

Arctic Soils (I002470)

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

Credits 5.0

Study time 140 h

Contact hrs

70.0h

Course offerings and teaching methods in academic year 2022-2023

A (semester 1)

English

Gent

seminar: coached exercises

7.5h

seminar

30.0h

guided self-study

13.75h

fieldwork

5.0h

lecture

13.75h

Lecturers in academic year 2022-2023

de Jonge, Lis Wollesen

AARHUS01 lecturer-in-charge

Offered in the following programmes in 2022-2023

crdts

offering

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

5

A

Teaching languages

English

Keywords

Position of the course

The course provides students with an understanding of the positive impact of climate change for agriculture in subarctic areas. The course will provide a fundamental understanding of the soil and environmental factors which may influence agricultural production in South Greenland.

Contents

The rapid climate change, which is taking place in Greenland, has serious repercussions for animal and plant life throughout the country. The rising temperatures can however, offer better conditions for future agricultural production in Greenland because of increased summer temperatures and prolonged growing seasons. Land use, though, is also influenced by many other factors such as soil quality and the increasing lengths of dry periods during vegetation season.

The course focusses on understanding the farming conditions in South Greenland. Physical and chemical properties of South Greenlandic soils will be investigated:

• Soil depth • Soil texture • Soil organic matter content and quality • Particle density • Bulk density • Soil water retention • Plant available water • Soil aeration • Hydraulic conductivity • Soil structure • pH • CEC • Micro and macro nutrient content • Soil specific surface area • Soil water repellency • Soil microbiology

The students will visit selected farmers in South Greenland and participate in field sampling activities. Also glacial rock flour deposits will be located and sampled. Glacial flour forms when glaciers crush underlying rocks and stones to very fine particle sizes of fine sand and silt. The material washes out from under the glacier and is then deposited. The material is available near the cultivated fields in South Greenland. Glacial flour may help to neutralize acidity, improve soil structure, promote microbial activity, and slow down soil depletion. The material may be a ready source of calcium, iron, magnesium, and potassium as well as other trace elements.

In the succeeding laboratory investigation students will perform experiments to illustrate the effect of adding glacial flour to Greenlandic soils. The results will be an integrative part of the final project report.

Initial competences

Basic knowledge in soil science, soil physics and soil chemistry

Final competences

At the end of the course the student should be able to:

- (i) Explain the importance of soil physical properties for agricultural production in South Greenland
- (ii) Explain the importance of soil chemical properties for agricultural production in South Greenland
- (iii) Explain the importance of environmental factors for agricultural production in South Greenland
- (iv) Use the appropriate methodology to quantify soil physical and chemical properties
- (v) Suggest practical solutions for intensifying agriculture in South Greenland.

Conditions for credit contract

This course unit cannot be taken via a credit contract

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Guided self-study, Seminar, Lecture, Fieldwork, Seminar: coached exercises

Extra information on the teaching methods

The course combines self-study, participation in a field trip to South Greenland, collection of soils and data in Greenland, theoretical lectures, soils analysis, project reports.

Learning materials and price

Learning material includes book chapters, notes and review articles.

References

1. Beerling D.J. et al. 2018. Farming with crops and rocks to address global climate, food and soil security. *Nature Plants*. 4:138-147
2. Caviezel, C., M. Hunziker, and N.J. Kuhn. 2017. Bequest of the Norsemen – The potential for agricultural intensification and expansion in Southern Greenland under climate change. *Land*: 87.
3. Hossein, M., W. Chen, and Y. Zhang. 2015. Bulk density of mineral and organic soils in the Canada's arctic and sub-arctic. *Information Processing in Agriculture*. 2: 183-190
4. Jacobsen, N.K. 1987. Studies on soils and potential for soil erosion in the sheep farming area of South Greenland. *Arctic and Alpine Research*. 19: 498-507
5. Jensen, P.W. 2018. Functional properties of Greenlandic soils. Master thesis. MSc Agro-Environmental Management, Aarhus University.

Course content-related study coaching

Assessment moments

end-of-term and continuous assessment

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

Written examination

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

Written examination

Examination methods in case of permanent assessment

Report, Participation

Possibilities of retake in case of permanent assessment

examination during the second examination period is possible

Extra information on the examination methods

Examination will be based on the submitted reports.

Participation in field trip to Greenland, approved participation in practical exercises and submitted project report

