

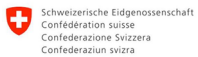
Modeling regional irrigation demand

Swiss Geoscience Meeting 2023

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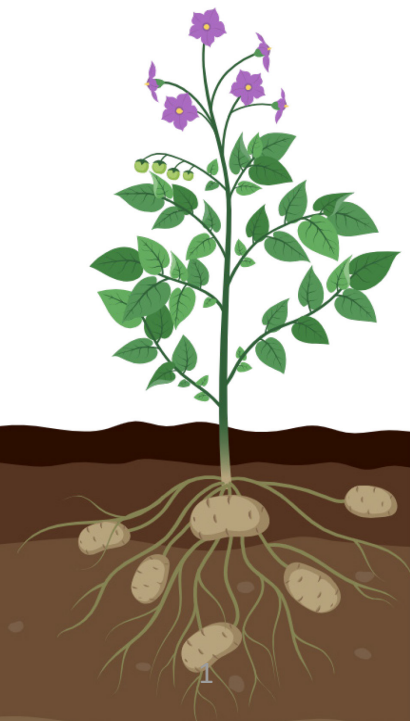
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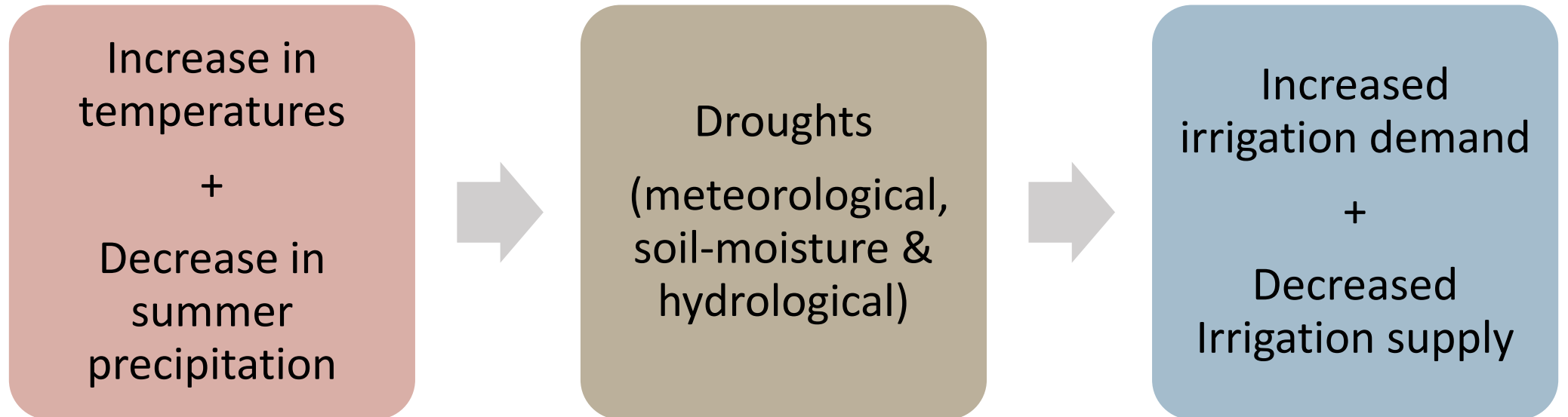
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Context



Avec la sécheresse, les interdictions d'arrosage sont de retour

Nyon et quelques communes du district de Morges interdisent le gaspillage du précieux liquide. Les sources se tarissent rapidement.

TROCKENHEIT

Erste Bewässerungsverbote in Aargauer Gemeinden: «Es geht nicht mehr anders»

Auf den Aufruf zum Wassersparen folgt das Bewässerungsverbot.

Hitze und Trockenheit

Tiefe Wasserstände, extreme Wärme: Wie die Behörden jetzt handeln

Aktualisiert am Mittwoch, 20.07.2022, 10:35 Uhr

Schweizer Bauer

Politik & Wirtschaft Markt & Preise Regionen Tiere Pflanzen Landtech

Tessin: Wasser wird knapp

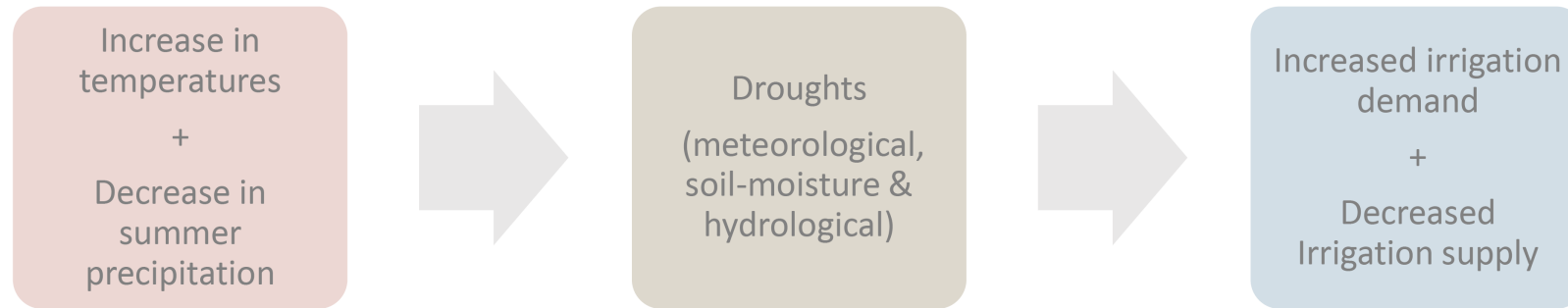
sda | 17.07.2022 16:39

Trockenheit zwingt Schweizer Landwirtschaft zum Umdenken

Startseite > News > Tagesschau > UT 14.07.2023 · 3 Min

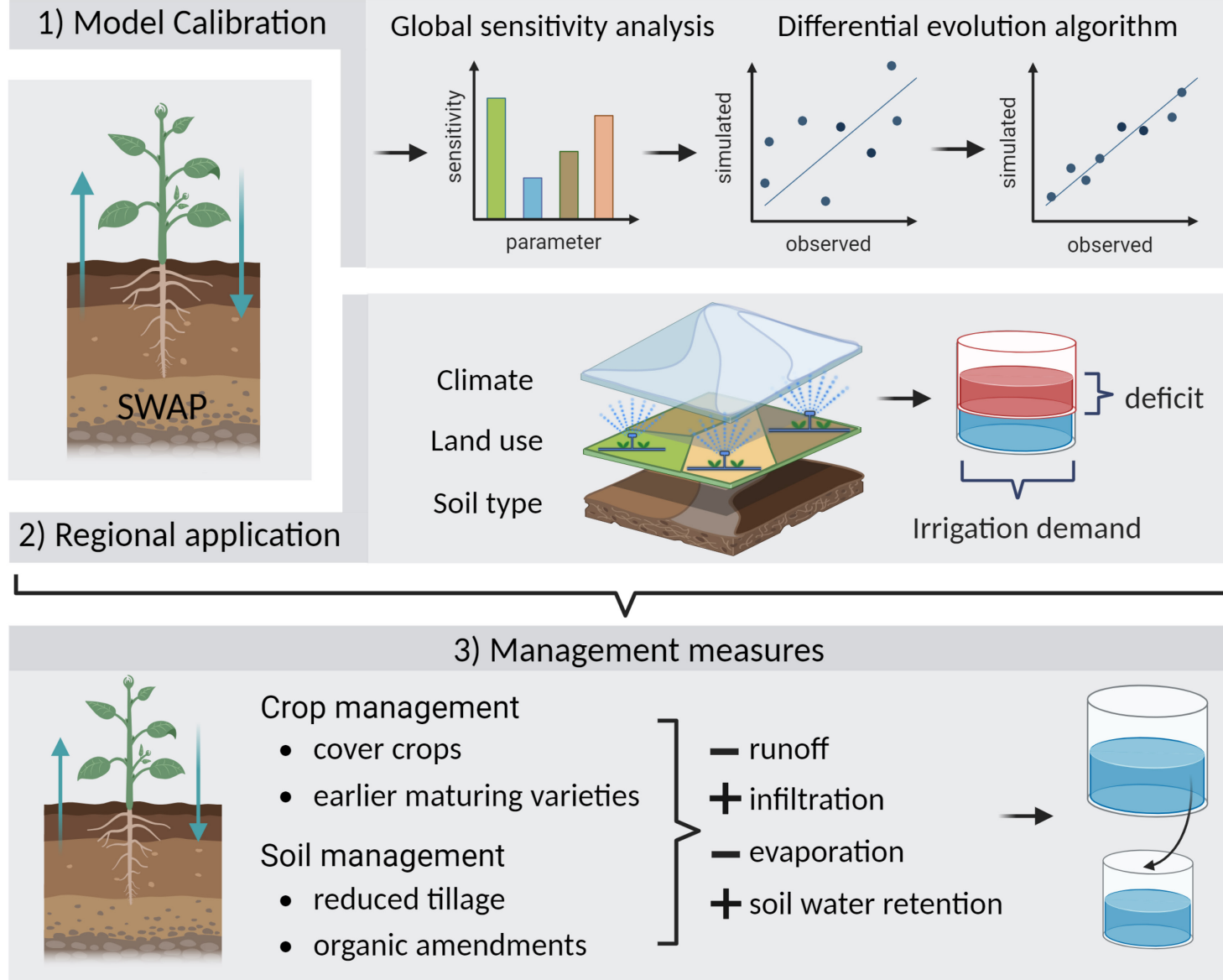
Die Landwirtschaft braucht in den heissen Sommern viel Wasser, gleichzeitig gibt es immer mehr Wasserentnahmeverbote wegen Trockenheit. Nun braucht es für eine sparsame Bewässerung neue Ideen.

