Georg-August-Universität Göttingen **Module B.ÖSM.228: Biogeography and Landscape Ecology**	6 C 2 WLH

Learning outcome, core skills: Im Rahmen dieses Modules werden grundlegende Kenntnisse der Biogeographie und Landschaftsökologie vermittelt und anhand ausgewählter aktueller Forschungsthemen vertieft. Hierfür werden wesentliche biogeographische und landschaftsökologische Konzepte und Methoden vorgestellt sowie die Zusammenhänge und Wechselwirkungen biotischer und abiotischer Umweltfaktoren und die damit verbundenen Stoff- und Energieflüsse behandelt. Die Studierenden entwickeln ein Verständnis für die Entwicklung und Dynamik von Raummustern an der Erdoberfläche und lernen die Prozesse und Mechanismen erklären zu können, die zur Differenzierung der Biosphäre und der Entstehung biotischer Muster führ(t)en.	**Workload:** Attendance time: 28 h Self-study time: 152 h

Course: Biogeographie und Landschaftsökologie (Lecture) *Contents*: In der Vorlesung werden die theoretischen Grundlagen der Biogeographie und Landschaftsökologie mit ihren Konzepten und Methoden vorgestellt. Ausgehend von diesen Grundlagen bearbeiten die Studierenden bereitgestellte Übungsaufgaben mit Hilfe englischer Fachartikel in Selbstlerneinheiten. Diese werden zu Beginn der folgenden Vorlesungseinheiten diskutiert.	2 WLH

Examination: Written examination (90 minutes) **Examination prerequisites:** 6 Übungsaufgaben (max. 3 Seiten, unbenotet) **Examination requirements:** Die Studierenden erbringen den Nachweis, dass sie in der Lage sind die Grundlagen, Fragestellungen und Methoden der Biogeographie und der Landschaftsökologie nachzuvollziehen und wiederzugeben. Die Teilnehmer*innen verinnerlichen grundlegende Themen und aktuelle Forschungsbereiche der Biogeographie und sind im Stande die in den Vorlesungseinheiten präsentierten Themen und die selbst erarbeiteten Inhalte der Übungsaufgaben zu begreifen und in prägnanter Form wiederzugeben. Dabei stehen insbesondere abiotische und biotische Interaktionen, Systeme und Skalen, Klassifikationssysteme wie Kladistik, Lebensformtypen und Funktionelle Gruppen, sowie Aspekte der Arealkunde, Biodiversität, Neobiota und Moore im Mittelpunkt der Betrachtung. Anmerkung Prüfungsvorleistung: Bearbeitung von 6 Übungsaufgaben mit einem Umfang von jeweils 2 - 3 Seiten (unbenotet). Zur Bearbeitung der einzelnen Übungsaufgaben werden jeweils mehrere aktuelle englische Fachartikel zur Verfügung gestellt, mit deren Hilfe ein zusammenhängender Text im Umfang von 2-3 Seiten verfasst werden soll.	6 C

Admission requirements: none	**Recommended previous knowledge:** Englischkenntnisse für das Lesen englischer Fachartikel (ca. B2-Niveau gem Europ. Referenzrahmen bzw. Abitur-Niveau), B.ÖSM.101 und B.ÖSM.111 oder äquivalent

Language:	Person responsible for module:
German, English	Dr. Simon Drollinger
Course frequency:	**Duration:**
each winter semester	1 semester[s]
Number of repeat examinations permitted:	**Recommended semester:**
twice	from 4
Maximum number of students:	
25	

Georg-August-Universität Göttingen	6 C
Module B.ÖSM.300a: Current Issues in Ecosystem Management Ia	4 WLH

Learning outcome, core skills:	Workload:
In diesem Modul werden wechselnde Themen aus dem Bereich Ökosystemmanagement behandelt, die mit den jeweils geeigneten Lehrformen und zu erlangenden Kompetenzen zu Beginn eines jeden Semesters bekannt gegeben werden. Allen zugrunde liegen Aktualität und ein interdisziplinärer und systemischer Ansatz.	Attendance time: 56 h Self-study time: 124 h
Je nach Veranstaltung verfügen die Studierenden so über vertiefte fachliche oder methodische Kenntnisse, arbeiten eher analytisch oder konzeptionell, erhalten theoretisches oder anwendungsbezogenes Wissen in gesellschaftlich relevanten Bereichen wie bspw. Klimawandel, Erneuerbare Energien, ökologische Agrarwende, Umweltbildung oder Naturschutzplanung.	

