

SCIENCE AND FOR EDUCATION FOR SUSSIAINABLE 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

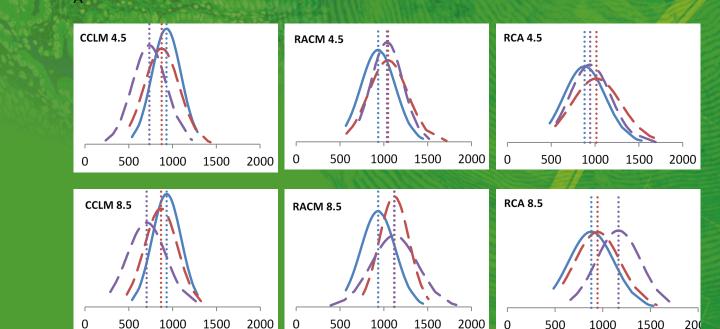


Talk today

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



1. Water issues changing, some discourses persist





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.

Lantbrukets sårbarhet – en uppföljning (Rapport från riksdagen 2020/21:RFR7.

- Vatten försörjning/åtgärder för klimat säkring (dränering , vattenuttag) och

dess , kompetens behov nämns särskilt....

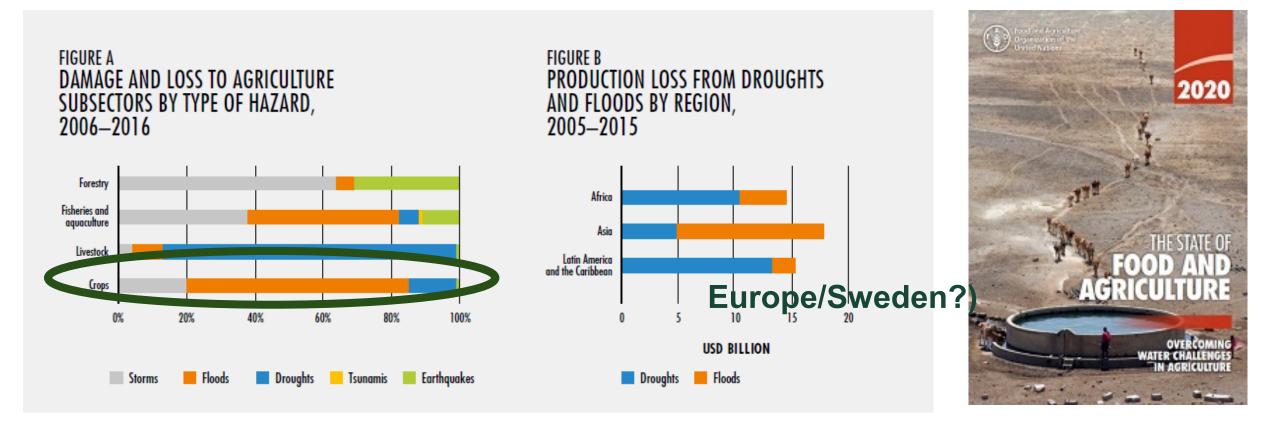
FIGURE IV Evolving Risks Landscape

Top Global Risks by Likelihood





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



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



Gräv en grop och lär känna din jord

Täckdikningen behöver öka

Bladgödsling som komplement och problemlösare

Sven-Erik Johansson på Nibble Gård: "Vi måste använda vetenskapliga metoder för att hitta nya lösningar"

