Dear students,

While you are on the search for thesis opportunities, you may use this booklet to get inspiration and ideas for your own MSc thesis research.

In the SLM chair group our research focuses on three domains, including (1) soil physics (flow and transport of water, heat, sediment and solutes), (2) ecohydrology (soil-water-plant interactions) and (3) land use and management (factors affecting soil degradation, conservation and restoration).

In this booklet you can find thesis opportunities which are currently available with our staff members and where you as a student can contribute to exciting projects! To make it easier to search for a topic, there is an overview in which all the topics are divided into the following classes: Water, Soil, Groundwater, Pollutants, Vegetation, Socioeconomic aspects.

Also, feel free to approach us with your own research ideas!

When you would like to do your thesis within the SLM group, first contact one of our thesis coordinators to discuss your ideas and plans. MEE students should contact Loes van Schaik (loes.vanschaik@wur.nl), for MIL students the contact person is Laura Ekpa (laura.ekpa-pol@wur.nl).

We are looking forward to collaborate with you!
# SLM staff involved in MSc thesis supervision

<table>
<thead>
<tr>
<th>Name</th>
<th>Email</th>
<th>Specializations</th>
</tr>
</thead>
</table>
| Prof. dr. C. (Coen) Ritsema | coen.ritsema@wur.nl          | - Land Degradation  
- Soil Management  
- Soil Physics |
| Laura Ekpa-Pol MSc          | laura.ekpa-pol@wur.nl         | - MSc thesis coordinator (MIL students)  
- Socio-economic analysis  
- Land policy / governance |
| Dr. NLMB (Loes) van Schaik  | loes.vanschaik@wur.nl         | - MSc thesis coordinator (MEE students)  
- Ecohydrology |
| Dr. ir. (Jantiene) Baartman | jantiene.baartman@wur.nl      | - Soil erosion modelling  
- Physical land degradation processes  
- Soil and water conservation |
| JP (Joao) Carvalho Nunes PhD| joao.carvalhonunes@wur.nl     | - Hydrological process  
- Soil erosion  
- Water contamination  
- Socio-hydrological systems |
| Dr. ir. JC (Jos) van Dam    | jos.vandam@wur.nl             | - Ecohydrology  
- Physical soil transport processes  
- Modelling |
| Dr. C. Stoof                | cathelijne.stoof@wur.nl       | - Land degradation  
- Pyrogeography  
- Soil management |
<table>
<thead>
<tr>
<th>Name</th>
<th>Email</th>
<th>Research Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>ing. G (George) Bier</td>
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</tr>
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</tr>
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</table>
### SLM staff involved in MSc thesis supervision

<table>
<thead>
<tr>
<th>Name</th>
<th>Email</th>
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<tr>
<td>dr. ir. MJPM (Michel) Riksen</td>
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<td>- Coastal dune management</td>
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<td>- Soil and water conservation</td>
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<td>- Environmental governance</td>
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<tr>
<td>dr. ir. CA (Aad) Kessler</td>
<td><a href="mailto:aad.kessler@wur.nl">aad.kessler@wur.nl</a></td>
<td>- Farmer decision-making &amp; adoption</td>
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<td>- Intervention strategies</td>
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<td></td>
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<td>- Integrated Farm Management</td>
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<tr>
<td>dr. ir. L (Luuk) Fleskens</td>
<td><a href="mailto:luuk.fleskens@wur.nl">luuk.fleskens@wur.nl</a></td>
<td>- Ecosystem services</td>
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<td>- Multi-scale impact assessments SLM</td>
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<td>- Scenario analysis</td>
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<td>- Farmer decision-making</td>
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<tr>
<td>dr. S (Saskia) van der Kooij</td>
<td><a href="mailto:saskia.vanderkooij@wur.nl">saskia.vanderkooij@wur.nl</a></td>
<td>- Water management</td>
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<td>- Resource efficiency</td>
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<td>- Circular economy</td>
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<tr>
<td>TA (Teun) Vogel MSc</td>
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<td>- Land restoration</td>
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<td>- GIS, drones</td>
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<tr>
<td>dr. K. (Karrar) Mahdi</td>
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<td>- Soil-landscape degradation</td>
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<td>- Climate smart agriculture</td>
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# Master thesis and internship topics SLM 2023

## Water

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<th>Topic</th>
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<tbody>
<tr>
<td>1</td>
<td>Effect organic amendments and earthworms on soil hydrology</td>
<td>Loes van Schaik</td>
</tr>
<tr>
<td>2</td>
<td>Analysis of near future demands for sprinkling irrigation in Brabant</td>
<td>Jos van Dam</td>
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<tr>
<td>3</td>
<td>Snow melt, frozen soils and soil erosion in Norway</td>
<td>Jantiene Baartman</td>
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<td>4</td>
<td>Effects of climate change and surface runoff on water quality</td>
<td>Jos van Dam/ Peter Schipper</td>
</tr>
<tr>
<td>5</td>
<td>Rainwater runoff and erosion management in Dutch Caribbean</td>
<td>Jantiene Baardman/ Klaas Metselaar</td>
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<td>6</td>
<td>Improving pF curve measurements</td>
<td>Harm Gooren</td>
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<td>Conductivity near saturation- solving a puzzle</td>
<td>Klaas Metselaar/ Harm Gooren</td>
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<td>8</td>
<td>Irrigation optimization and erosion control in a regenerative farm</td>
<td>Loes van Schaik</td>
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<td>9</td>
<td>Assessing &amp; managing environmental impacts in Irish catchments</td>
<td>Joao Pedro Nunes</td>
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<td>10</td>
<td>Feasibility of rainwater harvesting in Western Desert of Iraq</td>
<td>Karrar Mahdi/ Michel Riksen</td>
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<td>11</td>
<td>Exploring effects of mulch and erosion control on soil/water balance</td>
<td>Karrar Mahdi/ Joao Nunes</td>
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## Soil

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<tr>
<td>1</td>
<td>Soil monitoring in a regenerative organic farm</td>
<td>Loes van Schaik</td>
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<td>2</td>
<td>Soil heath in Norway</td>
<td>Loes van Schaik</td>
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<td>3</td>
<td>Soil texture determination: comparison of different methods</td>
<td>Loes van Schaik</td>
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<td>4</td>
<td>Meta-analysis on impact of cross slope barriers on SOC sequestration</td>
<td>Luuk Fleskens</td>
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<td>5</td>
<td>Soil degradation by fire/ soil conservation through mulch and biochar</td>
<td>Jantiene Baartman</td>
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<tr>
<td>6</td>
<td>Impact of global change on soil health and ecosystem services</td>
<td>Jantiene Baartman</td>
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<td>7</td>
<td>Wildfire effect on soil erosion and plant recovery</td>
<td>Jantiene Baartman</td>
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<td>8</td>
<td>Assessing and mitigating long-term soil and organic matter losses</td>
<td>Joao Pedro Nunes</td>
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<td>9</td>
<td>Soil compaction research in the Netherlands</td>
<td>Loes van Schaik/ Jos van Dam</td>
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## Groundwater - surface water

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<thead>
<tr>
<th>#</th>
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<tr>
<td>1</td>
<td>Development hydrological model Doorwerth Estates</td>
<td>George Bier</td>
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<td>2</td>
<td>Alternative water sources for the fosse of Hoekelum Estate</td>
<td>George Bier</td>
</tr>
<tr>
<td>3</td>
<td>Measures to improve the fen-meadow in Kraaigraaf</td>
<td>George Bier</td>
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<tr>
<td>4</td>
<td>Measures to improve water management Panovenpas</td>
<td>George Bier</td>
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<td>5</td>
<td>Water retention in higher sandy regions of the Netherlands</td>
<td>George Bier</td>
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<td>6</td>
<td>Bank erosion along the Meuse river</td>
<td>Jantiene Baartman</td>
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<tr>
<td>7</td>
<td>Impacts of climate and land use change on Mediterranean streamflow</td>
<td>Joao Pedro Nunes</td>
</tr>
<tr>
<td>8</td>
<td>Evaluating restoration measures of the Beekbergerwoud</td>
<td>George Bier/ Klaas Metselaar</td>
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# Vegetation
1. Bio-irrigation: an exploratory analysis  
   Klaas Metselaar
2. Water transfers of indigenous vs exotic tree species in forest, Chile  
   Jos van Dam
3. Deficit irrigation strategies and crop yield  
   Jos van Dam
4. Modelling drought and oxygen stress in clay soils  
   Jos van Dam
5. Combined effects of pesticides and microplastics on plant growth  
   Vera Silva / Abel Veloso
6. Peat bog patterns: a journey of discovery  
   Klaas Metselaar
7. Urban green walls: how much water is needed?  
   Klaas Metselaar
8. Almond growth, what are the determining factors?  
   Loes van Schaik

# Pollutants
1. Microplastic effect on earthworms  
   Meng Fanrong
2. Transport of microplastics and pesticides by earthworms  
   Meng Fanrong / Esperanza Huerta Lwanga
3. Transport of microplastics by ants  
   Kayode Jegede
4. EC pesticide registration system and reliability of exposure prediction  
   Vera Silva / Violette Geissen
5. Impact of pesticide mixtures on key aquatic producers species  
   Vera Silva / Nelson Abrantes
6. Wind erosion of pesticides from agricultural fields  
   Violette Geissen / Daniel Figueiredo
7. Pesticide mixtures: risk assessment of farm animals  
   Violette Geissen / Daniel Figueiredo
8. Impacts of pesticide mixtures on beneficial insects  
   Vera Silva / Nelson Abrantes
9. Scenarios for pesticide risk reduction, Soil quality app (SQAPP)  
   Vera Silva / Xiaomei Yang
10. Pesticide risk assessment, Chilean forest ecosystem  
    Vera Silva / Carlos Faundez
11. Effects of pesticide cocktails on earthworms  
    Meng Fanrong / Kayode Jegede / Esperanza Huerta
12. Spatial variability in microplastics urban green areas  
    Loes van Schaik

# Socio-economic analysis
1. Integrated farm planning approach (PIP) Burundi  
   Aad Kessler
2. Integrated farm planning approach (PIP) Uganda  
   Aad Kessler
3. Regional scenarios of land restoration in Madagascar  
   Luuk Fleskens
4. Climate Smart Agriculture practices in the MENA region  
   Luuk Fleskens / Karrar Mahdi
5. Silvopasture intervention for fodder production in India  
   Luuk Fleskens
Organic amendments and earthworm activity to improve soil hydrology

Country:
Host institute: WUR, Soil physics and land management and Soil Biology

Project description

Climate change leads to more frequent drought and high intensity rainfall events. In recent years, arable production suffered from both, with droughts being particularly impactful on sandy soils. Innovations are needed to prevent freshwater reserves from being depleted and crop production from being water-limited. Against this background we wish to design measures to improve infiltration and soil water retention through selective amendment of organic matter that promotes soil water retention. However, we do not know which quality of organic matter is particularly effective in promoting soil water retention.

In this thesis study, you will design an experimental set-up to test several types of organic matter on their capacity to improve soil water retention. On the long run, we would like to link this capacity to chemical characteristics of organic amendments, such that we are better able to advise farmers on organic matter management with the purpose to mitigate the impact of droughts and heavy showers.

