Georg-August-Universität
Göttingen

Modulverzeichnis

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. 18/2024 S. 430)

Module

Übersicht nach Modulgruppen

I. Ergänzende Modulübersicht für Studierende des Double-Degree-Programms mit der Universität Talca

1. Studium an den Universitäten Kassel und Göttingen im 1. und 2. 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. Pflichtmodule (24 C)

The following four compulsory modules must be successfully completed:

bb. Wahlpflichtmodule (18 C)

From the following three mandatory modules must be successfully completed:

cc. Wahlmodule (18 C)

b. Studium an der Universität Talca

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

aa. Wahlpflichtmodule (12 C)

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

bb. Wahlmodule (18 C)

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

2. Studium an den Universitäten Kassel und Göttingen im 1. und 4. 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. Studium an den Universitäten Kassel und Göttingen

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

aa. Pflichtmodule (18 C)

The following three compulsory modules must be successfully completed

bb. Wahlpflichtmodule (6 C)

From the following one mandatory module must be successfully completed

cc. Wahlmodule (6 C)

From the following one elective module must be successfully completed

b. Studium an der Universität Talca

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

aa. Pflichtmodule (6 C)

The following compulsory module must be successfully completed:

bb. Wahlpflichtmodule (24 C)

From the following four mandatory modules must be successfully completed:

cc. Wahlmodule (30 C)

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

3. Studium an den Universitäten Kassel und Göttingen im 3. und 4. Semester

Students who study as part of the double degree programme with the University of Talca complete the following study programme during the first two semesters at the University of Talca.

a. Studium an der Universität 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. Pflichtmodule (6 C)

The following one module must be successfully completed:

bb. Wahlpflichtmodule (24 C)

From the following four mandatory modules must be successfully completed:

cc. Wahlmodule (30 C)

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

b. Studium an den Universitäten Kassel und Göttingen

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

aa. Pflichtmodule (18 C)

The following three compulsory modules must be successfully completed:

bb. Wahlpflichtmodule (6 C)

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

cc. Wahlmodule (6 C)

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

II. MSc Sustainable International Agriculture (English)

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

1. Specialisations

At least 90 C must be succesfully completed within a specialisation.

a. International Agribusiness and Rural Development Economics

aa. Compulsory modules

The following four compulsory modules must be completed:

bb. Elective compulsory 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. Language courses at level B1 or B2 of the Common European Framework of Reference for Languages (CEFR) or comparable totaling 6 C may be considered once as electives, provided that the course is not English or the student's native language.

b. International Organic Agriculture

aa. Compulsory modules

The following bridging module (P07) and four compulsory modules comprising 30 C must be successfully completed.

bb. Elective compulsory 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. Language courses at level B1 or B2 of the Common European Framework of Reference for Languages (CEFR) or comparable totaling 6 C may be considered once as electives, provided that the course is not English or the student's native language.

c. Tropical Agricultural and Agroecosystems Sciences

aa. Compulsory modules

The following bridging module (P07) and four compulsory modules must be completed.

bb. Elective compulsory 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. Language courses at level B1 or B2 of the Common European Framework of Reference for Languages (CEFR) or comparable totaling 6 C may be considered once as electives, provided that the course is not English or the student's native language.

2. Master's thesis and Colloquium

Successful completion of the Master's thesis and of the colloquium for the Master's thesis is worth 30 Credits.

3. Voluntary additional Modules

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. Michael Georg Rostás
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 **Modul M.Agr.0056: Plant breeding methodology and genetic resources** *English title: Plant Breeding Methodology and Genetic Resources*	6 C 4 SWS

Lernziele/Kompetenzen:	**Arbeitsaufwand:**
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.	Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Plant breeding methodology and genetic resources (Vorlesung) *Inhalte*: 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 SWS
Prüfung: Klausur (Gewicht: 80%, Dauer: 90 Minuten) und Präsentation, Referat oder Korreferat (Gewicht: 20%, Dauer: ca. 20 Minuten) **Prüfungsanforderungen:** 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

Zugangsvoraussetzungen:	**Empfohlene Vorkenntnisse:**
keine	Basic knowledge (B.Sc. level) in genetics and plant breeding
Sprache: Deutsch, Englisch	**Modulverantwortliche[r]:** apl. Prof. Dr. Wolfgang Link
Angebotshäufigkeit: jedes Sommersemester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: 25	

Bemerkungen:

Literature:

Lecture based material.

Georg-August-Universität Göttingen **Modul M.Agr.0086: Weltagrarmärkte** *English title: World Agriculture Markets and Trade*	6 C 6 SWS

Lernziele/Kompetenzen: 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.	**Arbeitsaufwand:** Präsenzzeit: 84 Stunden Selbststudium: 96 Stunden

Lehrveranstaltung: World agricultural markets and trade (Vorlesung,Übung) *Inhalte*: 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 SWS
Prüfung: Mündlich (ca. 30 Minuten) **Prüfungsanforderungen:** 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

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** Basic knowledge of agricultural economics
Sprache: Englisch, Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Bernhard Brümmer
Angebotshäufigkeit: jedes Sommersemester; Göttingen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: 90	

Bemerkungen:

Literature:

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

Georg-August-Universität Göttingen **Modul M.Agr.0106: China Economic Development: From an agricultural economy to an emerging economy** *English title: China Economic Development: From an Agricultural Economy to an Emerging Economy*	6 C 4 SWS

Lernziele/Kompetenzen: The students learn more about the specificities of China's economic transformation as well as the underlying economic concepts.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: China Economic Development: From an agricultural economy to an emerging economy (Vorlesung,Seminar) *Inhalte*: 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 SWS
Prüfung: Präsentation, Referat oder Korreferat (ca. 25 Minuten, Gewichtung 50%) und Hausarbeit (max 15 Seiten, Gewichtung 50%) **Prüfungsanforderungen:** Presentation and critical discussion of a scientific aspect of China's economic transformation.	6 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Xiaohua Yu
Angebotshäufigkeit: jedes Wintersemester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: 25	

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 and maps **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 prove 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 reproducible • interpreting data and results through the use of graphical tools. The produced code has to be handed in along with the paper and will also be subject to the evaluation.	6 C

Admission requirements: Econometrics I (*M.WIWI-QMW.004*), Introduction to Econometrics (B.WIWI-VWL.0007) or equivalent	**Recommended previous knowledge:** Basic econometric techniques (OLS)
Language: English	**Person responsible for module:** Prof. Dr. Bernhard Brümmer
Course frequency: each winter 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.0174: Plant Health Management in Tropical Crops**	6 C 4 WLH

Learning outcome, core skills: Students are able to recognize pests and diseases of tropical crops as treated in this course. They critically evaluate scientific and non-scientific publications on crop protection in the tropics. Students are able to create a scientific presentation according to the standards of international conferences and use interactive teaching material; students know the scope and limits of their knowledge in the treated field, they know where to find relevant, reliable information. Students learn to consider subject-related issues from a variety of different perspectives and to work effectively in international teams.	**Workload:** Attendance time: 36 h Self-study time: 144 h

Course: Plant Health Management in Tropical Crops (Lecture,Excursion,Seminar) *Contents*: Blended learning module; presentation of the most important pests and diseases of the most important tropical crop plants: symptoms, life cycles and plant health management (eg. in rice, maize, cacao, coffee, bananas). Additional crops may be included according to students´ preferences and practical experience. Introduction to relevant international data banks and networks. Use of scientific videos on selected topics of crop protection in the tropics.	4 WLH
Examination: Written exam (45 min, 40%), Student presentation with discussion (ca. 20 min presentation + ca. 10 min discussion 60%) **Examination requirements:** • Written exam: main groups of causal agents, basic botany of the crop plants treated, basic biology of causal agents (life cycles etc.), recognition of symptoms, knowledge of control strategies. • Presentation: appropriate according to the standard of international conferences: relevant and sound content, clear structure, style, language (written and spoken) and pronunciation, citation and use of sources according to good scientific practice. • You must successfully complete and pass both partial examinations.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basics of plant pathology, including basics of integrated pest management
Language: English	**Person responsible for module:** Prof. Dr. Michael Georg Rostás
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 2
Maximum number of students: 30	

Additional notes and regulations:
The module is designed as a blended learning-course with strong emphasis on digital material and student based learning. Contact time is reduced to allow thorough preparation of the presentations.

Georg-August-Universität Göttingen **Module M.Agr.0180: Mineral Nutrition of Crops Under Different Climate and Environmental Conditions**	6 C 4 WLH

Learning outcome, core skills: Students acquire knowledge of characteristic properties and specialities of nutrient cycles of ecosystems of different climate zones and upon different environmental drivers. Participants develop understanding of important processes and interactions between abiotic condition of locations, processes in soils and in particular on their effects on plant nutrient uptake. They know plant adaptation mechanisms. Students also get knowledge of the use of stable isotopes for the study of the above processes.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Mineral nutrition of crops under different climate and environmental conditions (Lecture) *Contents*: Lectures focus on element dynamics in ecosystems starting with element inputs, their internal turnover processes and dynamics and outputs. In the course of the semester they will cover sub-arctic over temperate to tropical zones and key examples. In each zone a key focus will be on adaptation mechanisms that can be found among wild plants and crops. About one third of the module will address stable isotope methods for studying such subjects.	4 WLH
Examination: Written examination (90 minutes) **Examination requirements:** Knowledge of key characters of nutrient cycles in different climate zones with respect to major problems of soil fertility, plant nutrient supply and other environmental impacts, including anthropogenic management. Second important focus on adaptation mechanisms in plants to cope with nutritional constraints. Basic knowledge in stable isotope tracer methods and natural stable isotope abundance methods for the study of above research subjects.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basics in plant physiology, chemistry and soil science
Language: English	**Person responsible for module:** Prof. Dr. Klaus Dittert
Course frequency: each winter semester	**Duration:**
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 36	

Additional notes and regulations: After successful conclusion of M.Agr.0103 students can not complete M.Agr.0180

Georg-August-Universität Göttingen **Module M.Agr.0200: Machine Learning in Food Economics and Agribusiness**	6 C 4 WLH

Learning outcome, core skills:	**Workload:**
Machine learning is changing the world from different dimensions, and agricultural and food economics is no exception. In contrast to econometrics of causal analysis, machine learning put more emphasis on prediction and pattern recognition. This course will briefly introduce machine learning algorithms for research of agricultural and food economics. It will help master students to master bask techniques in programing for machine learning with Python and their application in food economics and agribusiness analysis.	Attendance time: 56 h Self-study time: 124 h

Course: Machine Learning in Food Economics and Agribusiness (Lecture,Exercise) *Contents*: This course will introduce basic algorithms in machine learning and apply them to research of agribusiness and food economics. Specifically, we will introduce Python language, and how to use Python to realize plotting, feature engineering, linear regression, logit model, support vector machine, k-nearest neighbor, random forest, k-means clustering, neural network and deep learning (ANN, CNN and RNN). **Course Outline** 1. Introduction to Python and its application of machine learning in agricultural economics 2. Data Plotting and visualization 3. Linear regression and feature engineering 4. Logit model and support vector machine 5. k-nearest neighbor and discrimination analysis 6. Classification and random forest 7. Artificial neural network and deep learning (CNN and RNN) 8. Unsupervised learning: k-means clustering, PAM, Principal Component Analysis, and 9. Machine learning with time series data **Programming Requirement**: 1. Python : https://www.python.org/ 2. Anaconda: https://www.anaconda.com/ 3. VScode: https://code.visualstudio.com/ **Text books:** Swamynathan Manohar.2017.Mastering Machine Learning with Python in Six Steps. APress. Matthes E. , 2022. Python Crash Course, 3rd Edition. No Starch Press, L.A. Raschka Sebastian, Yuxi (Hayden) Liu, Vahid Mirjalili.2022. Machine Learning with PyTorch and Scikit-Learn. Packet Press. 2022. **Reference Papers :**	4 WLH

Wang H. , X. Yu (2023) “Carbon Dioxide Emission Typology and Policy Implications: Evidence from Machine Learning”. Forthcoming in China Economic Review. Maruejols L., L. Hoeschle, X. Yu (2022) Vietnam between economic growth and ethnic divergence: A LASSO examination of income-mediated energy consumption. Energy Economics. Graskemper V., X. Yu and Jan-Henning Feil (2022) Values of Farmers-Evidence from Germany, Journal of Rural Studies. Vo. 89:13-24. Wang H., L. Maruejols, and X.Yu (2021) Predicting energy poverty with combinations of remote-sensing and socioeconomic survey data in India: Evidence from machine learning. Energy Economics. Vol. 102, 105510. https://doi.org/10.1016/j.eneco.2021.105510 Graskemper V., X. Yu and Jan-Henning Feil (2021). Farmer Typology and Implications for Policy Design – an Unsupervised Machine Learning Approach. Land Use Policy. Volume 103, April 2021, 105328.	
Examination: Written examination (120 minutes, 70%) and homework assignments (30%) **Examination requirements:** Examination requirements: 1. Understand the machine learning models taught in the class 2. Use python skillfully	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: not limited	

Georg-August-Universität Göttingen **Module M.Agr.0201: Dynamic modelling in land use systems**	6 C 4 WLH

