

Ministry of Education and Science of Ukraine Sumy National  
Agrarian University

Faculty of Agricultural Technologies and Environmental Management Department of  
Agricultural Technologies and Soil Science

**Work program (syllabus) of the educational component STABILITY AND**

**SUSTAINABILITY OF AGROECOSYSTEMS**


Compulsory

Implemented within the educational program

**AGRONOMY**


<b>Specialty</b>	201 Agronomy
<b>Educational program</b>	Agronomy
<b>Level of higher education</b>	Third (Doctor of Philosophy)

**Sumy – 2025**

Developer :  Melnyk A. V., d. ag. s., professor

Considered, approved and ratified at a meeting of the Department of Horticulture and Forestry.  
Minutes No. 14 dated 03 06 20 21

Agreed:

Guarantor of the educational program:  Andriy MELNYK

## 1. GENERAL INFORMATION ABOUT THE EDUCATIONAL COMPONENT

1.	Name of EC	Stability and sustainability of agroecosystems								
2.	Faculty/Department	Agrotechnologies and Environmental Management / Agrotechnologies and Soil Science								
3.	EC status	Mandatory								
4.	Program/Specialist (programs) that include EC	Agronomy / 201 – Agronomy								
5.	EC may be proposed for (for selective ECs)									
6.	NRK level	HPK Ukraine – level 8, FQ-EHEA – third cycle, EQF LLL – level 8								
7.	Semester and duration of study	2nd year; 3rd semester, 13 weeks								
8.	Number of ECTS credits	3.0								
9.	Total number of hours and their distribution	Total number of hours	Contact work (classes)						Independent work	
			Lectures		Practical		Laboratory		full-time	part-time
			Day	Part-time	Full-time	Part-time	full-time	part-time		
90	20	-	20	-	-	-	50			
10.	Type of control	Credit								
11.	Language of instruction	Ukrainian								
12.	Lecturer/Coordinator of the educational component	Andriy Vasylovych Melnyk								
13.	Contact	<p>Professor of the Department of Agricultural Technology and Soil Science  Office 21t, Building of Agricultural Technology and Environmental Management  Email <a href="mailto:melnyk_ua@yahoo.com">melnyk_ua@yahoo.com</a>  Teacher profile - <a href="https://agro.snau.edu.ua/kafedri/kafedra-sadovo-parkovogo-ta-lisovogo-gospodarstva/sklad-kafedri/melnik-andrij-vasilovich/">https://agro.snau.edu.ua/kafedri/kafedra-sadovo-parkovogo-ta-lisovogo-gospodarstva/sklad-kafedri/melnik-andrij-vasilovich/</a></p>								
14.	General description of the educational component	<p>The discipline “Stability and Sustainability of Agroecosystems” focuses on the study of the theoretical and practical foundations of the sustainable functioning of plant ecosystems. The course examines the photosynthetic activity of agroecosystems, approaches to their stabilization, and ecotonic relationships that arise during the production process under the complex influence of abiotic, edaphic, biotic, and anthropogenic factors. Special attention is given to the study of stress factors affecting agroecosystems and to methods of reducing their negative impact in order to ensure the maximum realization of the biological potential of productivity and quality indicators of agroecosystems.</p> <p>The stability of an agroecosystem is defined as its ability to withstand the negative effects of unfavorable environmental factors (abiotic and biotic) without significant reductions in productivity and product quality.</p>								
15.	The purpose of the educational component	The aim of studying this discipline is to provide students with theoretical and practical knowledge of the main indicators for establishing the dependencies and patterns of influence of climatic conditions and modern cultivation technology elements for the maximum possible realization of biological potential, stability, and sustainability of the agroecosystem.								
16.	Prerequisites for studying EC, connection with other educational components of the educational program	<p>Prerequisites: Modern aspects of agriculture, Selection and seed research methods in agronomy, Modern global agricultural technologies, Modern biotechnology, Methodology of scientific research.</p> <p>Post-requisites: Organization of scientific publications and dissertation writing; abstracts and articles, dissertation.</p>								
17.	Academic integrity policy	<p>During the educational process, the following actions are unacceptable:</p> <ul style="list-style-type: none"> <li>using sources of information that are not permitted by the instructor, including oral sources (hints), written sources (works of other persons), printed materials (books, methodological manuals), and electronic devices (mobile phones, tablets, etc.);</li> <li>asking for, providing, or receiving assistance from third parties (including acting as a proxy) during current, modular, semester, or final assessments; using personal, family, or professional connections to obtain a higher or positive grade;</li> <li>altering or attempting to influence the academic grade received;</li> <li>submitting written work prepared with the participation of other persons as one’s own;</li> <li>falsifying or fabricating information or research results for subsequent use in scientific papers or dissertations;</li> <li>offering bribes in order to obtain advantages in educational or research activities.</li> </ul>								