Objectives

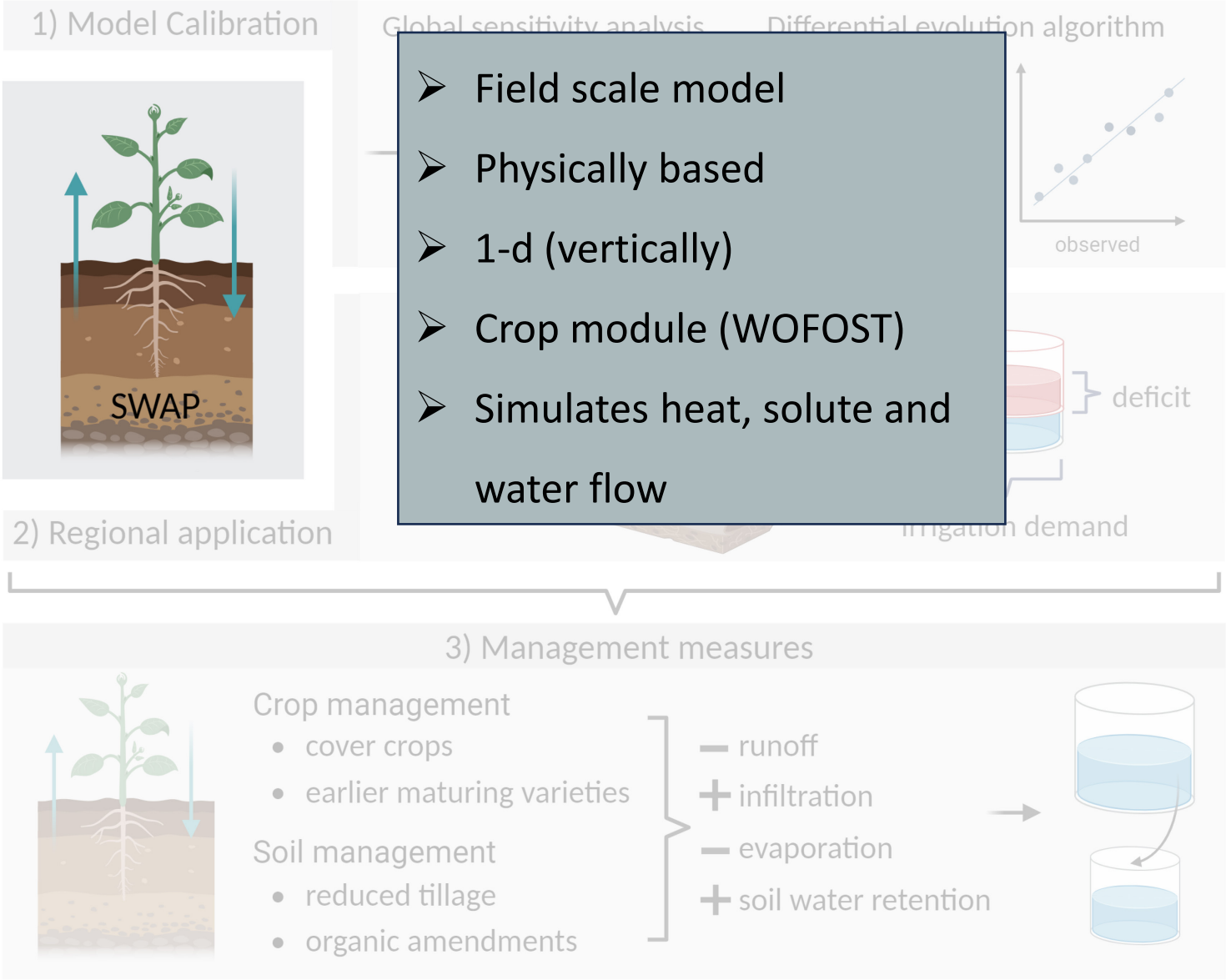


- How high is the regional irrigation demand?
- What are the impact of irrigation bans?
- To what extent can crop & soil management help?

