Georg-August-Universität
Göttingen

Directory of Modules

zu der Prüfungs- und Studienordnung für den konsekutiven Master-Studiengang "Sustainable International Agriculture" (Amtliche Mitteilungen I 6/2011, zuletzt geaendert durch Amtliche Mitteilungen I Nr. 2/2019 S. 19)

Modules

Index by areas of study

I. MSc Sustainable International Agriculture (English)

At least 120 C must be succesfully completed within the following regulations

1. Specializations

At least 90 C must be succesfully completed within a spezialization

a. International Agribusiness and Rural Development Economics

aa. Compulsory modules

The following four compulsory modules must be completed:

bb. Mandatory modules

From the following modules five mandatory modules (of which at least one module is on learning work methods with code M) must be completed:

cc. Elective modules

From the following modules (or the so far not chosen mandatory modules of the degree programme) six elective modules must be completed:

b. International Organic Agriculture

aa. Compulsory modules

The following bridging module (P07) and four compulsory modules comprising 30 C must be successfully completed. The preparatory module can be replaced on request by a mandatory module if corresponding module has been successfully completed.

bb. Mandatory modules

From the following modules four mandatory modules (of which at least one module is on learning work methods with Code M and one economics module with Code E) must be completed:

cc. Elective modules

From the following modules six elective modules must be completed. It is also possible to choose the mandatory modules of the degree programme so far not chosen.

c. Tropical Agricultural and Agroecosystems Sciences

aa. Compulsory modules

The following bridging module (P07) and four compulsory modules must be completed (the bridging module can be replaced by a mandatory module on request in the case of a corresponding preparatory study):

bb. Mandatory modules

From the following modules four mandatory modules (of which at least one module is on learning work methods with Code M) must be completed:

cc. Elective modules

From the following modules, six electives must be completed. It is also possible to choose the mandatory modules of the degree programme that have not already been chosen.

2. Master's thesis

Completion of the Master's thesis is worth 24 Credits.

3. Colloquium for the Master's thesis

Successful completion of the colloquium for the Master's thesis is worth 6 Credits.

II. Supplementary Modules for Student of the double degree program with the University of Talca

1. Study programme at the universities of Kassel and Goettingen in the first and second semester

a. Studium an den Universitäten Kassel und Göttingen

Students must complete during the first two semesters at the University of Göttingen and Kassel:

aa. Compulsary modules

The following four compulsory modules must be successfully completed:

bb. Mandatory modules

From the following three mandatory modules must be successfully completed:

cc. Elective Modules

From the following modules (or so far not chosen elective modules of the major field of study) three elective modules must be successfully completed:

b. Study programme at the university of Talca

During the last two semesters at the University of Talca, students must complete a range of modules from the following modules program:

aa. Mandatory modules

From the following modules two mandatory modules must be successfully completed:

bb. Elective Modules

From the following modules three electiv modules must be successfully completed:

2. Study programme at the universities of Kassel and Goettingen first and fourth semester

First semester at the Universities of Göttingen and Kassel, two semesters at the University of Talca and the last semester at Göttingen and Kassel.

a. Study programme at the universities of Kassel and Goettingen

Students must complete during the first semester at the Universities of Göttingen and Kassel:

aa. Compulsory Modules

The following three compulsory modules must be successfully completed

bb. Mandatory modules

From the following one mandatory module must be successfully completed

cc. Elective Modules

From the following one elective module must be successfully completed

b. Study programme at the university Talca

During the two semesters at the University of Talca, students must complete a range of modules from the following modules program:

aa. Compulsory Modules

The following compulsory module must be successfully completed:

bb. Mandatory modules

From the following four mandatory modules must be successfully completed:

cc. Elective Modules

From the following modules (or so far not chosen elective modules of the major field of study) five elective modules must be completed:

3. Study programme at the universities of Kassel and Goettingen during the thrid and fourth semester

Studierende, die im Rahmen des Double-Degree-Programms mit der Universität Talca studieren, absolvieren während der ersten zwei Studiensemester an der Universität Talca nachfolgendes Studienprogramm.

a. Study programme at the university Talca

Students who study under the double degree program with the University of Talca must complete during the first two semesters at the University of Talca:

aa. Compulsory Modules

The following one module must be successfully completed:

bb. Mandatory modules

From the following four mandatory modules must be successfully completed:

cc. Elective Modules

From the following modules (or not so far chosen elective modules of the major field of study) five module must be completed:

b. Study programme at the universities of Kassel and Göttingen

During the semester at the University of Kassel and Göttingen, students must complete range of modules from the following modules programme:

aa. Compulsory Modules

The following three compulsory modules must be successfully completed:

bb. Mandatory modules

From the following modules one mandatory module must be successfully completed:

cc. Elective Modules

From the following modules (or so far not chosen elective modules of the major field of study) one elective module must be successfully completed:

Georg-August-Universität Göttingen **Module M.Agr.0009: Biological control and biodiversity**	6 C 6 WLH

Learning outcome, core skills: Gain an understanding of what biological control is and how it can be used effectivelyas part of an IPM system and how biodiversity contributes to control of pest populations and other ecosystem services.	**Workload:** Attendance time: 84 h Self-study time: 96 h

Course: Biological Control and Biodiversity (Lecture, Exercise, Seminar) *Contents*: • Theoretical foundations of biological control • Natural enemy behaviour and biological control success • Biodiversity and ecosystem services in agroecosystems • Practical examples of biological control projects • Plant-herbivore-predator-interactionsPrinciples of population dynamics • Biological weed control	6 WLH
Examination: Written exam (70%; 45 minutes) and presentation (30%; approx. 20 minutes) **Examination prerequisites:** regular attendance at seminar and exercise and presentation of a seminar talk **Examination requirements:** Basic knowledge of the mechanisms of biological control of herbivorous insects; methodological approaches based on case examples; role of biodiversity for ecosystem processes and the population dynamic of herbivorous insects, multitrophic interactions between plants, herbivorous insects and their natural enemies; biodiversity and services of ecosystems.	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Stefan Vidal
Course frequency: each winter semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 12	

Additional notes and regulations: Lecture based materials; details provided during lectures.

Georg-August-Universität Göttingen **Module M.Agr.0056: Plant breeding methodology and genetic resources**	6 C 4 WLH

Learning outcome, core skills: Students learn the integration of classical and molecular approaches to solve present problems in plant breeding. Social aspects have to be considered. Students learn, in own presentations, to draw critical conclusions from recent research papers and to communicate these to other students.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Plant breeding methodology and genetic resources (Lecture) *Contents*: Principles of breeding methodology: Response to selection, breeding methods for clonal, line, hybrid and population cultivars. Marker assisted selection for monogenic and polygenic traits. Use of plant genetic resources: wild species, ex-situ and in-situ conservation, on-farm management. Breeding for marginal environments, demonstrated with examples from temperate and tropical regions.	4 WLH
Examination: Written exam (90 minutes, 80%) and presentation (approx. 20 minutes, 20%) **Examination requirements:** Population Genetics, Application of Markers in Plant Breeding, Concepts of using genetic resources in plant breeding. Good knowledge on: ‘Pre-Breeding’, categories and methods in Plant Breeding.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge (B.Sc. level) in genetics and plant breeding
Language: German, English	**Person responsible for module:** apl. Prof. Dr. Wolfgang Link
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 25	

Additional notes and regulations: **Literature:** Lecture based material.

Georg-August-Universität Göttingen **Module M.Agr.0086: World agriculture markets and trade**	6 C 6 WLH

Learning outcome, core skills: Theoretical foundations of international trade: Ricardo, Heckscher-Ohlin-Viner; Empirical tests for different trade theories; imperfect competition in international trade; gravity theory; institutions and organisations on world agricultural markets; agricultural trade liberalisation at the multilateral (WTO) and bilateral level; specific policy measures in agricultural trade.	**Workload:** Attendance time: 84 h Self-study time: 96 h

Course: World agricultural markets and trade (Lecture, Exercise) *Contents*: This module deals with the situation in the world agricultural markets and with the intervention of agricultural and trade policy in these markets based on an introduction into basics of the international trade theory. The students are able to discern populistic arguments against free-trade. They can estimate if there are reasons to deviate from the from the postulate of free-trade in matters of agricultural products, e.g. in order to reward the positive external effects of the agriculture, to ensure the food supply, to fend off dumping or to correct distorted world prices for agricultural products.	6 WLH
Examination: Oral examination (approx. 30 minutes) **Examination requirements:** Handelstheoretische Grundlagen: Ricardo, Heckscher-Ohlin-Vanek, Viner; Empirische Tests von Handelstheorien; unvollkommener Wettbewerb auf internationalen Märkten; Grundlagen von Gravitätsgleichungen; Institutionen und Organisationen auf Weltagrarmärkten; Agrarhandelsliberalisierung auf multilateraler (WTO) und bilateraler Ebene; spezielle Politikmaßnahmen im internationalen Agrarhandel	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of agricultural economics
Language: English, German	**Person responsible for module:** Prof. Dr. Bernhard Brümmer
Course frequency: each summer semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 90	

Additional notes and regulations:

Literature:

Feenstra, R.C. 2004: Advanced international trade: Theory and evidence. Princeton University Press

Georg-August-Universität Göttingen **Module M.Agr.0106: China Economic Development: From an agricultural economy to an emerging economy**	6 C 4 WLH

Learning outcome, core skills: The students learn more about the specificities of China's economic transformation as well as the underlying economic concepts.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: China Economic Development: From an agricultural economy to an emerging economy (Lecture, Seminar) *Contents*: The lecture is designed for master students enrolled at the University of Göttingen. The course covers experiences and lessons to be drawn from China's economic transformation, by explaining the root causes for a shift from an agriculturally dominated to an emerging economy.	4 WLH
Examination: Presentation (about 25 minutes, 50%) and homework (max 15 pages, 50%) **Examination requirements:** Presentation and critical discussion of a scientific aspect of China's economic transformation.	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Xiaohua Yu
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 25	

Georg-August-Universität Göttingen **Module M.Agr.0118: Applied Microeconometrics**	6 C 4 WLH

Learning outcome, core skills: Learn the basic logics behind each econometric model, understand the tests for model specification, and appropriately explain the model outputs in connection to economic theories.	**Workload:** Attendance time: 40 h Self-study time: 140 h

Course: Applied Microeconometrics" (Internship, Lecture, Seminar) *Contents*: This course mainly teaches how to correctly apply basic econometric models to studying specific research questions for master level students in agricultural economics, agribusiness, and related programs at the University of Goettingen. The main software package used in this course will be STATA.	4 WLH
Examination: Written examination (120 minutes, 70%) and term paper (max. 12 pages, 30%) **Examination requirements:** 1. Understand the econometric models taught in the class 2. Use Stata skillfully	6 C

Admission requirements: Ökonometrie I / Econometrics I	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Xiaohua Yu
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 25	

Georg-August-Universität Göttingen **Module M.Agr.0124: Environmental Economics and Policy**	6 C 4 WLH

Learning outcome, core skills: This module provides students with an overview of environmental and natural resource economics and in-depth knowedge of selected issues. Students will learn the basic theoretic concepts and methods applied in environmental economics. They will also learn to evaluate environmental policies. A special focus is placed on international and global environmental issues (e.g. climate change).	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Environmental Economics and Policy (Lecture, Exercise) *Contents*: • Property rights, externalities and the environment • Efficiency and sustainability • Valuing the environment • Selected topics of natural resource economics (land, common-pool resources) • Perspectives on environmental policy (command&control versus incentives) • Global environmental issues (climate change) • Development and the environment	4 WLH
Examination: Written examination (90 minutes) **Examination requirements:** Students have acquired in-depth knowledge on the above mentioned topics. They can explain and apply the theoretical concepts and methods taught in this course. They can evaluate environmental policies.	6 C

Admission requirements: Basic knowledge in agricultural economics and/or microeconomics	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Meike Wollni
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 60	

Additional notes and regulations: The exam can be done in german.

Georg-August-Universität Göttingen **Module M.Agr.0127: Breeding schemes and programs in plant and animal breeding**	6 C 4 WLH

Learning outcome, core skills:	**Workload:**
Students will learn the basic elements and structures of breeding programs in plant and animal breeding. They understand the relationship between biological characteristics of the crop or livestock species and the specific design of the breeding program. The students know the four breeding categories and design possibilities of breeding programs for self-pollination, cross-pollination and vegetative and clonally propagated crops. They learn breeding programs for major crops and livestock species.	Attendance time: 56 h Self-study time: 124 h

Course: Breeding schemes and programs in plant and animal breeding (Lecture, Excursion) *Contents*: Design of breeding programs. Basic elements of breeding programs: Breeding objectives and breeding planning, performance testing, selection and mate selection, use of biotechnologies, transfer of breeding progress in the production level, monitoring of the breeding progress. Breeding program structures in the most important crop species: cereals, corn, rape, sugar beet, specialty crops. Breeding program structures in the main livestock species: dairy cattle, pigs, poultry, beef cattle, small ruminants. Breeding program structures in forest genetics.	4 WLH
Examination: Written exam (45 minutes, 50%) and Presentation (about 20 minutes) with written outline (max. 10 pages) (50%) **Examination requirements:** Profound knowledge of basic breeding program structures and elements of breeding programs and their concrete implementation to various crops and livestock. Elaboration of the breeding planning for a livestock or crop species.	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Timothy Mathes Beissinger
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** Master: 1
Maximum number of students: 20	

Additional notes and regulations:
Mandatory excursions to practical plant breeding and animal breeding programs.

Georg-August-Universität Göttingen **Module M.Agr.0148: Policy analysis of international agri-environmental schemes**	6 C 4 WLH

Learning outcome, core skills: Students gain essential knowledge on the analysis of policy instruments in agri-environmental systems and are capable to apply selected methods and criteria for policy analysis.	**Workload:** Attendance time: 40 h Self-study time: 140 h

Course: Policy analysis of international agri-environmental schemes (Seminar) *Contents*: This module is aimed at analyzing public policies in agri-environmental schemes. The module will • Outline the role of agriculture for positive and negative environmental externalities, e.g. biodiversity loss, climate change, multi-functionality of agriculture • Introduce into governance and policy processes of agri-environmental schemes • Give an overview of policy instruments, such as economic incentives and environmental standards and regulation • Present criteria and methodologies to conduct policy analysis Students will subsequently conduct a small policy analysis of their own interest in the field of agri-environmental policy and incentive instruments (national, EU-level or international level), e.g. EU-CAP, PES schemes, carbon markets in agriculture, sustainability standards, environmental financing, or land-use planning.	4 WLH
Examination: Presentation (approx. 25 min; 30%) and term paper (max. 20 pages; 70%) **Examination requirements:** Students write a seminar paper on the analysis of specific agri-environmental policy measures applying selected evaluation criteria and methods. Subsequently, they present and discuss their findings in class.	6 C

Admission requirements: none	**Recommended previous knowledge:** M.Agr.0124: Environmental Economics and Policy
Language: English	**Person responsible for module:** Prof. Dr. Meike Wollni
Course frequency: each summer semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** Master: 2 - 3
Maximum number of students: 30	

Georg-August-Universität Göttingen **Module M.Agr.0151: Data Analysis with R in Agricultural Economics**	6 C

Learning outcome, core skills: Students learn • the basic functionality of the statistical software package R • how to retrieve, manage and analyze datasets • an independent and autonomous usage of online resources (e.g. packages, support, R-literature) with regard to topics in agricultural economics. The course aims at providing a tool-set for the successful completion of final thesis with quantitative focus.	**Workload:** Attendance time: 55 h Self-study time: 125 h

Course: Data Analysis with R in Agricultural Economics (Block course, Exercise) The course is split into two main components: The first one is mainly concerned with R programming while the second part deals with applied analysis of datasets connected to agricultural economics: **1. Programming in R:** Introduction and basic functionalities, data management, data visualization, coding styles, functions and programming, dynamic report generation **2. Applied Data Analysis:** data sources in agricultural economics and related API packages, application of selected econometric techniques	
Examination: Term Paper (max. 15 pages) **Examination requirements:** Students proof that they are capable of • finding relevant data, manage and manipulate datasets • applying an appropriate econometric or statistical method and create a corresponding code which is comprehensive and clean • interpreting data and results through the use of graphical tools. The produced code has to handed in along with the paper and will also be subject to the evaluation.	6 C

Admission requirements: Econometrics I (*M.WIWI-QMW.004*) or equivalent	**Recommended previous knowledge:** Basic econometric techniques
Language: English	**Person responsible for module:** Prof. Dr. Bernhard Brümmer
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 15	

Georg-August-Universität Göttingen **Module M.Agr.0156: Microfinance for the Rural Poor: A Business Class**	6 C

Learning outcome, core skills: Students learn concepts of different microfinance instruments, such as microcredit, microsaving, and microinsurance. Students can critically evaluate the potentials and drawbacks of microfinance tools for the rural poor. Designing their own business model, students learn how to properly • work in groups • brainstorm an idea • pitch and argue for their business idea • write a business plan	**Workload:** Attendance time: 66 h Self-study time: 114 h

Course: Microfinance for the Rural Poor: A Business Class (Block course, Lecture) *Contents*: This module provides students with an overview of microfinance instruments. In groups, the students will be given case studies involving rural poor from different regions, facing different problems. The challenge is to apply a microfinance instrument to the respective case study, making it a business model. Being supported, the groups will need to create their own business idea, pitch and argue for it and write a business plan to prove it is a thought through idea.	
Examination: Presentation (approx. 20 minutes, 40%) and term paper (max. 12 pages, 60%) **Examination requirements:** Good knowledge about microfinance instruments (definition, criticism, and examples), Applying business ideas in among low-income population (difficulties and chances); Proper writing of a business plan/ argumentation of an idea).	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Oliver Mußhoff
Course frequency: each winter semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 30	

Georg-August-Universität Göttingen **Module M.Forst.1512: International Forest Policy and Economics**	6 C 4 WLH

Learning outcome, core skills: **Global environmental and forest policy:** The objective is that students get basic knowledge of both the key policies related to forests and the application of the policy analysis on such issues. Students acquire comprehension about global forest related policy processes and factual knowledge about forest actors affecting the policy on a global level. The seminar combines a lead-in to global policy theory and its translation in practical, empirical knowledge about actors and processes of high importance in forestry. The different instruments for international policy formulation and implementation are discussed using case studies. **International forest economics:** The lecture is split in two main areas: 'International Wood Markets' and 'International Environmental and Forest Conservation'. The first part deals with the international trade with wood and wood products. International markets and the consequences of protectionism are analysed. Furthermore, aspects of international wood marketing are shown. In the second part, international environmental problems are described and possibilities as well as constraints for international co-operation are discussed. Finally, relations between environmental conservation and economic development are analysed.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Global environmental and forest policy (Seminar)	2 WLH
Examination: Written examination (60 minutes)	3 C

Course: International forest economics (Lecture)	2 WLH
Examination: Written examination (60 minutes)	3 C

Examination requirements: • Familiarity with international wood markets and international trade with wood and wood products • Understanding of international wood marketing • Ability to analyse consequences of protectionism • Apply economic theory in order to analyse possible solutions towards international environmental problems • Sound understanding of the relations between forest conservation and economic development	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Carola Paul
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted:	**Recommended semester:**

cf. examination regulations	
Maximum number of students: not limited	

Georg-August-Universität Göttingen **Module M.Forst.1521: Ecopedology of the tropics and suptropics**	6 C 4 WLH

Learning outcome, core skills: General understanding of the most important aspects of tropical and subtropical soils, their occurrence, genesis, geography, properties and use. Understanding the principles of the international FAO soil profile description and classification.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Ecopedology of the tropics and subtropics (Lecture) *Contents*: Part I: General introduction in soils of the tropics and subtropics, their functions, genesis, geography and properties. Objective: general understanding of the most important aspects of tropical soils, their occurrence, genesis, properties and use. The following topics will be discussed: Introduction; Climate, water and vegetation; Weathering and weathering products, clay minerals; Soil organic matter, C and N dynamic; Soil chemical reactions, variable charge; Soil forming processes and development of soils; Water and nutrient cycling of land use systems; Tropical shield areas (example: Amazon basin); Arid shields and platforms (example: West Africa); Tropical mountain areas (example: Andes); Fluvial and coastal areas in the tropics (example: coastal areas in Asia). Part II: Introduction in the description and classification of soils, using in international system (FAO). Objective: understanding the principles of the FAO soil profile description and classification. The course consists of introductory lectures in which the principles of the FAO soil description and classification will be explained. This knowledge will be practiced using examples of soil profiles from different tropical countries. The second part consists of a practical week during which soil profile descriptions and evaluations will be exercised in the field. We will visit three contrasting sites around Göttingen where a site and soil description will be made. The work will be done in small groups. Students discuss their results in a report.	4 WLH
Examination: Term paper (10 pages max.) and written exam (2 hours)	6 C

