
SLU
SCIENCE AND EDUCATION FOR SUSTAINABLE LIFE

Agricultural water management

a piece of the puzzle for sustainable production and healthy landscapes

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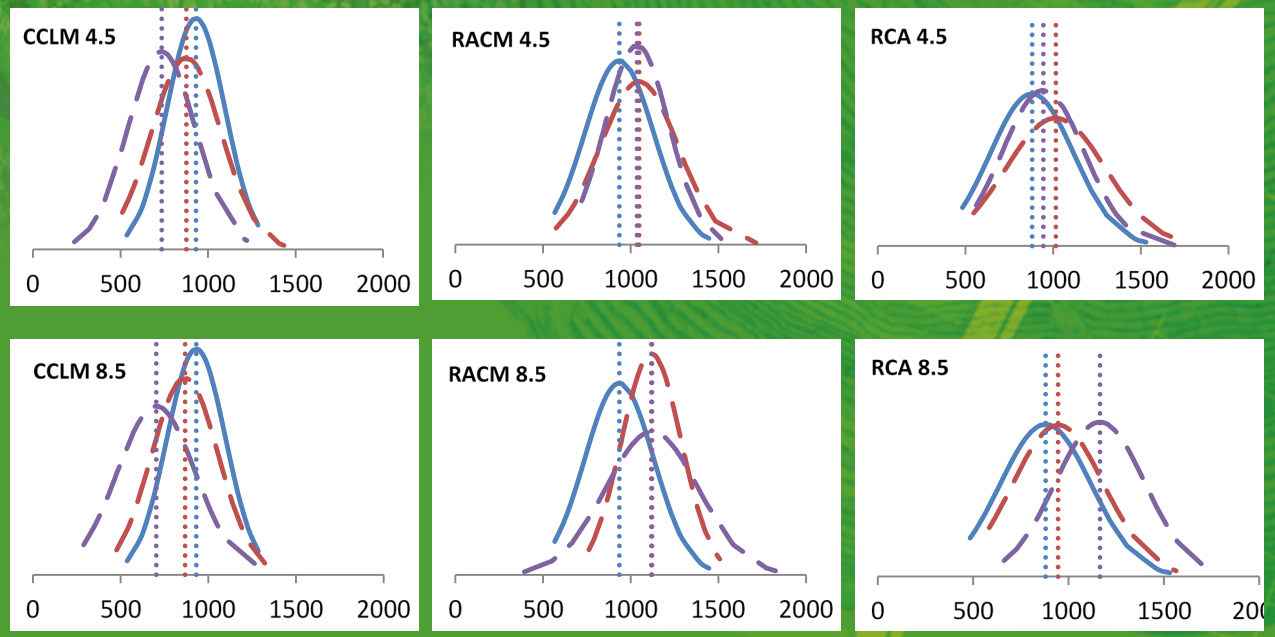
SLU Water Forum "*Current and future perspectives on water research at SLU - a seminar for collaborative activities*"
15 February 2021

Talk today

- Water issues changing, some discourses persist
- SLU Agricultural water management
- Current and future opportunities?

1. Water issues changing, some discourses persist

A



Extreme weather, climate risk affect water for agriculture

- High on the agenda (WEF, 2021; AR6)
- In EU: CAP, Water directive 2022-2027 etc
- In Sweden: e.g.

<u>Lantbrukets sårbarhet – en uppföljning</u>

(Rapport från riksdagen 2020/21:RFR7.

- Vatten försörjning/åtgärder för klimat säkring (dränering , vattenuttag) och dess , kompetens behov nämns särskilt….

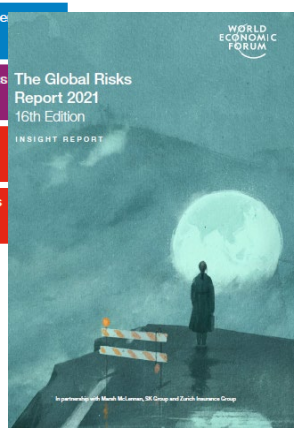
FIGURE IV

Evolving Risks Landscape

Top Global Risks by Likelihood

	1st	2nd	3rd	4th	5th	6th	7th
2021	Extreme weather	Climate action failure	Human environmental damage	Infectious diseases	Biodiversity loss	Digital power concentration	Digital inequality