Data and Methods



Data and Methods

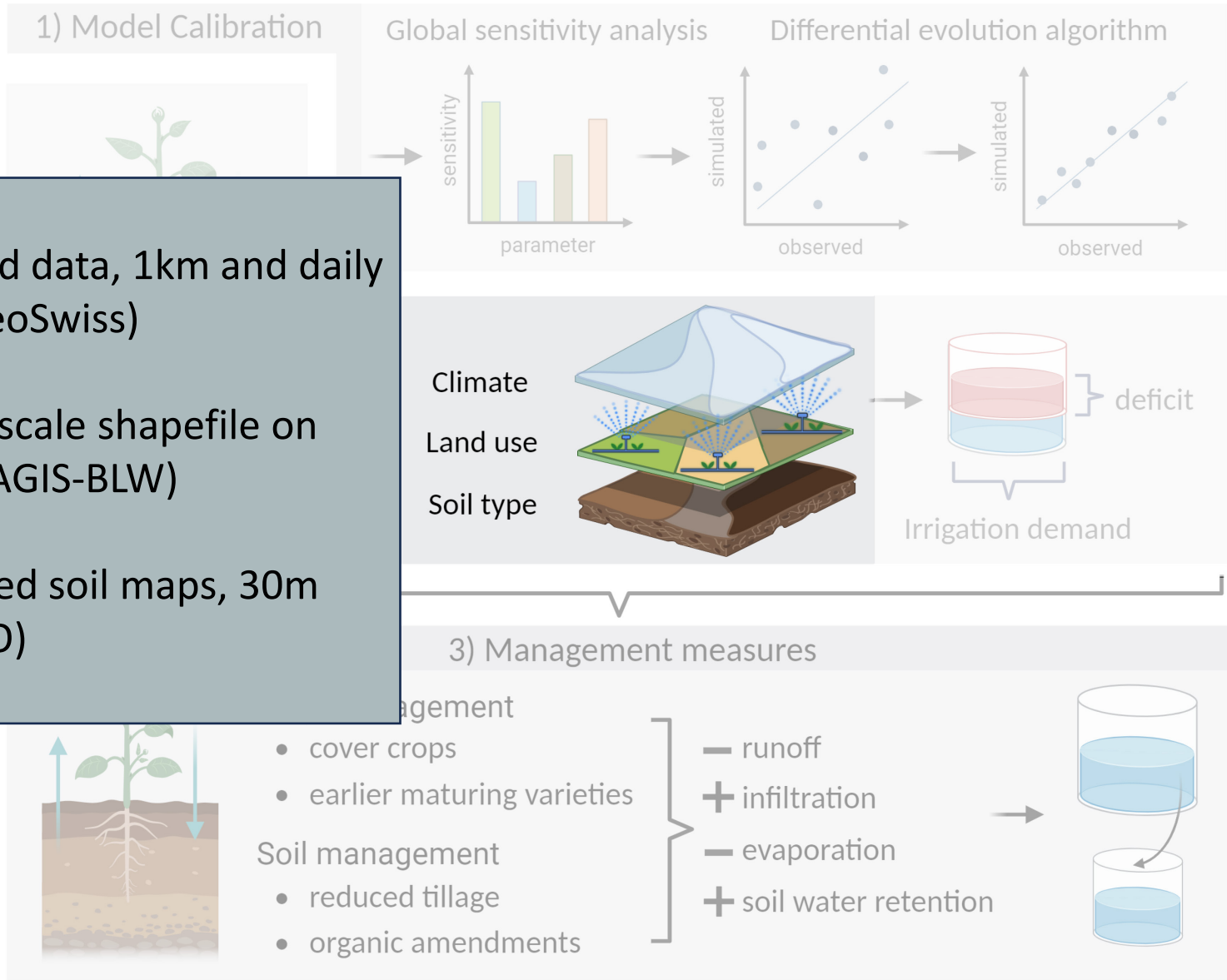


Data and Methods

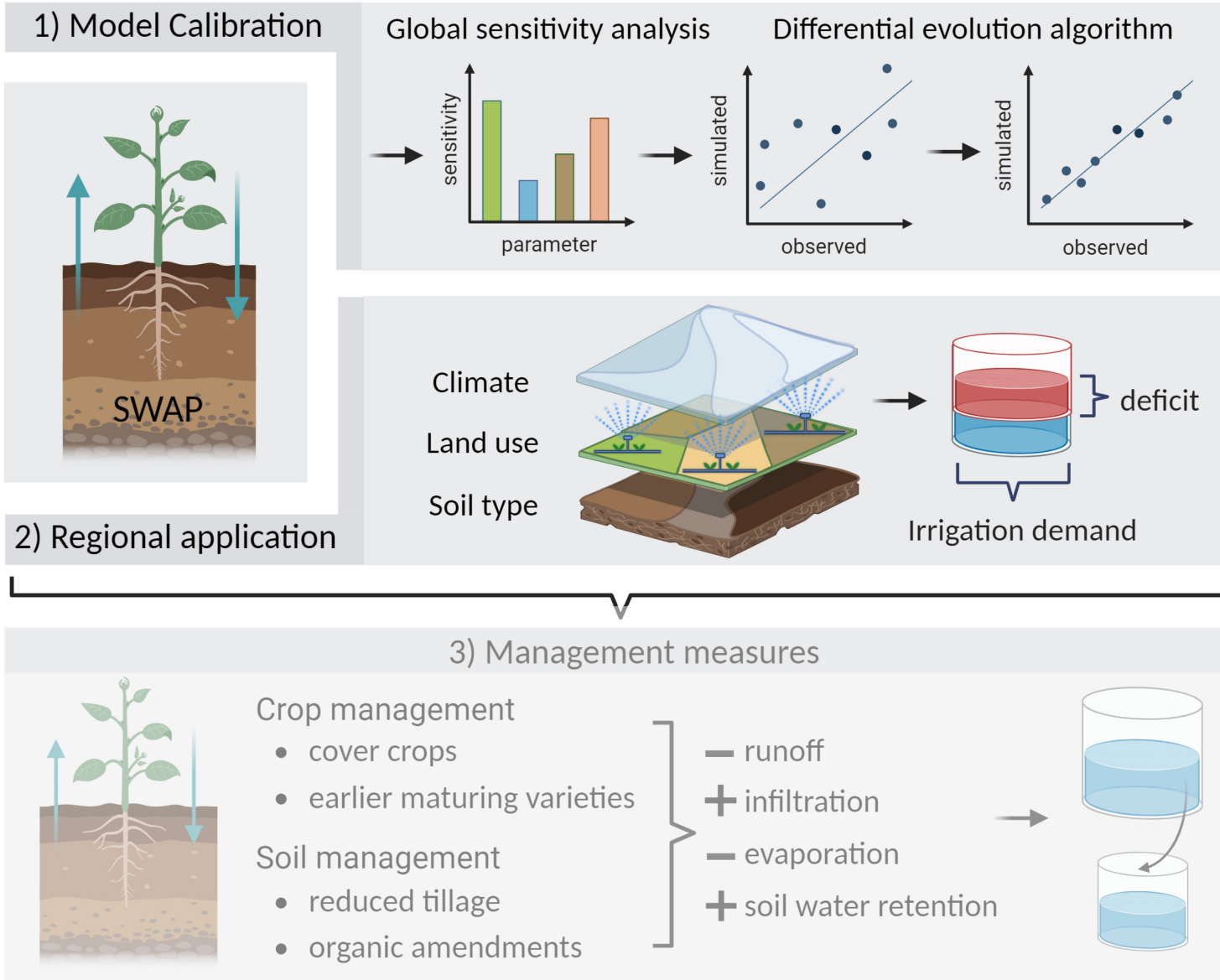
Climate = gridded data, 1km and daily resolution (MeteoSwiss)

Land use = field-scale shapefile on yearly landuse (AGIS-BLW)

Soil type = gridded soil maps, 30m resolution (KOBO)

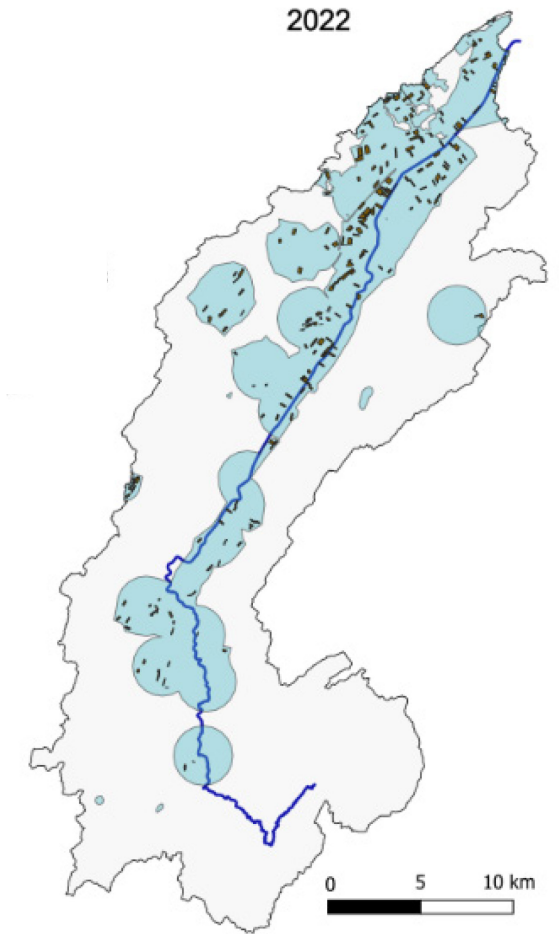
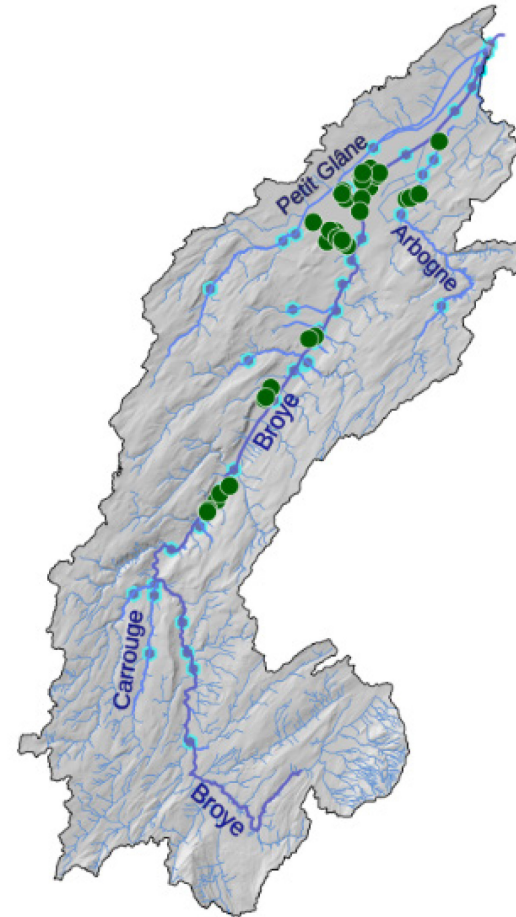
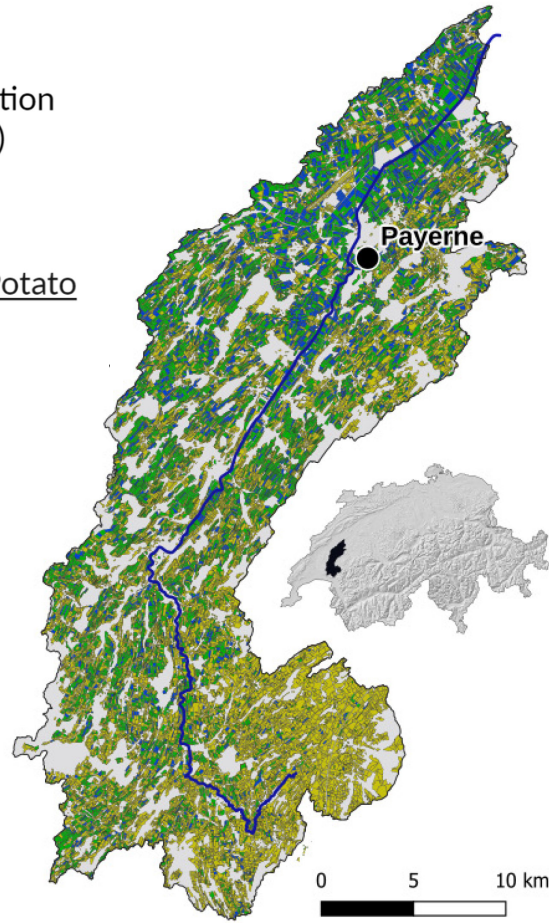
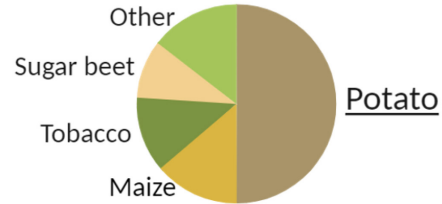


