AGRIFOOD
4Future

D4.3

Training program for “agricultural advisors”

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Grant agreement number	101104597
Project acronym	AgriFood4Future
Project name	AgriFood4Future: Centers of Vocational Excellence in Smart Farming and Sustainable Food Systems

Deliverable number	D4.3
Deliverable responsible	ARVALIS
Work package	WP4
Authors	Bochra Kammoun and Amandine Juhel
Deliverable type	OTHER
Dissemination level	**PUBLIC**

DOCUMENT VERSION HISTORY			
Version	**Date**	**Modification introduced**	**Modified by**
V0.0	15/11/2024	1st version	ARVALIS
V1.0	29/11/2024	2nd version after Peer-review	ARVALIS

Abstract

The purpose of this document is to provide a comprehensive guide to the structured design and development of the Agrifood4Future Training Program for farmers advisors, as part of Work Package 4. It details the organization of course content, as well as competencies and learning outcomes, developed in alignment with partner insights and the project aims.

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List of abbreviation

AF4F	AGRIFOOD4FUTURE
ESCO	European Skills, Competences, Qualifications, and Occupations
GPS	Global Positioning System
RTK	Real-Time Kinematic
IoT	Internet of Things
LCA	Life Cycle Assessment
GIS	Geographic Information Systems
WP	Work Package

1. Introduction

The Erasmus+ AGRIFOOD4FUTURE project is an innovative initiative aimed at promoting a sustainable agricultural future through education, innovation, and collaboration across Europe. The project recognizes the major challenges faced by modern agriculture, such as climate change, resource scarcity, and economic shifts, and seeks to provide adaptable solutions. By focusing on enhancing the sustainability, resilience, and productivity of the agricultural and food sectors, AGRIFOOD4FUTURE aims to equip stakeholders with the tools and knowledge needed to navigate these challenges.

A key focus of the project is the role of **agricultural advisors**, who are essential in empowering farmers with the latest knowledge and best practices. These advisors, however, need continuous access to education in order to stay informed and respond effectively to the ever-changing landscape of modern agriculture. This is where the AGRIFOOD4FUTURE project plays a pivotal role through the development of a lifelong learning curriculum for agricultural advice. This curriculum is designed as part of Work Package 4 (WP4), which focuses on designing, developing, and testing vocational education and training (VET), Higher Education (HEI), and life long learning (LLL) programs that enhance skills for smart farming and sustainable agri-food systems.

The goal of these innovative educational programs is to build a well-informed advisory network that can support farmers in implementing sustainable farming practices. By fostering a culture of lifelong learning among agricultural advisors, the AF4F curriculum ensures that they remain agile and responsive to emerging trends and technologies in agriculture, including those necessary for climate change mitigation and adaptation. This approach enhances advisors' expertise and strengthens their ability to support farmers in adopting productive, sustainable, and resilient methods. This document introduces the curriculum designed specifically to achieve this objective.

Through this deliverable, AGRIFOOD4FUTURE lays out a foundational pathway for building a knowledgeable and adaptive advisory network that can drive transformative change in the agricultural sector well into the future.

2. Definition of competencies and Learning Outcomes

2.1. Aligning Curriculum with Needs Analysis: Insights from WP2

The development of an effective training curriculum for agricultural advisors required a thorough understanding of current skills gaps and emerging needs within the agri-food sector. The comprehensive needs analysis carried out in Work Package 2 (WP2) provided crucial insights into the digital competencies, sustainability practices, and resource management skills required in modern agriculture. This analysis revealed significant variations in digital competencies among workers and identified critical gaps in areas ranging from data management to advanced technological applications such as robotic and sensor solutions.

The findings from WP2 were instrumental in shaping a curriculum that directly responds to the sector's most pressing needs. The analysis highlighted several critical areas requiring attention, such as:

- substantial need for training in digital technologies and data management.
- significant gaps in understanding and implementing sustainable and regenerative farming practices.
- considerable deficiencies in climate adaptation knowledge.
- notable gaps in resource optimization skills.

These insights guided the development of the AGRIFOOD4FUTURE six-module curriculum for agricultural advisors, ensuring a targeted approach to addressing these identified competency gaps. The specific alignment of our curriculum with the needs analysis findings demonstrates a methodical approach to addressing the identified skills gaps.

2.2. Curriculum Framework

Each module within the curriculum has been carefully designed to address specific skills deficiencies, ensuring that the program directly responds to the evolving demands of the modern agri-food sector.

The curriculum is structured in 6 modules (Figure 1) for a total of 18 hours of training activities:

- Introduction to Smart Agriculture
- Precision Agriculture

- Climate Smart-farming
- Regenerative agriculture
- Energy Cover Crops for Biogas Production
- Food Footprint: The Environmental Impact of the Agro-Food Chain

2.2.1. Module 1: Introduction to Smart Agriculture

The content of this module directly addresses the skills gaps identified in the needs analysis. By introducing core smart agriculture technologies such as GIS, remote sensing, IoT, and drones, the module responds to the documented deficiencies in digital literacy and technological understanding among agricultural advisors. Furthermore, the coverage of agroforestry systems and real-world smart agriculture applications provides practical, hands-on training to support the adoption of modern, technology-driven farming practices; a key need highlighted in the analysis. Crucially, the module's focus on equipping advisors with the ability to guide farmers through the process of adopting smart agriculture techniques directly meets the identified requirement to improve advisory capabilities in this domain, ensuring that agricultural professionals can effectively support the digital transition of the sector.

2.2.2. Module 2: Precision Agriculture

This module's in-depth coverage of GPS, RTK technology, and precision agriculture techniques aligns squarely with the needs analysis findings. The training directly targets the significant gaps found regarding the integration of sensor-based solutions and digital tools for improved crop management, an area where the needs assessment revealed substantial shortcomings. By enabling participants to compare the advantages and disadvantages of different GPS correction methods, the module helps fill the noted deficiencies in understanding precision agriculture applications and their suitability for different farming contexts. Ultimately, equipping advisors with the knowledge to recommend best practices for precision agriculture implementation aligns with the need to build practical, technology-focused skills among the workforce to drive innovation and efficiency in the sector.

2.2.3. Module 3: Climate Smart-Farming

The module's focus on understanding the impacts of climate change on agriculture and adapting farming practices directly addresses the identified gaps in climate adaptation knowledge and skills revealed by the needs analysis. By emphasizing the use of digital tools like the WaterRadar platform to assess climate risks and co-design sustainable solutions, the training meets the call for leveraging technology to support resilient and resource-efficient farming. Providing a comprehensive overview of traditional vs. smart agriculture methods, and enabling advisors to assess climate resilience, further aligns with the analysis's findings on the need to improve decision-making capabilities among agricultural professionals to navigate the challenges posed by a changing climate.