Course: Lehrveranstaltungen zu aktuellen Themen des Ökosystemmanagements	4 WLH
Contents: Veranstaltungsart und Inhalte variieren nach Angebot.	
Examination: Klausur (90 Minuten) oder Hausarbeit (max. 20 Seiten) oder Präsentation in Form eines Posters (1 Seite) oder Referats mit Handout (ca. 20 Minuten) **Examination requirements:** Die Studierenden erbringen den Nachweis, dass sie in einem ausgewählten Thema des Ökosystemmanagements über vertiefte Kenntnisse verfügen und diese anwenden können. Die Prüfungsform und -anforderungen werden den Lernzielen der jeweiligen Lehrveranstaltung(en) angepasst und können deshalb variieren. Sie werden zu Beginn des Semesters bekannt gegeben.	6 C

Admission requirements: none	Recommended previous knowledge: werden ggf. rechtzeitig bekannt gegeben
Language: German, English	Person responsible for module: Studiengangsbeauftragte*r
Course frequency: unregelmäßig	Duration: 1 semester[s]
Number of repeat examinations permitted: twice	Recommended semester:
Maximum number of students: not limited	

Additional notes and regulations:
Je nach angebotenem Thema und dafür geeigneter Veranstaltungsform kann die Anzahl der Plätze beschränkt sein. In Ausnahmefällen ist die Unterrichtssprache Englisch.

Georg-August-Universität Göttingen **Module M.Agr.0197: Sustainability – Basics and Application**	6 C

Learning outcome, core skills: In this course, students will learn about the fundamental concepts and ideas that underpin sustainability on a global level. It aims at creating a deeper understanding of the fair use of resources and its challenges on local and global scale. Sustainable development is not only a difficult practical challenge but also a conceptual, political and moral problem. How can an understanding of the complexities help to shape approaches to solutions? Students will acquire discursive and reflective competencies. Students will work with local stakeholders and acquire practical insights for implementing sustainability in real-life applications.	**Workload:** Attendance time: 26 h Self-study time: 154 h

Course: Sustainability – basics and application (Internship, Lecture, Seminar,) **Course: *Part 1 Sustainability basics*** (Lectures and self-study) The first module part introduces students to sustainability concepts (environmental, social and economic), and sustainable development (SDGs). Building on these foundations, the main part of the module is practical. *Part 2 Sustainability application* (seminar, practical work and self-study) Students can choose one topic and work on a sustainability-related task in either interdisciplinary teams or local companies, NGOs and university projects. What is a particular sustainability challenge? What measures can help to realize sustainability goals and what trade-offs hinder the success of implementation. A seminar will be organized to present, discuss and reflect the practical work.	
Examination: oral presentation in the seminar (ca. 10min, 30%) and written report for practical part 2 (max. 10 pages, 70%) **Examination prerequisites:** written exam Part 1 (20 Min, ungraded), seminar attendance	6 C

Admission requirements: open for all faculties	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dr. Simone Pfeiffer (CBL, Centre of Biodiversity and Sustainable Land Use) Dr. Michaela Dölle (Faculty of Forest Sciences and Forest Ecology)
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 35	

Georg-August-Universität Göttingen **Module M.FES.311: Tropical forest ecology and silviculture**	6 C 4 WLH

Learning outcome, core skills: General understanding of ecological concepts regarding tropical forests and their characteristics. Critically analyse silvicultural systems considering their advantages and drawbacks.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Tropical forest ecology and silviculture (Lecture) *Contents*: This course focuses on the ecology of tropical rain forests, threats to forests and options for ecologically sound land use. Lectures on forest ecology include characteristics of different tropical forest types such as lowland forest, montane forest, mangrove forest, and additionally the biodiversity of the forest, the role of fire, and the carbon balance of forests. More applied topics address silvicultural systems such as polycyclic and monocyclic management systems.	4 WLH
Examination: Oral examination (approx. 20 minutes)	6 C

Examination requirements: Emphasis lies on the ecology of tropical rain forests and options for ecologically sound management. Students shall know e.g. characteristics of different forest types, features of management systems and discuss land use options.	