Learning outcome, core skills: System dynamics is an interdisciplinary field of study that combines insights from various disciplines, such as sociology, agronomy, economics, ecology and computer science, to understand the behaviour of complex systems over time. The course on system dynamics aims to equip students with a solid understanding of the principles and methods used in this field. The targets of the course include developing an understanding of complex systems, teaching students how to model and simulate these systems, analysing feedback loops, understanding system behaviour, optimizing systems, and developing effective communication skills.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Dynamic modelling in land use systems (Lecture,Exercise) *Contents*: System dynamics is an interdisciplinary field of study that combines insights from various disciplines, such as sociology, agronomy, economics, ecology and computer science, to understand the behaviour of complex systems over time. The course on system dynamics aims to equip students with a solid understanding of the principles and methods used in this field. 1. Understanding complex systems: The primary target of a course on system dynamics is to help students develop an understanding of complex systems. System dynamics is concerned with the study of systems that are made up of interdependent components that interact with one another in complex ways. These systems can be found in a wide range of fields, such as economics, ecology, healthcare, and engineering. A course on system dynamics provides students with the necessary tools and techniques to analyse and model such systems, and to understand the behaviour of these systems over time. 2. Modelling and simulation: Another important target is to teach students how to develop models of complex systems and simulate their behaviour. System dynamics modelling involves constructing a graphical representation of the system, identifying the key components and their interrelationships, and developing equations that describe the behaviour of the system over time. Simulation involves running these equations to generate predictions of how the system will behave under different conditions. A course on system dynamics helps students develop the skills needed to create and run such models and simulations, and to interpret the results. 3. Analysis of feedback loops: Feedback loops are a central concept in system dynamics, and a course on this topic aims to help students understand their role in complex systems. Feedback loops occur when the output of a system is fed back into the system as input, leading to a cycle of cause and effect. System dynamics courses teach students how to identify different types of feedback loops, such as reinforcing and balancing loops, and how they can impact the behaviour of a system. Students also learn how to analyse the dynamics of feedback loops using mathematical and computational tools.	4 WLH

4. Understanding system behaviour: A course on system dynamics also helps students understand the behaviour of complex systems over time. System dynamics models can be used to generate predictions of how a system will behave under different conditions, and to identify key factors that influence the behaviour of the system. Students learn how to use these models to understand the behaviour of systems in various domains, such as business, healthcare, and the environment. They also learn how to interpret the results of these models and to use them to make informed decisions. 5. System optimization: In addition to understanding system behaviour, a course on system dynamics also teaches students how to optimize complex systems. System optimization involves identifying the goals of the system and developing strategies to achieve them while taking into account various constraints and trade-offs. Students learn how to use system dynamics models to optimize systems in various domains, such as supply chain management, energy systems, and transportation. 6. Communication: Finally, a course on system dynamics aims to develop students' communication skills. Students learn how to communicate complex concepts and models to a wide range of audiences, including policymakers, managers, and other stakeholders. Effective communication is critical in system dynamics, as it helps to ensure that the insights generated by models are understood and acted upon by decision-makers. The targets of the course include developing an understanding of complex systems, teaching students how to model and simulate these systems, analysing feedback loops, understanding system behaviour, optimizing systems, and developing effective communication skills.	
Examination: 4 Home assignments (50%), 1 written paper (50%) **Examination prerequisites:** attendance of 80% of the course sessions	6 C

Admission requirements: none	**Recommended previous knowledge:** Regional Economics, Agroecology, Agr. Sociology, div
Language: English, German	**Person responsible for module:** Dr. sc. agr. Holger Bergmann
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:**
Maximum number of students: 16	

Georg-August-Universität Göttingen **Module M.Agr.0221: Causal Machine Learning in Agricultural and Food Economics**	6 C 4 WLH

Learning outcome, core skills:	**Workload:**
Machine learning is changing the world in different dimensions, and agricultural and food economics is no exception. It provides more powerful computation and nonlinearity in addition to putting more emphasis on prediction and pattern recognition. This course will teach students to apply machine learning techniques in causal analysis for agricultural and food economics which can be used for impact analyses.	Attendance time: 40 h Self-study time: 140 h

Course: Causal Machine Learning in Agricultural and Food Economics (Internship,Lecture,Exercise,Seminar) *Contents*: This course will teach students to apply machine learning algorithms to causal analysis for the research of agribusiness and food economics. Combining lectures, practices, and excises, we will introduce Python language, and how to use Python to realize plotting and evaluate impacts with machine learning. The models to be studied include Double Machine Learning, Causal Forest, PSM+Xgboost, Meta Learner, IV lasso, and Deep IV.	4 WLH

Examination: Written examination (120 minutes, 70%), participation and homework assignments (max. 12 Pages, 30%) **Examination requirements:** Examination requirements: 1. Understand the causal machine learning models taught in the class 2. Use python skillfully to practice related models with real data for impact analysis in food economics and agribusiness.	

Admission requirements: none	**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.P1: Internship A**	6 C

Learning outcome, core skills: Students acquire practical skills in and gain insight of operational workflows in an agriculturally relevant business/NGO/research facility. They will be able to reflect their own abilities and interests based on the experience and come out better prepared for future endeavors in the professional world.	**Workload:** Attendance time: 160 h Self-study time: 20 h

Course: Internship A (Internship) *Contents*: Internship (at least 4 weeks)	
Examination: Internship report (max. 6 pages), not graded **Examination requirements:** The internship report need to show the students abilities to connect theoretical knowledge with practical work, formulate a well-structured text based on their project and reflect on the experience	6 C

Admission requirements: certificate of employment / proof of internship	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:** Dr. Esther Fichtler, Dr. Nadine Würriehausen-Bürger
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 200	

Additional notes and regulations:
Important note: The module can only be taken as a course on a voluntary basis. The module cannot be included in the course of study.

Georg-August-Universität Göttingen **Module M.Agr.P2: Internship B**	12 C

Learning outcome, core skills: Students acquire practical skills in and gain insight of operational workflows in an agriculturally relevant business/NGO/research facility. They will be able to reflect their own abilities and interests based on the experience and come out better prepared for future endeavors in the professional world.	**Workload:** Attendance time: 320 h Self-study time: 40 h

Course: Internship B (Internship) *Contents*: Internship (at least 8 weeks)	
Examination: Internship report (max. 9 pages), not graded **Examination requirements:** The internship report need to show the students abilities to connect theoretical knowledge with practical work, formulate a well-structured text based on their project and reflect on the experience	12 C

Admission requirements: certificate of employment / proof of internship	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:** Dr. Esther Fichtler, Dr. Nadine Würriehausen-Bürger
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 200	

Additional notes and regulations:
Important note: The module can only be taken as a course on a voluntary basis. The module cannot be included in the course of study.

Georg-August-Universität Göttingen **Module M.Agr.P3: Internship C**	18 C

Learning outcome, core skills: Students acquire practical skills in and gain insight of operational workflows in an agriculturally relevant business/NGO/research facility. They will be able to reflect their own abilities and interests based on the experience and come out better prepared for future endeavors in the professional world.	**Workload:** Attendance time: 480 h Self-study time: 60 h

Course: Internship C (Internship) *Contents*: Internship (at least 12 weeks)	
Examination: Internship report (max. 12 pages), not graded **Examination requirements:** The internship report need to show the students abilities to connect theoretical knowledge with practical work, formulate a well-structured text based on their project and reflect on the experience	18 C

Admission requirements: certificate of employment / proof of internship	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:** Dr. Esther Fichtler, Dr. Nadine Würriehausen-Bürger
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 200	

Additional notes and regulations:
Important note: The module can only be taken as a course on a voluntary basis. The module cannot be included in the course of study.

Georg-August-Universität Göttingen **Module M.FES.321: Ecopedology of the Tropics and Subtropics**	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: Being able to describe, classify and evaluate soils for forestry applications in (sub)tropical regions. Understand most relevant biogeochemical processes and function of (sub)tropical soils. Calculate water and nutrient stocks in soils. Explain differences between soils in different (sub)tropical regions.	

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.FES.734: Agroforestry Design Course**	6 C 4 WLH

Learning outcome, core skills: Acquiring knowledge to design an agroforestry system. The gained knowledge will be applied for own design work in groups, in cooperation with real farms that aim to plant agroforestry systems. This course is for students who aim to implement agroforestry in the field as farmers or as agroforestry consultants.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Agroforestry Design Course (Lecture,Excursion,Seminar) *Contents*: Learn about different agroforestry systems, historic developments, design processes, analysis of local conditions, (social) context, complexity, geography and water management, soil and plants, tree spacing and management, economy and marketing and map design. Two short excursions are included.	4 WLH
Examination: Presentation (approx. 10 minutes) with written outline (max. 5 pages)	6 C

Examination requirements: Agroforestry design as a group work of approx. 3 students. Presentation and report to explain and embed the design in scientifically sound contexts, as learned in the course	

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge on Agroforestry
Language: German	**Person responsible for module:** Franziska Leonie Gaede
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: cf. examination regulations	**Recommended semester:**
Maximum number of students: 30	

Georg-August-Universität Göttingen **Modul M.Forst.739: Grundlagen und Anwendung Geografischer Informationssysteme in den Lebenswissenschaften** *English title: Basics and application of Geographic Information Systems in life sciences*	6 C 2 SWS

Lernziele/Kompetenzen: Nach erfolgreichem Abschluss des Moduls sind die Studierenden in der Lage selbständig QGIS-Projekte und die zugehörigen Geodaten zu erstellen und zu verwalten, räumliche Analysen für Vektor- und Rasterdaten durchzuführen und wissenschaftliche Kartenlayouts anzufertigen.	**Arbeitsaufwand:** Präsenzzeit: 6 Stunden Selbststudium: 174 Stunden

Lehrveranstaltung: Grundlagen und Anwendung Geografischer Informationssysteme in den Lebenswissenschaften (Übung) *Inhalte*: Die Übung vermittelt grundlegende Kenntnisse zu Geographischen Informationssystemen (GIS; im Kurs QGIS) und wird als ILIAS-Selbstlernmodul angeboten. Das Lernmodul umfasst Hintergrundinformationen, Übungsaufgaben sowie Wissen zur praktischen Durchführung der Übungen in QGIS. Die Wissensvermittlung erfolgt mittels erläuternder Texte sowie kurzer Videosequenzen. Die Studierenden erwerben Kenntnisse und Kompetenzen • zur Anlage und Administration von GIS-Projekten, • zu Datenformaten und -management (Raster-/Vektordaten) • zu Datenquellen und -generierung (Digitalisierung, mobiles GIS, Online-Quellen wie WMS-/WFS-Dienste, etc.), • zum Umgang und der Arbeit mit Vektorattributdaten, • zur räumlichen Analyse von Vektor- und Rasterdaten, • zu Koordinatenbezugssystemen, • zu Symbologie-Optionen von Vektor- und Rasterdaten, sowie • zur Erstellung wissenschaftlicher Karten.	2 SWS
Prüfung: Klausur (90 Minuten)	6 C

Prüfungsanforderungen: Nachweis von Hintergrund- sowie Praxiswissen zu Geografischen Informationssystemen (QGIS): Projekterstellung und -verwaltung, Datenformate, -quellen und -generierung, *Handling* von Vektorattributdaten, räumliche Analysen von Vektor- und Rasterdaten, Koordinatenbezugssysteme, *Layout*-Optionen	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch, Englisch	**Modulverantwortliche[r]:** Dr. Inga Schmiedel
Angebotshäufigkeit: jedes Semester	**Dauer:** 1 Semester
Wiederholbarkeit: gemäß Prüfungs- und Studienordnung	**Empfohlenes Fachsemester:**

Maximale Studierendenzahl: 40	

Bemerkungen:

Dieses Modul kann nicht von Studierenden des Schwerpunktes "Waldnaturschutz" belegt werden.

Sobald das Modul M.Forst.739 erfolgreich absolviert wurde, kann das Modul M.Forst.221 nicht mehr belegt werden.

