

*Faculty of Agronomy
Institute of Agroecosystems and Soil Sciences
Vytautas Magnus University, Agriculture Academy*

COURSE DESCRIPTION

Code of the study subject: AGR8003

Title of the study subject:

in Lithuanian: Agroekologija

in English: Agroecology

Course volume: 7 credits, 187 hours, including 46 hours of contact work and 141 hours of independent work.

Dalyko anotacija lietuvių kalba

Agroekologijos samprata. Agroekosistemų principai, raida ir valdymas. Žemės ūkio augalų biocenozės ryšiai ir juos įtakojantys aplinkos veiksniai. Kintančio klimato ir dirvožemio agroekologinė reikšmė žemės ūkio gamybai. Pagrindinės industrinio žemės ūkio sąlygojamos agroekologinės problemos. Darnaus vystymosi koncepcija. Šiuolaikinių žemdirbystės sistemų vertinimas ilgalaikio ekologiškai stabilaus funkcionavimo požiūriu.

Dalyko anotacija anglų kalba

Agroecology concept. Fundamentals, development and management of agro-ecosystems. Relation of agricultural plant biocenosis and environmental factors affecting them. Agroecological significance of changing climate and soil for agricultural production. Major agroecological problems caused by industrial agriculture. The concept of sustainable development. Assessment of modern farming systems in terms of long-term ecologically stable functioning.

Forms and volume of work:

<i>Forms of contact work</i>	<i>Hours</i>	<i>Forms of independent work</i>	<i>Hours</i>
Lectures	42	Preparation for the test	26
Consultations	2	Preparation of an essay	35
Examination	2	Preparation for the exam	80

The purpose of the subject:

<i>Study cycle</i>	<i>Study programme</i>	<i>Subject type</i>
Third	Agronomy	Optional

Objective of the study subject: on the basis of the obtained knowledge, to assess the concepts, principles, development and biocenotic relationships of the ecosystems and agricultural systems as well as the effects of external conditions on the formation of these relationships.

Qualifications necessary for enrolment on the study programme: master's degree in agricultural sciences (preferably in agronomy (01 A) or a single-cycle higher education degree.

Outcomes of the study programme:

Knowledge and its application: a PhD student knows and is able to apply: the concept, structure and functioning of agro- and eco-systems and their management possibilities, the anthropogenic effect on

the formation of agroecological problems and solutions to these problems, the role of agricultural intensity in shaping general ecological status of the country, biosphere, water, air and soil resources, their pollution and protection, integrated application of the related fundamental and the latest knowledge of different branches of science.

Capacity to carry out research: to identify agroecological problems and their causes, to select the appropriate cause and effect assessment methods for the analysis of agroecological problems, to generate novel, original ideas, solutions and conclusions based on theoretical and practical data from agroecological experiments.

Special competences: to demonstrate agroecological understanding of the agricultural activity, to interpret agroenvironmental decisions, to understand the interface between man and environment, to scientifically assess the processes of the agroecosystem; to select rational, agricultural systems management practices/methods based on the original scientific research data, to describe energy cycling, biocenotic relationships and conditions for their control in the agroecosystem, to estimate the impact of changing climate on the agroecosystems and their adaptive capabilities, to plan sustainable use of genetic resources of agroecosystems and ecosystems.

Social skills: to be able to communicate with colleagues, scientific community and the public while developing and transferring innovations of their activity field; to perceive mankind as a factor which has the greatest environmental impacts; to foster technical, social and cultural progress favouring the development of society.

Personal skills: take responsibility to fully appraise, solve and creatively develop the problematic aspects of the subject area; be able to reveal and develop creative intellectual personal capabilities; be able to think creatively, critically and self-critically and to make use of various original concepts and information.

Assessment criteria of the subject study results:

1. Knowledge of the theoretical and practical aspects of the agroecology science and ability to apply them.
2. Understanding of social, ecological, and economic consequences of agricultural industrialization.
3. Ability to identify the demands and prospects of sustainable food production system; the role of different-intensity agriculture in the overall ecological status of the country and possibilities to improve it.
4. To summarize the agroecological significance of climate and soil for agricultural production on the global and local scale.
5. Ability to manage the complexity of environmental factors, to adapt the regularities of population processes in the agroecosystems.
6. Ability to evaluate biospheric resources, identify and rationally use genetic resources of the ecosystems and agroecosystems.
7. Ability to simulate energy flows of the agroecosystem.
8. Ability to combine, summarize and integrate the knowledge of different fields of science.
9. Ability to personally develop, project further prospects of learning, take responsibility to critically assess strategic decisions of his/her area of activity, ability to reveal and develop personal creative and intellectual competences.