2.2.4. Module 4: Regenerative Agriculture

This module's comprehensive coverage of soil health, regenerative farming principles, and the impacts of different practices closely matches the substantial training needs highlighted in the needs analysis. It directly targets the significant gaps found in understanding sustainable soil management and nutrient techniques, equipping advisors with the knowledge to assess soil conditions, evaluate the effectiveness of regenerative practices, and predict their long-term impacts on soil fertility. By integrating aspects of environmental policy understanding, the module also provides the necessary context to promote the adoption of sustainable agricultural practices, as indicated by the needs analysis findings.

2.2.5. Module 5: Energy Cover Crops for Biogas Production

The module's emphasis on energy cover crops, their production, and integration into dual culture systems aligns with the needs analysis findings. It addresses the identified need for training in renewable energy systems and resource optimization, equipping advisors with the skills to differentiate between species and varieties of winter energy cover crops, calculate nitrogen fertilization requirements, and recommend best management practices. Covering the technical and environmental aspects of energy cover crop production also meets the call for improving sustainable energy management practices, a critical area highlighted in the analysis.

2.2.6. Module 6: Food Footprint: The Environmental Impact of the Agro-Food Chain

The content of this module directly responds to the needs analysis findings. By providing training on the importance of environmental sustainability, the challenges and opportunities in the agro-food chain, and the Life Cycle Assessment (LCA) methodology, the module addresses the documented gaps in understanding environmental impact and corporate social responsibility. Equipping advisors with practical skills in identifying and evaluating environmental impacts along the supply chain, as well as developing their ability to improve sustainability and enhance communication on these issues, aligns with the analysis's emphasis on building knowledge and advisory capabilities in this domain.

Overall, the curriculum demonstrates a clear and thorough response to the key skills gaps and competency needs highlighted in the detailed needs assessment, ensuring that agricultural advisors are equipped with the critical knowledge and practical skills required to support the digital, sustainable, and resilient transformation of the agri-food sector.

3. Training program design

3.1. Collaborative Curriculum Design: Leveraging Partner Expertise

The training curriculum for farmers' advisors was developed through a collaborative effort, with each module proposed and designed by a partner organization based on their respective areas of expertise and focus within the agri-food sector (Figure 1).

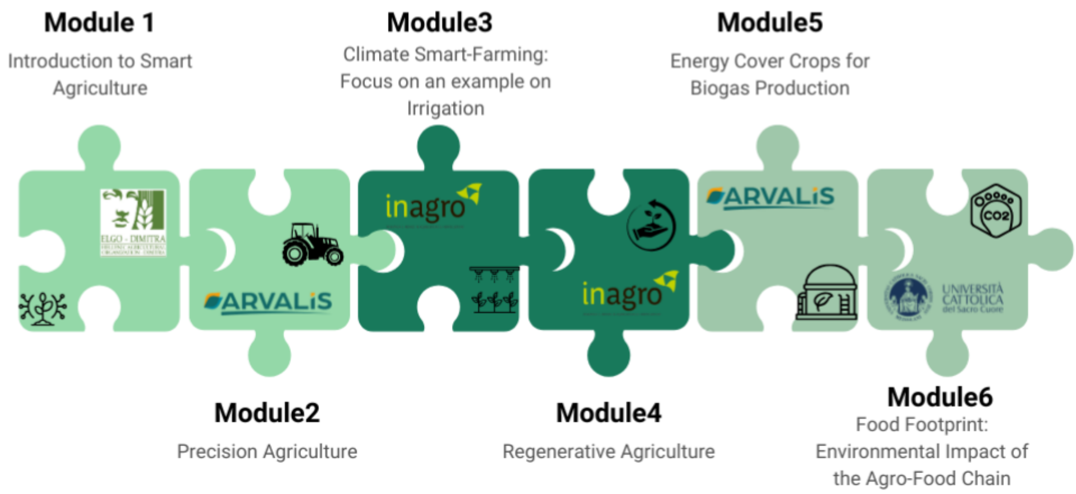

Figure 1: Training Program for Farmers Advisors: Structure and Partners

For the Module 1, "*Introduction to Smart Agriculture*", the Forest Research Institute of "Hellenic Agricultural Organization DIMITRA" (ELGO DIMITRA), a Greek research institute with extensive experience in forestry policy advisory and collaboration with end-users, took the lead. Leveraging their in-depth knowledge and strong ties to the agricultural community, ELGO ensured that this foundational module provided a robust grounding in smart agriculture concepts, technologies, and practical applications.

Modules 2 and 5, covering "*Precision Agriculture*" and *Energy Cover Crops for Biogas Production* " were proposed and designed by Arvalis, a French farmer-led organization that provides a full range of knowledge, techniques, and decision support tools for improving the performance of cropping systems. Drawing on their cross-sectoral expertise and close engagement with agricultural stakeholders, Arvalis designed these modules to equip advisors with the latest precision farming methodologies and sustainable energy solutions.

Modules 3 and 4, addressing "*Climate Smart-Farming*" and "*Regenerative Agriculture* ", were developed by Inagro, a Belgian research institute focused on improving the sustainability of local food production systems. Leveraging their strong expertise in co-creation and living lab methodologies, Inagro ensured that these modules integrated practical, user-centric approaches to building climate resilience and promoting regenerative farming practices.

Finally, the "*Food Footprint: The Environmental Impact of the Agro-Food Chain*" module was proposed and designed by the Faculty of Agriculture, Food, and Environmental Sciences of Università Cattolica del Sacro Cuore (UCSC) in Italy. As an internationally recognized leader in scientific research and innovative teaching in these domains, UCSC was well-positioned to develop this module, which equips advisors with the knowledge and tools to understand, assess, and communicate the environmental impacts along the agri-food supply chain.

This collaborative, partner-driven approach to curriculum development ensured that each module was designed by specialists who have a deep understanding of the unique needs, challenges, and opportunities within their respective fields. By leveraging the diverse expertise of the project consortium, the training program is set to provide agricultural advisors with comprehensive, practical, and impactful knowledge and skills, enabling them to lead the digital, sustainable, and resilient transformation of the agri-food sector.

3.2. Curriculum Description

Each module, described below in Units in the Training Outline Sections (3.2.1.4, 3.2.2.4, 3.2.3.4, 3.2.4.4., 3.2.5.4, 3.2.6.4), include the following structured components to ensure comprehensive and consistent delivery:

Training Objective: Defines the overall purpose and goals of the module.

Training Summary: Provides a concise overview of the content covered within the module.

Learning Objectives: Specifies the knowledge, skills, and abilities that learners are expected to acquire by the end of the module.

Training Outline: Details the sequence of topics and activities that will be covered.

Glossary: Includes key terms and definitions to support learners' understanding of specialized terminology.

Duration: States the estimated time required to complete the module.

Competences According to ESCO: The training curriculum was designed using the ESCO (European Skills, Competences, Qualifications, and Occupations) framework to define the competences that learners are expected to acquire. By aligning the curriculum with ESCO competences, the outlined skills, knowledge, and abilities are standardized and relevant to industry requirements.

