Module Name	Module Code
Modelling Grass-Based Dairy Systems	agrarAEF876-01a
Module Coordinator	
Prof. Dr. Friedhelm Taube	
Organizer	
Institute of Crop Science and Plant Breeding - Organic Agriculture	
Faculty	
Faculty of Agricultural and Nutritional Sciences	
Examination Office	
Faculty of Agricultural and Nutritional Sciences - Examination Office	

ECTS Credits	6
Evaluation	Graded
Duration	one semester
Frequency	Only takes place during summer semesters
Workload per ECTS Credit	30 hours
Total Workload	180 hours
Contact Time	60 hours
Independent Study	120 hours

Module Courses			
Course Type	**Course Name**	**Compul-sory/Optional**	**SWS**
Lecture	Introduction to agroecosystem modelling	Compulsory	2
Practical exercise	Application of agroecosystem model frameworks	Compulsory	1
Seminar	Analyses on grass-based dairy systems	Compulsory	1
Prerequisits for Admission to the Examination(s)			
The prerequisite for admission to the examination is a passed and graded seminar paper, including a written paper and an oral presentation. The grade is included in the examination grade at a rate of 50% only to improve the grade.			

Examination(s)				
Examination Name	**Type of Examination**	**Evaluation**	**Compulsory / Optional**	**Weighting**
Oral Examination: Modelling Grass-Based Dairy Systems	Oral Examination	Graded	Compulsory	100

Further Information on the Examination(s)

1.+2. period in summersemester
1. period in wintersemester

QIS 70700 with number of Examination 70710

Course Content

Participants of this module are taught in the theoretical background and the application of agroecosystem models to simulate yield formation and matter fluxes in forage production systems for dairy cattle. The module focusses on grass-based systems such as permanent grasslands used for silage and grazing as well as ley-arable systems combining clover-grass with arable crops in a crop rotation. A main focus of the module will be the modelling of nitrogen (N) fluxes in different dairy systems. The lecture provides the theory of crop modelling, from empirical to mechanistic model approaches and gives a broad range of examples for the application of grass and crop models. Furthermore, the lecture informs on the benefits of modelling and for which types of studies and research questions model approaches can provide deeper insights and process-understanding. The lecture also introduces specific agroecosystem models used to simulate all relevant processes and feedbacks in the soil-plant-atmosphere system, including nutrient and greenhouse gas fluxes. In the exercise, students are introduced to the application of a widely used agroecosystem model framework and work on pre-defined exercises that aim to sensitize students to the relevant impact factors for different processes in forage production systems. The exercises mainly deal with the impact of soil, management including animals and cultivated crops on yield and environmental impact of the forage production systems with special emphasize to N fluxes. Students are provided with data to set up and evaluate their model runs. Finally, students work independently on individual exercises that have to be completed by using the agroecosystem model framework and the respective results are presented at the end of the course

Learning Outcome

Students achieve knowledge on the principles of modelling plant growth and matter fluxes in agroecosystems with a specific focus on N cycling in grass-based dairy systems. The theoretical background and the application of agroecosystem models will improve the understanding of processes and feedbacks in the soil-plant-atmosphere system. By the completion of the exercises, students develop or improve practical knowledge on the application of the agroecosystem model software, data handling, sensitivity analyses, parameter optimization and model evaluation. During the seminar part of the module, the students improve their abilities to interpret, visualize and present their results. Overall, this module will improve the students' system-thinking and ability to assess forage production systems in terms of potential synergies and trade-offs of different goals (productivity vs. environmental footprint).

Reading List

Holzworth et al. (2018): APSIM Next Generation: Overcoming Challenges in Modernising a Farming Systems Model. Environmental Modelling & Software 103, 43–51, https://doi.org/10.1016/j.envsoft.2018.02.002.
APSIM General Training Manual https://www.apsim.info/Documentation/TrainingManualsandResources/APSIMGeneralTrainingManual.aspx
Further material will be provided during the course

Additional Information
Maximum number of participants: 20 Enrollment by OLAT.

Use	**Compulsory / Optional**	**Semester**
Master, 1-Subject, Agricultural Sciences, Specialisation Agricultural Economics, (Version 2017)	Optional	-
Master, 1-Subject, Agricultural Sciences, Specialisation Agribusiness, (Version 2017)	Optional	-
Master, 1-Subject, Agricultural Sciences, Specialisation Crop Sciences, (Version 2017)	Optional	-
Master, 1-Subject, Agricultural Sciences, Specialisation Animal Sciences, (Version 2017)	Optional	-
Master, 1-Subject, Agricultural Sciences, Specialisation Environmental Sciences, (Version 2017)	Optional	-
Master, 1-Subject, Dairy Science, (Version 2017)	Optional	-
Master, 1-Subject, Nutritional and Food Science, (Version 2013)	Optional	-
Master, 1-Subject, Nutritional and Consumer Economics, (Version 2017)	Optional	-