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:** Prof. Dr. Jens Tetens
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.A04: Livestock reproduction physiology**	6 C 4 WLH

Learning outcome, core skills: Acquire in-depth knowledge of the physiology of reproduction of agricultural livestock; Ability to critically consider what has been learned and to independently identify and solve problems of global challenges in the reproduction of farm animals	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Livestock reproduction physiology (Lecture,Excursion,Exercise,Seminar) *Contents*: Anatomical and physiological principles of reproduction in farm animals (endocrinology, growth factors, oogenesis, spermatogenesis, reproductive cycles, reproductive-specific behavior, insemination and fertilization, pregnancy, parturition, lactation and care of offspring); Reproductive Biotechnologies, Assisted Reproductive Technologies (artificial insemination, pregnancy diagnosis, gamete preservation, embryo transfer, in vitro fertilization, sex determination on gametes and fetuses, cloning techniques, creation of transgenes); 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) **Examination requirements:** The exam will ask knowledge and transfer questions related to the lecture content (i.e. endocrinology, physiology of reproduction, genetics, animal husbandry, animal nutrition, animal hygiene and reproductive biotechnologies). Emphasis is placed on being able to assess the interaction of the individual disciplines in reproductive management.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of animal sciences
Language: English	**Person responsible for module:** Prof. Dr. Michael Hölker
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:
After successful conclusion of M.Agr.0069, M.Agr.0070 and B.Agr.0331 students can not complete M.SIA.A04

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

Lernziele/Kompetenzen: 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.	**Arbeitsaufwand:** Präsenzzeit: 60 Stunden Selbststudium: 120 Stunden

Lehrveranstaltung: Unconventtional livestock and wildlife-management, utilization and conservation (Blockveranstaltung,Exkursion,Seminar) *Inhalte*: 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,	SWS

322 p.; Convention on International Trade in Endangered Species of Wild Fauna and Flora 1973/1979 at http://www.cites.org/ (incl. appendices)	
Prüfung: Klausur (90 Minuten, Gewicht: 70%) und Präsentation, Referat oder Korreferat (ca. 20 Minuten, Gewicht: 30%) **Prüfungsanforderungen:** 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

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** Basic knowledge (B.Sc. level) of soil, plant and animal sciences
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Eva Schlecht
Angebotshäufigkeit: SoSe, jedes 2 Jahr, alternieernd mit dem Modul M.SIA.A08; Witzenhausen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: nicht begrenzt	

Bemerkungen:

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** **Modul M.SIA.A08: Social-ecology in livestock production systems** *English title: Social-ecology in livestock production systems*	6 C 4 SWS

Lernziele/Kompetenzen: 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.	**Arbeitsaufwand:** Präsenzzeit: 60 Stunden Selbststudium: 120 Stunden

Lehrveranstaltung: Social-ecology in livestock production systems (Blockveranstaltung,Vorlesung,Seminar) *Inhalte*: 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.	SWS

Prüfung: Klausur (90 Minuten, Gewicht: 70%) und Präsentation, Referat oder Korreferat (ca. 20 Minuten, Gewicht: 30%) **Prüfungsanforderungen:** 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.	6 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** Basic knowledge (B.Sc. level) of soil, plant and animal sciences
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Brigitte Kaufmann
Angebotshäufigkeit: SoSe, jedes 2 Jahr, alternierend mit dem Modul M.SIA.A07; Witzenhausen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: 30	

Bemerkungen:

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** **Modul M.SIA.A11: Tropical animal husbandry systems** *English title: Tropical animal husbandry systems*	6 C 4 SWS

Lernziele/Kompetenzen: 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.	**Arbeitsaufwand:** Präsenzzeit: 60 Stunden Selbststudium: 120 Stunden

Lehrveranstaltung: Tropical animal husbandry systems (Vorlesung,Seminar) *Inhalte*: 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 SWS
Prüfung: Klausur (90 Minuten, Gewicht: 75%) und Präsentation, Referat oder Korreferat (ca. 15 Minuten, Gewicht: 25%) **Prüfungsanforderungen:** 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

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** Basic knowledge (B.Sc. level) of plant and animal sciences or agricultural economics

Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Eva Schlecht
Angebotshäufigkeit: jedes Wintersemester; Göttingen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: nicht begrenzt	

Bemerkungen:

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** **Modul M.SIA.A13M: Livestock-based sustainable land use** *English title: Livestock-based sustainable land use*	6 C 4 SWS

Lernziele/Kompetenzen: 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.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Livestock-based sustainable land use (Vorlesung,Übung) *Inhalte*: 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 SWS
Prüfung: Klausur (90 Minuten) **Prüfungsanforderungen:** 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

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** Basic knowledge (B.Sc. level) of soil, plant and animal sciences
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Eva Schlecht
Angebotshäufigkeit:	**Dauer:**

jedes Sommersemester; Witzenhausen	1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: nicht begrenzt	

Bemerkungen:

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: Animal nutrition and animal health: Students have a basic understanding of farm animal nutrition and health management; they understand the challenges emerging in organic livestock systems related to both animal nutrition and animal health and know how to assess, quantify, evaluate and approach these challenges. Animal welfare: Students have a basic understanding of animal welfare, familiarise 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: Animal nutrition and animal health (Lecture) *Contents*: Principles and regulations of organic livestock farming in Europe; Nutrition in organic cattle, pigs and poultry; Animal health and production diseases; Production diseases in organic cattle, pigs and poultry; Health management in organic livestock farms	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.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge (B.Sc. level) of animal and forage sciences.
Language: English	**Person responsible for module:** Dr. Margret Krieger
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:

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; Hopkins, A. 2000: Grass, its production and utilization. Blackwell Science, Oxford, UK; Cherney J.H. 1998: Grass for dairy cattle CABI Publishing, Exon, UK; Frame, J. 1992: Improved Grassland Management. Farming Press Books, Ipswich, UK; Marshall, A. & Collins, R. (eds.) 2018: Improving grassland and pasture management in temperate agriculture. Burleigh Dodds Science Publishing Limited, Cambridge, 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.A17: Digitalisation in Livestock Systems**	6 C 4 WLH

Learning outcome, core skills: Following a successful completion of this module, students are expected to: • Have an overview of the current trends in digital technology for agricultural development with particular emphasis on livestock husbandry. • Be familiar with key terminologies including Precision Agriculture (PA), Precision Livestock Farming (PLF), Precision Pasture Management (PPM), and Digital Livestock Farming (DLF). They should be able to give relevant examples of a range of technologies currently applied to facilitate individual animal management systems. • Identify the opportunities and challenges of PLF for organic agriculture • Be able to critically assess the benefits of digitalisation vis-à-vis the socioeconomic realities of agricultural transformation, especially in low- and middle-income countries • Develop scientific presentation and reporting skills	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Digitalisation in Livestock Systems (Lecture,Excursion,Seminar) *Contents*: **Course content:** Lectures (16 h), Seminars (plus excursion) 44 h Digitalisation is revolutionising the agricultural sector at an unprecedented pace requiring the building of human resource capacity to conveniently cope with the emerging norms of farming and livestock husbandry practices. In this module, students will be given a broader overview of the changes that have taken place in agricultural development. The concept of digital transformation which is enforcing the adoption of automation, high-tech sensors, cloud computing, decision making algorithms, and the Internet of Things will be introduced, and terminologies such as PA and PLF will be explained. Focusing on PLF, students will be helped to self-study a range of digital tools currently in use for either individual or group intensive and extensive management systems. These may include but not limited to the following: • Use of radio frequency identification (RFID) leveraged in other technologies for monitoring feed intake, weight gain etc. • Behavioural monitoring using on-animal motion and pressure sensors • Thermal and biochemical sensors for monitoring disease state • Autonomous animal location management (virtual fencing) • Pasture management using geographical information system (GIS) The students must have a fair understanding of what these tools/systems are, their mode of operation, associated costs, and the pros and cons of usage.	4 WLH

As part of the learning process, students will be provided with journal article(s) relevant to the trends in application of digitalisation in PLF. Each student would be required to carefully study/review the article provided, and prepare a 25-page (max.) PowerPoint presentation to be presented in a weekly seminar session. Non-presenting students are also required to attend the weekly seminars and learn from their colleagues. de Queiroz DM, Valente DSM, Pinto FAC, Borém A, Schueller JK, eds. 2022: *Digital Agriculture*. Springer	
Examination: Student presentation with discussion (ca. 25 min presentation + ca. 10 min discussion 70%) and written report (30%) **Examination requirements:** transitions in agricultural development; digital transformation and sustainability; role/trends of digital tools, e.g., sensors in livestock husbandry. Written report and PowerPoint presentation according to international conference standards: concise, sound content, clear structure, and very well communicated (orally in case of ppt).	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dr. Sowah Addo
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.A18: Grassland-based livestock systems and climate change mitigation**	6 C 4 WLH

Learning outcome, core skills: This course is divided into two sub-modules consisting of 3 credits each. **Sub-module A** has the following objectives: (i) to learn fundamental relationships between livestock management and forage value of grasslands; (ii) to learn about factors affecting animal performance and animal health; (iii) to become familiar with scientific approaches in animal science and grassland-based systems. In **Sub-module B**, you will: (i) understand the basics of greenhouse gas (GHG) emissions and climate change related to livestock; (ii) become familiar with key international climate conventions and agreements; (iii) get acquainted with the methodological approaches used for collecting data and calculating GHG emission from grassland-based livestock systems; (iv) become familiar with policies and mitigation measures for decreasing emissions in these systems.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Grassland-based livestock systems and climate change mitigation (Lecture) *Contents*: **Sub-module A:** Grasslands play a vital role for biodiversity and the climate. Grazing on grasslands has a long tradition in livestock farming and production of high-quality animal products. Today´s generations of livestock farmers face increasing challenges because of climate change, invasive plant species, modern animal genetics with high energy and nutrient requirements, and other factors. This sub-module will focus on these challenges from a farmer and animal perspective, looking at various grassland management practices that promote biodiversity and ensure animal health and the production of high-quality livestock products. Participants will learn to differentiate between feed qualities and recognize their effects on animal performance and product quality. Lectures will provide knowledge about selective plants and plant biodiversity in relation to animal health and product quality. The effects of grazing on forage quality and *vice versa* will be discussed and additional factors such as climate change and plant diversity will be considered. **Sub-module B:** Reducing GHG emissions is paramount to combat climate change globally. Grassland-based livestock systems contribute to climate change but are also affected by it, which means that livestock in these systems can be part of the solution. This sub-module is designed to provide participants with an introduction to the topic of GHG emissions from livestock in grassland-based systems. Key international climate conventions (e.g., the Paris Agreement) and other international commitments envisaged to combat climate change will be discussed. We will explore both qualitative and quantitative aspects needed for understanding, quantifying and mitigating GHG	4 WLH

emissions from grassland-based livestock systems. The sub-module will also present different policies and measures (e.g., carbon credits and tax incentives) that can be considered to support a decrease in GHG emissions from livestock in grassland-based systems. The lectures for each sub-module are given by researchers from FB11 at Uni Kassel and invited speakers. In the seminar part, students give a presentation on a topic from this course. Guest lecturers from international research institutions and the private sector will be invited for both sub-modules. Lecture slides will be provided for each lecture alongside further literature for self-study.	
Examination: Presentation (approx. 20 mins per tandem, 60%), oral exam (approx. 15 minutes, 40%) **Examination requirements:** **Examination prerequisites for both sub-modules:** Regular attendance of lectures and exercises, as well as presentation of a seminar talk.	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge (B.Sc. level) of plant and animal sciences
Language: English	**Person responsible for module:** Prof. Dr. Fenja Klevenhusen
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 1 - 3
Maximum number of students: 20	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.A19: Innovative Sustainable Breeding: Shaping the Future of Global Livestock Production**	6 C 4 WLH

Learning outcome, core skills: After taking the course "Sustainable Breeding Innovations: Shaping the Future of Livestock Production" module students • Understand the complex challenges facing global livestock production, including societal expectations, environmental sustainability, and efficient resource management. • Are able to explore and critically evaluate innovative breeding strategies that contribute to sustainable agricultural practices. • Gain practical insights into strategic breeding through interactive learning methods such as lectures, seminars, group discussions, and field trips (if feasible). • Design a sustainable livestock breeding program that addresses real-world issues, demonstrating an ability to integrate economic viability with social acceptability, animal welfare and environmental health. • Contribute meaningfully to policy discussions or practical interventions aimed at promoting sustainability within the livestock sector.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Innovative Sustainable Breeding: Shaping the Future of Global Livestock Production (Lecture,Seminar) *Contents*: Block module (3 weeks after the summer-semester examination period), lecture (in class in the morning), student seminars / written assignments *Contents:* In recent years, the paradigm has shifted from prioritizing animal productivity to embracing a more holistic approach in livestock breeding programs that includes animal health, environmental impact, and resource efficiency alongside with economic and production aspects. This course aims to provide students with a comprehensive understanding of these changes and to explore breeding strategies that align with contemporary societal values and international best practices. Students will engage with topics including: 1. Societal expectations and livestock production: Understanding how consumer preferences and societal norms are reshaping livestock breeding objectives. 2. Sustainable breeding practices: Exploring strategies that balance productivity with animal health, environmental sustainability, and resource efficiency.	4 WLH

3. Genetic diversity management: Examining the importance of preserving breed diversity as a cultural heritage and as an investment in future resilience to stresses such as zoonotic disease outbreaks and global warming. 4. Ethical breeding approaches: Investigating ethical considerations in breeding practices that respect animal welfare while meeting farmers' production goals and societal norms. 5. Policy implications: Assessing the role of policy in guiding sustainable breeding practices and protecting genetic diversity. Students will develop skills to critically analyze and synthesize literature related to livestock breeding challenges and opportunities, elaborate exemplary breeding approaches for diverse environmental and societal goals, learn to effectively communicate scientific research findings and propose solutions to stakeholders. Methods: Interactive lectures, student assignments and presentations, group discussions, one-day field trip to a farm or research institution (if feasible) **Literature:** Literature will be provided to prepare for the lectures and students' assignments / seminars	
Examination: Written exam (90 minutes, 70%) and individual assignment (30%): either written project report (max. 15 pages) or oral presentation (ca. 20 minutes). **Examination requirements:** Know contemporary challenges of livestock production and societal expectations; ability to evaluate and discuss sustainable and ethical breeding practices; understand the role of genetic diversity management; conclude on policy implications arising from the aforementioned aspects.	

