

## Land Evaluation (I000985)

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

Credits	5.0	Study time	135 h	Contact hrs	60.0 h
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Course offerings and teaching methods in academic year 2018-2019

A (semester 1)	English	seminar: practical PC room classes	26.25 h
		lecture: plenary exercises	5.0 h
		lecture	25.0 h
		microteaching	3.75 h

Lecturers in academic year 2018-2019

Verdoodt, Ann	LA20	lecturer-in-charge
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Offered in the following programmes in 2018-2019

	crdts	offering
<a href="#">Master of Science in Physical Land Resources (main subject Soil Science)</a>	5	A
<a href="#">Master of Science in Bioscience Engineering: Forest and Nature Management</a>	5	A
<a href="#">Master of Science in Bioscience Engineering: Land and Water Management</a>	5	A

Teaching languages

English

Keywords

Land, land classification, land suitability, land use planning, crop growth modelling, yield gap analysis

Position of the course

Land evaluation is the process of land performance assessment when that land is (to be) used for specific purposes, including its performance in providing ecosystem services.

Building on general insights in soil science, this course aims to provide the students with insights in the basic principles and approaches to land evaluation, including land capability assessments for general land uses (cropland, rangeland, forestry, conservation), more detailed assessments of land suitability for agronomic and urban land uses, as well as crop growth modelling. The students learn how to use the basic terminology and concepts and how to judge and apply the existing methods.

Interpretation of results is oriented towards land use planning, land consolidation, yield forecasts, estimations of the population supporting capacity and soil protection policies.

Contents

A land evaluator assesses the suitability of a piece of land for different kinds of land use.

In a short introduction, the definition of land and land evaluation is explained within the actual context of challenges, strategies and policies required for a sustainable use of the limited natural resources. Next, some basic concepts and principles defined in the FAO Land Evaluation Framework are outlined, followed by an in depth discussion on land characteristics and land qualities: the data sources and their interpretation. These concepts are illustrated using examples from land classification methods designed for agriculture, grazing, forestry, engineering and taxation purposes.

In the second part of the lecture notes, several existing qualitative and semi-

quantitative land evaluation tools are outlined and discussed. The qualitative tools include the general land capability assessments for various land uses and land suitability classifications for rainfed and irrigated agriculture, as well as for urban land uses. Conversion of these qualitative, physical land classifications into yield data allows to perform an economical land evaluation as well.

The third part of the lecture notes is devoted to concepts in productivity estimation and crop growth modelling. Application of these principles is illustrated in the chapters describing the agro-ecological zoning project and a semi-quantitative crop growth model. More advanced applications of land evaluation science such as population supporting capacity estimations and fuzzy logic applications, and current hot topics such as ecosystem services assessment, are illustrated in some case studies or as informative reading material.

#### Initial competences

The student

- has insight in the composition of soils, can explain the behaviour of soils on the basis of their physico-chemical properties, and understands classification of soils on a basic level.
- has basic knowledge of meteorological processes.
- knows the plant physiological processes photosynthesis, respiration, transpiration, water and nutrient uptake.
- can perform spatial analyses using GIS software on digital maps representing vector and raster data structures

#### Final competences

- 1 Understand and correctly use the specific terminology and principles in land evaluation techniques when communicating with experts.
- 2 Explain the selection and evaluation of different land characteristics or land qualities as they are used in existing land evaluation techniques.
- 3 Critical discussion of the basic concepts, advantages/disadvantages, boundary conditions, and output quality of existing land evaluation techniques.
- 4 Apply existing land evaluation techniques and estimate or calculate the land suitability or expected yields.
- 5 Know how to select the most relevant soil characteristics and how to design evaluation criteria in new land evaluation assessments.
- 6 Judge the environmental and socio-economical uniqueness of each land evaluation study, and translate it into adapted land evaluation techniques.
- 7 Display insights in recent evolutions in land evaluation technologies and applications
- 8 Report and communicate (own) land evaluation research methods and results clearly, unambiguously, soundly, and critically
- 9 Collaborate with fellow students in a (interdisciplinary) team to solve land evaluation assignments

#### 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, microteaching, lecture: plenary exercises, seminar: practical PC room classes

#### Learning materials and price

An English syllabus will be made available during the first lectures, downloadable from Minerva. There are no obligatory handbooks. During the course of the lectures, an electronic version of the slides will be deposited at the Minerva site.