	1st	2nd	3rd	4th	5th
2020	Extreme weather	Climate action failure	Natural disasters	Biodiversity loss	Human-made environmental disasters
2019	Extreme weather	Climate action failure	Natural disasters	Data fraud or theft	Cyberattacks
2018	Extreme weather	Natural disasters	Cyberattacks	Data fraud or theft	Climate action failure
2017	Extreme weather	Involuntary migration	Natural disasters	Terrorist attacks	Data fraud or theft
2016	Involuntary migration	Extreme weather	Climate action failure	Interstate conflict	Natural catastrophes
2015	Interstate conflict	Extreme weather	Failure of national governance	State collapse or crisis	Unemployme
2014	Income disparity	Extreme weather	Unemployment	Climate action failure	Cyberattacks
2013	Income disparity	Fiscal imbalances	Greenhouse gas emissions	Water crises	Population ageing
2012	Income disparity	Fiscal imbalances	Greenhouse gas emissions	Cyberattacks	Water crises



https://www.weforum.org/reports/the-global-risks-report-2021

Managing too much and too little water both in rainfed and irrigated systems, and in production landscapes

FIGURE A
DAMAGE AND LOSS TO AGRICULTURE SUBSECTORS BY TYPE OF HAZARD, 2006–2016

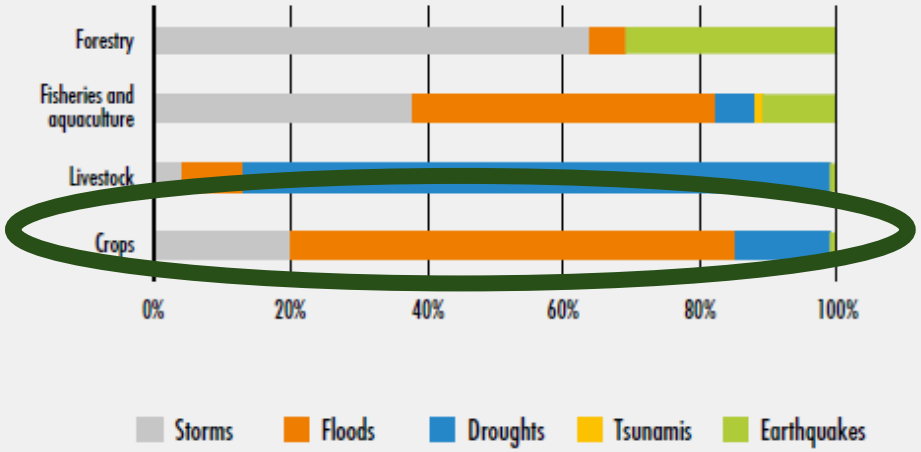
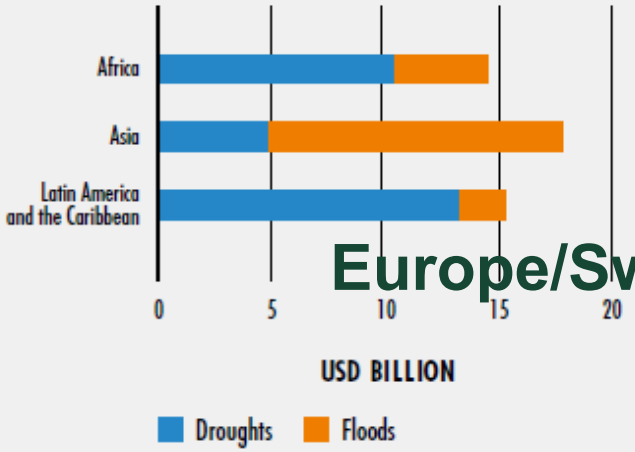
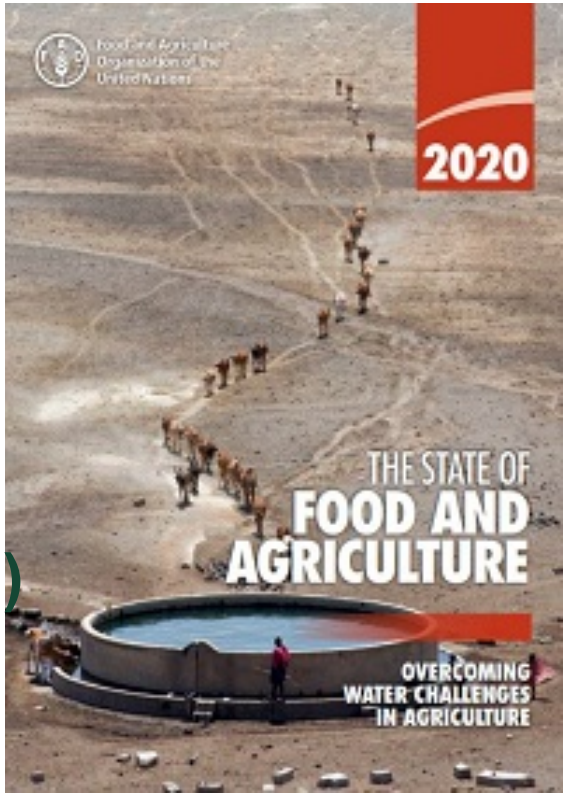


