

Thesis suggestions (as of 12 Oct 2020)

Potential title: Response of cropping patterns and crop water use under impact of climate change in Northern Sweden

A pilot study on impacts of climate change on agriculture in Northern Sweden. Focus on change of water use, elongated cropping season and positive/negative crop responses to changed growth conditions.

Activities: Review and analysis of available field study data, create database, possibly modelling of crop water use.

Contact: Louise Malmquist (louise.malmquist@slu.se)

Potential title: A timeline of quantified changes in land-use, water bodies and water morphology in Swedish agricultural catchments

The project aim to contribute to following hypothesis:

Historical landcover over Swedish agricultural catchments had higher coverage of water bodies, wetlands and more complex morphology than present land-cover.

The goal is primarily to develop and verify objectified and georeferenced layer files compatible for processing and analysis of quantified spatial changes of water bodies over time in GIS-software.

Tasks:

- Identification and objectifying of historical maps over selected Swedish agricultural catchments
- Quantitative analysis of changes in occurrence of water bodies and morphology of watercourses

Sweden has a history of land use-changes and fluctuation of agricultural areas, morphological alteration of watercourses and draining of water bodies and wetlands due to agricultural development and intensification. These type of alterations in both land-use formations and agricultural management have had changed hydrological flows, contributed to nutrient leakage in water bodies and changed habitat composition for local flora and fauna.

Based on a quick search in the search engine Web of knowledge however, we could not identify studies from Sweden or Scandinavia on quantitative impact on water bodies and streamflow morphology based on maps from these historic maps /data.

The magnitude and direction of impacts needs further studies. With uncertainty in climate change both precipitation, growing seasons and temperature, water bodies for agriculture is already of growing interest, for example the recreation of wetlands, or sediment /infiltration areas. Restoration and mitigation measures to increase buffering capacity towards changes and increased fluxes in quantitative hydrological flows and water availability for several sectors in the landscape becomes more important.

The scope of study will be to develop knowledge on impact of historical land-use and changes of water bodies in the landscape on quantitative water balance for specific catchment(s). This new information is a valuable tool when developing and decide sites for reestablishing of mitigating measures for predicted future quantitative fluctuations in hydrological flows and landscape water storage (retention) capacity.

Contact : Louise Malmquist (louise.malmquist@slu.se)

TOPIC: P- losses and liming for better soil health

P losses is a serious issue for water quality , and farmers are supported to carry out many on and off farm efforts to reduce P losses , especially to stream water in Sweden. At the department of Soil and Environment, several researchers study the fate of P from soil to catchment with modelling and empirical work in lab or in the field. These specific studies are part of the work by the Soil Mechanics group, that investigate soil tillage practices and soil compaction related to soil health. The following thesis studies are offered

1) Estimation of liming rate for different soil type to reduce P leaching from arable soils
(Laboratory test using rain simulator)

2) Effect of liming on soil aggregate stability and turbidity- influence of liming rate and soil texture
(Laboratory test using wet-sieving and turbidimeter)

Contact: Ararso Etana (Ararso.etana@slu.se)

TOPIC Support for the Hjälmare catchment management (part of LEVA)

In Sweden, to curb water pollution from non-point source pollution from agriculture, a new catchment initiative was initiated LEVA in 2018. This initiative supports coordinators in 20 agricultural catchments to help farmers develop and improve 'best management practices' (BMPs) to reduce nonpoint N and P loads, in line with national environmental and EU Water directive. This thesis would be to develop and support new knowledge in the LEVA area of Hjälmare. It would involve Studies related to soil health and water quality and BMPs, based on existing data and possible new sampling in the field /catchment with farmers involved in the LEVA initiative. Additional issues related to the Hjalmar crisis (loss of organic farmed soils vs lowering /regulated lake levels) would also be of interest as it causes conflicting interest around the lake.

Hjälmare - sjön som sänktes

Vi har ju hela Hjalmarekrisen (kolla artiklar på nätet och facebookgruppen Rädda Hjalmare!) med låga vattenstånd i Hjalmare pga av "regleringsmissar" i våras (återkommande under många år) +

klimatförändringar som nu också spelar in. Sjön sänktes knappt 2 meter under slutet av 1800-talet, man vann 15000 ha odlingsmark men det har fått stora efterverkningar senare. Konflikter mellan olika intressen blossar upp allt mer frekvent: fisket/ lantbruket /kraftindustrin/dricksvattenförsörjning/ rekreation /turism.