Data and Methods



Study area – Broye catchment

Irrigation water allocation
(Broye catchment)



- irrigated crops
- other arable crops
- meadows

- water withdrawal points
- reference data points

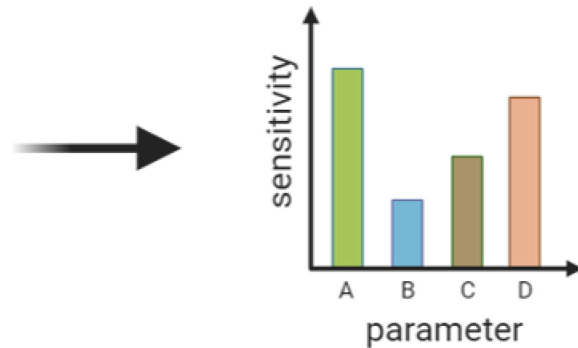
- potentially irrigated areas
- potato fields

Model Calibration

Global Sensitivity Analysis

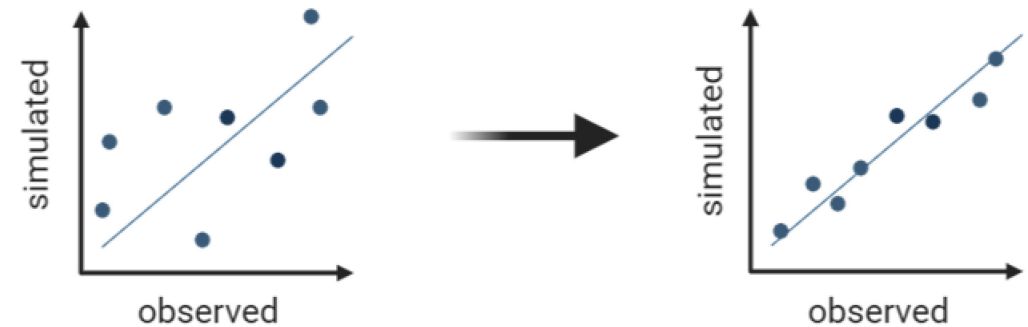
Latin hypercube sampling & Calculation of Sobol Indices

- parameter A
- parameter B
- parameter C
- parameter D
- ...



Parameter Optimization

Differential evolution algorithm (genetic algorithm). Objective function = maximize fit to seasonal irrigation amounts and crop yield



- 9 parameters optimized (regarding photosynthesis, phenology, biomass allocation and root architecture)

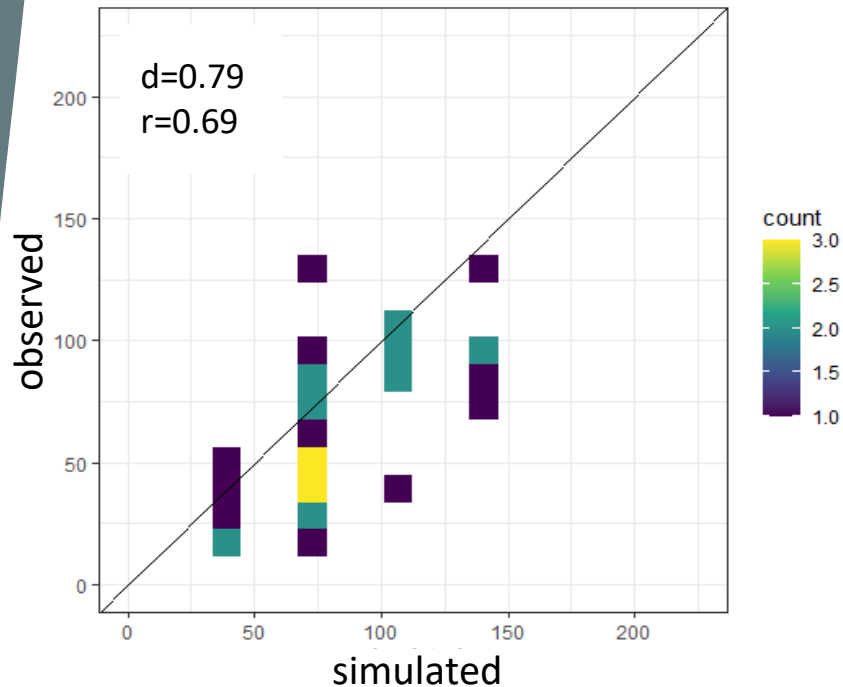
Fit to reference data from HAFL

➤ Irrigation amount

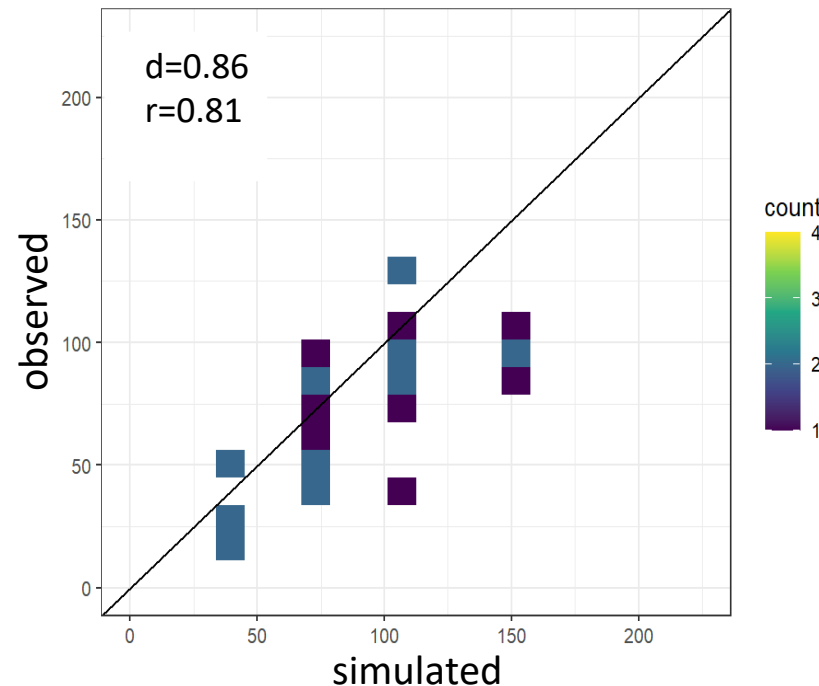


Berner Fachhochschule
▶ Hochschule für Agrar-, Forst- und
Lebensmittelwissenschaften HAFL

Default parameterization



Optimized parameterization



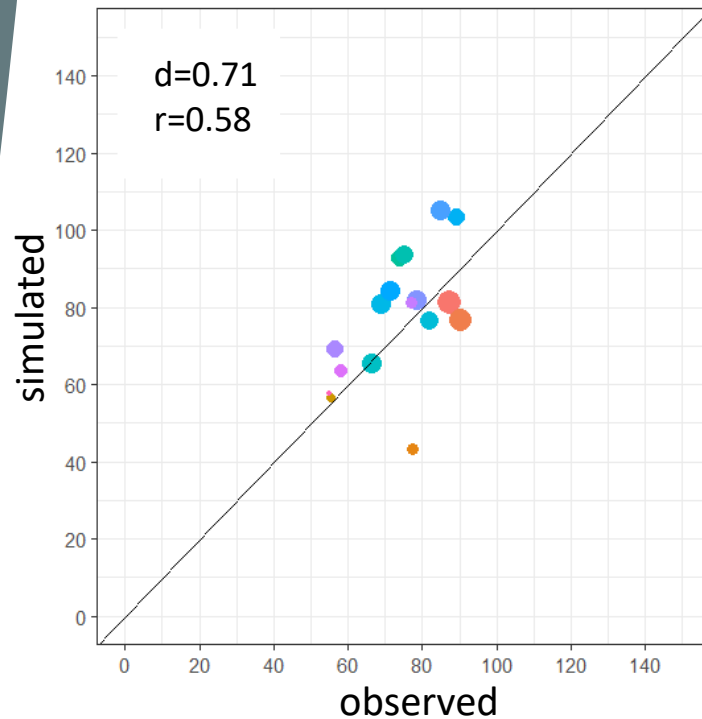
Reference data =

Irrigation timing and
amounts for irrigated
potato fields within the
Broye catchment from
2018-2021 + meta data
on site conditions