Examination requirements: Kenntnis der beschriebenen Lehrinhalte, Erreichung der festgelegten Lernziele und Nachweis der angestrebten Kompetenzen.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Edzo Veldkamp
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: cf. examination regulations	**Recommended semester:**
Maximum number of students: not limited	

Georg-August-Universität Göttingen **Module M.Forst.1615: Forest growth and tree-based land use in the tropics**	6 C 4 WLH

Learning outcome, core skills: Understanding of forest dynamics and growth research approaches in the tropics. Participants will become familiar with sampling, measurement, and analysis methods for age determination and increment measurement of trees and forest stands. The seminar will enable students to direct discussions on scientific topics.	**Workload:** Attendance time: 28 h Self-study time: 152 h

Course: Forest growth and tree-based land use in the tropics (Lecture, Exercise) *Contents*: The lecture include the following topics: geographical distribution of the tropics and their climatological characterization, dendrological and site characteristics of forests types, structure and dynamics of forests, status of tropical forests and situation of deforestation, climate growth relations of trees and stands, wood anatomical features of selected tree species, implications of growth studies on sustainable management systems and carbon flux estimations in tropical forests. Thes seminar focuses on the impact of natural and human perturbations on tropical forest ecosystems. Disturbances such as fire, harvesting, land-uses change and global warming to tropical forests will be evaluated. Through a series of student-led discussions founded on case studies from the lecture 'Tropical forest ecology and silviculture' and recent literature, we will address the effects of perturbations on ecological characteristics of forests such as net primary productivity, nutrient cycling and plant communities.	4 WLH
Examination: 2 Subexams: Written exam (60 minutes) and term paper (15 pages max.)	6 C

Examination requirements: Kenntnis der beschriebenen Lehrinhalte, Erreichung der festgelegten Lernziele und Nachweis der angestrebten Kompetenzen.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dr. Sophie Graefe
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: cf. examination regulations	**Recommended semester:**
Maximum number of students: not limited	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.A02M: Epidemiology of international and tropical animal infectious diseases**	6 C 4 WLH

Learning outcome, core skills: Based on a scientific and practical up-to-date level, students know to evaluate and develop modern and effective livestock hygiene and husbandry concepts and to integrate them into complex quality management programs. Graduates are trained to be competent in implementing and communicating their knowledge in a multidisciplinary occupational setting that establishes epizootic control programs.	**Workload:** Attendance time: 84 h Self-study time: 96 h

Course: Epidemiology of international and tropical animal infectious diseases (Lecture, Exercise) *Contents*: Infectious diseases play an enormous role in international animal health control. National health and veterinary authorities, as well as international organizations (WHO, FAO) are very much involved in the surveillance of epidemics and establishment of health and hygiene monitoring programs. These efforts will increase in future, because of a further globalization of international markets, and will require well-educated experts collaborating worldwide in this multidisciplinary field. This module will give a generalized view of current epidemics together with a specialized understanding of infectious diseases and hygienic programs in subtropical and tropical countries. Characteristics of the biology of relevant infectious agents like parasites, fungi and bacteria together with their toxins, viruses, and prions will be presented in detail. Some of these germs included in this unit cause severe zoonotic diseases with a lethal danger for humans. Immunological host-defence mechanisms of wild and domestic farm animals against pathogens will be discussed together with modern strategies of active and passive immunizations. Diagnostic methods presently available and new biotechnological approaches in future assay and vaccine development will be demonstrated. The adaptation of practical health and standardized quality management processes to various animal production systems (ruminants, pigs, poultry) and the corresponding management measurements will be explained. The view will deeply focus on environmental impacts (water, soil, air hygiene), epizootiology and modern tools in epizootiological research. It will include biology and eradication of vectors (insects, ticks) transmitting pathogens of animal and zoonotic diseases, as well as biological and chemical methods for vector control. In the laboratory course, this module will also communicate well-established techniques of microbiological and parasitological diagnostics. Students will be practically trained in classical methods and in modern biochemical, immunological, biotechnological and molecular biological techniques for the detection of infectious agents, toxins and noxious substances. Tissue culture procedures for vaccine or antibody development are also used. Modification of livestock-environment interactions through human management are discussed.	4 WLH
Examination: Oral examination (approx. 90 minutes)	6 C

Examination requirements: Knowledge of current veterinary epidemic and infectious diseases inclusive emerging diseases. Background of hygiene and eradication programs. Profound knowledge in important infectious agents (parasites, fungi, bacteria, viruses) as well as toxins and prions. Skills in immunologic defense mechanisms of wildlife, zoo and domesticated animals in connection with modern active and passive vaccination strategies and biotechnological vaccine development. Knowledge in modern diagnostic tools as well as in biology and control of biological vectors (ticks, midges).	

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge (B.Sc. level) of soil, plant and animal sciences
Language: English	**Person responsible for module:** N. N.
Course frequency: each winter semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 30	

Additional notes and regulations:

Literature:

Lecture based materials.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.A03M: International and tropical food microbiology and hygiene**	6 C 4 WLH

Learning outcome, core skills:	**Workload:**
Based on a scientific and practical up-to-date level, students know to evaluate and develop modern and effective food hygiene concepts and to integrate them into complex quality management programs. Graduates are competent to implement and to communicate their knowledge in a multidisciplinary occupational area establishing epizootic control programs in food microbiology and hygiene. They are able to understand international experts of public health authorities and collaborate in international and multidisciplinary platforms including control, monitoring, and research.	Attendance time: 84 h Self-study time: 96 h

Course: International and tropical food microbiology and hygiene (Lecture, Exercise) *Contents*: Infectious and toxic pathogens cause most of the food-borne impacts on human health all over the world. Global markets require an international surveillance system together with standardized food hygiene regulations. This module will give a generalized view of currently and internationally relevant food-borne zoonotic diseases, epidemics and food hygiene programs together with a specialized view on the conditions in subtropical and tropical countries. The biology of infectious agents (parasites, fungi, yeasts, bacteria, viruses, prions, together with their toxins) responsible for contaminations and intoxications of human food of animal origin will be discussed in detail. Some of these germs cause severe zoonotic diseases with a lethal potential for humans or certain age groups. Special characteristics of germ resistance in the food matrices meet, milk and eggs as well as in the corresponding products are elucidated along the complete manufacturing processes: from stable to table. Deterioration and spoilage of foodstuffs by microorganisms will be discussed as well. Diagnostic methods presently available for the detection of contaminated or spoiled nourishments and new biotechnological approaches in future assay designs will be analysed. The adaptation of practical hygiene and standardized quality management adjustment factors to various animal production systems (ruminants, pigs, poultry) as well as to the subsequent production processes will be explained together with the corresponding management measurements. This includes food conservation procedures, germ depletion and eradication techniques (cleaning, disinfection, autoclaving, sterilization). Beside negative microbial effects influencing food quality, positive effects especially of bacteria and fungi in food production will also be presented. Biotechnological aspects of genetic engineering of foodstuff supplements or directed genetic germ design will be discussed. In a laboratory course on food microbiology, this module will also communicate well-established techniques of microbiological and parasitological diagnostics in food matrices. Students will be practically trained in classical methods and in modern biochemical, immunological, biotechnological and molecular biological techniques for the detection of food-borne infectious agents, toxins and noxious substances.	4 WLH

Vorlesungsbegleitende Materialien	
Examination: Oral examination (approx. 90 minutes) **Examination requirements:** Knowledge in current food-borne zoonoses, programs in food hygiene and requirements for their implementation in tropical and subtropical countries. Background of the biology of infectious agents, tenacity of special microorganisms and microbial spoilage of foodstuffs, available diagnostic tools for detection of contaminated or spoiled foodstuffs and about new biotechnological diagnostic assays. Skills in practical hygiene norms, normative documents and standardized international quality management systems, foodstuff conservation, germ depletion and inactivation as well as in positive influences of bacteria and fungi on foodstuff production.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge (B.Sc. level) of soil, plant and animal sciences
Language: English	**Person responsible for module:** N. N.
Course frequency: each summer semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 20	

Additional notes and regulations:

Literature:

Lecture based materials.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.A04: Livestock reproduction physiology**	6 C 4 WLH

Learning outcome, core skills: Strong foundation in reproduction physiology as well as the development of creative potential and the fostering of independent thought are of focus; Other skills students develop include gathering and integrating information on how to solve problems; effective communication skills; self learners; as well as awareness of global issues driving changes in livestock sciences.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Livestock reproduction physiology (Lecture, Excursion, Exercise) *Contents*: Functional anatomy of reproduction; physiology of reproduction in livestock (hormones, growth factors, ovigenesis and fertilization, spermatogenesis, reproductive cycles, mating behaviour, fertilization, gestation, prenatal physiology, parturition, postpartum recovery, lactation); assisted reproductive technologies (artificial insemination, pregnancy diagnosis, preservation of embryos, embryo transfer, in vitro fertilization, sexing, cloning, transgenics); stem cells; ethics. Hafez B., Hafez, E.S.E. 2000: Reproduction in Farm Animals 7th ed. Lippincott Williams & Wilkins Publishing; Bearden, H.J., Fuquay, J.W., Willard, S.T. 2004: Applied Animal Reproduction, 6th ed. Pearson Prentice Hall Publishing; Squires, E.J. 2003: Applied Animal Endocrinology 1st ed. CABI Publishing; Pineda, M.H., Dooley, M.P. 2003: Mc Donald's Veterinary Endocrinology and Reproduction 5th ed. Blackwell Publishing. Senger P.L. (2003): Pathways to pregnancy and parturition (2nd edition). Current conceptions, Inc.	4 WLH
Examination: Oral examination (approx. 30 minutes, 70%) and written report (max. 10 pages, 30%) **Examination requirements:** The examinee should show her/his potential to understand the principles of reproductive physiology and to illustrate profound differences among various livestock species. Special focus will also be laid on the species-specific application of advanced assisted reproductive technologies.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of animal sciences
Language: English	**Person responsible for module:** Dr. med. vet. Carina Blaschka
Course frequency: each summer semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**

Maximum number of students: 10	

Additional notes and regulations:
After successful conclusion of M.Agr.0069, M.Agr.0070 and B.Agr.0331 students can not complete M.SIA.A04

Literature:

Hafez B., Hafez, E.S.E. 2000: Reproduction in Farm Animals 7th ed. Lippincott Williams & Wilkins Publishing; Bearden, H.J., Fuquay, J.W., Willard, S.T. 2004: Applied Animal Reproduction, 6th ed. Pearson Prentice Hall Publishing; Squires, E.J. 2003: Applied Animal Endocrinology 1st ed. CABI Publishing; Pineda, M.H., Dooley, M.P. 2003: Mc Donald's Veterinary Endocrinology and Reproduction 5th ed. Blackwell Publishing. Senger P.L. (2003): Pathways to pregnancy and parturition (2nd edition). Current conceptions, Inc.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.A05: Aquaculture in the tropics and subtropics**	6 C 4 WLH

Learning outcome, core skills: Students get to know basic principles of aquaculture and the ecological and socio-economic aspects of this resource utilization. They see the functions of aquaculture¿in system relationships and know the distinct utilisation variants. They are capable of analysing the advantages and disadvantages of the different aquaculture systems and are able to evaluate the possibilities of a sustainable intensification of such systems in a multidisciplinary approach.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Aquaculture in the tropics and subtropics (Lecture, Excursion, Exercise) *Contents*: This module provides an introduction to aquaculture in the tropics and subtropics with a focus on fresh-water fish farming. This resource can be managed independently or integrated with other ecological and socioeconomic aspects. The module covers: • biological and ecological principles; • aquaculture and aqua-agriculture systems; • tropical fish candidates and their performance in relation to production systems; specific breeding and raising methods; • functions and products of aquaculture. Vorlesungsbegleitende Materialien	4 WLH
Examination: Written examination (90 minutes) **Examination requirements:** Knowledge of the biological and ecological aquaculture in the tropics, the various aquaculture systems, as well as integrated agri-aquaculture systems. Knowledge about tropical fish species and their production efficiency in relation to production systems, as well as knowledge of specific breeding and husbandry practices and socio-economic functions and products of aquaculture.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of animal sciences
Language: English	**Person responsible for module:** Prof. Dr. Jens Tetens
Course frequency: each summer semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 30	

Additional notes and regulations:

Literature:

Lecture based notes.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.A06: Global aquaculture production, markets and challenges**	6 C 4 WLH

Learning outcome, core skills: Students get to know the most important aquaculture organisms worldwide as well as their prevalent production systems. They learn which national and international regulatory mechanisms influence trade of aquatic products. Through the work on case studies and their presentations, students obtain the capability to evaluate problems, chances and socioeconomic impacts of a globalized and sustainable aquaculture; they are enabled to independently get acquainted with scientific subjects and to apply the acquired knowledge for the consideration of complex conflicts of interest.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Global aquaculture production, markets and challenges (Lecture, Seminar) *Contents*: The production of the world wide most important aquaculture species and ornamentals (i.e. kelp, water hyacinths, water salad, oysters, clams, carp, tilapia, salmon, trout, Litopenaeus vannamei, Penaeus monodon), their distribution channels; national and international markets and trade with aquatic products; international trading agreements, law and their compliance; national and international legislation for the protection of the aquatic environment; aquatic animal health, trade and transboundary issues. Through case studies: Trends and developments of sector management (influence of national authorities, NGOs, societies, communities); socioeconomic impact of aquaculture; contribution to national food self-sufficiency; energy and resource efficiency in aquaculture; environmental management of aquaculture. *Literature:* Lecture based notes. *Course frequency:* each winter semester	4 WLH
Examination: Oral examination (approx. 20 minutes) **Examination prerequisites:** Project presentation (ca. 20 minutes) **Examination requirements:** Knowledge of the most important aquaculture organisms, their distribution structures, and the national and international markets and trade of aquatic products. Knowledge of the laws, national and international rules to protect the aquatic environment and the standards of hygiene and fish health in cross-border trade.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of animal sciences and agricultural markets
Language:	**Person responsible for module:**

English	Prof. Dr. Gabriele Hörstgen-Schwark
Course frequency: every 4th semester; Start WS 15/16; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 30	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.A07: Unconventional livestock and wildlife-management, utilization and conservation**	6 C

Learning outcome, core skills: Based on the historical development of agriculture, particularly the domestication of animals, students know the differences between livestock and wildlife and the importance and potential of unconventional livestock and wildlife for rural development and human livelihoods in different regions of the world. Students obtain an overview over the wide variety of unconventional livestock, their adaptive features, biology and ecology and the various production systems under which they are kept. Students familiarize with the variety of wildlife species, their biology, ecology, and population dynamics and the potential of their exploitation. They know the major international conventions pertaining to wildlife conservation and are familiar with the nature and magnitude of human/wildlife conflicts. They know about costs and benefits associated with human-wildlife-co-existence and understand the dilemma between (inter)national conservation objectives and local household livelihood objectives. Students obtain an overview over different terminal and non-terminal options of wildlife utilisation and management and their respective potential contribution to the above conflicting objectives.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Unconventtional livestock and wildlife-management, utilization and conservation (Block course, Excursion, Seminar) *Contents*: History of domestication of livestock. Unconventional livestock in Asia/Oceania, Africa and Latin America: Biology, management and, production systems. Commercial and subsistence products from little known domesticated animal species – such as insects, snails, reptiles, rodents, up to little-used ungulates. Local and national economic potential and contribution to local livelihoods. Wildlife in Asia, Africa and Latin America: Biology, wildlife demography and modelling of population dynamics, human/wildlife conflicts, international conventions on (agro)-biodiversity and conservation, strategies for wildlife conservation through utilisation, different wildlife utilisation concepts, wildlife-based tourism, terminal wildlife utilisation of different intensity ("Hunting/Trophy hunting", "Game-Ranching", "Game Farming", "Feedlot" with beginning domestication), community-based utilisation cum conservation approaches. Contribution of wildlife utilisation to the livelihood of rural communities. Regulations, possibilities and constraints for wildlife conservation. Diamond, J. 1999: Guns, Germs, and Steel: The Fates of Human Societies. W.W.Norton and Company, New York, 480 p.; Board on Science and Technology for International Development 1991: Microlivestock Little-Known Small Animals with a Promising Economic Future. National Academy Press, Washington D.C., 449; Bonner, R.. 1993: At the Hand of Man - Peril and Hope for Africa's Wildlife. Alfred A. Knopf Inc., New York, 322 p.; Convention on International Trade in Endangered Species of Wild Fauna and Flora 1973/1979 at http://www.cites.org/ (incl. appendices)	WLH

Examination: Written exam (90 minutes, 70%) and oral seminar presentation (ca. 20 minutes, 30%) **Examination requirements:** Domestication / taming; unconventional domesticated animals: Biology, management, husbandry, economic potential. Wildlife: Biology, population dynamics, modelling of population dynamics; human-wildlife conflicts, international conventions on biodiversity and species conservation. Wildlife utilization: Tourism, game ranching, game hunting, trophy hunting.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge (B.Sc. level) of soil, plant and animal sciences
Language: English	**Person responsible for module:** Prof. Dr. Eva Schlecht
Course frequency: SoSe, jedes 2 Jahr, alternieernd mit dem Modul M.SIA.A08; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: not limited	

Additional notes and regulations:

Literature:

Diamond, J. 1999: Guns, Germs, and Steel: The Fates of Human Societies. W.W.Norton and Company, New York, 480 p.; Board on Science and Technology for International Development 1991: Microlivestock Little-Known Small Animals with a Promising Economic Future. National Academy Press, Washington D.C., 449; Bonner, R.. 1993: At the Hand of Man - Peril and Hope for Africa's Wildlife. Alfred A. Knopf Inc., New York, 322 p.; Convention on International Trade in Endangered Species of Wild Fauna and Flora 1973/1979 at http://www.cites.org/ (incl. appendices)

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.A08: Social-ecology in livestock production systems**	6 C 4 WLH

Learning outcome, core skills: Students understand livestock systems as social-ecological systems in which livestock farmers, through their actions, establish, maintain and develop the respective production system. Consequently, these so-called human activity systems are assessed using an actor-oriented approach. Emphasis of this module is on methods that are used to analyse and improve livestock farmers' management. This serves to understand "why livestock farmers do what they do" and "how livestock farmers produce". Students learn how they can make use of the knowledge of livestock farmers to better understand how low external input systems work. Collaborative learning is introduced as methodology to develop human activity systems in a transdisciplinary research approach. They deal with the question of how mutual understanding between livestock farmers and scientists can be achieved despite the different knowledge systems. Students obtain a profound insight into methods for farmer experimentations in which livestock farmers and scientists collaborate, and into using computer models as learning tools for ex-ante assessment of improvement measures in community based approaches. In "what – if" analyses, the change of action rules on the performance of socio-ecological systems is assessed.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Social-ecology in livestock production systems (Block course, Lecture, Seminar) *Contents*: Theoretical background of the social-ecological system view: System theory, 1st and 2nd order cybernetics, complex adaptive systems, human activity systems. Actor-oriented approach to understand and influence low external input systems: Local knowledge and situated practices Methodology for understanding local knowledge: Second order observation and knowledge analysis Collaborative learning: Exchange between knowledge systems, dialogue, action research, livestock farmer experimentation, participatory monitoring and evaluation Modelling of livestock systems as tool for collaborative learning: Bio-economic modelling, multi-agent modelling, role plays. Kaufmann, B.A. 2007: Cybernetic analysis of socio-biological systems: The case of livestock management in resource poor systems. In: Kommunikation und Beratung, Volume 81, Margraf Publishing; McCown, R.L. 2002: Changing systems for supporting farmers' decisions: problems, paradigms and prospects. Agricultural Systems 74: 179-220; Wiener, N. 1948: Cybernetics or control and communication in the animal and the machine. John Wiley, New York.	WLH
Examination: Written exam (90 minutes, 70%) and presentation (ca. 20 minutes, 30%)	6 C

Examination requirements: Social-ecological systems analysis; systems theory, cybernetic, complex adaptive systems, human activity systems. Local knowledge and situated practices; analysis of local knowledge; cooperative learning; modelling of livestock husbandry systems.	