Course content:*Lectures:*

1. Introduction to the agroecology.
2. Evolution of the agroecology. Agroecology as a separate branch of science.
3. Agroecological problems.
4. Concept of agroecology.
5. Effects of climate and its change on the agroecosystems.
6. Soil and land assessment and protection.
7. System-level agroecological interactions.
8. Agricultural crops and environmental factors. External conditions for the formation of plant biocenotic relationships.
9. Agroecological role of animal husbandry.
10. Genetic resources of agroecosystems.
11. Energetics of agroecosystems.

Study methods: use of multimedia equipment and/or a graphic projector in lectures, the lecture material is illustrated by slides. Individual work. Each PhD student is given an individual task for systemic analysis on the basis of which essay is prepared.

The written essay is presented verbally in the form of a scientific discussion. The presentation is followed by a discussion. Control work/test is done in writing or verbally (when no group of PhD students is present). Control work is designed to check the student's knowledge and competences upon completion of the part of the study programme. Besides answering theoretical questions, a student describes agroecological problems and provides an analysis of problem solution methods and implementation possibilities, which show the PhD student's ability to creatively and independently apply the knowledge and formulate targeted solutions. At a scheduled time, PhD students are additionally consulted directly or in the cyberspace.

If there is no minimal number of students necessary for delivering a lecture, the studies are organized in the form of consultations. An individual timetable of consultations is made. A student individually studies the literature indicated by the lecturer. At a time scheduled for each subject's topic, a direct consultation is arranged to estimate the student's achievements and to explain the questions that need extra attention and to clarify the essential aspects of the topics under analysis.

Methods and structure of cumulative assessment of students' achievements: a ten-point scale criterion and cumulative assessment scheme are applied. Scientific discussions are encouraged. Tasks of independent work during the semester – essay (written and verbal presentation) and individual control work/test (in writing or verbally) – assessed by giving marks, final assessment is determined during the exam by multiplying the mid-term assessments by the weighting factor and by adding the products. The assessment point is determined according to the PhD student's ability to comprehensively and systematically analyse the given problematic questions and to participate in the interdisciplinary discussions. The assessment of student's knowledge and competences during the exam (oral examination) and the final assessment are done by the commission composed of three members: a lecturer coordinating the subject studies, a lecturer, and a supervisor or consultant of the student.

Structure of cumulative assessment

<i>Work forms</i>	<i>Weighting factor</i>	<i>Scheduled dates</i>
Test/control work	0.10	8 th week
Essay	0.20	10 th week
Exam	0.70	17 th -20 th week

Major sources of study:

1. Agroekosistemų komponentų valdymas. Sudaryt. Tripolskaja L. ir kt. Akademija, Kėdainių r., 2010. 568 p.
2. Brazauskienė D. Agroekologija ir chemija. K., Naujasis lankas, 2004. 207 p.
3. Dalgaard T., Hutchings N.J., Porter J.R. Agroecology, scaling and interdisciplinarity. Agriculture, Ecosystems and Environment, 100, 2003. 39–51 p.
4. Forskning G. Fate and biological effects of pesticides in soil and water ecosystems. The Norwegian Crop Research Institute. 2002. 216 p.
5. Gliessman S.R. Field and Laboratory Investigations in Agroecology. 2nd edition. CRC Press, 2007. 302 p.
6. Gliessman S.R. Agroecology: The Ecology of Sustainable Food System. CRC Press, New York, 2007. 384 p.
7. Lazauskas P., Pilipavičius V. Agroekologija. Mokomoji knyga. LŽŪU, Akademija. UAB „IDP Solutions“ 2008. 133 p.
8. Marozas V. Sausumos ekosistemų įvairovė ir apsauga. Vadovėlis. LŽŪU. UAB “IDP Soliutions”. 2008. 246 p.
9. Scientific journals – Agriculture, Ecosystems and Environment; Agricultural Systems; Journal of Applied Ecology; Agronomy for Sustainable Development; European Journal of Agronomy ir kt.
10. Newton P.C.D., Carran R.A., Edwards G.R., Niklaus P.A. Agroecosystems in a Changing Climate. CRC Press, USA. 2007. 364 p.
11. Wojtkowski P. A. Introduction to Agroecology: Principles and Practices. 2006. 403 p.

