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ProLand

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Table of Content

Summary School Introduction 3

Module 1 3

Module 2 ..... **Błąd! Nie zdefiniowano zakładki.**

Module 3 ..... **Błąd! Nie zdefiniowano zakładki.**

Module 4 10

Module 5 20

Project KA220-HED - Cooperation partnerships in higher education, Reference number: 2024-1-PL01-KA220-HED-000252809

Summer School Introduction

Participation in the summer school enables students to gain unique theoretical and practical knowledge in areas such as agronomy, agricultural economics, environmental protection, and law. The dominant field is law, in particular agricultural law and environmental protection law, creating a specific framework for the protection of agricultural land.
The summer school is based on open dialogue between scientists from various fields, including practitioners (specialists) who can add value in understanding the quantitative and qualitative needs of agricultural land in the face of climate change and environmental protection.
The topics covered by the summer school go beyond the usual curriculum, which contributes to raising awareness and acquiring theoretical and practical knowledge by students during their participation in multidisciplinary teaching activities.

Module 1 (day 1)

Title: *Agricultural Land Markets in Different Countries within the EU - Overview of key issues and current challenges*

Lecturer(s): *Lucia Palsova* (SUA)/ *Ivan Takac* (SUA)

Objective of the Module: The objective of this lecture is to provide an overview of the current situation of the agricultural sector in the Slovak Republic and to analyse the key trends and challenges that influence its development.

The lecture aims to:

I) Analyse the current state of agriculture in the Slovak Republic and its role within the national economy.

II) Identify key structural characteristics of the agricultural sector, including farm structure, employment, and land use.

III) Examine the main economic, environmental and social challenges affecting Slovak agriculture, including climate change, demographic trends, and market conditions.

IV) Explain the importance of agricultural land protection, land prices, and land market dynamics.

Project KA220-HED - Cooperation partnerships in higher education, Reference number: 2024-1-PL01-KA220-HED-000252809

V) Encourage students to critically reflect on sustainable agricultural development and the future of rural areas.

Teaching Methods: lecture, discussion, practical

The lecture combines several teaching approaches in order to ensure that students understand both the theoretical and practical aspects of agricultural sector development.

The main teaching methods include:

Part I – Presentation and explanation of statistical data and indicators describing the agricultural sector in Slovakia.

Part II – Analytical discussion of key structural problems, including farm structure, demographic challenges and market conditions.

Part III – SWOT analysis and interpretation of economic indicators in order to evaluate strengths, weaknesses, opportunities and threats for the agricultural sector.

Part IV – Discussion of land market indicators, including land prices and customary rent.

Part V – Interactive discussion with students aimed at developing critical thinking about sustainable agricultural and rural development.

Course Learning Outcomes:

Knowledge	Students will gain knowledge about: 1. The structure and economic importance of agriculture in the Slovak Republic. 2. Key trends and challenges affecting the agricultural sector, including climate change, market volatility and demographic developments. 3. Agricultural land structure, land prices and land market dynamics in Slovakia. 4. The role of agricultural policy and public support in shaping the development of agriculture.
Skills	Students will develop the ability to: 1. Analyse statistical data related to agricultural production, land use and

	economic indicators. 2. Identify structural strengths and weaknesses of the agricultural sector. 3. Evaluate the impact of economic and environmental factors on agricultural development. 4. Interpret data related to land markets, agricultural land prices and rental values.
Social skills	Students will improve their ability to: 1. Discuss agricultural policy challenges and sustainability issues. 2. Participate in discussions about rural development and environmental protection. 3. Formulate arguments related to sustainable agricultural land management.

Content:

Trends and Challenges in the Agricultural Sector of the Slovak Republic

I. Introduction – Importance of Agriculture in Slovakia

Agriculture, forestry and fisheries play an important role in the Slovak Republic. They contribute not only to food production but also to rural development, landscape management and environmental sustainability.

Although the sector contributes a relatively small share to the national GDP, it remains an important part of the economy and rural society.

Agricultural land covers approximately **47% of the territory of Slovakia**, while forests cover around **41% of the territory**.

Agriculture is increasingly influenced by environmental and climate factors that require more efficient land management and adaptation strategies.

II. Structure of the Slovak Agricultural Sector

Slovak agriculture has several specific structural characteristics.

The sector contributes approximately **2–3% to the gross value added of the Slovak economy**, which places it at a similar level as sectors such as arts, entertainment and recreation.

A distinctive feature of Slovak agriculture is the **large average farm size**, which is among the largest in the European Union.

Important characteristics include:

- Average farm size exceeding **100 hectares**
- Over **90% of agricultural land cultivated by farms larger than 50 hectares**
- Large agricultural enterprises dominating production

These characteristics are partly the result of historical developments, particularly collectivisation during the socialist period.

III. Structural Challenges of Slovak Agriculture

Despite its production capacity, the agricultural sector faces several structural challenges.

One of the key problems is the **weak position of farmers in the food supply chain**. Farmers often receive a relatively small share of the final price of food products.

Other important challenges include:

- fluctuations in global agricultural markets
- increasing production costs
- unfair commercial practices
- climate-related risks
- fragmentation of land ownership
- existence of unknown landowners

These factors create uncertainty and limit the long-term stability of agricultural production.

IV. Demographic Trends in Agriculture

Demographic developments represent another important challenge.

The agricultural sector in Slovakia is characterised by an **ageing farming population**.

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In 2023 only **11.9% of farm managers were under the age of 40**, which is only slightly above the EU average.

This trend raises concerns about the generational renewal of the sector and the long-term sustainability of rural areas.

Encouraging young farmers and improving access to land and financial resources therefore represents an important policy priority.

V. SWOT Analysis of Slovak Agriculture

A SWOT analysis provides a useful overview of the strengths, weaknesses, opportunities and threats of the sector.

Strengths

- relatively low environmental pressure compared to some other EU countries
- high level of education among farmers
- favourable farm structure for large-scale production

Weaknesses

- decline of certain agricultural sectors, particularly fruit and vegetable production
- low level of research and development investment
- negative trade balance in agri-food products

Opportunities

- potential increase of the sector's economic importance
- public support from national and EU policies
- development of innovative and sustainable farming systems

Threats

- climate change and weather volatility
- fluctuations in commodity prices
- stronger support for farmers in neighbouring countries

VI. Agricultural Land Structure

Agricultural land is a key production resource.

The utilised agricultural area in Slovakia has gradually declined in recent decades.

Data show:

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- decrease in the number of farms
- decrease in agricultural employment
- increase in the average farm size

These trends indicate a process of structural transformation and consolidation within the sector.

VII. Agricultural Land Prices

Agricultural land prices in Slovakia vary significantly between regions.

In 2023:

Average price of **arable land:**
approximately **0.54 € per m^2**

Average price of **permanent grassland:**
approximately **0.40 € per m^2**

The highest prices were recorded in:

- Bratislava region
- Nitra region
- Trenčín region
- Trnava region

Lower prices are typical for eastern regions of the country.

Land prices are influenced by factors such as land quality, location, demand for land and agricultural policy.

VIII. Customary Rent of Agricultural Land

Agricultural land is often used through lease agreements.

Slovak legislation defines the concept of **"customary rent"**, which represents the average rent per hectare of agricultural land.

The customary rent is published annually by district offices based on real lease contracts concluded in the previous year.

Factors influencing rent include:

- land quality and fertility
- location and accessibility
- supply and demand in the land market

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- EU agricultural subsidies
- economic conditions in the agricultural sector

IX. Economic Performance of Agriculture

Recent developments show several important trends in the economic performance of the agricultural sector.

In 2023:

- gross crop production declined
- livestock production slightly increased
- agricultural input costs increased
- farm profitability decreased

At the same time, public financial support remains an important part of agricultural revenues.

Total public support from **EU and national sources reached approximately €807 million** in 2023.

X. Conclusions

The agricultural sector of the Slovak Republic faces a complex combination of economic, environmental and structural challenges.

Key issues include:

- climate change and environmental pressures
- ageing farming population
- volatility of global agricultural markets
- structural weaknesses in the food supply chain

At the same time, agriculture plays an essential role in ensuring food security, rural development and environmental sustainability.

The future development of the sector will therefore depend on effective agricultural policies, innovation and sustainable land management practices.