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge (B.Sc. level) of soil, plant and animal sciences
Language: English	**Person responsible for module:** Prof. Dr. Brigitte Kaufmann
Course frequency: SoSe, jedes 2 Jahr, alternierend mit dem Modul M.SIA.A07; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 30	

Additional notes and regulations:

Literature:

Kaufmann, B.A. 2007: Cybernetic analysis of socio-biological systems: The case of livestock management in resource poor systems. In: Kommunikation und Beratung, Volume 81, Margraf Publishing; McCown, R.L. 2002: Changing systems for supporting farmers' decisions: problems, paradigms and prospects. Agricultural Systems 74: 179-220; Wiener, N. 1948: Cybernetics or control and communication in the animal and the machine. John Wiley, New York.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.A10M: Livestock nutrition and feed evaluation under (sub)tropical conditions**	6 C 4 WLH

Learning outcome, core skills: Students are able to: • describe the function of the major digestive systems and processes of domestic livestock species and their consequences for ration formulation • understand the different feeding strategies and nutritional requirements of the main livestock species • assess the quality of feedstuffs through theoretical concepts and practical feed quality analyses • calculate rations for the main livestock species • understand abiotic and biotic environmental influences on the physiology of different livestock species • discuss opportunities and limitations of feeding strategies for an optimization of livestock production under specific agro-ecological settings	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Livestock nutrition and feed science *Contents*: The lecture explains and discusses the nutritional physiology of the main livestock species. The adaptation of the different livestock species to climatic conditions and to qualitatively and quantitatively variable fodder supply is analysed. Possibilities to reduce the negative impact of environmental factors on animal production through adapted feeding strategies and ration formulation are evaluated.	2,5 WLH
Course: Laboratory analyses of feedstuffs *Contents*: Students are introduced to the main standard methods of feed quality analyses, such as determination of crude protein, macro-minerals, cell wall constituents and *in vitro* digestibility. They apply these methods onto selected tropical feed samples and write an essay on one method, thereby interpreting the quality of their feed samples which they determined with the selected method.	1,5 WLH
Examination: Oral (approx. 20 minutes; 75%) and protocol (max. 6 pages; 25%) **Examination requirements:** Knowledge of basic terms relevant to livestock nutrition and physiology, feed science and feed quality analysis; insights into interdependencies between the discussed fields and livestock performance; ability to explain species-specific implications of nutrition physiology on global feed requirements of livestock systems.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge (B.Sc. level) of animal sciences
Language: English	**Person responsible for module:** Prof. Dr. Eva Schlecht

Course frequency: each winter semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 12	

Additional notes and regulations:

Literature:

- *Close, W.H., Menke, K.H. (eds.) 1986: Selected topics in animal nutrition. A manual. Deutsche Stiftung für Internationale Entwicklung (DSE), Feldafing, Germany*
- *Payne, W.J.A., Wilson, R.T. 1999: An Introduction to Animal Husbandry in the Tropics. Blackwell Science Ltd., Oxford, UK*
- *Van Soest, P.J. 1994: Nutritional Ecology of the Ruminant. Cornell University Press, Ithaca, US*
- *Selected up-to-date journal articles*

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.A11: Tropical animal husbandry systems**	6 C 4 WLH

Learning outcome, core skills: Students are able to: understand the impact of the natural and economic environment on the evolution of different types of husbandry systems as well as on their orientation and intensity of production; gain understanding for parameters that have to be considered when aiming at the improvement of livestock husbandry systems within a given framework; individually analyse and present a specific tropical livestock production system.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Tropical animal husbandry systems (Lecture, Seminar) *Contents*: This module provides an extensive overview on the different forms of animal husbandry systems in developing and transformation countries of Africa, Asia and Latin America, ranging from camel nomadism in deserts to beef ranching and intensive dairying in tropical highlands. The system-specific strategies of livestock management are analysed in view of their ecological and economic sustainability. The (potential) interactions of livestock with other components of the farming system are explored, thereby differentiating between market and subsistence oriented systems. The role of additional factors influencing livestock production systems such as cultural, social, economical and political frame conditions are discussed. Delgado, C., Rosegrant, M., Steinfeld, H., Ehui, S., Courbois, C. 1999: Livestock to 2020. The next food revolution. FAO Discussion Paper 28, FAO Rome, Italy; Devendra, C., Thomas, D., Jabbar, M.A. and Zerbini, E., 2000: Improvement of Livestock Production in Crop-Animal Systems in Agro-ecological Zones of South Asia. ILRI, Nairobi, Kenya; Falvey, L., Chantalakhana, C. (eds) 1999: Smallholder Dairying in the Tropics. ILRI, Nairobi, Kenya	4 WLH
Examination: Written exam (90 minutes, 75%) and oral seminar presentation (ca. 15 minutes, 25%) **Examination requirements:** abiotic and biotic conditions of animal husbandry in the (sub-)Tropics; characteristics, opportunities/constraints of pastoral, agro-pastoral, silvo-pastoral, aquatic, industrial and urban systems; species-specific management and production (cattle, sheep, goat, camel, yak, pig, poultry).	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge (B.Sc. level) of plant and animal sciences or agricultural economics
Language:	**Person responsible for module:**

English	Prof. Dr. Eva Schlecht
Course frequency: each winter semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: not limited	

Additional notes and regulations:

Literature:

Delgado, C., Rosegrant, M., Steinfeld, H., Ehui, S., Courbois, C. 1999: Livestock to 2020. The next food revolution. FAO Discussion Paper 28, FAO Rome, Italy; Devendra, C., Thomas, D., Jabbar, M.A. and Zerbini, E., 2000: Improvement of Livestock Production in Crop-Animal Systems in Agro-ecological Zones of South Asia. ILRI, Nairobi, Kenya; Falvey, L., Chantalakhana, C. (eds) 1999: Smallholder Dairying in the Tropics. ILRI, Nairobi, Kenya

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.A13M: Livestock-based sustainable land use**	6 C 4 WLH

Learning outcome, core skills: To understand the interactions of livestock with the natural resource base and their site- and management specific positive or negative environmental impacts; To get acquainted with and test methodological approaches used in field research on livestock-environment interactions; To learn about simple modelling approaches and the significance of their results.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Livestock-based sustainable land use (Lecture, Exercise) *Contents*: This module highlights the general positive and negative impacts of livestock and livestock management on the natural resources (air, water, soil vegetation), specifically under (sub)tropical conditions, at the plot to the watershed scale. It discusses options for sustainable livestock-based land use, thereby building upon the beneficial impacts of animals on soils and plants. Management options for reducing negative environmental effects of livestock (gaseous emissions, nutrient excretion) are highlighted, and possibilities for consolidating the interests of livestock keepers with international conventions are discussed. The students are introduced, in lectures, own reading and practical field tests to up-to-date quantitative and qualitative methods that are used in studies on animal-environment interactions. Simple modelling approaches that depict animal-environment interactions at the plot level up to the watershed scale are presented and tested by the participants. Steinfeld, H., Gerber, P., Wassenaar, T., Castel, V., Rosales, M., de Haan, C. 2006: Livestock's long shadow. Fao, Rome, Italy; Specific scientific articles, distributed in the course.	4 WLH
Examination: Written examination (90 minutes) **Examination requirements:** Influences of animal husbandry / the individual animal on its environment: soil fertility and soil erosion, pasture vegetation, nutrient transfers, greenhouse gas emissions; livestock keeping versus nature conservation; methods for assessing quality and quantity of pasture vegetation; methods to determine the animal's behavior at pasture and its feed intake.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge (B.Sc. level) of soil, plant and animal sciences
Language: English	**Person responsible for module:** Prof. Dr. Eva Schlecht
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]

Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: not limited	

Additional notes and regulations:

Literature:

Steinfeld, H., Gerber, P., Wassenaar, T., Castel, V., Rosales, M., de Haan, C. 2006: Livestock's long shadow. Fao, Rome, Italy; Specific scientific articles, distributed in the course.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.A14: Organic livestock farming under temperate conditions**	6 C 4 WLH

Learning outcome, core skills: *Advances in animal nutrition and animal health:* Students get to know scientific tools for quantifying, assessing and evaluating problems within organic livestock production. *Animal welfare :* Students have a basic understanding of animal welfare, familiarize with different organic husbandry systems, practical problems and scientific concepts including how to assess animal welfare both at farm and system level. *Sustainable forage production systems:* Students are able to assess the relationships between sward management and structural (yield, botanical composition) and functional (nutrient efficiency) sward characteristics.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Animal Welfare (Lecture) *Contents*: • Principles of animal welfare in relation to organic farming; scientific methods of welfare assessment	1,33 WLH
Course: Advances in animal nutrition and animal health (Lecture) *Contents*: • Organic livestock production in Europe • Possibilities and limitations within organic farming to ensure a high level of animal health • Strategies within animal nutrition to increase the efficiency in the use of limited esources • System-oriented versus technical approaches	1,33 WLH
Course: Sustainable forage production systems (Lecture) *Contents*: • Design and management of a sustainable forage production • Management of forage quality and biodiversity on grassland • Minimizing nutrient losses towards water and atmosphere	1,33 WLH
Examination: Written examination (90 minutes) **Examination requirements:** Knowledge of basic terms relevant to organic livestock systems; insights into aspects of feeding, healthcare, welfare, forage production and forage quality assessment; linkages and interdependencies between the discussed fields. One written exam with all three parts**.**	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge (B.Sc. level) of animal sciences
Language: English	**Person responsible for module:** Prof. Dr. Albert Sundrum
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 35	

Additional notes and regulations:

Literature:

Advances in animal nutrition and animal health:

- Vaarst, M., Roderick, S., Lund, V., Lockeretz, W. (eds.) 2004: Animal health and welfare in organic agriculture. CABI Publishing

Animal welfare:

- Appleby, M.C., Hughes, B.O. (eds) 1997: Animal welfare. CAB International, Wallingford;
- Vaarst, M. et al. (eds.) 2004: Animal health and welfare in organic Agriculture. CAB International, Wallingford

Sustainable forage production systems:

- Hopkins, A. 2000: Grass, its production and utilization. Blackwell Science, Oxford, UK;
- Cherney J.H. 1998: Grass for dairy cattl.e CABI Publishing, Exon, UK;
- Frame, J. 1992: Improved Grassland Management. Farming Press Books, Ipswich, UK.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.A15M: Scientific writing in natural sciences**	6 C 4 WLH

Learning outcome, core skills: In the course of their study programme, when compiling their MSc thesis and for their further (academic) career, students have to deliver a variety of scientific texts. Therefore, this module aims at presenting and discussing the main principles of such texts. It provides training in how to write different types of essays, abstracts, grant winning proposals and complex texts (chapters) in preparation and writing of the master thesis research. At successful completion of this module, participants will be able to: • differentiate the structure and format of various types of scientific texts; • search scientific literature, set up and manage an electronic literature database and compile reference lists; • write term papers, grant proposals, conference abstracts, and final thesis (chapters); • compile scientific tables and figures and be able to decide which type of data is best expressed in which format; • apply the rules of good scientific practice; • give and receive constructive feedback on scientific texts.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Scientific writing in natural sciences *Contents*: To provide participants with theoretical basics and practice these, the module will offer a mixture of lecture and exercises. Within the course a variety of facets and techniques of scientific writing will be imparted that graduate SIA students should be able to master. Consequently, participants are introduced to scientific literature search and analysis, good scientific practice and how to avoid plagiarism. Additionally, guidelines for creating concise tables and figures are presented. To be prepared for their master thesis work, students will be taught how to write different scientific text documents such as grant proposals and conference abstracts. By reviewing and discussing a scientific article and peer-reviewing an abstract of a fellow student by using an online tool, module participants will train how to give and receive constructive feedback. Finally, students will choose a topic for their term paper (see below) to further apply the newly acquired knowledge.	

Examination: 3 short written assignments (approx. 4 pages, 50%) are to be handed in during the semester and one major text (term paper, approx. 6 pages 50%) is to be submitted at the end of the semester.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of Word (Microsoft or Open Office) and Adobe Acrobat.
Language: English	**Person responsible for module:** Prof. Dr. Eva Schlecht

Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 1 - 3
Maximum number of students: 30	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E02: Agricultural price theory**	6 C 4 WLH

Learning outcome, core skills: Significance of prices from individual and societal viewpoint, agricultural price structure, role of technical change, vertical and spatial price formation, price formation in quota markets, futures and forward contracts.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Agricultural price theory (Lecture) *Contents*: This module is designed to provide students with an introduction to the theory and measurement of price formation on agricultural markets. Students will learn about price formation and price linkages over space and time, and how prices on markets in different locations and/or for products of different levels of processing are linked with one another. They will also learn about special examples of price determination that are unique (land markets) or especially common (markets influenced by quota schemes) in agriculture. A final focus will be placed on future markets and their possible use as a risk management tool in agriculture and agribusiness. Vorlesungsbegleitende Materialien	4 WLH
Examination: Written examination (90 minutes) **Examination requirements:** Knowledge of impact of prices from an individual and macroeconomic point of view, of agricultural price structure as well as the importance of the technical progress, vertical and spatial price formation, price formation in the farm land market and the quoted market, as well as of commodities future markets	6 C

Admission requirements: none	**Recommended previous knowledge:** Background in agricultural markets and policy recommended
Language: English	**Person responsible for module:** Prof. Dr. Bernhard Brümmer
Course frequency: each winter semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 60	

Additional notes and regulations:

Literature:

A script and a variety of supplemental reading will be provided.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E05M: Marketing research**	6 C 4 WLH

Learning outcome, core skills: Students (i) are able to outline the steps in a marketing research process; (ii) are able to develop a marketing research design; (iii) know all relevant methods for data collection, analysis and prognosis with their specific advantages and problems; (iv) elaborate written and oral presentations in teamwork.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Marketing researches (Lecture, Seminar) *Contents*: Tasks and management of marketing research; methods of data collection; methods of data analysis, methods of prognoses. - Aaker, D.A., Kumar, V., Day, G.S. (2011): Marketing research. 10thed., Hoboken, NJ: Wiley. - Bryman, A. (2008): Social Research Methods. 3rded., Oxford: Oxford University Press. - Burns, A.C., Bush, R.F. (2006): Marketing Research. 5thed., Upper Saddle River, NJ, et al.: Prentice Hall. - Denzin, N.K., Lincoln, Y.S. (2008): Strategies of qualitative inquiry. 3rded., Los Angeles, CA, et al.: Sage Publications. - Churchill, G.A., Brown, T.J. (2007): Basic marketing research. 6thed., Mason, OH: Thomson South Western. - Dillman, D.A., Smyth, J.D., Christian, L.M. (2009): Internet, mail, and mixed-mode surveys. 3rded., Hoboken, NJ: Wiley. - Greenbaum, T.L. (2000): Moderating focus groups. A practical guide for group facilitation. Thousand Oaks, CA, et al.: Sage Publications. - Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E. (2009): Multivariate data analysis, 7thed., Upper Saddle River, NJ, et al.: Prentice Hall. - Malhotra, N.K., Birks, D.F., Wills, P. (2012): Marketing research, 4thed., Harlow, Pearson. - McQuarrie, F. (1996): The marketresearchtoolbox:aconciseguideforbeginners. Thousand Oaks, CA, et al.: Sage Publications. - Ritchie, J., Lewis, J. (2006): Qualitative research practice: A guide for social science students and researchers. London et al.: Sage Publications. - Shao, A.T., Zhou, K.Z. (2007): Marketing research. 3rded., London et al.: Thomson Learning. - Webb, J.R. (2005): Understanding and designing marketing research. 2nded., London: Thomson Learning. - Wooldridge, J.M. (2006): Introductory econometrics – a modern approach. 3rded., Mason, OH, et al.: Thomson South Western.	4 WLH

Examination: Presentation (ca. 20 minutes) with written outline (max. 5 pages) (50%) and oral exam (ca. 30 minutes) (50%) **Examination requirements:** Knowledge of tasks and management of marketing research; methods of data collection; methods of data analysis, methods of prognoses.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge on marketing
Language: English	**Person responsible for module:** Prof. Dr. Ulrich Hamm
Course frequency: each winter semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 40	

Additional notes and regulations:

Literature: Aaker, D.A., Kumar, V., Day, G.S. (2013): Marketing research. 11th ed., Hoboken, NJ: Wiley. - Bryman, A. (2008): Social Research Methods. 3rd ed., Oxford: Oxford University Press. - Burns, A.C., Bush, R.F. (2010): Marketing Research. 6th ed., Upper Saddle River, NJ, et al.: Prentice Hall. - Denzin, N.K., Lincoln, Y.S. (2008): Strategies of qualitative inquiry. 3rded., Los Angeles, CA, et al.: Sage Publications. - Churchill, G.A., Brown, T.J. (2007): Basic marketing research. 6thed., Mason, OH: Thomson South Western. - Dillman, D.A., Smyth, J.D., Christian, L.M. (2009): Internet, mail, and mixed-mode surveys. 3rd ed., Hoboken, NJ: Wiley. - Greenbaum, T.L. (2000): Moderating focus groups. A practical guide for group facilitation. Thousand Oaks, CA, et al.: Sage Publications. - Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E. (2009): Multivariate data analysis, 7th ed., Upper Saddle River, NJ, et al.: Prentice Hall. - Malhotra, N.K., Birks, D.F., Wills, P. (2012): Marketing research, 4th ed., Harlow, Pearson. - McQuarrie, F. (1996): The market research toolbox: a concise guide for beginners. Thousand Oaks, CA, et al.: Sage Publications. - Ritchie, J., Lewis, J. (2006): Qualitative research practice: A guide for social science students and researchers. London et al.: Sage Publications. - Shao, A.T., Zhou, K.Z. (2007): Marketing research. 3rd ed., London et al.: Thomson Learning. - Webb, J.R. (2005): Understanding and designing marketing research. 2nd ed., London: Thomson Learning. - Wooldridge, J.M. (2006): Introductory econometrics – a modern approach. 3rd ed., Mason, OH, et al.: Thomson South Western.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E06: International markets and marketing for organic Products**	6 C 4 WLH

Learning outcome, core skills: (i) Analysis of international markets for organic products; International trade (ii) Import regulations for organic products in different countries; (iii) Import regulations for agricultural products in the EU; (iv) Export market research and analysis from the viewpoint of developing countries; (v) Marketing strategies for the export of organic products; (vi) Marketing measures for the export of organic products; (vii) Case study for export of organic products from a developing country to the EU.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: International markets and marketing for organic products (Lecture, Seminar) *Contents*: (i) Analysis of international markets for organic products; International trade (ii) Import regulations for organic products in different countries; (iii) Import regulations for agricultural products in the EU; (iv) Export market research and analysis from the viewpoint of developing countries; (v) Marketing strategies for the export of organic products; (vi) Marketing measures for the export of organic products; (vii) Case study for export of organic products from a developing country to the EU Jain, S.C. 2001: International marketing, 6th ed., South Western Thomson Learning, Cincinatti; Kotler, P., Keller, K.L. 2006: Marketing management, 12th ed., Pearson Prentice Hall, Upper Saddle River; Schmid, O., Hamm, U., Richter, T., Dahlke, A. 2004: A guide to successful organic marketing initiatives. Research Institute of Organic Agriculture, Frick/Switzerland; Wilson, R.M.S., Gilligan, C. 2003: Strategic marketing management, 2nd ed., Elsevier Amsterdam.	4 WLH
Examination: Presentation (ca. 20 minutes) with written outline (max. 5 pages) (50%) and oral exam (approx. 30 minutes) (50%) **Examination requirements:** Knowledge of tasks and approaches in market research as well as knowledge of data survey methods, prognosis methods and analysis methods.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge on marketing
Language: English	**Person responsible for module:** Prof. Dr. Ulrich Hamm
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 25	

Additional notes and regulations:

Literature:

Literature: Development of organic agriculture world wide - Lockeretz, W. (ed.) (2007): Organic farming: An international history. CABI, Wallingford/UK. - Willer, H. and Kilcher, L. (eds.) (2012): The world of organic agriculture. Frick/Switzerland. - http://www.soel.de - http://www.ifoam.org - http://www.fao.org - http://www.orgprints.org General political framework for imports of organic products in the EU - http://eur-lex.europa.eu/en/legis/20110301/chap03.htm Marketing concepts - Armstrong, G., Kotler, P., Harker, M. and Brennan, R. (2009): Marketing. An Introduction. 9th ed., Pearson Education, Harlow/England (European version) - Doyle, P. and Stern, P. (2006): Marketing management and strategy. 4th ed., FT Prentice Hall, Hemel Hempstead/UK - Jain, S. C. (2001): International marketing management. 6th ed., South Western, Cincinnati, Ohio/USA - Kotler, P. and Keller, K. L. (2006): Marketing management. 12th ed., Prentice-Hall Pearson, Upper Saddle River, New Jersey/USA - Schmid, O., Hamm, U., Richter, T. and Dahlke, A. (2004): A guide to successful organic marketing initiatives. Organic marketing initiatives and rural development vol. 6, Research Institute of Organic Agriculture, Frick/Switzerland - Wilson, R. M. S. and Gilligan, C. (2005): Strategic marketing management. 3rd ed., Butterworth-Heinemann, Oxford/UK - Zander, K., Hamm, U., Freyer, B., Gössinger, K., Hametter, M., Naspetti, S., Padel, S., Stolz, H., Stolze, M. and Zanoli, R. (2010): Farmer Consumer Partnerships – How to successfully communicate the values of organic food consumers. University of Kassel.http://orgprints.org/17852/1/CORE_FCP_Handbook_en_2010.pdf

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E11: Socioeconomics of rural development and food security**	6 C 4 WLH

Learning outcome, core skills: Students learn concepts of development and problem-oriented thinking in a development policy context. The identification of interdisciplinary linkages is trained. Building on case-study analyses, course participants can pinpoint appropriate economic and social policies and assess their impacts. These qualifications can also be transferred to unfamiliar situations.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Socioeconomics of rural development and food security (Lecture) *Contents*: This module provides students with an overview of socioeconomic aspects of hunger and poverty in developing countries. Apart from more conceptual issues and development theories, policy strategies for rural development and poverty alleviation are discussed and analyzed. Special emphasis is put on problems in the small farm sector. Numerous empirical examples are used to illustrate the main topics.	4 WLH
Examination: Written examination (90 minutes) **Examination requirements:** Concepts and measurement of hunger and poverty; development theory; classification and evaluation of rural development policies	6 C

Admission requirements: none	**Recommended previous knowledge:** Prior knowledge of microeconomics at the BSc level is useful
Language: English	**Person responsible for module:** Prof. Dr. Matin Qaim
Course frequency: each winter semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 120	

Additional notes and regulations:

Literature:

Text books, research articles and lecture notes.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E12M: Quantitative research methods in rural development economics**	6 C 4 WLH

Learning outcome, core skills: Students are familiar with empirical, quantitative methods in rural development economics. Thus, they are able to develop and implement their own research projects.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Quantitative research methods in rural development economics (Lecture) *Contents*: This module teaches and trains methodological skills for the analysis of micro data in rural development economics. In particular, farm and household level data are used. Apart from statistical and econometric techniques, approaches of primary data collection are covered (questionnaire development, survey sampling design). These methods are used for concrete examples in the computer lab.	4 WLH
Examination: Written examination (90 minutes) **Examination requirements:** Use and interpretation of descriptive statistics and standard econometric methods; hypothesis testing; data management; sampling design.	6 C

Admission requirements: Familiarity with the contents of the module "Socioeconomics of Rural Development and Food Security" is assumed.	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Matin Qaim
Course frequency: each summer semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 40	

Additional notes and regulations:

Literature:

Text books, research articles and lecture notes.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E13M: Microeconomic theory and quantitative methods of agricultural production**	6 C 4 WLH

Learning outcome, core skills: Microeconomic Theory of Agricultural Production Students are familiar with microeconomic approaches and can apply them to analyze issues related to agriculture and rural development. Quantitative Methods in Agricultural Business Economics Students are familiar with quantitative methods used for the analysis and planning of farms and enterprises in the agricultural sector.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Microeconomic theory of agricultural production (Lecture) *Contents*: Consumer theory, producer theory, markets, monopoly situations, risk and uncertainty, economics of technical change, farm household models, sharecropping contracts.	2 WLH
Course: Quantitative methods in agricultural business economics (Lecture) *Contents*: Budgeting, accounting, annual balance sheets, linear programming, finance, investment analysis	2 WLH
Examination: Written examination (120 minutes) **Examination requirements:** Consumer theory; producer theory; risk; technological progress; farm household models; budgeting and accounting; linear programming; finance; investment analysis	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Matin Qaim
Course frequency: each winter semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 40	

Additional notes and regulations:

Literature:

Text books, research articles and lecture notes.

After successful conclusion of M.Agr.0060 students can not complete M.SIA.E13M

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E14: Evaluation of rural development projects and policies**	6 C 4 WLH

Learning outcome, core skills: Students understand the standard methods in the economic analysis and evaluation of development projects and policies. They are able to design and perform cost-benefit analysis as well as project evaluations independently.	**Workload:** Attendance time: 40 h Self-study time: 140 h

Course: Evaluation of rural development projects and policies (Lecture) *Contents*: This module teaches standard methods in the economic analysis and evaluation of development projects and policies. It covers the economic and financial assessment of rural development projects (in particular cost-benefit analysis), as well as experimental and quasi-experimental impact evaluation methods. These methods are illustrated with examples and students learn to apply these methods in different exercises.	4 WLH
Examination: Written exam (90 minutes, 70%) and homework (max. 10 pages, 30%) **Examination requirements:** Cost-benefit analysis; impact evaluation	6 C

Admission requirements: none	**Recommended previous knowledge:** Knowledge of the content of the module "Socioeconomics of Rural Development and Food Security" and "Econometrics I" is required.
Language: English	**Person responsible for module:** Prof. Dr. Matin Qaim
Course frequency: each summer semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 45	

Additional notes and regulations:

Literature:

Text books, research articles and lecture notes.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E17M: Management and management accounting**	6 C 4 WLH

Learning outcome, core skills: The main aim of the module is to acquaint students with the theory and practice of management and management accounting/control, and the role of environmental, social and governance issues therein. More specifically, the aims of the module are: • To provide students with insights into different theoretical perspectives; an understanding of the implicit assumptions held by each perspective as well as the implications of these perspectives for management practice and research; • To provide students with the conceptual and practical skills necessary to effectively understand and critically analyse management/corporate practice; • To provide students with practical experience in and knowledge about “managing and accounting for sustainability”; • To enable students to understand why traditional accounting and accountability do not serve managers and other corporate stakeholders well in the light of increasing demands for social accountability, transparency and social responsibility	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Management and management accounting (Lecture, Seminar) *Contents*: • The fundamentals of management practice, the roles and functions undertaken by managers; • The development and evolution of management theory; • A critical reflection on the wider responsibilities of management (incl. moral decision-making, managing for sustainability); • An introduction to the traditional accounting and accountability theory and practice; key management accounting and control systems and concepts; performance measurement and management; • The developments in new accounting and accountability tools and their role (and limitations) in supporting managerial decision making and increasing transparency on environmental, social and sustainability performance. Lussier, R.N. 2006: Management fundamentals – Concepts, Applications, Skill Development, Thomson, London, UK; Robbins, S.P., Coulter, M. 2007: Management, 9th edition, Pearson, Upper Saddle River; Drury, C. 2005: Management Accounting for Business, Thomson, London, UK; Atkinson, A.A., Kaplan, R.S., Young, S.M. 2004: Management Accounting, 4th Edition, Upper Saddle River.	4 WLH
Examination: Presentation (ca. 15 minutes, 50%) and written examination (90 minutes, 50%) **Examination requirements:** Students should demonstrate a sound understanding of the management / management accounting concepts and frameworks (written exam). Students are also expected to apply the knowledge acquired in class to a case study company and to present and discuss their findings with others (workshops incl. role play and group work).	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Christian Herzig
Course frequency: each winter semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 35	

Additional notes and regulations:

Literature:

Lectures and short lectures combined with facilitated group discussion; seminars include case study-based group work and exercises

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E18: Organization of food supply chains**	6 C 4 WLH

Learning outcome, core skills:	**Workload:**
Students are introduced into various issues of the organizational design of food supply chains and agribusiness firms. Students learn to write a seminar paper and they are also able to independently acquire additional knowledge by advanced literature search. The preparation and presentation of selected topics as well as the contribution to oral discussions during seminar sessions will be examined. The comprehensive overview of various organizational theories enables the students to identify and classify complex organizational problems in food supply chains and develop solutions.	Attendance time: 68 h Self-study time: 112 h

Course: Organization of food supply chains (Seminar) *Contents*: The module introduces into basic concepts of organizational design in food supply chains and the agribusiness sector. The students write a paper based on the combination of a selected organizational theory and a practical example. The students present their papers and discuss the various organizational issues with high importance for the food and agribusiness sector. Key aspects of the lecture are: - Stakeholder management for farms and agribusiness firms - Efficient organizational design of food supply chains: Contracts, open markets, vertical integration - Competitive strategy and the organizational design of food supply chains - Certification schemes from an organizational perspective - Cooperatives and the organization of food supply chains - Transparency of food supply chains The seminar makes use of various organizational theories and provides students with insights into the practical implications of these theories. Vorlesungsbegleitende Materialien	4 WLH
Examination: Homework (max. 15 pages, 65%) and 2 presentations (about 45 min, 20% and about 15 min, 15%) **Examination requirements:** Ability to write a paper based on the combination of a selected organizational theory and a practical example, to present the paper, serve as a discussant of the paper of another group and discuss the various organizational issues with high importance for the food and agribusiness sector. 1. Presentation: ca. 45 minutes presenting the contents of the own homework; 2. Presentation: ca. 15 minutes discussing the homework of another group of participants.	6 C

Admission requirements:	**Recommended previous knowledge:**
none	Basic knowledge food supply chains and agribusiness management
Language:	**Person responsible for module:**
English	Dr. Verena Otter

Course frequency: each summer semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 21	

Additional notes and regulations:
Students are not allowed to take the module M.Agr.0053 if they have passed M.SIA.E18.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E19: Market integration and price transmission I**	6 C 4 WLH

Learning outcome, core skills: Students gain insight into the functioning of the price mechanisms on agricultural markets and into the determinants of market integration. They learn to apply econometric analysis methods to the study of horizontal and vertical price transmission processes (time series methods, cointegration, including non-linear cointegration and non-linear error correction models).	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Market integration and price transmission I (Lecture) *Contents*: Theory and empirical analysis of agricultural market integration	4 WLH
Examination: Written examination (60 minutes) **Examination requirements:** Students are able to explain the economic theory of price transmission and market integration (e.g. how can we explain the prevalence of asymmetric price transmission on agricultural markets), and are able to apply the most important methods of empirical price transmission analysis (in particular the econometric estimation of error correction models).	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of econometrics
Language: English	**Person responsible for module:** Prof. Dr. Stephan von Cramon-Taubadel
Course frequency: each summer semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 30	

Additional notes and regulations:

Literature:

A list of seminar papers (Garnder, Ravallion, Goodwin, Fackler, Barrett) will be circulated to students, together with a list of recent applications.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E21: Rural sociology**	6 C 4 WLH

Learning outcome, core skills: One of the primary objectives of this course is to introduce students to the principles of sociology in general and key concepts of rural sociology in particular. In addition, we want to provide the analytical tools for understanding the processes inherent to these concepts. Beyond that, the course aims at enhancing students' ability to identify different research perspectives and to critically discuss and analyse research strategies and methods.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Rural Sociology (Lecture, Seminar) *Contents*: As an introduction to rural sociology, this course is designed to give an overview of the sociological concepts of "demographic change", "social structural developments and social problems in rural areas" (deprivation, rural poverty): Lectures outline each of these issues and position them within the context of sociology. We will use seminars to debate key questions raised during lectures and to discuss selected issues based on academic publications.	4 WLH
Examination: Homework (max. 20 pages, 50%) and presentation (approx. 30 minutes, 50%) **Examination requirements:** Presentation of and critical discussion on concepts and methods in the field of rural- and agricultural sociology.	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Claudia Neu
Course frequency: each summer semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 25	

Additional notes and regulations:

Literature:

Adequate literature is presented in the lecture; text book chapters supply basic knowledge and are complemented by scientific publications.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E24: Topics in rural development economics I**	6 C 4 WLH

Learning outcome, core skills: The objective of this course is to acquaint Master students with the reading and understanding of scientific journal articles on relevant topics of rural development economics. Student should learn how to develop a scientific research question, choose appropriate research methods and strucutre a scientific article.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Topics in Rural Development Economics I (Lecture) *Contents*: This course will provide Master Students with an overview of relevant topics in rural development economics, which will also enable them to develop own research questions and study approaches in this field. The module is structured as a reading course, building on selected articles from relevant international journals. Students are required to read announced articles before the classroom sessions, in order to enable a critical debate in class. The articles selected for the course are clustered around key topics relevant to rural development economics, such as listed below. Tentative Topics 1. The food system transformation and smallholder farmers 2. Rural livelihood strategies and income diversification 3. Adoption and impact of modern agricultural technology 4. Economics of nutrition and health 5. Gender and intra-household resource allocation Master students will have to write a summary of a selected journal article. Furthermore, the course should enable them to develop own research questions and study approaches in the field of rural development economics.	4 WLH
Examination: Presentation (approx. 10 minutes, 40%) and homework (max. 4 pages, 60%) **Examination requirements:** Constructive participation in the discussion during the lectures, which requires the reading of the articles indicated. In both the written and the oral assignments, students are supposed to demonstrate that they are able to identify the most relevant aspects of the articles and to critically evaluate the research questions, the methods and the results of the studies.	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Meike Wollni
Course frequency:	**Duration:**

each summer semester; Göttingen	1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: not limited	

Additional notes and regulations:

Literature:

Selected articles from academic journals and book chapters

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E31: Strategic management**	6 C 4 WLH

Learning outcome, core skills: • The contents and framework of strategic management; • An introduction to organisational & business strategies; • The importance of values and purpose in defining organisation's strategic goals; • The management of stakeholder relations; • Performance management and strategic control; • The management of strategic change;	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Strategic management (Lecture, Seminar) *Contents*: • Concepts and frameworks used in strategic management; • The importance of values and purpose in defining an organisation's strategic goals; • The analysis of the complex environment of agrifood organisations and how it shapes the strategic behaviour of members of the value chain and an organisation's competitive environment; • A critical review of strategic frameworks (e.g. Porter's five forces, life cycle analysis); • The analysis of the internal environment (value creating activities, capabilities and resources); • An introduction to organisational and business strategies; • The management of stakeholder relations; • The relationship between organisation and strategy; • The management of strategic change and the role of strategic leadership.	4 WLH
Examination: Oral presentation (approx. 20 minutes, 50%) and written examination (60 minutes, 50%) **Examination requirements:** Students should demonstrate a sound understanding of the strategic management concepts and frameworks. Further requirements include: development of a research design to contribute to the development of a scenario analysis; collection and analysis of data in groups.	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Christian Herzig
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students:	

not limited	

Additional notes and regulations:
Lectures and short lectures combined with facilitated group discussion; seminars include research based learning elements such as case studies and research activities involving students (e.g. scenario analysis).

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E33: Responsible and sustainable food business in global contexts**	6 C 4 WLH

Learning outcome, core skills: The aims of the module are: • To deepen the students' understanding of the role of food business in society and the social responsibility and accountability issues that arise in a global business setting; • To familiarise students with the concepts and frameworks used in responsible and sustainable food business, the development of business principles for responsible food businesses, to meet stakeholders' interests; To provide students with the knowledge and confidence to critically reflect corporate practice; • To raise awareness for different perspectives which provide contrasting and competing ways of making sense of responsible food business practices.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Responsible and sustainable food business in global contexts (Lecture, Seminar) *Contents*: This module explores issues related to responsible and sustainable food business in global contexts. Individual themes include: • The process of globalisation and its impact on the agrifood sector; • Corporate social responsibility, governance and accountability; • The role of transparency of products and markets in the context of an increasingly globalised world; • The scope, nature and types of international operations (and their managerial implications); • The management of global supply chains in the agrifood sector; • The management and reporting of environmental and social information in complex organisational settings (such as multinational food businesses); • The contrasting perspectives in social responsibility and accountability of business across borders.	4 WLH
Examination: Written report (in the form of a learning journal; 60%) and oral presentation (40%)	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Christian Herzig
Course frequency: each winter semester; Witzenhausen/Kassel	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**

Maximum number of students: 35	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E34: Economic valuation of ecosystem services in developing countries**	6 C 4 WLH

Learning outcome, core skills: Students get introduced to the essential concepts and methods of interdisciplinary Ecosystem Services (ES) research. Special emphasis will be put on the integrated and systematic assessment of ES, including their dependencies of and impacts on biodiversity, climate change and development. Students will familiarize themselves with common methods of economic valuation of ES and learn about different examples of practical implementation in developing countries. Within the scope of a presentation and a term paper, students will review and evaluate selected scientific literature, process the findings in an environmental-economic analysis and compile results and derived policy recommendations for better maintenance, sustainable use and integration of ES into development planning.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Economic Valuation of Ecosystem Services in Developing Countries (Seminar) *Contents*: • Integrated and interdisciplinary analysis of ES • Dynamic linkages between ES, biodiversity, climate change and development • Methods and applications of economic valuation of ES • Implementation examples from developing countries • Integration of ES in development planning (entry points to the policy cycle) • Practical application in a case study (literature work, monetary quantification)	4 WLH

Examination: Term paper (max. 20 pages, 70%) and oral presentation (approx. 30 minutes, 30%) **Examination requirements:** For a given case study students will develop appropriate analytical strategies and implement them with the help of identified scientific literature. Methodological knowledge provided during the lectures will be essential for the case work. Most relevant results will be summarized in a presentation. The compilation of the term paper requires basic techniques of scientific literature research.	6 C

Admission requirements: none	**Recommended previous knowledge:** M.Agr.0079 Environmental Economics and Policy or similar skills
Language: English	**Person responsible for module:** Prof. Dr. Meike Wollni
Course frequency: each winter semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**

Maximum number of students: 30	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E36: Institutions and the food system**	6 C 4 WLH

Learning outcome, core skills: • Will become familiar with the role of institutions and governance in the food system • Will be familiar with public choice and political science approaches to the analysis of constitutions and policies and their change • Will be familiar with theories of decentral and central institutional change in the traditions of economics, political science and sociology • Will apply this conceptual knowledge concerning the role, performance and change of institutions and governance of a variety of aspects of food systems in different countries in and outside Europe • Will review global drivers of change of food and agricultural production systems	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Institutions and the food system (Lecture, Excursion, Seminar) *Contents*: Institutions are core elements structuring economic exchange in the food system. The course starts out with a discussion of what institutions are and what roles a stratified, multi-disciplinary concept of institutions has in food and agricultural systems and their change. Approaches will cover the study of institutions in classical and new institutional economics, in evolutionary economics, in economic sociology and in political sciences. Subsequently, discussions will be organized along public choice and constructivist approaches to understanding centrally driven institutional change on the one hand and economic and constructivist approaches to understanding decentral institutional change on the other. Discussions of the role of institutions for performance of the food and agricultural sectors and their change will be illustrated through ample recourse to examples drawn from studies of the food and agricultural production systems in and outside of Europe. That way, principal drivers of the change of food systems will be reviewed. In this regard, as far as possible examples will be drawn from one particular cultural, national or regional context. Ending the module, potentials and limits of researching the role of institutions in the food and agricultural sectors will be evaluated and corresponding research designs will discussed. Literature and seminar papers will be circulated to students at the beginning of term	4 WLH
Examination: Oral exam (about 25 min., 60%) and term paper (max. 15 pages, 40%) **Examination prerequisites:** Four oral and written literature discussions (each max 2 pages, about 5 minutes) **Examination requirements:** • Understanding of the role of institutions and governance in the food system • Knowledge of public choice and political science approaches to the analysis of constitutions and policies and their change • Knowledge of theories of decentral and central institutional change in the traditions of economics, political science and sociology	6 C

• Application of conceptual knowledge concerning the role, performance and change of institutions and governance to a variety of aspects of food systems in different countries in and outside Europe • Knowledge of global drivers of change of food and agricultural production systems	

Admission requirements: none	**Recommended previous knowledge:** Background in agricultural and environmental policy and economics
Language: English	**Person responsible for module:** Prof. Dr. Andreas Thiel
Course frequency: each winter semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: not limited	

Additional notes and regulations:

Further examination prerequisites:

Participation in the excursion/ thematic day and its preparation/ evaluation

Literature:

Literature and seminar papers will be circulated to students at the beginning of term