Project details

Group: Soil Physics and Land Management & Soil Biology
Project type: Thesis / Research practice
Study programme: MIL / MEE / MIL & MEE
Begin date: any time
End date: 

Supervisor(s): Loes van Schaik, Ellis Hoffland
Examiner: t.b.d.
Contact details: loes.vanschaik@wur.nl, Ellis.hoffland@wur.nl

Contact

Used skills:
Sprinkling irrigation demand and groundwater

Country: The Netherlands
Host institute: Waterboard Brabantse Delta
Online possible: Yes

Project description

Groundwater levels in parts of Brabant are declining, which affects brooks and nature reserves. In this research agrohydrological modeling is used to determine the current and future demand for sprinkling irrigation by agriculture. We will analyse how this will affect groundwater recharge, brook discharges and natural seepage areas in dry years.

The central research question is how satellite images, soil moisture data and agrohydrological modeling can be combined to assess the effect of drought periods on agricultural yields, groundwater recharge and seepage fluxes.

Proposed methods are:
• Literature research on techniques to measure soil moisture and their performance (reliability, accuracy)
• Analyses of available field measurements of soil moisture at various locations in Brabant and comparison with satellite data and observed groundwater levels.
• Simulation of soil moisture content and groundwater levels with SWAP.

Project details

Group: Soil Physics and Land Management
Project type: Thesis
Begin date: flexible
Used skills: modeling (agrohydrology, groundwater)
Requirements: Atmosphere Vegetation Soil Interactions; Groundwater systems and flow.

Contact

Supervisor(s): Jos van Dam (SLM), Kees Vink (Brabantse Delta)
Contact details: jos.vandam@wur.nl
Project description

Problem context

One of the research themes of the NIBIO institute in Southern Norway (As) is the understanding of water pathway processes in small catchments and to define small, local measures for reducing peak flow and soil loss.

Research Objective/Question

Depending on the interests of the student, and the time of the year, several research topics can be formulated, e.g.:

- Gully erosion: modelling and measuring
- Soil erosion after spring snowmelt periods
- Effectiveness of local soil conservation measures for erosion control and peak flow reduction
- Modelling soil erosion, with focus on cold climate processes

What is expected from the student (type of research)

Mix of fieldwork, laboratory and data analysis. Fieldwork could consist, depending on the research focus, of sampling and measurement of soil and vegetation characteristics, measurement of runoff and soil loss from small catchments and snow dynamics measurements, acquisition and processing of aerial photography (drone) and/or satellite imagery.

Project details

Group: Soil Physics and Land Management group
Project type: Thesis / Internship / Research practice
Study programme: MIL & MEE

Begin date: tbd
End date: tbd

Used skills: varying with project, but e.g. GIS, modelling, data analysis, fieldwork

Requirements: see above

Contact

Supervisor(s): Jantiene Baartman & Jannes Stolte
Examiner: Coen Ritsema
Contact details: jantiene.baartman@wur.nl
Climate change and Surface runoff in agriculture; impact on water quality: phosphorous and pesticides

Background
Extreme rainfall increases the number and amount of surface runoff at agricultural fields. This increases the risk of emissions of contaminants to surface water, especially phosphorous and residues of pesticides. This is recognized by environmental policy. However, scientifically based quantification of surface runoff and related emissions is limited, so the effectiveness of measures to reduce the runoff is also unknown or uncertain.

Starting point
Two Wageningen Research projects enables to quantify surface runoff and the related emissions of P and (residues of) pesticides to streams (for a reference situation and mitigation measures):
1) Research in which 30 years of rainfall events for soil-crop combinations were simulated with the Soil-Water-Atmosphere-Plant (SWAP) model for a reference situation and a mitigation measure.
2) Experimental measurements in ridged fields for potato, where the amount of surface runoff is collected (reference ridges and ridges with micro-dams) and concentrations of P, pesticides and other substances are measured in our laboratory.

Objective
The objective is to integrate these 2 research project by:
- Validation of the 30 years SWAP simulation results
- Extrapolate the experimental measurements from the ridged potato fields temporal (future meteorologic scenario’s) and spatially (sandy regions in the Netherlands)

Method (suggested)
- Selection of SWAP-profiles that represent the situation at the experimental sights
- Compare the calculated and measured amount of runoff (mm) in the period 2020 and 2021
- Calculate surface runoff loads for P and one / a few pesticides based on the SWAP-simulations (mm) and measured concentrations
- Define and run modelling scenario’s to estimate the effect of mitigation measures

Interests and skills student
The student researcher is interested in environmental solutions, has analytical and programming skills.

Involved researchers Wageningen Research:
Jos van Dam jos.vandam@wur.nl, Peter Schipper (p.schipper@wur.nl), Wim Beltman and Pim Dik
Rainwater, runoff and erosion management on the Dutch Caribbean

Country: Bonaire, St. Eustatius and Saba
Host institute: t.b.d.
Online possible: depending on topic

Project description

Problem context
On Bonaire, Saba and St. Eustatius, intensive rain showers lead to rainwater runoff, resulting in soil erosion and sedimentation, which causes nuisance, damage, and impacts the coral reef. The freshwater balance of the islands is hardly known, while rainwater on Saba and Sint Eustatius is an important source of irrigation and sometimes still drinking water. On Bonaire, the freshwater supply in the groundwater is unknown - it is known to be brackish, but getting and keeping an overview is difficult due to the geology of the island (karst). The small areas of open fresh water are of great importance to the local fauna, especially birds and migratory birds. Better management of rainwater therefore serves two purposes: preventing nuisance caused by runoff and sediment transport, and contributing to the fresh water supply on these islands, for humans (limited) and animals (essential).

Research Objective/Question
In order to achieve sustainable rainwater management, insight is required into:
1. Rainwater runoff: which areas contribute most to surface runoff and where do we see water concentrations occurring?
2. Quantifying erosion and sediment: sources and sediment transport towards the coast through modelling (e.g. LISEM)
3. What rainwater management structures already exist on the islands, both in urban areas and in the countryside: What kind of measures are there and how do they function?
4. The stakeholders in the problem areas: which parties influence water management and who are experiencing nuisance or lack of water? What plans have been made that could possibly influence rainwater discharge?
5. Potential technical and policy measures for sustainable water management on the islands.

What is expected from the student (type of research)
Depending on the exact research topic, various activities will be carried out, ranging from field measurements of runoff, infiltration and other biophysical parameters, modelling and/or GIS analysis, mapping and analysing existing structure and interviews and stakeholder analysis.

Project details
Group: Soil Physics and Land Management group
Project type: Thesis / Research practice
Study programme: MIL & MEE

Begin date: tbd
End date: tbd

Used skills: fieldwork, GIS analysis, mapping, measuring, modelling, interviewing

Contact
Supervisor(s): Jantiene Baartman, Sander Mucher (WENR), Michel Riksen en/of Klaas Metselaar
Examiner: Coen Ritsema
Contact details: michel.risken@wur.nl, klaas.metselaar@wur.nl or jantiene.baartman@wur.nl
Can Vapor Equilibration be used to bring soil samples to a certain pF value?

Country: Wageningen
Host institute: Wageningen University, soil physics lab

What is the Problem?

For many types of Soil Physical measurements to be compared properly, the soil should be brought to a certain pF value. This can for example be done at a sandbox or in a pressure chamber. However, these methods are often not suitable for soil samples that are in the form of aggregates of other shapes.

In literature the option is proposed to use a salt solution in a closed chamber and to use Vapor Equilibration to bring soil samples to a certain pF value. First experiments in our Soil Hydro Physics laboratory have been done and give promising results.

Optional work to be done:

- Design and setup an experiment to check if this method is indeed working.
- Which pF values can be reached with which salt solutions?
- Evaluate the performance according to the current standards.
- Evaluate which kind of samples can be used for this method.
- Determination of a more suitable method for treating such samples.
- Evaluate if the applicable standards need to be adjusted.

Project details

Group: Soil Physics and Land Management group
Project type: Thesis / Internship / Research practice
Study programme: MIL / MEE / MIL & MEE

Begin date: any time
End date:

Contact

Supervisor(s): Harm Gooren
Examiner: tbd
Contact details: Harm.gooren@wur.nl;
Conductivity near saturation – solving a puzzle

Country: Wageningen
Host institute: Wageningen University, soil physics lab

Problem context
Most soils in the Netherlands are mapped in soil maps: an aggregation of soils distributed in the different areas. Within soil hydro-physics research, these soils are parameterized such that calculations of the movement of water in the soil, and dissolved compounds, can be done. This is a very important step, because it is crucial information for model research for societal issues that need to be solved at Local, Regional, National, European, and Global scales. For example this information is needed to determine drought stress for agricultural crops, CO2-emissions in peat soils, soil salinity occurrence in the coastal areas, soil compaction, rapid loss of nutrients in cracking clay soils, etc. The parameterization however hampers a good description of the water conductivity in the near saturated zone. The K050 measuring setup is developed to cover this data lack. The setup is however not tested yet, and possibly needs adjustments.

Research Objective/Question
The setup needs to be completed and tested on different soil types. Based on the findings the setup needs to be adjusted to improve its design.

What is expected from the student (type of research)
• Set up a systematic experiment with different artificial, and natural soils.
• Compare to the saturated conductivity, and assess the importance of the information using a simulation model.
• Analyze and discuss the results in the context of the above research objective.

Project details
Group: Soil Physics and Land Management group
Project type: Thesis / Internship / Research practice
Study programme: MIL / MEE / MIL & MEE

Contact
Supervisor(s): Harm Gooren/ Klaas Metselaar
Examiner: tbd
Contact details: Harm.gooren@wur.nl;
Begin date: any time
End date:
Irrigation optimization and erosion control in a regenerative farm, Spain

Country: Spain
Host institute: Regeneration Academy
Online possible?: No

Project description

- Are you eager to make a real-world impact in sustainable farming practices? Finca El Roble, a regenerative farm in Spain, is currently seeking a motivated student to conduct research on irrigation optimization and erosion reduction.

- Our farm wants to optimize irrigation while at the same time it faces big challenges minimizing erosion during extreme rain events. As part of your research, you will have the opportunity to design and model solutions to these challenges, and evaluate their effectiveness on our farm. Data collection for optimization of the modelling will be needed.

- Not only will you conduct valuable research, but you will also have the opportunity to gain hands-on experience by working on the farm and attend classes one day a week to further develop your knowledge and skills in regenerative farming practices.

- This project is ideal for students pursuing a master's thesis or internship. Join our student research project at Finca El Roble/La Junquera and be a part of shaping the future of sustainable and regenerative farming. Apply now to take on this exciting research opportunity!

Project details

**Group:** Soil Physics and Land Management group  
**Project type:** Internship  
**Study programme:** MIL / MEE / MIL & MEE  
**Begin date:** March or September  
**End date:** June or December  
**Used skills:** Modeling  
**Requirements:** experience on irrigation optimization

Contact

**Supervisor(s):** You need to find a supervisor at WUR, Clara Bosch will supervise from the Regeneration Academy.  
**Examiner:** To be found at WUR  
**Contact details:** email: Clara@regeneration-academy.org  
**Website:** https://www.regeneration-academy.org/
Irrigation optimization and erosion control in a regenerative farm, Spain

Country: Spain
Host institute: Regeneration Academy
Online possible? : No

Project description

• Are you eager to make a real-world impact in sustainable farming practices? Finca El Roble, a regenerative farm in Spain, is currently seeking a motivated student to conduct research on irrigation optimization and erosion reduction.