		Cases of violations of academic integrity by students are considered in accordance with the Code of Academic Integrity of Sumy National Agrarian University, which defines the procedures and powers of the relevant bodies responsible for addressing such violations: <a href="http://docs.snau.edu.ua/documents/education/quality/kodeks_akadem_dobrochesnosti.pdf">http://docs.snau.edu.ua/documents/education/quality/kodeks_akadem_dobrochesnosti.pdf</a>
18.	Keywords	Agro-system, biodiversity, stability and sustainability, agrocenosis, stress, agronomic audit.

## 2. LEARNING OUTCOMES FOR THE EDUCATIONAL COMPONENT AND THEIR RELATIONSHIP TO THE PROGRAMME LEARNING OUTCOMES

Learning outcomes for the educational component: After studying the educational component, the applicant is expected to be able to...	Program learning outcomes that the EC is aimed at achieving (indicate the number according to the numbering given in the OP)				How RND is assessed
	PRN <sub>1</sub>	PRN <sub>3</sub>	PRN <sub>5</sub>	PRN <sub>7</sub>	
<b>DRN 1.</b> Apply advanced conceptual and methodological knowledge in the philosophy of science, agronomy, and related scientific fields, as well as research skills necessary for planning and conducting relevant applied scientific research.	x				Assessment methods include multiple-choice tests, solving calculation problems, oral defense of practical work, and careful checking and analysis of completed tasks.
<b>DRN 2.</b> Plan and conduct theoretical and experimental research in agronomy and related scientific fields using modern methods, technologies, and research tools; critically analyze the results of one's own research and the results of other researchers in the context of the current body of knowledge on the problem under study.		tests			Assessment methods include multiple-choice tests, solving calculation problems, oral defense of practical work, and careful checking and analysis of completed tasks.
<b>DRN 3.</b> Present and discuss research results, scientific issues, and applied problems in agronomy with specialists and non-specialists in both the state and foreign languages, and competently disseminate research results through scientific publications in leading international journals.			x		Assessment methods include multiple-choice tests, solving calculation problems, oral defense of practical work, and careful checking and analysis of completed tasks.
<b>DRN 4.</b> Demonstrate a deep understanding of the general principles and methods of agricultural sciences, as well as the methodology of scientific research, and apply them in one's own research in agronomy and in teaching practice.					multiple-choice tests, solving calculation tasks, oral defense of practical work, and careful checking and analysis of completed assignments.

### 3. CONTENTS OF THE EDUCATIONAL COMPONENT (ACADEMIC DISCIPLINE PROGRAM)

Issues to be covered	Distribution within the overall time budget						Recommended literature for
	Classroom work				Self-study		
	Lectures		Practical sessions		DF	SF	
	DF	ZF.	DF	Z.F.			
<b>Module 1. Components of agrosystem functioning</b>							
<b>Topic 1. Agricultural System: Structure and Interrelationships Between Its Elements</b> Plan: Types of ecosystems. Main factors influencing plant growth and development. Vulnerability of agroecosystems.	2		2		5		1, 9,10
<b>Topic 2. Current Trends in Climate Change in the World and in Ukraine</b> Plan: Trends in rising temperatures. Precipitation deficit. Heat and drought. Soil salinization. Carbon footprint.	2		2		5		1, 14, 17, 22
<b>Topic 3. Agroecosystems as a Structural Element of the Agricultural System</b> Plan: Characteristics of an agroecosystem. Structure of an agroecosystem.	2		2		5		1, 9, 10, 15
<b>Topic 4. Biodiversity and the Production Process of Agroecosystems</b> Plan: Problems of biodiversity conservation. Basic principles of agroecological monitoring.	2		2		5		1, 2, 10, 15
<b>Topic 5. Physiology of Stress and Ways to Reduce Its Negative Impact on Agroecosystems</b> Plan: Types of stress in plants (in agroecosystems). Adaptability of plant organisms. Modern methods for measuring plant stress.	2		2		5		1, 19, 23
<b>Module 2. Ways to improve the stability and sustainability of the agroecosystem</b>							
<b>Topic 6. Theoretical Foundations for Improving the Resilience of Agroecosystems. Plant Adaptation</b> Plan: Resilience of agroecosystems to adverse environmental factors. Types of plant adaptations.	2		2		5		1, 19, 23, 25
<b>Topic 7. Ecological Plasticity and Stability of Agroecosystems</b> Plan: Improving the ecological stability of crop varieties and agroecosystems. The importance of agroecosystem stability.	2		2		5		1, 12, 25

