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Amálie Pilot Farm
Application of the Smart Landscape Concept

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Smart Landscapes

- Overall optimization of water management.
- Minimizes the impacts of hydrological extremes – drought and floods.
- Is an environmentally sound and sustainable part of the intensification of agriculture and forestry.
- Minimizes soil erosion.
- Promotes overall biodiversity.

- Makes the landscape more comfortable for living, including microclimate modification.
- Increases the aesthetic value of the landscape.
- Represents a sophisticated landscape system of interconnected water management, soil protection and eco-stabilizing elements supplemented by rational landscape management.

Amalie farm – Location

- CZU farm → pilot site for demonstrations of new innovations
- Nature protected area Krivoklatsko
- Natura 2000 and other nature protection types
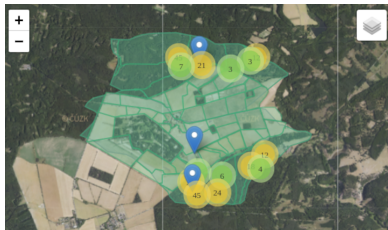- 45 min far from → ● CZU Campus

DSS

- Advanced monitoring system – **BIG DATA**
- Digital Solutions
- Advanced Modeling Tools
- Measures on Biodiversity
- Demonstrations of measures, innovation development
- Carefully selected set of case studies
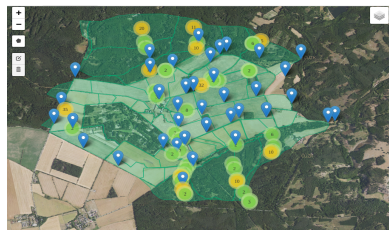
CAPACITY BUILDING

DSS – Amalia site

At the start of the project

At the end of the project

- Mostly forested areas
- No dense coverage of agriculture

- All main LU categories
- 5G connectivity, private 5G network

Final numbers

more than 329 sensors, 3 big meteo stations with $3\times20(30)$ sensors, several small meteo stations, more than 1K time series

Attempt to create BIG DATA

- ET and CO_2 Flux Monitoring
- $2 \times$ Advanced Meteo Stations, $3^{rd} \rightarrow$ to be installed
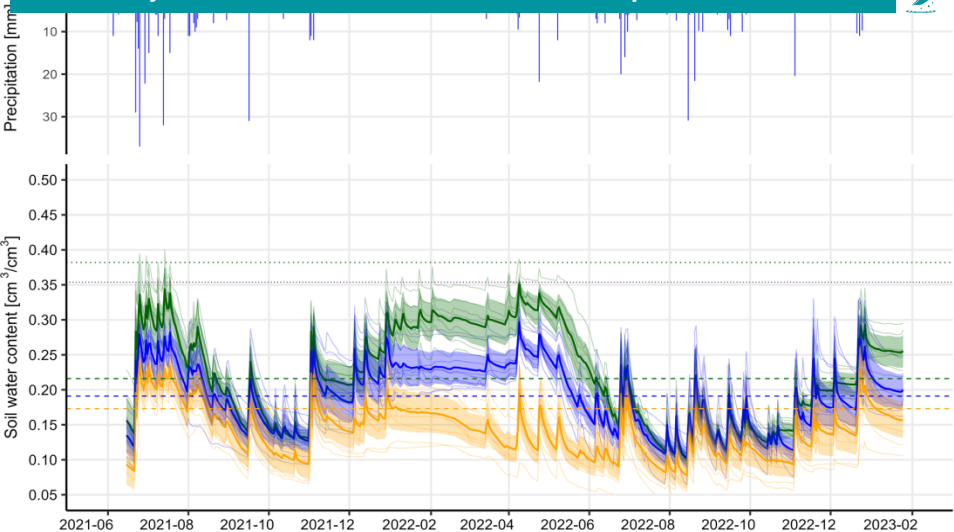- Direct connection fo AdAgriF