Examples of Assessment Methods: Provides sample methods to assess learners' understanding and mastery of the module content.

References: List of scientific references related to each topic addressed by each module

3.2.1. Module 1: Introduction to smart agriculture

3.2.1.1. Training Objective

This module aims to provide participants with foundational knowledge and skills in smart agriculture practices and technologies.

3.2.1.2. Training Summary

This course introduces participants to the fundamentals of smart agriculture, focusing on its key concepts, technologies, and benefits. It covers an overview of smart agriculture, including definitions, historical context, and advantages, and introduces essential technologies such as GIS, remote sensing, IoT, and drones. Participants also learn about agroforestry systems and their implementation, explore real-world applications and success stories in smart agriculture, and receive practical tips for advising farmers on adopting smart practices. The module offers a solid foundation in modern, technology-driven agricultural practices aimed at enhancing sustainability and efficiency.

3.2.1.3. Learning Objectives

By the end of this module, the learner will:

- have knowledge about the definition, key components and scope of smart agriculture, its historical context, and benefits.
- be able to recognize key technologies in smart agriculture (e.g., geografic information systems, remote sensing, IoT and Drones).
- have knowledge on agroforestry, the types of agroforestry systems, and how to set up an agroforestry system.
- be able to recognize some applications and success stories in smart agriculture.

3.2.1.4. Training Outline (sections with aims)

1. Introduction to smart agriculture

The aim of this section is to provide theoretical information about the definition, key components, scope, historical context and benefits of smart agriculture.

2. Key technologies in smart agriculture

The aim of this section is to make the participant familiar with the key technologies used in smart agriculture, i.e., Geographic Information Systems, Remote Sensing, IoT and Drones.

3. Agroforestry

The aim of this section is to provide understanding of agroforestry, types of agroforestry systems, and how to set up an agroforestry system.

4. Applications and success stories in smart agriculture

a. Applications and success stories in smart agriculture

The aim of this section is to provide participants with examples of smart agriculture practices so they can advise farmers.

b. Tips for farmer advisors

The aim of this section is to give some tips to farmer advisors.

3.2.1.5. Glossary

- **Precision Agriculture:** Utilizing data from sensors, GPS, and remote sensing to make informed decisions about planting, watering, fertilizing, and harvesting crops.
- **Internet of Things (IoT):** Connecting various devices and sensors in the farm to collect real-time data and automate processes.
- **Remote Sensing (RS):** Using satellite or aerial imagery to monitor crop health, soil conditions, and environmental factors.
- **Geographic Information Systems (GIS):** Analyzing spatial data to optimize land use, manage resources, and monitor environmental impacts.
- **Drones and UAVs:** Employing unmanned aerial vehicles for surveillance, planting, and spraying crops.
- **Remote sensing:** Remote Sensing involves acquiring data about an area from a distance using satellites or aircraft.
- **Increased Productivity:** Enhancing yield and quality through precise management of resources and inputs.
- **Resource Efficiency:** Reducing waste by applying water, fertilizers, and pesticides only where and when needed.
- **Environmental Sustainability:** Minimizing the environmental footprint of farming operations through better management practices.
- **Economic Benefits:** Lowering costs and increasing profitability by optimizing resource use and improving crop performance

3.2.1.6. Duration

2h

3.2.1.7. Competences

- E -agriculture (http://data.europa.eu/esco/skill/97272b3e-d497-4420-893d-612b15d377d9)
- A groforestry (http://data.europa.eu/esco/skill/8034a1ea-5ee0-4a84-8fd3-16411c8d86fb)

3.2.1.8. Assessment Examples

- **What is one key benefit of using precision irrigation systems?**

A) Increased water usage

B) Improved crop health

C) Higher labor costs

- **How does smart agriculture contribute to environmental sustainability?**

A) By increasing chemical runoff

B) By optimizing resource use

C) By ignoring soil conditions

- **What economic advantage is associated with smart agriculture?**

A) Increased input costs

B) Higher crop yields and reduced costs

C) Decreased farm efficiency

- **What is the primary function of Geographic Information Systems, or GIS, in agriculture?**

A) Visualizing geographic data to improve decision-making

B) Controlling pests in real-time

C) Replacing manual labor?

- **How do IoT sensors contribute to smart farming?**

A) They collect real-time data on soil conditions and automate processes

B) They reduce the need for fertilizers

C) They track livestock locations manually

- **What advantage do drones offer in precision agriculture?**

A) They replace manual labor for planting crops

B) They provide real-time aerial data for crop monitoring and targeted spraying They increase the use of pesticides?

3.2.1.9. References

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Ghosh, P., & Kumpatla, S. P. (2022). GIS applications in agriculture. In Geographic Information Systems and Applications in Coastal Studies. IntechOpen.

3.2.2. Module 2: Precision agriculture

3.2.2.1. Training Objective

At the end of the training, learners will be able to define precision agriculture, explain how GPS works and identify its applications.

3.2.2.2. Training Summary

This training, "Precision Agriculture", is designed for Farmers advisors, catering to both beginners and advanced professionals. It focuses on precision agriculture and its applications in large-scale farming.

During the course, participants will gain a solid understanding of smart farming and precision agriculture. They will learn about the role and functioning of GPS in agriculture, including the use of RTK technology. The training will cover various forms of RTK technology and their applications in agriculture.

Additionally, participants will be able to compare the advantages and disadvantages of different GPS correction methods. By the end of the training, they will be equipped with the knowledge to recommend best practices for implementing precision agriculture in crop production. This training will empower agricultural advisors to provide informed guidance to farmers, helping them optimize crop production and maximize efficiency using precision agriculture techniques.

3.2.2.3. Learning Objectives

By the end of this module, the learner will be able:

- to explain precision agriculture as a specific approach within smart farming.
- to define the functioning of the GPS and the RTK technology, to identify its forms and applications and to compare the advantages and disadvantages of the different GPS correction methods.
- to understand and assess precision agriculture techniques for effective weed management in crop production.
- to summarize key concepts of precision agriculture and explore future trends and opportunities of its application.

3.2.2.4. Training Outline (sections with aims)

1. **Introduction to precision agriculture**

a. Introduction to GPS

Aim of the Section: To provide a foundational understanding of GPS technology, including its origins, functionality, and significance as a satellite-based navigation system for various applications.

b. GPS in Agriculture

Aim of the Section: To explain how GPS technology is utilized in agriculture to enhance operational efficiency and accuracy, helping farmers optimize resource management and improve crop production.

2. **GPS technology in agriculture**

a. GPS Correction Methods

Aim of the Section: To introduce different GPS correction methods used in agriculture, outlining their mechanisms, accuracy levels, and suitability for various farming applications.