• Our farm wants to optimize irrigation while at the same time it faces big challenges minimizing erosion during extreme rain events. As part of your research, you will have the opportunity to design and model solutions to these challenges, and evaluate their effectiveness on our farm. Data collection for optimization of the modelling will be needed.

• Not only will you conduct valuable research, but you will also have the opportunity to gain hands-on experience by working on the farm and attend classes one day a week to further develop your knowledge and skills in regenerative farming practices.

• This project is ideal for students pursuing a master's thesis or internship. Join our student research project at Finca El Roble/La Junquera and be a part of shaping the future of sustainable and regenerative farming. Apply now to take on this exciting research opportunity!

Project details

Group: Soil Physics and Land Management group
Project type: Internship
Study programme: MIL / MEE / MIL & MEE

Begin date: March or September
End date: June or December

Used skills: Modeling
Requirements: experience on irrigation optimization

Contact

Supervisor(s): You need to find a supervisor at WUR, Clara Bosch will supervise from the Regeneration Academy.
Examiner: To be found at WUR
Contact details: email: Clara@regeneration-academy.org
Website: https://www.regeneration-academy.org/
**Project description**

**Teagasc – the Agriculture and Food Development Authority** – is the national body in the Republic of Ireland providing integrated research, advisory and training services to the agriculture and food industry and rural communities. As part of Teagasc, the Environment Research Centre at Johnstown Castle (Wexford) is Ireland's leading research centre for soils and the rural environment. The centre conducts research on soils, nutrient efficiency, recovery and losses; air and water quality; the agricultural environment and agro-ecology. The research results generated are used widely by advisors, farmers, scientists and policy makers.

**The Agricultural Catchment Programme (ACP)** program at Johnstown Castle is focused on water related research, with a focus on assessing the connection between agriculture and water quality. Within this programme, a range of different research topics can be pursued as a master's thesis topic or internship. Listed below are research topics for which MSc students are currently being sought, however students are also invited to propose their own research topic which suits their interests:

❖ Application of hydrologic models to examine the impact of management practice and/or climate change on water quality, with a focus on upscaling current models to larger spatial scales to address EU legislated water quality targets. This work will include catchment scale modelling, GIS, as well as general data management and analysis. **[Primary Supervisor: Daniel Hawtree]**

❖ Application of methods to explore high resolution data for insights about catchment hydrologic functioning and processes. This work will be coupled with model-based analysis to extrapolate findings to expanded spatial and temporal scales. This work will include working extensively with high resolution hydrochemical datasets to carry out exploratory analysis, statistical assessments, and coupling with ongoing modelling work. **[Primary Supervisor: Per-Erik Mellander]**

**Project details**

**Group:** Soil Physics and Land Management group  
**Project type:** Thesis / Internship  
**Study programme:** MIL & MEE

**Begin and end date:** to be decided with the student

**Used skills:** vary with the sub-topic but can include fieldwork, modelling, or socio-economic research

**Requirements:** varies with the sub-topic selected

**Contact**

**Supervisor(s):** Joao Nunes, Daniel Hawtree (Teagasc)  
**Examiner:** Coen Ritsema

**Contact details:** joao.carvalhonunes@wur.nl
The Feasibility Of Using Rainwater Harvesting Method In The Western Desert Of Iraq

Country: Iraq
Host institute: University of Anbar (or another country e.g., Jordan/Tunisia)
Online possible?: Yes

Project description

Iraq used to be considered as "rich water-resources country" due to rivers of Tigris and Euphrates. However, due to dam construction on the tributaries of the rivers in Turkey, Iran and Syria has resulted in water scarcity in Iraq. Additionally, Iraq’s growing population has raised the demand for water, while climate change and declining rainfall rates have further restricted the water supply since 2007. Iraq’s Western Desert is the most affected by water scarcity and therefore people struggle to manage the precarious water supply. Harvesting rainwater technique aimed to be used as sustainable methods that can be used to increase the water supply in this region.

Research objectives:-

The study's main objectives are to understand the present state and procedures of existing rainwater harvesting systems, as well as to evaluate their long-term viability. The research also intended to identify shortcomings or constraints that have affected system sustainability, then provide recommendations and solutions for sustaining rainwater collection systems.

What is expected from the Student?

The student is expected to discuss and to reflect on his/her findings against the existing theoretical literature as well as empirical literature. Understand and analyses the current conditions and practices of existing rainwater harvesting. Interested student will receive the required data and support from the host organization, without any obligation to travel there.

Project details

Group: Soil Physics and Land Management group
Project type: Thesis
Study programme: MIL & MEE

End date:

Contact

Supervisor(s): Karrar Mahdi/Michel Riksen
Host Supervisor: Ammar Ali
Examiner: Coen Ritsema
Contact details: Karrar.mahdi@wur.nl

Used skills: literature review, GIS, modelling

Requirements: (e.g., GIS skills)
Exploring the effects of mulch and erosion control design on soil water balance.

Country: Portugal

Host institute: University of Evora-MED (Mediterranean Institute for Agriculture, Environment and Development of Evora.

Online possible: Yes

Project description

Problem context
The spreading of a layer of organic material over the soil surface, “mulching”, has been recognized in the academy as an effective soil conservation technique. Still, the effects on hydrologic processes (runoff, infiltration, soil water retention) are not very well understood. Researchers have shown important effects on runoff at some plot scales, with the use of rainfall simulators, field plots or catchment scales, but few research has been carried out to measure or model the soil and water processes involved in the soil water balance.

Research Objective: The main aim of the work is to improve the knowledge on the effects of mulch in the hydrologic processes governing at each spatial scale, from the point, to the plot to the catchment scale. The specific objectives are to:
1. Monitor each process via laboratory rainfall simulations with prepared soil trays including different mulches;
2. Field monitoring of runoff from different plots at the catchment scale, using water level recorders,
3. Design a Soil conservation plan for the study field site.
4. Modelling of existing long-term runoff datasets in field research sites in the Western Iberian Peninsula

Expected research methods: The workplan involves the following tasks:
1. Laboratory assessment of the different soil water compartments (runoff, leaching, soil moisture) in mulched/unmulched trays;
2. Field monitoring of water discharge in mulched/unmulched catchments and ancillary DTM data collection;
3. Multivariate analysis of key factors, with special focus on rainfall (amount and intensity), ground cover (vegetation, stone, bare, mulch amount) and soil properties.
4. Desk study to select the best conservation design for the study area.

Project details

Group: Soil Physics and Land Management group
Project type: Thesis
Study programme: MIL & MEE

Begin date: 01-09-2023
End date: 01-06-2024

Used skills: data compilation, field work and statistics
Requirements: soil sciences knowledge

Contact

WUR Supervisor: Karrar Mahdi/Joao Nunes
Host Supervisor: Sergio A. Prats/José Muñoz-Rojas
Examiner: Coen Ritsema
Contact details: joao.carvalhonunes@wur.nl and karrar.mahdi@wur.nl
Soil monitoring in a regenerative organic farm, Spain

Country: Spain
Host institute: Regeneration Academy
Online possible?: No

**Project description**

- Are you passionate about regenerative farming and eager to dive deep into the intricacies of soil, and how different practices affect it? And would you like to live on a regenerative organic farm in the south of Spain?
- Join the research program at the regenerative academy! We collaborate with two regenerative farms in the South of Spain, La Junquera (7 years under regenerative agriculture) and Finca el Roble (just converted to regenerative agriculture).
- What can you do?:
  - Help us out with the creation of a soil monitoring plan.
  - What are the main parameters and indicators needed?
  - Which tools and resources do we need?
  - Compare different regenerative practices on farm (no-till, reduced tillage, conventional tillage // use of swales// cover crops// etc).
  - Compare moisture, carbon & soil life.
- Help us in general with soil monitoring
  - Taking soil samples, comparing fields, creating a soil map, where is erosion happening on the farms?, are there differences between crops?, where is the most macro-biodiversity?, can you compare the fields with GIS methods?.
- Join our Research Program at La Junquera and be a part of shaping the future of regenerative farming. During this program you will also get the opportunity to learn about how we manage the farm and help us out. Apply now to take on this exciting research opportunity!

**Project details**

Project type: Internship
Study programme: MIL / MEE / MIL & MEE
Begin date: March or September
End date: June or December

**Contact**

**Supervisor(s):** You need to find a supervisor at WUR, Clara Bosch will supervise from the Regeneration Academy.
**Examiner:** To be found at WUR
**Contact details:** email: Clara@regeneration-academy.org
**Website:** [https://www.regeneration-academy.org/](https://www.regeneration-academy.org/)
Soil health in Norway

Country: Wageningen / As, Norway
Host institute: Wageningen University/ NIBIO Norway

Spatial distribution of land use in Norway

Indicators of soil health

Project description
Soil degradation negatively impacts soil ecosystem services (ES), which is defined as the benefits people obtain from ecosystems. In Norway, the most prominent soil degradation processes are erosion by water, soil compaction, decline of soil organic matter and soil biodiversity loss. Methodologies and tools for assessing soils are necessary to monitor soil degradation, to evaluate land management strategies, whilst also considering soil ES that are beneficial to human beings. The concept of soil health has recently gained attention in this regard. The Food and Agriculture Organization of the United Nations (FAO, 2008) defines soil health as:

"the capacity of soil to function as a living system, with ecosystem and land-use boundaries, to sustain plant and animal productivity, maintain or enhance water and air quality, and promote plant and animal health. [...]". Soil health cannot be measured directly, but is evaluated through measurements of physical, chemical and biological soil indicators. In this thesis, you are invited to come to Norway to assess soil health through soil sampling, lab and data analysis. Your approach can of course be adapted according to your interests and will depend also on the travel restrictions / possibilities related to the development of the COVID Pandemic.

Project details
Group: Soil Physics and Land Management group
Project type: Thesis / Internship / Research practice
Study programme: MIL / MEE / MIL & MEE

Contact
Supervisor(s): Loes van Schaik, Frederik Boe, Jannes Stolte
Examiner: tbd
Contact details: loes.vanschaik@wur.nl

Begin date: any time
End date:
Soil texture determination: comparison of different methods

Country: Wageningen
Host institute: Soil Physics Lab, Wageningen University

Project Description

The classical soil texture determination is done by sieving and sedimentation analysis. As a large part of the scientific literature in which soil texture is related to soil functioning is based on soil texture as measured with this method, it is known as the reference method for soil texture determination. This is a very labor intensive method. The classification of soil particles in size groups (clay, silt, sand) with this method is based on an equivalent particle diameter which is derived from the theoretical rate of sedimentation of particles with a spherical shape in the water column. Laser spectroscopy has been used as a quicker method for texture measurements. However due to the shape of clay particles, their influence on the diffraction of the laser beams is very different than that of spherical particles, leading to a strong underestimation of clay. The QICPIC is a relatively new method for particle size analysis, based on dynamic image analysis, which is still under development. The method seems to have the advantage that the form and size of all the particles can be analysed. The question however is how these measurements relate to the classical method of sieving and sedimentation and whether the additional information on form and size has adds our understanding of the influence of clay particles in soil functioning.