FIGURE B
PRODUCTION LOSS FROM DROUGHTS AND FLOODS BY REGION, 2005–2015

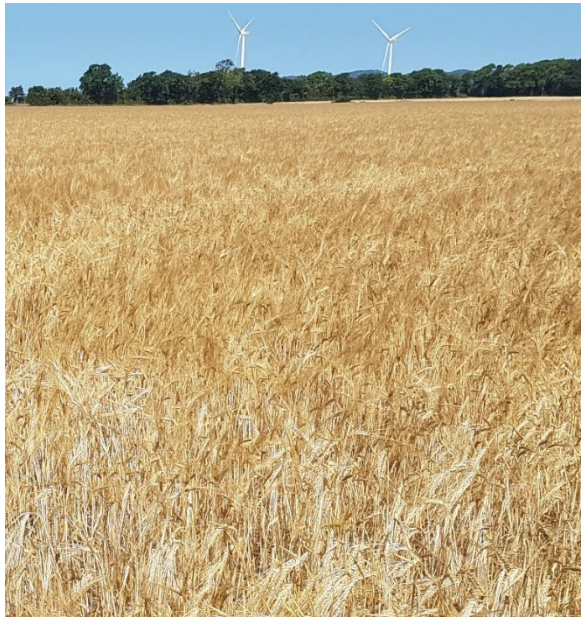


Europe/Sweden?)



Agricultural water management at the heart of production, sustainability and climate resilience

Most food produced in rainfed systems



Rainfed systems: 80% av crop land +100%pasture

Produce ca 60-70% av food

SWEDEN ***<95% area is rainfed, and 70% drained***

..but change of diet demand more irrigation?

Irrigated: 20% crop land

Produce ca 30-40% food

SWEDEN ca 3% area irrigated ,

with ca 3% of freshwater outtake

2 SLU Agricultural water management

How can agricultural water management support production, climate-resilience and healthy ecosystems ?

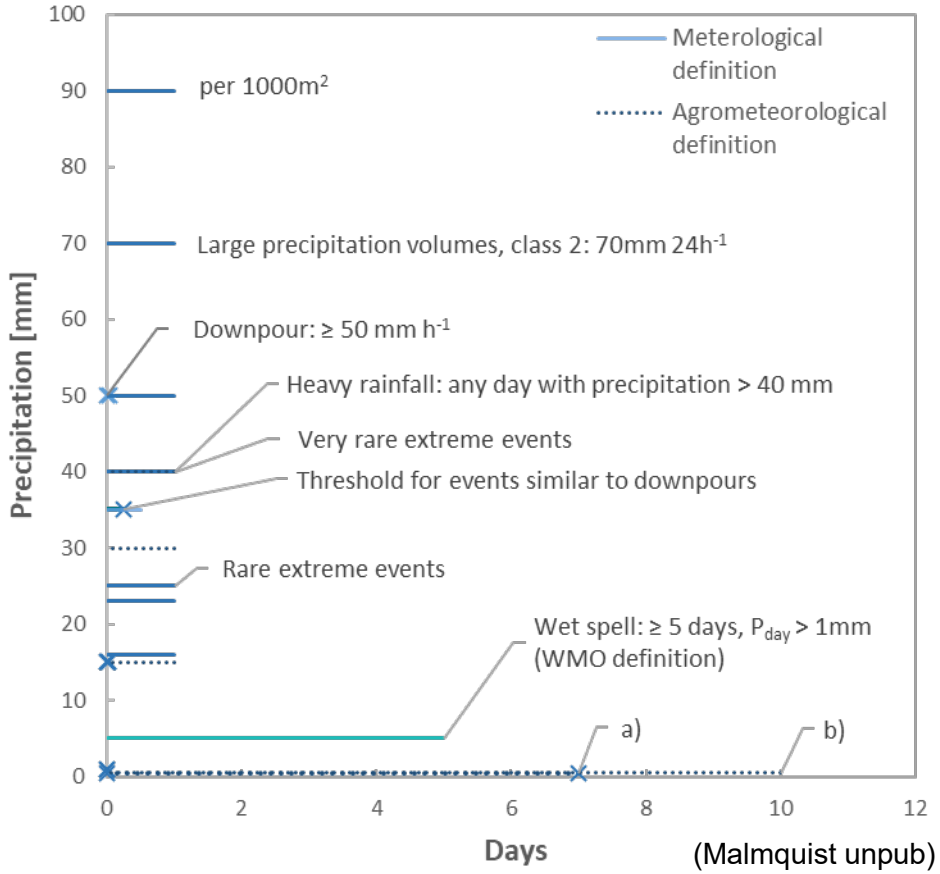

NV Skåne: January 2018 (4 months saturated)


