talkingfields

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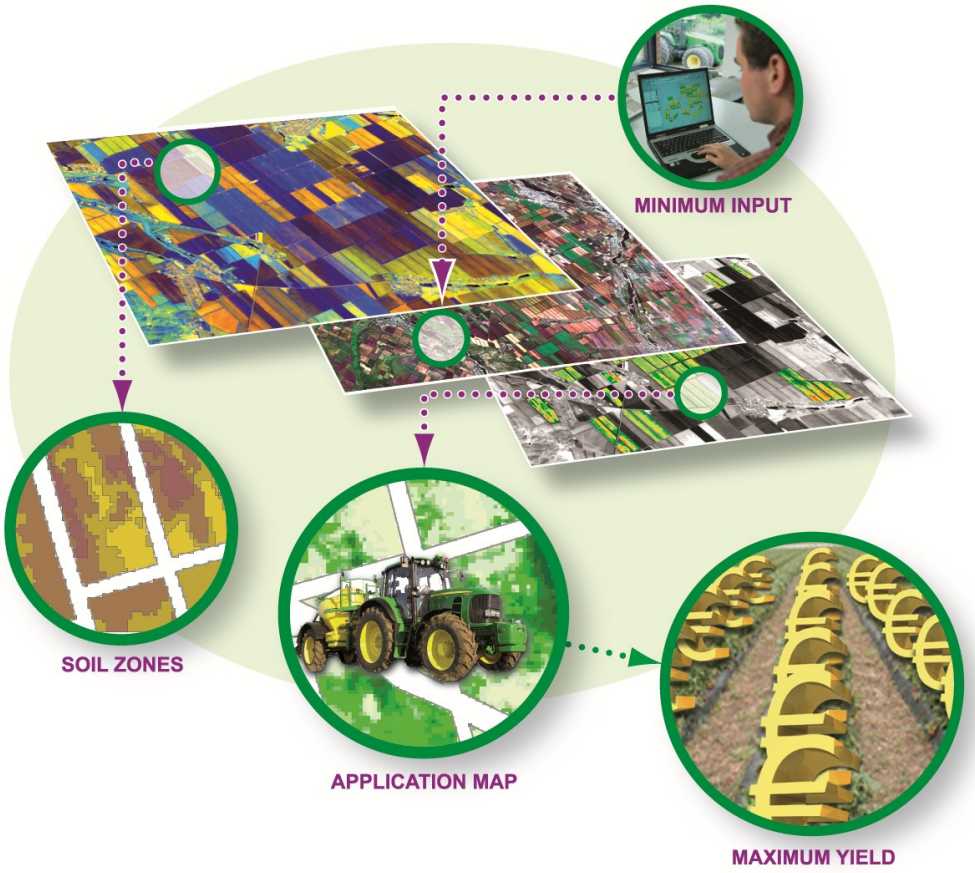
Precision Farming using Satellite Techniques

GPS satellites support site- specific **seeding**, **fertilization**, **plant protection** and **yield mapping** through global **navigation** services.

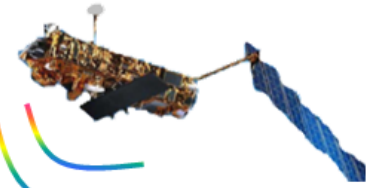
Satellite images monitor crop status and help farmers to manage their fields best for economic and ecologic benefits.

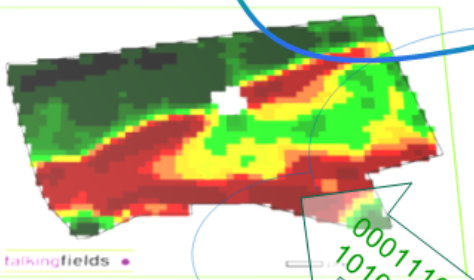
Smart Farming for sustainable & cost-efficient food production!