Project details

Group: Soil Physics and Land Management group
Project type: Thesis / Internship / Research practice
Study programme: MIL / MEE / MIL & MEE

Begin date: any time
End date: 

Contact

Supervisor(s): Loes van Schaik, Harm Gooren
Examiner: tbd
Contact details: loes.vanschaik@wur.nl; Harm.Gooren@wur.nl
Global meta-analysis of the impact of cross-slope barriers on soil carbon sequestration

Country: Netherlands
Host institute: Wageningen University
Online possible: Yes

Project description

Problem context
Converting land from natural to agricultural use is generally associated with a decline in soil organic carbon. Carbon sequestration in agricultural land is therefore seen as one way in which the agricultural sector can contribute to climate change mitigation. Results obtained in this regard tend to vary broadly, depending on multiple factors such as climatic conditions, soil type, soil depth and time span considered, and technology applied. Whereas multiple meta-analyses exist for restoration measures such as agroforestry, cover crops and reduced and no-till systems, there is no systematic review of the effects of cross-slope barriers such as soil bunds and terraces on soil carbon sequestration.

Research Objective/Question
What is the effect of cross-slope barriers on soil carbon sequestration, and is this effect sensitive to factors such as climate, soil type, soil depth, and time? The objective of this study is to systematically review the available evidence for this question.

What is expected from the student (type of research)
Build upon an initial analysis and conduct a global meta-analysis based on published papers and other sources. The activities will consist of querying research databases, literature review to extract measured data, statistical analysis and writing up of the results.

Project details

Group: Soil Physics and Land Management group
Project type: Thesis (SLM-80336)
Begin date: Flexible
End date: 
Used skills: Literature review, meta-analysis
Requirements: Some knowledge on statistics

Contact

Supervisor: Luuk Fleskens
Examiner: 
Contact details: luuk.fleskens@wur.nl
Project description

Problem context

Three of the principal research themes of the soil conservation researchers at CESAM are the understanding of: (i) wildfire-enhanced soil erosion processes and their mitigation; (ii) post-fire soil and ecosystem carbon fluxes; (iii) soil improvement through biochar application.

Research Objective/Question

Depending on the interests of the student, and the time of the year, several research topics can be formulated, e.g.:

- measuring and/or modelling of post-fire soil erosion and wildfire ash mobilization and the effectiveness of emergency stabilization measures such as mulching;
- measuring the so-called Birch effect from wildfire ash, i.e. carbon effluxes induced by simulated rainfall;
- measuring the impacts of biochar type and application rates on the sponge function of soils.

What is expected from the student (type of research)

Ideally, the student will do a mix of fieldwork, laboratory work and data analysis or modeling, with the focus of the efforts depending on the research topic. Fieldwork could consist of recording or measuring vegetation and soil properties (e.g. soil water repellency), collecting eroded sediment and soil samples, and gathering data from rainfall and soil moisture sensors. Laboratory work could include the laboratory analysis of collected soil and eroded sediment samples, doing rainfall simulations on soil columns, or simulating rainfall-runon events of wildfire ash mobilization.

Project details

Group: Soil Physics and Land Management group
Project type: Thesis / Internship / Research practice
Study programme: MIL & MEE
Begin date: tbd
End date: tbd

Used skills: varying with project, but e.g. GIS, modelling, data analysis, fieldwork
Requirements: see above

Contact

Supervisor(s): Jantiene Baartman, Jacob Keizer, Frank Verheijen
 Examiner: Coen Ritsema
Contact details: jantiene.baartman@wur.nl
The impacts of global change on soil health and ecosystem services in Mediterranean environments

Country: Spain
Host institute: Spanish Research Council (CEBAS-CSIC)
Online possible: No

Project description

At the Soil and Water Conservation Research Group in Murcia (Spain), we focus on monitoring and modelling the impacts of global change and Sustainable Land Management (SLM) on soil health, water security, and ecosystem services in Mediterranean and semi-arid environments. We aim to assess the potential of SLM for climate change adaptation and mitigation and for holistic landscape restoration.

We monitor the farm level impacts of SLM practices on soil health indicators in collaboration with farmers at 12 experimental farms, including 2 farms with long-term monitoring data (>10yr). This includes, for example, indicators of chemical, physical and biological soil health, greenhouse gas fluxes, soil erosion, and crop yield.

We develop and apply hydrological and soil erosion models to assess the regional scale impacts of global change and SLM. These models are often tested in a catchment with high field data availability, and applied to larger catchments to assess the upscaling potential of adaptation measures (e.g. SLM, Nature-based Solutions, landscape restoration).

We use the outcomes of monitoring and modelling and additional data collection (literature, interviews, workshops) to identify and evaluate scenarios for holistic landscape restoration using integrated cost-benefit analyses and Multi Criteria Analysis.

Possible thesis topics include:
- Identification of indicators to monitor soil health at different scales in Mediterranean environments.
- Evaluation of the farm-scale impacts of SLM practices on soil physical properties and water availability.
- Modelling the regional scale impacts of climate change on soil erosion and water security (SPHY-MMF).
- Development of a catchment-scale carbon budget under different land use scenarios.
- Integrated evaluation of local and regional scale impacts of Regenerative Agriculture (MCA, cost-benefit)

Project details

Group: Soil Physics and Land Management group
Project type: Thesis / Internship / Research practice
Study programme: MIL / MEE / MIL & MEE
Begin date: tbd
End date: tbd

Used skills: depending on the topic; fieldwork, laboratory analysis, GIS, modelling, interviewing, MCA analysis
Requirements: tbd, depending on the topic

Contact

Supervisor(s): Jantiene Baartman, María Martinez-Mena, Carolina Boix-Fayos, Joris de Vente, Joris Eekhout
Examiner: Coen Ritsema
Contact details: jantiene.baartman@wur.nl
Wildfire effect on soil erosion and plant recovery and post-fire conservation measures

Country: Spain
Host institute: Castilla La Mancha University (Albacete Campus)
Online possible: To be discussed

Project description

Problem context
Wildfires disturb Mediterranean ecosystems and affect soil hydrological properties, often leading to increased runoff and erosion. To mitigate fire effects, prescribed fires are used to removes or reduces the plant material that is prone to forest fires by creating fuel discontinuity and minimising fire intensity. This forest management measure potentially impacts Mediterranean ecosystems’ hydrological response and plant biodiversity by influencing water infiltration into soil and directly burning vegetation.

Postfire restoration practices encompass those which aim to reduce negative wildfire impacts and to improve burned area rehabilitation. Mulching, Contour-felled log debris (CFD) and log erosion barriers (LEB) are techniques used worldwide on hillslopes after wildfires in order to avoid soil erosion. In this context, it is essential to evaluate how these restoration techniques can affect soil and plant ecosystems by increasing or decreasing wildfire impacts.

Research Objective/Question
Multiple research questions can be addressed, depending on the student’s interests and the host availability. E.g.:
- To evaluate the effects of prescribed fires severity on soil erosion and plant diversity under semiarid conditions.
- To evaluate the effects of postfire hillslope stabilisation techniques (Mulching, log erosion barriers and contour-felled log debris) on soil quality, nutrient content and plant biodiversity.

What is expected from the student (type of research): Research methods vary and may include:
• Fieldwork including soil and plant biodiversity surveys and biomarkers of the soil microbial community’s functional ability, such as soil enzyme activities, microbiological soil parameters and soil nutrient content.
• Lab analyses including soil bulk density and other physicochemical soil properties (soil texture, OM, ...)
• Statistical analyses work
• Soil erosion modelling

Project details

Group: Soil Physics and Land Management group
Project type: Thesis / Internship / Research practice
Study programme: MIL & MEE

Begin date: tbd
End date: tbd

Used skills: varying with project, but e.g. GIS, modelling, data analysis, fieldwork

Contact

Supervisor(s): Jantiene Baartman & Manuel Esteban Lucas Borja
Examiner: Coen Ritsema
Contact details: jantiene.baartman@wur.nl
Assessing and mitigating long-term soil and organic matter losses following wildfires

Country: Portugal
Host institute: University of Evora – MED
Online possible: Yes

Project description

Problem context

Wildfires can lead to considerable changes in geo-morphological and hydrological processes. Researchers have shown extreme erosion responses after fire, especially during the first post-fire year. The remaining soil organic matter (OM) can also be eroded off-site of the burned area, with potential negative consequences for soil quality. However, the long-term impacts of fires (above 10 years) are still poorly understood. Soil erosion models could help assess the costs and benefits of applying mitigation measures, but they are still untested on long-term datasets, which are scarce.

Research Objective: assess the long-term soil degradation after fires, and its mitigation with novel mulch-based treatments. The workplan can include one or more of the following objectives:

1. Compile and analyze existing long-term datasets for soil erosion and organic matter losses in the Western Iberian Peninsula and collect ancillary data (rainfall, ground cover, soil descriptors, etc.);
2. Assess the suitability of simple soil erosion models (e.g. MMF, RUSLE) to predict soil erosion and OM losses using the above-mentioned dataset;
3. Assess the effectiveness of new much-based mitigation measures to mitigate soil and OM losses.

Expected research methods: the workplan can involve the following tasks:

1. Processing and multivariate statistical analysis of long-term erosion data, and ancillary data such as rainfall, ground cover, soil properties, or mulch application.
2. Soil erosion modelling, including initial parametrization, model calibration and validation.

Project details

Group: Soil Physics and Land Management group
Project type: Thesis
Study programme: MIL & MEE

Begin date: after 01-09-2023
End date: before 01-06-2024

Used skills: Modelling, data compilation
Requirements: soil sciences knowledge

Contact

WUR Supervisor: Joao Nunes
Host Supervisor: Sergio A. Prats
Examiner: Coen Ritsema
Contact details: joao.carvalhonunes@wur.nl
Soil compaction affects crop growth. This can be hampered by limitations of water and air management and rootability. It is only known to a limited extent which of these three factors is the most decisive and how they differ for the various soil types and crops. Boone (1988) and Håkansson & Lipiec (2000) have already given indications in their studies how the various factors depend on the pore pressure and density/porosity. If it is not sufficiently known which factors inhibit plant growth, it is also impossible to properly assess whether a soil can be regarded as compacted and whether this applies to all crops. Soil compaction in the field is now often determined on the basis of dry bulk density and resistance to penetration. However, it appears that these two values cannot properly explain the reduction in plant growth. Also because, if provided with sufficient water and nutrients, plants can grow well even in highly compacted soils.

The aim of the research is to determine the consequences of soil compaction on plant growth and water management, as a result of which:

- It is easier to predict which drought and wetness damage crops will incur with further soil compaction.
- It can be better determined and measured to what extent which soils are compacted or are sensitive to compaction.
- Targeted measures can be indicated to prevent further soil compaction and the negative consequences for plant growth caused by agricultural vehicles.