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of animal sciences and animal breeding
Language: English	**Person responsible for module:** PD Dr. Regina Rößler
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 15	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Modul M.SIA.E02: Agricultural price theory** *English title: Agricultural price theory*	6 C 4 SWS

Lernziele/Kompetenzen: 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.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Agricultural price theory (Vorlesung) *Inhalte*: 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 SWS
Prüfung: Klausur (90 Minuten) **Prüfungsanforderungen:** 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

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** Background in agricultural markets and policy recommended
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Bernhard Brümmer
Angebotshäufigkeit: jedes Wintersemester; Göttingen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: 60	

Bemerkungen:
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 · are able to describe how marketing research relates to the marketing concept · are able to outline the steps in the marketing research process and show how the steps are interrelated · know the factors to consider in defining the marketing problem or opportunity · are able to develop a research design · are able to state the specific advantages of the most important methods of data collection · know fundamentals of sampling theory · acquire personal skills for oral and written presentations in teamwork.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Marketing researches (Lecture,Seminar) *Contents*: • Steps and management of marketing research • Development of research design • Methods of data collection • Oral and written presentation of market research topic Aaker, D.A., Kumar, V., Leone, R.P., Day, G.S. (2013): Marketing research. 11th ed., Hoboken: Wiley; Nunan, D., Birks, D.F., Malhotra, N.K. (2020): Marketing research, 6th ed., Harlow: Pearson Education	4 WLH
Examination: Oral examination (30 minutes) 60%, oral and written presentation (20min + 5 p.) 40%	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge on marketing
Language: English	**Person responsible for module:** Prof. Dr. Katrin Zander
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:

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

Learning outcome, core skills: Students • are able to describe international markets for organic food • know about international organic regulations • are able to outline the steps for developing a marketing strategy • know how to develop a marketing concept on international markets • acquire personal skills for oral and written presentations in teamwork.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: International markets and marketing for organic products (Lecture,Seminar) *Contents*: • Analysis of international markets for organic products • Organic regulations • Basics of food marketing for exporters • Oral and written presentation of marketing topic Vahlen, Munich. Armstrong, G, Kotler, K., Opresnik, M.O. 2016: Marketing: An Introduction, 13th ed., Pearson, Harlow, UK. Hollensen, S., Opresnik, M.O. 2015: Marketing: A Relationship Perspective.	4 WLH
Examination: Presentation (ca. 20 minutes) with written outline (max. 5 pages) (40%) and oral exam (approx. 30 minutes) (60%) **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. Katrin Zander
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:

Armstrong, G, Kotler, K., Opresnik, M.O. 2016: Marketing: An Introduction, 13th ed., Pearson, Harlow, UK.

Hollensen, S., Opresnik, M.O. 2015: Marketing: A Relationship Perspective.

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 and food security 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, malnutrition, and poverty in developing countries. Apart from more conceptual issues and development theories, policy strategies for sustainable rural development and poverty alleviation are discussed and analyzed. Special emphasis is put on problems in the small farm sector. Empirical examples are used to illustrate the main topics.	4 WLH
Examination: Written examination (90 minutes) **Examination requirements:** Concepts and measurement of hunger, malnutrition, and poverty; 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. Liesbeth Colen
Course frequency: each winter semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** until 1
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. They understand the basic elements of research-study design, data collection, and data analysis. Thus, they are able to initiate, 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 the design of quantitative research in rural development economics, starting from formulating research questions and developing a research proposal to undertaking analysis. It 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, sampling design, and implementation of household surveys). Aspects of using secondary data are also covered. The statistical and econometric methods are used for concrete examples in the computer lab.	4 WLH
Examination: Written exam (90 Minutes) (85%) and homework assignment (max. 15 pages) (15%) **Examination requirements:** Types of research designs; 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. Doris Läpple
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.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 analyses 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 assignments (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:** Ph.D. Bethelhem Legesse Debela
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** **Modul M.SIA.E17M: Management and management accounting** *English title: Management and management accounting*	6 C 4 SWS

Lernziele/Kompetenzen: 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	**Arbeitsaufwand:** Präsenzzeit: 60 Stunden Selbststudium: 120 Stunden

Lehrveranstaltung: Management and management accounting (Vorlesung,Seminar) *Inhalte*: • 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 SWS
Prüfung: Presentation (ca. 15 minutes, 50%) and written examination (90 minutes, 50%) **Prüfungsanforderungen:** Students should demonstrate a sound understanding of the management / management accounting concepts and frameworks (written exam). Students are also expected to	6 C

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).	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Bettina König
Angebotshäufigkeit: jedes Wintersemester; Witzenhausen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: 35	

Bemerkungen:

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	Prof. Dr. Silke Hüttel

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 A list of seminal papers (Gardner, Goodwin and Fackler, Barrett and others) will be provided to students Lecture notes and presentations are made available on StudIP	4 WLH
Examination: Written examination (90 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: Every second summer semester (Start: 2021)	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 2
Maximum number of students: 40	

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** **Modul M.SIA.E21: Rural Sociology** *English title: Rural sociology*	6 C 4 SWS

Lernziele/Kompetenzen: 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.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Rural Sociology (Vorlesung,Seminar) *Inhalte*: 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 SWS
Prüfung: **Prüfungsanforderungen:** Presentation of and critical discussion on concepts and methods in the field of rural- and agricultural sociology.	6 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Claudia Neu
Angebotshäufigkeit: jedes Sommersemester; not 2014 Göttingen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: 25	

Bemerkungen:

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** **Modul M.SIA.E24: Topics in Rural Development Economics I** *English title: Topics in rural development economics I*	6 C 4 SWS

Lernziele/Kompetenzen: 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.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Topics in Rural Development Economics I (Vorlesung) *Inhalte*: 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 SWS
Prüfung: Präsentation, Referat oder Korreferat (ca. 10 Minuten, Gewichtung: 40%) und Hausarbeit (max. 4 Seiten, Gewichtung: 60%) **Prüfungsanforderungen:** 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

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Meike Wollni
Angebotshäufigkeit:	**Dauer:**

jedes Sommersemester; Göttingen	1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: nicht begrenzt	

Bemerkungen:
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. Bettina König
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.E34: Economic Valuation of Ecosystem Services**	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.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: 56 h Self-study time: 124 h

Course: Agricultural policy analysis (Lecture) *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 B. Hill (2013): Understanding the Common Agricultural Policy, Earthscan	6 WLH

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 Selected readings and lecture notes / slides provided by the lecturer on StudIP	
Examination: Written examination (90 minutes) **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)	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic micro- and macroeconomics
Language: English	**Person responsible for module:** Prof. Dr. Stephan von Cramon-Taubadel
Course frequency: Every second summer semester (Start: 2020)	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 2
Maximum number of students: 50	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E38: Scientific working 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*: 1) **Research process and paper structure**: An introduction is given on structuring seminar-papers and master-theses, literature search in various literature databases, formulating valid objectives, research questions and hypotheses. Thereby, the basic principles of describing the research gap based on previous findings and correct citing are covered. Students practice structuring and writing during different practical assignments like creating a commented outline , a reference list or writing an introduction and conclusion for a seminar-paper or a thesis. 2) **Literature review, citation and plagiarism:** An introduction is given on the rules of “good academic practice” according to the standards of the German Research Association (DFG). 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 Citavi are introduced. 3) **Data and methods:** An introduction is given on (i) how to structure, process and present primary and secondary data, and (ii) how to choose and present a method in accordance to the respective research question. Formal requirements and good scientific practice for the illustration in written text, tables and figures are presented. Special emphasis will be given to the interpretation of results (hypothesis testing). Students practice data and results illustration during different practical assignments like structuring datasets, creating a methods & data chapter, preparing tables and figures and embed them into a 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 explained and the typical corporate design of the Georg-August-University is introduced. As an assignment students prepare a presentation about scientific contents.	4 WLH
Examination: 2 Written assignments (max. 800 words each), 1 data sheet and 1 presentation-file (max. 6 slides)	6 C

Examination requirements: Students have to prepare two written assignments, one data sheet and one presentation file (se above) and upload the documents. The required assignments accompany the content of the lecture and include the following topics: • Sections of scientific manuscripts (Introduction; Methods&Data, Results) • data documentation (e.g. descriptive tables) • presentation slides.	

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:** Prof. Dr. Silke Hüttel
Course frequency: each winter semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 37	

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 “Commoning” approaches 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 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 presentations, 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. 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:

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*: 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. Weible, Christopher M. (2018): Theories of the Policy Process. 4th ed. Milton: Routledge.	4 WLH
Examination: presentation (approx. 30min, 50%), written exam (60min, 50%) **Examination prerequisites:** submission of protocols (literature-related questions, max. 1 page) in regard to 80% of assigned readings (max 8 articles) **Examination requirements:**	6 C

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 Dr. Matthias Stolze
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.E42: Agriculture, Nutrition and Sustainable food systems**	6 C 4 WLH

Learning outcome, core skills:	**Workload:**
Students learn how food systems connect the decision on what we eat, how our food is produced, processed and distributed, with human health and planetary health outcomes. Students can analyse the drivers of dietary decisions using a micro-economic approach and can discuss how policies can steer diets in more healthy and sustainable directions, applying to both low- and high-income countries. Students can analyse household level consumption data to construct dietary indicators, the cost of healthy diets and analyse socio-economic drivers of dietary outcomes.	Attendance time: 56 h Self-study time: 124 h

Course: Agriculture, Nutrition and Sustainable food systems (Lecture) *Contents*: The module consists of two parts. During the lectures, students are introduced to the global challenges of food security, nutrition, health and sustainability. A micro-economic approach is used to analyse the drivers of dietary decisions. Examples of policies that aim to steer diets in more healthy and sustainable directions are discussed. Course material consists of presentations and lecture notes. In the second part of the module, students use statistical software (STATA) to analyse household consumption survey data, construct dietary indicators and perform a statistical analysis of socio-economic drivers of diets, nutrition and health outcomes. *Course frequency:* each winter semester	4 WLH
Examination: Written examination (90 minutes, 50%) and assignments and presentation (50%) **Examination requirements:** Students are able to explain the concepts related to food systems, to analyse food policies, and to generate and interpret relevant statistics related to nutrition, food policies and global sustainability. In a written assignment, students provide critical analysis of a specific food system and/or food policy intervention.	6 C

Admission requirements:	**Recommended previous knowledge:**
Introduction to Econometrics (B.WIWI-VWL.0007) or Econometrics I (M.WIWI-QMW.004), or equivalent introduction in statistics or econometrics	Prior introductory knowledge of microeconomics and basic econometrics/statistics.
Language: English	**Person responsible for module:** Prof. Dr. Liesbeth Colen
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted:	**Recommended semester:**

twice	
Maximum number of students: 25	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E45: Introduction to choice experiments in food economics**	6 C 4 WLH

Learning outcome, core skills: • Students experience the entire process of (choice) experimental practice in the field of social sciences, including its possibilities, limitations and interpretation of results • Students learn how to identify and narrow down a research question into a testable hypothesis. Students learn how to test such a hypothesis by identifying control and treatment groups, the importance of power calculations, sampling design and analysis of data. • Students improve their general understanding of the scientific practice, correct interpretation of scientific results and their contribution to (public) decision making. • Students train their teamworking skills, through brainstorming exercises, discussions, self-organization and distribution of tasks of the team.	**Workload:** Attendance time: 55 h Self-study time: 125 h

Course: Introduction to choice experiments in food economics (Block course,Exercise) *Contents*: This module consists of two blocks. • The first block concerns the introduction to choice experimental practice and the set-up of a small online experiment addressing a specific research question in the field of agricultural, food or nutrition economics. • The second block concerns the analysis of the obtained data and interpretation of results. Students will work in groups of 4-5 students to identify and narrow down a research question in the field of agriculture, food or nutrition economics, learn how to translate a research question into a testable hypothesis, design the choice experiment, perform power calculations, and effectively launch the online survey. In the second part, the results of the survey will be analysed and each group will present the results, limitations and lessons learned.	4 WLH
Examination: Term Paper (max. 10 pages, 70%) and presentation (approx. 20 minutes, 30%) **Examination requirements:** Short paper describing the set-up and execution of the experiment (70%), and presentation presenting the approach, results and limitations/lessons learned (30%)	6 C

Admission requirements: Econometrics I (M.WIWI-QMW.004), M.SIA.E12M: Quantitative research methods in rural development economics	**Recommended previous knowledge:** Basic statistics/econometrics Students proof that they are capable of

Or a similar introduction to statistics or econometrics	• Identifying research question and developing a testable hypothesis • Collaborate in groups to brainstorm, guide the discussion towards a practically implementable outcome, and implement the experiment • Analyse, interpret and discuss experimental results
Language: German, English	**Person responsible for module:** Prof. Dr. Liesbeth Colen
Course frequency: each summer semester; Göttingen	**Duration:**
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 12	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E46: Food Systems Governance and Agriculture**	6 C 4 WLH