NV Skåne July 2018 (3 months dry)

Ex1: Identify and assess knowledge gaps:

Current and future weather –water impacts for agricultural production

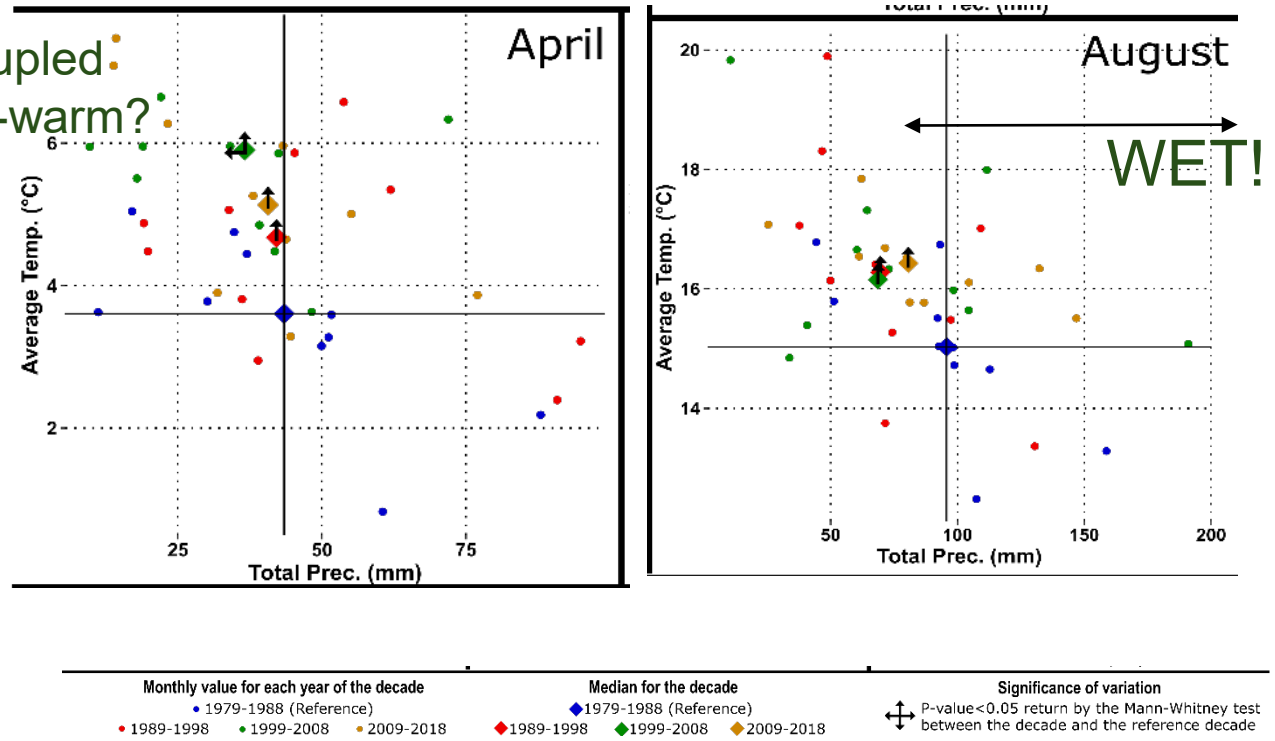
- Define agro-ecological criteria for extremes and normal



(Malmquist unpub)

Identifying historic coupled extremes (T, P) with relevant resolution (seasonal/daily)

Coupled dry-warm?



(Grusson et al unpubl)

Example 2: Test and develop understanding of agricultural water management from soil health to landscapes