**Project details**

- **Group:** Soil Physics and Land Management group
- **Project type:** Thesis / Internship
- **Study programme:** MIL & MEE
- **Begin and end date:** to be decided with the student
- **Used skills:** vary with the sub-topic but can include fieldwork or modelling
- **Requirements:** varies with the sub-topic selected

**Contact**

- **Supervisor(s):** Loes van Schaik / Jos van Dam, Guido Bakema
- **Examiner:** Coen Ritsema
- **Contact details:** loes.vanschaik@wur.nl, guidobakema@wur.nl
Introduction
The Geldersch Landschap & Kastelen (GLK) manages a large number of (natural) sites, including Natura 2000 areas. Eco-hydrological conditions are of great importance for the preservation of the natural values for many sites. These conditions are under pressure for a number of these sites. GLK requests a hydrological model research carried out for these sites in order to gain insight into the current eco-hydrological conditions, to identify possible causes of deterioration of the natural values and how potential measures can be carried to restore these conditions.

Several estates within the cluster Doorwerth (Castle Doorwerth, Duno, Oorsprong and Zilverberg) contain a large diversity in hydrological conditions and flora. At the transition from ice pushed ridges and the floodplains of the Rhine different ecosystems can be distinguished; rain water fed higher areas, springs at the lower parts of the ridges and upward seepage in the floodplains next to the ridges.

Objective
An analysis of the regional hydrological system through modeling to capture the main hydrological aspects of the area at Doorwerth.

Project details
Group: Soil Physics and Land Management group
Project type: Thesis / Internship / Research practice
Study programme: MIL / MEE / MIL & MEE

Contact
Supervisor(s): George Bier
Examiner: tbd
Contact details: George.bier@wur.nl
Investigate alternative water sources for the fosse of Hoekelum Estate

Country: Netherlands
Host institute: Wageningen University

Introduction
The Geldersch Landschap & Kastelen (GLK) manages a large number of (natural) sites, including Natura 2000 areas. Eco-hydrological conditions are of great importance for the preservation of the natural values for many sites. These conditions are under pressure for a number of these sites.

GLK requests a hydrological model research carried out for these sites in order to gain insight into the current eco-hydrological conditions, to identify possible causes of deterioration of the natural values and how potential measures can be carried to restore these conditions.

The estate Hoekelum, located between Ede and Bennekom, suffers from the changed hydrological conditions over past decades. The water level of the fosse (NL: gracht) can now only be maintained with pumping from the subsoil which is far from optimal. Originally the fosse was fed from the ice pushed ridge. Later on a spring was dug for this purpose but due to water management measures in the surrounding area the spring fell dry.

Objective
An analysis of the hydrological system, through modeling, to obtain insight in the current hydrological conditions and investigate measures to retain the water capacity of the dug spring.

Project details
Group: Soil Physics and Land Management group
Project type: Thesis / Internship / Research practice
Study programme: MIL / MEE / MIL & MEE

Contact
Supervisor(s): George Bier
Examiner: tbd
Contact details: George.bier@wur.nl
Measures to improve eco-hydrological conditions fen-meadow in Kraaigraaf

Country: Netherlands
Host institute: Wageningen University

Introduction
The Geldersch Landschap & Kastelen (GLK) manages a large number of (natural) sites, including Natura 2000 areas. Eco-hydrological conditions are of great importance for the preservation of the natural values for many sites. These conditions are under pressure for a number of these sites.

GLK requests a hydrological model research carried out for these sites in order to gain insight into the current eco-hydrological conditions, to identify possible causes of deterioration of the natural values and how potential measures can be carried to restore these conditions.

Kraaigraaf is a nature area north west of Twello which contains fen-meadows (NL:blauwgrasladen) which depend heavily on wet conditions (upward seepage) of good quality. Although the terrain is small (19 hectares) the fen-meadows have good potential in further development and expansion.

Objective
An analysis of the hydrological system, through modeling, to obtain insight in the current hydrological conditions and investigate measures to improve the conditions to extend the area with fen-meadows.

Project details
Group: Soil Physics and Land Management group
Project type: Thesis / Internship / Research practice
Study programme: MIL / MEE / MIL & MEE

Begin date: any time
End date: 

Contact
Supervisor(s): George Bier
Examiner: tbd
Contact details: George.bier@wur.nl
Measures to improve water management Panovenpas

Country: Netherlands
Host institute: Wageningen University

Introduction
The Geldersch Landschap & Kastelen (GLK) manages a large number of (natural) sites, including Natura 2000 areas. Eco-hydrological conditions are of great importance for the preservation of the natural values for many sites. These conditions are under pressure for a number of these sites.

GLK requests a hydrological model research carried out for these sites in order to gain insight into the current eco-hydrological conditions, to identify possible causes of deterioration of the natural values and how potential measures can be carried to restore these conditions.

Panovenpas a small forest in the floodplains of the Waal near Dodewaard and contains an abundance of Rough Horsetail (NL:Schaafstro). Due to poor hydrological conditions the nature area is hardly passable making maintenance of the site laborious.

Objective
An analysis of the hydrological system, through modeling, to obtain insight in the current hydrological conditions and investigate measures to improve the water management in and around the area of the site.

Project details
Group: Soil Physics and Land Management group
Project type: Thesis / Internship / Research practice
Study programme: MIL / MEE / MIL & MEE

Begin date: any time
End date:

Contact

Supervisor(s): George Bier
Examiner: tbd
Contact details: George.bier@wur.nl
Introduction
The higher sandy regions are increasingly confronted with drought in agriculture and nature, due to discrepancy between precipitation and evapotranspiration demand, and interventions in the past to remove excess water preventing flooding, use of groundwater for drinking, industry and agriculture and reduced groundwater recharge due to land use changes (e.g., pine forests planting). Sandy regions with a mosaic of intertwined functions with conflicting water requirements (mainly nature, agriculture, drinking water companies) oppose to optimize for all functions.

Objective/research question
How can measures in the drainage network of ditches and watercourses improve water retention in higher sandy regions? What is the contribution of measures in the tertiary (small ditches along agricultural fields) compared to measures in the secondary and primary drainage network (watercourses managed by water boards).

Approach
• Familiarize with the current available regional models (I-MOD)
• Set up catchment-scale models to analyze (1) the groundwater drainage process in time and space and (2) effects of different measures in the drainage system on water retention, groundwater levels and catchment discharge.
• Translate effects on groundwater levels to consequences for agriculture and nature using the Waterwijzers Landbouw and Natuur.
• Optimize the catchment drainage network to fulfill as good as possible the different requirements of agriculture and nature in the catchment.

Project details
| Group: | Soil Physics and Land Management group |
| Project type: | Thesis / Internship / Research practice |
| Study programme: | MIL / MEE / MIL & MEE |

Begin date: any time

Used skills: 

Requirements:

Contact
Supervisor(s): George Bier / Perry de Louw
Examiner: 
Contact details: george.bier@wur.nl
Project description

In the Meuse River bank protections are removed to create conditions for nature friendly banks. Unprotected banks do erode because of ship waves and during floods. Depending on the composition of the banks, the eroded sediments deposit in the river or are transported downstream. In 2022 a BSc thesis project assessed the erosion volumes based on digital terrain models for the period 1997 to 2020 (AHN1-4) (van Houten 2022: Quantifying erosion rates of the natural and nature-friendly banks of the Meuse river). For the sediment balance of the Meuse River it is important to know the composition of the eroded bank material (clay, silt, sand or gravel) and assess the uncertainty of the eroded volumes.

Purpose of the project is to extend the analysis of van Houten (2022) related to the composition of the eroded bank material and an assessment of the uncertainties involved.

For the composition of the eroded material the BRO (Basis Registratie Ondergrond) provides relevant information and particular the GeoTop model (https://basisregistratieondergrond.nl/inhoud-bro/registratieobjecten/modellen/geotop-gtm/). Through combination of the GIS information on the erosion volumes (van Houten, 2022) and the GeoTop model, information on the volumes of eroded clay, silt, sand and gravel may be generated.
For the uncertainty band the accuracy of the base data as well as a combination of calculated erosion volumes with field data and data on bank protection (no erosion expected) provides further insights.

Project details

Group: Hydrology and Quantitative Water Management
Group & Soil Physics and Land Management group
Project type: Thesis
Study programme: MIL & MEE
Begin date: February 2023
End date: August 2023

Used skills: GIS, uncertainty assessment
Requirements: GIS, basic programming + affinity with sediment erosion and sediment transport processes.

Contact

Supervisor(s): Hermjan Barneveld (HWM), Jantiene Baartman (SLM)
Examiner: Coen Ritsema
Contact details: hermjan.barneveld@wur.nl, 06 22571112 or jantiene.baartman@wur.nl
Project description

In the western Mediterranean region, a decrease in streamflow and, consequently, in water availability for irrigation has been observed in the last decades. This is often associated with climate change whose impacts are already being felt. However, there have also been important changes in land use and land management that could contribute to this situation by increasing evapotranspiration, such as the replacement of crops by pasturing, the rewilding of abandoned farmlands, or an increase in irrigation use by small farms.

The two processes are difficult to separate, also due to the irregularity of rainfall in Mediterranean climates. Hydrological modelling can therefore be very useful to unravel the contribution of these different factors, given the existence of long hydrological time series for calibration. This is the main aim of this research.

The proposed workplan is to apply the Soil & Water Assessment Tool (SWAT) eco-hydrological model to the Sorraia watershed in Portugal, which is the focus of several research projects on agriculture sustainability due to the presence of a large-scale irrigation infrastructure. The model would be used to assess one or more of the following topics:

1) water balance under different land management practices, including present-day land-use, historical land-use (last 30 years), and natural vegetation cover;
2) impacts of recent climate change (last 50 years) on hydrological drought, without land management;
3) role of land management in enhancing or mitigating hydrological droughts;
4) potential impacts of future climate change on hydrological droughts under different land management.

Project details

Group: Soil Physics and Land Management group
Project type: Thesis
Study programme: MIL & MEE

Begin date: anytime
End date: anytime

Used skills: GIS analysis, numerical modelling
Requirements: knowledge of GIS

Contact

Supervisor(s): Joao Pedro Nunes
Examiner: Coen Ritsema
Contact details: joao.carvalhonunes@wur.nl
Project description

The Beekbergerwoud is considered to be the last primeval forest of the Netherlands before it was deforested and turned into grasslands in 1780. Natuurmonuments (owner) started restoration measures (affecting local water management and elevations) in 2006 to turn this area back into its original state.

Research question:
Are the undertaken restoration measures sufficient to have a resilient natural forest at this location?

Approach:
Use and analysis of various documents and data, setting up a regional groundwater model with MODFLOW including UZF simulating the unsaturated zone flow.

Project details

Group: Soil Physics and Land Management group
Project type: Thesis / Internship
Study programme: MIL & MEE
Begin and end date: to be decided with the student
Used skills: can include fieldwork and modelling
Requirements: SLM33306 Advanced Hydrological Systems
Analysis

Contact

Supervisor(s): Klaas Metselaar / George Bier
Examiner: Klaas Metselaar / George Bier
Contact details: klaas.metselaar@wur.nl george.bier@wur.nl
Bio-irrigation – an exploratory analysis

Country: Netherlands
Host institute: SLM, together with Plant Production Systems

Project description

It is known that some species take up water but then "lose" it on the way up. This sounds really inefficient and a waste of energy, but is it? For a mixed cropping system this could be beneficial, but how large could this effect be? We will analyse this system using a model, which you have to formulate yourself. The idea is to provide an order of magnitude estimate- of course if the irrigating crop loses all its water it will die. Can we provide a more specific answer? Currently there are claims that this would be a very rational and surprisingly efficient way of setting up cropping systems. Is it?