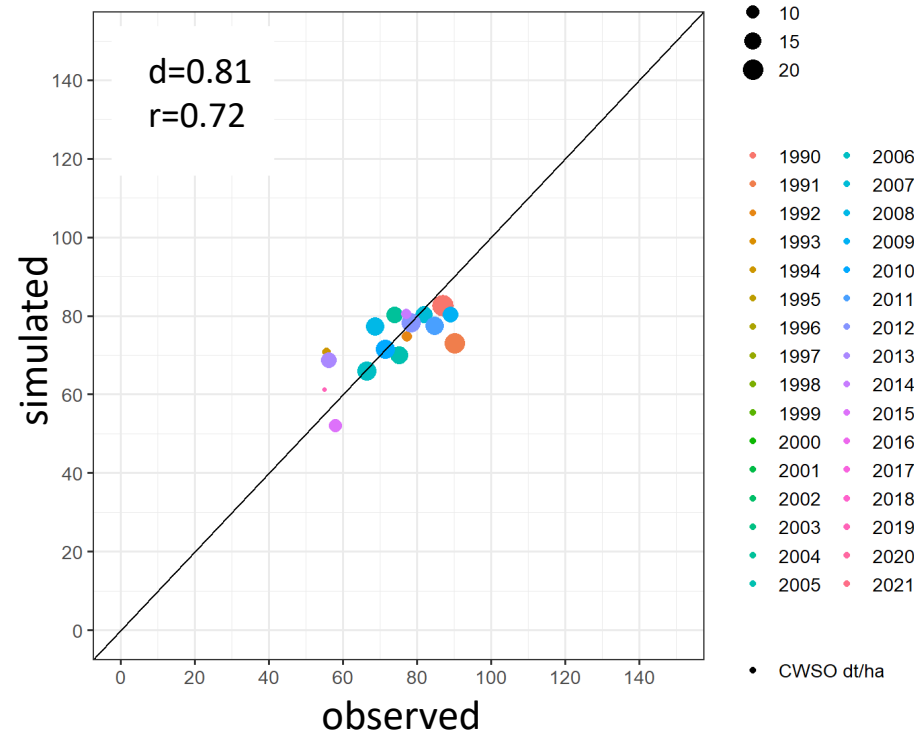
Fit to reference data from Agroscope

➤ Yield

Default parameterization

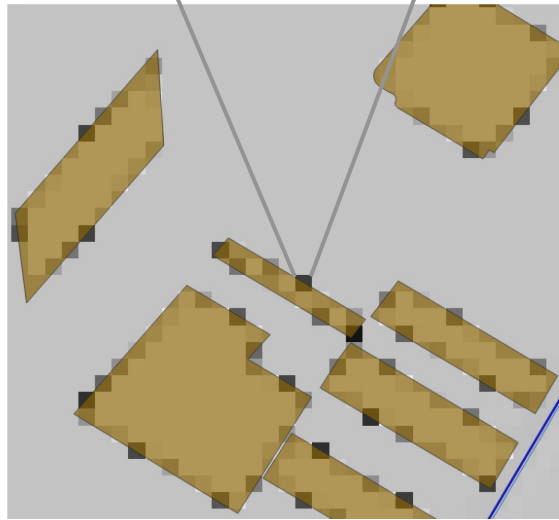
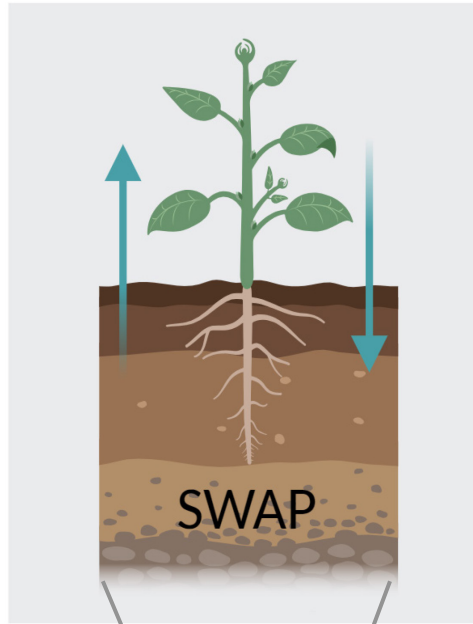


Optimized parameterization



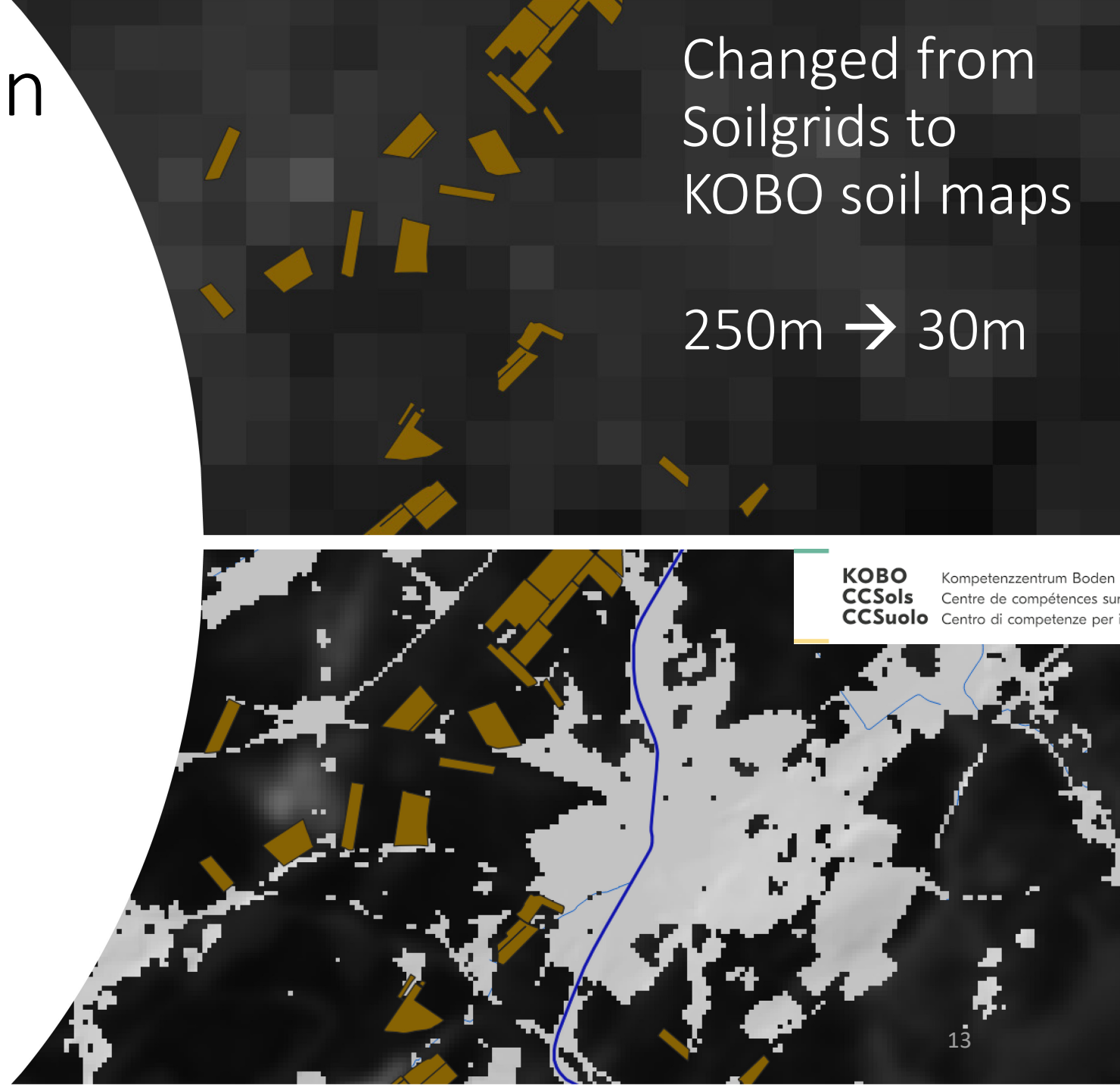
Reference data =
Yield data from farms
15km around Payerne
1990-2021