Learning outcome, core skills: Students • will understand the food system concept and the role of governance and institutions within it against the background of the European Union, and its role for and interactions with diverse production systems worldwide • will obtain an overview of the ways in which the many European food systems and demands for agricultural produce shape local agriculture and rural areas in Europe and worldwide • will obtain an overview of the role of policies, governance arrangements and institutions for the way Europe shapes global food systems and agriculture • will become familiar with a public choice and institutionalist perspective on public policy making • will become familiar with a constitutional, new institutional economic and a critical institutionalist perspective on food system interactions and their change • will reflect on the concepts of the course throughout seminar discussions • will explore analytical tools throughout issue-related discussions with practice partners.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Food Systems Governance and Agriculture (Lecture,Seminar) *Contents*: Agricultural production is nowadays conceived as integral part of global food, feed, fuel, and fibre-related supply systems. The European Union plays a major role in structuring global agriculture, food and supply systems. Policies structuring governance and institutions are core elements shaping economic exchange in the food system and the exploitation of natural resources. The course covers what food and agricultural systems are, what roles policies, governance and institutions play in these, and how the European Union's structure of agricultural production shapes them. To explain policy outcomes, the course relies on a public choice and institutionalist perspective. For analyzing the food system, it further introduces new and critical institutionalist approaches and collective action theory, and illustrates these through case materials and literature discussions. Analytical perspectives will further be explored through the discussion of various European governance issues with practice partners and policy makers. Methods: Lecture, seminar, group works, virtual and in presence stakeholder meetings and potentially short excursions, presentations, readings, presentations (learning through teaching)	4 WLH
Examination: Five literature discussions or responses to set questions (graded) 40%; Oral presentation (student-led seminar) (ca. 20 min.) or oral examination (ca.	6 C

25 min.) or written term paper (max. 2500 words) 60%; or working report (max. 2500 words) 100% **Examination requirements:** Throughout term students discuss particular literatures or questions in relation to ongoing course contents in class or at home and submit these short answers in writing, Up to 10 opportunities to submit such work exist. Best 5 graded answers will enter final grading with 40% weight. For 60% of marking students have the choice between overall oral examination (25 minutes), oral seminar-style presentation in relation to a topic related to the course contents and agreed with lecturer (20 minutes presentation per person involved) and term paper on a topic related to the course contents and agreed with lecturer (2500 words (graded) including 10 minutes discussion of the paper) – introductory literatures on term paper topic and presentation would be provided	

Admission requirements: none	**Recommended previous knowledge:** none
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: 12	

Additional notes and regulations:

Literature:

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

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.E47: Sustainable food systems and management**	6 C 4 WLH

Learning outcome, core skills: The students - can describe and ethically reflect on the social role(s) of companies and other actors in the agriculture and food sector and their social responsibility and accountability to society. - can explain definitions, concepts and theories that are important for sustainable management and interaction with stakeholders in the agriculture and food sector and are aware of the associated strengths, weaknesses and uncertainties. - can use their knowledge of management systems and approaches as well as systems for sustainability assessment and communication to select and apply suitable instruments for the respective needs and analyse and discuss examples of entrepreneurial action. - can differentiate and discuss the different perspectives with which sustainable food systems and socially responsible corporate behaviour are understood.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Sustainable food systems and management (Lecture,Seminar) *Contents*: *Contents:* • Sustainability challenges in the global food system; history and status quo of CSR and sustainable development • Different stakeholder views on responsibility and sustainability (NGO'S, government, employees, investors…) • Voluntary and mandatory approaches to addressing responsibility and sustainability challenges in the food system • Contemporary research and practice examples **Literature:** Hahn, R. (2022). Sustainability Management: Global Perspectives on Concepts, Instruments, and Stakeholders. Germany: Rüdiger Hahn. Rasche, A., Morsing, M., & Moon, J. (Eds.). (2017). Corporate Social Responsibility: Strategy, Communication, Governance. Cambridge University Press.	4 WLH
Examination: Oral presentation (ca. 15 min.) including 400-800 words exposé 40%, written assignment (max. 8000 words) 60%	6 C

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

each winter semester; Witzenhausen	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.E48: Political agroecology**	6 C 4 WLH

Learning outcome, core skills: Students will understand • the foundations of agroecology and the history of the concept and thinking on it • connections between agroecology and Ecological Economics • the normative positions of political agroecology in regard to governance, institutions and the role of farmers and other stakeholder groups (public policy making, science, food retailers) in the food system and scrutinize underlying scientific evidence • context-specificity of agroecology movements worldwide (i.e. empirical examples from different regions and countries (EU, MENA, Latin America, etc.) • transformative potentials and needs of agroecology • will consider relevant theories of transformation and transformative practices • the current stage of policy making on agroecology in different contexts and countries	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Political agroecology (Seminar) *Contents*: Agroecology is an alternative paradigm to currently dominating industrialized agriculture. It stands side by side with other more or less related paradigms such as regenerative agriculture, organic farming, climate smart agriculture, etc. However, it distinguishes itself particularly because it sees agricultural practices is bound by their social-ecological, governance and institutional context. Some versions of agroecology are explicit on the political implications of transforming agricultural production and the food system. The course introduces the foundations of agroecology and connects it to ecological economics. Further, it spells out the normative aspirations of agroecology and their emphasis on questions of governance and institutions. It reviews corresponding scientific evidence and discusses its transferability and issues in upscaling agroecology. It discusses the role of policies for agroecology and the role of particular social-ecological and national contexts for agroecological policies and transformations. It assesses potentials and problems of an agroecological transition and transformation as well as it reflects on the relevance of the theme for agricultural transition. Literature and seminar papers will be circulated to students at the be- ginning of term, González de Molina Navarro u. a., 2020. Political agroecology: Advancing the transition to sustainable food systems. Boca Raton: CRC Presshttps://www.routledge.com/Political-Agroecology-Advancing-the-Transition-to-Sustainable-Food-Systems/de-Molina-Petersen-Pena-Caporal/p/book/9781138369221 *Course frequency:* Bi-annually	4 WLH
Examination: Presentation (15 min.) 40%, term paper (3000 words) 60%; active developing of questions during the seminar **Examination requirements:**	

students demonstrate that they master a topic related to the module well and that they can research, present, and discuss it at an appropriate level and draw useful conclusions from it. They will do so for one topic by holding a seminar and for another in writing.	

Admission requirements: Food system governance and agriculture	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Andreas Thiel
Course frequency: each summer semester; Bi-annually	**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.E50M: Microeconomics and Quantitative Analysis for Agri-Food Systems**	6 C 4 WLH

Learning outcome, core skills:	**Workload:**
The course introduces microeconomic theory and quantitative methods applied to the agri-food system. On successful completion of the course, students should be able to: - Apply economic principles to understand consumer and producer decisions in relation to food production and consumption. - Understand different market structures in the agri-food sector. - Use behavioral economic concepts to explain decision-making. - Understand concepts on agricultural investment behavior. - Perform quantitative analysis applied to the agri-food sector.	Attendance time: 56 h Self-study time: 124 h

Course: Microeconomic theory of agricultural production (Lecture,Exercise) *Contents*: This part of the course introduces students to the concepts of microeconomic theory applied to the agri-food sector. Topics include consumer behavior, production and resource use, perfect, imperfect competition and market power, and concepts from behavioral economics. This is complemented with exercises and student presentations on selected economic topics.	2 WLH
Course: Quantitative methods in agricultural business economics (Lecture,Exercise) *Contents*: This part of the course provides students with the tools for conducting quantitative analysis in the agri-food sector. Topics covered include the process of agricultural decision-making, basic concepts in finance, and investment behavior in agriculture. The theoretical learning is complemented by hands-on exercises and student presentations on peer-reviewed papers.	2 WLH
Examination: written exam (90 min, 70 % of grade) and continuous assignments (30%) **Examination requirements:** Consumer and producer theory; Market structure, behavioral economics risk; technological progress; farm household models; agricultural decision-making; investment behavior; quantitative analysis.	

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

English	Prof. Dr. Doris Läpple Maria Luísa F. de Araujo
Course frequency: each winter semester; Göttingen	**Duration:**
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 the successful conclusion of M.Agr.0060 or M.SIA.E13M, students can not complete M.SIA.E50M. This module is designed for students without or limited previous knowledge of economics.

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

Lernziele/Kompetenzen: 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.	**Arbeitsaufwand:** Präsenzzeit: 28 Stunden Selbststudium: 152 Stunden

Lehrveranstaltung: Management of (sub-)tropical landuse systems (Blockveranstaltung,Vorlesung) *Inhalte*: 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.	
Prüfung: Klausur (90 Minuten) **Prüfungsanforderungen:** 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

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** Knowledge in plant, soil and animal sciences
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Andreas Bürkert
Angebotshäufigkeit: WiSe 13/14, einmal in 2 Jahren, alternierend mit Modul I07; Witzenhausen	**Dauer:** 1 Semester

Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: 25	

Bemerkungen:

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** **Modul M.SIA.I03: Food quality and organic food processing** *English title: Food quality and organic food processing*	6 C 4 SWS

Lernziele/Kompetenzen: 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	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Food quality and organic food processing (Vorlesung) *Inhalte*: 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 SWS
Prüfung: Präsentation, Referat oder Korreferat (ca. 20 Minuten, Gewichtung: 50%) und Projektarbeit (max. 20 Seiten, Gewichtung: 50%) **Prüfungsanforderungen:** 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

Zugangsvoraussetzungen:	**Empfohlene Vorkenntnisse:**

keine	Basic knowlegde in chemistry
Sprache: Englisch	**Modulverantwortliche[r]:** Dr. Nicolaas Busscher
Angebotshäufigkeit: jedes Sommersemester; Witzenhausen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: 40	

Bemerkungen:

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 (Block course,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 and their extracted juices (e.g. sugar/acid ratio, ethanol in fruit juice), sensors of fruit and vegetable juices.	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 food chemistry, statistics, scientific writing.
Language: English	**Person responsible for module:** Prof. Dr. Susanne Neugart
Course frequency: each winter semester; Göttingen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 12	

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

Lernziele/Kompetenzen: 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	**Arbeitsaufwand:** Präsenzzeit: 119 Stunden Selbststudium: 61 Stunden

Lehrveranstaltung: International land use systems research - an interdisciplinary study tour (Vorlesung,Exkursion,Seminar) *Inhalte*: 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 SWS
Prüfung: Mündliche Prüfung (ca. 20 Minuten, Gewichtung: 50%) und Präsentation, Referat oder Korreferat (ca. 20 Minuten) mit schriftlicher Ausarbeitung (max. 4 Seiten) (Gewichtung: 50%) **Prüfungsvorleistungen:** Protokoll (Tagesbericht) max. 2 Seiten **Prüfungsanforderungen:** 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

Zugangsvoraussetzungen:	**Empfohlene Vorkenntnisse:**

keine	Study focus on international agriculture and development policy
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Eva Schlecht
Angebotshäufigkeit: Winter semester, every second year, alternating with Module I02; Witzenhausen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: 25	

Bemerkungen:

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 5 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: 60 h Self-study time: 120 h

Course: Applied Statistical Modelling (Lecture,Exercise) *Contents*: **Statistical analyses in animal science, soil science and plant sciences** (Lecture, computer practical) • Review of statistical concepts (boxplots, QQ plots, distributions, classical tests, • General aspects of hypotheses formulation and testing • Correlations, analyses of count and proportion data • Basic concepts of experimental design • Standard experimental field designs • Introduction to the software R • Regression (multiple linear, non-linear and logistic) • Statistical modelling, model types and model simplifications • Transformations • Analyses of variance, post-hoc tests • Non-parametric test procedures • Analysis of covariance • Particularities of unbalanced designs • Formulation of statistical models and basic programming in R • Linear mixed models	5 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: twice	**Recommended semester:**
Maximum number of students: 25	

Additional notes and regulations:
Admission requirements:

Registration

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.

Welham, S.J., Gezan, S.A., Clark, S.J., Mead, A. 2014. Statistical Methods in Biology. Design and Analysis of Experiments and Regression, CRC Press, Boca Raton.

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

Lernziele/Kompetenzen: 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.	**Arbeitsaufwand:** Präsenzzeit: 0 Stunden Selbststudium: 180 Stunden

Lehrveranstaltung: Free project *Inhalte*: 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.	
Prüfung: Üblicher Weise Projektarbeit (ca. 15 Seiten bzw. 4000 Wörter) **Prüfungsanforderungen:** In agreement with the instructor. Generally project work (max. 15 pages or 4000 words).	6 C

Zugangsvoraussetzungen: Written agreement with instructor on topic, form and time frame for the project.	**Empfohlene Vorkenntnisse:** keine
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Stephan von Cramon-Taubadel
Angebotshäufigkeit: jedes Semester; Göttingen oder Witzenhausen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: nicht begrenzt	

Bemerkungen:

Literature:

Scientific publications on the topic agreed upon with the instructor.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Modul M.SIA.I12: Sustainable International Agriculture: basic principles and approaches** *English title: Sustainable international agriculture: basic principles and approaches*	6 C 4 SWS

Lernziele/Kompetenzen: 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	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Sustainable International Agriculture: basic principles and approaches (Vorlesung) *Inhalte*: 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 SWS
Prüfung: Klausur (90 Minuten) **Prüfungsanforderungen:** • 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.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Eva Schlecht
Angebotshäufigkeit: jedes Wintersemester; Witzenhausen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: nicht begrenzt	

Bemerkungen:
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: 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
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
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. Jayan Wijesingha
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:** Liliana Stefanovic
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.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:** Maria Chiara Camporese
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.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. 20 minutes; 35%) written outline to the excursion resport (max. 4 pages; 30%), and oral examination (35%) **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	6 C

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. Sören Köpke
Course frequency: each winter semester	**Duration:** 2 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.I24: Modelling climate impacts on agroecosystems**	6 C 4 WLH

Learning outcome, core skills: The students have an overview of models used to capture climate change impacts on different agroecosystems and the effects of climate adaptation measures. The module teaches climate change impacts on various agroecosystems, adaptation measures and how these aspects can be captured by different types of statistical and process-based agricultural models. With this knowledge, the students are able understand and develop agricultural models to assess climate impacts, risks and resilience. In the last section, adaptation measures to climate change are modeled, discussed and evaluated using various methods and indicators.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Modelling climate impacts on agroecosystems (Lecture,Exercise,Seminar) *Contents*: The course gives an overview of climate change impacts across different agroecosystems, a solid understanding of climate and agricultural models and the projected climate impacts on the agricultural production, resilience and adaptation. In addition, short term climate and weather risks are discussed in the course. The lecture is in parallel with an exercise, where the students rebuild and develop own models in the statistic software R.	4 WLH
Examination: Oral examination (approx. 30 minutes, 50%) and written report (max. 7 pages, 50%) **Examination requirements:** Students write a written report which includes an data exercise in R and understand the content taught in the lecture.	6 C

Admission requirements: none	**Recommended previous knowledge:** First experience with the statistic software R is valuable.
Language: German, English	**Person responsible for module:** Prof. Dr. Christoph Gornott
Course frequency: each summer semester1	**Duration:**
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 20	

Additional notes and regulations:

Literature:

Shukla, Gleixner, Yalew, Schauberger, Sietz, Gornott, 2021: Dynamic vulnerability of smallholder agricultural systems in the face of climate change for Ethiopia, Environmental Research Letters.Laudien,

Schauberger, Makowski, Gornott, 2020: Robustly forecasting maize yields in Tanzania based on climatic predictors, Nature Scientific Reports.