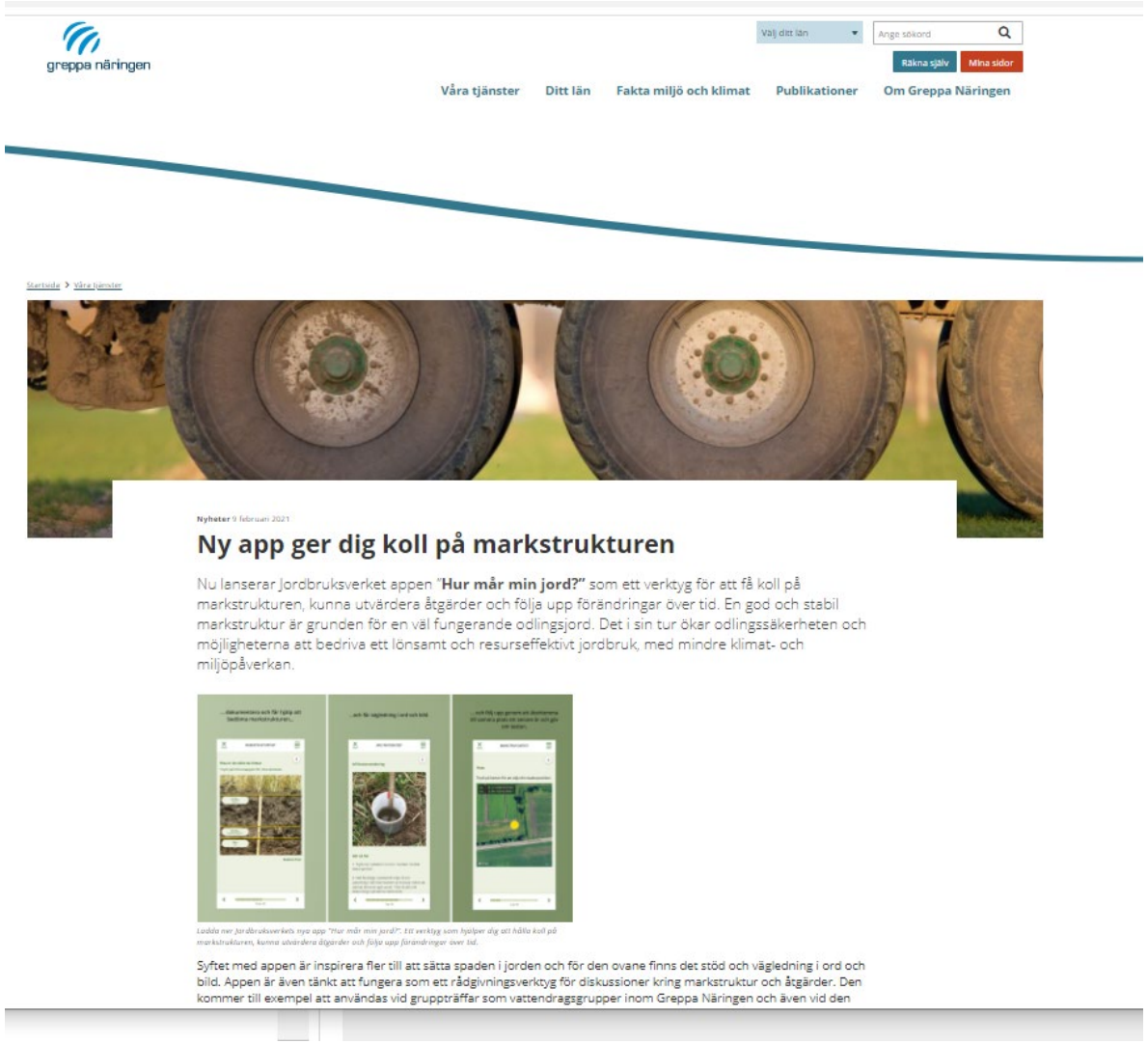
- Soil health, soil structure
- Drainage and irrigation
- Best mgt for field to stream water quality management (crop/soil rotation and management, to physical structures i.e., 2-stage ditches, retention/pond/reservoirs , erosion structures, etc)
- Catchment/landscape water implications

Example 3: Co-develop evidence-based tools and policy advice

- ***Hur mår min jord?*** App to support farmers and extension to interpret soil physical properties to take action for soil health: soil compaction water infiltration

(Berglund et al , 2021)

- Determine biophysical potential for BMP implementation in LEVA catchments (Mårtenssson et al , unpubl)



3 Current and future opportunities

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Scientist finds UK water companies use 'magic' to find leaks

21 November 2017 Share

GETTY IMAGES

The process of using divining rod has been in use for hundreds of years

Water companies are using divining rods to find underground pipes despite there being no scientific evidence they work, an Oxford University scientist found.

International water discourses are constantly evolving:

Water security and non-stationarity

Resilience, adaptive capacity

‘Work with nature’/nature –based solutions, Green/circular economy,

Inclusive /participatory and transparent

Value of water…..