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





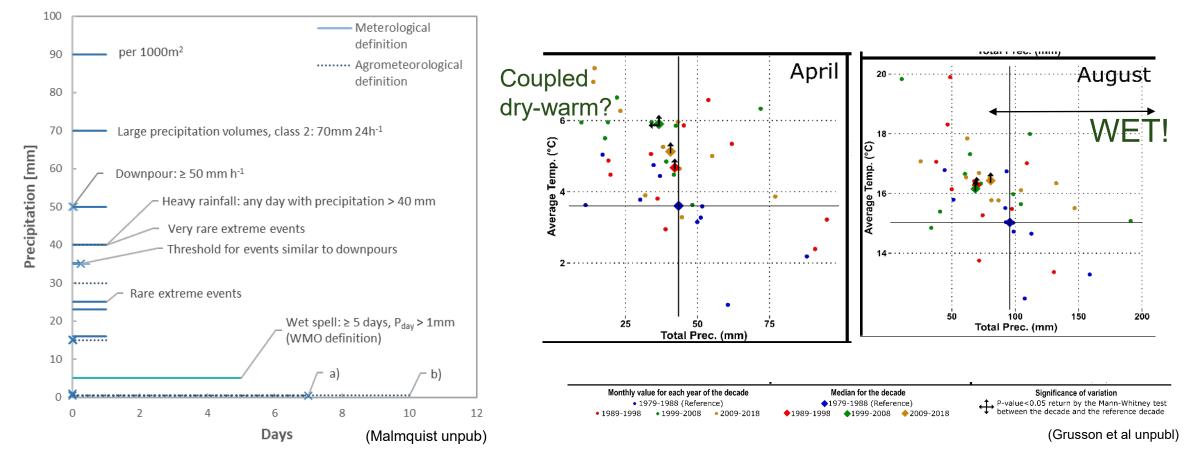


Ex1: Identify and assess knowledge gaps:

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Current and future weather –water impacts for agricultural production

 Define agro-ecological criteria for extremes and normal Identifying historic coupled extremes (T, P) with relevant resolution (seasonal/daily)



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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

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		phosphorus and tota	e methods for determining total al nitrogen reference concentrations in Norway and Sweden as well as the	deviation from undisturbed conditions (CIS 2003a). Stoddard et al. (2006) advocated that RC should reflect minimally disturbed conditions or	* ICRESAT Development Center, International Orops Research Intainue for the Semi-Arid Tropics, Patancheru, 502 324 Hyderabad, Tolangana, India			f mobilization, flushing an rochemical indices can b on freshwater quality an	
		established referen	tee conditions and evaluated the fer and harmonisation of methods. We	dition of streams in the absence of significant h turbance', but in lowland rivers such conditions	⁴ Swedish University of Agricultural Sciences, Uppsa ⁶ Former Research Program Director-Asia, ICRESAT, ⁷ International Center for Research in Agroforestry (la, Sweden India	, Manua (RMC.APRO), Collar Prancise, India		on treshwater quality an n stream ecology.
		lowland rivers with	hods and values differed, especially for a high proportion of agriculture in the	found. In consequence, several methods have b cated for establishing nutrient RCs (CIS Guidar	International Center for Research in Agrigorousy ((CROP), NOV DEDI, MILL			dynamics observed in stre
		conditions for river	Denmark has not yet set reference rs, two of the Nordic methods were inditions. We conclude that some of the	Stoddard et al. 2006; Poikane et al. 2019). In th of pristine water bodies, the preferred method to nutrient RCs is use of monitoring data on nut	ARTICLEINFO	ABSTRAC			cedented technological bro lamental questions about h
		development is re-	ls are promising but that further equired. We moreover argue that	nutrient-sensitive biological indicators. In the a pristine water bodies, a variety of other metho	This manuscript was handled by Emmanouil Anagnostou, Editor-in-Chief Keywords	systems in pove	rty-affected regions. Innovations in soil and	he food and income security of smallholder farming water management, especially in the drylands, are targets of Agenda 2030. This study analyzes how	ing process understanding
		common benchmark	ference conditions is needed to obtain as for assessing the impacts of current changes on water quality.	used, including models, data and information deribitotical records, expert judgement or a comb these. Determination of RCs is important since the R serves different purposes (Stoddand et al. 2006; et al. 2019; Fig. 1). Hawkins et al. (2010) noted of the published studies on cocological assessme	k-gywedic Water soarcity Grouadwater resilience Livelihood development Semi-arid tropics	mitted agriculture on be intensited with marginal impact on the indicase water balance. The impact minimute harvaring intertures on holescope bytology and association application association and sensi and Anna dimitri of handshikani region in cortem India. The France Statish pilot insuitable water and Anna dimitri of handshikani region in cortem India. The France Statish pilot insuitable transmitted and the sense of the sense of the sense of the sense of the sense insuitable sense of the sense bismute the sense of the sense monitored instensively to analyze the landscape's water balance composi- bilization in the sense of the sense of the landscape by balance. The sense and the sense of the sense o		associated agricultural services was analyzed in the	bery.com/journal/hep 1 c
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		INTRODUCTION		the last 25 years have depended on the determini "ecological benchmark for context". In the W also used as a basis for establishing the boundar		water scarcity is cultivation. Cro	ssues of the communities in recurring dry ye p yields increased by 10-70% and average b	indiviter levels increased by 2-5 m (m), alleviating ars. Nearly 20% of fallow lands were brought under ousehold income increased from US\$ 960/year to US Sicape. The combined soil-water-vegetation efforts	
		assessing the current	ns (RC) represent a baseline for t ecological status of water bodies and , for instance, biological indicators and	"good" and "moderate" ecological status (G/M I This can be done either directly, for example, plying the nutrient RC with a constant or by		strengthened wa	mpared to that in the non-intervention iam ater resilience and environmental systems i	a agricultural landscape.	
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increased risk, and production and economic losses (Wi