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E37: Agricultural policy analysis**	6 C 6 WLH

Learning outcome, core skills: • Students get an overview on EU institutions and the history of the EU's common agricultural policy (CAP) • Students learn different theories and methods for the analysis of agricultural policies • Students learn how to analyse different policy measures and instruments and evaluate them	**Workload:** Attendance time: 84 h Self-study time: 96 h

Course: Agricultural policy analysis (Lecture, Exercise) *Contents*: **1. Introduction into Economic Policy and Economic Theory** Definition of agricultural policy, Analytical framework of economic analysis, Objectives, measures, institutions, The coordination process, a model for the economic process **2. Market Failure** Public Goods & externalities, Market power & monopolistic behavior, State intervention due to Instability of markets, State intervention & government failure, principal-agent theory **3. The European Union – A short introduction** History of the EU, the importance of the agricultural sector in the EU, institutions and political structure of the EU, decision-process in the EU, **4. The EU's common agricultural policy: Description and Analysis** The history and analysis of the Common Agricultural Policy (CAP) of the EU **5. Introduction into Environmental policy** Objectives, measures and analysis and interaction with agricultural policy **Literatur**: B. Hill (2013): Understanding the Common Agricultural Policy, Earthscan A. Cunha & A. Swinbank (2011): An Inside View of the CAP Reform Process, Oxford University Press A. Oskam, G. Meester & H. Silvis (2011): EU policy for agriculture, food and rural areas, Wageningen, University Press Swinnen, Johan F.M. (2008): The Perfect Storm – the political Economicy oft he Fischler Reforms oft he Common Agricultural Policy, Centre for European Policy Studies, Brussels Krugman, P.R., M. Obstfeld & M.J. Melitz (2011), International Economics (9.Ed.), Pearson	6 WLH
Examination: Written examination (90 minutes)	6 C

Examination requirements: • Fundamental knowledge of EU institutions and the EU's common agricultural Policy (CAP) • Knowledge of different theories and methods to analyze agricultural policies • Analysis of different measures and instruments of the EU's common agricultural policy (CAP)	

Admission requirements: none	**Recommended previous knowledge:** Microeconomics
Language: English	**Person responsible for module:** Dr. Sebastian Lakner
Course frequency: each winter semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: not limited	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E38: Scientific writing in Agricultural Economics**	6 C 4 WLH

Learning outcome, core skills: Students have a deep understanding of the following aspects of scientific writing and good academic practice and are prepared to apply them appropriately • Scientific writing and structuring • Literature search • Good academic practice, citation and avoidance of plagiarism • Use of citation software • Structuring and preparation of primary and secondary datasets • Result illustration • Presentation of academic content	**Workload:** Attendance time: 48 h Self-study time: 132 h

Course: Scientific writing in Agricultural Economics (Lecture, Exercise) *Contents*: The lecture comprises the following three main topics: 1) **Structure and writing:** An introduction is given on structuring seminar-papers and master-theses, literature search in various literature databases, formulating precise research-questions/-objectives and research -motivation. Thereby, the basic principles of writing referring to Orwell (year) and other standard literature are covered. Students practice structuring and writing during different practical assignments like creating a commented outline of a paper, a reference list or writing an introduction and conclusion for a seminar-paper or a thesis. 2) **Citation and plagiarism:** An introduction is given on the rules of “good academic practice” according to the standards of the German Research Association (DFG) and the Georg-August-University. In addition to detailed explanations about the appropriate use of references and correct citing, the topic of plagiarism and intellectual property rights is addressed in detail including concrete examples. Furthermore, software applications such as Endnote, Mendeley or Citavi are introduced. Students practice the use of references and citing during different practical assignments; the first about creating text chapters including citations from various different sources manually, the second by using software applications. 3) **Data:** An introduction is given on structuring and preparation of primary and secondary data sets using corresponding statistics software like SPSS and R as well as the structuring of methods and results chapters. Formal requirements and good practice for the illustration of results in written text, tables and figures are presented. Students practice data preparation and results illustration during different practical assignments like structuring and preparing a primary and secondary datasets, creating a methods & data chapter, preparing tables and figures and embed them into a self-written results chapter. 4) **Presentation:** An introduction is given on the design and structure of scientific presentations. In detail, common practices for presenting scientific contents are	4 WLH

explained and the typical corporate design of the Georg-August-University is introduced. As an assignment students prepare a presentation about scientific contents to practice. ***Literatur**:* Theisen, M.R. (2011): Wissenschaftliches Arbeiten (15.A), München, Vahlen	
Examination: Written assignments (9 each max. 3 pages), 2 data sheets and 1 presentation-file (max. 15 slides) **Examination requirements:** Students have to prepare weekly assignments and have to upload the particular documents on a weekly basis. Required contents: • Annotated outline • Reference list • Introduction • Literature review • Methods chapter • Primary data sheet • Secondary data sheet • Results presented in tables and figures • Results chapter • Conclusion • Presentation	6 C

Admission requirements: Enrolled in SIA study-program with focus on International Agribusiness and Rural Development Economics	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dr. agr. sc. Verena Otter Dr. Sebastian Lakner
Course frequency: each winter semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 30	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E39: Critical and Collective Perspectives on the Global Food System**	6 C 4 WLH

Learning outcome, core skills: Students • will be aware of development tendencies of the global food system • will be able to critically analyse the global food system informed by political ecology • will be introduced to collective action theory and critical approaches advocating the spread of “Commoning” in the Global Food System • will be familiar with different conceptions of society-nature relationships • will be acquainted with methods of political ecology • will be acquainted with transition and transformation studies • will be acquainted with food regime studies • will be able to critically evaluate and apply the corresponding approaches	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Critical and Collective Perspectives on the Global Food System (Lecture, Seminar) *Contents*: The course introduces students to critical and commoning approaches and studies of the global food system. It introduces the concepts, theories and methods of political ecology, food regime theory collective action theory and transitions studies and discusses these in relation to empirical studies worldwide.	4 WLH
Examination: Presentation (approx. 45 minutes, 40%) and term paper (max. 15 pages, 60%) **Examination prerequisites:** Submission of protocols (literature-related questions) in regard to 80% of assigned readings (max 8 articles) **Examination requirements:** Students will need to demonstrate: • Understanding of political ecology, collective action and commoning perspectives, transition approaches and critical perspectives • Understanding of a food systems approach • Ability to apply political ecology approaches to the food system and its change • Knowledge of global drivers of food and agricultural production systems • Academic presentation, discussion and writing skills Details on Examination: Presentation 20 min. + 25 minutes guided discussion (student-led seminar) (40%) and term paper (15 pages, 3000 words) (60%)	6 C

Admission requirements: none	**Recommended previous knowledge:** Background in agricultural and environmental policy and economics

Language: English	**Person responsible for module:** Prof. Dr. med. Andreas Thiel
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: not limited	

Additional notes and regulations:

Literature:

Literature will be circulated to students at the beginning of term and throughout

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E40: Agriculture, Environment and Development**	6 C 4 WLH

Learning outcome, core skills: This module treats the economic and political causes of environmental problems in the context of agriculture and development. Global challenges such as climate change, sustainable development and poverty are in the focus. Selected basic concepts of environmental and resource economics are addressed, followed by a deepened analysis of important aspects such as management of common pool resources, pollution control and climate protection in international agri-environmental contexts.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Agriculture, Environment and Development (Lecture, Exercise, Seminar) *Contents*: The module consists of a combination of lectures and tutorials during the first semester term. Theoretical concepts from lectures will be deepened and complemented by examples from scientific research and practical applications. During the second semester term students present an analysis of a scientific case study from selected topics in the seminar. This enables students to deepen the contents learned in an independent and targeted manner and to apply concepts in the evaluation of a case study. Contents: • Basic concepts (market failure, natural resources, natural capital) • Efficiency and sustainability: Concepts, criteria and application • Economics of common pool resources in developing countries • Economics of land use in developing countries • Economics of water use in developing countries • Poverty, development and environment • Agriculture and climate change • Global initiatives and international agreements on sustainable development and climate protection	4 WLH
Examination: Written exam (60 minutes, 70%) and presentation (approx. 20 minutes, 30%) **Examination prerequisites:** Regular attendance in seminar **Examination requirements:** Knowledge of selected basic concepts of environmental and resource economics. Understanding of important concepts such as economic efficiency and sustainability. Knowledge of important relationships between agriculture, resource use, sustainability and climate change in development contexts. Discussion of current courses of action.	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language:	**Person responsible for module:**

English	Prof. Dr. Meike Wollni
Course frequency: each summer semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 40	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E41: EU Policies and Organic Agriculture**	6 C 4 WLH

Learning outcome, core skills: The students deal with selected key issues of European agricultural policy that are relevant to organic farming. They work on these policies in a project-oriented way and apply concepts and methods of knowledge integration, policy process analysis and policy evaluation. This enables them to transfer the knowledge that they have acquired in their agricultural policy and governance courses to concrete issues and to link them to particular political and international contexts. At the same time, the aim of the course is to make students from Europe and beyond familiar with the relevance of these dimensions for their future professional life and to understand European organic agricultural policy through discussions from the perspectives of different the regional contexts represented by students of the course.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: EU Policies and Organic Agriculture *Contents*: Critical and Collective Perspectives on the Global Food System (Lecture, Seminar, Excursion) Organic farming is influenced both by the EU Organic Farming Regulation (Regulation (EC) No 834/2007) and by the policy measures of the EU Common Agricultural Policy. Working on selected key issues of EU agricultural policy during the course, students analyse specific policy processes and evaluate policy measures. To start with, the lecturers introduce the role of the EU for organic farming, highlight selected key issues of and they re-fresh the different conceptual and methodological issues of analysing them. Students then work on these key issues from different lenses in topic-related small groups which are supervised by the lecturers. Each group first develops the project concept (definition of a research question, methodological approach). These project concepts are presented by the different groups and discussed in the plenary before the small group projects are implemented. At the end of the semester, all groups present and reflect their project results. Finally, the project results are discussed from both the European and the international perspective. Parallel to working on these key issues, students learn about methods of knowledge integration (e.g. system analysis, multi-criteria analysis), policy evaluation and policy process analysis and they are able to apply these methods. Literature und publications will be provided for the course. Vedung, E., 1997. Public policy and program evaluation. Transaction Publishers, New Brunswick, London. Scholz, R.W., Tietje, O., 2002. Embedded case study methods: Integrating quantitative and qualitative knowledge. Sage Publications, Thousand Oaks.	4 WLH

Examination: presentation (approx. 30min, 50%), written exam (60min, 50%)	6 C

Examination prerequisites: submission of protocols (literature-related questions, max. 1 page) in regard to 80% of assigned readings (max 8 articles) **Examination requirements:** The course presupposes attendance of one of the following modules: „Institutions and the food system“ or “Critical and collective perspectives on the global food system“	

Admission requirements: none	**Recommended previous knowledge:** Background in agricultural and environmental policy and economics
Language: English	**Person responsible for module:** Prof. Dr. Andreas Thiel
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 25	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I02: Management of (sub-)tropical landuse systems**	6 C

Learning outcome, core skills: Enable students to understand the functioning and bio-physical limitations of (subtropical agro-pastoral land use systems, to argue for the need of interdisciplinary approaches to overcome these and to apply current research methods in land use systems analysis.	**Workload:** Attendance time: 28 h Self-study time: 152 h

Course: Management of (sub-)tropical landuse systems (Block course, Lecture) *Contents*: Witzenhausen: Plant-animal interactions, diet selection and nutritional wisdom, impact of grazing on pastures; statistical approaches to measure and cope with short-distance variability in crop growth; measurement techniques for nutrient fluxes in different agro-ecosystems. Prague: Land-use management: farm and family income in different farming systems, soil conservation technologies for smallholder farming systems, conservation tillage systems, potential use of waste-stream products to enhance soil productivity in tropical peri-urban and rural areas, crop diversity in tropical agricultural systems. Altieri, M. 1995: Agroecology, Westview Press, USA; Martius, C. 2002: Managing Organic Matter in Tropical Soils: Scope and Limitations. Kluwer Academic Publishers; Van Soest, P. 1994: Nutritional ecology of the ruminant. Cornell University Press, London, UK; Provenza, F.D. 1995: Post-ingestive feedback as an elementary determinant of food preference and intake in ruminants. Journal of Range Management, 48: 2-17.	
Examination: Written examination (90 minutes) **Examination requirements:** Knowledge about: the ability of animals to select feed; animal-plant interactions; effects of grazing on grasslands and pastures; statistical methods and measurements material flows in various agroecosystems; landuse management; incomes in different operating systems; soil conservation measures for smallholders and soil conservation systems; potential use of waste products to increase productivity and the significance of agrobiodiversity.	6 C

Admission requirements: none	**Recommended previous knowledge:** Knowledge in plant, soil and animal sciences
Language: English	**Person responsible for module:** Prof. Dr. Andreas Bürkert
Course frequency: WiSe 13/14, einmal in 2 Jahren, alternierend mit Modul I07; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**

Maximum number of students: 25	

Additional notes and regulations:

Literature:

Altieri, M. 1995: Agroecology, Westview Press, USA; Martius, C. 2002: Managing Organic Matter in Tropical Soils: Scope and Limitations. Kluwer Academic Publishers; Van Soest, P. 1994: Nutritional ecology of the ruminant. Cornell University Press, London, UK; Provenza, F.D. 1995: Post-ingestive feedback as an elementary determinant of food preference and intake in ruminants. Journal of Range Management, 48: 2-17.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I03: Food quality and organic food processing**	6 C 4 WLH

Learning outcome, core skills: Students will be able to define food quality and quality systems in agriculture and food industry discuss principles of organic food production (agriculture, processing) according to EEC 2092/91) discuss and evaluate food processing techniques and quality assessment methods	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Food quality and organic food processing (Lecture) *Contents*: European and international legislation for organically produced agricultural commodities (focussing : Annex II, Annex VI EEC 2092/91; contracting, quality standards, product handling) Quality standard setting and the Organic Guarantee System Certification systems for organic and conventional products (overview, principles, concept, certification) Accreditation and accreditation agencies Process and product orientated food quality concepts and assessments; “holistic” quality definitions Processing techniques for organic food processing (different product groups) Quality assessment methods for small and medium-size enterprises Florkowski et al. 2000: Integrated View of Fruit and Vegetable Quality, Technomic; Welti-Chanes et al. 2001: International Congress on Engineering and Food, Volume I and II, Technomic; Luning et al. 2002: Food quality management, Wageningen Pers; Lawless et al. 1999: Sensory evaluation of Food, Kluwer; Kent et al.1994: Technology of cereals, Pergamon; Bidlack et al. 2000: Phytochemicals as bioactive agents, Technomic; Linden et al. 1994: New ingredients in food processing, CRC; Souci et al. 2000: Nutrition Tables, Medpharm	4 WLH
Examination: Presentation (ca. 20 minutes, 50%) and project work (max. 20 pages, 50%) **Examination requirements:** Knowledge about the quality of food in terms of concepts and criteria with focus on organic production. Insides in processing and management of organic food according the guidelines, standards and practices. Basic knowledge in the concepts of HACCP and QACCP.	6 C

Admission requirements:	**Recommended previous knowledge:**
none	Basic knowlegde in chemistry

Language: English	**Person responsible for module:** Dr. Nicolaas Busscher
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 40	

Additional notes and regulations:

Literature:

Florkowski et al. 2000: Integrated View of Fruit and Vegetable Quality, Technomic; Welti-Chanes et al. 2001: International Congress on Engineering and Food, Volume I and II, Technomic; Luning et al. 2002: Food quality management, Wageningen Pers; Lawless et al. 1999: Sensory evaluation of Food, Kluwer; Kent et al.1994: Technology of cereals, Pergamon; Bidlack et al. 2000: Phytochemicals as bioactive agents, Technomic; Linden et al. 1994: New ingredients in food processing, CRC; Souci et al. 2000: Nutrition Tables, Medpharm

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I06M: Exercise on the quality of tropical and subtropical products**	6 C 4 WLH

Learning outcome, core skills: Students are able (i) to analyze and discuss experimental data considering economics and consumer expectations, (ii) to work with scientific primary literature, (iii) to elaborate written presentations in teamwork, (iv) to exchange their opinions about sensorial evaluation.	**Workload:** Attendance time: 40 h Self-study time: 140 h

Course: Exercise on the quality of tropical and subtropical products (Exercise) *Contents*: Exercises on quality properties of wheat, rice, potatoes, fruits and vegetables: Starch and protein quality of baking wheat; dough and baking properties of wheat, sensors of baking goods, rheological properties of rice flour and other starch containing products, cooking and frying properties of potatoes; consumer acceptance of potatoes; Marketing properties of fruits and vegetables; texture, ripeness, inner quality properties of fruit and vegetable (e.g. sugar/acid ratio, nitrate in leaf vegetable), sensors of fruit and vegetable juices. Belitz, Grosch, Schieberle 2004: Food Chemistry, 3rd rev. ed., Springer Berlin.	4 WLH
Examination: Project work (max. 40 pages) **Examination prerequisites:** Participation in all introductory meetings and at all experimental laboratory work **Examination requirements:** Knowledge about quality parameter of wheat, rice and starch containing products, potatoes, fruits and vegetables. Knowledge about starch and protein quality of baking wheat, sensoric properties of bread and bakery products, rheological properties of rice flour and other starch containing products, consumer acceptance of potatoes, marketing of fruits and vegetables, texture analysis, intrinsic quality parameter of fruits and vegetables and sensoric proerties of fruits and vegetables.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge on agriculture production and chemistry
Language: English	**Person responsible for module:** Dr. Inga Smit
Course frequency: each winter semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 24	

Additional notes and regulations:

Literature:

Belitz, Grosch, Schieberle 2004: Food Chemistry, 3rd rev. ed., Springer Berlin.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I07: International land use systems research - an interdisciplinary study tour**	6 C 8,5 WLH

Learning outcome, core skills:	**Workload:**
To gain multi- and interdisciplinary insights into (international) approaches towards opportunities and challenges of agro-silvo-pastoral production systems, sustainable resource use and agricultural development interventions. To familiarize participants with theoretical and practical questions of field research in an international contexts	Attendance time: 119 h Self-study time: 61 h

Course: International land use systems research - an interdisciplinary study tour (Lecture, Excursion, Seminar) *Contents*: Through the combination of one semester of preparatory impulse lectures and student seminars and the 12-14 day excursion to a (sub)tropical country, this module provides participants with interdisciplinary insights into the bio-physical and socio-economic components of agro-silvo-pastoral systems in the global context. The small- to large-size farm enterprises, processing plants and marketing organisations to be visited during the excursion exemplify the opportunities and challenges of agricultural activities in their specific context, whereby particular attention is paid to aspects of sustainability and environmental safety. The excursion targets regions where the two universities conduct research programmes, and also includes visits to partner universities and (inter)national research institutions. This will allow the MSc students to gain a first impression on how field research is organized and carried out in (sub)tropical countries. Up-to-date research approaches are presented to the participants, and questions targeting the sustainable use of natural resources as well as questions of development cooperation are discussed in an international and interdisciplinary context.	8,5 WLH
Examination: Oral exam (ca. 20 minutes, 50%) and oral seminar presentation (ca. 20 minutes) with written outline (max. 4 pages) (50%) **Examination prerequisites:** Day protocol of the excursion (max 2 pages) **Examination requirements:** The module and excursion contents are reviewed in an oral exam whereby two examiners are putting forward questions to the below topics (10 minutes each): A) Aspects of soil, plant, crop and forestry sciences pertaining to the regions and enterprises/farms visited during the excursion. B) Aspects of animal husbandry and socio-economic issues pertaining to the regions and enterprises/farms visited during the excursion.	6 C

Admission requirements:	**Recommended previous knowledge:**
none	Study focus on international agriculture and development policy

Language: English	**Person responsible for module:** Prof. Dr. Eva Schlecht
Course frequency: Winter semester, every second year, alternating with Module I02; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 25	

Additional notes and regulations:

Literature:

Specific general and scientific articles dealing with the excursion country, distributed in the course.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I10M: Applied statistical modelling**	6 C 4 WLH

Learning outcome, core skills: Students have a detailed understanding of the concepts of statistical modelling, regression analyses and analyses of variance. They are familiar with the basic concepts of 'linear models', 'generalized linear models' and 'non-parametric estimation procedures', which now belong to the standard methods in applied statistics. Students are able to practically apply these methods and carry out statistical analyses in soil, plant and animal sciences using the statistical software R. They are able to apply the acquired skills in the analysis of their own MSc (and PhD) datasets.	**Workload:** Attendance time: 84 h Self-study time: 96 h

Course: Applied Statistical Modelling *Contents*: **Course Part I: Statistical analyses in soil and plant sciences** (Lecture, Internship) • Review of statistical concepts (boxplots, QQ plots, distributions, classical tests, correlations, analyses of count and proportion data) • Experimental design: populations and samples • Introduction to the software R • Regression (multiple linear, polynomial, non-linear, logistic) • Statistical modelling, model types and model simplifications • Transformations **Course Part II: Statistical analyses in animal sciences** (Lecture, computer practical) • General aspects of hypotheses formulation and testing • Data distribution (normal, categorical, Poisson) and model selection criteria • Analyses of variance, post-hoc tests • Non-parametric test procedures • Mixed model procedures (linear, non-linear) • Formulation of statistical models and basic programming in R	4 WLH
Examination: Written examination (120 minutes) **Examination requirements:** One written exam with two parts. Knowledge of basic statistical terms and approaches, linear and generalized linear models and non-parametric estimation procedures. Ability to apply the methods and models to real data by using the software package R.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge (B.Sc. level) of applied statistics
Language: English	**Person responsible for module:** Prof. Dr. Bernard Ludwig
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted:	**Recommended semester:**

twice	
Maximum number of students: 25	

Additional notes and regulations:

Literature:

Lecture notes

Crawley, M.J. 2012. The R Book, Wiley

Dobson A. & Barnett A. (2008) An Introduction to Generalized Linear Models, Chapman & Hall.