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https://www.agrobiznis.sk
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Module 2 (day 2)

Title of the lectures: *Interactions between the Use of Natural Resources (Land and Water, Plant and Animal Genetic Resources, Vegetation, Soils) for Food Production-Overview of key issues and current challenges*

1. Soil Health and Legal Protection: Use and Limitation of Agrochemicals
2. Sustainable Management and Use of Soil and Water in Sustainable Production

Lecturer(s): Prof. Dr Monika Jakubus

Objective of the Module: Familiarizing the participants with the current challenges in maintaining soil health and fertility in the context of the use of agrochemicals and sustainable use of natural resources as soil and water.

Teaching Methods: lecture, discussion, practical

Course Learning Outcomes:

Knowledge	The student is familiar with the legal, economic, and environmental conditions for the protection of agricultural land.
Skills	The student is able to use specialized vocabulary, participate in discussions, respond to various opinions and positions, identify and interpret basic legal, economic, and environmental phenomena and processes characterizing contemporary agricultural land protection.
Social skills	The student is ready to critically evaluate their knowledge and the content they receive, recognize new solutions, and seek expert opinions. The student is ready to think in legal, economic, and environmental terms when making decisions related to the protection of agricultural land.

Content of *Soil Health and Legal Protection: Use and Limitation of Agrochemicals*

The term "soil" has different meanings depending on an individual's scientific background and experience. For example, to an agronomist or botanist, soil is best defined as a medium for plant growth. To an engineer, soil refers to the loose material that lies between the ground surface and solid rock. To a soil scientist, soil is defined as the unconsolidated mineral and organic matter at the Earth's surface that has been altered by soil-forming processes. Although there is no uniform, comprehensive definition of soil, it is clear that soil performs numerous functions. Soils are dynamic ecosystems that support plant life by providing essential requirements for growth, including nutrients, water, and oxygen. Soil is also necessary to sustain human life because it provides natural resources (e.g., food, fiber, construction materials), support for dwellings and roads, and a means of recycling or detoxifying waste materials produced daily. Soils also perform important filtration and retention functions for water, and sequester carbon in the form of CO_2. In the current era of climate change, these functions are increasingly discussed, and the importance of soils is being emphasized.
However, among all soil functions, the productive function is the most important, and individual soil properties determine the suitability of the soil for cultivation, as well as its health and fertility. In order for soil to fulfill its functions, it must be characterized by specific properties: physical, chemical, biological, and ecological. Each of these properties is responsible for a different functions, but all of them are jointly responsible for the quality and health of the soil.
Currently, due to the dynamic development of civilization, a number of sectors affect soils, most often leading to unfavorable phenomena. The sectors that most strongly and negatively affect soil health include agriculture, industry, transport, waste landfills, and, both directly and indirectly, climate change. Numerous negative changes caused by the above-mentioned sectors lead, at different rates and in different ways, to a decrease in the functionality and health of soils. These changes result in soil degradation, such as a decrease in water retention and sorption capacity (plant nutrient absorption), reduction of organic matter, acidification or salinization, contamination with various organic and inorganic xenobiotics, and diminished biodiversity. Degraded soil loses its productive and environmental functions. The problem of soil degradation is global and affects all soils regardless of location. The scale and scope of the phenomenon are indicated by data showing that as much as 35% of all soils in the world are degraded to varying degrees. Focusing on the territory of the European Union, the current situation is as follows:

- 25% of European soils are being eroded by water and wind,
- 45% of European soils have a low organic matter content (defined as less than 2% organic carbon),
- 3.8 million hectares of soil are subject to salinization,

❖ more than a third of European soils are classified as having a high or very high susceptibility to compaction,

❖ 2.5 million sites are estimated as potentially vulnerable to contamination, while 342,000 hectares are identified as contaminated,

❖ at least 275 hectares of soil are lost per day in the EU, amounting to 1,000 km^2 per year as a result of soil sealing (the permanent covering of soil with impermeable material).

Due to the large scale and intensity of unfavorable factors impacting soil, it is necessary to care for and strengthen soil health. Soil health presents soil as a finite and dynamic living resource and is directly related to plant health. It is the capacity of soil to function as a vital living system to sustain biological productivity, maintain environmental quality, and support plants, animals, and humans. Healthy soils are biologically active (rich in microorganisms, fungi, earthworms), structurally stable (with good aggregation and porosity), chemically balanced (optimal pH, nutrient content), and resilient to erosion, drought, and pollution.

In relation to the various degradation factors, it can be stated that soil health is threatened by erosion, reduced water retention capacity, decreased organic matter, acidification, salinization, pollution, compaction, and sealing. It is estimated that 60–70% of EU soils are affected by one or more soil degradation processes and can be considered unhealthy. The resulting loss of soil health may also trigger a cascade effect, leading to a decrease in organic matter and changes in nutrient inputs and cycling, ultimately affecting productivity-especially in croplands-and leading to an overall loss of soil ecosystem services. Soil health is based on soil properties related to parent materials and soil formation; environmental factors related to climate, landscape, and other biotic and abiotic influences; water-related issues that influence the drought–flood syndrome; and human dimensions that affect availability and access to inputs, along with social, cultural, and environmental issues. Healthy soil is essential for food security, biodiversity, water regulation, and climate mitigation (carbon storage). Soil health impacts food production by storing and making plant nutrients available, cycling and transforming elements, delivering macro- and micronutrients when needed, storing water in the root zone to increase plant-available water capacity, denaturing and filtering pollutants, moderating climate through sequestration of carbon in the soil and biota, buffering against abrupt fluctuations in moisture and temperature, regulating gaseous emissions into the atmosphere, providing habitat and energy sources for biota, and providing industrial raw materials. Therefore, taking care of soil health is a priority. Many countries and international institutions recognize the need for legal frameworks to protect soils from degradation caused by unsustainable agriculture, erosion, contamination, and chemical overuse. To draw attention to the problem of soil degradation and the need to protect soils, the Thematic Strategy for Soil Protection was developed in 2006 (updated in 2012). This document highlights the problem of soil

degradation and specifies the threats that may affect soils. It has now been replaced by the Soil Strategy for 2030. According to the most important provisions, by 2050 we should achieve the following goals:

- ensure that all EU soil ecosystems are healthy and more resilient, enabling them to continue delivering essential services,
- achieve no net land take and reduce soil pollution to levels healthy for humans and ecosystems,
- establish the protection of soils, sustainable management practices, and restoration of degraded soils as common EU standards.

All these assumptions are very ambitious, and their global implementation is a significant challenge, especially when considering the introduction of a common, unified framework for environmental management, particularly soil management in the context of sustainable agriculture. This approach is multidirectional and includes agricultural practices that aim, among other things, to limit the use of agrochemicals. Agrochemicals (fertilizers, pesticides, herbicides, insecticides, fungicides), alongside other pollutants such as heavy metals and PAHs (polycyclic aromatic hydrocarbons) are among the main factors leading to the so-called chemical degradation of soils-a phenomenon very common in soils used intensively and unsustainably for agriculture. Soil contamination as part of chemical land degradation is caused by the presence of xenobiotics (human-made chemicals) or other alterations in the natural soil environment. It is typically caused by industrial activity, agricultural chemicals, or improper disposal of waste. Generally, contamination is correlated with the degree of industrialization and the intensity of chemical usage in plant production.

Currently, in the EU, there are approximately 450 active substances approved for use in plant protection products, with roughly 356,000 tons of pesticides sold annually in the 2011–2019 period among EU Member States. Polluted soils, in the case of pesticides, can become a source of pollution for groundwater by leaching contaminants, and for freshwater and the marine environment by transporting contaminants through wind and water erosion. As a result, ecosystem services such as water quality are affected. Pesticides decrease the abundance and diversity of soil fauna, with stronger effects on the latter, even when applied at recommended rates. The pesticide residues in soils are widespread in European agricultural soils, with approximately 74.5% affected.

