

## Soil Water Management (I002708)

**Course size** *(nominal values; actual values may depend on programme)*

**Credits** 5.0

**Study time** 150 h

**Contact hrs**

50.0h

**Course offerings and teaching methods in academic year 2022-2023**

A (semester 2)

English

Gent

seminar: coached exercises

1.25h

lecture

27.5h

seminar: practical PC room

20.0h

classes

lecture: plenary exercises

1.25h

**Lecturers in academic year 2022-2023**

Cornelis, Wim

LA20

lecturer-in-charge

**Offered in the following programmes in 2022-2023**

**crdts**

**offering**

Master of Science in Sustainable Land Management(main subject Land and Groundwater Management)

5

A

International Master of Science in Soils and Global Change (main subject Physical Land Resources and Global Change)

5

A

Master of Science in Bioscience Engineering: Land, Water and Climate

5

A

Exchange Programme in Bioscience Engineering: Agricultural Sciences (master's level)

5

A

Exchange Programme in Bioscience Engineering: Environmental Technology (master's level)

5

A

Exchange Programme in Bioscience Engineering: Land and Forest management (master's level)

5

A

**Teaching languages**

English

**Keywords**

Soil-hydrological processes, soil hydraulic properties, water conservation, water harvesting, water balance, sustainability, water productivity, rainfed

**Position of the course**

Soil-water management is essential for sustainable crop production while minimizing environmental risks, and to build resilience to droughts and floods, particularly under a changing climate. The course provides deeper insight in soil hydrological processes and presents a wide range of practices to improve the partitioning of rainwater hence optimizing the water regime. Such practices contribute to address several Sustainable Development Goals directly and indirectly, and to formulate evidence-based sustainable solutions to climate change (i.e. adaptation). They are an essential part of climate-smart agriculture.

**Contents**

**PARTIM A. Concepts and principles of rainwater partitioning and soil-water management practices**

1. Building resilience against drought: the soil-water management perspective

*Part 1. Rainwater partitioning*

2. Infiltration - entry of water into soil

3. Redistribution of water in soil

4. Evaporation from bare soil

5. Surface runoff

*Part 2. Soil-water management practices to increase crop productivity*

6. Improving restricted rainfall infiltration

7. Physical structures across slope or along contour
8. Reducing water losses from evaporation and excessive transpiration
9. Reducing rainwater drainage beyond the rooting zone
10. Improving soils with restricted rooting
11. Maximizing usefulness of low and erratic rainfall

#### **PARTIM B. Methods to evaluate and model rootzone water balance**

12. Assessing components of rootzone water balance
13. Crop response to water using the crop-water model AquaCrop

#### **Practical exercises**

The practical exercises comprise a variety of exercises in Excel and with the computer simulation models Hydrus and AquaCrop.

#### **Initial competences**

'Soil-water Management' primarily builds on the learning outcomes of the course 'Soil Physics'. The learning outcomes may also have been achieved in a different way.

#### **Final competences**

- 1 Explain how to use water sustainably and advice policy makers accordingly.
- 2 Explain the components of the field water cycle.
- 3 Select and evaluate techniques to conserve and harvest rainwater, in order to increase water productivity while minimising the environmental risks.
- 4 Use the Hydrus computer model to simulate changes in water content and matric potential during infiltration, redistribution and evaporation processes.
- 5 Use the AquaCrop model to predict crop-response to water under various conditions.

#### **Conditions for credit contract**

Access to this course unit via a credit contract is determined after successful competences assessment

#### **Conditions for exam contract**

This course unit cannot be taken via an exam contract

#### **Teaching methods**

Lecture: plenary exercises, Lecture, Seminar: coached exercises, Seminar: practical pc room classes

#### **Extra information on the teaching methods**

**Lecture:** interactive ex cathedra lectures; all lectures are given in PC rooms which enables an optimal mix between theory and practical work

**Seminars: coached exercises, practical PC room classes, self-reliant study**

**activities:** assignments start during the contact hours; if not finished they need to be completed at home and Hydrus screen shots and Excel (or other) sheets need to be uploaded in Ufora.

#### **Learning materials and price**

A syllabus is available. Additional documentation (slide shows, background information, exercises, video) can be found on Ufora platform. Cost: 5.0 EUR

#### **References**

- Hillel, D. (1998). Environmental soil physics. Academic Press, San Diego Hudson, N. W. (1987). Soil and water conservation in semi-arid areas FAO Soils Bulletins 57, Rome
- Shaxson, F. and Barber, R. (2003). Optimizing soil moisture for plant production. The significance of soil porosity. FAO Soils Bulletin 79, Rome
- Oweis, T. Y. , Prinz, D. and Hachum, A.Y. (2012). Rainwater harvesting for agriculture in the dry areas. CRC press

#### **Course content-related study coaching**

The lectures enable intensive interaction between instructors and students, during which ample opportunity is provided for questioning and discussion. Instructors (professor/assistants) are available for questions and further explanations on appointment.

#### **Assessment moments**

end-of-term and continuous assessment

#### **Examination methods in case of periodic assessment during the first examination period**

Written examination with open questions

**Examination methods in case of periodic assessment during the second examination period**

Written examination with open questions

**Examination methods in case of permanent assessment**

Participation, Assignment

**Possibilities of retake in case of permanent assessment**

examination during the second examination period is possible in modified form

**Extra information on the examination methods**

**Written exam with open questions:** short answer and essay questions + exercises

**Participation:** solutions to exercises (Excel files or screen shots of Hydrus simulation model results) need to be uploaded on Ufora

**Assignment:** scenario analysis of various options to build resilience to drought with the AquaCrop model.

**Calculation of the examination mark**

End-of-term assessment: 70%, continuous assessment: 30%

Students who eschew period aligned and/or non-period aligned evaluations for this course unit may be failed by the examiner. This means that if, in that case, a grade of 10 or more out of 20 is obtained, the grade may be brought down to 7/20.