Iizumi, T., Hirata, R., Matsuda, R. (2019) Adaptation to Climate Change in Agriculture, Springer, ISBN 978-981-13-9235-1

Bryant, C.R., Sarr, M.A., Délusca K. (2020) Agricultural Adaptation to Climate Change, Springer, ISBN 978-3-319-31392-4

Torquebiau, E. (2016) Climate Change and Agriculture Worldwide, Springer, ISBN 978-94-017-7462-8

Castro, P., Azul, A.M., Leal Filho, W., Azeiteiro, U.M. (2019) Climate Change-Resilient Agriculture and Agroforestry, Springer, ISBN 978-3-319-75004-0

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I25: Engineering software in agriculture and livestock farming**	6 C 4 WLH

Learning outcome, core skills: The participants will have gained computer programming skills in image processing, signal processing, machine learning in agriculture and livestock farming. They will also learn about the related software and application in the context.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Engineering software in agriculture and livestock farming (Exercise,Seminar) *Contents*: • Introduction to engineering solutions in agriculture and livestock farming • Advanced Machine vision for agricultural context • Advanced computer programming in MATLAB®software • Image and signal processing algorithms in MATLAB® • Machine learning algorithms • Training, validation and test set selection in machine learning models	4 WLH
Examination: Report (field work) 30% (max. 8 pages), practical exam 70% (software application) **Examination prerequisites:** attendance is compulsory **Examination requirements:** • Understanding of computer programming in MATLAB • Knowledge of image processing in agriculture and livestock farming • Ability of data analysis and classification • Ability to work and use optical sensors in agriculture and livestock farming	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of MATLAB, scientific research and data collecting
Language: English	**Person responsible for module:** Dr. Sowah Addo
Course frequency: each summer semesterWitzenhausen	**Duration:**
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 20	

Additional notes and regulations:
Papajorgji P. J. und P. Pardalos 2006: Software Engineering Techniques Applied to Agricultural System. Springer.

Gonzalez R. C., Woods R. E. and S. L. Eddins 2003: Digital Image Processing Using Matlab. Prentice-Hall, Inc., USA

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I27: Postharvest Technology**	6 C 4 WLH

Learning outcome, core skills: Students are able to understand Postharvest operations and can evaluate them in respect to loss reduction and quality aspects. They can select proper criteria for quality assurance and can decide fitting instrumentation for control purposes.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Postharvest Technology (Lecture) *Contents*: Basics of processing and storage of agricultural products (drying, cooling) Selection of machinery and process technology Quality assessment and respective instruments	4 WLH
Examination: Oral examination (approx. 30 minutes) **Examination requirements:** Students are able to critically select process technology, chose instrumentation for process control and quality assessment, and they are able to interpret the measurements	6 C

Admission requirements: Fundamentals of Physics	**Recommended previous knowledge:** Basic course in agricultural engineering
Language: English	**Person responsible for module:** Prof. Dr. Oliver Hensel
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:

- Hand-outs in lectures and exercises

Wild, Y. and R. Scharnow, Container Handbook, Vol. 3, German Insurance Association – GDV, Berlin, 2003

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I28M: Unoccupied aerial vehicle (UAV) applications in agriculture**	6 C 4 WLH

Learning outcome, core skills: The students will learn about the unoccupied aerial vehicle (UAV) based remote sensing data acquisition and use in the agricultural context. They will understand the logic of using UAVs for agricultural applications and challenges and the essential theoretical background of available airborne technology, including international legislation and regulations for UAVs. They will learn to prepare a flight plan with all the prerequisites and to execute a safe flight mission. They will get experience in collecting UAV remote sensing data and the corresponding validation in-situ data on the field. Students will develop the ability to process the collected remote sensing data using open-source software to prepare maps and interpret them. They will obtain basic modelling skills to calibrate/validate models and estimate crop parameters with collected in-situ data and UAV remote sensing data	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Unoccupied aerial vehicle (UAV) applications in agriculture (Exercise) *Contents*: • Basic principles of vegetation remote sensing with a focus on different sensors and their characteristics. • Overview of the UAV application for agriculture, including opportunities and challenges. * Understanding of essential components of UAVs and international rules and regulations for UAVs. • Design an agricultural application with UAVs (Problem identification, data to be collected, selection of UAV and sensor, designing flying plans) • Field-level experience in UAV flying, mission planning, remote sensing and crop in-situ data (e.g., LAI, plant height), and ground control point data collection. • Introduction to structure from motion (SfM) technology for processing UAV images. • Processing of UAV remote sensing data using Open-Drone-Map (ODM) to develop image ortho-mosaics. • Visualisation of developed image products in Quantum GIS (QGIS) and their interpretation. • Basic principles of regression models and introduction to R. • Calibration and validation of crop in-situ data models using UAV remote sensing data, generation of estimated crop parameter maps, and interpretation of outputs.	4 WLH
Examination: Oral exam (approx. 30 min) 70 %; Presentation (approx. 15 min + 2 side handout) 30 % (45 minutes) **Examination prerequisites:** Basic understanding of remote sensing for vegetation analysis, opportunities and limitations of UAV for agriculture, and how to design UAV data collection for agriculture applications.	6 C

Admission requirements:	**Recommended previous knowledge:**

none	Participation in the I14M SIA module and programming with R would be advantageous.
Language: English	**Person responsible for module:** Jayan Wijesingha
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:

- Unmanned Aerial Vehicle: Applications in Agriculture and Environment, edited by Ram Avtar, and Teiji Watanabe, Springer International Publishing AG, 2019. ProQuest Ebook Central, https://ebookcentral.proquest.com/lib/unikassel/detail.action?docID=5979944.
- E-agriculture in action: Drones for agriculture. Thailand, Food & Agriculture Org., 2018.; UAV Remote Sensing for Plant Traits and Stress. N.p., Frontiers Media SA, 2022.
- UAS-Remote Sensing Methods for Mapping, Monitoring and Modeling Crops. N.p., MDPI AG, 2021.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I29M: Research Methods and Data Science in the Life Sciences**	6 C 4 WLH

Learning outcome, core skills: Students have an understanding of the methods of quantitative and qualitative data collection in the life sciences and the different sampling techniques and experimental designs. They are able to apply standard data analysis techniques. They understand the usefulness and limitations of selected multivariate approaches for regressions and pattern recognitions in the data science and learn the concepts of different machine learning approaches. They are able to apply the acquired skills in the analysis of their own MSc (and PhD) datasets.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Research Methods and Data Science in the Life Sciences (Internship,Lecture) *Contents*: Research methods and standard analyses in the life sciences • Introduction to methods of quantitative and qualitative data collection in the life sciences • introduction to sampling techniques and standard statistical techniques (regressions and analyses of variance) Data science in the life sciences • Application of multivariate approaches: principal component analysis (PCA) and regression (PCR), cluster analyses, factor analyses • Introduction to machine learning: perceptron, artificial neural networks, regression trees, rule-based models and support vector machine classification and regression	4 WLH
Examination: Oral examination (approx. 30 minutes) **Examination requirements:** Profound knowledge of existing research methods and standard analyses in the life sciences. Solid understanding of the concepts, usefulness and limitations of multivariate and machine learning approaches for data analyses in the life sciences.	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 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:

Everitt, B., Hothorn, T. P. 2011. An Introduction to Applied Multivariate Analysis with R. Springer, New York

Jones, E., Harden, S., Crawley, M.J. 2023. The R Book. 3rded. Wiley

Holmes, D., Moody, P., Dine, D., Trueman, L. 2017. Research Methods for the Biosciences. Oxford University Press

Touchon, J.C. 2021. Applied Statistics With R: A Practical Guide for the Life Sciences. Oxford University Press

Wehrens, R. 2020. Chemometrics with R. 2nd ed. Springer

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I30: Organic Agriculture in Europe**	6 C 4 WLH

Learning outcome, core skills:	**Workload:**
Students understand the situation of organic agriculture in different European countries. Students are able to discuss and judge standards of organic agriculture.	Attendance time: 50 h Self-study time: 130 h

Course: Organic Agriculture in Europe (Seminar) *Contents*: Online seminar: Comparison of standards of organic agriculture (IFOAM, EU, within EU). Situation of organic production, processing and markets in different European countries. Organic agriculture in European Universities: current research projects, teaching activities. Necessary measures on all levels in the coming future to transform agriculture production in different countries to organic agriculture.	
Examination: Work report (max. 15 p.) 80% or presentation (approx. 25 min) 40% and work report (max. 10 p.) 40%; oral test (approx. 15 min) 20% **Examination requirements:** Students have to analyze the situation of organic agriculture in different European countries and to compare the situation and development under defined criteria.	6 C

Admission requirements:	**Recommended previous knowledge:**
none	none
Language: English	**Person responsible for module:** Prof. Dr. Gunter Backes M.Sc. Holger Mittelstraß
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:
The international module is offered online by ENOAT (European network of organic agriculture teachers) for students of all participating European universities.

Literature:

FIBL and IFOAM (ed.) 2022: The world of organic agriculture. Frick/Switzerland

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I31: Sustainable land-use and climate mitigation**	6 C 4 WLH

Learning outcome, core skills: Upon successful completion of the module students • will be able to understand key scientific concepts around climate change and its mitigation. • have deep knowledge on land-based mitigation options, their potentials, interplays and side-effects • will understand the scientific principles of the interplay between climate mitigation and other sustainable development targets • will be able to develop interdisciplinary and holistic viewpoints on sustainable land management including land-based mitigation • will obtain an overview of models used to assess mitigation pathways • will be able to understand land-use models and Integrated Assessment Models that are used to derive future pathways • will become familiar with international assessment bodies such as IPCC or IPBES • develop critical thinking of the scenarios used in international assessments such as IPCC and IPBES • will explore analytical tools such as scenario explorers and land-use models • will reflect on the concepts of the course throughout seminar presentations and discussions	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Sustainable land-use and climate mitigation (Lecture) *Contents*: Land-based climate mitigation measures have gained significant attention and importance in public and private sector climate policies. To start with, this course provides an overview on climate change and its mitigation in general, focusing on the land-use sector. It will highlight the contributions of land use to as well as its potentials for mitigating climate change. Hereby, the course will help to increase the understanding of the needs, opportunities, potentials, interplays of different land-based mitigation options as well as their interaction with other sustainable development targets such as biodiversity protection. The course continues introducing international assessment bodies such as IPCC and IPBES being one of the major scientific basis of public and private sector decision making. Moreover, the scenarios as well as the tools applied for developing these scenarios will be assessed and discussed. Students then work on selected current topics of Land-Based Climate Mitigation from different perspectives which are accompanied by the lecturers. At the end of the semester, all students present their outcomes. Part of the module will take place at the Potsdam Institute of Climate change. Leimbach, M., et al. (2011): Integrated assessment models -the interplay of climate change, agriculture, and land use in a policy tool. In: Dinar, A., Mendelsohn, R. (eds.):	4 WLH

Handbook on Climate Change in Agriculture. Edward Elgar, Cheltenham, UK. (Chapter 10) Dietrich, J. et al (2019): MAgPIE 4 -A modular open source framework for modeling global land-systems. Geoscientific Model Development. 12, 1299-1317. Pörtner, H.O., et al (2021) IPBES-IPCC co-sponsored workshop report on biodiversity and climate change; IPBES and IPCC. DOI:10.5281/zenodo.4782538.	
Examination: Oral presentation (approx. 15 min.) 40% and oral exam (approx. 15 min.) 60% **Examination requirements:** Presentation – appropriate according to the standard of international conferences: relevant and sound content, clear structure, style, language (written and spoken) and pronunciation, citation and use of sources according to good scientific practice. Oral exam – The exam will ask knowledge and transfer questions related to the lecture content (i.e. climate change and mitigation, land-based mitigation options (potentials, sustainability dimension), land-use and IAM models, scenarios, international assessments such as IPCC, IPBES).	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Alexander Popp
Course frequency: each summer semester; Witzenhausen/Potsdam	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 15	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I32: Biodynamic agriculture**	6 C 4 WLH