In relation to such a situation, the need to reduce the use of agrochemicals (mainly Plant Protection Products, PPPs) is included in key EU documents such as the European Green Deal, Farm to Fork Strategy, and Sustainable Use of Pesticide Regulation. Currently, for a large number of active PPP substances, the permit that was set to expire in 2023 has been extended to the end of 2025. Simultaneously many agents are already prohibited and unavailable. Therefore, alternatives are being sought in the form of new low-risk PPP substances. However, not all of them have obtained permits, because the studies are still underway on their impact on all elements of the environment, especially the soil

ecosystem. Pesticide alternatives are various methods and measures that aim to protect plants from pests, diseases, and weeds without using chemical plant protection products. Here are the main alternatives:

1. Biological plant protection methods: natural enemies of pests (e.g., ladybugs that fight aphids, parasitic wasps, predatory mites); microorganisms (e.g., *Bacillus thuringiensis*, entomopathogenic viruses, entomopathogenic fungi); pheromones (to attract or disorient insects, e.g., pheromone traps).

2. Cultivation and agrotechnical practices: crop rotation (reduces the pressure of diseases and soil pests); appropriate selection of varieties (choosing varieties that are resistant or tolerant to diseases and pests); intercropping (planting plants that repel pests, e.g., basil with tomatoes).

3. Mechanical and physical methods: removing weeds manually or mechanically, screens and nets (protecting plants from insects), light and sticky traps (for monitoring or pest control)

4. Plant extracts and natural agents: used as sprays to repel insects or limit the development of fungi

5. IPM – Integrated Pest Management: a systematic approach combining various methods (biological, mechanical, agrotechnical) with limited and justified use of chemicals.

Today, in the fight against unfavorable changes in the soil resulting from various factors, different approaches are used. One of them is the concept of Land Degradation Neutrality (LDN), which considers all forms of land degradation, whether due to human or natural causes. LDN emphasizes the link between human well-being and natural land capital, and the concept of neutrality involves both ecosystem degradation and restoration.

The principle of this program is that prevention is better than cure—aiming for "zero net land degradation." Therefore, a three-step hierarchy is introduced to avoid soil degradation. The most beneficial is to avoid degradation, then to reduce degradation through the application of sustainable management practices, and finally, to reverse degradation by restoring or rehabilitating land through active assistance in the recovery of ecosystem functions. Sustainable agronomic management on farmland (e.g. land improvement through mulching or intercropping) is strongly emphasized throughout the entire conservation process within LDN, as key techniques can prevent degradation. In general, these principles are part of strategies that lead to the maintenance and improvement of soil health, such as:

- reduced tillage,
- crop rotation practices with promotion of plants with different rooting depths,
- cover cropping practices,
- application of organic amendments,
- maintenance of nutrient balance in soil

- ❖ soil reaction (pH) control,
- ❖ soil structure development,
- ❖ increased water retention capacity,
- ❖ reduction of agrochemical application,
- ❖ avoidance of soil contamination.

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Content of *Sustainable Management and Use of Soil and Water in Sustainable Production*

The rapid development of urban and industrial environments observed in recent decades has put significant pressure on the world's natural resources, resulting in resource shortages, price increases, instability, and ecosystem degradation. Ecosystems can be significantly affected by changes in land and water use, which may diminish their capacity to support and integrate soil and water functions necessary for long-term sustainability. Soil is a non-renewable natural resource. Water can theoretically be renewed, although this is increasingly problematic in the context of current climate

change. Sustainable management of both soil and water involves their wise use, with future generations in mind. Proper soil management should include: preventing erosion and depletion, adding organic matter (e.g., compost, manure), avoiding excessive application of agrochemicals, and using crop rotation. For water, sustainable management should include: economical water use (e.g., drip irrigation), protection of water sources and streams from pollution, collecting rainwater and increasing retention in the landscape, and preventing droughts and floods (e.g., small retention ponds). Sustainable water management aims to use water so that the needs of society are met both now and in the future. This requires both short- and long-term measures, as well as an understanding of the physical and social processes that affect water resources, necessitating the integration of knowledge in water resource management. Soil water refers to water that exists naturally in soil as gravitational water, capillary water, and hygroscopic water, depending on soil functions. The extent to which water is stored or redistributed in soil depends on the size and distribution of soil pores, which are determined by soil texture and structure. The availability of these waters varies, and plants primarily use capillary water. This water represents a soil solution in which nutrients are dissolved and taken up by the plant. Gravitational water is only available to plants to a very limited extent, while hygroscopic water is completely unavailable. The water supply to the soil comes largely from precipitation and can be easily lost through transpiration (so-called “green water”—plant-available water) and leakage that enters aquifers and groundwater (so-called “blue water” in rivers, lakes, and ponds). Due to the relatively small amount of soil water available to plants, it is important to maintain not only the appropriate level of water in the soil, but above all to ensure the health of the soil, which makes this possible. Healthy soil not only maintains favorable moisture parameters but also ensures water filtration and the removal of pollutants. A complex of physical, chemical, biological, and ecological properties is involved in ensuring the maintenance of water in the soil, its circulation, and its availability for plants. Once again, it is necessary to emphasize the importance of soil health, which is paramount for the correct transformation of water in the soil and the functioning of the entire ecosystem. Unfortunately, in many cases, the intensification of agricultural production and the lack of sustainable management lead to a number of unfavorable changes, expressed as reductions in soil health and productivity. The most important threats to soil and water resources include: soil degradation through erosion, compaction, salinization, and nutrient depletion; water scarcity due to overuse, pollution, and climate change; and unsustainable agricultural practices such as monoculture, excessive tillage, and over-irrigation. Taking these factors into consideration, a number of EU documents have been developed that outline the correct paths for sustainable soil management. First of all, it is important to emphasize the significance of the Soil Strategy for 2030, which contributes to the objectives of the European Green Deal (EGD). This is an ambitious vision to have all EU soil ecosystems in healthy condition by 2050. The key concept of the Strategy is

the introduction of sustainable soil management. To achieve this, it is necessary to implement the proposals developed within the EGD, including the Biodiversity Strategy 2030, the Farm to Fork Strategy, and the European Climate Law, all of which include actions for sustainable soil management. According to these policies, the objectives of soil protection and sustainable management can be achieved by reducing the use of pesticides and fertilizers by 50% and 20%, respectively; greater control of nutrient balance by reducing losses from the soil by 50%; introducing organic farming on 25% of agricultural land; and increasing protected land area by 30%.

Important tools to achieve the EGD objectives are the Common Agricultural Policy (CAP) and Good Agricultural and Environmental Conditions (GAECs). They are central drivers for the sustainable management of soil used for agricultural production. The standards set in 2021 within GAECs are to: maintain a certain share of permanent grassland of the total agricultural area (GAEC 1); protect wetlands and peatlands (GAEC 2); maintain soil organic matter and soil structure through a ban on burning arable stubble (GAEC 3); protect water from pollution through the establishment of buffer strips along watercourses (GAEC 4); prevent soil erosion through relevant practices (GAEC 5); protect soil by defining rules for minimum soil cover (GAEC 6); preserve soil potential through crop rotation (GAEC 7); maintain non-productive areas and landscape features, and ensure the retention of landscape features through, for example, a ban on cutting hedges and trees during the bird breeding and rearing season (GAEC 8); and protect environmentally-sensitive permanent grasslands in Natura 2000 sites (GAEC 9).

In general, the CAP is based on three pillars, which align with the principles of sustainable agriculture and are related to the rational use of soil and water, as well as minimizing the negative effects of adverse changes. The main emphasis is placed on reduced tillage, the obligation to introduce crop rotation with legumes, and the necessity to use organic additives. CAP assumptions include GAECs relevant to soil protection, such as the protection of wetlands, a ban on burning arable stubble, the introduction of buffer strips, tillage management to reduce soil erosion, maintaining minimum soil cover, the addition of organic amendments, and crop rotation including legumes. Implementing these practices helps minimize potential losses in soil health and therefore protects it from further negative changes.