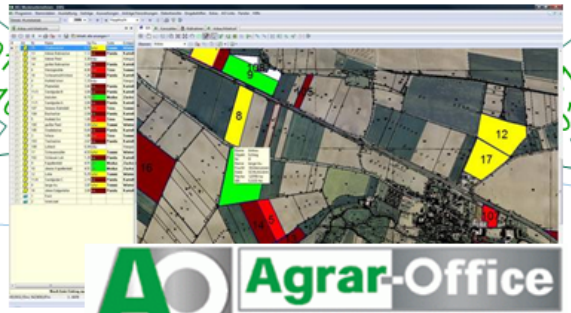
Concept of talkingfields in the frame of IAP

INFORMATION





Communication



Agrar-Office
Das integrierte System.

Or comparable FMIS

NAVIGATION

Important: Easy workflow for farmer in his Farm Management Information System!

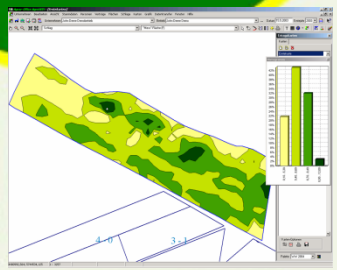
talkingfields

Documentation

Field in base data

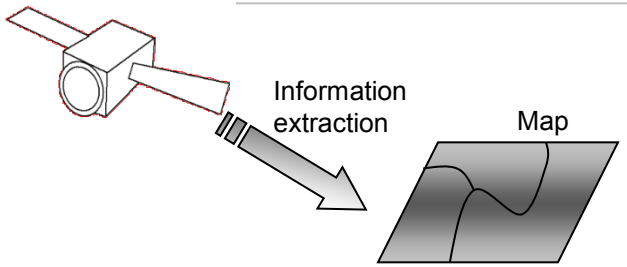
Reading in data, noting down measures

Conducting measures



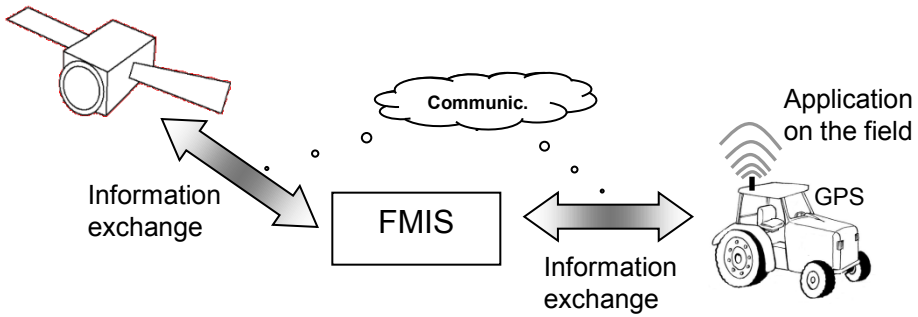
Measure planning and preparation

Comparison to other EO services for PF



Present EO based precision farming services:

One-way-street, maximum interaction with farmer: field boundary upload, end point is a map
No standard EO service provides the service chain to the farm machinery.



talkingfields services:

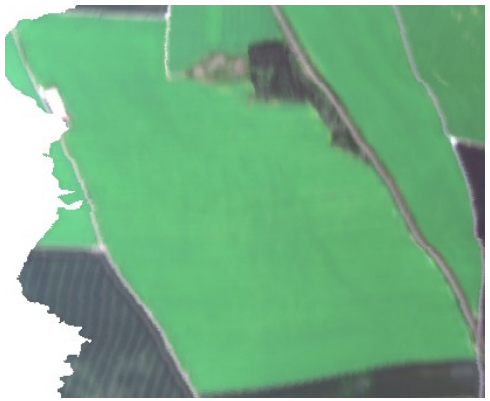
Loop, direct interaction with farmer via Farm Management Information System:

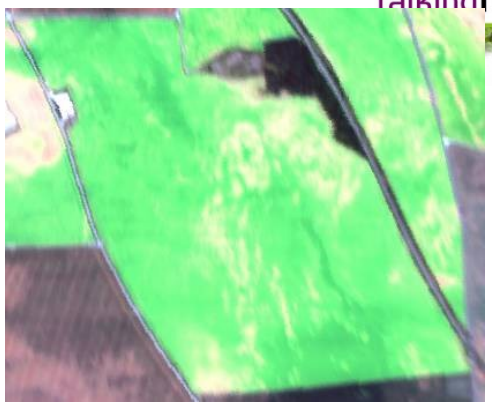
- input from FMIS farmer data bank to EO analysis
- EO derived information to FMIS
- FMIS input to machinery
- Application on field with machinery
- Feedback about application back to FMIS for documentation