- Runoff inflow into the SWR
- Several V Weirs on main drainage channels and river network (mobile and stable)
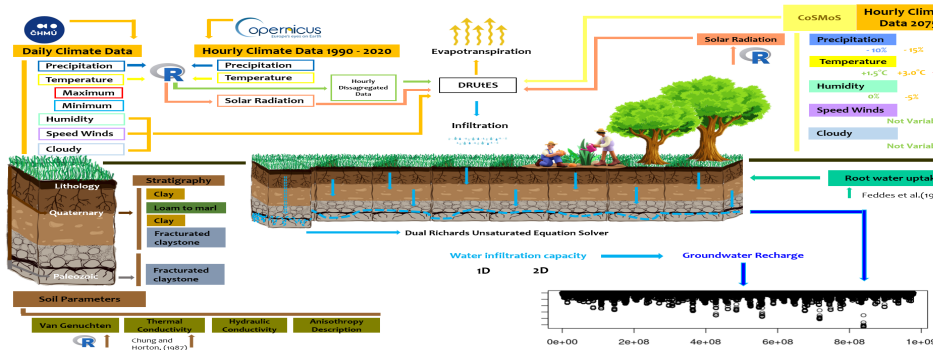
- Open lake evaporation of SWR
- Real-time monitoring

- Beech Larch and Spruce, 90 sensors
- Biodiversity → Water Resources

- DruTes hydrodynamic modeling framework
- Real Time forecasting → Assimilation of forecast Norwegian Meteorological Institute

dHRUM

- Hydrological Modelling framework aiming at the hydrological balance reconstruction

- The Assesment of structural uncertainty - 448 various structures of HRU - hydrological response units

- Impact studies on drought assessment

- Impact studies on climate change impact assessment

- Semi-distributed hydrological modelling framework
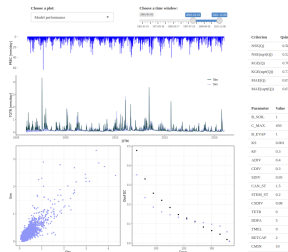
- Domain decomposed into the set of HRU units - hydrological response units

- Components explain using HRU dHRUM modelling approach

- Quantile mapping of time-series of hydrological fluxes and state variables

- Drought indices used for the drought severity description

- The assessment of climate change impact of hydrological balance components
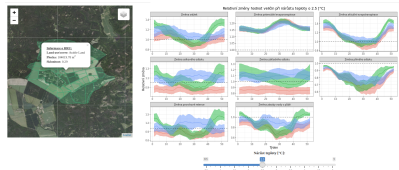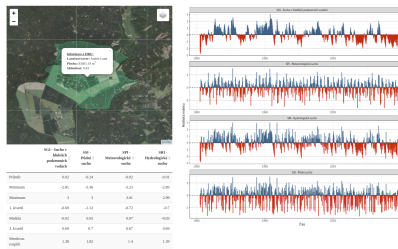
Circular Solutions
Solar Pumping

- Stable and Mobile Circular Solutions
- Enhancing the biodiversity of Aquatic Ecosystems

Stable System of Solar Pumping

- Connected to SWR
- Real-Time Control
- Connected to the Digital part of DSS
- Solar Panels installed in the vicinity of SWR
- Combined with Smart Irrigation → Multipurpose Circular NBS
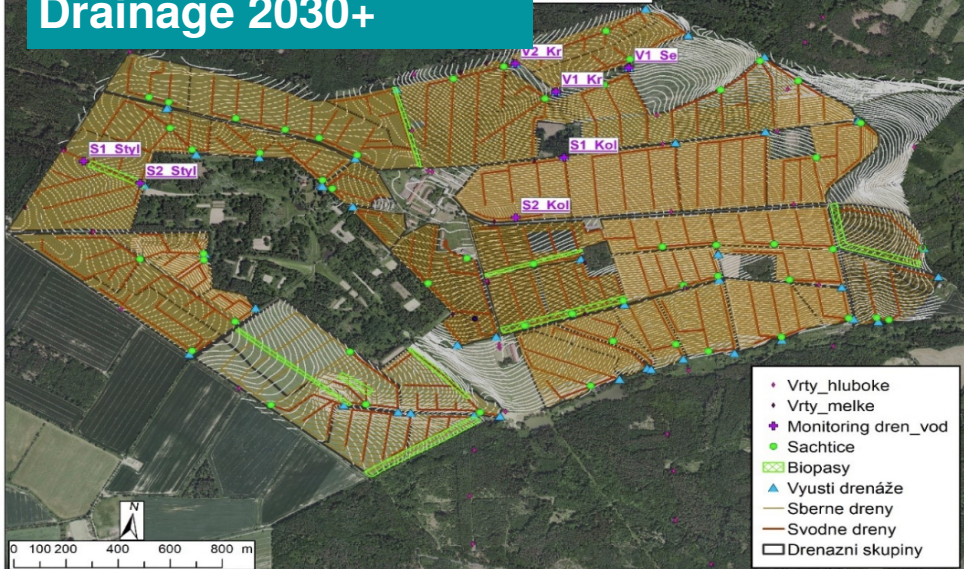
Mobile System of Solar Pumping