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

Georg-August-Universität Göttingen **Module M.FES.313: Monitoring of Forest Resources**	6 C 4 WLH

Learning outcome, core skills: Familiarize the students with the range of methods and techniques applied to forest monitoring in the preparation, planning, implementation and analysis phase. Objective is that the students are eventually in the position to carry out their own monitoring projects, and that they have the criteria to judge the quality of monitoring projects in general. Focus is on the target-oriented planning and the definition of the most appropriate sampling design and plot design that guarantees the generation of high-quality information for the decision makers in forestry.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Monitoring of forest resources (Lecture, Exercise) *Contents*: Forest monitoring is a forestry discipline that aims at the comprehensive and objective characterization of the forests as a production system and/or as an ecological system in a defined geographic area, in terms of status quo and changes. Forest inventories are the core element of monitoring and they generate data and information required by foresters, forest politicians and forest researchers to support decision making. The course module "Monitoring of forest resources" intends to familiarize the students with the range of methods and techniques applied to forest inventories in the preparation, planning, implementation and analysis phase. Objective is that the students are eventually in the position to carry out their own monitoring projects of forests and related resources, and that they know the criteria to judge the quality of monitoring projects in general. Focus is on the target-oriented planning and the definition of the most appropriate sampling design and plot design that guarantees the generation of high-quality information for the decision makers in forestry. That includes comprehensive presentation of statistical sampling. Examples of small and large area inventories and monitoring are presented and critically analysed. The important remote sensing applications for forest monitoring are not dealt with in detail in this module, as this topic is covered in other modules; but the relevance of integrated inventories (combining field sampling and remote sensing) is addressed. The development of forest inventories towards integrated "landscape inventories", "multi-resource inventories", "tree inventories" is also addressed of this course. Prerequisites: Sound basis in "Forest mensuration" and basic statistics.	4 WLH
Examination: Written exam (120 minutes)	6 C

Examination requirements: In the module „Monitoring of Forest Resources", the students should know and be able to manage and understand all topics that were covered in the lectures and labs. This includes: • the relevance of data sources and data quality; • the relevance of methodological soundness in planning, implementing and analyzing forest inventory data;	

- the basic principles of in planning, implementing and analyzing forest inventory data;
- important options of sampling and plot design and its characteristics (including application examples and calculation of estimates);
- the critical reading of forest inventory reports;
- the role of forest inventories when monitoring the "resource forest" and the "ecosystem forest";
- the role of forest inventory and forest monitoring in decision processes at stand-, enterprise-, national and global level.

And, of course, calculation skills in producing sample based estimates are equally relevant.

Admission requirements:	Recommended previous knowledge:
none	Required is a good command of forest mensuration, descriptive statistics, basic sampling statistics and cartography (along what is commonly covered in Bachelor study programs).
Language:	**Person responsible for module:**
English	Prof. Dr. Christoph Kleinn
Course frequency:	**Duration:**
each winter semester	1 semester[s]
Number of repeat examinations permitted:	**Recommended semester:**
cf. examination regulations	
Maximum number of students:	
not limited	

Georg-August-Universität Göttingen **Module M.FES.314: Forest utilization and wood processing**	6 C 4 WLH