- Differential GPS (DGPS)
- Real-Time Kinematic (RTK) GPS
- Network RTK
- Centipede (Example of Network RTK in France)

b. Advantages and Disadvantages of GPS Correction Methods

Aim of the Section: To compare and contrast various GPS correction methods, assessing their strengths and weaknesses in terms of cost, accuracy, and practical application in agriculture.

c. GPS Technology in Practice

Aim of the Section: To illustrate the practical applications of GPS technology in agriculture, focusing on key technologies like autoguidance and section control that improve operational efficiency and resource management.

- Autoguidance
- Section Control

3. Implementing precision agriculture in crop production

Aim of the sequence: to present a real-life scenario where precision agriculture techniques are applied in crop production particularly for weed management. These include:

a. GPS-guided Machinery: Modern tractors with GPS systems can make precise passes to minimize tillage or herbicide application areas.
b. Drones and Sensors: Drones equipped with cameras and sensors can detect weeds in fields and deliver herbicides or monitor infestations for targeted control.
c. Robotic Weeders: Automated machines that can identify and remove weeds without damaging crops are gaining popularity in high-value cropping systems.

4. The future of precision agriculture

This sequence will summarize the key learnings from the course and discuss the future of precision agriculture. It will also provide learners with resources for further learning and professional development.

3.2.2.5. Glossary

- **Autoguidance**: Autoguidance is a GPS-based technology that allows farmers to guide their equipment with precision. This can improve efficiency and reduce operator fatigue. Autoguidance can be used for a variety of tasks, including planting, spraying, and harvesting.
- **Centipede**: Centipede is a free RTK network available in France. It uses a network of base stations to provide real-time corrections to GPS signals, allowing farmers to achieve high precision in their operations without the need for a private base station.
- **Differential GPS (DGPS)**: This method uses a network of ground-based reference stations to improve the accuracy of GPS signals. It can provide accuracy of up to 1-3 meters.

- **GPS**: GPS, or Global Positioning System, is a satellite-based navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth. It was developed by the United States Department of Defense and became fully operational in 1993.
- **Precision Agriculture**: Precision agriculture is a farming management concept based on observing, measuring, and responding to inter and intra-field variability in crops. It involves the use of technology, such as GPS-guided machinery, drones, sensors, and robotic weeders, to improve crop yields, reduce environmental impact, and make more efficient use of resources.
- **Robotic Weeders**: Robotic weeders are automated machines that can identify and remove weeds without damaging crops. They use sensors and cameras to detect weeds and remove them using mechanical or chemical means. This technology allows for more precise and efficient weed control.
- **RTK Technology**: RTK (Real-Time Kinematic) technology is a GPS correction technique used to enhance the precision of position data. It provides real-time corrections to GPS signals, enabling centimeter-level accuracy.
- **Section Control**: Section control is a GPS-based technology that allows farmers to automatically turn on and off equipment sections to avoid overlaps and skips. This can help to reduce input costs and improve efficiency. Section control can be used for a variety of tasks, including planting, spraying, and spreading.

3.2.2.6. Duration

2h

3.2.2.7. Competences

- E- agriculture (http://data.europa.eu/esco/skill/97272b3e-d497-4420-893d-612b15d377d9)
- Agricultural equipment (http://data.europa.eu/esco/skill/5f95f9c9-30ee-4735-ab63-8045ec8f78f8)
- Apply precision farming (http://data.europa.eu/esco/skill/8ca08a35-2d2e-46f5-b440-8fc8ce736287)
- Assess new farming technologies (http://data.europa.eu/esco/skill/b82f51d0-38d1-45f6-99a0-4586309c6b60)

3.2.2.8. Assessment Examples

- **What technology is commonly used in precision agriculture?**
    - Artificial intelligence
    - Blockchain
    - GPS, drones, and sensors
- **What is a real-life application of precision agriculture?**
    - Breeding new varieties of crops
    - Weed management in crop production
    - Soil erosion control
- **What is RTK technology in the context of GPS?**
    - A type of drone
    - A type of sensor
    - A type of GPS technology
    - A type of robot
- **TRUE or FALSE : GPS technology in agriculture allows farmers to improve the efficiency and accuracy of their operations without any additional costs.**

- **What is GPS technology used for in agriculture?**
    - Tracking cattle movements
    - Creating maps of fields and tracking equipment
    - Predicting weather patterns
- **What is Centipede in the context of GPS technology in agriculture?**
    - A type of GPS correction method
    - A free RTK network available in France
    - A satellite-based navigation system
- **Who developed the Global Positioning System (GPS)?**
    - NASA
    - The United States Department of Defense
    - European Space Agency
- **TRUE or FALSE : Drones equipped with cameras and sensors can only detect weeds in fields but not monitor infestations.**

- **Which technology allows for more precise application of herbicides in precision agriculture?**
    - GPS-guided machinery
    - Robotic weeders
    - Drones equipped with cameras and sensors
- **How does precision agriculture contribute to reduced environmental impact?**
    - By increasing crop yields
    - By reducing the need for manual labor
    - By allowing for more precise and efficient use of resources
    - By increasing farmer profit

3.2.2.9. References

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3.2.3. Module 3: Climate smart-farming: focus on an example on irrigation

3.2.3.1. Training Objective

This module provides a tool to define the contribution of digital agriculture to climate change management.

3.2.3.2. Training Summary

This training is designed to equip agricultural advisors with essential knowledge of climate smart farming and the role of digital agriculture in managing climate change. Participants will explore the impacts of climate change on agriculture and learn the basics of climate-smart agriculture, including adapting crop cycles and managing biotic risks. The course emphasizes the use of digital tools, such as the WaterRadar platform, to evaluate water demand and supply, assess climate risks, and co-design climate-smart solutions. Through practical demonstrations and analysis of regional water patterns, participants will gain a comprehensive understanding of how technology can enhance sustainable and resilient farming practices. By the end of the training, participants will be able to compare traditional and smart agriculture methods, assess systems for climate resilience, and provide informed advice to farmers on how to adapt their practices to mitigate the impacts of climate change.

3.2.3.3. Learning Objectives

By the end of this module, the learner will:

- be able to define the concept of climate change and its impacts on agriculture.
- be able to describe the role of technology in climate change mitigation.
- be able to Identify the features and benefits of the WaterRadar platform.
- be able to compare and contrast traditional and smart agriculture practices in relation to climate change.

3.2.3.4. Training Outline (sections with aims)

1. **Understanding climate change and its impacts on agriculture**

    a. Temperature change

The aim of this section is to show how higher temperatures can affect crop growth

    b. Precipitation patterns

The aim of this section is to understand the impacts of droughts and floods

    c. Extreme weather events

The aim of this section is to understand the climate change events

2. **Role of digital agriculture in climate smart farming**

    a. Remote sensors

The aim of this section is to understand the use of sensors to monitor crops

    b. Data analytics

The aim of this section is to understand how optimize crop management with smart agriculture

3. **Using the The WaterRadar Platform**

    a. The W aterRadar platform

The aim of this section is to describe the platform

    b. Benefits of using the platform

The aim of this section is to show the benefits of this platform

4. **Regional water demand and supply patterns**

    a. Understanding water demand and supply patterns

The aim of this section is to understand the differences by regions

    b. Comparison of traditional and smart agriculture practices

The aim of this section is to have clues in different crop managements

3.2.3.5. Glossary

- **Climate Change**: Significant changes in global temperatures and weather patterns over time, primarily caused by human activities such as burning fossil fuels and deforestation.