- Real-Time Control
- Connected to the Digital part of DSS
- Supports the retention and accumulation function of MDD $\rightarrow$ Drainage systems 2030+
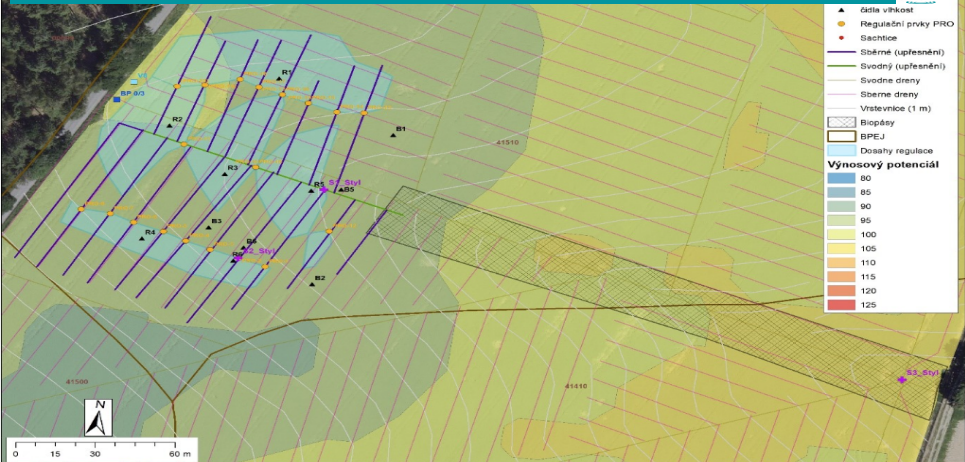- Transferable or Portable Circular System

Drainage 2030+

- approx 30 % of arable land drained by man made drainage systems in CZ

Regulated Drainage Systems

- Manual and Automatic Regulations Solutions
- Connected to biodiversity → Regulation Controls located outside Arable land
- Linked to margin meadow
- Precise fertigation and yield maps obtain by UAV survey

- Newly made margin meadows
- New source of biodiversity
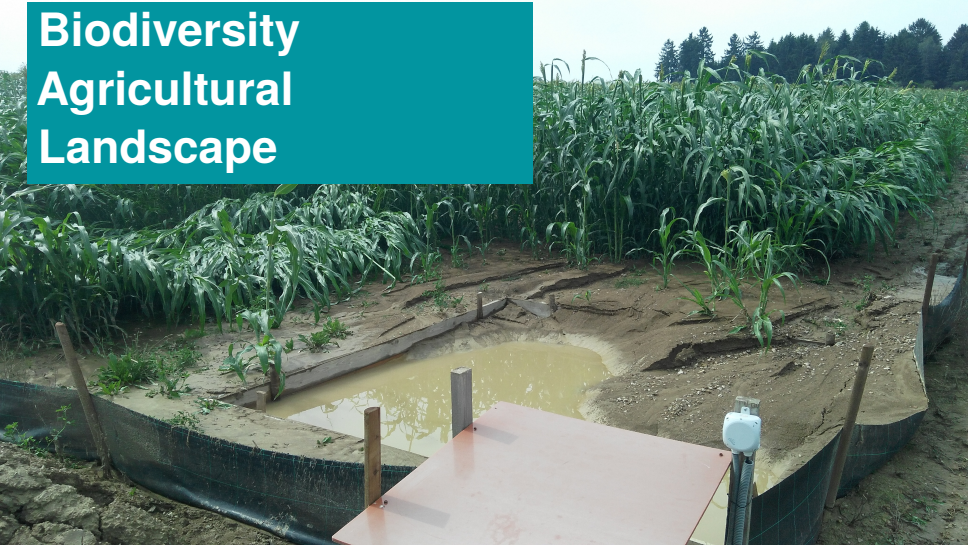- NBS linked to the these solutions