Sometimes an “Eurocentric” perspective? E.g., new indicators…

Some collaboration suggestion 1:

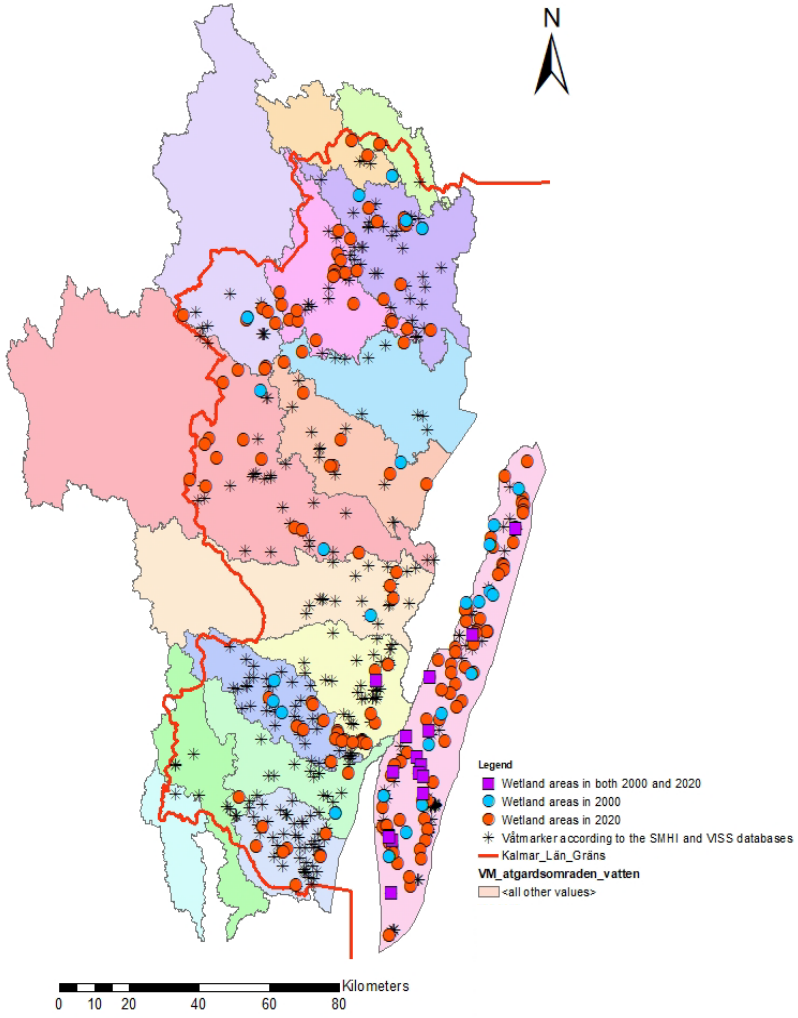
- Need to ***make the case for multi-functionality/benefits and limitations of water management/AWMs/BMPs*** (biodiversity, agric. production, water quantity/quality, GHG, economics): large public and private (farmer) investments but lagging in impact , need critically discuss benefits and trade-offs, support prioritisation (protocol? framework?)

Longterm experiment:
mgt drained organic soils for GHG emissions

Some collaboration suggestion 2-4:

- ***Pickup the conversation on 'man-made' vs 'natural' water infrastructure (incl. hydromorf) in production landscapes*** : what does this entail in Swedish landscapes? Is 'man-made' water infrastructure always sub-optimal in delivery of function and services?

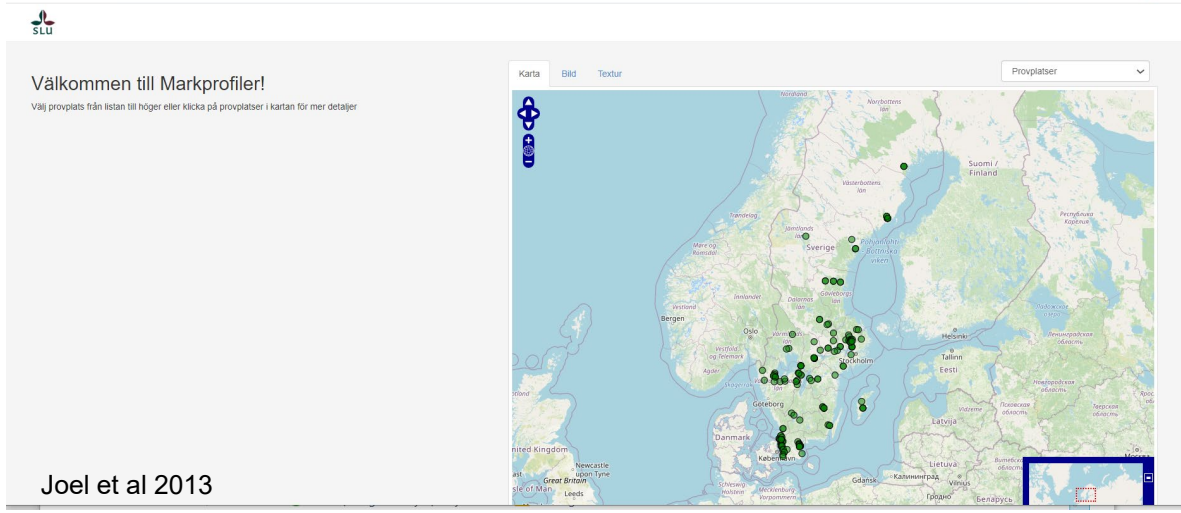
- Climate change scenario /AR 6 and useability
- Water management and GHGs: re-construction of wetlands and implications?



