Tárgytematika / Course Description
Crop growth models and plant physiological analysis

N_DMA08

Tárgyfelelős neve / Teacher's name: dr. Neményi Miklós
Félév / Semester: 2023/24/2
Beszámolási forma / Assesment: Vizsga
Tárgy heti óraszáma / Teaching hours(week): 0/0/0
Tárgy féléves óraszáma / Teaching hours(sem.): 30/0/0

OKTATÁS CÉLJA / AIM OF THE COURSE

Short Description of the Course:
The course will cover the basic principles and applications of crop growth simulation models. Crop growth simulation modelling is a systematic approach and powerful tool for gaining quantitative and mechanistic understanding of crop-weather-soil-management relationships and interactions, as well as for helping improve and optimize crop management based on growing season characteristics and management options. Simulation models are traditionally carried out by using conventional experience-based agronomic research in which soil-plant-atmosphere system functions are derived from statistical analysis. The structure of crop models and simulation techniques will be illustrated (e.g., data request, models structure and application of models). In the course, principles of theoretical crop production ecology will be explained. Applications of crop simulation models will also be demonstrated using practical examples. This course will provide an introduction to the basic concepts, issues, opportunities and difficulties involved with using some of the model tools with management information. Students will have the opportunity to gain first-hand experience of running simulations on a wide range of scenarios for corn and wheat yields. In the most satisfactory crop growth models the validation of the models are used to predict crop response to different climate change models or agricultural management (e.g., hybrids or dates of seeding) and offers great potential to make good decisions.

TANTÁRGY TARTALMA / DESCRIPTION

1. Overview of physical and biological systems in the soil-plant-atmosphere system.
2. Simulation of solar radiation (accumulation of dry matter in soil), photosynthesis, evaporation and water demand on cultivars.
3. Overview of crop systems models (historic background and general); importance of decision support models in agriculture.
4. Structure of crop growth models (structure, data request, etc.).
5. Fields experiments and data requirements for adapting and using crop models and validation of models.
6. Climate change and plant growth: adaption and use of different climate models.
7. Decision support models in precision agriculture.
8. Case study: simulation of maize hybrid growth and development with various input data.
9. Case study: simulation of wheat hybrid growth and development with various input data.
10. Genetic factors of winter and summer cereals, ecological and nutrient demand, physiological responses.
11. Maize production for different utilization; phenological development and environmental demand under various management practices (in particular for sustainable crop production).
12. Oil seed phenology and development in Hungarian environmental conditions.

13. Analysis of effects on soil cultivation, seeding, harvesting and the physiological growth and development of cultivars.

SZÁMONKÉRÉSI ÉS ÉRTÉKELÉSI RENDSZERE / ASSESMENT'S METHOD

Meeting the conditions set by the supervisor.

KÖTELEZŐ IRODALOM / OBLIGATORY MATERIAL

Fischer, G., Shah, M., Tubiello, N. F., Velhuizen, H. (2005): Socio-economic and climate change impacts on agriculture: an integrated assessment, 1990-2080. Philosophical Transaction of the Royal Society. 360, pp. 2067-2083. (doi: 10.1098/rstb.2005.1744)
Fischer, G., Shah, M., Velthuizen, H., Nachtergaele, F. (2006): Agro-ecological zones assessment. EOLSS Publishers. Oxford, UK.
Hoogenboom, G., Jones, J. W., Porter, C. H., Wilkens, P. W., Boote, K. J., Hunt, L. A. ,Tsuji, G. Y. (2010): Decision Support System for Agrotechnology Tranfer (DSSAT) Version 4.5 (CD-ROM), volume 1. Overview. University of Hawaii, Honolulu.
Hoogenboom, G., Jones, J., Porter, C. H., Wilkens, P. W., Boote, K. J., Batchelor, W. D., Hunt, L. A., Tsuji, G. Y. (2003): Decision Support System for Agrotechnology Transfer (DSSAT) Version 4.0, volume 1. Overview. University of Hawaii, Honolulu.
Radics L. (szerk.) (2010): Fenntartható szemléletű szántóföldi növénytermesztés I., II., III. Budapest, Agroinform Kiadó
Nagy J. (2008): Maize Production. Budapest, Akadémiai Kiadó

AJÁNLOTT IRODALOM / RECOMMENDED MATERIAL