Overview of application possibilities of satellite techniques for precision farming

- **Inventory** via site characterisation and classification into zones. The farmer can manage zones with different characteristics differently.
  - Basal dressing according to soil zones
  - Seeding according to yield potential
- Information for **planning of site-specific measures** according to **currently** observed canopy development
  - Plant protection measures according to biomass or canopy density
  - N-Fertilization according to leaf area and N-uptake

Improved soil mapping requires quantification of persistent patterns

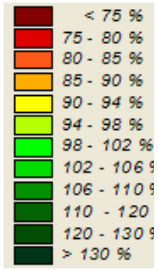


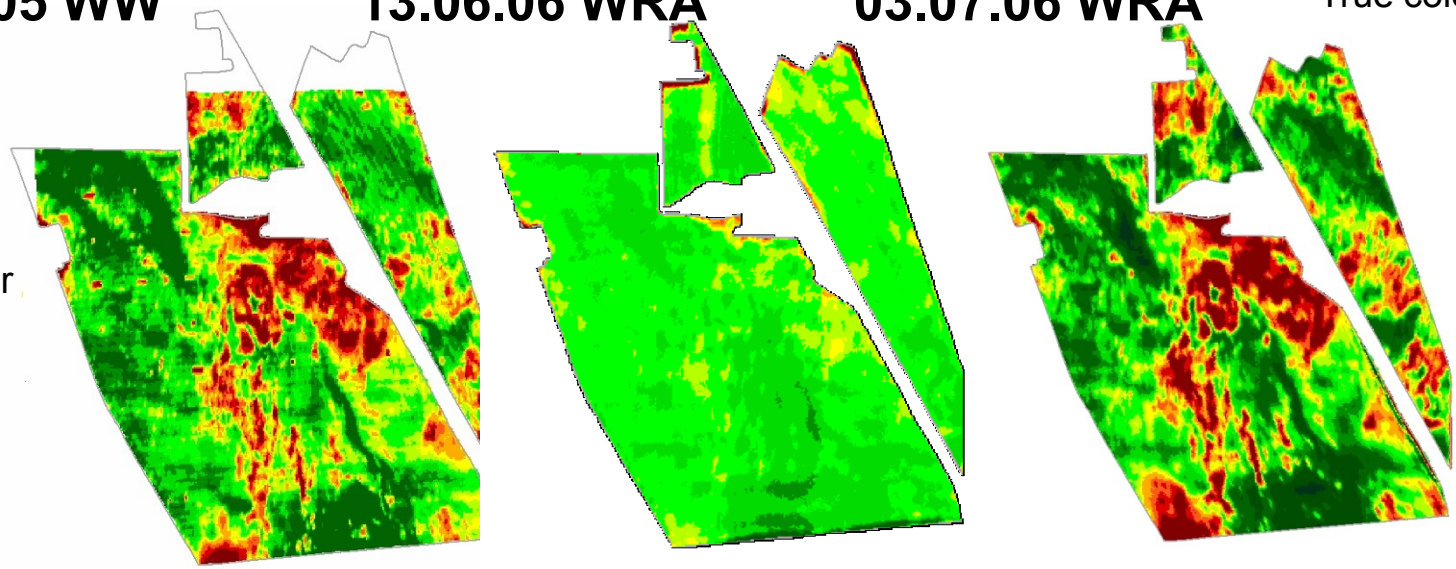


N

21.06.05 WW **13.06.06 WRA** **03.07.06 WRA** True color

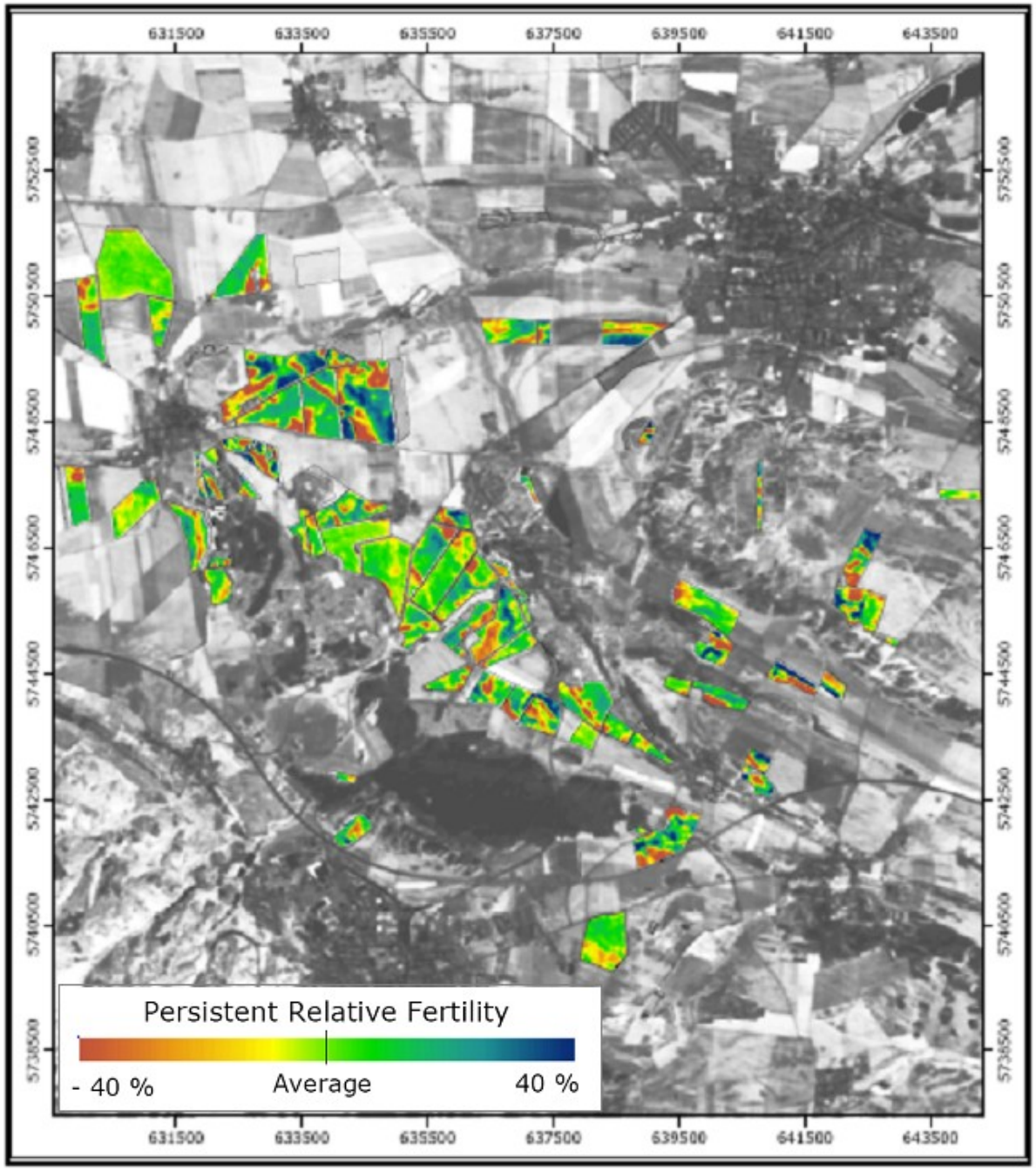
Crop vigor



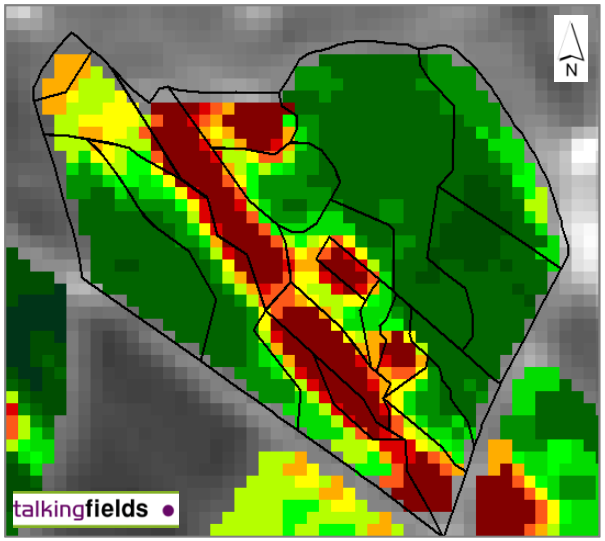


important: similar phenology of the different crops

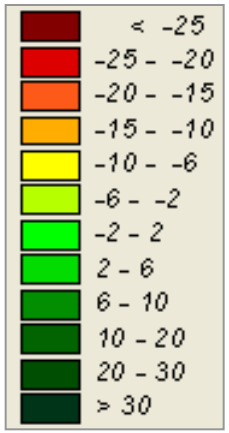
TF Base Map Results: Münchhoff-Klamroth