Regional application



Changed from
Soilgrids to
KOBO soil maps

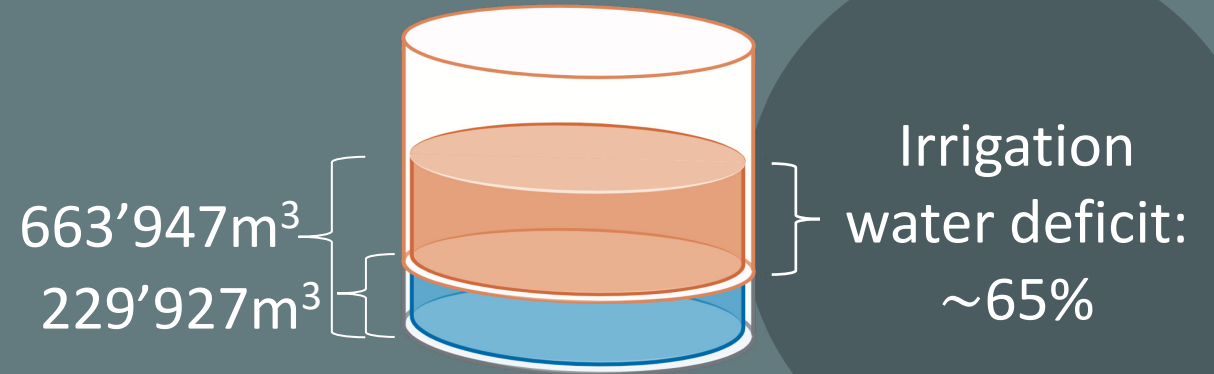
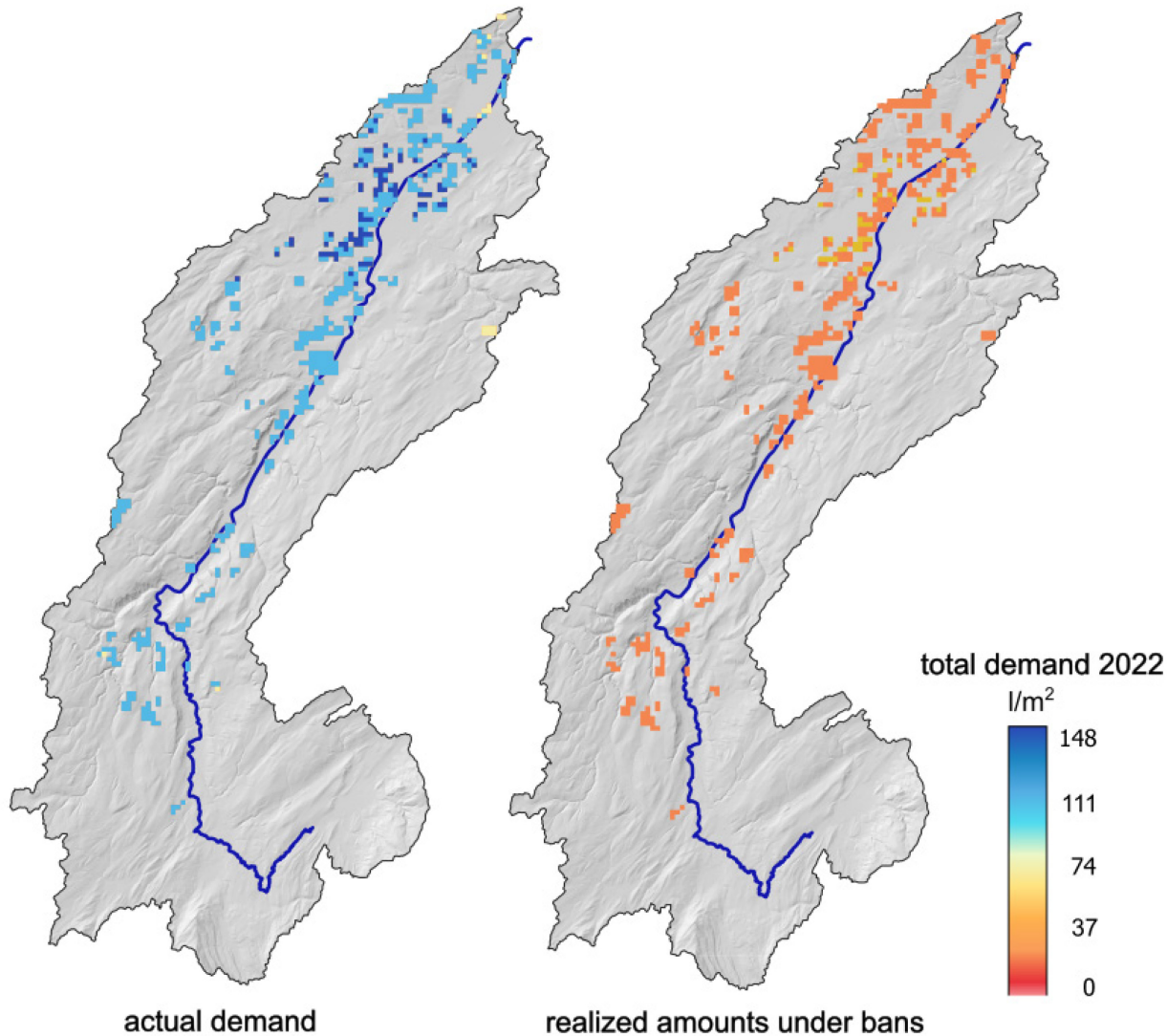
250m → 30m



KOBO Kompetenzzentrum Boden
CCSols Centre de compétences sur
CCSuolo Centro di competenze per

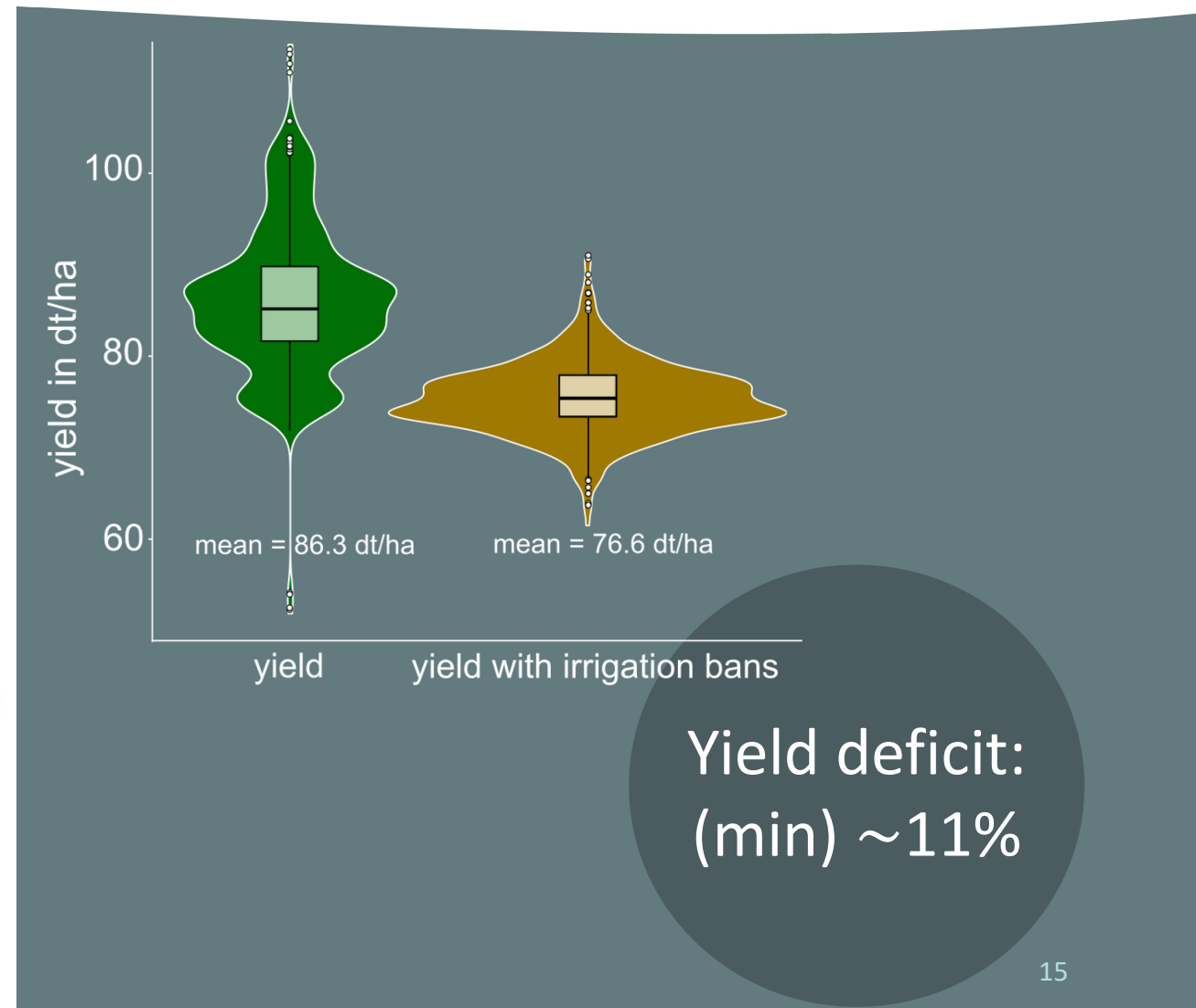
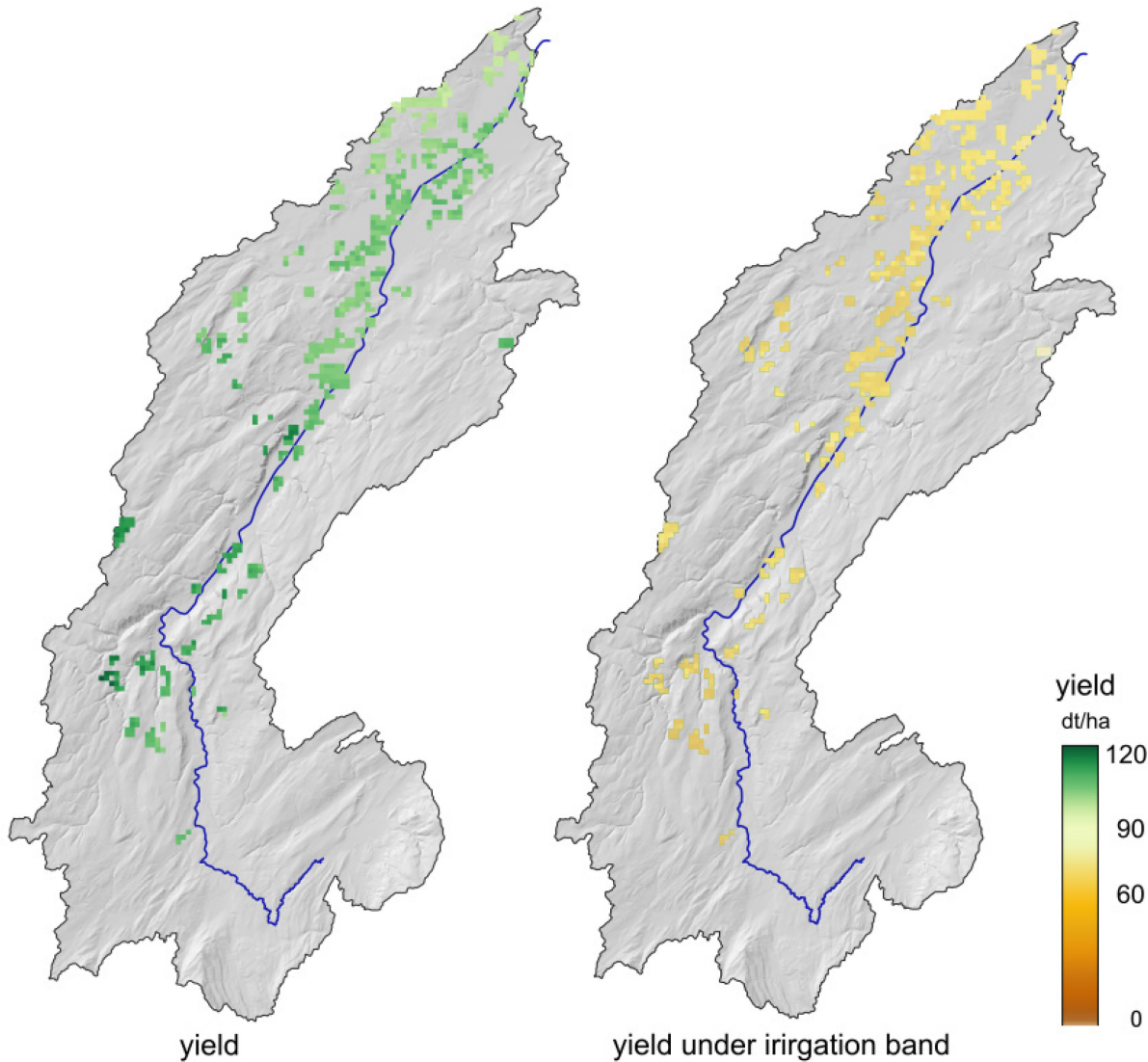
Preliminary results