To encourage the adoption of beneficial changes and convince farmers to implement such practices, a new tool has been introduced within the CAP: Eco-schemes. Eco-schemes play an important role in transforming European agriculture towards greater sustainability. They are mandatory for EU countries to include in their plans, but voluntary for farmers. Through Eco-schemes, the EU rewards farmers for preserving natural resources, including soils. Eco-schemes are fully financed from EU funds and do not require co-financing from national budgets, which is a significant incentive to implement appropriate programs. Eco-schemes refer to various activities in which

farmers can declare their willingness to participate. The most popular practices applied by farmers are:

1. Organic farming.
2. Integrated pest management, including buffer strips with management practices and without pesticides, mechanical weed control, increased use of resilient, pest-resistant crop varieties and species.
3. Agro-ecology, including crop rotation with leguminous crops, cover crops between tree rows on permanent crops, winter soil cover, and catch crops.
4. Carbon farming, including conservation agriculture, rewetting wetlands/peatlands, appropriate management of residues (i.e. burying agricultural residues, seeding on residues, establishment and maintenance of permanent grassland).
5. Precision farming, including nutrient management plans, use of innovative approaches to minimize nutrient release, control of optimal pH for nutrient uptake, reduced inputs (fertilizers, water, plant protection products), and improved irrigation efficiency.
6. Other practices beneficial for soil, including erosion prevention strips and windbreaks, establishment or maintenance of terraces, and strip cropping.

A common policy and guidelines for sustainable soil and water management emerge from the review of the assumptions contained in EU programmes. In the case of sustainable soil management, we should undertake the following principles of soil conservation:

- ❖ reducing erosion by contour plowing, terracing, and cover cropping,
- ❖ enhancing organic matter by applying compost, green manure, or crop residues to improve soil structure and fertility,
- ❖ reducing tillage to minimize soil disturbance, protect microbial life, and reduce erosion,
- ❖ proper nutrient management by applying fertilizers based on crop needs to avoid overuse and runoff,
- ❖ promoting agroforestry by integrating trees with crops and livestock to stabilize soil and enhance biodiversity,

Regarding the principles of sustainable water management, we should consider:

- ❖ efficient irrigation by using drip or sprinkler systems to reduce water loss and improve delivery,
- ❖ rainwater harvesting by collecting and storing rainwater for irrigation or livestock use,
- ❖ water recycling and reuse by treating wastewater for safe agricultural use,
- ❖ watershed management by coordinating land use within a watershed to maintain water quality and quantity,
- ❖ buffer zones and wetlands focused on protecting water bodies from agricultural runoff and nutrient pollution.

Since agriculture cannot consider soil and water separately, these two natural production resources must be linked and integrated in the overall process of environmental management during cultivation. In this context, common points should be highlighted, such as:

- ❖ conservation agriculture,
- ❖ integrated nutrient and water management (coordinating fertilizer application with irrigation schedules),
- ❖ landscape approaches (managing land use across farms and ecosystems to address upstream-downstream interactions),
- ❖ climate-smart agriculture.

It can be assumed that taking individual actions within the framework of the above-mentioned strategies will bring tangible benefits of sustainable management, expressed through:

- ❖ increased productivity (healthier soils and efficient water use lead to better yields),
- ❖ resilience to climate change (improved soil moisture retention and water efficiency help cope with droughts and floods),
- ❖ biodiversity conservation (healthy soils and clean water support a wide range of organisms),
- ❖ economic benefits (lower input costs and improved resource efficiency).

Sustainable soil and water management is not just an environmental imperative-it is central to achieving long-term agricultural productivity, food security, and ecosystem stability. Water is the basis not only of life and health, but above all of plant production. The availability and quality of water are strictly dependent on the health of the soil; therefore, it is important to care for and manage this non-renewable resource in a sustainable manner. Nowadays, many legal and financial tools have been developed to enable sustainable soil and water management aimed at maintaining soil health. The implementation of the designated principles for sustainable soil and water use varies across different Member States. The success of implementing ambitious EU guidelines on soil protection and sustainable management of natural resources depends largely on the knowledge and willingness of farmers—this should always be kept in mind.

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Module 3 (day 3)

Title: Technical Options to Reduce Negative Environmental Impacts of Land in Europe Climate Change Adaptation and Mitigation: Climate adaptation strategies in agriculture Natural Revegetation, Afforestation, and Lignocellulosic Crops for Bioenergy – Combined with carbon capture and storage as climate change mitigation options

Lecturer(s): prof. G. Spoto

Objective of the Module: Familiarizing participants with current challenges related to the implementation of climate change adaptation strategies in agriculture

Teaching Methods: lecture, discussion, practical

Course Learning Outcomes:

Knowledge	The student is familiar with the legal, economic, and environmental conditions for the protection of agricultural land.
Skills	The student is able to use specialized vocabulary, participate in discussions, respond to various opinions and positions,

	identify and interpret basic legal, economic, and environmental phenomena and processes characterizing contemporary agricultural land protection.
Social skills	The student is ready to critically evaluate their knowledge and the content they receive, recognize new solutions, and seek expert opinions. The student is ready to think in legal, economic, and environmental terms when making decisions related to the protection of agricultural land.

Content:

1. Climate Change and the Transformative Role of Agriculture

Climate change represents one of the most significant structural transformations of the contemporary era. It is not merely a question of rising average global temperatures, but rather a profound alteration in the functioning of natural, economic, and social systems. Precipitation patterns are shifting, extreme weather events are becoming more frequent and intense, ecosystems are degrading, and biodiversity is declining. Ocean acidification and increasing pressure on major biogeochemical cycles further intensify these dynamics. The principal driver of these changes remains the accumulation of greenhouse gases (GHGs), primarily linked to fossil fuel use, industrial processes, transport, and land-use change.

Within this framework, agriculture occupies a uniquely complex and paradigmatic position. On the one hand, it is among the sectors most vulnerable to climate impacts. Agricultural productivity depends directly on climatic stability, soil fertility, water availability, and seasonal predictability. Prolonged droughts, heatwaves, floods, and emerging phytosanitary threats increasingly challenge farmers' capacity to ensure stable yields and secure incomes. On the other hand, agriculture is also a significant source of greenhouse gas emissions, particularly methane (CH_4) from livestock and nitrous oxide (N_2O) from fertilisers and soil management practices.

This dual character—simultaneously vulnerable and emissive—demonstrates that climate governance in agriculture cannot rely on partial or sectoral responses. Instead, it requires an integrated strategy combining mitigation and adaptation.

2. Mitigation, Adaptation and Climate-Smart Agriculture

Mitigation aims to address the causes of climate change through emission reductions and the enhancement of carbon sinks. Adaptation seeks to reduce vulnerability to

unavoidable climate impacts by strengthening the capacity of systems to absorb and recover from climatic shocks. In agricultural systems, these dimensions are deeply intertwined. Practices that increase soil organic matter enhance carbon sequestration while simultaneously improving resilience to drought and erosion.

This integrated perspective is reflected in the Paris Agreement and, at the European level, in the European Green Deal. It also underpins the concept of climate-smart agriculture (CSA), promoted by FAO and progressively incorporated into EU policies. CSA is based on three interconnected objectives: sustainably increasing productivity, strengthening resilience, and reducing or removing emissions. European agricultural law is therefore evolving from a production-oriented framework toward a sustainability-based model aligned with climate objectives.

3. Soil as Natural Climate Infrastructure

Within this transformation, soil emerges as a pivotal element. Scientific evidence demonstrates that terrestrial soils represent one of the largest carbon reservoirs on the planet, containing more organic carbon than the atmosphere and vegetation combined. Even modest changes in soil management can significantly influence the global carbon balance.

Soil is inherently ambivalent: intensive tillage and reduced vegetative cover may turn it into a source of emissions, while conservation practices—such as crop rotation, cover crops, agroforestry, and organic amendments—can transform it into a carbon sink. This dual capacity justifies viewing soil as a form of natural climate infrastructure situated at the intersection of mitigation and adaptation.

The EU Soil Strategy for 2030 recognises healthy soils as essential for climate protection, biodiversity conservation, food security, and rural resilience. Closely connected to this perspective is the concept of Carbon Dioxide Removal (CDR), which refers to activities that remove CO_2 from the atmosphere and store it durably. Genuine removals require effective capture, long-term storage, and intentional human intervention.

4. The LULUCF Framework and the Strengthening of Carbon Sinks

Within EU law, land-based emissions and removals are regulated under the LULUCF sector (Land Use, Land Use Change and Forestry), governed by Regulation (EU) 2018/841, as amended in 2023 within the framework of the Fit for 55 and in alignment with the binding climate neutrality objective established by Regulation (EU) 2021/1119.

The Regulation establishes harmonised accounting rules and binding obligations for Member States concerning greenhouse gas emissions and removals from land use, land use change and forestry.