Variable Fertigation

- UAV or Satelite Based Yields maps
- Spatially targeted application of fertilizers
- Water Quality issues

- System of Dikes → lowing down the runoff
- Combining various NBS → Margin meadow, Regulated Drainage System, Precise fertigation and Solar Circular Solution
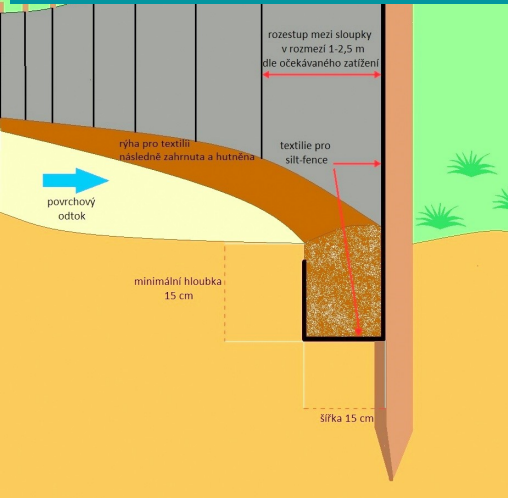
Biodiversity Agricultural Landscape

- Agricultural practices → support biodiversity on arable land
- Soil erosion control measures enhnacing the biodiversity
- Unique case study on soil erosion

- 3 × 1ha parcels with different Agricultural practices
- Soil erosion control measures enhnacing the biodiversity
- Equipped with Advanced Monitoring system on soil erosion and fluxes

Labels in diagram:
- rozestup mezi sloupky v rozmezí 1-2,5 m dle očekávaného zatížení
- rýha pro textilii následně zahrnuta a hutněna
- textilie pro silt-fence
- povrchový odtok
- minimální hloubka 15 cm
- šířka 15 cm