Irrigation demand of potato fields in 2022



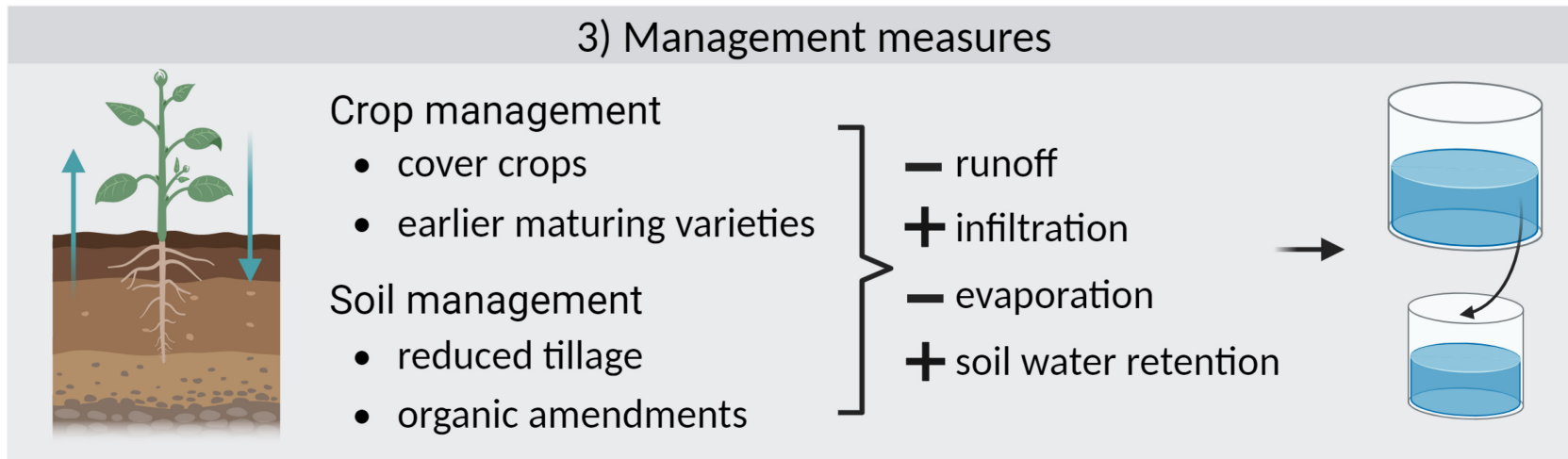
Preliminary results

yield of potato fields in 2022



Outlook


Implementation of management practices &
Evaluation of their potential to reduce irrigation demand



