

**NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL
SCIENCES OF UKRAINE**

Department of Agroecology and Environmental Control

APPROVED

Faculty of Plant Protection,
Biotechnology and Ecology

“21”__05__2025_

CURRICULUM OF ACADEMIC DISCIPLINE

«Agroecology»

Area of knowledge 10 Natural Sciences

Specialty 101 Ecology

Academic programme Ecology

Faculty of Plant Protection, Biotechnology and Ecology

Developed by: Associate Professor, PhD in Agricultural Sciences **L. Vagaliuk**

Kyiv – 2025

Description of the discipline «Agroecology»

The discipline aims to equip students with core knowledge and practical skills for applying ecological principles to the analysis, design and management of sustainable agroecosystems.

Within the course, students study:

- key concepts of systems ecology in agriculture (energy flow, nutrient cycling, trophic interactions);
- legal and policy frameworks for sustainable agriculture and land use (FAO Guidelines, EU Green Deal, national standards);
- methods for assessing soil health, water use efficiency and functional biodiversity;
- design and evaluation of diversified cropping systems (crop rotations, intercropping, agroforestry) and their ecosystem services;
- integrated pest, nutrient and water management based on ecological monitoring and decision-support tools;
- impacts of climate change, land degradation and intensive input use, and strategies for resilience and adaptation.

This discipline integrates theory and hands-on practice (soil assays, field trials, GIS mapping), preparing graduates for roles in agroecological consulting, sustainable farm planning, environmental monitoring and policy development.

Field of knowledge, specialty, educational program, educational degree		
Educational degree	Bachelor	
Specialty	101"Ecology"	
Educational program	Ecology	
Characteristics of the discipline		
Kind of the discipline	Elective	
Total number of hours	150	
Credit amount ECTS	5	
Number of content modules	2	
Course project (work) for availability)	-	
Form of control	Exam	
Indicators of academic discipline for full-time and part-time forms of education		
	Full-time	Part-time
Year of preparation (course)	3	
Semester	6	
Lectures	30	
Practical, seminar classes	30	
Laboratory classes	-	
Individual work	90	
Number of weekly classrooms hours for full-time study	4	

1. Aim, competences and expected learning outcomes of the discipline

The aim of the discipline *Agroecology* is to provide students with fundamental knowledge of ecological principles and their application in agricultural systems. The course emphasizes sustainable land use, biodiversity conservation, and ecological balance in agroecosystems, fostering environmentally responsible approaches to agricultural production.

Competences acquired:

Integral competence (IC): The ability to solve complex specialized tasks and address practical problems in the field of ecology, environmental protection, and sustainable natural resource management, or in the course of study. This involves the application of fundamental theories and methods of environmental sciences and is characterized by complexity and uncertainty of conditions.

General competence (GC):

GC01. Knowledge and understanding of the subject area and professional activity.

GC08. Ability to conduct research at the appropriate level.

GC19. Ability to assess the impact of technogenic processes on the state of the environment and to identify environmental risks associated with industrial activities.

GC27. Ability to participate in the management of environmental protection activities and/or ecological projects.

Program Learning Outcomes (PLO):

PLO 03. To understand the fundamental concepts, theoretical and practical issues in the field of natural sciences necessary for analysis and decision-making in ecology, environmental protection, and sustainable natural resource management.

PLO 07. To solve problems in the field of environmental protection using generally accepted and/or standard approaches, as well as international and national experience.