Reference
Hydraulic Redistribution by Native Sahelian Shrubs: Bioirrigation to Resist In-Season Drought

Project details

Group: Soil Physics and Land Management group
Project type: Thesis / Internship / Research practice
Study programme: MIL / MEE / MIL & MEE

Begin date: any time
End date:

Contact

Supervisor(s): Klaas Metselaar
Examiner: tbd
Contact details: klaas.metselaar@wur.nl
Water transfers of indigenous versus exotic trees species, growing in Mediterranean forest of Chile

Country: Chile
Host institute: Universidad Adolfo Ibañez

Project description

Mediterranean regions, such as the central-south zone of Chile, are particularly vulnerable to water availability changes as they often are very populated and productive zones. The gradual decrease in precipitation and streamflow in these regions has affected ecosystem water yield and productivity. Climate change projections predict more severe droughts. Previous studies did show the negative and positive effects of Pinus Radiata plantations and native forests on catchment water yield. Therefore, finding a trade-off between native and plantation covers is needed to ensure both present and future ecosystem productivity and water yield. Process-based eco-hydrological models link local vegetation productivity with streamflow production. However, most models fit accurately to agricultural areas and show biases and errors in forest ecosystems.

Our main goal is to improve forest water yield and productivity quantification from local to catchment scale by accurately predicting water balance components and ecohydrological thresholds.

The thesis should answer part of this problem, by implementing water transfers models such as HYDRUS or SWAP. An extensive experimental design is set up in the Cauquenes catchments in Central Chile, with several plots with soil moisture and sap flow data. However, complementary data of plant eco-physiological thresholds is required.

Project details

Group: Soil Physics and Land Management group
Project type: Thesis
Study programme: MIL / MEE / MIL & MEE

Begin date: April 2023
End date: Dec 2023

Required skills: GIS, ecohydrological modeling

Contact

Supervisor(s): Mauricio Galleguillos (Chile), Jos van Dam
Examiner: Jos van Dam

Contact details: m.galleguillos@uai.cl
jos.vandam@wur.nl
Deficit irrigation strategies and crop yields

Country: Israel
Host institute: Gilat Research center

Project description

Problem context
In the Middle East, freshwater amounts are very limited. Israel is performing extensive lysimeter research to investigate the effects of deficit irrigation and various salinity levels on agricultural production. At Gilat Research Centre, long term irrigation experiments are performed with varying water quantities, qualities and crops. Among other applications, the lysimeter data are used to calibrate agrohydrological models such as SWAP (Soil Water Air Plant) of Wageningen University and Research center. The calibrated SWAP can be used to analyse irrigation and drainage design in water deficit regions in the Middle East and beyond.

Examples of earlier projects
• Irrigation water strategy for grape vines (Joost Iwema)
• The impact of soil salinization on Olive trees (Rocio Ramirez Crisostomo)
• Use of tree dendrometer data to optimize water productivity in Olive orchards (Janine de Wit)
• Monitoring avocado tree water status (Jop van der Wel)

What is expected from the student (type of research)
• Active participation in ongoing research program
• Perform measurements at field sites, with lysimeters or in the laboratory
• Sound analysis of collected data, including the application of agrohydrological models

Project details

Group: Soil Physics and Land Management group
Project type: Thesis (SLM-80336)
Begin date: flexible
End date: flexible

Used skills: measurement, data analysis
Requirements: knowledge water – soil – plant relations

Contact

Supervisor: Alon Ben Gal
Examiner: Jos van Dam
Contact details: jos.vandam@wur.nl
Drought and oxygen stress in clay soils

Country: The Netherlands
Host institute: Wageningen Environmental Research
Online possible: Yes

Project description

Potentially clay soils are very fertile. Nevertheless, proper cultivation of clay soils is hard as they may change rapidly in soil moisture content and trafficability in dry and wet periods. Also, in agrohydrological modelling proper simulation of drought- and oxygen stress in clay soils is still a challenge.

In the Netherlands, recently the model instrument ‘WaterVision Agriculture’ became available (see site waterwijzerlandbouw.wur.nl). This instrument simulates the effects of soils, water, farm management and climate change on agricultural production. It includes the hydrological model SWAP and the generic crop growth model WOFOST, and simulates in detail the effects of dry, wet or saline conditions in the root zone.

Although WaterVision Agriculture shows good results for sandy and loamy soils, the results for clay soils are less reliable. In this master thesis research, you investigate the reliability of current and alternative modeling concepts for clay soils.

Project details

Group: Soil Physics and Land Management
Project type: Thesis
Begin date: flexible
Used skills: agrohydrological modeling
Requirements: Atmosphere Vegetation Soil Interactions

Contact

Supervisor(s): Marius Heinen (WENR)
Examiner: Jos van Dam (SLM)
Contact details: jos.vandam@wur.nl
Legume crops are important and sustainable protein suppliers for human diet and their capacity to fix nitrogen from the atmosphere may also contribute to improve soil fertility. However, pesticide residues, aggravated with microplastic contamination, may have a negative effect in symbiotic relationships with N-fixing bacteria and, therefore, restrict those benefits.

Research objective/question
This MSc thesis intends to evaluate the effect of pesticide residues and microplastics on the growth of leguminous plants and on their symbiosis with N-fixing bacteria. It will involve a field/mesocosms experiment.

What is expected from the student (type of research)
• Motivation, responsibility and curiosity;
• Interest in designing and conducting controlled experiments;
• Data management and analysis;
• Fluency in English.

Project details
Group: Soil Physics and Land Management group
Project type: Thesis / Internship / Research practice
Study programme: MIL & MEE

Begin date: flexible, but ideally as soon as possible
End date: flexible

Used skills:
Requirements:

Contact
Supervisors (WUR): Vera Silva, Esperanza Huerta Lwanga,
Supervisors (host institution): Abel Veloso, Carmo Horta,
Maria Paula Simões
Examiner: Violette Geissen
Contact details: abel.veloso@wur.nl
Peat bog patterns: a journey of discovery.

Country: Netherlands
Host institute: WUR

Project description

Problem context
The pictures above tell the story – can we come up with hypotheses as to which processes lead to the formation of these patterns? There are many competing hypotheses which you could discuss and compare, using image analysis, climate data, and modelling approaches. It will be fun to include experimental – small scale approaches. Let’s discuss. The underlying problem of course is that of climate change, carbon sequestration and ecosystem stability or resilience.

Project details

Group: Soil Physics and Land Management group
Project type: Thesis (SLM-80336)
Begin date: 
End date: 

Used skills: modelling measuring literature
Requirements: interest in image analysis

Contact

Supervisor: Klaas Metselaar
Examiner: tbd
Contact details: klaas.metselaar@wur.nl
Vertical walls: how much water is needed?

Country: Netherlands
Host institute: WUR

Project description

Problem context
In urban greening one of the most expensive solutions are green walls. Especially if the vegetation is planted not at soil level irrigation systems are needed. When planted at soil level, the exposition will influence the water balance quite a bit. So we will look at a model system, and will need a lot of discussions with meteorologists.

Project details

Group: Soil Physics and Land Management group
Project type: Thesis (SLM-80336)
Begin date: 
End date: 
Used skills: modelling, measuring, literature.
Requirements: lots of water

Contact

Supervisor: Klaas Metselaar
Examiner: tbd
Contact details: klaas.metselaar@wur.nl
Almond growth, what are the determining factors?

Country: Spain  
Host institute: Regeneration Academy  
Online possible?: No

Project description

• Are you passionate about regenerative farming and eager to dive deep into the intricacies of almond growth? Look no further! La Junquera, a regenerative farm in Spain, is currently seeking a motivated student to conduct research on the factors that influence the growth of almonds.

• Our farm has observed that almonds grown with "tillage" tend to grow faster than those grown under "reduced tillage + vegetation strips ~1m" or "full ground cover." We believe that competition for water and the influence of tillage on capillary rise may play a role in this outcome.

• As part of your research, you will have the opportunity to investigate these hypotheses and determine the specific factors that have the most impact on almond growth. This project is ideal for students pursuing a master's thesis or internship.

• Join our Research Program at La Junquera and be a part of shaping the future of regenerative farming. During this program you will also get the opportunity to learn about how we manage the farm and help us out. Apply now to take on this exciting research opportunity!

Project details

Group: Soil Physics and Land Management group  
Project type: Internship  
Study programme: MIL / MEE / MIL & MEE

Begin date: March or September  
End date: June or December

Used skills: Carry on your own research  
Requirements: Research material from WUR (Humidity sensors)

Contact

Supervisor(s): You need to find a supervisor at WUR, Clara Bosch will supervise from the Regeneration Academy.  
Examiner: To be found at WUR  
Contact details: email: Clara@regeneration-academy.org  
Website: https://www.regeneration-academy.org/
Effect of the cocktail of microplastics on earthworms and coleoptera larvae

Country: Netherlands
Host institute: Wageningen University

Project description

Soil invertebrates, as earthworms are good indicators of soil quality and in recent years it has been investigated how microplastics produce an effect on the biology and ecology of these organisms. When concentrations are high, these invertebrates less weight and consequently die. Coleoptera larvae, are important also in the organic matter decomposition cycle. One of the objectives of the H2020-MINAGRIS project is to assess the effect of low concentrations of different types of microplastics (alone or in combination with other stressors) on earthworms and coleoptera larvae. Therefore, experiments in laboratory will be carried out. We welcome students for Master thesis or internship. If you want to know more over the MINAGRIS project, go to: www.minagris.eu.

Project details

Group: Soil Physics and Land Management group
Project type: Thesis / Internship / Research practice
Study programme: MIL / MEE / MIL & MEE

Begin date: 15 May 2023
End date: 20 September 2023

required skills: laboratory experience is well appreciated

Contact

Supervisor(s): Meng Fanrong
Examiner: Esperanza Huerta Lwanga
Contact details: fanrong.meng@wur.nl & esperanza.huertalwanga@wur.nl
Transport of microplastics with pesticides by earthworms

Country: Netherlands
Host institute: Wageningen University

Project description

Soil ecosystem engineers as earthworms are good indicators of soil quality. In recent years it has been informed how microplastics can be transported by earthworms. One of the objectives of the H2020-MINAGRIS project is to assess the transport of microplastics by earthworms, with different types of soils, different types of plastics and with or without other stressors as pesticides. Therefore, experiments in laboratory will be carried out. We welcome students for Master thesis or internships. If you want to know more over the MINAGRIS project, contact us or go to: www.minagris.eu.

Project details

Group: Soil Physics and Land Management group
Project type: Thesis / Internship / Research practice
Study programme: MIL / MEE / MIL & MEE
Begin date: 15 May 2023
End date: 15 September 2023

required skills: laboratory experience is well appreciated

Contact

Supervisor(s): Meng Fanrong, Esperanza Huerta Lwanga
Examiner: Xiaomei Yang
Contact details: esperanza.huertalwanga@wur.nl
Project description

Ants are also considered soil ecosystem engineers due to different modifications that they can produce in soils. In recent years it has been informed how microplastics can be transported by different soil invertebrates, but on ants it has not been explored. One of the objectives of the H2020-MINAGRIS project is to assess the transport of microplastics by ants, with different types of soils, and different types of plastics and with or without other stressors as pesticides. Therefore, experiments in laboratory will be carried out. We welcome students for Master thesis or internships. If you want to know more over the MINAGRIS project, contact us or go to: www.minagris.eu.

