + Land use + Waterbodies

Marvin Melzer (Poster Nr. 12)

Identification of potential to reduce soil erosion and erosion hotspots at subfield level for four landscape windows (5x5 km) in Brandenburg and Bavaria
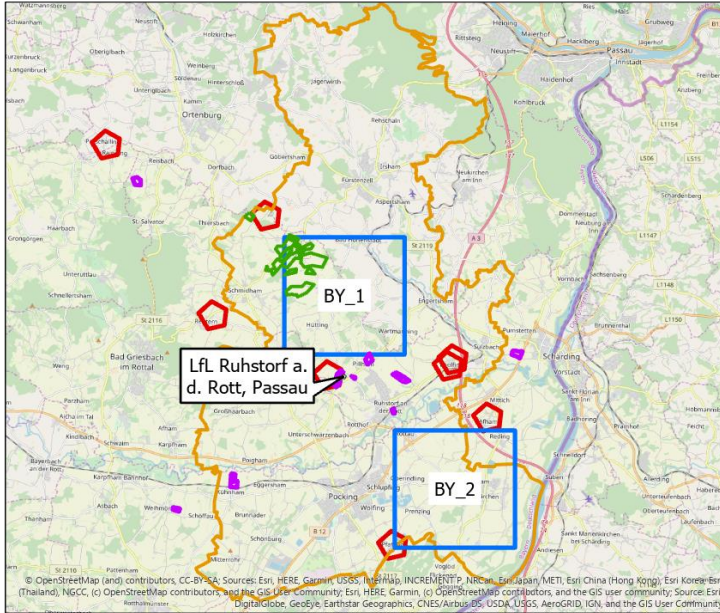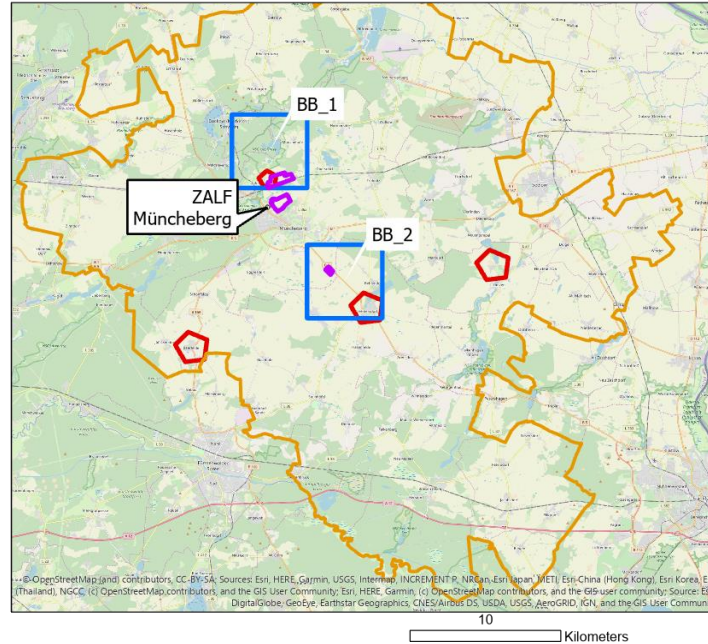
Hotspot!

10

Chosen Landscape Windows (blue squares, 5x5 km) in Bavaria and Brandenburg exemplary shown in a relief or FFH biotopes GIS map. Also present are differences in climate, soil and field size.

Advantage of landscape approach

Bayern

Nested approach Brandenburg:

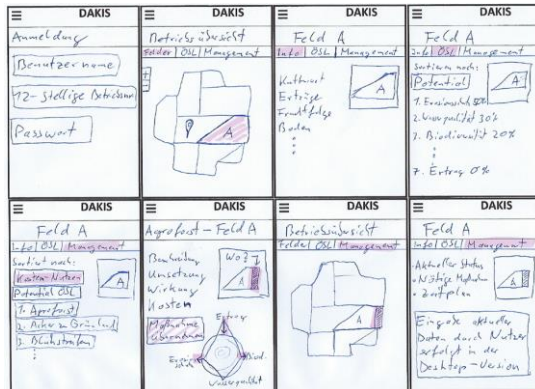Stakeholder analysis, ESS analysis, field trials, cooperative farmers

Brandenburg

Challenges
Connect landscape appraoch to farm-management

12

Front-end design

Back-end design

Theorie vs. Praxis

https://adz-dakis.com/

14

ROW-GUARD

Intelligente Robotiksysteme
autonomen Beikrautregulier

FARMDROID

landtechnikmagazin.de

Lenksteuerung der Hacke
(Einböck)

Source: 123comics

On going! Do visit:
https://adz-dakis.com/

- The DAKIS is a unique tool
  - taking into account heterogeneity of ESS, biodiversity
  - support decision-making toward a site-adapted small-scale multifunctional and diversified agriculture
  - Landscape windows approach can open new perspectives (Living Lab!)
  - Further study are to connect sensors data for timly (real time) process simulation model, that is connected to economic model, scenarios and impact assessment

Thank you for your attention.

Contact: Sonoko.Bellingrath-Kimura@zalf.de