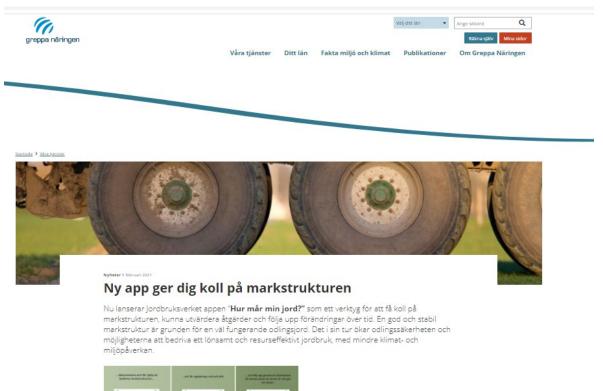


Example 3: Co-develop evidence-based tools and policy advice

 <u>Hur mår min jord</u>? 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)





. Ladda ner Jardbruksverkets nya app "Hur mär min jard?". Ett verktyg som hjölper dig att hälla kol markstrukturen, kunna utvärdera ätgärder och följa upp färändringer över tid.

Syftet med appen är inspirera fler till att sätta spaden i jorden och för den ovane finns des töd och vägledning i ord och bild. Appen är även tänkt att fungera som ett rådgivningsverktyg för diskussioner kring markstruktur och åtgärder. Den kommer till exempel att användas vid gruppträffar som vattendraggrupper inom Greppa Näringen och även vid den



3 Current and future opportunities

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

③ 21 November 2017

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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.....

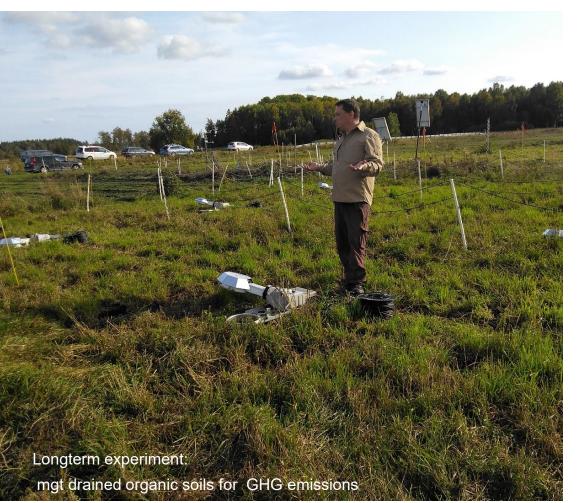
Sometimes an "Eurocentric" perspective? E.g., new indicators...

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Some collaboration suggestion 1:

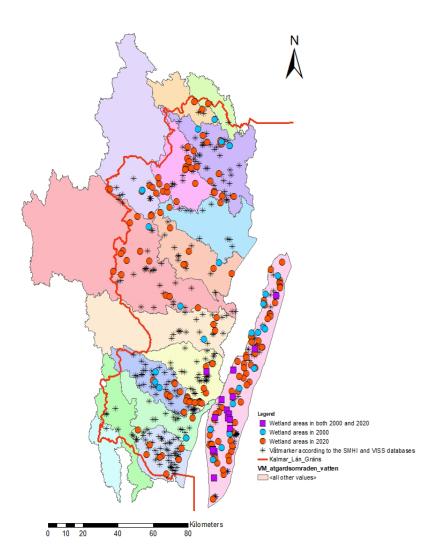
 Need to make the case for multifunctionality/benefits and limitations of water management/AWMs/BMPs (biodiversity, agric. production, water quantity/quality, GHG, economics): large public and private (farmer) investments but lagging in impact, need critically discuss benefits and trade-offs, support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





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?