For the period 2021–2025, the core obligation was encapsulated in the so-called “no-debit rule”, according to which emissions from the LULUCF sector had to be fully

compensated by at least equivalent removals, thus preventing the sector from becoming a net source of greenhouse gases.

Following the 2023 revision, the regulatory framework has evolved from a mere neutrality requirement toward a more ambitious mitigation architecture. For the period 2026–2030, the Regulation introduces binding national targets contributing to an overall EU objective of achieving a net removal of 310 million tonnes of CO_2 equivalent by 2030. The logic therefore shifts from ensuring neutrality to actively strengthening the carbon sink function of the sector.

5. Nature-Based and Technological Carbon Removal Solutions

The debate on carbon removals frequently distinguishes between nature-based and technological solutions. Nature-based approaches enhance biological processes such as soil carbon accumulation and ecosystem restoration. They often generate co-benefits for biodiversity and ecosystem services but may be affected by measurement uncertainty and risks of reversibility.

Technological solutions—such as Direct Air Capture (DAC) and Bioenergy with Carbon Capture and Storage (BECCS)—offer greater measurability and control but involve high costs and complex infrastructure.

Biochar represents an intermediate solution. Produced through the pyrolysis of biomass, it stabilises carbon in a durable form that can be incorporated into soils. However, its recognition as a removal requires traceable supply chains, reliable quantification, lifecycle emission assessment, and proof of durability.

No single solution is sufficient; a diversified portfolio approach is required.

6. Carbon Farming and Agricultural Practices

Carbon farming refers to a structured set of agricultural and forestry practices aimed at increasing carbon stocks in soils and biomass, preventing the release of stored carbon, and reducing greenhouse gas emissions compared to conventional management systems. It represents one of the most operationally relevant applications of climate-smart agriculture, as it simultaneously contributes to mitigation and adaptation objectives.

From a legal and conceptual perspective, it is crucial to distinguish between emission reductions, emission avoidance, and genuine removals. Emission reductions occur when farming techniques lower the amount of greenhouse gases emitted—for example through precision fertilisation, improved manure management, or more efficient energy use. Emission avoidance refers to practices that prevent the release of carbon that would otherwise occur, such as the protection of permanent grasslands or the rewetting of drained peatlands. Removals, by contrast, require a measurable and additional increase in carbon stocks in soils or biomass relative to a baseline scenario.

The core agricultural practices associated with carbon farming include cover crops, agroforestry systems, reduced or no-tillage techniques, organic amendments, crop rotation and diversification, sustainable grassland management, and peatland restoration.

Cover crops maintain continuous soil cover between production cycles, increasing organic inputs into the soil and limiting erosion. Over time, they contribute to soil organic carbon accumulation and enhance water retention, thereby strengthening resilience to drought and extreme rainfall.

Agroforestry integrates trees with crops or livestock on the same land. Trees function as long-term carbon reservoirs while improving microclimatic conditions, biodiversity, and soil stability. Their dual contribution to biomass and soil carbon makes agroforestry one of the most structurally significant carbon farming practices.

Reduced tillage limits soil disturbance and decreases the oxidation of organic matter, thereby slowing carbon loss. However, its climate effectiveness depends on proper integration within crop rotation systems and may involve agronomic trade-offs.

Organic amendments such as compost and digestate directly increase soil organic matter. Their effectiveness depends on traceable supply chains, quality control, and a favourable overall emissions balance.

Finally, peatland restoration plays a particularly important role. Degraded peat soils are major emission sources; restoring hydrological conditions prevents carbon release and preserves existing stocks.

Overall, carbon farming cannot be conceived as a short-term technical adjustment. Carbon accumulation is gradual, context-dependent, and potentially reversible. Its effectiveness therefore requires long-term commitments, stable governance frameworks, and integration into broader agricultural strategies.

7. Carbon Farming Projects and the CRCF

Transforming practices into credible climate benefits requires structured governance. Carbon farming projects must define a baseline scenario, demonstrate additionality, and implement robust monitoring, reporting, and verification (MRV) systems. Permanence and reversal risk must also be addressed.

To harmonise standards, the European Union adopted the Carbon Removals Certification Framework (CRCF) under Regulation (EU) 2024/3012. The Regulation introduces common quality criteria summarised under the acronym QU.A.L.ITY: quantification, additionality, long-term storage, and sustainability.

Quantification requires accurate and conservative measurement of removals. Additionality ensures that certified benefits exceed regulatory requirements. Long-term storage addresses durability and the management of reversal risks. Sustainability

guarantees that certified activities do not cause significant environmental or social harm, in line with the broader EU “do no significant harm” principle.

Through independent verification procedures and electronic registries, the CRCF creates a structured system for transparency and traceability. In this way, it strengthens environmental integrity while enabling the orderly development of carbon farming within European climate governance.

8. Externalities, Pigou, Coase and Carbon Markets

Greenhouse gas emissions constitute a classic negative externality: their social costs are not fully borne by emitters. Two theoretical approaches help explain climate policy instruments. The Pigouvian approach advocates corrective intervention through taxes, standards, or subsidies that internalise environmental costs. Carbon taxes and binding emission limits reflect this logic.

The Coasean approach emphasises clearly defined rights and market exchange. Emissions trading systems combine a regulatory cap with tradable allowances, allowing reductions to occur where economically most efficient.

European climate policy integrates both approaches. The EU Emissions Trading System embodies a cap-and-trade model within a regulatory framework, while voluntary carbon markets operate through exchange mechanisms supported by certification and verification rules. Carbon farming projects lie at the intersection of these logics, combining public standards with private contractual exchange.

9. Land Grabbing and Land-Use Governance Risks

The growing economic valorisation of land as a carbon reservoir may intensify competition in land markets and contribute to concentration phenomena described as land grabbing. Such dynamics may emerge not only through outright acquisition but also through long-term contractual arrangements that transfer effective control over land management.

If extensive areas of agricultural land were primarily oriented toward carbon credit generation, tensions could arise between climate objectives and the social function of land, particularly food production and rural livelihoods. Climate policies must therefore safeguard food security, equitable access to land, and territorial cohesion to ensure that the ecological transition remains socially sustainable.

10. Greenwashing and Environmental Integrity

The credibility of climate governance depends on preventing greenwashing. Claims of climate neutrality based on low-quality credits or insufficiently verified projects risk undermining public trust and weakening policy effectiveness.

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By establishing harmonised quality criteria and independent verification procedures, the CRCF strengthens environmental integrity and transparency, ensuring that certified removals correspond to real and durable climate benefits.

11. Conclusions: Toward an Integrated Governance Model

Climate change is profoundly reshaping the role of agriculture and agricultural law in Europe. Agriculture is no longer merely a productive sector but a strategic domain of the ecological transition. Soil, as natural climate infrastructure, stands at the centre of this transformation.

Carbon farming and certified removals offer significant potential, provided they are embedded within rigorous governance frameworks ensuring additionality, permanence, transparency, and social sustainability. The integration of agricultural policy, certification mechanisms, and market-based instruments illustrates the emergence of a structured European model capable of reconciling environmental effectiveness, social equity, and long-term economic sustainability. The climate transition in agriculture is therefore not only a technical endeavour, but also a profoundly legal and political process.

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Co-funded by the European Union

ProLand

Module 4 (day 4)

Title: *Legal protection of agricultural lands in the context of climate change and other emergency conditions: Ukrainian realities and European dimensions*

Lecturer(s): Volodymyr Nosik, Taras Shevchenko National University of Kyiv

Objective of the Module: To familiarize participants with legal models for protecting agricultural land in the context of climate change and the Russian-Ukrainian war in Ukraine, in line with EU requirements for soil protection by 2030.

Teaching Methods: lecture, discussion, practical

Course Learning Outcomes:

Knowledge	The student is familiar with the legal, economic, and environmental conditions for the protection of agricultural land.
Skills	The student is able to use specialized vocabulary, participate in discussions, respond to various opinions and positions, identify and interpret basic legal, economic, and environmental phenomena and processes characterizing contemporary agricultural land protection.
Social skills	The student is ready to critically evaluate their knowledge and the content they receive, recognize new solutions, and seek expert opinions. The student is ready to think in legal, economic, and environmental terms when making decisions related to the protection of agricultural land.