2. Programme and structure of the discipline

Names of content modules and topics	Number of hours									
	full-time					part-time				
	total	including				total	including			
		l.	p.	lab.	ind.		l.	p.	lab.	ind.
1	2	3	4	5	6	7	8	9	10	11
Module 1. Sustainable Agricultural Practices and Ecosystem Management										
Lecture 1. Principles of Sustainable Agriculture	14	2	2	-	10	14	2	-	2	10
Lecture 2: Soil Health and Conservation Techniques	14	2	2	-	10	12		-	2	10
Lecture 3. Water Management in Agroecosystems	14	3	3	-	8	14	2	-	2	10
Lecture 4. Integrated Pest Management (IPM) and Biological Control	16	4	4	-	8	14	2	-	2	10
Lecture 5. Agroforestry and Crop Diversification for Sustainability	21	4	4	-	13	10		-		10
Total for the module 1	79	15	15	-	49	64	6	-	8	50
Module 2. Anthropogenic impact on agroecosystems										
Lecture 1. Types of Anthropogenic Impacts on Agroecosystems	12	2	2	-	8	14	2	-	2	10
Lecture 2. Soil Degradation and Contamination due to Agricultural Practices	12	2	2	-	8	12		-	2	10

Lecture 3. Impact of Agrochemicals on Soil and Water Quality	14	3	3	-	8	10				10
Lecture 4. Climate Change and Its Effects on Agroecosystems	14	4	4	-	6	10				10
Lecture 5. Strategies for Mitigating Negative Anthropogenic Effects	19	4	4	-	11	10				10
Total for the module 2	71	15	15	-	41	56	2	-	4	50
Total	150	30	30	-	90	120	8	-	12	100

3. Topics of lectures

No.	Topic	Hours
1	Principles of Sustainable Agriculture	
2	Soil Health and Conservation Techniques	
3	Water Management in Agroecosystems	
4	Integrated Pest Management (IPM) and Biological Control	
5	Agroforestry and Crop Diversification for Sustainability	
6	Types of Anthropogenic Impacts on Agroecosystems	
7	Soil Degradation and Contamination due to Agricultural Practices	
8	Impact of Agrochemicals on Soil and Water Quality	
9	Climate Change and Its Effects on Agroecosystems	
10	Strategies for Mitigating Negative Anthropogenic Effects	

4. Topic of laboratory (practical, seminars) classes

No	Topic	Hours
1	Analysis of features of historical stages of the interaction of society and nature	2
2	Types of nutrition and types of relationships in agrobiocenosis	2
3	Ecological factors and their interaction in agrobiocenosis	4
4.	Analysis of schemes of circulation of basic substances in nature for the change of their links by anthropogenic activity	4
5.	The existing and optimal structure of nature management in Ukraine	3
6.	Analysis of the peculiarities of the development of the protected area network of Ukraine	2
7.	Assessment of chemical pollution of soils in settlements	2
8.	Assessment of the state of aquatic environments	4
9.	Research of successional changes in the agrobiocenosis	4
10	Determination of the level of food pollution by nitrates	3
	Total	30

5. Topics of self-study

No.	Topic	Hours
1.	Historical Development and Global Trends in Agroecology	10
2.	Comparison of Conventional and Agroecological Farming Systems	10
3.	Agroecosystem Components and Functions	8
4.	Agroecological Zoning and Landscape Approaches	8
5.	Biodiversity and Its Role in Sustainable Agriculture	8
6.	Socio-economic Aspects and Policy Frameworks in Agroecology	5
7.	Ecological Soil Management Practices	8
8.	Water Use Efficiency and Irrigation in Agroecology	8
9.	Agroecology and Climate Change Adaptation	8
10.	Integrated Pest Management (IPM) Principles	6

11.	Case Study: Agroecological Practices in Ukraine or Other Region	6
12.	Innovations and Future Prospects in Agroecological Research	5
	Total	90

6. Methods of assessing expected learning outcomes:

- Oral or written questioning
- Exam
- Module tests
- Essays, presentations
- Calculations (individual assignments)
- Defense of practical works

7. Teaching methods:

- Verbal method (lecture, discussion, interview, etc.)
- Practical method (laboratory and practical classes)
- Visual method (illustration method, demonstration method)
- Working with educational and methodological literature (note-taking, summarizing, annotating, reviewing, writing essays)
- Video method (distance learning, multimedia, web-based formats, etc.)
- Independent work (completion of assignments)
- Individual research work of higher education students

8. Results assessment.

The student's knowledge is assessed by means of a 100-point scale converted into the national grades according to the "Exam and Credit Regulations at NULES of Ukraine" in force.