Project details

Group: Soil Physics and Land Management group
Project type: Thesis / Internship / Research practice
Study programme: MIL / MEE / MIL & MEE
Begin date: 15 May 2023
End date: 15 September 2023
required skills: laboratory experience is well appreciated

Contact

Supervisor(s): Kayode Jegede
Examiner: Esperanza Huerta Lwanga
Contact details: esperanza.huertalwanga@wur.nl
Pesticide registration relies strongly on the outcomes of EFSA risk assessment procedures, which use exposure proxies. These exposure proxies, PECs in the case of soil (predicted environmental concentrations in soil), are obtained by simple modeling exercises. Despite the relevance of PECs in the pesticide approval decision, these predicted values lack field validation. This happens due to the difficulty to gather detailed pesticide application records, and the high analytical costs and know-how necessary to analyze the different pesticide residues across environmental matrices, in space and time.

Preliminary data from the H2020 SPRINT project (coordinated by the SLM group), from 10 case study sites in Europe, suggest that predictions in soil (PECs) are hardly representative of the actual pesticide levels in soil, and that the EC procedure may require some correction factors for more realistic risk assessments.

In this thesis, we would like to explore the PECs – MECs (measured environmental concentration in soil) relationship. For that, the student is expected to

i) collect application data and soil samples from Unifarm experimental fields (the possibility to extend to other SPRINT-involved countries can be discussed – see the list here: [https://sprint-h2020.eu/index.php/project-information/case-studies](https://sprint-h2020.eu/index.php/project-information/case-studies))

ii) analyze selected pesticide residues in soil samples, in SLM- WFSR (Wageningen Food Safety Research) facilities

iii) and explore approaches to derive corrections factors, which will be of high relevance for soil and pesticide-related political context.

**Project details**

**Group:** Soil Physics and Land Management group  
**Project type:** Thesis  
**Study programme:** MIL / MEE / MIL & MEE

**Begin date:** flexible  
**End date:** flexible

**Used skills:** -  
**Requirements:** -

**Contact**

**Supervisor(s):** Vera Silva and Dennis Knuth  
**Examiner:** Violette Geissen  
**Contact details:** [vera.felixdagracasilva@wur.nl](mailto:vera.felixdagracasilva@wur.nl)
Impacts of pesticide mixtures on key aquatic producers species

Country: Portugal
Host institute: University of Aveiro – Departments of Biology and Environment
Online possible? : No

Project description

Problem context

Agriculture is highly dependent on the use of pesticides to maximise crop yields. However, some pesticides are potentially harmful to environmental, animal and human health. Data on the risks and impacts of pesticides are, at present, fragmented and incomplete. There is, therefore, a need to deliver an integrated approach to fill this data gap. Hence, the European Project SPRINT- Sustainable Plant Protection Transition: A Global Health Approach (https://sprint-h2020.eu/) will develop and test an integrated global health approach to assessing the risks and impacts of pesticides on environmental, crop, livestock and human health, thus contributing to accelerate the transition towards more sustainable pesticide use.

Research objective

• Under the scope of the SPRINT Project, the main goal of this study is to assess the effects of pesticides mixture in two producer species (algae: Raphidocelis subcapitata and macrophyte: Lemna minor). To evaluate the possible causal link between ecotoxicological effects and pesticides mixture the growth rates of the R. subcapitata and L. minor, will be assessed.

What is expected from the student (type of research)

• Independence, responsibility and autonomy;
• Motivated and flexible;
• Interest in ecotoxicology;
• Interest in learning methodological procedures to conduct ecotoxicological assays;
• Data and statistical analyses.

Project details

Group: Soil Physics and Land Management group
Project type: Thesis / Internship
Study programme:

Begin date: to be determined
End date: to be determined

Used skills: litterature review, labwork, data analysis

Contact

Supervisor(s): Nelson Abrantes (UA)
Examiner:
Contact details: vera.felixdagracasilva@wur.nl
Agriculture is highly dependent on the use of pesticides to maximize crop yields. However, some pesticides are potentially harmful to environmental, animal and human health. In the SPRINT-project (https://sprint-h2020.eu/) we are simulating pesticides dispersion in the environment and exposure of ecosystems, crops, livestock and human health. One important route for pesticide transfer is via wind-erosion of agricultural land.

Research objective
This thesis project aims to assess wind-erosion of agricultural fields under different climatic conditions and influence on pesticide dispersion. The student would work with a previously developed wind erosion model. The student would do different simulations by fixing parameters and changing others to see what influences the transport of pesticides outside of the field the most. The student would also be involved in the verification of model results with measured data. Moreover, given the different possibilities to simulate the fate of particles in the environment, the student would study alternatives to the gaussian plume model.

What is expected from the student (type of research)
Independence, responsibility and autonomy;
Interest in learning statistical approaches for in-silico model verification
Data and statistical analyses.

Project details
Group: Soil Physics and Land Management group
Project type: Thesis / Internship
Study programme: 
Begin date: May or later (to be discussed)
End date: to be determined
Used skills: literature review, data analysis, spatial data (GIS)
Requirements: basic knowledge of statistics

Contact
Supervisor(s): Daniel Figueiredo (UU)
Examiner: Violette Geissen, WUR
Contact details: d.m.figueiredo@uu.nl
Project description

Agriculture is highly dependent on the use of pesticides to maximize crop yields. However, some pesticides are potentially harmful to environmental, animal and human health. In the SPRINT-project ([https://sprint-h2020.eu/](https://sprint-h2020.eu/)) we are developing a toolbox that will incorporate different data in order to assess integrated global health risks and impacts of pesticides on ecosystems, crops, livestock and human health.

Research objective

This thesis project aims to assess the exposure and risk of different farm animals to pesticide mixtures applied under different agricultural practices. To address these, the student will calculate both environmental exposure, as well as exposure from feed to cows and chickens. Silicone wristbands were used to measure pesticide concentrations in farm animals, and this will be used for verification of estimates. Finally, the incorporation of ecotox data on terrestrial species will allow for a proper risk assessment of pesticide mixtures. The result of this project will be a tool (e.g. calculator or equation) that uses several inputs and outputs a risk (e.g. low, medium, high).

What is expected from the student (type of research)

Independence, responsibility and autonomy;
Interest in learning statistical approaches for in-silico model verification
Data and statistical analyses.

Project details

Group: Soil Physics and Land Management group
Project type: Thesis / Internship
Study programme:

Begin date: May or later (to be discussed)
End date: to be determined

Used skills: literature review, data analysis, spatial data (GIS)
Requirements: basic knowledge of statistics

Contact

Supervisor(s): Daniel Figueiredo (UU)
Examiner: Violette Geissen, WUR
Contact details: d.m.figueiredo@uu.nl
Assess the impacts of pesticide mixtures in beneficial insects

Country: Portugal
Host institute: University of Aveiro – Departments of Biology and Environment
Online possible?: No

Project description

Problem context

Agriculture is highly dependent on the use of pesticides to maximise crop yields. However, some pesticides are potentially harmful to environmental, animal and human health. Data on the risks and impacts of pesticides are, at present, fragmented and incomplete. There is, therefore, a need to deliver an integrated approach to fill this data gap. Hence, the European Project SPRINT - Sustainable Plant Protection Transition: A Global Health Approach (https://sprint-h2020.eu/) will develop and test an integrated global health approach to assessing the risks and impacts of pesticides on environmental, crop, livestock and human health, thus contributing to accelerate the transition towards more sustainable pesticide use.

Beneficial insects provide natural ecosystem services as biological control and pollination. However, the effects of pesticides in this particular group have been largely neglected.

Under the scope of the SPRINT Project, the main goal of this study is to assess the effects of pesticides mixtures on beneficial insects, providing new important ecotoxicological information.

What is expected from the student (type of research)

• Independence, responsibility and autonomy;
• Motivated and flexible;
• Interest in ecotoxicology;
• Interest in learning methodological procedures to conduct ecotoxicological assays;
• Data and statistical analyses.

Project details

Group: Soil Physics and Land Management group
Project type: Thesis / Internship

Begin date: to be determined
End date: to be determined

Used skills: literature review, labwork, data analysis

Contact

Supervisor(s): Nelson Abrantes (UA)
Examiner:
Contact details: vera.felixdagracasilva@wur.nl
Current food production seems to be caught in a “vicious circle”: increasing pesticide use to increase yields, leading to worsening environmental degradation and escalating health costs. Re-evaluation of agronomic practices and implementation of strategies to overcome lock-ins of undesired status are necessary for safer and more sustainable production. The recently published Farm to Fork Strategy adds to this discussion.

The Farm to Fork strategy sets the first pesticide reduction targets at the EU level - a 50% reduction in use and risks from chemical pesticides by 2030. The EC has not provided yet enough guidance on how to achieve these goals. In this thesis, we will use available information on pesticide use and pesticide hazardous characteristics to develop scenarios for pesticide risk reduction. The acceptance and implementation likelihoods of the scenarios should be explored with farmers and regulators (interviews). The broader implications of the scenarios on productivity, biodiversity and economy should be further explored with scientists (literature review or cost-benefit analyses). The most promising scenarios will be integrated into the SQAPP.

Setting a new standard in soil quality assessment – the SLM team has built an app for mobile devices to use anywhere in the world, providing location-specific soil quality information and sustainable land use management options. The app includes a basic pesticide module now, based on pesticide representative uses. A new version of the app will provide pesticide alternatives and better pesticide options for their users. This can be based on the pesticide use dataset, hazard dataset, developed scenarios, and the development of a new pesticide selection index.

Project details

**Group:** Soil Physics and Land Management group
**Project type:** Thesis / Internship (if only the app part)
**Study programme:** MIL / MEE / MIL & MEE

**Begin date:** flexible
**End date:** flexible

**Used skills:** -
**Requirements:** -

Contact

**Supervisor(s):** Vera Silva and Xiaomei Yang
**Examiner:** Violette Geissen
**Contact details:** vera.felixdagracasilva@wur.nl
Project description

Chile has been facing a megadrought since more than a decade ago. Therefore, water availability is essential for the Chilean government. Water availability is composed of water quality and water quantity. Studies on water quantity are commonly performed in Chile; however, water quality assessments, especially in Chilean forestry ecosystems, are not performed yet. Hydrological models are valuable for water quality assessments because they explicitly incorporate soil physical and chemical properties and boundary conditions over time.

The main goal of this thesis is to implement a hydrological model using a dataset including; a soil database, rainfall, soil depth, water content measurements, sap flow measurements, and groundwater in a forest ecosystem located in Cauquenes Valley, Maule Region, Chile. Most of the dataset is already available; only groundwater remains uncertain in some places of the catchment. Furthermore, pesticide information will be obtained from the literature, including on mobile and highly absorbed pesticides and variations in DT50. Since Chile does not have pesticides regulation yet for threshold concentration in groundwater, the European Union ones should be applied.

The student can work online (using our dataset) or travel to Chile (cost not included). If you decide to travel, three field campaigns will be done (cost included) where mainly saturated hydraulic conductivity will be measured with a SATURO, METER GROUP equipment.