Field, A., Miles, J., Field, Z. 2012. Discovering Statistics using R, SAGE

Mrode R. A. (2005) Linear Models for the Prediction of Animal Breeding Values, CABI Publishing.

Searle S. R. (1982) Matrix Algebra Useful for Statistics, Wiley Series in Probability and Statistics.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I11M: Free Project**	6 C

Learning outcome, core skills: Students are able to plan and carry out a scientific project. This includes critical evaluation of publications and the ability to apply acquired knowledge to problems in the field or in economic or social sciences. Students are also able to present results and discuss them on the basis of their knowledge.	**Workload:** Attendance time: 0 h Self-study time: 180 h

Course: Free project *Contents*: A topic for a project is chosen in agreement with the instructor. The aim of the project is to gain profound scientific knowledge on the chosen topic. This can include experimental work. The result of the project can be a written thesis, an oral presentation and/ or an electronically stored result.	
Examination: Project work (max. 15 pages or 4000 words) **Examination requirements:** In agreement with the instructor. Generally project work (max. 15 pages or 4000 words).	6 C

Admission requirements: Written agreement with instructor on topic, form and time frame for the project.	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Stephan von Cramon-Taubadel
Course frequency: each semester; Göttingen oder Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: not limited	

Additional notes and regulations:

Literature:

Scientific publications on the topic agreed upon with the instructor.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I12: Sustainable international agriculture: basic principles and approaches**	6 C 4 WLH

Learning outcome, core skills: Students • are able to describe the main bio-physical and socio-economic drivers shaping agricultural production systems and land and resource use strategies; • have knowledge of relevant ecological, economic and social indicators • can describe and apply integrated approaches of indicator use for the evaluation of a system's sustainability	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Sustainable International Agriculture: basic principles and approaches (Lecture) *Contents*: In view of global change spanning from population growth, migration, and urbanization to climate change, land degradation and water scarcity, the sustainable use of human and natural resources for the continued provision of quantitatively and qualitatively adequate food poses a major challenge to all stakeholders involved in agricultural production worldwide. This module therefore addresses the basic concepts and principles of sustainability and sustainable agriculture, in its ecological, economic and social dimensions. Approaches to determine the bio-physical and socio-economic sustainability of a land use systems and of agricultural value chains are evaluated, and possibilities to implement sustainable management strategies along the continuum of water, soils, plants, animals, producers and consumers are discussed, thereby also accounting for relevant temporal and spatial scales.	4 WLH
Examination: Written examination (90 minutes) **Examination requirements:** • general definitions and indicators for sustainable development; strong and weak sustainability; the substitution-paradigm and its limits; carrying capacity and critical natural capital; economic growth models; economic approaches for the quantification of sustainable development; SNA / green accounting; cost-benefit analysis. • dimensions of social sustainability; utilization of communal resources; McDonaldisation of agriculture; agriculture and social justice. • multi-functionality and farm-management; realization of sustainability concepts in the farm enterprise; agro-ecological systems and sustainable farm management; indicators for enterprise sustainability; controlling of sustainability; profitability of organic farming; collective forms of farming. • sustainability of livestock husbandry; environmental effects of animal keeping and their avoidance: a) GHG emissions and environmental pollution from animal holdings; b) overgrazing.	6 C

• concepts of sustainability; agroforestry systems; shifting cultivation; effects on soil fertility and sustainability. • role of soils in ecosystems; soil types; soil functions and soil threats/degradation; physical, chemical and biological soil quality indicators; soil organic matter; soil as a carbon sink or source and greenhouse gas emissions; soil conservation; soil compaction.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Eva Schlecht
Course frequency: each winter semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: not limited	

Additional notes and regulations:

Literature:

Lecture notes and reading materials distributed during the module;
Bell, S. & Morse, S., 2003. Measuring sustainability: learning by doing; Earthscan, London, UK. Bell, S. & Morse, S., 2008. Sustainability indicators: measuring the immeasurable? Earthscan, London, UK.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I14M: GIS and remote sensing in agriculture**	6 C 4 WLH

Learning outcome, core skills: GIS: A broad overview of basic GIS functions and related background knowledge should enable students to explore GIS-Software for relevant commands and prepare functional strategies for spatial data management and analysis. Lecture and exercise examples have predominantly agricultural reference. Remote Sensing The lecture will introduce physical principles (reflectance, transmittance, and absorption), sensor techniques (passive and active sensors, satellites, field spectrometer) and methods of analysis (calibration, validation) in remote sensing applications. This technical framework is presented using agricultural examples, as e.g. the generation of maps for crop yield and protein, assessment of species composition in mixed vegetation (e.g. grassland), like legume content for a calculation of residual nitrogen and crop rotation effects.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: GIS (Lecture) *Contents*: The course gives an introduction to Geographical Information Systems (GIS). Starting from geodetical background information, a wide range of different GIS- methods and -functions are presented using agricultural examples (e.g. data import, georeferencing, aggregation, (re)classification, interpolation, overlays and image analysis). The students have the opportunity to carry out exercises on the computer themselves for some important GIS-procedures. A special focus is given on data capturing using maps and field data survey with GPS as well as the spatial analysis of site conditions. Finally a particular view on GIS in organic farm management and Precision Farming is given.	2 WLH
Course: Remote sensing in agriculture (Lecture) *Contents*: The lecture will introduce physical principles (reflectance, transmittance, and absorption), sensor techniques (passive and active sensors, satellites, field spectrometer) and methods of analysis (calibration, validation) in remote sensing applications. This technical framework is presented using agricultural examples, as e.g. the generation of maps for crop yield and protein, assessment of species composition in mixed vegetation (e.g. grassland), like legume content for a calculation of residual nitrogen and crop rotation effects.	2 WLH
Examination: Oral examination (approx. 30 minutes) **Examination requirements:**	6 C

Knowledge about basic GIS functions and the preparations of functional strategies for spatial data management. Knowledge of physical principles, methods of analysis and sensor techniques.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dr. Thomas Möckel
Course frequency: each winter semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 20	

Additional notes and regulations:

Literature:

Principles of Geographical Information Systems
by Peter A. Burrough and Rachael A. McDonnell (2015)

Introduction to Remote Sensing
by James B. Campbell **a**ndRandolph H. Wynne (2011)

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I17: Sustainable diets**	6 C 6 WLH

Learning outcome, core skills: Students are able to describe the interactions of diets, sustainability and human nutrition/health. Students are able to assess the impacts of a dish/meal (as unit) on sustainability and nutrition parameters.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Sustainable diets (Lecture, Excursion) *Contents*: • Culture and cultural patterns of diets • Interactions of food quality and lifestyle on sustainability and human health • Healthy diets within sustainable food systems • Model diets such as Med. Diet and New Nordic Diet • Optimization of a dish/meal according sustainability and nutrition impacts • Role of organic food systems	6 WLH
Examination: Presentation (ca. 15 minutes, 50%) with written outline (max. 15 pages, 50%) **Examination requirements:** Knowledge of lifestyles and interaction with food quality (in selected countries). Knowledge of methods for the collection of environmental and nutritional parameters. Knowledge of legal requirements for the labelling of foodstuffs as well as guidelines for the processing of sustainable food products.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge on nutrition, statistics and environmental issues.
Language: English	**Person responsible for module:** Prof. Dr. Johannes Kahl
Course frequency: each winter semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 40	

Additional notes and regulations:

Literature:

Will be provides via the system2teach platform.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I18: Project seminar: Social-ecological analysis and management of agricultural landscapes**	6 C 4 WLH

Learning outcome, core skills: After successfully completing this module students should: • understand the main principles of of landscape sustainability science • be able to systematically analyse landscape change processes from a social-ecological perspective • have developed a thorough understanding of the role of human perceptions and values as connected to landscape change • have gained a basic working knowledge on social-ecological approaches to investigating landscape change (particularly interviews) This module contributes to the following skills: • analytical thinking • sound reasoning • constructively dealing with scientific literature • group work techniques (organization of working schedule, team work) • data acquisition and analysis, selection and presentation of data • presentation skills and communication of main research results	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Project seminar: Social-ecological analysis and management of agricultural landscapes (Lecture, Seminar) *Contents*: This project module highlights the interdisciplinary field of „landscape sustainability science“ and demonstrates its applications for analysis and management of agricultural landscapes. It will discuss current drivers of agricultural landscape change, such as intensification, urbanization or land abandonment. The course will then discuss the multiple social values of these landscapes. Accompanied by comprehensive introduction and supervision, students will form small project groups to carry out an empirical assessment (through social-ecological methods such as participatory scenario planning) to reveal values of and/or conflicts around agricultural landscapes in an area nearby Witzenhausen or Göttingen. Key concepts used are social-ecological production landscapes, social values and cultural ecosystem services.	4 WLH
Examination: Group reports (max. 20 pages; 70%) and group presentations (approx. 30 minutes; 30%) **Examination requirements:** Knowledge of the main principles of of landscape sustainability science and understanding of the role of human perceptions and values as connected to landscape change.	6 C

Admission requirements:	**Recommended previous knowledge:**
none	none

Language: English	**Person responsible for module:** Prof. Dr. Tobias Plieninger
Course frequency: each winter semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 21	

Additional notes and regulations:
Literature: Pinto Correia, T. et al. (2018): European Landscapes in Transition. Implications for Policy and Practice. Cambridge University Press. Course materials to be provided.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I19M: Participatory research methods for sustainability**	6 C 4 WLH

Learning outcome, core skills:	**Workload:**
This course will look at the importance of place-based, participatory and transdisciplinary research methods in sustainability science. Students will learn different participatory methods to capture the knowledge and aspirations of the different agents that operate in agricultural landscapes and will be able to integrate this knowledge in practical outcomes for sustainable land management. After successfully completing this module students should: • comprehend the fundaments of participatory research • be familiar with the different types of participatory research methods • be able to design and implement participatory processes This module contributes to the following skills: • performance of transdisciplinary processes • integration of knowledge and aspirations of different agents towards sustainable land management • data collection and analysis using participatory methods • group work techniques (organization of working schedule, team work) • presentation skills and communication of main research results	Attendance time: 56 h Self-study time: 124 h

Course: Participatory research methods for sustainability (Lecture, Seminar) *Contents*: The course is structured in three parts. An introductory part focuses on research principles of sustainability science, paying particular attention to the role of transdisciplinary and ethics in the participation processes. A second part showcases a broad suite of different participatory research methods (e.g. photo-voice, participatory mapping, storytelling) for sustainable landscapes management and land-use conflict resolution. The full research process is addressed, from participatory process design, the approaching and involvement of participants and the organisation and facilitation of participatory activities, to the analysis, integration and presentation of the outcomes. In the third part of the course, students have the opportunity to choose and design a protocol for a participatory study, applied to a specific geographical location and a specific problem, and share the insights of the process with the class. The first part will be outlined in lectures, the second part will take the form of seminars and the third part will consist of group work with a final presentation to the class where the different experiences will be critically discussed.	4 WLH

Examination: Presentation (approx. 30 minutes, 50%) and Term paper (max. 20 pages, 50%) **Examination requirements:** Presentation and critical analysis of a participatory research approach applied to a land-use topic of the students' choice.	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Tobias Plieninger
Course frequency: each winter semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 25	

Additional notes and regulations:

Literature:

Bergmann, M. et al. (2012). Methods for Transdisciplinary Research: A Primer for Practice. Campus Verlag.
Course materials to be provided.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I20: Agriculture and ecosystem services**	6 C 4 WLH

Learning outcome, core skills: This course will introduce students into the concepts of ecosystem services and human well-being, with a particular focus on their relevance for agriculture and other land uses. It will foster the ability of students to assume an interdisciplinary research perspective (including ecological, socio-cultural, and economic approaches) and to critically discuss and analyse the concept of ecosystem services in its multiple scientific, political and practical meanings.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Agriculture and ecosystem services (Lecture, Exercise, Seminar) *Contents*: Global environmental assessments (e.g., the Intergovernmental Platform on Biodiversity and Ecosystem Services, IPBES) have highlighted that human well-being is critically dependent on ecosystem services – the benefits that nature provides to people. Depending on the particular land-use system and its social-ecological context, agriculture can either degrade or enhance such ecosystem services. This course gives an overview on the rising field of ecosystem services science. Focus will be on: • techniques for decision support, • practical applications of the approach in agriculture and other land-use sectors, and • linkages to other sustainability issues (e.g., biodiversity, climate change, water security, poverty). These topics will be outlined in lectures and deepened in seminars and field exercises, where key issues will be explored and critically discussed.	4 WLH
Examination: Presentation (approx. 30 minutes, 50%) and term paper (max. 20 pages, 50%) **Examination requirements:** Presentation and critical analysis of a case study that takes a particular ecosystem services problem in a land-use setting and geographic location of the participants' choice into focus.	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Tobias Plieninger
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students:	

25	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I21M: From conceptualisation to communication: key steps in empirical research**	6 C 4 WLH

Learning outcome, core skills: This course will enable students to develop and execute their own empirical (MSc) research project, to elaborate empirical real-world data in a meaningful way and to communicate major insights in a professional manner. The approaches and methods taught are applicable to a wide range of research topics. After successful completion of this module, students can: • Formulate research questions and hypotheses; • Write a grant application for acquisition of funding for their research project; • Design an e-questionnaire for interview-based data acquisition; • Recover interview data in a tabulation program and elaborate meaningful results; • Pinpoint research highlights in a prize-winning poster.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: From conceptualisation to communication: key steps in empirical research (Lecture, Exercise) *Contents*: This module prepares students with a natural sciences focus for international agricultural research in the framework of their M.Sc. thesis, the prerequisites of which include the ability to identify a research topic, formulate research questions and working hypotheses, elaborate a data collection matrix, analyse the collected data and communicate the obtained results in an effective manner. Therefore this module emphasises the practice of skills concerning the conceptualisation of a research project, data acquisition and analysis, and presentation skills. It is organised in four major sections: **Part I: Conceptualisation of a research project** – 15% of time In a participatory process, students will brainstorm on research topics, learn to formulate research questions and working hypotheses, and familiarize with the full conceptualisation of an MSc study proposal, for submission to, e.g., PROMOS or *fiat panis* grants. **Part II: Elaboration of a structured e-questionnaire using freeware** – 20% of time Students are introduced to the CS PRO freeware for the setup of e-questionnaires; they then individually conceptualise and computerise their own questionnaire of 20-30 differently scaled questions and test its functionality. **Part III: Descriptive and creative analysis of data using tabulation software** – 50% of time Participants receive real-world interview-based data from finalised or ongoing research projects of the principal instructor's group. In groups of 2 to 3 persons, they elaborate the information contained in the database, thereby answering to a series of simple as well as more complex research questions that guide this analytical step.	4 WLH

Part IV: Preparation and presentation of a research poster – 15% of time Being provided with guidelines and templates, each group of students designs a research poster to present their most relevant results (see part III), thereby using PowerPoint or corresponding freeware. Posters are printed on A0 paper and are presented in short oral communications of 3-5 minutes, just as at a conference. Each poster is evaluated by the non-involved participants (standardized evaluation sheet, covered) and the three best posters receive a poster price.	
Examination: Written exam (90 minutes; weight: 50%) and presentation (ca. 20 minutes; weight: 50%) **Examination requirements:** Knowledge of the steps, do's and don'ts of research project conceptualisation, grant application, interview/questionnaire design, data elaboration and poster presentation. Part of the examination is an assessment of data evluation.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of Excel and PowerPoint or corresponding freeware
Language: English	**Person responsible for module:** Prof. Dr. Eva Schlecht
Course frequency: each summer semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 25	

Additional notes and regulations:

Literature:

- Lecture notes
- Schoonmaker-Freudenberger, K. 2008: Rapid rural appraisal (RRA) and participatory rural appraisal (PRA):
  a manual for CRS field workers and partners. (online resource; www.crs.org).
- de Hoyos, M., Barnes, S.A. 2012. Analysing interview data. Warwick Institute for Employment Research (online resource).