- Sil fence → soil erosion control measure
- Monitoring of surface runoff

- Monitoring of surface runoff

Agroforestry

- two systems on Agroforestry

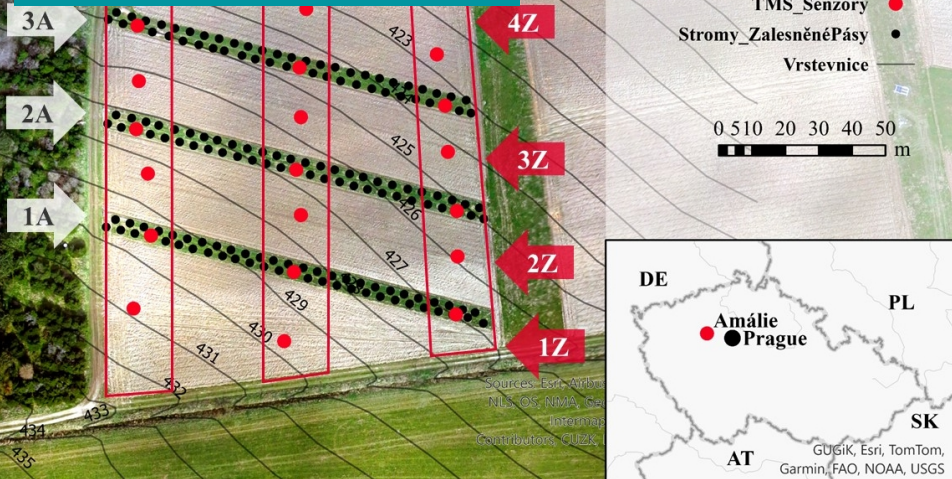# Agroforestry - pasture oriented system

- Pasture and forestry $\rightarrow$ farm cattle and new forested pasture
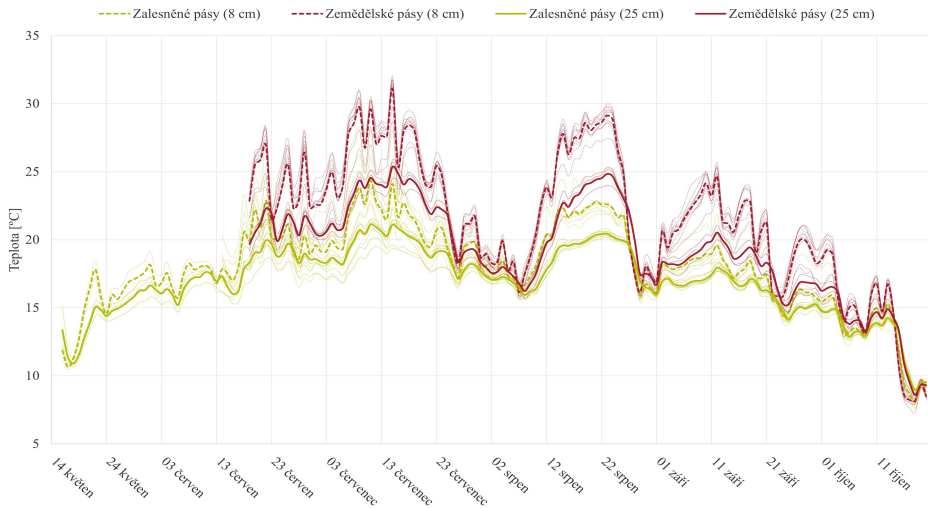
Agroforestry – combined with tillage

- Pilot site designed to test the parametrization of Agroforestry

Agroforestry – Monitoring

Legend:
- TMS_Senzory ●
- Stromy_ZalesněnéPásy ·
- Vrstevnice —

0 5 10 20 30 40 50 m

3A, 2A, 1A
4Z, 3Z, 2Z, 1Z

DE, PL, SK, AT
Amálie ● Prague

Sources: Esri, Airbus
NLS, OS, NMA, Geo
Internap
Contributors, CUZk

GUGiK, Esri, TomTom, Garmin, FAO, NOAA, USGS

- Dense monitoring network included into the DSS

Legend: Zalesněné pásy (8 cm) — Zemědělské pásy (8 cm) — Zalesněné pásy (25 cm) — Zemědělské pásy (25 cm)

Y-axis: Teplota [°C]

X-axis: 14 květen, 24 květen, 03 červen, 13 červen, 23 červen, 03 červenec, 13 červenec, 23 červenec, 02 srpen, 12 srpen, 22 srpen, 01 září, 11 září, 21 září, 01 říjen, 11 říjen

- Temperature profile → Analyses of the Edge Effect
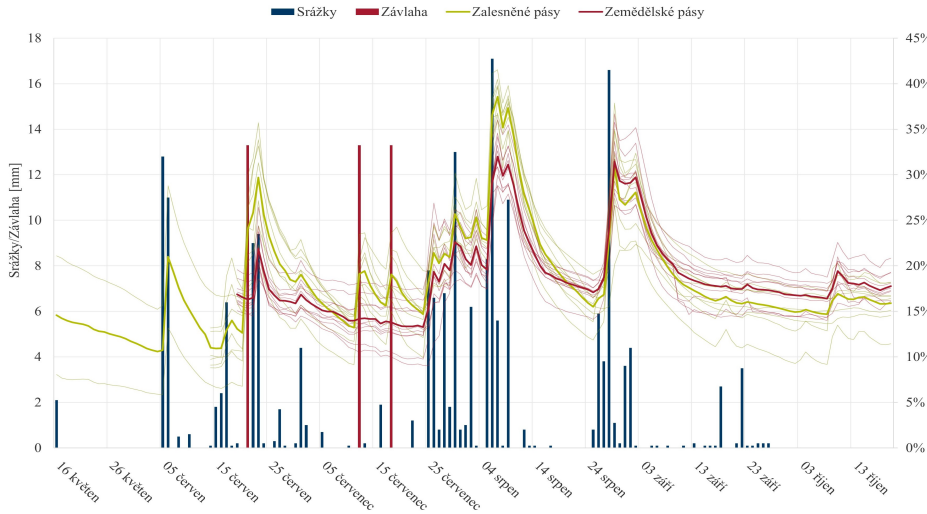
- Soil Water content profile → Analyses of the Edge Effect

Thank for your Attention

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