Project details

Group: Soil Physics and Land Management group  
Project type: Thesis  
Study programme: MIL / MEE / MIL & MEE  
Begin date: to be determined  
End date: to be determined

Contact

Supervisor(s): Carlos Faúndez Urbina, and Vera Silva  
Examiner: Jos van Dam  
Contact details: cfaundez@udla.cl

Used skills: Modeling, GIS, Rscript, Fieldwork(optional)  
Requirements: GIS skills (basic), R script (basic), SWAP
Project description

Soil invertebrates, as earthworms are good indicators of soil quality and in it is known how pesticides or plant protection products (PPPs) produce a negative effect on their biology and ecology. The H2020 SPRINT project aims to develop a Global Health Risk Assessment Toolbox to assess impacts of Plant Protection Products (PPPs) on environment and human health and to propose several transition pathways. One of the tasks of the SPRINT project is to evaluate the effect of different mixtures of pesticides on earthworms, and the innovation will be to test those mixtures on different species of earthworms together, earthworms belonging to different ecological categories. If you want to know more of the SPRINT project, please go to: https://sprint-h2020.eu/.

Project details

Group: Soil Physics and Land Management group
Project type: Thesis / Internship / Research practice
Study programme: MIL / MEE / MIL & MEE
Begin date: 15 May 2023
End date: 20 September 2023
required skills: laboratory experience is well appreciated

Contact

Supervisor(s): Meng Fanrong, Kayode Jegede, Esperanza Huerta Lwanga
Examiner: Violette Geissen
Contact details: fanrong.meng@wur.nl & esperanza.huertalwanga@wur.nl, or sprint@wur.nl
Microplastics in green spaces: local spatial distribution

Country: Wageningen / Coimbra, Portugal
Host institute: Wageningen University

Project description

Introduction
Microplastics cause a high degree of concern worldwide, since they are poorly controlled. This pollutant has been studied in aquatic environments, especially marine. However, there are few studies involving microplastics in terrestrial environments, especially in urban spaces. In this context, we are looking for a student to assess the occurrence of microplastics in urban and non-urban green spaces, as well as the local distribution of microplastics according to different characteristics. To extract and quantify microplastics, the student would use different methods, in order to find possible differences in the results.

Research questions
- Is there a considerable difference between the occurrence of microplastics in urban and non-urban green spaces?
- Do local characteristics of green spaces influence the local distribution of microplastics in soil?
- Do different methods of extraction and visualization of microplastics lead to different results of occurrence of microplastics?

Project details

Group: Soil Physics and Land Management group
Project type: Thesis / Internship / Research practice
Study programme: MIL / MEE / MIL & MEE

Begin date: any time
End date:

Contact

Supervisor(s): Loes van Schaik, Ines Amorim Leitao
Examiner: tbd
Contact details: loes.vanschaik@wur.nl; ines.amorimdovalleleitao@wur.nl
MIL thesis opportunities on SLM and PIP-related topics in Burundi

Country: Burundi
Host institute: WUR (SLM)

**Project description**

Burundi is open again for students and offers great opportunities for thesis research! We offer both physical and socioeconomic related topics within running projects in which SLM and WENR are involved. In Burundi we started about 8 years ago developing the PIP approach, which is now spreading within Burundi and motivating farmers stakeholders to engage in **sustainable land management and erosion control**, so there is a lot investigate.

There are 2 main projects that can host your research:

1. The Fish Farm project in which the **PIP approach** is applied and where we work on **sustainable farming**, tackling land degradation with organized farmer groups and villages, and mapping of **land use changes and degradation process**, also in the upstream watersheds of the fish farms.

2. The PAGRIS project in which farmers apply **integrated farm and soil management practices**, and work in organized groups on sustainable land and **watershed management**, also based on trainings with the PIP approach and with enhanced motivation to invest in their land.

Specific research topics are still open and can be discussed, depending on the interest of the student.

Speaking French (or willing to learn it) is important in Burundi.

**Project details**

**Group:** Soil Physics and Land Management group  
**Project type:** Thesis research  
**Begin date:** any time  
**End date:**

**Requirements:** French speaking or willing to learn French

**Contact**

**Supervisor(s):** Aad Kessler
**Examiner:**  
**Contact details:** aad.kessler@wur.nl
MIL thesis opportunities on SLM and PIP-related topics in Uganda

Country: Uganda
Host institute: WUR (SLM)

Project description

Uganda is an exciting country where WENR has recently started a new project in the West of Uganda, the CommonGround project, in which both PhD and MSc students from the SLM group can do research.

We offer both physical and socioeconomic related topics within the CommonGround project, because this project works with the PIP approach as its core strategy, and focuses on both empowering & organizing farmers for sustainable land management, as well as establishing resilient farming systems with a diversity of crop and land management practices.

The CommonGround project works both in the West and East of Uganda, especially in the highland areas where land degradation is the main threat, and with smallholder farmers on improving their farming systems, land management and access to markets.

Specific research topics are still open and can be discussed depending on the interest of the student, but there are numerous possibilities for more socioeconomic studies (e.g. impact assessment studies, changes in farmers’ motivation and practice) as well as more physical studies (e.g. using GIS, assessing land use changes, SWC practices, etc.)

Project details

Group: Soil Physics and Land Management group
Project type: Thesis research
Begin date: any time
End date:
Requirements: no requirements

Contact

Supervisor(s): Aad Kessler
Examiner:
Contact details: aad.kessler@wur.nl
Regional scenarios of land restoration in the southern central highlands of Madagascar

Country: Madagascar
Host institute: BIONEXX (Fianarantsoa)
Online possible: yes

Project description

Problem context
Land degradation in different forms (deforestation, landslides, soil erosion) is a huge problem in Madagascar. WU-SLM has, in collaboration with partners, developed a prototype simulation platform to assess the consequences of alternative decisions (primarily investment) on the achievement of development objectives (e.g. food security) and environmental objectives (e.g. forest cover, carbon storage). The platform is intended to support integrated decision making for landscape management across sectors and levels of government. We now have a project working at local scale in the Southern Highlands to improve valley bottom rice and artemisia production. Within the project, we want to look at opportunities to integrate restoration activities on hillslopes currently underused as marginal grasslands. What impacts could such restoration have on regional land productivity, energy balance and environmental conservation?

Research Objective/Question
Inventorying options for hillslope land restoration and using the land simulation platform to assess the regional impacts of such interventions.

What is expected from the student (type of research)
Reviewing with stakeholders the possible land restoration options and building a scenario that considers such interventions at regional scale. Run the scenario using the LANDSIM-P platform and analyse the results.

Project details

Group: Soil Physics and Land Management group
Project type: Thesis (SLM-80336)
Begin date: Flexible
End date: Used

Skills: Literature review, scenario development, possibly French for interviews
Requirements: Some knowledge on GIS

Contact

Supervisor: Luuk Fleskens
Examiner: Contact details: luuk.fleskens@wur.nl
Climate Smart Agriculture Practices In MENA Region

Country: MENA
Host institute: t.b.d (in Tunisia, Jordan or in Egypt)
Online possible? : Yes

Project description
The agriculture sector is regarded as the driving force for the development of (most of) the Middle East and North Africa (MENA) region, especially in non-oil producing countries as it is accounting for about 40% of total employment and about 20% of total trade. Rural population amounted to 132 million in 2006, accounting for 42.5% of the total population in the region. The MENA region is one of the most affected regions by the impacts of climate change, as all countries are facing challenges such as low rainfall, high temperatures and drought, which has impacted the available water resources for agriculture and other uses. The food and water security situation in MENA is already poor and the available water resources in the region are overexploited, while the population is expected to double by 2070. Many of the MENA countries support diversified systems such as rain-fed, irrigated, agro-pastoral, and desert farming that are well-adapted to the harsh climate and could be conceptualised as climate smart agricultural (CSA) methods. However, currently the food production is not sufficient to meet the dietary needs of the booming population, which forces many countries to import the majority of needed cereals.

Research objectives:-
The study’s main objectives are to review the most used CSA methods in the MENA region, to identify gaps, and to conclude with new CSA adaptation strategies. The specific objectives are to:
1. Which climate-smart agriculture applications have been applied in MENA since 2010?
2. How do the currently applied CSA applications affect water resources, soil quality, food production, resilience, and climate change mitigation in farming systems?
3. What are the critical factors that are limiting CSA adoption?
4. What CSA practices need to be conducted to sustainably increase food production and ensure sustainable use of water resources?

What is expected from the Student?
A systematic literature review for the CSA studies in MENA and to conduct complementary analysis of data with a comparison between an CSA practice, and a conventional practice. A meta-analysis is required to identify those CSA practices that most significantly increase food production and ensure sustainable use of water resources and soils.

Project details
Group: SLM
Project type: Thesis
Begin date: flexible
End date: 
Used skills: literature review; meta-analysis

Contact
Supervisor(s): Luuk Fleskens and Karrar Mahdi
Examiner: Coen Ritsema
Contact details: Karrar.mahdi@wur.nl
Silvopasture intervention for fodder production in tribal belt of India’s Jharkhand state

Country: India
Host institute: PRADAN
Online possible? : No

Project description

India is the world's largest exporter of sheep and goat meat (APEDA, 2016), the largest producer of milk, the third largest exporter of bovine meat, and a major exporter of grain for intensive livestock keeping (agricultural stats 2021). Agropastoralism is widely practiced in India, where livestock feeds on common property resources like grazing lands and forests. However, currently there are large deficiencies in India’s livestock sector for quality feed. The deficit for dry fodder is 24% and green fodder is 63%, a major problem creating vulnerability for livestock rearing populations. The main reasons for these deficiencies include: 1) diminishing of common lands and other grazing resources, 2) reduction of crop residues due to drastic shift from food crop cultivation to cash crop cultivation, 3) changing rainfall patterns and increased temperatures cause, with extensive land use, cause land degradation and desiccation of the land, and 4) growing quality feed on private land would be input- and labour intensive.

In the Santhal-Pargana tribal belt in Jharkhand state, India, goat keeping is an important source of livelihood, also called "the poor women’s cow". Feeding practice is fully free-grazing based, because of degraded forests and seasonal fodder scarcity, this is challenging. Further, existing biomass is inadequate for feeding all goats. Therefore, silvopasture interventions are started, integrating trees, forages and livestock to boost soil health and ecological functions, with the main purpose to produce low-cost high-quality feed to upgrade goat production.

Research objectives:
The study’s main objective is to analyse the functions of silvopasture plots in Jharkhand and contribute to fine-tuning the model, the specific objectives include:
1. Analyse how the silvopasture model affects bio-physical parameters, e.g. water resources, soil quality, feed production, and climate change mitigation.
2. Assess and review the selection of grasses and trees, their growth and health, and explore alternative indigenous vegetation options for multiple purposes.
3. Investigate the inter-relations between silvopasture model and the community’s farming systems and the socio-economic impact.

What is expected from the Student?
A fieldwork monitoring exercise on-ground in Jharkhand combined with surveys/interviews among the communities and data analysis, combined with literature review to assess the potential of silvopasture models for climate change mitigation and high-quality feed production.

Project details
Group: SLM
Project type: Thesis or internship
Begin date: April/May 2023
End date: 
Used skills: Fieldwork monitoring, data analysis, literature research

Contact
Supervisor(s): Luuk Fleskens and Luwieke Bosma
Examiner: Coen Ritsema
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