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I22: Process development for sustainable food production and premium food quality**	6 C 4 WLH

Learning outcome, core skills: The participants will have gained a holistic understanding of the socio-economic and technological issues around post-harvest handling of food stuffs and gained some experience in evaluating value chains and actually preserving food stuffs and assessing the quality.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Process development for sustainable food production and premium food quality (Lecture, Practical course, Seminar) *Contents*: Agricultural value chains and postharvest losses background • Value chain concepts and approaches • PHL/waste in developing countries / emerging economies • Policies and projects to address socio-economic and nutritional outcomes in agricultural value chains and reduce food losses and waste Technical and Food Quality Aspects • Basics Postharvest technologies and processing • Food quality and quality assessment (mechanical and optical) • Technical and energetic aspects of food preservation • Laboratory exercises: Production of dried and ground products, quality assessment using destructive and non-destructive methods	4 WLH
Examination: Written exam (90 minutes; 60%) and Laboratory report (max. 20 pages, 40%) **Examination requirements:** • Fundamental understanding of value chain concepts and approaches • Knowledge of post-harvest losses and waste, main causes, and characteristics in the context of developing countries • Knowledge of and ability to critically evaluate different policy and project approaches to addressing nutrition and PHL in agricultural value chains Understanding of postharvest technologies and processing, technical and energetic aspects of food preservation • Understanding of food quality and independent implementation of mechanical and optical quality assessment	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** PD Dr. habil. Barbara Sturm
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]

Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 15	

Additional notes and regulations:

Literature:

Hand-outs in lectures and seminars

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I23: Sustainable agricultural practices in Mediterranean regions**	6 C 2 WLH

Learning outcome, core skills: To gain interdisciplinary insights into (international) approaches towards opportunities and challenges of sustainable agricultural systems under limited water conditions, sustainable resource use, and agricultural development interventions. Students will get to know socio-cultural contexts on the ground about the impacts of agricultural intensification and their repercussions on local well-being (e.g., immigrated population welfare, labor issues, and environmental degradation) and sustainable agricultural alternatives. To familiarize participants with theoretical and practical questions of field research in an international contexts. Learn and put into practice research methods of data collection and analysis.	**Workload:** Attendance time: 96 h Self-study time: 84 h

Course: Sustainable agricultural practices in Mediterranean regions *Contents*: Sustainable agricultural practices in the context of Mediterranean water-scarce regions: an interdisciplinary field trip (Lecture, Excursion, Seminar) Through the combination of preparatory lectures and student seminars and the 10 days excursion to a Mediterranean country, this module provides participants with interdisciplinary insights into the ecological, socio-cultural and economic components of sustainable agricultural systems and practices within the Mediterranean context. The different agricultural systems, from small- to large size farms, enterprises, local associations and non-governmental organisations to be visited during the excursion will exemplify the opportunities and challenges of agricultural activities in their specific context. In addition, particular attention will be paid to aspects of sustainability, water management, social and local well-being, and environmental safety. The participation of different universities and international research institutions will allow the MSc students to gain a first impression on how field research is organized and carried out in the Mediterranean countries. In addition, the participation of local associations and non-governmental institutions will provide another view of the social, and economic contexts, as well as, conflicts of the specific visited region/country. Specific general and scientific articles dealing with the excursion country, distributed in the course	2 WLH

Examination: Presentation (approx ca. 20 minutes) (50%) and written outline (max. 4 pages) (50%) **Examination requirements:** Examination prerequisites: Day protocol of the excursion (max. 2 pages)	6 C

Examination requirements: Presentation and critical analysis of a case study that will be covered during the excursion, focusing on interdisciplinary aspects from the ecological (agricultural oriented) dimension to the socio-cultural and human well-being contexts, developed during the preparatory seminars.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dr. Cristina Quintas Soriano
Course frequency: each summer semester	**Duration:** 2 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 20	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P01: Ecology and agroecosystems**	6 C 4 WLH

Learning outcome, core skills: Students are able to define site-specific conditions of sustainability, identify key constraints to the productivity and sustainable use of agro-ecosystems, assess the scope of human (management) interventions, determine the causes of productivity decline and chose approaches to strengthen sustainability	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Ecology and agroecosystems (Lecture, Seminar) *Contents*: Case-study based analysis and discussion of ecological framework conditions (limitations) in different arid and sub-humid agro-ecosystems of tropical and temperate zones with a particular focus on marginal soils and/or difficult infrastructural conditions where effective nutrient cycling, integration of cropping and animal husbandry systems as well as the use of biodiversity for income generation at the farm level is of particular importance. The potential/role of organic agriculture will be discussed and a more general discussion of the potential of organic agriculture to strengthen the resilience of agro-ecosystems will be presented.	4 WLH
Examination: Written Exam (90 min., 70%) and presentation (25 min., 30%) **Examination requirements:** Students should be able to explain the function and biophysical limits of (sub)tropical agro-pastoral land use systems, to justify the need to establish interdisciplinary approaches and to describe current research methods in land use systems analysis.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge in plant, soil and animal science, willingness to analyse agro-ecosystems quantitatively
Language: English	**Person responsible for module:** Prof. Dr. Andreas Bürkert
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 25	

Additional notes and regulations:

Literature:

Altieri, M. 1987: Agroecology: the scientific basis of alternative agriculture. Westview Press, Boulder, Colorado, USA; Gliessman, S.R. 1998: Agroecology: ecological processes in sustainable agriculture. Ann Arbor Press, Michigan, USA.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P03: Ecological soil microbiology**	6 C 4 WLH

Learning outcome, core skills: Students learn to use microbiological methods and to interpret the obtained data. Students develop a consciousness for the complexity of soil fertility and soil quality and see the difficulties in diagnosing it.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Ecological soil microbiology (Lecture, Excursion, Seminar) *Contents*: Introduction to, and application of important up-to-date methods in soil-microbiology to determine the activity, biomass and community structure of soil- microorganisms. The complete operational sequence of a research project is simulated: (1) sampling, (2) sample preparation, (3) measurements and data collection (application of methods), (4) data processing, (5) statistics and (6) drafting a manuscript. Up-to-date literature is presented and discussed by the students.	4 WLH
Examination: Project work (max. 12 pages) **Examination prerequisites:** 2 presentations (each ca. 20 minutes) **Examination requirements:** Knowledge of modern methods of soil microbiology for the determination of the activity, the community structure of soil microorganisms and their biomass, as well as knowledge about soil fertility and soil quality and their determination.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge in biology, chemistry, and soil sciences. To do an experimental Master's thesis in soil sciences or plant nutrition this module is compulsory.
Language: English	**Person responsible for module:** Prof. Dr. R.G. Jörgensen
Course frequency: each winter semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 12	

Additional notes and regulations:
Literature:

Coyne, M.S. 1999: Soil microbiology: an exploratory approach. Thomson Press; Paul, E.A., Clark, F.E. 1996: Soil microbiology and biochemistry. 2nd ed. New York Academic Press; papers to be presented in the course are provided.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P04: Plant nutrition in the tropics and subtropics**	6 C 4 WLH

Learning outcome, core skills: Based on knowledge of principles of plant nutrition the students are able to find solutions for specific problems with regard to plant nutrition in the tropics.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Plant nutrition in the tropics and subtropics (Lecture, Practical course) *Contents*: Lecture: Dynamics and availability of nutrients in acid, highly weathered soils, alcaline soils, and paddy soils. Nutrient deficiency and toxicity in plants. Problems with Al-toxicity and salinity. N-fertilization, N2-fixation. Nutrient cycling in special cropping systems like shifting cultivation, intercropping, agroforestry, paddy rice. Laboratory course: Investigations about P availability, P uptake, and P efficiency mechanisms. Performing a complete experiment including the necessary chemical analyses and data evaluations.	4 WLH
Examination: Oral examination (approx. 20 minutes) **Examination prerequisites:** Oral exam (20 minutes) **Examination requirements:** Knowledge of basic principles of plant nutrition and tropical plant nutrition in particular. Knowledge of cropping systems and their influence on soil fertility and nutrient cycles. Special aspects of plant nutrition in paddy rice.	6 C

Admission requirements: Prerequisite for admission to examination is the attendance at the laboratory course.	**Recommended previous knowledge:** Baisc knowledge in soil and plant sciences
Language: English	**Person responsible for module:** Dr. Bernd Steingrobe
Course frequency: each winter semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 30	

Additional notes and regulations:
Literature:

Will be given during the lecture.

Laboratory course: blocked in a week at the beginning of the semester break.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P05: Organic cropping systems under temperate and (sub)tropical conditions**	6 C 4 WLH

Learning outcome, core skills: Students are able to describe the principles and functions of agro-ecosystems, understand nutrient cycles and options for their improvement as an important basis of organic farming, evaluate systems of land use with a particular focus on organic modes of production and their role in agro-ecosystems, assess the role of livestock for nutrient cycling and with respect to the conservation of plant and animal biodiversity in (sub-)tropical settings.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Organic cropping systems under temperate and (sub)tropical conditions (Lecture, Excursion, Seminar) *Contents*: Visits of organic farms; case studies of livestock-oriented organic farming under different environmental conditions and constraints; development, evaluation and comparison of land use management systems under diverse natural, economic and socio-cultural conditions; nutrient cycling in plant-animal systems; site-specific contributions of legumes to N supply; P availability, P recycling and use of rock phosphates; modes of P supply in farming systems; EC, Australian, Japanese and North American regulations for organic farming – problems and opportunities.	4 WLH
Examination: Oral exam (ca. 15 minutes, 75%) and presentation (ca. 15 minutes, 25%) **Examination requirements:** Knowledge of organic plant cultivation systems, management of nutrient cycle systems, targeted use of legumes for site-specific N supply and knowledge of the basics of P availability, P recycling and the use of raw phosphates. Knowledge about the possibilities of P-supply in different cultivation systems, about the differences and problems with the ecostandards in EU, Japan, Australia and USA as well as knowledge about the contribution of livestock to the sustainability of organic farming systems.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge in plant, soil and animal sciences
Language: English	**Person responsible for module:** Prof. Dr. Andreas Bürkert
Course frequency: each winter semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: not limited	

Additional notes and regulations:

Literature:

Altieri, M. 1987: Agroecology: the scientific basis of alternative agriculture. Westview Press, Boulder, Colorado, USA; Willer, H. et al. 2008: The World of Organic Agriculture - Statistics and Emerging Trends 2008, IFOAM, Bonn, Germany.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P06: Soil and water**	6 C 4 WLH

Learning outcome, core skills: Students understand soil - water - plant relations and basic soil physical, soil hydrological and soil (micro)biological processes. They are able to critically evaluate soil and water problems and limits of soils as a natural resource and judge soil management options for sustainable land use.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Soil and water (Lecture, Exercise) *Contents*: Fundamental physical and hydrological processes; Soil water storage and transport; Physicochemical properties, Soil water in relation to mechanical processes (e.g. workability, deformation, soil strength); Soil – Water - Plant Relations (root water uptake, root growth, transpiration, soil-plant-atmosphere continuum); Field water cycle and management effects (e.g. mulching, tillage, irrigation); Irrigation principles and practices; Soil degradation and conservation (e.g. soil salinisation, compaction, acidification, contamination); Edaphon and its functions; Mycorrhiza; Rhizobia; Methods in soil biology; Indicators of soil fertility; Turnover of the soil microbial biomass; Habitat protection and ecotoxicology; Soil biology and fertility of tropical soils.	4 WLH
Examination: Oral examination (approx. 30 minutes) **Examination requirements:** Students show that they understand soil - water - plant relations and basic soil physical, soil hydrological and soil (micro)biological processes. They are able to critically evaluate soil and water problems and limits of soils as a natural resource and judge soil management options for sustainable land use.	6 C

Admission requirements: none	**Recommended previous knowledge:** Fundamentals of soil science; Module Soil and Plant Science or equivalent.
Language: English	**Person responsible for module:** Prof. Dr. Stephan Peth
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: not limited	

Additional notes and regulations:

Literature:

N.C. Brady & R. R. Weil, 2008. The Nature and Properties of Soils. 14th ed., Pearson International Press; Hillel, D. (1998): Environmental Soil Physics. Academic Press; Jury, W. & Horton, R. (2004): Soil Physics.

Wiley & Sons; Lal, R. & Shukla, M.K. (2004): Principles of Soil Physics, Marcel Dekker Inc.; Ehlers, W. & Goss, M. (2003): Water Dynamics in Plant Production, CABI Publishing; Kirkham, M. B. (2005): Principles of Soil and Plant Water Relations, Elsevier; Coyne, M. S. (1999). Soil microbiology: an exploratory approach, Thomson Press; Paul, E.A., Clark, F.E. (1996). Soil microbiology and biochemistry, 2nd ed., New York Academic Press.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P07: Soil and plant science**	6 C 4 WLH

Learning outcome, core skills: Bridging module for students lacking basic knowledge in some agronomy disciplines. With the help of lectures and reading materials students will be enabled to fill in gaps and get updated on state-of-the art knowledge with a special focus on questions pertinent to organic agriculture. Students, having taken this module, will be able to follow advanced courses in the above fields.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Soil and plant science (Lecture, Seminar) *Contents*: Influence of soil formationprocesses on physical properties (texture, soil water, pore space), chemical properties (buffering, exchange capacity, nutrients), and biological properties (organic matter, edaphon), soil formation and classification. Nutrient availability and and nutrient mobilization under conventional and organic agricultural conditions. Major and minor nutrients and food quality.Plant breeding goals for different agricultural systems. Plant morphology, genetics and breeding: principles of plant domestication and use, characterization and evaluation, use of genetic resources in plant breeding, genetic basis for plant breeding Genetics of host-parasite interactions, epidemiology and plant defence. Insect physiology and ecology. Spezifische allgemeine und wissenschaftliche Artikel, die sich mit dem Zielland der Exkursion befassen werden über eine E-Learning Plattform zur Verfügung gestellt	4 WLH
Examination: Written exam (120 minutes) or oral exam (ca. 20 minutes) **Examination requirements:** Fundamentals of soil science: Physical properties (texture, soil water, pore space), chemical properties (buffering, exchange capacity, nutrients), biological properties (organic matter, edaphon), soil formation and classification. Plant nutrition: Role of major and minor elements in plants, nutrient availability and nutrient mobilisation, plant nutrients and food quality Plant breeding and genetics: plant morphology, genetics and breeding: principles of plant domestication and use, characterization and evaluation, use of genetic resources in plant breeding, genetic basis for plant breeding. Plant protection: principles of plant pathology and entomology, genetics of plant diseases, epidemiology, plant defence mechanisms; insect physiology and ecology	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dr. Helmut Saucke
Course frequency:	**Duration:**

each winter semester; Witzenhausen	1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: not limited	

Additional notes and regulations:

Literature:

Brady, N.C. 1990: The nature and properties of soils. 10th edition, Prentice Hall; Marschner, H. 1995: Mineral Nutrition of Higher Plants, Academic Press, New York; Sanchez, P. 1976: Properties and Management of Soils of the Tropics, Wiley, New York; van Wyk, B.E. 2005: Food Plants of the World. Briza Publication, Pretoria; Rehm, S., Espig, G. 1991: The Cultivated Plants of the Tropics and Subtropics. Verlag Josef Margraf, Weikersheim, Germany; Agrios, G.N. 2005: Plant Pathology, 5th edition, Academic Press, New York; Pedigo, L.P. 2002: Entomology and Pest Management, 4th edition, Macmillan Pub Co.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P08: Pests and diseases of tropical crops**	6 C 6 WLH

Learning outcome, core skills: Students should become familiar with the causes of diseases (abiotic & biotic diseases), with the taxonomy of disease agents (bacteria, fungi, virus) and insect pests, with basics of integrated pest management (approaches, economic threshold, epidemiology), and biological, cultural control (cultivars, crop rotation, planting term, manual control), and chemical control options (toxicology, fungicides, insecticides) of the main crops in subtropical and tropical regions	**Workload:** Attendance time: 84 h Self-study time: 96 h

Course: Pests and diseases of tropical crops (Lecture, Seminar) *Contents*: Pests and diseases of selected crops are treated together for each crop including approaches to integrated control. The following crops will be presented: rice, maize, cotton, cocoa, coffee, cassava, phaseolus beans, bananas, and others. For each crop, a short introduction to botanical and agronomic features (as far as they concern disease or pest control) is given, together with an overview of the main diseases world-wide. The economic importance of diseases and pests in different geographical areas is discussed. The most important diseases and pests of die crop are treated in detail and die possibilities for integrated control are discussed. Short introductions (reviews) on basic subjects of plant protection are given, these include: causes of diseases (abiotic & biotic diseases), taxonomy of disease agents (bacteria, fungi, viruses) and insect pests, integrated pest management (approaches, economic threshold), biological control (diseases, pests), cultural control (varieties, crop rotation, planting term, manual control), and chemical control (toxicology, fungicides, insecticides). Students will give seminars on related topics. Vorlesungsbasierte Literatur	6 WLH
Examination: Written exam (60 minutes, 67%) and presentation (ca. 20 minutes, 33%) **Examination prerequisites:** Seminar speech **Examination requirements:** Knowledge on the most important pests and diseases of tropical and subtropical crops; chemical and biological control options, phytosanitary approaches, and sustainable cropping systems for tropical crops.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge (B.Sc. level) in agricultural entomology, plant diseases and plant production
Language: English	**Person responsible for module:** Prof. Dr. Stefan Vidal
Course frequency:	**Duration:**

each summer semester; Göttingen	1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 30	

Additional notes and regulations:

Literature:

Lecture based materials; details provided during lectures.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P10: Tropical agro-ecosystem functions**	6 C 4 WLH

Learning outcome, core skills: Knowledge of the processes of soil degradation as well as of the measures for their control or prevention in selected land use systems of the tropics and subtropics; knowledge of ecological system functions and their synthesis in agronomic concepts for the adaptation to unfavourable climatic and pedological conditions in the tropics and subtropics.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Tropical agro-ecosystem functions (Lecture, Seminar) *Contents*: Introduction to and overview of agronomy-based land use systems in the tropics and subtropics taking into account ecological points of view. Analysis of the sustainability of plant production under special consideration of the physical, chemical and biological soil quality as well as the efficient water use in the seasonal tropics.	4 WLH
Examination: Presentation (ca. 30 minutes, 50%) and oral exam (ca. 30 minutes, 50%) **Examination requirements:** Knowledge about the processes of soil degradation and the measures taken to control or prevent in selected land use systems in the tropics and subtropics; knowledge of ecosystem functions and their synthesis in agronomic concepts to adapt to unfavorable climatic and pedological conditions in the tropics and subtropics.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge (B.Sc. level) of soil and plant sciences
Language: English	**Person responsible for module:** Dr. Ronald Franz Kühne
Course frequency: each summer semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 15	

Additional notes and regulations:

Literature:

Lecture notes and handouts, selected chapters from textbooks; copies of PowerPoint presentations

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P13: Agrobiodiversity and plant genetic resources in the tropics**	6 C 4 WLH

Learning outcome, core skills: Students are able to understand the role of agrobiodiversity in tropical agro-ecosystems, to present approaches of functional biodiversity analysis and to discuss the needs and strategies of on-farm (in situ) and off-farm conservation of plant genetic resources.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Agrobiodiversity and plant genetic resources in the tropics (Lecture, Seminar) *Contents*: Case-study based analysis of the role of biodiversity for selected crops in different agro-ecosystems from the arid to the humid climate zones; importance of biodiversity for the stability / sustainability of smallholder (subsistence) versus commodity-oriented commercial agriculture in the Tropics, assessment and utilization of diversity, principles and practices in conservation of genetic resources, role of homegardens and indigenous wild fruit trees for in situ conservation of biodiversity, causes and consequences of genetic erosion, approaches of germplasm collection.	4 WLH
Examination: Oral exam (about 15 minutes, 60%) and presentation (about 20 minutes, 40%) **Examination requirements:** Students should be able to understand the role of agrobiodiversity in tropical agroecosystems, to present basic approaches to functionally analyse biodiversity and to discuss the need of and strategies for *in* and *ex situ* conservation of genetic resources.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge in plant and soil sciences
Language: English	**Person responsible for module:** Prof. Dr. Gunter Backes
Course frequency: each winter semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: not limited	

Additional notes and regulations:

Literature:

Altieri, M. 1987: Agroecology: the scientific basis of alternative agriculture. Westview Press, Boulder, Colorado, USA; Eyzaguirre, P.B., Linares, O.F. 2004: Home gardens and agrobiodiversity. Smithsonia

Books, Washington, USA; Wood, D., Lenne, J.M. 1999: Agrobiodiversity: Characterization, utilization and management. CABI Publishing, Wallingford, UK.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P15M: Methods and advances in plant protection**	6 C 4 WLH

Learning outcome, core skills: Students are able to critically evaluate published results and apply this knowledge to actual problems in the field. They are also able to deal with problems in the field: Identification and measurements, design of experimental and analytical approaches to problems.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Methods and advances in plant protection (Lecture, Excursion, Exercise) *Contents*: Advanced course in plant pathology and entomology. Methodology and evaluation methods in plant protection. Case studies of specific plant protection issues in organic farming in the form of lectures, seminars and practical courses.	4 WLH
Examination: Written exam (120 minutes) or oral exam (ca. 20 minutes) (70%) and work reports (max. 3 pages) or seminar speech (ca. 10 minutes) (30%) **Examination requirements:** Advanced knowledge in plant protection (Entomology and Pathology) Methodology and evaluation methods in plant protection based on case studies.	6 C

Admission requirements: Introductory course in plant protection (entomology and pathology, at least 6 ECTS or equivalent) or bridging module M.SIA.P07 Soil and Plant Science	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Maria Renate Finckh
Course frequency: each winter semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: not limited	

Additional notes and regulations:

Literature:

Agrios, G.N. 2005: Plant Pathology, 5th edition Academic Press, New York; Pedigo, L.P. 2002: Entomology and Pest Management, 4th edition, Macmillen Pub Co.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P16M: Crop modelling for risk management**	6 C 4 WLH

Learning outcome, core skills: • Gain knowledge of the features of different crop modelling concepts and model families and learn to use the Agricultural Production Systems Simulator (APSIM) • Understand the basic principles of production ecology and agro-ecosystems modelling • Apply crop modelling to typical agronomic questions related to risk management strategies	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Crop modelling for risk management (Lecture, Seminar) *Contents*: Using the agricultural production system simulator (APSIM) students will be introduced to theconcepts (potential, water-limited and nitrogen-limited production) and application options of agro-ecosystem modelling. In the first part of the lecture students will learn along guided exercises to set up differentsimulations (single season cropping, rotation, intercropping, climate change effects etc.). In the second partselected case studies are presented, which address typical agronomy questions (fertilizer management, closingyield gap, identifying suitable crop rotations).	4 WLH
Examination: Presentation (about 30 min, 30%) and Homework (max. 20 pages, 70%) **Examination requirements:** • Knowlegde of the basic principles of agro-ecosystems modelling • Working knowledge of using APSIM to investigate typical agronomic questions • Knowledge of analyzing simulated data and present it	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge (B.Sc. level) of plant sciences
Language: English	**Person responsible for module:** Prof. Dr. Reimund P. Rötter
Course frequency: each summer semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 20	

Additional notes and regulations:

Literature:

Van Keulen & Wolf, eds. 1986. Modelling of agricultural production: weather, soils and crops. Simulation Monographs, Wageningen, The Netherlands

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P17M: Nutrient dynamics: long-term experiments and modelling**	6 C 4 WLH

Learning outcome, core skills: Students are able to use established models and the statistical software R for a study and description of ecological processes in arable soils. Based on their understanding of soil nutrient dynamics they are able to evaluate and critically assess the significance of long-term and laboratory experiments for studying C, N and P dynamics and to consider all influencing variables.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Nutrient dynamics: long-term experiments and modelling (Lecture, Exercise) *Contents*: • Description of the dynamics of C, N and P (forms, transformations and availability) in arable soils • Presentation of the results of existing long-term experiments with emphasis on the variables and variants influencing these results • Modelling of the turnover of soil organic matter using the Rothamsted Carbon Model • Statistical modelling: combined regression and analysis of variance and linear mixed effects models • Application of the statistical software R for a description of C and N dynamics	4 WLH
Examination: Oral examination (approx. 30 minutes) **Examination requirements:** Knowledge of biological and chemical processes in soils and of the C and N dynamics. Basic knowledge of modelling, including statistical modelling, and the structure of the Rothamsted Carbon Model and the DNDC model. Verständnis bodenkundlicher Prozesse, insbesondere der C- und N-Formen und Kreisläufe, Grundverständnis der Modellierung (einschließlich statistischer Modellierung), Kenntnisse der Modelle Rothamsted Carbon Model und DNDC.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge (B.Sc. level) of soil and plant sciences
Language: English	**Person responsible for module:** Prof. Dr. Bernard Ludwig
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**

Maximum number of students: 20	

Additional notes and regulations:

Literature:

Coleman, K., Jenkinson, D.S. 2014: RothC - A model for the turnover of carbon in soil. http://www.rothamsted.ac.uk
Crawley, M.J. 2012: The R book. 2nd edition, Wiley; Field, A., Miles, J., Field, Z. 2012: Discovering Statistics using R. Sage Everitt, B., Hothorn, T. P. 2011. An Introduction to Applied Multivariate Analysis with R. Springer, New York Field, A., Miles, J., Field, Z. 2012. Discovering Statistics using R, SAGE

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P19M: Experimental techniques in tropical agronomy**	6 C 4 WLH

Learning outcome, core skills: Knowledge of the botanical, ecological and agronomic facts of the introduced crop plants and multiplication techniques, scientifically correct interpretation and discussion of results from a greenhouse experiment, limitations and potentials of the interpretation of measuring procedures for the description of physiological state variables in tropical crop plants.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Experimental Techniques in Tropical Agronomy (Lecture, Exercise, Seminar) *Contents*: Principles and practice of vegetative and generative propagation techniques in the greenhouse of the division. Introduction to statistical experimental design and analysis of greenhouse experiments. Theory and practice of eco-physiological measurement methods for the water balance and status, as well as gas exchange / photosynthesis rates in tropical crop plants **Literatur** Kopien von Powerpoint-Präsentationen, ausgewählte Kapitel von Lehrbüchern.	4 WLH
Examination: Presentation (ca. 30 minutes, 50%) and protocol (max. 20 pages, 50%) **Examination requirements:** Knowledge of botanical, ecological and agronomic facts of the presented crop plants; scientifically correct planning, implementation, evaluation, description and discussion of the results of a greenhouse experiment; limits and possibilities of interpretation of measurement methods for describing the physiological state variables of tropical crop plants.	6 C

Admission requirements: M.SIA.P12	**Recommended previous knowledge:** Basic knowledge (B.Sc. level) of plant sciences
Language: English	**Person responsible for module:** Dr. Ronald Franz Kühne
Course frequency: each summer semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 15	

Additional notes and regulations:
Literature:

Copies of PowerPoint presentations, selected chapters from textbooks

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P20: Plant nematology**	6 C 4 WLH

Learning outcome, core skills: Students will gain advanced insight in plant nematology, nematode interactions with other plant pathogens, and management strategies; hands-on training will be provided on nematode sampling, processing, identification and disease evaluation Students having taken this module will be able to detect nematode damage and identify plant-parasitic nematodes to genus.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Plant Nematology (Lecture, Exercise, Seminar) *Contents*: Introduction: History (first records, evolution, phylogeny), General function of nematodes (nutrient cycling, beneficial nematodes, parasites of plants and animals), Biology (anatomy, classification, life cycle, reproduction, feeding behaviour, parasitism strategies), Ecology (spread, population dynamics, distribution in soil, survival strategies, worldwide occurrence, interaction with other pathogens), Symptoms (aboveground/ belowground,), Plant-Nematode Interactions (feeding sites, plant defence mechanisms, nematode survival), Economic importance (quantitative/qualitative yield losses, main damaging genera, most vulnerable crops) Methodology: Sampling procedures (sampling depth, number of cores per sample, total sample volume), Sample processing for (a) cysts from soil (Fenwick can, centrifugal/ flotation, elutriation), for (b) mobile stages from soil (Baermann funnel, sieving, flotation, elutriation), for (c) mobile stages from plant material (Baermann funnel, direct preparation, mistifier), Staining of nematodes (in roots, egg masses), Scoring root damage (gall index) Nematode identification: fishing of nematodes, fixation, mounting, permanent slides, identification keys, preparation of vulval cones (cyst nematodes) and perineums (root-knot nematodes) Management: Threshold levels, Quarantine, Crop rotation (hosts, non-host-plants, trap crops, antagonistic crops, fallow), Resistance/tolerance (classical breeding, molecular approaches), Organic amendments (compost, green manure), Biological Control (antagonistic microorganisms, suppressive soils), Physical Control (heat, steam, flooding, radiation), Chemical control (nematicides, fumigants)	4 WLH
Examination: Oral exam (ca. 20 minutes) or written exam (120 minutes) (50%) and presentation (ca. 15 minutes, 50%) **Examination requirements:** General and special biology of nemtodes, especially plant parasitic nematodes. Metnodologies in nematology and identification, general management of nematodes.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge (B.Sc. level) of soil, plant and animal sciences

Language: English	**Person responsible for module:** Prof. Dr. Maria Renate Finckh
Course frequency: each winter semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 15	

Additional notes and regulations:

Literature:

Perry, N.R., Moens, M. 2006: Plant Nematology, CAB International. Luc. M., Sikora, R.A., Bridge, J. 2005: Plant parasitic nematodes in subtropical and tropical agriculture, 2nd edition. Ciancio, A., Mukerji, K.G. 2008: Integrated Management and Biocontrol of Vegetable and Grain Crops Nematodes, Springer-Verlag. Perry, R.N., Moens, M., Starr, J.L. 2009: Root-Knot Nematodes, CAB International. Agrios, G.N. 2005: Plant Pathology, 5th edition. Berg, R.H., Taylor, C.G. 2009: Cell Biology of Plant Nematode Parasitism. Springer-Verlag. Ferraz, L.C.C.B., Brown, D.J.F. 2002: An Introduction to Nemtaodes: Plant Nematology, Pensoft. Weischer, B., Brown, D.J.F. 2000: An Introduction to Nematodes: General Nematology, Pensoft, Shurtleff, M.C., Averre III, C.W. 2000: Diagnosing plant diseases caused by nematodes, APS Press

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P21: Energetic use of agricultural crops and Field forage production**	6 C 4 WLH

Learning outcome, core skills: Based on the data presented, students are able to identify and calculate potentials and limits of energy and raw material production from renewable plant resources. Furthermore students are able to classify and to assess the importance of field forage production for organic cropping systems.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Energetic use of agricultural crops and Field forage production (Lecture, Excursion) *Contents*: Management of agricultural crops for energetic use. Energy scenario and potentials, emission of greenhouse gases, sources of energy from biomass and waste material, selecting and processing biomass as a fuel. Biogas, fermentation process and plant technology. Gasification, Fischer-Tropsch-Process. Benefits and restrictions by the replacement of fossil fuel-based materials through biomass-based products. The importance of field forage production (ffp) for organic cropping systems; basics of ffp – plant species; integration of ffp in crop rotation systems; environmental impact of ffp, quality aspects; nutrient-dynamics	4 WLH
Examination: Oral examination (approx. 30 minutes) **Examination requirements:** Basic and theme specific deepened knowledge on the energetic use of agricultural biomass and on the presented aspects of field forage production.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowlege in soil and plant sciences, physics and chemistry.
Language: English	**Person responsible for module:** Prof. Dr. Michael Wachendorf
Course frequency: every 4th semester; Start WiSe 2017/2018; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 20	

Additional notes and regulations:
Literature:

Literature: Klass, D. 1998: Biomass for Renewable Energy, Fuels, and Chemicals, Academic Press; Sims, R. 2002: The Brilliance of Bioenergy. James & James, London, UK; Rosillo-Calle, F. 2007: The Biomass Assessment Handbook. Earthscan; London, UK

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P22: Management of tropical plant production systems**	6 C 4 WLH

Learning outcome, core skills: Knowledge of botanical, ecological and agronomic facts of presented crops and cropping systems. The students should be able to classify crops and cropping systems in relation to site conditions and undertake system-orientated evaluation of sustainable production.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Management of tropical plant production systems (Lecture) *Contents*: Presentation of the most important crops with respect to: botany, morphology, origin, climatic and ecological requirements, crop production, harvest procedure, significance in local farming systems, utilisation as food, feed, raw materials and as bioenergy source. Discussion of specific cropping systems in the tropics and subtropics and specific management systems for the sustainable improvement of productivity. **Literatur** Rehm, S., Espig, G. 1991: The Cultivated Plants of the Tropics and Subtropics. Verlag Josef Margraf. Weikersheim, Germany; lecture notes	4 WLH
Examination: Written exam (90 minutes) or oral exam (ca. 30 minutes) **Examination requirements:** Knowledge of botanical, ecological and agronomic facts of the presented crops and cropping systems. Knowledge of the assignment of crops and cropping systems to different site conditions, as well as system-oriented evaluation of sustainable production at selected sites.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge on plant production (BSc-level)
Language: English	**Person responsible for module:** Prof. Dr. Reimund P. Rötter
Course frequency: each winter semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 30	

Additional notes and regulations:
exam on the first examination, oral exam on the second examination

Literature:

Rehm, S., Espig, G. 1991: The Cultivated Plants of the Tropics and Subtropics. Verlag Josef Margraf. Weikersheim, Germany; lecture notes

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P23M: Modern Plant Nutrition - Application of Molecular Methods in Plant Nutrition Research**	9 C 8 WLH

Learning outcome, core skills:	**Workload:**
Theoretical backgrounds, advantages and disadvantages of the respective methods and analytical skills will be imparted to the students. They learn how to apply those methods in a targeted manner and learn how to interprete the data, put the results into context and analyse them as such. Furthermore, students will improve their team work skills by exchanging informations and communicating clearly about problems and solutions. Methods that will be taught are extraction of DNA, RNA and proteins of different samples, PCR, qPCR including primer design, 2D gel elctrophoresis, sequencing and state of the art software data analysis.	Attendance time: 120 h Self-study time: 150 h

Course: Modern Plant Nutrition - Application of Molecular Methods in Plant Nutrition Research (Block course, Internship, Lecture) *Contents*: Within this block module students will learn current molecular methods and their potential applications in plant nutrition research. In lecture sessions students will learn the theoretical background of the respective methods and then will apply those methods to study a central issue in practical sessions in the laboratory. The aim is to impart methodological skills in molecular analysis of microbial communities, as well as the analysis of genes, transripts and proteins of microbes and plants. Students will be guided from planning and preparation of analyses to interpretation and evaluation of obtained data.	8 WLH
Examination: Written exam (90 minutes, 75%) and oral exam (approx. 15 minutes, 25%) **Examination requirements:** Knowledge about the molecular methods and their theoretical backgrounds, advantages and disadvantages, and the field of application. Additionally, knowledge about the relationship of molecular mechanisms in plants and the influence of plant nutrients on plant physiology as well as knowledge on the role of microbial communities for plant nutrition and methods for analysis of microbial communities and their activity in soil and plants.	9 C

Admission requirements:	**Recommended previous knowledge:**
none	Basic knowledge about soil and plant sciences (B.Sc.level)
Language: English	**Person responsible for module:** Jun.-Prof. Dr. Merle Tränkner
Course frequency: each summer semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted:	**Recommended semester:**

twice	
Maximum number of students: 15	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P24: Agroforestry**	6 C 4 WLH

Learning outcome, core skills: This course will introduce students into the basic concepts and current trends in the science and practice of agroforestry systems in temperate and tropical regions. Using a series of introductory lectures, students will cover basics concepts, principles, and drivers related to agroforestry practices. Subsequently, a series of invited speakers with different backgrounds will develop seminars focusing on specific-contexts agroforestry case studies, from a multidisciplinary and innovative perspective. Students will get to know multiple biophysical contexts that drive the diversity of agroforestry systems, the multiple benefits that people obtain of them, but also the socio-cultural systems that influence the management and sustainability of those systems and the current challenges in the context of global and social changes.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Agroforestry (Lecture, Seminar) *Contents*: Through the combination of introductory lectures and seminars of guest speakers, this module provides participants with multidisciplinary insights into the ecological and social components of agroforestry systems and practices. This module will provide an overview on the agroforestry science. Focus will be on the study of the: 1. techniques for characterization and evaluation; 2. practical applications from multidisciplinary backgrounds (e.g., agroforestry science, policy resource management or ecosystem service evaluation) and across multiple sites in the Mediterranean, and; 3. linkages to sustainability issues (e.g., climate change, water security management, or human well-being). These topics will be outlined in introductory lectures and deepened in seminars, where key issues will be explored and critically discussed.	4 WLH
Examination: Presentation (approx. 20 minutes, 50%) and Term paper (max. 20 pages, 50%) **Examination requirements:** Knowledge of the main concepts and characteristics of agroforestry systems and understanding of the role of different practices and human management in the sustainability of future landscapes.	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dr. Cristina Quintas Soriano
Course frequency:	**Duration:**

each winter semester; Witzenhausen	1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 25	

Additional notes and regulations:

Literature:

Jose, S. 2009. Agroforestry for ecosystem services and environmental benefits: an overview. Agroforest Systems 76:1–10,https://doi.org/10.1007/s10457-009-9229-7

Fagerholm, N., et al. 2016. A systematic map of ecosystem services assessments around European agroforestry. Ecological Indicators, 62:47–65,http://dx.doi.org/10.1016/j.ecolind.2015.11.016

Advances in Agroforestry. Book Series: 2004 – 2017. Integrating Landscapes: Agroforestry for Biodiversity Conservation and Food Sovereignty. Montagnini, F. Springer, https://doi.org/10.1007/978-3-319-69371-2

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P25: Sustainable agricultural practices in Mediterranean regions**	6 C 2 WLH

Learning outcome, core skills: To gain interdisciplinary insights into (international) approaches towards opportunities and challenges of sustainable agricultural systems under limited water conditions, sustainable resource use, and agricultural development interventions. Students will get to know socio-cultural contexts on the ground about the impacts of agricultural intensification and their repercussions on local well-being (e.g., immigrated population welfare, labor issues, and environmental degradation) and sustainable agricultural alternatives. To familiarize participants with theoretical and practical questions of field research in an international contexts. Learn and put into practice research methods of data collection and analysis.	**Workload:** Attendance time: 96 h Self-study time: 84 h

Course: Sustainable agricultural practices in Mediterranean regions (Lecture, Excursion, Seminar) *Contents*: Through the combination of preparatory lectures and student seminars and the 10 days excursion to a Mediterranean country, this module provides participants with interdisciplinary insights into the ecological, socio-cultural and economic components of sustainable agricultural systems and practices within the Mediterranean context. The different agricultural systems, from small- to large size farms, enterprises, local associations and non-governmental organisations to be visited during the excursion will exemplify the opportunities and challenges of agricultural activities in their specific context. In addition, particular attention will be paid to aspects of sustainability, water management, social and local well-being, and environmental safety. The participation of different universities and international research institutions will allow the MSc students to gain a first impression on how field research is organized and carried out in the Mediterranean countries. In addition, the participation of local associations and non-governmental institutions will provide another view of the social, and economic contexts, as well as, conflicts of the specific visited region/country.	2 WLH
Examination: Presentation (approxca. 20 minutes; 50%) and written outline (max. 4 pages; 50%) **Examination prerequisites:** Protocol of the excursion (max. 2 pages) **Examination requirements:** Presentation and critical analysis of a case study that will be covered during the excursion, focusing on interdisciplinary aspects from the ecological (agricultural oriented) dimension to the socio-cultural and human well-being contexts, developed during the preparatory seminars.	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dr. Cristina Quintas Soriano
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 20	

Additional notes and regulations:

Literature:

Specific general and scientific articles dealing with the excursion country, distributed in the course

Georg-August-Universität Göttingen **Module M.WIWI-QMW.0004: Econometrics I**	6 C 6 WLH

Learning outcome, core skills: This lecture provides a detailed introduction and discussion to the theory of several topics of econometrics. In a practical course the students will apply the methods discussed to real economic data and problems using the statistical software packages Eviews and R.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Econometrics I (Lecture) *Contents*: Multiple linear regression model: Estimation, Inference and Asymptotics. Maximum likelihood modeling. Generalized least squares. Stochastic regressors. Intrumental variable estimators. Generalized method of moments, likelihood based inference. Dynamic models, weak exogeneity, cointegration, stochastic integration. **Literature:** Wooldridge, Jeffrey M. 2006. *Introductory econometrics: a modern approach*. Mason, OH: Thomson/South-Western; Chapters 1, 2, 3, 4, 5, 6, 8. Verbeek, Marno. 2008. *A guide to modern econometrics*. Chichester, England: John Wiley & Sons; Chapters 1-4, 6. Judge et al. 1988. Introduction to the theory and practice of econometrics. Wiley, 2nd edition.	2 WLH
Course: Econometrics I (Exercise) *Contents*: The practical deepens the understanding of the lecture topics by applying the methods from the lecture to economic problems and data, and reviewing and intensify theoretical concepts.	2 WLH
Course: Econometrics I (Tutorial) *Contents*: The tutorials are small classes with max. 20 students, which give room for applying the concepts to specific problem sets and discussing questions, that students might encounter regarding the concepts addressed in the lecture and practical. A part of the tutorial are hands-on computer exercises using the software R. This enables students to conduct regression analysis in practice and prepares them for others (applied) courses.	2 WLH

Examination: Written examination (90 minutes)	6 C

Examination requirements: Linear regression models, generalized linear regression models. OLS, GLS, EGLS estimation. Multiplikative heteroskedasticity, autocorrelation. LM specification testing, Durbin Watson test. Convergence in probability, convergence in distribution. Asymptotics (consistency, asymptotic normality) of OLS estimators. IV estimation, GMM estimation.	

Admission requirements:	**Recommended previous knowledge:**

none	Notwendige: Mathematik (lineare Algebra), Statistik. Erwünscht: Einführung in die Ökonometrie (oder vergleichbare Vorlesung)
Language: English	**Person responsible for module:** Prof. Dr. Helmut Herwartz
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 1 - 2
Maximum number of students: not limited	

Georg-August-Universität Göttingen **Module M.WIWI-VWL.0008: Development Economics I: Macro Issues in Economic Development**	6 C 4 WLH

Learning outcome, core skills: Expose students to macroeconomic issues in economic development, including how economic growth, trade, inequality, aid, capital flows, and population issues affect economic development. They understand historical roots of underdevelopment and acquire knowledge of current economic models and empirical approaches in these topic areas.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Development Economics I (Lecture) *Contents*: Overview of macroeconomic issues and approaches to analyzing problems of developing countries. Topics include measurement of development, historical evolution of income differences, growth theory, and linkages between trade, finance, aid, population, and inequality and economic development.	2 WLH
Course: Development Economics I (Exercise) *Contents*: The tutorial is used to deepen understanding of concepts used in the lecture, discuss relevant literature, and apply concepts and methods developed in the lecture.	2 WLH
Examination: Written Exam	6 C

Examination requirements: The students demonstrate a good understanding of key theories and models of economic development. They are able to critically present these theories and models, are able to interpret empirical results that relate to these models, and are able to crucially draw relevant policy conclusions coming out of these models and empirical assessments.	

Admission requirements: None	**Recommended previous knowledge:** Knowledge of macroeconomics and econometrics at BA level is highly desirable.
Language: English	**Person responsible for module:** Prof. Stephan Klasen
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 1 - 3
Maximum number of students: not limited	