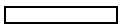
Comparison with on-site soil information



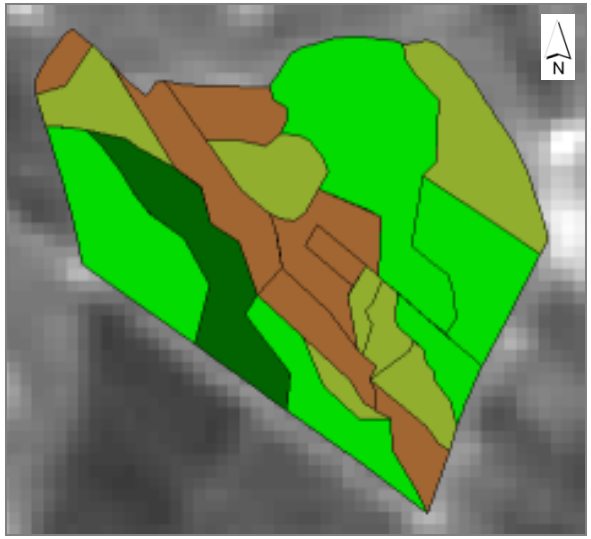
TF-Persistent relative fertility map



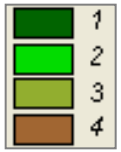
Persistent relative fertility in %



150 m



Farm soil map

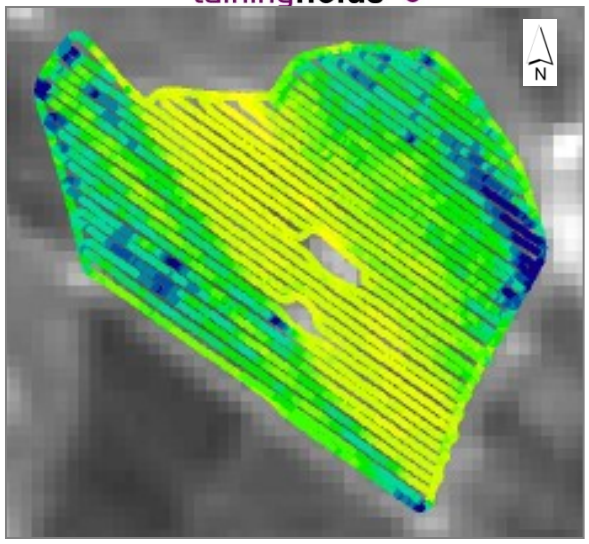


Yield level of the soil

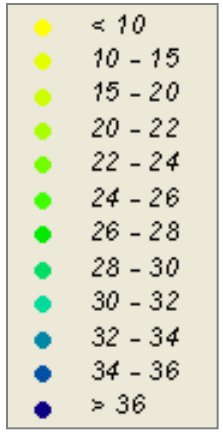
(derived of the Klassenzeichen)

1 = high yield level

4 = low yield level



Electrical Conductivity (EC 25)