Kalmar, Öland
wetland development in
downstream/discharge areas
(Naomi ter Borg et al , Unpubl)

Specific and immediate demands

- Research sites integration and (EU) ‘Living labs’ and ‘light houses’
- Specific interested : continue build **database for soil physical properties** Sweden: need measured data from forest and urban soils

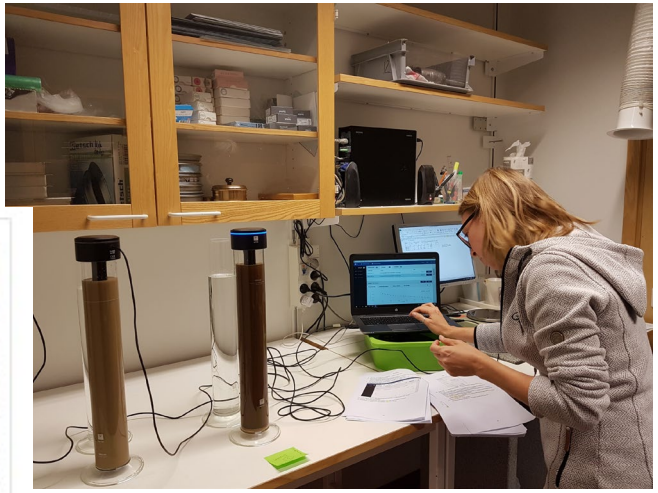


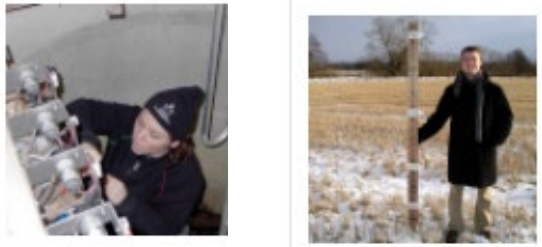
Communicate SLU Water capacity more comprehensively?

- Express our SLU research and tools from source to sea
- Coordination at global, national responses

Research facilities and infrastructure

- Unique Soil physics lab facility
- Long term experiments irrigation , controlled drainage, cop rotation and nutrient leaching ,
- FOMA Observatory fields and catchments





Water management

Through leaching experiments, we can follow the direct and long-term impact of various cultivation measures and crop rotation on plant nutrient flows in crops, soil and run-off water.

Hydrotechnology

In the subject area of hydrotechnology, there are three long-term experiments: Cultivation on organogenic soil, the long-term structural effects of lime and regulated soil drainage.

Jordbrukslandskap

Övergödning

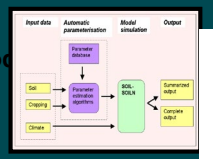
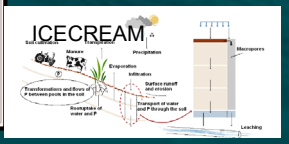
Thank you!

The team

The methods:





Some key partners

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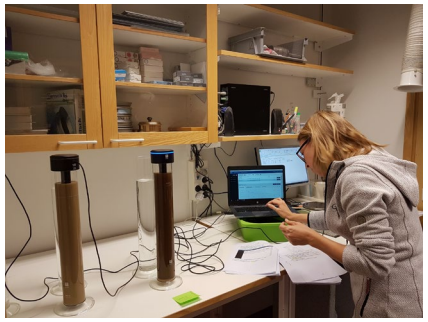
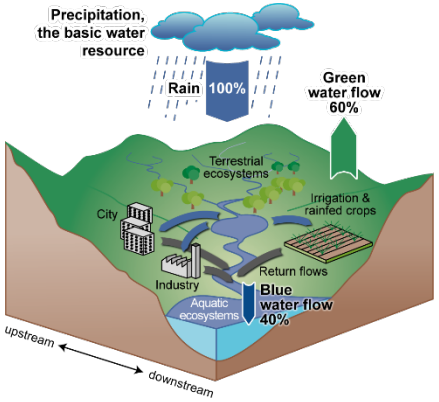
Study agricultural area soil physical properties and water quantity and quality, to develop and evaluate 'best practises' for sustainable and climate smart production systems