Learning outcome, core skills: Learn to know basic principles of biodynamic agriculture (in Germany and worldwide), critical discussion of practical examples and scientific studies on the topic, as well as insight into practice on a biodynamic farm and into research work on the issue**.**	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Biodynamic agriculture (Lecture) *Contents*: Introduction to the basics of biodynamic agriculture with practical examples from Germany and around the world. The areas of animal husbandry, plant breeding and product quality as well as the underlying principles of biodynamic agriculture will be discussed. With a focus also on scientific studies on the subject and current concepts like one health. The course includes a 3-day excursion to a biodynamic farm and a research institution. Brock et al. (2019): Research in biodynamic food and farming – a review. Open Agriculture https://doi.org/10.1515/opag-2019-0064	4 WLH
Examination: Presentation (approx. 30 min.) 50% and oral exam (approx. 30 min.) 50% **Examination requirements:** Good knowledge about biodynamic agriculture and practical examples	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dr. Daniel Kusche
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 16	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.I33: Food Processing**	6 C 4 WLH

Learning outcome, core skills: Students can: - Describe the basic processes and systems of food processing - Derive quality-relevant steps, raw material and product properties - Discuss the differences between industrial and artisanal production - Classify the production of food in the wider context of sustainable development	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Food Processing (Lecture,Seminar) *Contents*: Students gain in-depth knowledge of the production of the most important food product groups and the chemical reactions that take place. Furthermore, a principle knowledge of analytical methods for quality and authenticity testing of these product groups will be provided. Animal foodstuffs: milk and dairy products; eggs and egg products; meat and meat products; fish and fish products. Plant foods: vegetable fats and oils; fruit and fruit products; vegetables and vegetable products; Legumes; cereals and cereal products; sugar, cocoa and chocolate; coffee and tea; Alcoholic beverages: beer, wine and spirits; Flavors and spices **Additional notes and regulations:** Seminars include research-based learning elements such as case studies and research activities involving students giving short presentations	4 WLH
Examination: Oral examination (approx. 20 minutes) **Examination requirements:** basic processes and systems of food processing, quality of processing and products, industrial and artisanal production	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Fabian Weber
Course frequency: each winter semester; Witzenhausen	**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.I34: Bioeconomy and sustainability**	6 C 4 WLH

Learning outcome, core skills: By the end of the course, students will be able to: • Explain core concepts of bioeconomy and circularity within the context of sustainable agriculture • Evaluate the management strategies and potential of biomass from natural conservation areas • Understand the role of biorefineries and biomass valorisation in enhancing farm resilience and rural livelihoods • Apply systems thinking to integrate ecological, economic, and social considerations in sustainable land management • Critically reflect on new models like doughnut economics and how they align with regenerative bioeconomy strategies	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Bioeconomy and sustainability (Lecture) *Contents*: This module provides a comprehensive overview of the role of the bioeconomy in sustainable agriculture. Key topics include the use and management of biomass from natural conservation areas (such as grasslands), circular economy principles, and the application of doughnut economics to agricultural systems. Students explore biorefinery concepts adapted to farm-scale, bio-based value chains, and emerging technologies such as biomass fermentation and decentralized processing solutions. The course also addresses the environmental impacts of the bioeconomy and sustainability trade-offs. A field visit to a demonstration site introduces students to real-life processes such as biomass pre-treatment, pelletization, and pyrolysis. These practical insights are reinforced through case studies, group work, and interactive sessions that foster critical thinking and systems-based understanding.	
Examination: Written test (60 min, 50%), Project report (appr. 15 pages, 50%)	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dr. Carolina Bueno
Course frequency: each winter semester	**Duration:**
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** **Modul M.SIA.P05: Organic cropping systems under temperate and (sub)tropical conditions** *English title: Organic cropping systems under temperate and (sub)tropical conditions*	6 C 4 SWS

Lernziele/Kompetenzen: 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.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Organic cropping systems under temperate and (sub)tropical conditions (Vorlesung,Exkursion,Seminar) *Inhalte*: 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 SWS
Prüfung: Mündliche Prüfung (ca. 15 Minuten, Gewichtung: 75%) und Präsentation, Referat oder Korreferat (ca. 15 Minuten, Gewichtung: 25%) **Prüfungsanforderungen:** 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

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** Basic knowledge in plant, soil and animal sciences
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Andreas Bürkert
Angebotshäufigkeit: jedes Wintersemester; Witzenhausen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: nicht begrenzt	

Bemerkungen:

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** **Modul M.SIA.P07: Soil and plant science** *English title: Soil and plant science*	6 C 4 SWS

Lernziele/Kompetenzen: 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.	**Arbeitsaufwand:** Präsenzzeit: 60 Stunden Selbststudium: 120 Stunden

Lehrveranstaltung: Soil and plant science (Vorlesung,Seminar) *Inhalte*: 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 SWS
Prüfung: Klausur (120 Minuten) oder Fachgespräch (ca. 20 Minuten) **Prüfungsanforderungen:** 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

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Englisch	**Modulverantwortliche[r]:** Dr. Helmut Saucke

Angebotshäufigkeit: jedes Wintersemester; Witzenhausen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: nicht begrenzt	

Bemerkungen:

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.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 term paper (max. 10 pages, 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** **Modul M.SIA.P15M: Methods and advances in plant protection** *English title: Methods and advances in plant protection*	6 C 4 SWS

Lernziele/Kompetenzen: 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.	**Arbeitsaufwand:** Präsenzzeit: 60 Stunden Selbststudium: 120 Stunden

Lehrveranstaltung: Methods and advances in plant protection (Vorlesung,Exkursion,Übung) *Inhalte*: 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 SWS
Prüfung: Klausur (120 Minuten) oder Fachgespräch (ca. 20 Minuten) (Gewichtung: 70%) und Protokoll (max. 3 Seiten) oder Referat (ca. 10 Minuten) (Gewichtung: 30%) **Prüfungsanforderungen:** Advanced knowledge in plant protection (Entomology and Pathology) Methodology and evaluation methods in plant protection based on case studies.	6 C

Zugangsvoraussetzungen: Introductory course in plant protection (entomology and pathology, at least 6 ECTS or equivalent) or bridging module M.SIA.P07 Soil and Plant Science	**Empfohlene Vorkenntnisse:** keine
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Maria Renate Finckh
Angebotshäufigkeit: jedes Wintersemester; Witzenhausen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: nicht begrenzt	

Bemerkungen:

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** **Modul M.SIA.P16M: Crop Modelling for Risk Management** *English title: Crop Modelling for Risk Management*	6 C 4 SWS

Lernziele/Kompetenzen: • 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	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Crop modelling for risk management (Vorlesung,Seminar) *Inhalte*: Using the Agricultural Production Systems sIMulator (APSIM) students will be introduced to the concepts (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 different simulations (single season cropping, rotation, intercropping, climate change effects etc.). In the second part selected case studies are presented, which address typical agronomy questions (fertilizer management, closing yield gap, identifying suitable crop rotations).	4 SWS
Prüfung: Präsentation, Referat oder Korreferat (ca. 20 Minuten, Gewichtung: 50%) und Protokoll (max. 20 Seiten, Gewichtung: 50%) **Prüfungsanforderungen:** Good understanding of the model APSIM and its underlying theory (process) descriptions and of input- and output variables and technical model features for simulating genotype x environment x management interactions in potential, water-limited and nitrogen-limited production situations; Understanding of model evaluation methods.	6 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** Basics in agronomy, soil science & plant nutrition
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Reimund Paul Rötter Dr. Gennady Bracho Mujica
Angebotshäufigkeit: jedes Sommersemester; Göttingen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: 16	

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. Infrastructure like lab benches, cabins, climate chambers and plantarray lysimeters can be used and might be involved in the experiments done by the students in working groups. **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: none	**Recommended previous knowledge:** Basic knowledge (B.Sc. level) of plant sciences
Language: English	**Person responsible for module:** Dr. Muhammad Habib Ur Rahman
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:	**Workload:**
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.	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: Referat (ca. 15 Minuten, Gewichtung: 10%), Protokoll (max. 15 Seiten, Gewichtung: 40%), Klausur (120 Minuten, Gewichtung 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:	**Recommended previous knowledge:**
Basic knowledge (B.Sc. level) of soil, plant and animal sciences, alternatively course P07	Grundkenntnisse (B.Sc.Niveau) in Boden-, Pflanzen- und Tierwissenschaften

Language: English	**Person responsible for module:** Prof. Dr. Maria Renate Finckh
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 12	

Additional notes and regulations:

Literature:

Perry, N.R., Moens, M. 2013: Plant Nematology, CAB International. Sikora, R.A., Coyne, A., Hallmann, J,, Timper, P. 2018: Plant parasitic nematodes in subtropical and tropical agriculture, 3nd 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 evaluate potentials and limits of energy 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,pyrolysis, combustion. Benefits and restrictions with 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. Environmental evaluation by lifecycle assessment analysis.	4 WLH
Examination: Oral examination (approx. 30 minutes) **Examination requirements:** Basic and theme specific deepened knowledge on the use of agricultural biomass for energetic purposes and for 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:

Guide to Biogas - From production to use. 2012. Fachagentur Nachwachsende Rohstoffe e. V. (FNR)

Kaltschmitt, M. Energy from Organic Materials (Biomass). Springer, New York, NY. https://doi.org/10.1007/978-1-4939-7813-7.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Modul M.SIA.P22: Management of tropical plant production systems** *English title: Management of tropical plant production systems*	6 C 4 SWS

Lernziele/Kompetenzen: 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.	**Arbeitsaufwand:** Präsenzzeit: 60 Stunden Selbststudium: 120 Stunden

Lehrveranstaltung: Management of tropical plant production systems (Vorlesung) *Inhalte*: 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 SWS
Prüfung: Written exam (90 minutes) or oral exam (ca. 30 minutes) **Prüfungsanforderungen:** 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

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** Basic knowledge on plant production (BSc-level)
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Reimund Paul Rötter
Angebotshäufigkeit: jedes Wintersemester; Göttingen	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: 35	

Bemerkungen:
Literature:

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

Slides, selected articles and other materials will be provided

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P27M: Nutrient dynamics, experimental design and statistical modelling - bilingual**	6 C

Learning outcome, core skills: Students understand the advantages and disadvantages of different experimental designs in agricultural experiments. For each design, they are able to carry out correct data analyses using combined regression and analysis of variance or linear mixed effects models in R. Based on their understanding of soil nutrient dynamics and experimental designs they are able to evaluate and critically assess the significance of field and laboratory experiments for studying C, N and P dynamics and to consider all influencing variables.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Nutrient dynamics: long-term experiments and modelling - bilingual (Lecture,Exercise) *Contents*: • Description of the dynamics of C, N and P (forms, transformations and availability) in arable soils • Experimental designs in agricultural experiments: completely randomized design, randomized complete block design, Latin square design, split-plot design and balanced incomplete block design • Statistical modelling: combined regression and analysis of variance and linear mixed effects models Modelling of the turnover of soil organic matter using the SoilR package in R • Application of the statistical software R for a description of C and N dynamics Crawley M.J. 2012: The R book. 2nd edition, Wiley Everitt B., Hothorn T. P. 2011: An Introduction to Applied Multivariate Analysis with R. Springer, New York Welham S.J., Gezan S.A., Clark S.J., Mead A. 2014: Statistical Methods in Biology. Design and Analysis of Experiments and Regression, CRC Press, Boca Raton Glaz B., Yeater K.M. 2020: Applied Statistics in Agricultural, Biological, and Environmental Sciences. John Wiley & Sons	
Examination: Oral examination (approx. 25 minutes)	6 C

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

English	Prof. Dr. Bernd Ludwig
Course frequency: each summer semester	**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.P28: Digitilization in agriculture**	6 C 4 WLH

Learning outcome, core skills: The participants will have gained a holistic understanding of precision agriculture, digitalization in agriculture, image processing and machine learning, data classification and pattern recognising and prediction methodologies around agricultural and animal farming stuffs.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Digitalization in agriculture (Exercise,Seminar) *Contents*: • Introduction to sensor solutions, digital technologies in agricultural science • Application and principle of optical and infrared technology for monitoring of agricultural and animal products • Machine vision and image processing in agricultural context • Basic techniques and functions of matrices in MATLAB® • Computer programming in MATLAB® • Machine learning algorithms • Pattern recognition and object detections algorithms • Development of data classification and pattern forecasting models in agricultural and livestock farming datasets	4 WLH
Examination: Report (field work) 50% (max. 8 pages), practical exam 50% (software application) **Examination prerequisites:** Regular participation **Examination requirements:** • Fundamental understanding of digitalization concepts and approaches in smart farming • Knowledge of technology application for crop, animal and food monitoring • Knowledge and basic ability to program MATLAB software in the context of agricultural science application • Ability to work and use optical sensors in crop monitoring	6 C