- **Climate Models**: Computer simulations that predict future climate conditions based on various economic and social factors, such as greenhouse gas emissions and carbon storage.
- **Decision Support Systems (DSS)**: Computer-based tools that help farmers make informed decisions about crop management. They can be used to optimize irrigation, fertilization, and pest management, and to reduce greenhouse gas emissions.
- **Greenhouse Gasses** : Gasses that trap heat from the sun in the Earth's atmosphere, causing the Earth's average temperature to rise, a phenomenon known as global warming.
- **Irrigation**: The process of applying water to crops to supplement rainfall and ensure adequate water supply. Irrigation depends on factors such as water sources, infrastructure, and water management practices.
- **Precipitation Patterns**: The distribution of rainfall and snowfall over time and space.
- **Soil Type**: The physical and chemical characteristics of soil, such as texture, structure, and water-holding capacity. Soil type can affect water demand in agriculture.
- **Smart Agriculture Practices**: Agricultural practices that use technology and data to manage water resources more sustainably. Examples include precision irrigation and water-saving technologies.
- **Water Demand**: The amount of water required for a specific use or purpose, such as agriculture, industry, or domestic use. In the context of agriculture, water demand is influenced by factors such as crop type, climate, and soil type.
- **Water Supply**: The amount of water available for a specific use or purpose. In agriculture, water supply depends on factors such as rainfall and irrigation.

3.2.3.6. Duration

2h

3.2.3.7. Competences

- E- agriculture (http://data.europa.eu/esco/skill/97272b3e-d497-4420-893d-612b15d377d9)
- Agricultural equipment (http://data.europa.eu/esco/skill/5f95f9c9-30ee-4735-ab63-8045ec8f78f8)
- Apply precision farming (http://data.europa.eu/esco/skill/8ca08a35-2d2e-46f5-b440-8fc8ce736287)
- Assess new farming technologies (http://data.europa.eu/esco/skill/b82f51d0-38d1-45f6-99a0-4586309c6b60)

3.2.3.8. Assessment Examples

- **TRUE or FALSE : Climate change can potentially extend the growing season, allowing for multiple harvests in a year.**

- **How does smart agriculture help mitigate the impacts of climate change on agriculture?**
  - By increasing the use of chemical fertilizers
  - By improving irrigation systems
  - By optimizing crop management and reducing greenhouse gas emissions
- **How do changes in precipitation patterns due to climate change impact crop growth?**
  - Changes in precipitation patterns have no significant impact on crop growth.
  - Changes in precipitation patterns can cause crops to wilt and die or waterlog the soil, making it difficult for crops to grow.
  - Changes in precipitation patterns always extend the growing season, allowing for multiple harvests in a year.
- **What is the primary focus of the WaterRadar case study?**
  - Monitoring crop health and soil moisture
  - Predicting future climate conditions
  - Optimizing irrigation with treated wastewater Reducing greenhouse gas emissions
- **TRUE or FALSE : The WaterRadar platform helps farmers manage water resources more effectively.**

- **What is the main purpose of the WaterRadar platform?**
  - To help farmers manage water demand and supply
  - To sell farming equipment
  - To provide weather forecasts
- **What are the primary factors influencing water demand in agriculture?**
  - Crop type and irrigation infrastructure
  - Climate, soil type, and crop type
  - Soil texture and rainfall distribution
- **What is the primary source of water for agriculture?**
  - Rainfall
  - Irrigation
  - Groundwater
- **Which smart agriculture practices can help manage water resources more sustainably?**
  - Genetically modified crops and pesticides
  - Precision irrigation and water-saving technologies
  - Traditional agriculture practices and rainfall reliance
- **What can affect water demand in agriculture according to the course?**
  - Economic factors only

  - Crop type, climate, and soil type
  - Water supply only
  - Government policies only

- **Which practice can help farmers manage water resources more sustainably according to the course?**
  - Traditional agriculture practices
  - Smart agriculture practices
  - Irrigation only
  - Rainfall only

3.2.3.9. References

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3.2.4. Module 4: Regenerative agriculture

3.2.4.1. Training Objective

By the end of this training, participants will be able to advise farmers on regenerative agriculture practices, assess soil types, understand core principles, and evaluate the impact of these methods on soil health and long-term fertility to support sustainable farming.

3.2.4.2. Training Summary

This training module aims to equip them with a solid understanding of regenerative agriculture. By the end of this course, participants will grasp the essence of regenerative agriculture and its role in maintaining soil health. They will learn about various soil types and their properties, enabling them to assess soil conditions effectively. The training will delve into the core principles of regenerative farming and its implementation, shedding light on how different farming practices influence soil health. Participants will explore the benefits and drawbacks of regenerative agriculture, as well as the obstacles that may arise during its implementation. By applying regenerative farming strategies in practical scenarios, learners will gain the ability to evaluate the effectiveness of these practices. Moreover, they will acquire the knowledge to predict the long-term impacts of regenerative agriculture on soil fertility, thereby enhancing their capacity to promote sustainable farming practices.

3.2.4.3. Learning Objectives

By the end of this module, the learner will:

- have a good understanding of soil types and soil properties (physical, chemical, and biological properties).
- have the skills to use hand on methodologies to assess soil conditions in terms of soil health, soil fertility and water retention capacity (by showing some examples of profile pits)
- understand the main principles of regenerative agriculture.
- be able to evaluate the impact of farming practices on soil conditions and soil fertility and to implement appropriate regenerative farming strategies.

3.2.4.4. Training Outline (sections with aims)

1. **The soil types and their properties**

Introduction to the soil types and their properties. The aim of this section is to provide theoretical information about the soil.

2. **How to assess soil conditions**

The aim of this section is to assess the condition of the soil by studying/explaining some profile pits (online: video's, pictures).

3. **The main principles of regenerative farming**

The aim of this section is to explain the main principles of regenerative agriculture (what are the main principles and what's the purpose of these principles.

4. **Regenerative agriculture implemented**

The aim of this section is to introduce learners to regenerative agriculture in a deeper way.

3.2.4.5. Glossary

- **Assessing soil conditions:** The process of evaluating the physical, chemical, and biological properties of soil to determine its suitability for regenerative agriculture practices.
- **Available water capacity**: A measure of the amount of water that the soil can hold and make available to plants, which can be assessed using laboratory tests or field test kits.