Learning outcome, core skills: Students gain knowledge of technological relevant wood properties of important commercial timbers and technology of major forest products in tropics (lumber, veneer, plywood, woodbased panels, pulp and paper). Students are able to plan, evaluate and select forest operations with respect to technical implementation, human impacts and environmental consequences. In addition, forest operations are put into the broader context of society and forest ecosystems and stresses of the human factor involved. Emphasis is directed to systems analysis and long-term perspectives.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Forest utilization (Lecture) *Contents*: The module covers forest areas of the world and their characteristics with regard to forest operations, forest products, sorting of timber, fuelwood, technical systems and work methods for harvesting and other forest operations, ergonomics, occupational safety and health, appropriate technology, economic analysis of forest operations. In addition, basic elements of road planning, construction and maintenance are presented and information about recent developments (information and communication technology, GIS, logistics) are given.	2 WLH
Course: Wood processing (Lecture) *Contents*: We will impart consolidated knowledge about wood properties considering wood anatomy, wood physics, and wood chemistry including the role of water related to wood. Wood energy. Sawmill technology and wood products. Special regard on wood-based composites like particleboard, fiberboard, plywood, OSB and WPC. Wood destroying insects and fungi. Wood preservation and modification.	2 WLH
Examination: Written examination (120 minutes)	6 C

Examination requirements: Wood processing: The students should know the basics of wood properties in context with chemistry and micro-structure. They must know how to optimize the use of wood by producing convenient wood-based products and how to protect them. Forest utilization: The students should be able to describe and analyse the complex setting of forest operations and to find optimal solutions integrating economic, ecological, ergonomical and social aspects.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Dirk Jaeger

Course frequency:	Duration:
each winter semester	1 semester[s]
Number of repeat examinations permitted:	**Recommended semester:**
cf. examination regulations	
Maximum number of students:	
not limited	

Georg-August-Universität Göttingen	6 C
	4 WLH
Module M.FES.705: Forest Protection and Agroforestry	

| **Learning outcome, core skills:** | **Workload:** |
| Assessment of forest protection problems and available methods of insect or pathogen control with special emphasis on sustainable methods. Basic understanding of agroforestry systems in the tropics. | Attendance time: 56 h Self-study time: 124 h |

| **Course: Forest protection and agroforestry** (Lecture) | 4 WLH |
| *Contents*: | |

Forest protection is aimed at protecting natural, near natural and plantation forests from disease and pests. Diseases do include abiotic diseases (damage from lack and excess of nutrients, fire, drought pollution, etc.) and biotic diseases caused by microorganisms including viruses and protozoa, and parasitic plants. Forest protection deals also with damage from animal pests, meaning arthropods and there specially insects, but also damage from mammalians. The matter is presented in a concept of integrated pest and disease management, here pests and diseases affecting specific tree species (mahogany, teak, Pinus, Dipterocarpaceae, Acacia, Eucalyptus, etc.) are treated together. Beside this core lectures. A prerequisite for the lectures and practical training, is knowledge of basic subjects of phytomedicine. However, if necessary, missing, incomplete and not up to date knowledge may be supplemented in lectures such as: Overview of abiotic diseases, theoretical approach to integrated pest and disease management, biological, bio-technical and chemical control of pests and diseases. The main focus of the module is explanation of specific (and for forest protection important) features of the individual tree species and/or forest types, diagnostic of the disease and pest attack and explanation of strategies for the integrated management of the disease or pest. Possible control strategies include. Experiences of the lecturers are in Germany and abroad (South and Central America, North Africa and South East Asia) and advice can be provided also in Spanish. silvicultural based measures, i. e. displacing the attack of diseases and pests by changing planting distance, managing shadow, managing thinning, establishing mixed stands, change of logging practices. Reducing spread of disease or pest by eradication of individual trees or group of trees or certain areas of the forest (hot spots) or manual collecting of specific insect stages. Genetic based measures i. e. resistant species, subspecies, f. sp., varieties and different provenience, and, if available, genetic engineered plants trimmed for resistance to diseases and pests. Chemical oriented plant protection. Applied according to the principles of integrated pest management, which includes economic threshold, consideration of the residue problems and health of the applying forester. Basic knowledge are required, but may be supplied in a specific lectures. Biological and biotechnical oriented plant protection. In this context experiences and possibilities of applying these measures in the field are being discussed. Specific examples are treated and possible approaches to new problems are discussed. The influence of different factors (including the above listed approaches) on the biological and biotechnical plant protection are considered. Basic knowledge is required, but may be supplied in specific lectures. Agroforestry systems are land-use systems and practises in which woody perennials are deliberately grown