µSiemens/cm

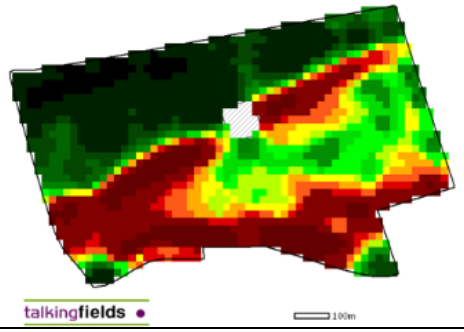
Improved Soil Mapping / Site characterisation

Concept:

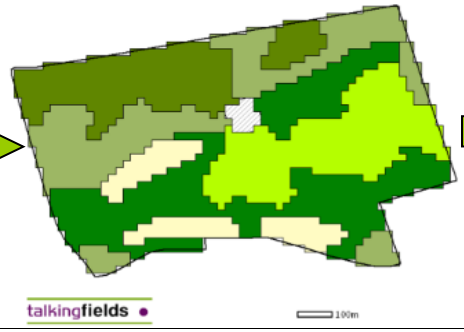
- Optimization of soil sampling strategy for an improved soil mapping
- Use of satellite information for selective instead of raster sampling
- Specific zones for soil sampling are created according to TF Base Map
- Reduction of necessary amount of lab analyses sometimes possible

Soil sampling using **satellite navigation**

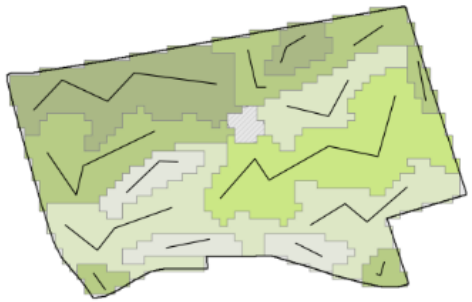
TF Base Map



TF Zone Map



Soil Sampling Strategy



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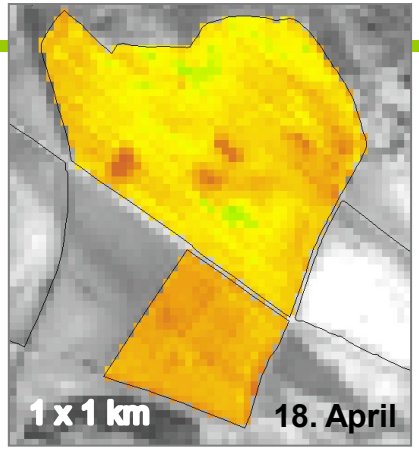
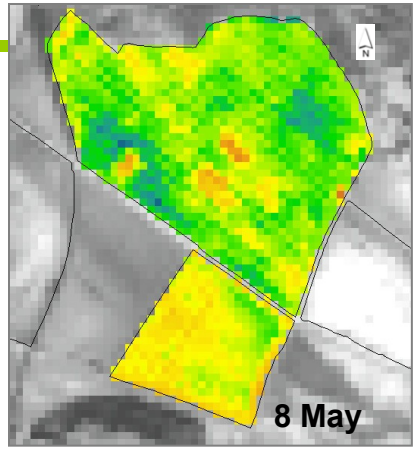
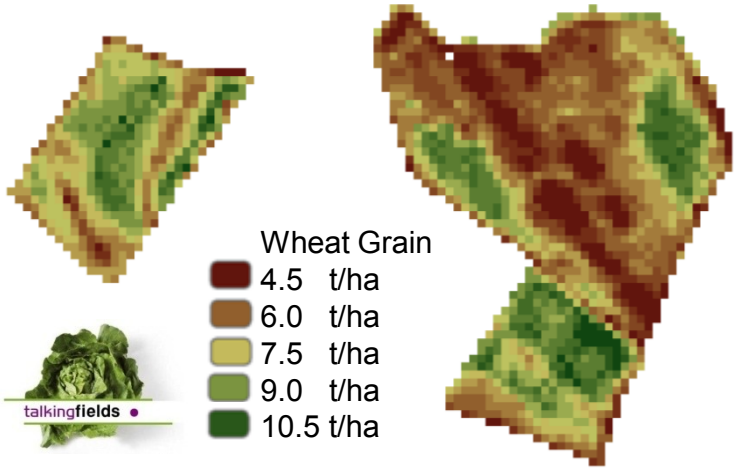
From biomass to yield