#### References

- Hewitt A., Dominati E., Webb T., Cuthill T. (2015). Soil natural capital quantification by the stock adequacy method. *Geoderma* 241-242 (2015) 107-114
- Nguyen, T.T., Verdoodt, A., Tran, V.Y., Delbecque, N., Tran, T.C., and Van Ranst, E. (2015). Design of a GIS and Multi-criteria Based Land Evaluation Procedure for Sustainable Land-use Planning at the Regional Level. *Agriculture Ecosystems & Environment* 200: 1-11.
- Constantini, E.A.C. (2009). *Manual of Methods for Soil and Land Evaluation*. Science Publishers.
- FAO (2007). *Land evaluation. Towards a revised framework*. FAO Land and Water Discussion paper n°6. FAO, Rome. ([http://www.fao.org/NR/Iman/abst/Iman\\_070601\\_en.htm](http://www.fao.org/NR/Iman/abst/Iman_070601_en.htm))
- Lehmann, A., David, S., Stahr, K. (2006). TUSEC - Technique of urban soil

evaluation in city regions – a method for the assessment of natural and anthropogenic soils. Hohenheim.

- FAO (2003). Global agro-ecological assessment for agriculture in the twenty-first century (CD-ROM). FAO Land and Water Digital Media Series n° 21, FAO, Rome. (<http://www.fao.org/ag/agl/agll/gaez/index.htm>)
- Verdoodt, A. and Van Ranst, E. (2003). A Two-Level Crop Growth Model for Annual Crops. Ghent University, Laboratory of Soil Science, Ghent (available in library)
- Sys, C., Van Ranst, E., Debaveye, J. and Beernaert, F. (1991, 1993). Land Evaluation. Part I, II and III, Agricultural Publ. N° 7, ABOS, Brussels (being revised)

#### Course content-related study coaching

Personal coaching before and after the lectures and during the guided exercises.  
Feedback about the corrected applications during the guided exercises.

#### Evaluation methods

end-of-term evaluation and continuous assessment

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

Written examination with open questions

#### Examination methods in case of periodic evaluation during the second examination period

Written examination with open questions

#### Examination methods in case of permanent evaluation

Oral examination, participation, report

#### Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible in modified form

#### Extra information on the examination methods

Theory – period aligned examination: written examination (closed book) with more emphasis on general comprehension of the basic principles, boundary conditions, and scope of application of the different land evaluation tools than on encyclopedic knowledge.

Exercises first examination session - permanent evaluation: Case studies on application of land evaluation tools need to be solved during coached exercises with group reporting. Reports are to be submitted at regular time steps. Deadlines for submission need to be strictly respected. Each student is responsible for the organisation, communication of results and presentation of a part of the case study. Each group member is expected to contribute to all practicals and group reports. All group members must combine and integrate their results in the final discussion of conclusions. At the end of the semester, during the last lecture, the groups present their case study to the class.

Exercises second examination session - period-aligned examination: Examination of the practical skills in the 2nd session will be in adapted form: written exam on 2 exercises related to the land evaluation techniques learned.

#### Calculation of the examination mark

- Theory: 60% (written exam)
- Exercises: 40% (20% on group reports, 5% on group slide presentation, 15% on individual presentation, discussion & participation)

If there is an obvious difference in input and commitment between the different group members, the marks for the group reports might differ among the students belonging to the same group.

Unfoundedly eschewing the non-period aligned evaluation for this course unit leads to a total mark (theory+exercises) of maximum 9/20, regardless of the marks for the theoretical part. In case of foundedly, repeatedly eschewing the practicals, (an) alternative task(s) will be provided.