- **Cover crops**: Plants grown to cover the soil rather than for harvest. Cover crops can improve soil health by increasing organic matter, reducing erosion, and improving water infiltration.
- **Fertilizers**: Substances used to improve crop growth.
- **Geographic Information Systems (GIS):** Used to collect, store, analyze, and visualize geographic data.
- **Microbial activity**: The activity of microorganisms in the soil, playing a crucial role in nutrient cycling, soil structure, and disease suppression.
- **No-till farming**: The practice of planting crops without tilling the soil, reducing erosion, increasing organic matter, and improving soil structure.
- **Physical properties:** Characteristics of soil that can be observed and measured without a microscope, like texture and structure.
- **Soil compaction:** Occurs when soil particles are pressed together, reducing air and water space, impacting root growth and water infiltration.
- **Soil fertility:** The soil's ability to support plant growth, essential for high crop yields and productivity.
- **Soil pH:** A measure of soil acidity or alkalinity affecting nutrient availability and microorganism activity.
- **Soil structure**: The arrangement of soil particles into aggregates, affecting water infiltration, root penetration, and nutrient cycling.
- **Soil types**: Classified by texture, structure, and composition, including Sandy, Clay, Loamy, Peaty, and Chalky soils.
- **water retention capacity:** Soil's ability to hold water, influenced by texture, structure, and organic matter content.

3.2.4.6. Duration

2h

3.2.4.7. Competences

- Soil science (http://data.europa.eu/esco/skill/91a6da8d-24dc-4453-9821-de305864677c)
- Soil structure (http://data.europa.eu/esco/skill/6c1143b7-1a4c-49ba-849a-ae328673e566)
- Maintain plant soil nutrition (http://data.europa.eu/esco/skill/6d53015b-6867-408f-8f3a-4eb9d5dae101)

3.2.4.8. Assessment Examples

- **TRUE or FALSE : Regenerative agriculture practices can have negative long-term effects on soil fertility.**

- **TRUE or FALSE : Conventional farming practices, such as tillage and the use of synthetic fertilizers and pesticides, promote soil health.**

- **What is the primary goal of regenerative agriculture?**
  - To maximize crop yield
  - To improve soil health, increase biodiversity, and enhance ecosystem services
  - To promote the use of synthetic fertilizers and pesticides
- **What is the role of soil health in regenerative agriculture?**
  - Soil health is not a critical component of regenerative agriculture.
  - Healthy soil is essential for supporting biodiversity and mitigating climate change.
  - Healthy soil is essential for the growth of crops and the provision of ecosystem services in regenerative agriculture.
- **What are the principles of regenerative agriculture?**
  - The principles of regenerative agriculture include maximizing tillage and the use of synthetic fertilizers and pesticides.
  - The principles of regenerative agriculture include maximizing profits and reducing labor costs.
  - The principles of regenerative agriculture include minimizing soil disturbance, maximizing biodiversity, and enhancing ecosystem services, as well as the use of cover crops, crop rotation, and integrated pest management.
- **Which soil property affects the soil's ability to supply nutrients to plants and support plant growth?**
  - Physical Properties
  - Chemical Properties
  - Biological Properties
- **Which indicator can be used to assess soil fertility?**
  - Infiltration rate
  - Nutrient content
  - Soil pH
  - Cation exchange capacity
- **TRUE or FALSE :** No-till farming is suitable for all environments, including areas with high weed pressure.

- **Which regenerative agriculture practice increases soil organic matter and stores large amounts of carbon?**
  - Crop rotation
  - No-till farming and cover cropping
  - Organic fertilization
  - Agroforestry

- **Which regenerative agriculture practice enhances soil biodiversity by promoting the growth of beneficial microorganisms?**
    - Cover cropping and organic fertilization
    - No-till farming
    - Crop rotation
    - Agroforestry

3.2.4.9. References

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3.2.5. Module 5: Energy cover crops for biogas production

3.2.5.1. Training Objective

At the end of the training, participants will be able to understand sustainable management of biomass from energy cover crops, minimizing land use change, and exploring renewable energy production through experimental biogas applications.

3.2.5.2. Training Summary

This training course focuses on energy cover crops and their management. It examines the need for energy cover crops, crop rotations and their integration into agricultural systems, as well as their biomass potential. The technical and environmental issues of the production of these covers are also addressed, as well as the stages of recovery in on-farm biogas facilities. Participants will learn how to differentiate between species and varieties of winter energy cover crops and how to calculate the amount of nitrogen fertilization needed. At the end of the training, they will be able to recommend management practices for energy cover crops integrated into a dual culture system.

3.2.5.3. Learning Objectives

By the end of this module, the learner will be able:

- to describe the projection needs of energy cover crops in the national energy transition scenarios as well as the main crop rotations and the needs to include an energy cover crop.
- also to identify the available biomass potential of energy cover crop from different studies.
- to discuss the technical and environmental challenges of energy crop production and to choose and advise management for the double cropping system adapted to the local conditions.
- to explain how a farm biogas plant works and to examine the steps and warning points to valorise energy cover crops in on farm biogas plants.
- to differentiate the species and varieties of winter energy cover crops and describe their strengths and weaknesses and outline of research and to calculate an amount of nitrogen fertilisation for energy cover crops.

3.2.5.4. Training Outline (sections with aims)

1. **Energy cover crop Biomass feedstock**

    a. Energy cover crop needs

The aim of the sequence is to discover the needs for energy crops in national energy transition scenarios. Projections of these needs will be presented.

    b. Energy crop introduction into cropping systems

The aim of the sequence is to learn about the main crop rotations and the needs to include an energy crop. The rotation systems will be examined in detail. Energy cover crop potential

    c. Energy cover crop potential

The aim of the sequence is to learn about the main crop rotations and the needs to include an energy crop. The rotation systems will be examined in detail.

2. **Energy cover crop management into double cropping systems**

    a. Energy crop issues

    The aim of the sequence is to learn about the different technical and environmental challenges related to the production of energy crops. Factors affecting biomass production will be discussed.

b. Energy crop management

The aim of the sequence is to learn how to choose and advise management practices for energy crops integrated into a dual cropping system. Adapted management strategies will be presented.

3. MetAplatform

a. MetAplatform presentation

The aim of the sequence is to discover how works a farm biogas plant.

b. Energy cover crop digestion

The aim of the sequence is to learn the different steps and points of attention to recover energy crops in anaerobic digestion plants. The stages of valorization will be presented in detail.

4. Energy cover crop trials

a. Species and varieties

The aim of the sequence is to learn how to differentiate between species and varieties of winter energy crops. The strengths and weaknesses of each species and variety will be presented.

b. Nitrogen fertilisation

The aim of the sequence is to learn how to calculate the amount of nitrogen fertilization needed for energy crops. The calculations will be made using concrete examples.