Content:

Questions for discussion:

1. Agricultural lands as an object of legal regulation in Ukraine

2. Agricultural lands and soil as an object of legal protection in Ukraine

3.Modern challenges and their impact on agricultural land use.

Project KA220-HED - Cooperation partnerships in higher education, Reference number: 2024-1-PL01-KA220-HED-000252809

4.The concept and types of land restoration in national legislation of Ukraine.

5. Transformation of soil protection legislation according to the eurointegration course of **Ukraine.**

Content

1. *Agricultural lands as an object of legal regulation in Ukraine*

Ukraine is a large agrarian state that has the most valuable standard soils in the world agricultural lands account for almost 70%, or 41.8 million hectares, of the 60.3 million hectares of all Ukrainian land agricultural lands are the main and indispensable means of agricultural production, and provide food security not only for Ukraine, but for other countries as well regarding agricultural lands, priority of their use is ensured in the Land Code of Ukraine: lands suitable for agricultural needs should be provided primarily for such purposes as agriculture; forestry; creation of territories and objects of the nature reserve fund (art. 23)

Due to the all abovementioned facts there is a specific legal regime for agricultural lands in national legislation of Ukraine.

According to art. 22 of the Land Code agricultural lands defined as the lands provided for the production of agricultural products, agricultural research and training activities, allocation of relevant production facilities, including the infrastructure of wholesale markets for agricultural products, or intended for these purposes.

Agricultural lands include: a) farmlands (arable land, perennial plantations, hayfields, pasture fields and fallow land) and b) non-agricultural lands (farm roads and drift fences, field-protective forest belts and other protective plantings, other than those classified as lands of other categories, lands occupied by farm buildings and yards, lands designated for infrastructure of wholesale agricultural markets, temporary abandoned lands, etc.).

Agricultural lands may not be transferred to the ownership of foreign nationals, stateless persons, foreign legal entities and foreign states. This provision shall cease to be valid if such decision will be approved by referendum.

2. Agricultural lands and soil as the objects of legal protection in Ukraine.

According to The Land Code of Ukraine, 2001 and the two simultaneously adopted Laws of Ukraine: “On Land Protection” and “On State Control over the Use and Protection of Land», 19 June 2003 *Land protection* is a system of legal, organizational, economic and other measures aimed at rational land-use, preventing unreasonable extraction of agricultural and forestry lands, protection against harmful anthropogenic impact, reproduction and increase of soil fertility, increasing the productivity of forestry lands, supporting a special regime of the use of lands of environmental, health-improving, recreational and historical and cultural designation *(art.162 LC).*

Soil as a component of the land parcel surface is one of the most important natural objects due to its unique property - fertility. Soils of land plots shall be the object of special protection (*art. 168 LC).*

Article 3 of the Law of Ukraine "On Land Protection" defines the principles of state policy in the field of land protection:ensuring the protection of land as the main national wealth of the Ukrainian people;

- priority of environmental safety requirements in the use of land as basis, natural resource and main means of production;
- compensation for damages caused by violation of the legislation of Ukraine on land protection;
- regulation and systematic limitation of the impact of economic activity on land resources;
- combination of economic incentive measures and legal responsibility in the field of land protection;
- publicity in resolving land protection issues, using funds from the State Budget of Ukraine and local budgets for land protection.

Land resources and soil before the February 2022 - the Russians full-scale invasion date

Intensive use of Ukrainian agricultural lands has led to the development of degradation processes:

dehumification, susceptibility to erosion, compaction, destructuring, pollution, etc.

Official data on Ukraine's land resources indicated that:

- about a third of the arable land has been eroded (13.3 million hectares, including 10.6 million hectares of arable land);
- more than 6 million hectares of land are systematically subject to wind erosion, and in years with dust storms - up to 20 million hectares;
- medium and highly saline soils occupy 0.5 million hectares of agricultural land, and saline soils - 1.7 million hectares;
- 30% of organic elements has been lost;
- about 20% has been polluted;
- about 12% has been flooded;
- approximately 40% of arable soils in the subsoil layer are over-compacted nutrient reserves are noticeably decreasing.

Since the land has been used as a space for military operations for almost 4 years now, it suffers from a number of negative factors with a powerful synergistic effect:

- the landscape changes due to the construction of fortifications, diggingtrenches, as a result strikes, shelling, etc.
- the soil is polluted by various substances;
- lands are littered with explosive objects and other war debris.

According to the official data on August 15, 2025 since the beggining of Russian full-scale invasion of Ukraine:

26 billion euro - total damage to Ukraine's land

412 million euro - damage from soil pollution

1 213 196 m² of Ukrainian territory - contaminated soil

25, 351 billion euro - damage from clogging of lands

23 905 430 m2 of Ukrainian territory - littered lands

3.Modern challenges and their impact on agricultural land use

Ukraine as a partner for **the United Nations Framework Convention on Climate Change (from 1996) and the Paris Agreement (from 2016)** directs state climate policy towards achieving climate neutrality.

The full-scale invasion caused enormous challenge in this sphera: greenhouse gas emissions caused by warfare, buildings reconstruction, landscape fires, damage to energy infrastructure bring the total to 230 Million Tonnes of Carbon Dioxide Equivalent since 24 February 2022. These emissions are the equivalent of the annual emissions of Austria, Hungary, Czech Republic and Slovakia combined or the annual emissions of 120 million fossil fuel automobiles. This greenhouse gases entail the climate change, causing the warming effect. This climate-related damage amounts to over 42 billion USD, and the The Russian Federation should be held liable for these emissions.

In 2024 Framework Law of Ukraine "On the Basic Principles of State Climate Policy" was adopted. This fundamental document contains key provisions of the EU acquis and partially implemented Regulation (EU) 2018/2066 on the monitoring and reporting of greenhouse gas emissions of 19.12.2018, as well as enshrined the commitments to update its long-term low-carbon development strategy. Regulation (EU) No 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing a framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EC) 2018/1999 (the "European Climate Law").

4. The concept and types of land restoration in national legislation of Ukraine

The classic system of land restoration measures enshrened in legislation includes:

recultivation of damaged lands by restoring the soil cover on a certain area and the productivity of damaged lands **(art.166 LC)**

land conservation - taking degraded and unproductive land parcels out of production on a specified period, as well as rewilding or afforestation **(art. 171-172 LC).**

land reclamation - a complex of hydrotechnical, cultural, chemical, agrotechnical, agroforestry, and other land reclamation measures **(the Law of Ukraine "On Land reclamation", 2000**

Demining of agricultural lands – new type of land restoration

Project KA220-HED - Cooperation partnerships in higher education, Reference number: 2024-1-PL01-KA220-HED-000252809

Due to the full-scale Russian invasion Ukraine became one of the most polluted with explosive objects country in the world.

On March, 2025 – 139, 000 sq. km of land in Ukraine are **potentially mined** – it`s about a **23 % of the Ukrainian territory.** (data aren`t final due to continuing military activity).

On January 2024 156, 000 sq.km (65,000 sq.km under Ukrainian control, and more than 77 sq.km temporally occupied by Russia).

35, 000 sq.km have been demined from 2022 to January, 2025. In 2024 - 2850 sq. km of agricultural lands were demined.

By 2033, it is planned to return 80% of contaminated lands to use// Resolution of the Cabinet of Ministers of Ukraine dated June 28, 2024 No. 616-r "On approval of the National Mine Action Strategy for the period until 2033 and approval of the operational plan of measures for its implementation in 2024 - 2026"

1.4 billion euro price of priority demining of agricultural lands in Ukraine.

Demining of agricultural lands is carried out within the framework of humanitarian demining and consists of three stages:

1. non-technical survey
2. technical survey
3. thorough cleaning and demining

Demining "on the ground" is carried out only by certified operators of anti-mine activity— private companies, non-profit organizations that have the appropriate certificate and are included in the List of Operators approved by the Ministry of Defense (nowadays there are 125 entities, including the agricultural holding "Nibulon", which carries out only non-technical surveys).