Crop Growth Model

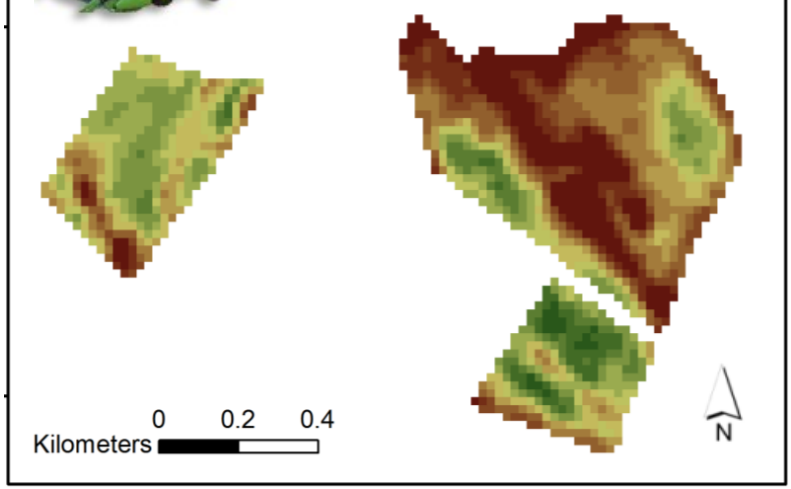




Satellite based modeled yield

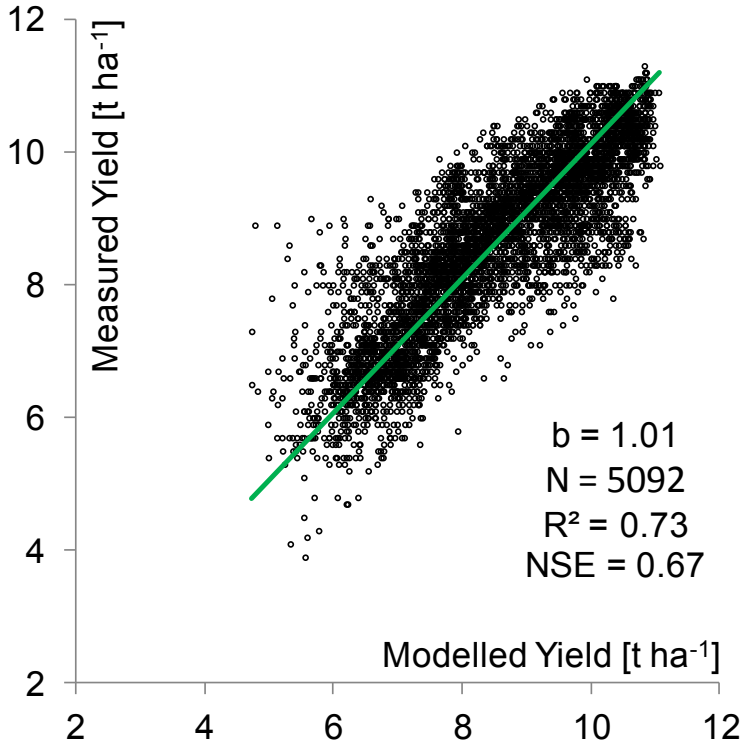


Measured yield

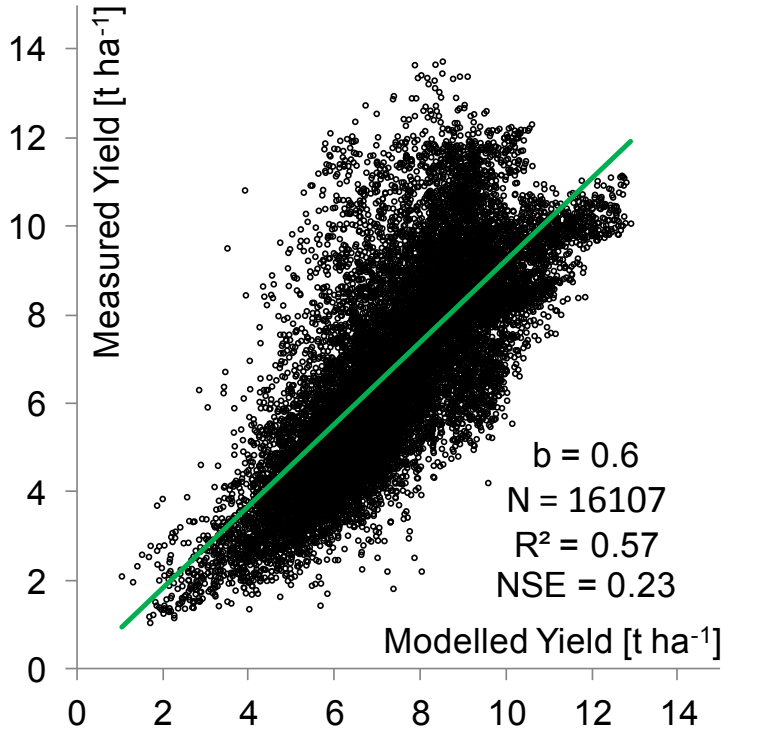


2011

Technical Validation – TF Yield Map



Correlation 2010 (200 ha)



Correlation 2011 (>800 ha)

Summary of TF Services and Products

Service	Products	Product description
Improved Soil Mapping	TF Base Map TF Zone Map	Persistent relative fertility [%] Zones as input for GPS-based selective soil sampling
Economic Evaluation	TF Economic Evaluation Tool plus field statistics	Software tool for calculation of economic profiles of different precision farming strategies based on the histogram of the persistent relative fertility [%]
Plant Protection Measures	TF Biomass Map	Above-ground dry biomass as risk estimation for plant protection [t/ha]
Yield Estimation	TF Yield Map TF Yield Forecast	Yield map as hindcast and nowcast [t/ha] Yield estimation as forecast up to 4 weeks in advance [t/ha]

What have we achieved so far?

Targets talking**fields** at Kick-Off

- Build 4 integrative services for farmers
- Raise awareness for satellite technologies with farmers
- Have 30 000 ha service area for Improved Soil Mapping in first year after Demo Phase

Achievements talking**fields** so far

- 2 of 4 integrative services pre-operational, 2 services starting near-real-time demo phase
- Two stakeholder workshops conducted with positive feedback (including service purchase)
- 27 000 ha service area for TF Base Map already processed