3.2.5.5. Glossary

1. **Anaerobic digestion plant**: A plant that transforms biomass into biogas, which can be used as an energy source.
2. **Biogas**: The gas produced by the fermentation of biomass in a biogas plant.
3. **Digestion conditions**: Digestion conditions must be optimized to produce methane efficiently. Factors to consider include temperature, pH, oxygen content, and the presence of nutrients.
4. **Digestion reactor size**: The size of the digestion reactor should be appropriate for the amount of energy cultures to be digested. If the reactor is too small, it will not be able to digest all the cultures efficiently.
5. **Digestate post-treatment**: Digestate post-treatment is the process of turning digestate into compost or fertilizer. It can include solids and liquids separation, drying, and granulation.
6. **Dual-cropping systems**: A method of cultivation that consists of growing two different species on the same plot of land in the same year. This can include main crops and energy crops
7. **Energy cover crops** Energy cover crops are plants grown specifically to produce biomass for energy production.

8. **Greenhouse gasses**: Gasses that contribute to the greenhouse effect, such as carbon dioxide, methane, and nitrous oxide.
9. **Legumes**: Legumes are plants in the Fabaceae family, characterized by their ability to fix nitrogen from the air thanks to symbiotic bacteria present in their roots. In the context of IVEF, the legumes used are vetch, clover, peas, and faba beans.
10. **Local organic matter**: Local organic matter is locally available agricultural or agro-industrial waste that can be used in addition to IVIC to produce biogas.
11. **Nitrogen excess or deficiency**: When the amount of nitrogen available is greater or less than the needs of energy crops, which can have negative consequences on biomass growth and production.
12. **On-farm biogas plants**: On-farm biogas plants are systems that use anaerobic fermentation to turn organic waste into biogas, which can be used as an energy source.
13. **Organic matter**: The material from the decomposition of plants and animals, which can be used to improve soil quality.
14. **Rotation systems**: Rotation systems are methods used by farmers to rotate crops to maintain soil fertility and control diseases and pests. There are several types of rotation systems, each with its advantages and disadvantages.
15. **Separation of biogas and digestate**: The separation of biogas and digestate is the process of separating biogas, which is produced by anaerobic digestion, from digestate, which is the solid residue of digestion.

3.2.5.6. Duration

4h

3.2.5.7. Competences

- Operate biogas plant (http://data.europa.eu/esco/skill/0e81fcff-2fb5-4c87-afc2-49b5e5d9db50)
- Maintain biogas plant (http://data.europa.eu/esco/skill/8e01e994-0e09-4fbb-a76b-7f615678cc7d)
- Harvest cover crops (http://data.europa.eu/esco/skill/18c91584-b27a-4ffb-83ca-9b6f0092af07)

3.2.5.8. Assessment Examples

- **TRUE or FALSE : Crop rotation can affect the amount of nitrogen fertilization needed for energy crops.**
- **What is the solid residue of anaerobic digestion?**
  - Biogas
  - Compost
  - Digestate
- **What gas is produced during the anaerobic digestion of energy crops?**
  - Carbon dioxide

  - Oxygen
  - Methane

- **What is one of the points of attention to make use of energy crops in anaerobic digestion plants?**
  - The amount of water in the anaerobic digestion plant
  - The quality of energy crops
  - The rotational speed of the anaerobic digestion plant

- **What is the role of anaerobic bacteria in the anaerobic digestion plant?**
  - They consume the methane produced
  - They break down energy crops and produce methane
  - They transform methane into electricity

- **What are the advantages of dual cropping systems?**
  - They increase biomass production.
  - They reduce biomass production.
  - They reduce the quality of the soil.
  - They increase greenhouse gas emissions.

- **What is the role of residues in the production of energy crops?**
  - Residues are always harmful to the environment
  - Residues can be used to enrich the soil
  - Residues have no effect on the environment
  - Residues cannot contain contaminants

- **What are the factors affecting biomass production in energy crops?**
  - Climate
  - Water pollution
  - Diseases and Parasites
  - Specialized equipment
- **What is the main reason why farmers introduce Energy cover crops into rotation systems?**
  - To increase biomass production
  - To reduce greenhouse gas emissions
  - To diversify crops
  - To increase soil fertility
- **How can Energy cover crops be integrated into crop rotation systems?**
  - Completely replacing food crops
  - Alternating food crops and Energy cover crops
  - Growing Energy cover crops on land not used for food production

  - By growing Energy cover crops in monoculture
- **What is the main factor determining the need for intermediate energy crops (CIVES) for anaerobic digestion plants?**
  - Availability of local organic materials
  - Energy production objectives
  - The capacity of the biogas plant
  - The desire to develop renewable energy production

3.2.5.9. References

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3.2.6. Module 6: Food Footprint: the environmental impact of the agro food chain.

3.2.6.1. Training Objective

By the end of this training, participants will be able to assess and communicate the environmental impacts of the agro-food supply chain, utilizing Life Cycle Assessment (LCA) methodologies.

3.2.6.2. Training Summary

This training is designed for beginners who advise farmers and are interested in understanding the environmental impact of the agro-food chain. Participants will learn about the importance of environmental sustainability in food production and the main environmental impacts it brings. They will gain knowledge on the challenges and opportunities related to sustainability in the agro-food chain, as well as grasp the Life Cycle Assessment (LCA) methodology and its stages.

The training will provide practical examples of LCA application, enabling participants to identify and evaluate environmental impacts along the entire agro-food supply chain. By analyzing case studies and developing sustainability projects, participants will gain practical skills in improving sustainability and enhancing their communication skills related to environmental impact in the food sector. Ultimately, this training will equip farmer's advisors with the necessary knowledge and tools to make informed decisions and contribute to a more sustainable agro-food chain.

3.2.6.3. Learning Objectives

By the end of this module, the learner will be able:

- to understand the concept of environmental sustainability and identify key environmental impacts in agro-food production
- to conduct a Life Cycle Assessment (LCA) and evaluate environmental impacts of specific products within the agro-food chain.
- to analyze case studies and extract practical lessons for improving sustainability in their own practices.

3.2.6.4. Training Outline (sections with aims)

1. **Introduction to the Concept of Environmental Sustainability in the Agro-Food Chain**

a. Definition of environmental sustainability and its importance in the agro-food chain.

b. Analysis of the main environmental impacts in agro-food production.

c. Discussion of the challenges and opportunities related to sustainability in the agro-food chain.

2. **Life Cycle Assessment (LCA) Methodology for Impact Evaluation**

a. Detailed explanation of the LCA methodology and its stages.

b. Identification and evaluation of environmental impacts along the entire agro-food supply chain.
c. Practical examples of LCA application to agro-food products.

3. Case Studies

a. Practical group activities to apply concepts learned during the course.
b. Development of projects or solutions to enhance sustainability in specific areas of the agro-food chain.
c. Presentation of results and classroom discussion.