Register of territories contaminated/presumably contaminated with explosive objects (in the process of creation)// Resolution of the Cabinet of Ministers of Ukraine dated June 7, 2024 No. 740 "On approval of the Procedure for maintaining, administering, and using information from the register of territories contaminated/presumably contaminated with explosive objects") will contain information on:

- ***territories contaminated with explosive objects*** - where the presence of explosive objects has been confirmed based;
- ***territories <u>allegedly</u> contaminated with explosives*** - an area that, based on indirect proofs, is considered to be potentially contaminated with explosives

The <u>new models</u> of land restoration

In the new circumstances the new models of land restoration not enshrined in Ukrainian legislation and offered by the scientists:

bioremediation - involves the use of microbial preparations, probiotics, etc. on contaminated land that can decompose toxic substances in the soil

phytoremediation of contaminated lands - system of measures based on the use of the properties of certain plant species (their metabolic potential), resistant to high concentrations of pollutants in soils, capable of absorbing and accumulating several metals simultaneously in high concentrations by developed root system

Detoxification

restoration contaminated lands by **cutting the soil layer, collecting pollutants**

steam extraction

5. Transformation of legislation in the field of agricultural land and soil protection according to the eurointegration course of Ukraine

2014 is the year of the signing of **the Association Agreement between Ukraine and the EU, the European Atomic Energy Community and their member states**, and **Ukraine's receipt of candidate status for EU membership** on **June 23, 2022**, put on the agenda the achievement of legal compatibility of Ukraine's national legislation with the EU acquis.

This process is characterized by:

1) the absence of direct requirements for Ukraine to implement EU legal acts in the field of land and soil protection

2) the cross-border nature of the problem and the presence in the Association Agreement provisions, the implementation of which indirectly affects the agricultural lands soils and requires adaptation.

In **June, 2025 official scree5ing** of the compliance of Ukrainian legislation with EU law under Chapter 27 “Environment, Climate and Civil Protection” was carried out and assessed as “partially adopted”.

Despite the war-time Ukraine provided the main achievements that concerns land protection:

in the field of waste management –

1)the provisions of Directive 2008/98/EC on waste are reproduced in the Law of Ukraine “On Waste Management” of June 20, 2022

2)The provisions of Directive 2010/75/EU on industrial emissions (integrated approach to pollution prevention and control) are reproduced in the Law of Ukraine "On Integrated Prevention and Control of Industrial Pollution" of 16.07.2024, which introduces effective tools to prevent soil pollution by industrial waste (includes

maximum permissible emission standards; requirements for protection, land protection and monitoring of pollution levels):

in the field of agrochemicals management - the provisions of Directive 91/676/EEC on the protection of waters against pollution caused by nitrates from agricultural sources of 12.12.1991 **(Nitrates Directive)** are reproduced in the order of the Ministry of Environmental Protection and Natural Resources of Ukraine № 244 of 15.04.2021, which approved the methods for determining zones vulnerable to (accumulation of) nitrates; Order of the Ministry of Agrarian Policy and Food of Ukraine № 382 dated November 24, 2021, which introduced rules for ensuring soil fertility and the use of certain agrochemicals, and Order of the Cabinet of Ministers of Ukraine № 1134-r dated December 9, 2022, which approved the Water Strategy of Ukraine for the period until 2050;

in the field of land monitoring - on March 20, 2023, the Law of Ukraine was adopted, which updated the environmental monitoring system and approved the concept of the state environmental monitoring program, and in 2024, the procedure for monitoring land and soils was standardized;

in the field of agriculture sector – the Strategy for the Development of Agriculture and Rural Areas in Ukraine for the period until 2030 was adopted, which was developed taking into account the EU acquis and provides for the promotion of sustainable development and efficient use of soil, air and water, and also defines the conditions for the implementation of GAEC;

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Module 5 (day 5)

Title: *Parties, Stakeholders, and Contractual Arrangements*

Legal instruments for agricultural land management: obligations of the parties into accord or contractual arrangements
The principle of pacta sunt servanda as applied to EU and Member State agreements
Interrelation of human rights and the environment

Lecturer(s): prof. Maria Jose Cazorla Gonzalez, UAL; Alba Paños Pérez, UAL; Fátima Pérez Ferrer, UAL; Alberto Andujar Vaca , UAL

Objective of the Module:

I) Identify and evaluate the legal instruments and contracts applicable to agricultural land management, defining the obligations and responsibilities of the parties and incorporating verifiable clauses and indicators that guarantee sustainable management (soil quality, efficient use of resources, and compliance).

2) Analyze the application of the principle of pacta sunt servanda within the framework of the EU and its member states, determining its contribution to compliance and legal certainty of commitments relating to agricultural land, and linking them to control mechanisms, monitoring, and measurable results.

3) Integrate the interrelationship between human rights and environmental protection into agricultural land management, establishing criteria that guide decisions towards a just and sustainable transition, safeguarding key rights (health, water, food, and participation) and avoiding disproportional impacts.

Teaching Methods:

The methods used in each of the sections were as follows:

Part I: analysis and drafting of contractual clauses (identification of obligations, responsibilities).

Part II: analysis of EU–State legal cases and texts (application of *pacta sunt servanda* to cases and verification of control mechanisms).

Part III: practices with scenarios/simulations (assessment of impacts on human rights and the environment; design of criteria for a just and sustainable transition).

Course Learning Outcomes (General):

Knowledge	The student is familiar with the legal, economic, and environmental conditions for the protection of agricultural land.
Skills	The student is able to use specialized vocabulary, participate in discussions, respond to various opinions and positions, identify and interpret basic legal, economic, and environmental phenomena and processes characterizing contemporary agricultural land protection.
Social skills	The student is ready to critically evaluate their knowledge and the content they receive, recognize new solutions, and seek expert opinions. The student is ready to think in legal, economic, and environmental terms when making decisions related to the protection of agricultural land.

Course Learning Outcomes (Specific):

Knowledge	1. Legal (civil and criminal) and contractual framework applicable to agricultural land management (obligations, responsibilities, monitoring and enforcement clauses).

	2. Fundamentals of the principle of *pacta sunt servanda* and its place in EU–Member State agreements, including its connection with human rights and environmental protection.
Skills	1. Analyze and draft contractual clauses/commitments incorporating verifiable indicators (soil quality, efficient use, compliance). 2. Evaluate cases and legally argue the relationship between regulatory commitments and measurable results in land management.
Social skills	1. Teamwork and interdisciplinary collaboration (legal–environmental–territorial) to resolve cases and propose solutions. 2. Communication and negotiation: defending positions based on legal grounds, reaching agreements, and managing disagreements constructively.

Content:

I. General Approach and the CAP 2023–2027 Framework

This unit examines the agreements and contracts governing the management of agricultural land and their linkages with (i) the CAP 2023–2027, (ii) the principle of *pacta sunt servanda* at both EU and domestic level, and (iii) the relationship between human rights and the environment in the agricultural sector. The starting point is that the legal instruments by which the use and exploitation of land are acquired or transferred are primarily structured through contracts (sale and purchase, agricultural lease, sharecropping, contract farming/harvest contracts, etc.). Their effects are not confined to "traditional" obligations (legal capacity, rent, term, warranties, termination), but increasingly incorporate management, quality, delivery and marketing conditions, particularly where there are links with cooperatives, agri-industry or organic production.

With the new CAP 2023–2027, these contracts take on an enhanced dimension: contractual regulation and farming practice must be aligned with economic, social and environmental objectives. Through national Strategic Plans, the CAP promotes a commitments-based model fostering good agricultural practice, environmental

protection and generational renewal. In this regard, the text identifies the ten specific objectives underpinning the CAP: a fair income; competitiveness; improving the farmer's position in the value chain; climate action; environmental care; biodiversity and landscape; generational renewal; vibrant rural areas; food quality and health; knowledge and innovation.

Accordingly, the contemporary agricultural contract emerges as an instrument which, beyond organising economic exchange, also implements public policy: soil conservation, biodiversity protection, climate-change mitigation and compliance with standards. The core idea is that sustainability ceases to be an "added extra" and becomes embedded in enforceable clauses (for example, obligations linked to GAEC—Good Agricultural and Environmental Conditions—eco-schemes and enhanced conditionality).