Soil physics lab

- Analyses
- Quality assurance
- Methods development

Field/ farmscale

- Technologies, BMPs
- Longterm experiments

Catchment /landscape

- Monitor & evaluate (FOMA)
- Contr. LEVA
- Support reporting

National/international

- Contribute assessments
- Input policy
- Open access
- Capacity building

Agricultural Water Management

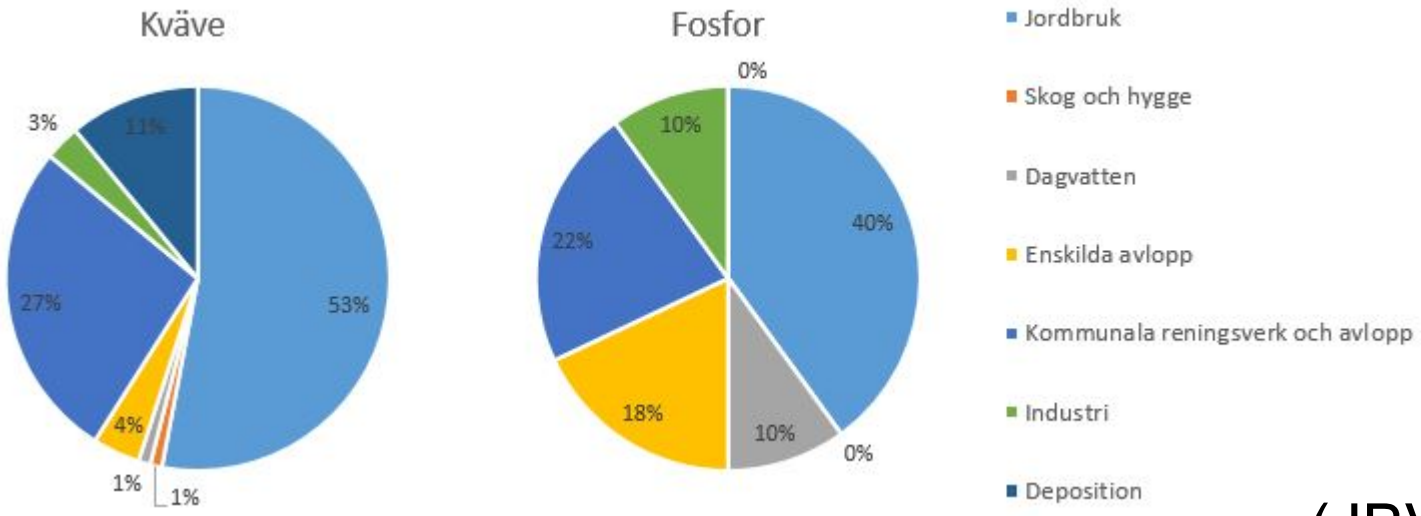
Study agricultural area soil physical properties and relation to water flows and water quality, develop and evaluate 'best practises' for sustainable use of water resources whilst enhancing production

- Soil physical properties and soil health for water management incl. Erosion , drainage leaching, soil structural management

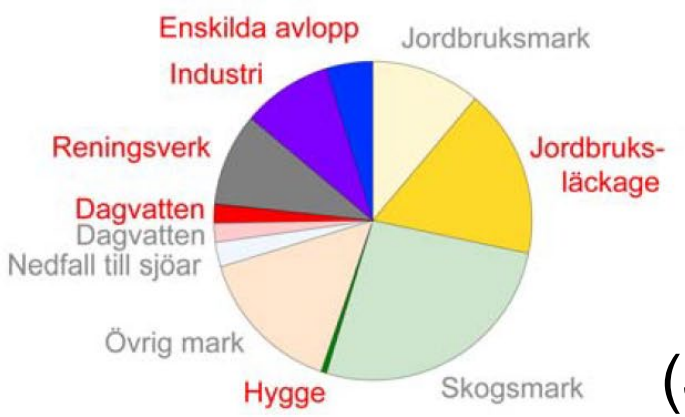
- Management of water quantity and quality for climate resilience and production capacity in landscapes (rainfed, soil structure, irrigation, drainage and ditches, water storage/retention , re-wetting, leaching)
- Environmental monitoring agrutural catchemnt and observatory field s, long term experimenst

- Support monitoring and reporting of environmental indicators incl GHG on agricultural soils
- In Sweden and international

N and P load are serious water issues and agriculture is one (of several) sectors contributing: example Sweden



(JBV, 2016)



(JBV, 2008)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