Thank you

Swiss Geoscience Meeting 2023

Malve Heinz

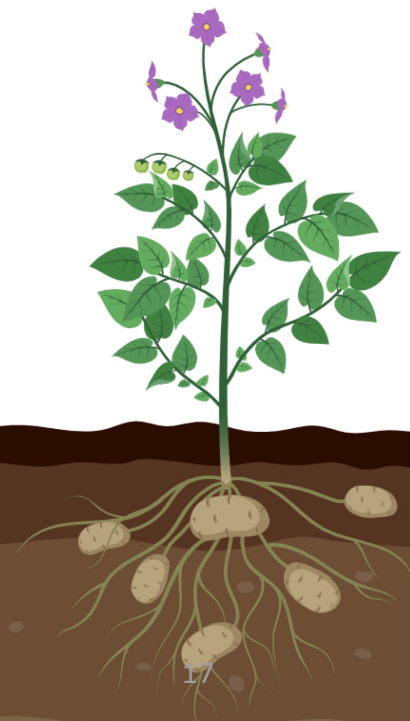
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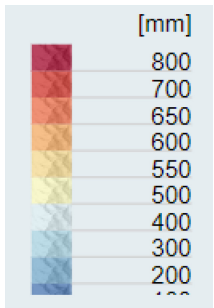
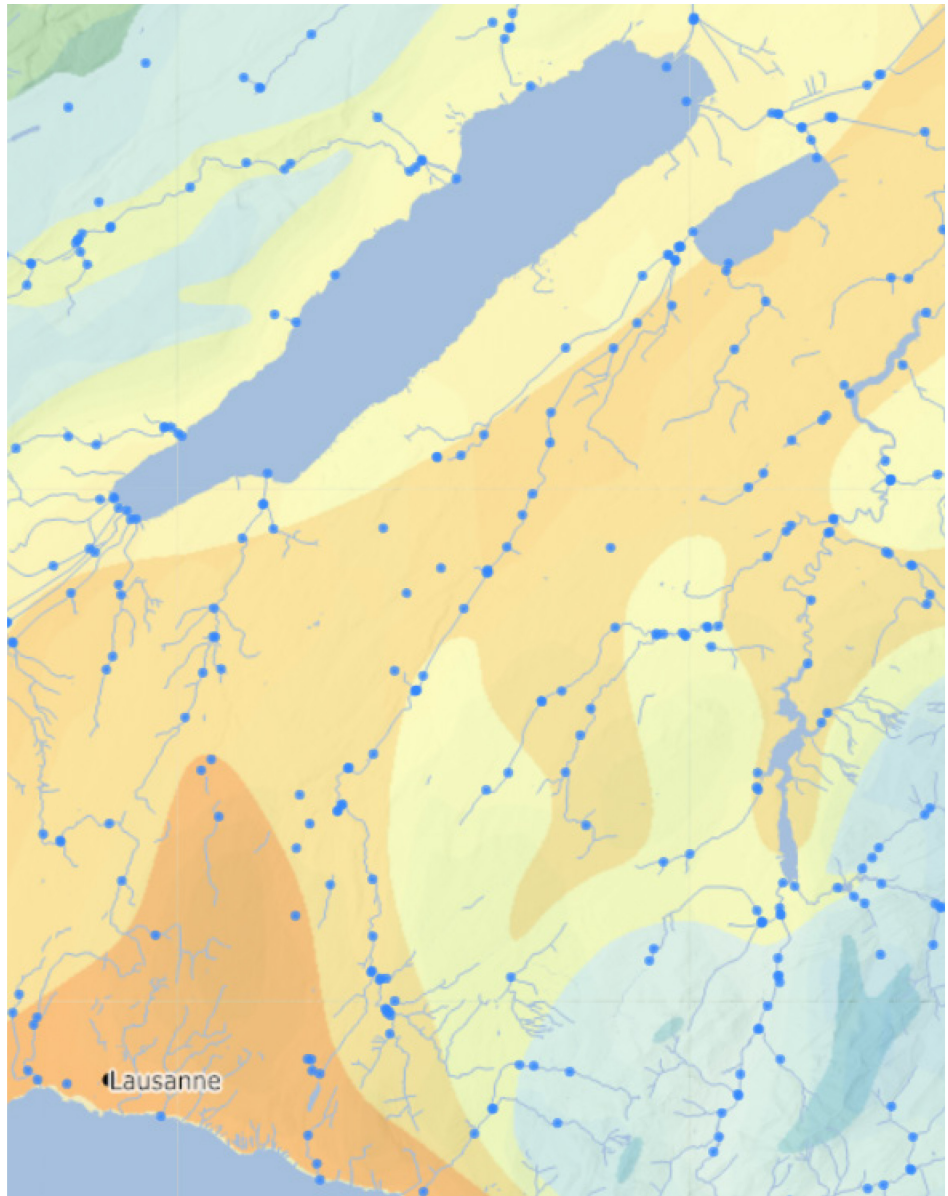
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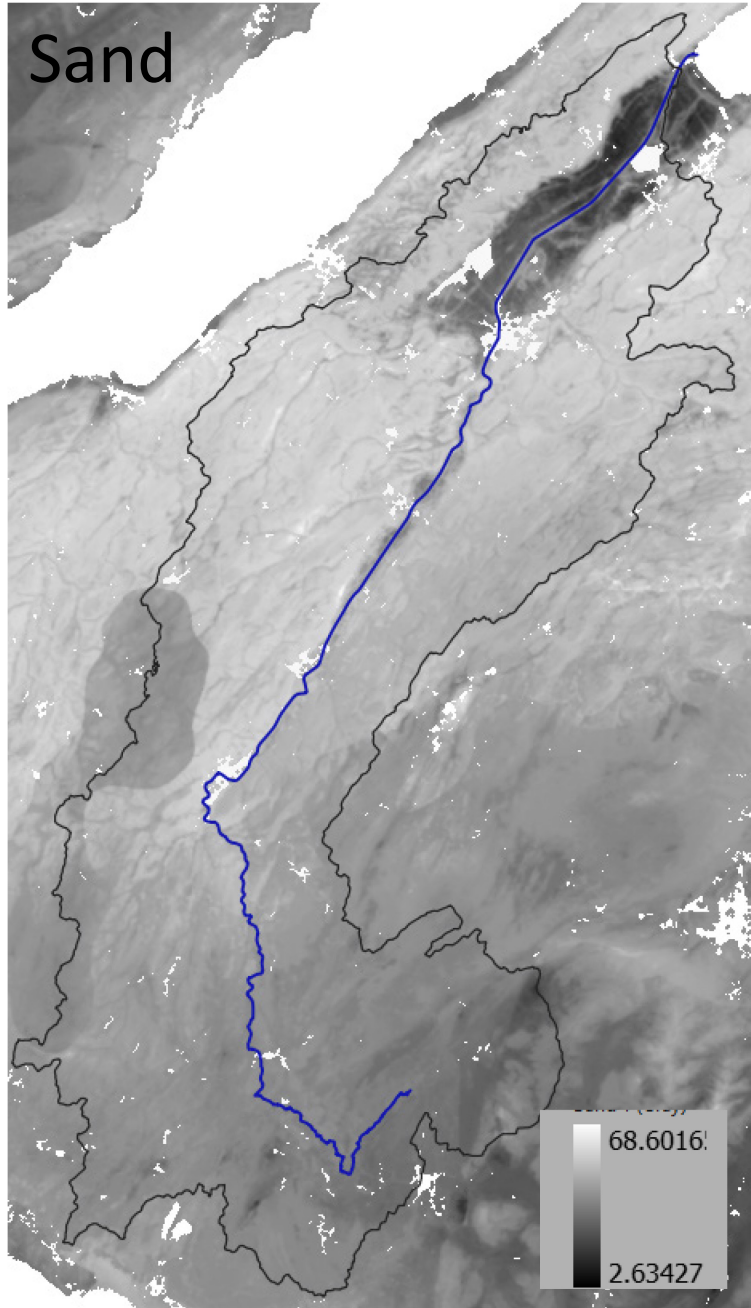
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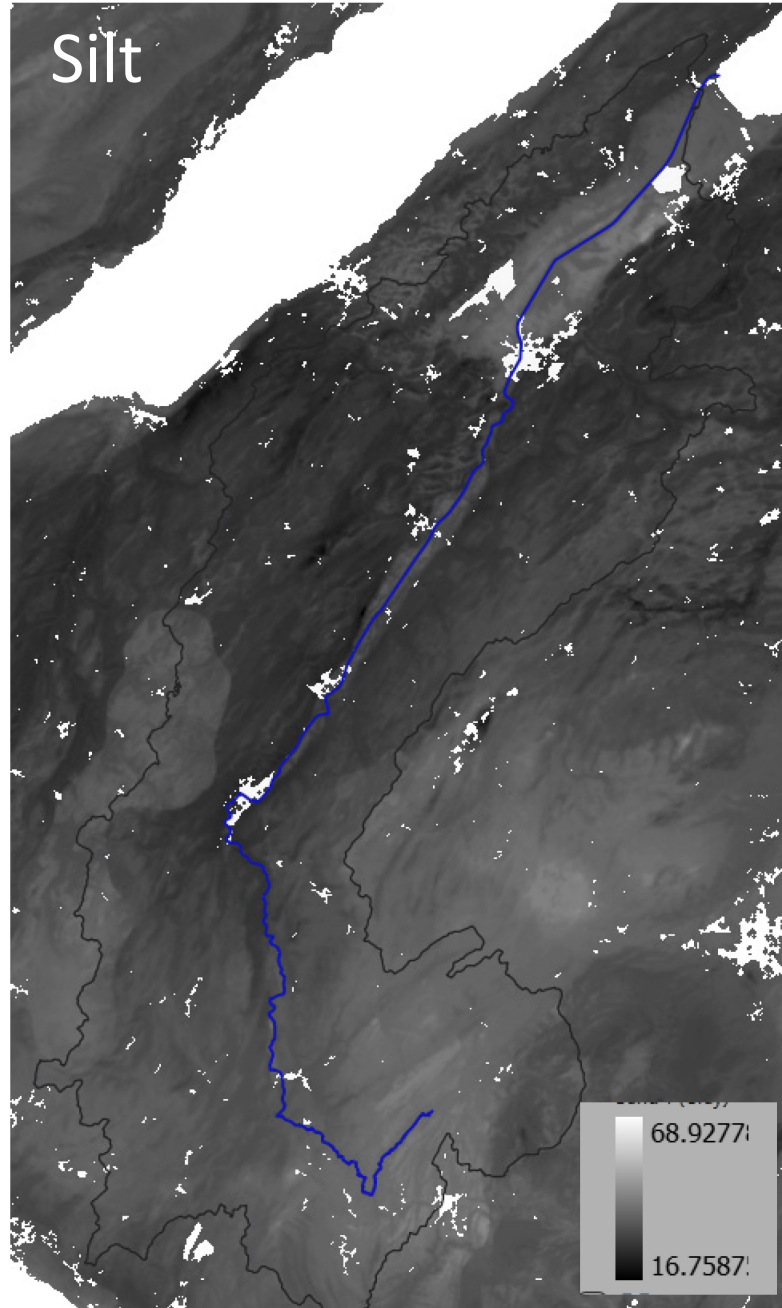




Sand



Silt



Clay