on the same land management unit as crops and/or animal husbandry, either in some form of spatial arrangement or in a time sequence, and in which there is a significant interaction between the woody perennials and the crops or animals. Starting with general considerations in agroforestry systems, a selection of systems in which trees or other woody perennials play an important role are discussed: The classical Taungya System, the tumpangsari system in Java, the Malang and Magelang system, the Juhm system of Nagaland, different home and forest gardens of S-E-Asia. In detail discussed are the role of trees in agroforestry systems and a selection of suitable tree species for agroforestry systems.	
Examination: Written exam (120 minutes)	6 C

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

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** N. N.
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.712: Bioclimatology and global change**	6 C (incl. key comp.: 6 C) 4 WLH

Learning outcome, core skills: Scientific basis of climate and climate change, trace gas budgets of soils and whole ecosystems and the potential to sequester carbon and nitrogen in managed and unmanaged terrestrial ecosystems.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Bioclimatology and global change (Lecture) *Contents*: The module "Bioclimatology and Global Change" will introduce the students to the global climate system and its interaction with the biosphere. A lecture course will focus on the scientific basis of climate and climate change covering basic physical and chemical processes governing the climate system, climate zones, modelling as well as global and regional climate phenomena with a focus on tropical climates. A seminar course will highlight trace gas budgets of soils and whole ecosystems and their potential to sequester carbon and nitrogen in managed and unmanaged terrestrial ecosystems and their vulnerability to climate change. Using journal literature the students will work out oral presentations concerning current research topics concerning the global climate system and its interaction with the biosphere.	4 WLH
Examination: Written exam (90 minutes, 50%) and oral presentation (approx. 20 minutes, 50%)	6 C

Examination requirements: Understanding the most relevant processes at the biosphere-atmosphere interface and of biogeochemical cycles. Being able to find, read, evaluate, and present scientific literature related to Global Change.	

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

Additional notes and regulations:

Literature:

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

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

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

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

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

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

Additional notes and regulations:

Literature:

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

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

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

Course: Livestock-based sustainable land use (Lecture, Exercise) *Contents*:	4 WLH
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.	
Examination: Written examination (90 minutes) **Examination requirements:** Influences of animal husbandry / the individual animal on its environment: soil fertility and soil erosion, pasture vegetation, nutrient transfers, greenhouse gas emissions; livestock keeping versus nature conservation; methods for assessing quality and quantity of pasture vegetation; methods to determine the animal's behavior at pasture and its feed intake.	6 C

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

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

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

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

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)	4 WLH
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	

Examination: Homework (max. 15 pages, 65%) and 2 presentations (about 45 min, 20% and about 15 min, 15%)	6 C
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.	

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

Course frequency:	Duration:
each summer semester; Göttingen	1 semester[s]
Number of repeat examinations permitted:	**Recommended semester:**
twice	
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 Module M.SIA.E21: Rural sociology	6 C 4 WLH

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

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

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

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

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

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

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

Admission requirements: none	Recommended previous knowledge: none
Language: English	Person responsible for module: Prof. Dr. Liesbeth Colen
Course frequency:	Duration:

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

Additional notes and regulations:
Literature:
Selected articles from academic journals and book chapters

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

Learning outcome, core skills:	Workload:
• 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	Attendance time: 56 h Self-study time: 124 h

Course: Agricultural policy analysis (Lecture)	6 WLH
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	

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.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.E42: Agriculture, Nutrition and Sustainable food systems	6 C 4 WLH