II. Temporary Land-Use Transfer Contracts and Other Arrangements (Obligations and Trends)

The text sets out the main contracts for the temporary transfer of land use for agricultural exploitation. First, the agricultural (rural) lease, whereby the lessor grants the lessee the use of the land in exchange for rent, and the terms of use and conservation are stipulated. Second, sharecropping, under which the owner grants use to the sharecropper in return for a share of the produce, thereby allocating risks and benefits between the parties. The typical obligations of the owner/lessor/transferor are summarised as: permitting the agreed use; delivering the holding in a suitable condition; providing, where applicable, resources or infrastructure; and respecting the agreed term and grounds for termination. The obligations of the lessee/sharecropper include: using the land in accordance with the agreement; performing the necessary farming operations; paying rent or the agreed share; and maintaining the holding and its resources. The text also stresses the need to define duration, allocation of responsibilities, dispute-resolution mechanisms and adaptation to the specificities of production.

A relevant development is the growing tendency to include sustainability clauses: good agricultural and environmental practices (GAEC), habitat conservation, avoidance of water over-exploitation, crop rotation and the maintenance of permanent grassland, derived from eco-schemes and the requirements of the Strategic Plans under Regulation (EU) 2021/2115.

In addition, the text refers to other private-law instruments under national civil and commercial law:

- **Agricultural partnership/cooperation agreements** (between producers and agri-industrial or marketing undertakings), involving the sharing of resources, risks and benefits. A distinction is drawn between **cooperatives,** governed by democratic principles ("one member, one vote"), and relationships with non-member producers.
- **Arrangements dependent not only on contract but also on registration/statute**, such as **shared ownership of agricultural holdings** in Spain

(Law 35/2011), aimed at formalising joint management of the holding by spouses or partners, promoting equality and access to aid.

- **Land loans** (gratuitous use) and **collective/communal realities** (indigenous territories, peasant reserves, *ejidos*, etc.).

III. Contract Farming, Sale and Purchase, and "Accidental Terms" of the Contract

The text develops **contract farming** (harvest or production contracts), understood as an agreement between farmer and buyer setting production and marketing conditions: quality, quantity, price and delivery timeframes. It is emphasised that such contracts should be in writing and should address term, remuneration, allocation of risks and responsibilities, and grounds for termination, including deposits/penalties/compensation where applicable. The text argues that these contracts should be geared towards "agreed sustainability", incorporating clauses on carbon footprint, waste, sanitary requirements or animal welfare, as well as incentives linked to organic certification or sustainable practices.

It also notes the advantages and disadvantages: for farmers (better access to inputs, credit, planning and innovation; but reduced flexibility, environmental risks or dependency) and for buyers (more stable and traceable supply; but higher management costs and reputational risk, among others). This framework supports the view that contract farming can provide stability, yet may also generate asymmetries and dependency where bargaining power is unbalanced.

The text also addresses the **sale and purchase of agricultural land or a farm holding**: an onerous, transfer-of-title contract, with the essential elements of consent, object (land/holding duly identified) and a definite price in money; and it highlights the importance of form for registration purposes. It further warns about rights of pre-emption and redemption (*tanteo* and *retracto*) (for tenants, neighbours or the administration where applicable), limits on concentration/fragmentation of land, and constraints attached to agricultural use.

Finally, it examines the "accidental terms" which often give rise to disputes:

- **Condition** (including: suspensive/resolutory; positive/negative; express/implied; causal/potestative/mixed) and the limitation that it must not depend solely on the debtor's will.
- **Term or time limit**, determining when an obligation becomes enforceable or when effects cease.
- **Mode/charge**, an ancillary burden in gratuitous transactions, with remedies such as demanding performance or revocation in the event of breach.

IV. International Instruments, Environmental Criminal Protection, and *Pacta Sunt Servanda*

The unit incorporates international instruments relevant to land governance and agrarian justice: the FAO **Voluntary Guidelines** (2012) on responsible governance of tenure; the UN **Declaration on the Rights of Peasants** (UNDROP, 2018); and ILO **Convention No. 169** on Indigenous and Tribal Peoples. From these, it derives principles for implementation: human dignity, non-discrimination, equity and justice, gender equality, a holistic and sustainable approach, participation, the rule of law, transparency, accountability and continuous improvement. It distinguishes the responsibilities of **States** (recognising legitimate rights, preventing forced evictions, ensuring access to justice, preventing corruption and conflicts) from those of **non-State actors** (due diligence and respect for rights).

At EU level, the text highlights the evolution towards **criminal-law protection of the environment**, with reference to the most recent Directive on environmental offences and sanctions (strengthening environmental criminal protection and replacing earlier directives). Key features include: a broader catalogue of offences; qualitative/quantitative thresholds; differentiation between intent and gross negligence; aggravating circumstances for extensive/irreversible damage; criteria for assessing "substantial damage"; and requirements for national strategies and cross-border cooperation. It underlines the convergence between criminal law and administrative sanctions as a deterrent response to environmental harm and transnational crime.

In parallel, the principle of *pacta sunt servanda* is presented as a cornerstone of legal certainty: agreements are binding and must be performed responsibly, both in domestic law (contracts) and in international law (treaties), together with freedom of contract, party autonomy, legal certainty and good faith. Its function is to sustain trust, predictability and order in legal relations.

Nevertheless, the text emphasises that the principle is not absolute: it is balanced against good faith, equity, the protection of the weaker party and changing circumstances. In international law it is linked to Article 26 of the Vienna Convention, and contrasted with the *rebus sic stantibus* exception (Article 62) for a fundamental and unforeseeable change of circumstances, which is interpreted restrictively. The text also refers to guiding criteria in the PECL and the DCFR regarding renegotiation, adaptation or judicial termination due to supervening hardship/excessive onerousness.

V. The Food Supply Chain, Contractual Fairness and Human Rights–Environment (Case-law)

In domestic law, the text explains how *pacta sunt servanda* is reflected in the binding force of a validly concluded contract, but is tempered by good faith and equity, particularly in contexts marked by an imbalance of bargaining power, such as the food supply chain. To address abuses, it refers to the transposition of Directive (EU) 2019/633 on unfair trading practices and, in Spain, the reform of Law 12/2013, introducing requirements of written formalisation, transparency, pricing rules and the obligation that the price must cover at least the effective cost of production for the

primary producer. Thus, contractual performance is assessed not only formally but also through the lens of substantive fairness.

The text includes jurisprudential and administrative examples: sanctions for late payment or breach of deadlines and abusive practices; and an example from the High Court of Justice of Madrid (2024) concerning payments beyond the statutory deadline in food contracts, rejecting the notion that "if the other party accepts" an adverse term becomes legitimate, precisely because the rules protect the weaker party. It also mentions a CJEU case on the transfer of aid entitlements in the sale of a holding (interpreting the compatibility of private agreements with CAP objectives and limiting contractual arrangements that undermine the purpose of the aid scheme).

In its final section, the unit examines the interrelationship between agriculture, human rights and the environment within the EU framework: Article 37 of the Charter of Fundamental Rights requires a high level of environmental protection and sustainable development to be integrated into EU policies. It notes the progressive "greening" of the CAP since the 1990s and its intensification in 2023–2027 through eco-schemes and conditionality. It describes the environmental impacts of intensive agriculture (pollution from fertilisers/pesticides, emissions, biodiversity loss, soil degradation) and links them to EU strategies (the Green Deal, Farm to Fork) and targets to reduce pesticide use and increase organic farming.

A global dimension is added: UN recognition of the right to a clean, healthy and sustainable environment (2021–2022) and the rise of climate litigation. The text refers to corporate due diligence in agri-food supply chains (the 2022 Directive proposal) and measures such as Regulation (EU) 2023/1115 on deforestation-free products, reinforcing responsibility "beyond borders".

Finally, it synthesises recent European case-law: climate cases before the ECtHR (2024)—inadmissibility decisions on jurisdiction/exhaustion of domestic remedies, and, conversely, the finding against Switzerland in *KlimaSeniorinnen* for violation of Article 8 and the right of access to justice—and their significance in consolidating State obligations in relation to climate risks. It also recalls classic ECtHR cases on pollution and serious risks (*López Ostra*; *Öneryildiz*; *Giacomelli*) and notes that, although the ECHR does not expressly recognise an autonomous right to the environment, the Court has linked environmental harm to Articles 2, 6 and 8, requiring positive obligations and, where necessary, responses also of a criminal-law nature.

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