<b>Topic 8. Management and Design of Stable Agroecosystems</b> Plan: Formation of agroecosystems. Allelopathy. Problems and prospects for the use of allelopathy in the formation of agroecosystems.	2		2		5		1, 12, 22, 25
<b>Topic 9. Technological Principles for Improving the Stability of Agroecosystems</b> Plan: Adaptive cultivation technologies. Modern methods for measuring the photosynthetic activity of agroecosystems. Advanced diagnostics of nutrient availability (N-test, field analyzers, and laboratory equipment). Quality management of agroecosystems.	2		2		5		1, 18, 19, 24
<b>Topic 10. Agronomic Audit: Methodology and Methods for Comprehensive Assessment of the State of Agroecosystems of Agricultural Crops</b> Plan: Methodology for comprehensive assessment of the state of agroecosystems. Existing methods of agroecological monitoring using GIS technologies and specialized software.	2		2		5		1, 5
<b>Total</b>	<b>20</b>		<b>20</b>		<b>50</b>		

#### 4. TEACHING AND LEARNING METHODS

DRN	Teaching methods (work to be done by the teacher during classroom sessions, consultations)	Number of hours		Learning methods (what types of learning activities should the applicant perform independently)	Number of hours	
		day	part-time		day on	part-time
<b>DRN 1.</b> Apply advanced conceptual and methodological knowledge in the philosophy of science, agronomy, and related scientific fields, as well as research skills necessary for planning and conducting relevant applied scientific research.	Lecture, presentation, discussion, explanation of problem solving	10		Taking notes, lecture notes, careful rereading; solving calculation problems; working with additional literature; preparing reports, presentations; completing individual assignments.	10	
<b>DRN 2.</b> Plan and conduct theoretical and experimental research in agronomy and related scientific fields using modern methods, technologies, and research tools; critically analyze the results of one's own research and the results of other researchers in the context of the current body of knowledge on	Educational lecture, presentations, discussion, explanations practical work	10		Taking notes and summaries lectures, their careful rereading; solving computational problems; working with additional literature; preparation of reports, presentations; implementation individual tasks; conducting laboratory research and defending work after implementation.	20	

the problem under study.					
<b>DRN 3.</b> Present and discuss research results, scientific issues, and applied problems in agronomy with specialists and non-specialists in both the state and foreign languages, and competently disseminate research results through scientific publications in leading international journals.	Educational lecture, presentation, discussion, explanation solving tasks	10		Taking notes, summaries lectures, careful rereading of them; solving calculation problems; working with additional literature; preparation of reports, presentations; execution individual assignments.	10
<b>DRN 4.</b> Demonstrate a deep understanding of the general principles and methods of agricultural sciences, as well as the methodology of scientific research, and apply them in one's own research in agronomy and in teaching practice.		10		Keeping records, notes lectures, carefully rereading them; solutions to computational problems; working with additional literature; preparation of reports, presentations; implementation individual tasks.	10
<b>Total</b>		<b>40</b>			<b>50</b>

### 5. ASSESSMENT BY EDUCATIONAL COMPONENT

Continuous assessment is used for assessment by educational component – this is a combination of summative and formative assessment. Continuous assessment is used to establish feedback with students and summative assessment to record grades. It is essential that the assessment method allows for verification of whether the established learning outcomes have been achieved. To this end, several methods are used simultaneously.

#### 5.1. Summative assessment

*Summative assessment* summarizes the student's learning activities at a certain point in time, usually at the end of modules (module 1, module 2) and certification. Summative assessment can be described as an assessment at the end of a course that allows you to determine the level of student achievement, summarizing a certain stage of learning.