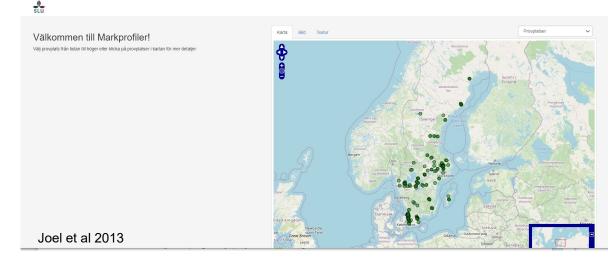


Kalmar, Öland wetland development in downstream/discharge areas (Naomi ter Borg et al , Unpubl)



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



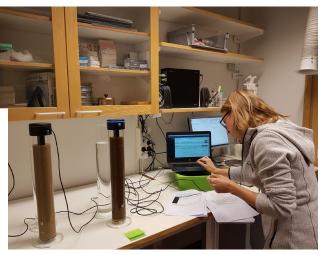
Water management

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!

Jennie Barron

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The team



The methods:



í.

cHyd







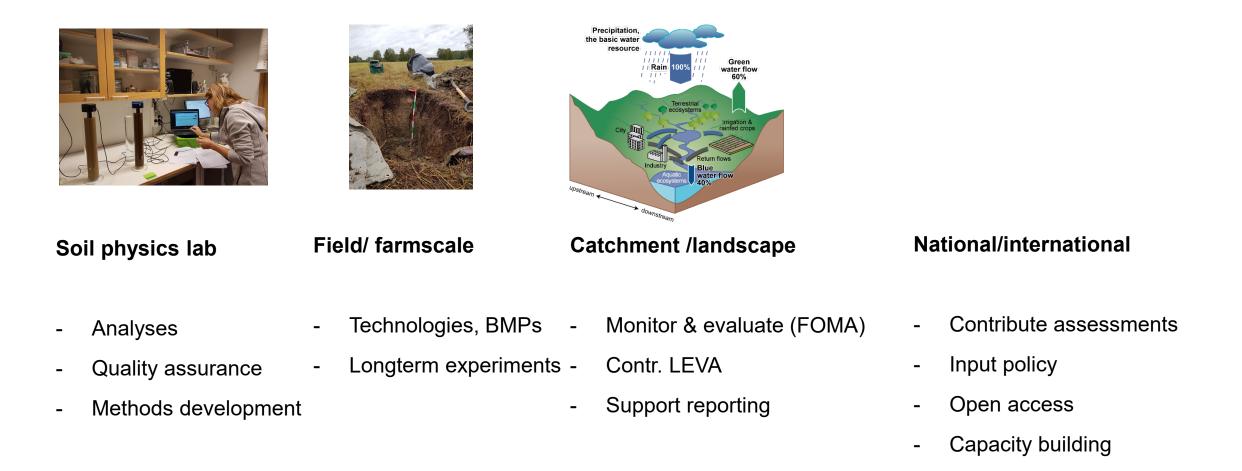
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Some key partners





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





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

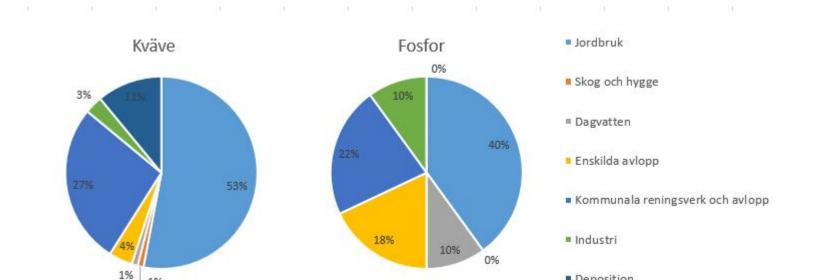


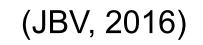


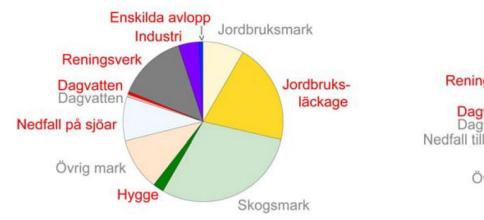


• In Sweden and international

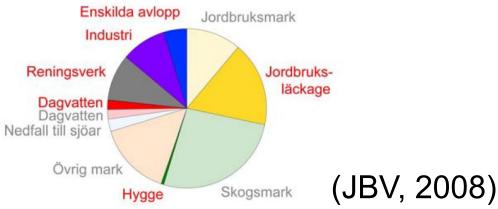
N and P load are serious water issues and agriculture is one (of several) sectors contributing: SLU example Sweden







1%



Deposition