Learning outcome, core skills: Students learn how food systems and food policies are shaping what we eat, how we produce our food, and how this links to sustainable development in a global context. The course covers food systems in both developing and developed countries. Students learn to engage in a critical debate on the role of food policies and other drivers in shaping what we consume, how this links to food production and sustainable development, including health, environment and the economy. Students learn to analyze these themes by engaging in basic data analysis, case studies and the critical analysis and exposition of arguments.	Workload: Attendance time: 56 h Self-study time: 124 h

Course: Agriculture, Nutrition and Sustainable food systems (Lecture) *Contents*: This module introduces students to apply systems thinking to the global challenges of food security, nutrition, health and sustainability. It introduces the relevant concepts, analyses the drivers and food policies that may transform food systems using an interdisciplinary approach. Every lecture is accompanied by a more practical session in which basic analysis of data (using Stata) or comparative and critical analysis are applied to the specific themes or policies covered in the lecture. Course material consists of presentations and lecture notes. A list of scientific reports, research articles and relevant data will be provided to students. *Course frequency:* each winter semester	4 WLH
Examination: Written examination (60 minutes, 50%) and paper (max. 15 pages, 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: none	Recommended previous knowledge: Prior knowledge of microeocnomics at BSc level is useful. Prior experience with Stata or SPSS may be helpful but is not a requirement.
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:	
45	

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

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

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

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

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

Admission requirements:
none

Recommended previous knowledge:
none

Language:
English

Person responsible for module:
Prof. Dr. Eva Schlecht

Course frequency:
each winter semester; Witzenhausen

Duration:
1 semester[s]

Number of repeat examinations permitted:
twice

Recommended semester:

Maximum number of students:
not limited

Additional notes and regulations:

Literature:

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

Georg-August-Universität Göttingen Universität Kassel/Witzenhausen Module M.SIA.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 <u>students with a natural sciences focus</u> 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.P16M: Crop Modelling for Risk Management**	6 C 4 WLH

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

Course: Crop modelling for risk management (Lecture, Seminar) *Contents*: Using the Agricultural Production 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 WLH
Examination: Presentation (about 20 min, 50%) and written report (max. 20 pages,50%) **Examination requirements:** 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

Admission requirements: none	**Recommended previous knowledge:** Basics in agronomy, soil science & plant nutrition
Language: English	**Person responsible for module:** Prof. Dr. Reimund P. Rötter Dr. Gennady Bracho Mujica
Course frequency: each summer semester; Göttingen	**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.P22: Management of tropical plant production systems**	6 C 4 WLH

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

Course: Management of tropical plant production systems (Lecture) *Contents*: Presentation of the most important crops with respect to: botany, morphology, origin, climatic and ecological requirements, crop production, harvest procedure, significance in local farming systems, utilisation as food, feed, raw materials and as bioenergy source. Discussion of specific cropping systems in the tropics and subtropics and specific management systems for the sustainable improvement of productivity. **Literatur** Rehm, S., Espig, G. 1991: The Cultivated Plants of the Tropics and Subtropics. Verlag Josef Margraf. Weikersheim, Germany; lecture notes	4 WLH
Examination: Presentation (ca. 30 Minuten, 50%) und written report (max. 15 pages, 50%) **Examination requirements:** Knowledge of botanical, ecological and agronomic facts of the presented crops and cropping systems. Knowledge of the assignment of crops and cropping systems to different site conditions, as well as system-oriented evaluation of sustainable production at selected sites.	6 C

Admission requirements: none	Recommended previous knowledge: Basic knowledge on plant production (BSc-level)
Language: English	Person responsible for module: Prof. Dr. Reimund P. Rötter
Course frequency: each winter semester; Göttingen	Duration: 1 semester[s]
Number of repeat examinations permitted: twice	Recommended semester:
Maximum number of students: 35	

Additional notes and regulations: Literatur: 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.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 (30 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:	Recommended previous knowledge:
none	none
Language:	**Person responsible for module:**
English	Prof. Dr. Reimund P. Rötter
Course frequency:	**Duration:**
each winter semester	1 semester[s]
Number of repeat examinations permitted:	**Recommended semester:**
twice	
Maximum number of students:	
24	