Additional sources of study:

1. Altieri M.A. Agroecology. Westview Pres, 1995. 431 p.
2. Baltrėnas P., Lygis D. ir kt. Aplinkos apsauga. Enciklopedija. V., 1996. 287 p.
3. Bučienė A. Žemdirbystės sistemų ekologiniai ryšiai (monografija). Klaipėda: LKU leidykla, 2003. 176 p.
4. Galminas Z. Melioracija ir aplinkosauga. V., 1999. 225 p.
5. Holmgren D. Permaculture: principles and pathways beyond sustainability. Holmgren design services. Australia. 2004. 286 p.
6. Jankauskas B. Dirvų apsauga nuo erozijos. Vilnius. 1990.
7. Kormondy J.E. Ekologijos sąvokos. Litera Universitati Vytauti Magni. 1992. 320 p.
8. Lietuvos žemės našumas. Sudarytojas Mažvila J. Akademija, Kėdainių r., 2011. 280 p.
9. Loomis R.S., Connor D.J. Crop ecology. Cambridge university press. 1992. 538 p.

10. Mokslinės duomenų bazės – Web of Science; Science direct; Agricola, ir kt.
11. Nadzeikienė J. Aplinkos apsaugos inžinerija. Mokomoji knyga. Aleksandro Stulginskio universitetas. Akademija, Kauno r., 2012. 120 p.
12. Ozolinčius R. Aplinkos ištekliai. Kaunas, VDU leidykla. 2005. 211 p.
13. Pilipavičius V., Navickas K. Atsinaujinantys agrariniai ištekliai ir atliekų perdirbimas. Mokomoji knyga. LŽŪU, Akademija. UAB „IDP Solutions“ 2008. 142 p.
14. Pilipavičius V., Pupalienė R., Marcinkevičienė A. Pasėlių bendrijos ir jų tyrimai. Mokomoji knyga. LŽŪU, Akademija. UAB „IDP Solutions“ 2008. 112 p.
15. Pleijelis H. Knyga apie ekologiją. Vilnius, 1994. 96 p.
16. Raškauskas A. Bendroji ekologija. V., 1991. 239 p.
17. SOER 2015 — The European environment — state and outlook 2015. [interaktyvus] [žiūrėta 2016 m. sausio 18 d.]. Prieiga per internetą: < <http://www.eea.europa.eu/soer> >
18. Stončius D. Gamtotvarkos vaidmuo saugant biologinę įvairovę. V., 2001. 85 p.
19. Stravinskienė V. Ekologijos įvadas. K., 2001. 155 p.
20. Stravinskienė V. Bendroji ekologija. K., 2003. 232 p.
21. Tausojamoji žemdirbystė našiuose dirvožemiuose. Sudarytoja Maikštėnienė S. Akademija, Kėdainių r., 2008. 327 p.
22. Tivy J. Agricultural Ecology. Longman Scientific and Technical. 1990. 374 p.
23. Tumas R. Vandenų ekologija. LŽŪU, VDU., K., 1999. 132 p.
24. Velička R., Pupalienė R. Demografinės padėties, klimato kaitos ir agroekologijos sąsajos. mokomoji knyga. LŽŪU, Akademija, 2010. 98 p.
25. Черникова В.А., Чекереса А.И. Агроэкология. Москва, Колос. 2000. 535 с.

Lecturer coordinating the studies of the subject: prof. habil. dr. Rimantas Velička, VMU Faculty of Agronomy, Institute of Agroecosystems and Soil Sciences.

Other lecturers of the subject: prof. habil. dr. Rimantas Velička, VMU Faculty of Agronomy, Institute of Agroecosystems and Soil Sciences; dr. Žydrė Kadžiulienė, Institute of Agriculture, LRCAF (LAMMC).

The description of the study programme has been prepared by: prof. habil. dr. Rimantas Velička; dr. Žydrė Kadžiulienė.

Reviewers:

Reviewer from VMU Faculty of Agronomy Institute of Agroecosystems and Soil Sciences: prof. dr. Kęstutis Romaneckas *Reviewer appointed by the Committee of PhD Studies in Agronomy:* assoc. professor, dr. Steponas Raudonius, prof. habil. dr. Pavelas Duchovskis, dr. Vita Tilvikienė.

Approved at the meeting of VMU Faculty of Agronomy Institute of Agroecosystems and Soil Sciences on 19 04 2019, protocol No. 6(6)

Approved in the meeting of the programme's Doctoral Studies Committee on , protocol No.

Description of the subject has been certified until .