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of scientific research and data collecting
Language: English	**Person responsible for module:** Dr. Abozar Nasirahmadi
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students:	

20	

Additional notes and regulations:

- Gonzalez R.C., Woods R.E. and S.L. Eddins 2010: Digital Image Processing using MATLAB. New Delhi: Tata McGraw Hill Education;
- Stafford S. (ed.) 2019: Precision agriculture for sustainability. Cambridge, UK: Burleigh Dodds Science Publishing

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P29: Impact of climate extremes on plant production systems around the globe**	6 C 4 WLH

Learning outcome, core skills: Students will: • Gain a deeper understanding of shifts in climate variability and weather extremes and its relevance in important agricultural regions • Get a global perspective on how ongoing climate change is projected to amplify the occurrence of climate extremes • Learn about major impacts of climate extremes on important plant production systems around the globe • Get familiarized with widely used tools for quantifying impacts of climate extremes on plant production systems (i.e. experiments, eco-physiological & statistical and systems modelling). • Learn about current progress in experimentation aimed at getting a deeper understanding of responses of major crops to different types of climate extremes.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Impact of climate extremes on plant production systems around the globe (Lecture,Seminar) *Contents*: • Weather/climate and plant production. Climate variables determining growth and development of plants, and operational and strategic management. • Natural and anthropogenic weather and climate variability. Temporal and spatial scales. Statistical methods for detecting extremes. • What makes an event or series of events extreme? Theory on climate extreme events. Major climate extremes and their damage potential, likely shifts under future climate: illustrated by in-depth cases studies from major plant production systems. • Data sources, data types and scales required for quantitative analysis of potential impacts (e.g. yield loss) and adaptation options/management of risk and opportunities for major plant production systems. Available experimental and modelling data on indicators and thresholds for major plant production systems. • Introduction to state of the art analysis (statistical and systems modelling) techniques for quantifying impacts, adaptations and risk management strategies at different scales/ levels of organization - from plant/field via farm to landscape/ regional level.	4 WLH
Examination: Written exam (60 minutes, 50%) and written report (10 pages max. 50%) **Examination requirements:** written report on a specific case, i.e. combination of agro-climatic extreme x cropping systems (10 pages max. 50%) Basic knowledge of agronomy, agro-meteorology and soil science	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Reimund Paul Rötter
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 24	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P30M: Ecological Genetics**	6 C 4 WLH

Learning outcome, core skills: Students will get an understanding of the role of intraspecific (genetic) variation in managed and unmanaged ecosystems with a main focus on tropical ecosystems. They will be acquainted with the analysis of the dynamics of genetic diversity in space and time. They will be conscious of the role of genetic diversity for adaptation to changing environmental conditions including changes of land use and climate change, and they will understand methods to conserve plant genetic resources.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Ecological Genetics (Lecture,Exercise,Seminar) *Contents*: Fundamentals of genetics: inheritance, DNA structure and function. Evolution and evolutionary factors: Mutation, migration, drift, selection. Evolutionary adaptations. Population structure, measurement of genetic diversity within and among populations. Genetic diversity management in plant breeding. Human impacts on genetic diversity: breeding, land use change and global climate change. Conservation of plant genetic resources. Case studies: Genetic diversity patterns of tropical plants.	4 WLH
Examination: Oral presentation 40% (approx. 30 minutes) and oral examination 60% (approx. 60 minutes) **Examination requirements:** Students prove that they have a sound understanding of • The role of intraspecific diversity in natural and managed ecosystems • Evolutionary factors shaping genetic diversity patterns • The temporal and spatial dynamics of genetic variation • Evolutionary adaptations to changing environmental conditions • Human impacts on genetic diversity • Conservation strategies for plant genetic resources	6 C

Admission requirements: none	**Recommended previous knowledge:** Basics of molecular and general genetics
Language: English	**Person responsible for module:** Prof. Dr. Reiner Finkeldey
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 100	

Additional notes and regulations:

Literature:

Finkeldey, R. and H.H. Hattemer (2007) Tropical Forest Genetics. Springer, Berlin, Heidelberg, New York. 315 pages.

Other literature will be introduced during the course.

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P33M: Water in the Soil Plant system**	6 C 4 WLH

Learning outcome, core skills: Students will be able to understand and model energy, water and nutrient flows in the soil-plant-atmosphere system. The main focus is on methods for working with models	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Water in the Soil Plant system (Lecture) *Contents*: The course focuses on the basic methods for working with process models. physical processes in the soil-plant-atmosphere system. The course consists of roughly equal parts lecture content and computer-based exercises. In the lecture part, the most important concepts for modeling the relevant soil and plant growth processes are explained, and in a second part, a detailed introduction to the agroecosystem simulation model Expert-N is given. Computer exercises are carried out in which students perform simulations on the following topics: - Water flow in agroecosystems - Water extraction and distribution, surface irrigation, sprinkler irrigation, drip irrigation - Carbon and nitrogen turnover in soils - Plant growth and crop yield - Climate change and crop production	4 WLH
Examination: Oral examination (approx. 25 minutes) **Examination requirements:** Knowledge of processes on the land surface, evapotranspiration, water flows in the soil	6 C

Admission requirements: none	**Recommended previous knowledge:** Modul Soil and plant science or equivalent
Language: English	**Person responsible for module:** Prof. Dr. Tobias Weber
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 12	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P34: Nutrient acquisition by plants**	6 C 4 WLH

Learning outcome, core skills: Students obtain more detailed knowledge on how nutrients, especially nitrogen and phosphorus, are acquired by plants. Students know how to conduct scientific literature research and how to write a scientific mini-review on a specific topic.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Nutrient acquisition by plants (Lecture) *Contents*: Topics include e.g. different mechanisms of plants to acquire nitrogen, phosphorus (e.g. prior/after mineralisation processes, via support of bacteria & fungi), and also micronutrients, competition for nutrients between plants and soil microbes, rhizodeposition, dependence on abiotic factors, influence of invasive species. Other skills: Conducting scientific literature research Citing correctly Presenting a short lecture on a specific topic Moderating a discussion Scientific writing of a mini-review Some literature will be provided in the framework of the course, e.g. Näsholm et al. 2009: Uptake of organic nitrogen by plants. New Phytologist 182, 31-48.. For the specific oral presentations, literature search is conducted by the students.	4 WLH
Examination: 55% oral presentation (20 min) plus leading the following discussion, 45% mini-review (c. 15-20 pages) **Examination requirements:** Knowledge on how nutrients, especially nitrogen and phosphorus, are acquired by plants	6 C

Admission requirements: English at B2 level	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Judy Simon
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students:	

24	

Georg-August-Universität Göttingen **Universität Kassel/Witzenhausen** **Module M.SIA.P35M: Plant-soil Interactions**	6 C 4 WLH

Learning outcome, core skills: After successful completion of the module, students will be able to: · formulate a research question and derive corresponding hypotheses based on theoretical foundations, · apply both basic and advanced laboratory and analytical methods, · critically evaluate and interpret experimental results using appropriate statistical approaches, · present, discuss, and reflect on their findings according to scientific standards, demonstrating the ability to connect theory and practice. Throughout the module, students strengthen their capacity for independent and critical thinking, integrating theoretical knowledge with practical research experience.	**Workload:** Attendance time: 60 h Self-study time: 120 h

Course: Plant-soil Interactions (Lecture,Practical course,Seminar) *Contents*: Introduction to theoretical principles and practical approaches in plant-soil interactions under abiotic stress. Students set up and maintain their own experiments. Practical methods include, for example, microscopy, microbiological techniques, and biochemical analyses. Students process and analyse plant / soil samples, evaluate the obtained data, and present their results according to scientific standards. Current scientific literature is read, presented, and critically discussed. Wall DH et al. (2012) Soil Ecology and Ecosystem Services, Oxford Academic Lambers H & Oliveira RS (2019) Plant Physiological Ecology, Springer Further relevant literature will be provided in the framework of the course.	4 WLH
Examination: Presentation of a scientific publication (c. 20 min) 40%, Written exam(90 min) 60% **Examination requirements:** Short manuscript presenting a rationale for the experiment, describing the set-up (incl. justification) and execution of the experiment as well as description and discussion of the results Presentation of a scientific paper incl. the experimental approach, results and limitations / lessons learned	6 C

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

English	Prof. Dr. J. Simon
Course frequency: each summer semester; Witzenhausen	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 12	

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.	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: none	**Recommended previous knowledge:** Required: Mathematics (linear algebra), statistics. Desirable: Introduction to Econometrics (or comparable lecture).
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 globalization, aid, debt, population, the environment, and inequality and economic development.	2 WLH
Course: Development Economics I (Exercise) *Contents*: The exercise session 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 **Examination prerequisites:** Submission of 6 exercise sheets (of sufficient quality). The exercises deepen the understanding of concepts and empirical methods taught in the lecture and apply it to specific cases.	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. Dr. Andreas Fuchs
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	

Georg-August-Universität Göttingen **Module M.WIWI-VWL.0096: Essentials of Global Health**	6 C 3 WLH

Learning outcome, core skills: The goal of this course is to provide students with a comprehensive understanding of global health. By the end of the course, students will be able to: • explain main concepts of global health • describe linkages between health and economic development • describe determinants of health • describe different components of health systems • demonstrate familiarity with the concept of burden of disease and risk factors and how health status is measured • describe key measures to address the burden of disease in cost-effective ways • read, discuss and present recent scientific literature in the global health field • write a clear and concise policy brief tailored to a specific audience	**Workload:** Attendance time: 42 h Self-study time: 138 h

Course: Essentials of Global Health (Seminar) *Contents*: The course will introduce students to the main concepts of the public health field and critical links between global health and economic development. Students will get an overview of the determinants of health and learn how health status is measured. The course will be global in coverage, but with a focus on low- and middle-income countries and on the health of the poor. The course will cover: • Global health concepts • Linkages between health and development • Global burden of disease, measurement and global trends • Determinants of health and social network effects • Health disparities • Health systems • Global health efforts • Health behaviour in developing countries	2 WLH
Course: Essentials of Global Health (Exercise) *Contents*: Practical exercises related to the topics discussed in the seminar give students the opportunity to deepen and enhance their understanding of the seminar's content.	1 WLH
Examination: Portfolio* (max. 15 pages) **Examination requirements:** In their portfolio, students should demonstrate their familiarity with key concepts and topics discussed in the lecture as well as an ability to critically discuss these topics by completing various assignments related to particular seminar contents. In addition, students will be expected to have read the background literature mentioned in the course.	3 C
Examination: Oral Presentation (approx. 60 minutes)	3 C

Examination requirements: Students will present current research articles in global health and demonstrate an understanding of the main concepts of global health and their linkages with economic development. Students will be further required to demonstrate skills to critically discuss scientific articles.	

Admission requirements: none	**Recommended previous knowledge:** Basics in microeconomics and macroeconomics, understanding of econometrics, ability to read scientific articles
Language: English	**Person responsible for module:** Prof. Dr. Sebastian Vollmer
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 3 - 4
Maximum number of students: 18	

Additional notes and regulations:
* A portfolio is a collection of the following assignments related to particular seminar contents: summaries of a text, response papers, reading reports and comments on presentations (max. 15 pages).

Georg-August-Universität Göttingen **Module M.iPAB.0002: 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:** Dr. Birgit Jutta Zumbach
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** Master: 1
Maximum number of students: 30	

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

Georg-August-Universität Göttingen **Module SK.CBL.0002: Scientific Conference Management**	3 C (incl. key comp.: 3 C) 2 WLH

Learning outcome, core skills: Upon successful completion of this module, students will have acquired: · Basic understanding of scientific event planning and management concepts · Knowledge about main challenges in event project planning within academic contexts · Familiarity with recent developments in the field, including sustainability considerations and digital integration · Competence in organizing conferences through designing, planning, budgeting, and marketing to final execution · Experience in team-based project work with clearly assigned roles (program, advertising, speaker coordination, registration, IT, catering…) · Evaluation Methods: Post-event analysis and impact assessment **This hands-on course specifically incorporates scientific conference planning in theory and practice for the Tropentag, September 2026** www.tropentag.de the annual international conference on research in tropical and subtropical agriculture, natural resource management and rural development. Course open to Master and PhD students in the fields of agriculture, forestry, biology, geography, and developmental economics *	**Workload:** Attendance time: 50 h Self-study time: 40 h

Course: Scientific Conference Management (Key competence) *Contents*: Theoretical Phase (April - June): Monthly seminar meetings covering key elements of conference management, detailed planning processes (check list, budgeting, session planning and timing, promotion, advertising, registration) Practical Phase (June onwards): Application through hands-on experience in preparation in team-based projects with allocated specialized roles and responsibilities, Important is a strong drive to work independently, and responsibility for conference tasks, in-person participation Tropentag, September 14-18, 2026 *Course frequency:* each winter semester	2 WLH

Examination: written practical report (10 pages) as part of a comprehensive conference management manual **Examination prerequisites:** minimum 40 hours of practical work for the Tropentag Conference	

Admission requirements:	**Recommended previous knowledge:**

none	none
Language: English	**Person responsible for module:** Dr. Simone Pfeiffer
Course frequency: once; SoSe 2026	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 3
Maximum number of students: 50	

Additional notes and regulations:
* Participants may independently organize an oral or poster presentation of their own research at the conference.