- Near-real-time services rely heavily on Sentinel-2 data in operational phase ➔ delay in launch affects market opportunities after end of demo phase

➔ A lot of work remains to be done, but the achievements of the first 2/3 of the project are promising!

Current Status of Processing

Demo User Mr. von Breitenbuch‘s idea about „perfect data“

Yield – Forecast - System

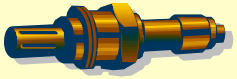
Yield Map

- Daten Vergangenheit

Soil Information

Meteodata

- Past to present



Biomass Maps

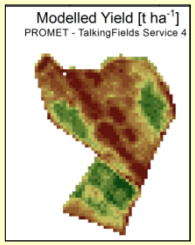
- Past to present

Software for Yield Estimation

Purpose:

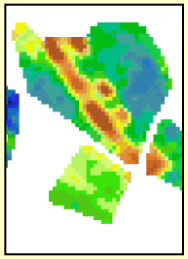
- **Controlling**
- **Rentability (input vs. output)**
- **Contract management**

The Talking Fields solution



TF Yield Map

- Available for past 10 years
- Homogeneous data base



TF Base Map

Persistent, relative biomass patterns

Meteodata

LAND-DATA EUROSOFT

- Own meteostation with online data access
- Archive data from surrounding stations

TF Biomass Map

- Available for past 10 years
- absolute biomass data in t/ha

PROMET

LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN

Plant growth model PROMET for yield forecast

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www.talkingfields.de

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Thank you for your attention!

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VISTA Remote Sensing in Geosciences GmbH

University of Munich, LMU

PC-Agrar GmbH, Pfarrkirchen

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