8.1. Distribution of points by types of educational activities

Educational activity	Results	Assessment
Module 1. Sustainable Agricultural Practices and Ecosystem Management		
Practical work №1. Analysis of features of historical stages of the interaction of society and nature	To analyze the main features of the historical stages of the interaction between human society and the natural environment, identify key patterns and consequences of these interactions, and form a comprehensive understanding of the evolution of environmental consciousness and nature management practices.	10
Practical work № 2. Types of nutrition and types of relationships in agrobiocenosis	To investigate the types of nutrition and ecological relationships among organisms within agrobiocenoses, understand their role in the stability and productivity of agroecosystems, and analyze the balance between natural and anthropogenic influences	10
Practical work № 3. Ecological factors and their interaction in agrobiocenosis	To study the main ecological factors influencing agrobiocenoses, analyze their interactions, and evaluate their effects on the structure, productivity, and sustainability of agricultural ecosystems.	10
Practical work № 4. Analysis of schemes of circulation of basic substances in nature for the change of their links by anthropogenic activity	To examine the natural cycles of key substances (carbon, nitrogen, phosphorus, water, etc.) and analyze how human activities disrupt or alter their pathways, leading to ecological consequences.	10

Practical work № 5. The existing and optimal structure of nature management in Ukraine	To analyze the current system of nature management in Ukraine, identify its strengths and weaknesses, and explore optimal strategies and organizational structures to improve sustainable use and conservation of natural resources.	10
Self-study 1. Comparison of volumes and structure of pollution of the cities of Ukraine.	To analyze and compare the volume and composition of pollution in different Ukrainian cities, understand the main sources and types of pollutants, and assess their environmental and health impacts.	10
Self-study 2. Case Study – Comparison of Organic and Conventional Farming Systems	To examine and compare organic and conventional farming systems in terms of environmental impact, productivity, sustainability, and socio-economic factors, using case study analysis.	10
Module control work 1.		30
Total for module 1	PLO 03, PLO 07.	100
Module 2. Anthropogenic impact on agroecosystems		
Practical work № 1. Analysis of the peculiarities of the development of the protected area network of Ukraine	To study the history, current state, and unique features of the development of Ukraine's protected area network, evaluating its effectiveness in biodiversity conservation and identifying challenges and opportunities for improvement.	10
Practical work № 2. Assessment of chemical pollution of soils in settlements	To analyze the extent and types of chemical pollutants in soils within settlements, assess their sources and potential risks to human health and the environment, and develop approaches for monitoring and remediation.	10
Practical work № 3. Assessment of the state of aquatic environments	To evaluate the physical, chemical, and biological conditions of aquatic environments, identify pollution sources and ecological risks, and propose measures for their protection and sustainable management.	10
Practical work № 4. Research of successional changes in the agrobiocenosis	To investigate the processes and stages of ecological succession within agrobiocenoses, analyze factors influencing these changes, and understand their impact on agroecosystem stability and productivity.	10
Practical work № 5. Determination of the level of food pollution by nitrates	To analyze and measure nitrate concentrations in food products, assess potential health risks associated with nitrate contamination, and understand methods for monitoring and controlling nitrate levels in food.	10
Self-study 1. Estimation of the noise load on industrial facilities	To assess the intensity and characteristics of noise pollution generated by industrial facilities, evaluate its impact on the environment and human health, and develop recommendations for noise mitigation.	10
Self-study 2. Agroecological Assessment of a Local Farm	To evaluate the ecological state and sustainability of a local farm by analyzing soil quality, biodiversity, water use, and farming practices, aiming to identify strengths,	10

	weaknesses, and opportunities for improvement.	
Module control work 2.		
Total for module 2	PLO 03, PLO 07	100
Class work	(M1 + M2)/2*0,7 ≤ 70	
Exam/credit	30	
Total for year	(Class work + exam) ≤ 100	