##### 5.1.1. The following methods are used to assess the expected learning outcomes

No	Methods of summative assessment	Points / Share in the overall assessment	Date of completion
			Full-time
<i>Module 1. Components of agrosystem functioning (topics 1-5)</i>			
1.	Defense of completed practical work, or control test	20 points / 20%	1 semester Up to 5 weeks
<i>Module 2. Ways to improve the stability and sustainability of the agroecosystem (topics 6-10)</i>			
2.	Defense of completed practical work or control test	20 points / 20%	1 semester up to week 12
3.	Presentation, report (independent work)	30 points / 30%	1st semester Exam week
4	Exam (detailed written answer to questions or test)	30 points / 30%	1st semester during exam session

##### 5.1.2. Assessment criteria

Component	Unsatisfactory	Satisfactory	Good	Excellent
Protection of completed practical/laboratory work, or a control test (multiple-choice questions)	<b>&lt;9 points</b> Requirements for the task not completed, practical skills not developed.	<b>9-12 points</b> Most requirements have been met, but some components are missing or insufficient reveal, when answering questions of practical nature,	<b>13-16 points</b> All requirements of the task have been fulfilled, has practical skills, expresses their thoughts on the reasons for certain other questions, but is assumed certain inaccuracies and errors in the logic the presentation	<b>17-20 points</b> All task requirements have been fulfilled, creativity and thoughtfulness have been demonstrated. thoughtfulness, freely uses acquired theoretical knowledge in analyzing practical of the material,

		reveals inaccuracies in knowledge.	theoretical content or, when analyzing practical level.	expresses his attitude to those or other problems, demonstrates a high level of mastery of practical skills.
Control test (questions from multiple choice)	<b>&lt;9 points</b>	<b>9-12 points</b>	<b>13-16 points</b>	<b>17-20</b>
	student solved less than 60.5% of proposed set of test tasks	student solved 60.5-79% of proposed set of test tasks	student decided 80-94% of proposed set of tests tasks	– student decided 95-100% of proposed set of tests tasks
Defense of independent work (presentations, or agromonitoring of the agrocenosis)	<b>&lt;15 points</b>	<b>16-20 points</b>	<b>21-25 points</b>	<b>25-30 points</b>
	students partially and superficially revealed only individual provisions the question and admitted in certain significant errors, which significantly affected the general understanding of the issue.	students correctly determined the essence the issue, insufficiently or superficially revealed most its individual provisions and making some mistakes that partially affected the overall understanding of the issue.	students correctly determined the essence questions, but revealed it not completely, by making some minor errors that do not affect the overall understanding of the issue.	students fully and thoroughly revealed theoretical issues, used in not only mandatory, but also additional literature
	<b>&lt;60</b>	<b>60-74</b>	<b>75</b>	<b>91</b>

### 5.2. Formative assessment:

Formative assessment is used to evaluate current progress in learning and identify areas for further improvement. It is a source of information about the success of learning outcomes for both teachers and students. Formative assessment is usually conducted during the course of study. The results of the students' assessment tasks help the teacher make decisions about the nature of further learning.

No.	Elements of formative assessment	Date
1	Oral questioning after studying topics 1-5	Week 5
2	Oral test after studying topics 6-10	Week 12
3.	Careful review and analysis of completed assignments and tests	Weekly, throughout the study of the discipline
4.	Oral defense of completed practical and laboratory work	Within 1 week after completion this work
5.	Individual discussions about the results of completed tasks	Weekly, throughout the course of study the discipline
6.	Oral feedback from the teacher and students during preparation for defending independent work	Throughout the course

### 5.3. Distribution of points received by students during the study of EC

Ongoing testing and independent work													Total for modules	Exam	Total points
Content module 1 (0-20)					Content module 2 (0-50)										
T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13			
2	3	5	5	5	2	3	5	5	5	10	10	10	70	30	10

T1, T2 ... T13 – topics of content modules.

### Grading scale: national and ECTS

Total points for all types of educational activities	ECTS grade	Assessment on the national scale for exams, course projects (work), practical training
90–100	<b>A</b>	excellent
82	<b>B</b>	good
75-81	<b>C</b>	
69-74	<b>D</b>	satisfactory
60-68	<b>E</b>	
35	<b>FX</b>	unsatisfactory with the possibility of re-retake
1-34	<b>F</b>	unsatisfactory with mandatory retake of the course