Vore intressant att få något belyst kring sänkning av sjön Hjälmarens, genomgång av hur mycket odling vi har på torrlagd sjöbotten nationellt? Hur kan vi säkra livsmedelsförsörjning trots att många jordar bortodlas succesivt och torrläggning, sjösänkningar och vattenavledningsföretags tillstånd ligger fast. Hjälmarens har nog sänkts så mycket den kan nu, sänker man vattennivåerna mer för att tillgodose lantbrukets behov blir många andra livsmiljöer hotade för både människor och djurliv. En olöslig konflikt?

Uppsatsidé från Anna Eklund, LEVA-samordnare, Hjälmarens Vattenvårdsförbund

Samband mellan jordhälsa och vattenkvalitet i Blackstaåns avrinningsområde

Undersökning av jordhälsa på ett antal svin- och hönsgrårdar i Blackstaåns avrinningsområde. Flytgödselspridning på lättleror med svag struktur och relativt enformig växtföljd har skapat packningsskadade jordar som läcker näring genom ffa erosion vid stora regnmängder höst och vinter. Kan man hitta en effektiv strategi för att reparera packningsskadade jordar i ett avgränsat avrinningsområde? Och vilken effekt kan det få på vattenkvalitet i närliggande vattendrag. I Blackstaåns avrinningsområde sker vattenprovtagning i huvud- och biflöden 2 ggr / månad under 2019-2023. Vi mäter vattenföring i 9 punkter och tar vattenprov (tot fosfor, tot kväve, suspenderat material, absorbans, turbiditet). Rådata samt sammanställning och analys av vattenprovtagning i Blackstaån med biflöden kommer finnas att tillgå. Kompletterande mätningar på markpackning skulle kunna komplettera

Uppsatsidé från Anna Eklund, LEVA samordnare, Hjälmarens Vattenvårdsförbund

Contact: Jennie Barron (jennie.barron@slu.se) and Anna Eklund (co supervisor Hjälmarens Vattenvårdsförbund)

Thesis topic: Modelling water stress on plant growth to support precision farming tools

Precision farming is rapidly developing to support farmer management of crops . In Sweden there is especially focus on developing precision nutrient management based on soil parameters. In a new 2-year research project, we also trial the close interaction of nutrient and soil moisture status, in order to further refine recommendations. An ongoing project is treating the effect of water stress on the availability of nutrients for the plant and by consequence on the yield. During the period April-August 2020, a first experiment was carried on Oats crop at SLU's experimental station in Götala (close to Skara), many parameters were assessed during the experiment (weather, Soil, plant growth and yield).

The aim of the master thesis is to use a model to simulate the effect of water stress on the crop growth and yield using the available data. During the coming cultivation season, the student will have opportunity to participate in installing equipment and following measurements for the new growing season.

Contact: Omran Alshihabi omran.alshihabi@slu.se>

Thesis topic: Assessing climate and landuse change for Ethiopian watersheds

Rapidly transforming agricultural landscapes are often subject to the claim of adding environmental negative impacts, and not the least sediment load, and reduced permanent vegetation. Yet there are numerous examples of landscapes that has intensified and re-vegetated by smallholder farmers, disproving the hypothesis of increasingly degraded landscapes. This study intends to develop better understanding of 4 small catchment's in Ethiopia, on the historical climate (rainfall and temperature) and landuse/land management trends, using existing data. The assessment is done as a desk study with GIS /RS and additional verification eg google Earth. Agro climatic assessment uses daily met data over historic period. Data will be provided as a starting point.

The candidate should ideally have interest and some expertise in landuse-land management assessment using GIS/RS . Additional understanding of basic statistics (to be applied in the climate analyses) is also an advantage

The work was initially formed under an international project addressing SWC and sustainable intensification with Dr Zenebe Adimassu, IWMI Ethiopia.

Contact Jennie Barron (jennie.barron@slu.se)