8.2. Scale for assessing student's knowledge

Student's rating, points	National grading (exam/credits)
90-100	excellent
74-89	good
60-73	satisfactory
0-59	unsatisfactory

8.3. Assessment policy

Deadlines and exam retaking rules	<i>EXAMPLE:</i> works that are submitted late without valid reasons will be assessed with a lower grade. Module tests may be retaken with the permission of the lecturer if there are valid reasons (e.g. a sick leave).
Academic integrity rules	<i>EXAMPLE:</i> cheating during tests and exams is prohibited (including using mobile devices). Term papers and essays must have correct references to the literature used
Attendance rules	<i>EXAMPLE:</i> Attendance is compulsory. For good reasons (e.g. illness, international internship), training can take place individually (online by the faculty dean's consent)

9. Teaching and learning aids:

- e-learning course of the discipline
(<https://elearn.nubip.edu.ua/course/view.php?id=5010>)
- references to digital educational resources;
- textbooks, manuals, tutorials;
- guidelines for studying a discipline by full-time and part-time students;
- internship programmes of the discipline (if included in the curriculum)

1. Vagaliuk L. Lecture notes for the "Bachelor" students in the discipline "Agroecology" Lecture notes.- К.: Компрінт, 2021.- 117 с.

2. Vagaliuk L. Guidelines to conduct practicals in the discipline: "Agroecology".- К.: Компрінт, 2021.- 66 с.

10. Recommended sources of information

1. M FAO (2018b) The state of world fisheries and aquaculture 2018. Fisheries and Aquaculture Department of the Food and Agriculture Organization of the United Nations, Rome, <http://www.fao.org/docrep/016/i2727e/i2727e.pdf>

2. Eickhout B, Bouwman AF, van Zeijts H (2016) The role of nitrogen in world food production and environmental sustainability – agriculture. Ecosyst Environ 116:4–14

3. Evenson RE, Gollin D (2018) Assessing the impact of the green revolution, 1960 to 2000. Science 300:758–762

4. FAO (2018) World agriculture: towards 2015/2030 – An FAO perspective. Food and Agriculture Organization of the United Nations, Rome. Earthscan Publications, London/www.fao.org/fileadmin/user_upload/esag/docs/Interim_report_AT2050web.pdf

Regulatory and Reference Literature (Normative Literature)

1. **Gliessman, S.R.** (2015). *Agroecology: The Ecology of Sustainable Food Systems* (3rd ed.). CRC Press.— A foundational textbook introducing core agroecological principles, ecosystem management, and sustainable farming practices.
2. **Wezel, A. (Ed.)** (2014). *Agroecological Practices for Sustainable Agriculture: Principles, Applications, and Making the Transition*. World Scientific Publishing.— Provides practical tools for applying agroecology in farming systems and policy planning.
3. **FAO** (2018). *The 10 Elements of Agroecology: Guiding the Transition to Sustainable Food and Agricultural Systems*. Food and Agriculture Organization of the United Nations.— Official UN document outlining the international framework for agroecological development. [Available online: <https://www.fao.org/agroecology/knowledge/10-elements>]
4. **FAO** (2021). *Agroecology and Sustainable Food Systems: Policy Guidance for Transforming Food and Agricultural Systems*.— Offers policy-oriented guidance based on agroecological principles.[Available online: <https://www.fao.org/documents>]
5. **Altieri, M.A.** (1995). *Agroecology: The Science of Sustainable Agriculture* (2nd ed.). CRC Press.— A classic work that explores the scientific foundation of agroecology with case studies from Latin America and beyond.
6. **Lampkin, N.** (2002). *Organic Farming*. Old Pond Publishing.— Though focused on organic agriculture, this text provides technical and regulatory insights applicable to agroecological practice.
7. **European Commission** (2020). *From Farm to Fork Strategy: For a Fair, Healthy and Environmentally-Friendly Food System*.— Strategic framework guiding the EU's agroecological and food sustainability policy.[Available online: <https://food.ec.europa.eu>]