## RECOMMENDED LITERATURE

### Basic Literature

1. Melnyk, A. V., Danko, Yu. I., Mishchenko, Yu. G., et al. (2025). Agronomy: Textbook for the Third (Educational and Scientific) Level of Higher Education in the Specialty N1 Agronomy. Edited by A. V. Melnyk and Yu. I. Danko. Odesa: Oldi+. 550 p. (Series “To Help Postgraduate Students”).
2. Mishchenko, Yu. G. (2023). Agroeconomic and Environmental Assessment of Crop Rotation. Monograph. Sumy: University Book. 225 p.
3. Monitoring and Protection of Biodiversity in Ukraine: Animal World. (2020). Series “Conservation Biology in Ukraine”, Issue 16, Vol. 2. Kyiv–Chernivtsi: Druk Art. 248 p.
4. Rudyk, O. L., & Lavrynenko, S. O. (2024). Regulation of Weed Infestation in Modern Agroecosystems. Tutorial. Odesa: Oldi+. 104 p.
5. Zhigunov, D. O., Voloshenko, O. S., & Broslavtseva, I. V. (2021). Technology and Quality Assessment of Grain Products. Monograph. Odesa: Oldi+. 225 p.
6. Zozulia, O. L., Mykhalska, L. M., Kovel, O. M., & Shvartu, V. V. (2020). Digital Technologies in Crop Production. Monograph. Kyiv: Institute of Feed Research and Agriculture of Podillia NAAS of Ukraine & Syngenta LLC. 72 p.
7. Mazur, V. A., Palamarchuk, V. D., & Palamarchuk, O. D. (2017). Modern Agrotechnologies in Crop Production. Textbook. Vinnytsia. 588 p.
8. Kharchenko, O. V., Prasol, V. I., Kravchenko, S. M., & Mokrienko, V. A. (2014). Agroeconomic and Ecological Foundations of Forecasting and Programming Crop Yields. Study guide. Sumy: University Book. 240 p.
9. Palamarchuk, V. D., Polishchuk, I. S., Yermakova, L. M., & Kalenska, S. M. (2012). Systems of Modern Intensive Technologies. Educational manual. Vinnytsia. 370 p.
10. Smaglyi, O. F., Kardashov, A. T., Litvak, P. V., et al. (2006). Agroecology. Textbook. Kyiv: Higher Education. 671 p.
11. Sozinov, O. O., Prydatok, V. I., & Lysenko, O. I. (Eds.). (2005). Agrobiodiversity of Ukraine: Theory, Methodology, Indicators, Examples. Book 2. Kyiv: Nychlava. 592 p.
12. Pysarenko, V. M., & Pysarenko, P. V. (2008). Agroecology. Poltava: Poltava State Agrarian Academy. 284 p.
13. Melnyk, A. V. (2013). Agrobiological Features of Growing Sunflower and Spring Rapeseed in the Conditions of the North-Eastern Forest-Steppe of Ukraine. Monograph. Sumy: University Book. 225 p.

### Methodological Support

14. Melnyk, A. V., & Melnyk, T. I. (2025). Lecture Notes for the Course “Stability and Sustainability of Agroecosystems” for PhD students in the specialties N1 Agronomy and E2 Ecology. Sumy. 42 p.
15. Melnyk, A. V., Melnyk, T. I., & Dudka, A. A. (2025). Methodological Recommendations for Independent Work on the Course “Stability and Sustainability of Agroecosystems” for PhD students in the specialties N1 Agronomy and E2 Ecology. Sumy. 31 p.
16. Melnyk, A. V., & Melnyk, T. I. (2025). Methodological Recommendations for Practical Classes on the Course “Stability and Sustainability of Agroecosystems.” Sumy. 12 p.

### Additional Sources

17–25. Scientific articles in international journals (Bulgarian Journal of Agricultural Science; Journal of Central European Agriculture; Pakistan Journal of Botany; Journal of Ecological Engineering; AgroLife Scientific Journal; Plant and Soil Science; Tavriya Scientific Bulletin; Atlantis Press Proceedings). DOI links and URLs are provided for each publication.

### Electronic Resources

26. SNAU Library resources – [<https://library.snau.edu.ua>](<https://library.snau.edu.ua>)
27. SNAU Institutional Repository – [<http://repo.snau.edu.ua>](<http://repo.snau.edu.ua>)
28. V. I. Vernadsky National Library of Ukraine – [<http://www.nbu.gov.ua>](<http://www.nbu.gov.ua>)
29. Electronic Encyclopedia of Agriculture – [<http://www2.agroscience.com.ua>](<http://www2.agroscience.com.ua>)

### Software

30. Microsoft Word
31. Microsoft Excel
32. Microsoft PowerPoint