3.2.6.5. Glossary

- **Agro-food chain**: The sequence of processes involved in the production, processing, distribution, consumption, and disposal of food products.
- **Emissions**: The release of greenhouse gasses, such as methane and nitrous oxide, which contribute to climate change.
- **Energy Use**: The production, processing, and transportation of food, which require significant amounts of energy and can contribute to greenhouse gas emissions and climate change.
- **Environmental Sustainability**: The ability to maintain the conditions under which humans and nature can exist in productive harmony. In the context of the agro-food chain, it refers to the production of safe, high-quality food products while minimizing negative environmental impacts.
- **Greenhouse Gas Emissions**: Gasses that trap heat in the Earth's atmosphere, contributing to climate change. Agriculture is a significant source of greenhouse gas emissions.
- **Impact Assessment**: The third stage of LCA, which involves evaluating the potential environmental impacts of the inputs and outputs identified in the inventory analysis.
- **Interpretation**: The fourth stage of LCA, which involves interpreting the results of the impact assessment and drawing conclusions about the environmental performance of the product or service.
- **Inventory Analysis**: The second stage of LCA, which involves collecting data on all the inputs and outputs of the system, including raw materials, energy, water, and emissions.
- **Land Use**: The use of land for agriculture, which can lead to deforestation, loss of biodiversity, and soil degradation.
- **Land Use and Deforestation**: The use of land for agriculture and the clearing of forests for agricultural purposes. Agriculture is the leading cause of deforestation, which contributes to biodiversity loss and climate change.
- **Life Cycle Assessment (LCA)**: A methodology used to evaluate the environmental impacts of products and services throughout their life cycle. LCA consists of four stages: goal and scope definition, inventory analysis, impact assessment, and interpretation.

- **Soil Degradation**: The decline in soil quality and productivity as a result of agricultural activities. Soil degradation can reduce the resilience of agricultural systems and their ability to adapt to changing conditions.
- **Waste**: The production and consumption of food, which generate significant amounts of waste, including food waste and packaging waste.
- **Water Use**: The use of water for irrigation, which can lead to water scarcity and depletion of aquifers.

3.2.6.6. Duration

4h

3.2.6.7. Competences

- Knowledge:
  - Product life-cycle (http://data.europa.eu/esco/skill/21e0cad8-4eef-42be-b18b-0f8e37f0dbd0)
- Skills:
  - Measure company's sustainability performance (http://data.europa.eu/esco/skill/d53eab76-e8ff-4e28-af26-7e012951c763)
- Transversal skills and competences
  - Assess environmental impact (http://data.europa.eu/esco/skill/e541c69c-ea80-4b17-87cb-4001d0b9d303)

3.2.6.8. Assessment Examples

- **TRUE or FALSE : Agriculture is the leading cause of deforestation, contributing to climate change.**
- **TRUE or FALSE : Fruit and vegetable production have no significant environmental impacts.**
- **TRUE or FALSE : LCA methodology is not used to evaluate the environmental impacts of products and services throughout their life cycle.**
- **What is the LCA methodology used for?**
  - To measure the economic viability of a product
  - To evaluate the social impacts of a product
  - To evaluate the environmental impacts of a product
- **What is the main purpose of a Life Cycle Assessment (LCA) in the agro-food chain?**
  - To compare the economic viability of different farming practices
  - To evaluate the environmental impacts of products and services throughout their life cycle
  - To promote sustainable farming practices
  - To monitor and reduce environmental impacts using technology.

- **TRUE or FALSE: LCA cannot be used to identify opportunities to reduce environmental impacts in beef production.**
- **Which of the following is not an environmental impact identified and evaluated by LCA in the agro-food chain?**
    - Land Use
    - Noise Pollution
    - Water Use
- **What is the purpose of the Impact Assessment stage in LCA?**
    - To evaluate the potential environmental impacts of the inputs and outputs identified in the inventory analysis. To interpret the results of the impact assessment and draw conclusions about the environmental performance of the product or service.
    - To define the purpose of the LCA, the product or service being assessed, and the system boundaries.
- **Which of the following is NOT a practical example of LCA application in agro-food products?**
    - Beef Production
    - Dairy Production
    - Fruit and Vegetable Production
    - Fish Farming
- **What is a practical application of LCA in the agro-food industry?**
    - To identify opportunities to reduce environmental impacts in beef production.
    - To evaluate the financial performance of a food processing plant.
    - To assess the nutritional value of a food product.
- **What are the four main stages of Life Cycle Assessment (LCA) methodology?**
    - Goal and Scope Definition, Inventory Analysis, Impact Assessment, Interpretation
    - Definition, Analysis, Assessment, Conclusion
    - Planning, Execution, Evaluation, Reporting

3.2.6.9. References

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4. Training Program Development and Implementation

Following the design phase, the developed curricula will be implemented across each partner country, involving over 80 farmer’s advisors sourced through our consortium partner network. The curriculum is available in the six primary languages of the project: English, French, Italian, Portuguese, Greek, and Spanish to simplify the development of the educational material adapted to each context. The program will be delivered in both online and offline formats to maximize accessibility and flexibility. Educational materials created by the module leaders will be uploaded to the e-learning platform, https://agrifood4future-e-learning.com/login/index.php , providing essential resources for partners to adapt and localize the program for their respective countries. On the platform, there are also other programs available, including a MOOC titled Digital agriculture: transforming field crop. Module leaders will coordinate with Arvalis to upload their content onto the platform. These materials will also be accessible to advisors who wish to participate online, with content initially available in English and options for translation into other languages.

For partners opting to deliver certain modules face-to-face, site visits will be organized, as outlined in WP3, Task 3.7 (Design and implementation of COVE networking, demo days and site/farm visits) in collaboration with local partners. Multiple program editions may be scheduled to reach the maximum number of advisors. Partners are responsible for preparing and adapting their materials into their local languages. For instance, Module 2 will include a site visit in France in March 2025, while Module 5 will be delivered in April 2025.Additionally, a micro-credentialing procedure to validate the skills acquired is being developed (within the Task 4.8 - Recognition and validation of learning outcomes) to support a coherent testing system in line with life-long learning principles. This will enable certification of competency, with credits available both at the end of the course and at intermediate levels, recognizing advisors' progress and skills acquisition throughout the program.

The development and implementation phase will continue until November 2026. During this period, changes and adaptations may be made based on initial participant feedback, leading to the creation of a second version of the curricula.

5. Conclusion

The development of the lifelong learning curriculum for agricultural advisors empowers key actors with up-to-date knowledge and skills to drive sustainable practices at the farm level.

The curriculum framework is designed to close the skills gaps identified in the detailed needs analysis. The curriculum offers targeted learning in key areas such as smart and precision agriculture, climate-smart farming, regenerative practices, renewable energy, and environmental impact assessment. Each module delivers both theoretical foundations and practical tools, ensuring that advisors are equipped to guide farmers through the adoption of cutting-edge practices and technologies.

For example, modules such as Introduction to smart agriculture and precision agriculture address deficiencies in digital literacy and technological integration, enabling advisors to navigate the digital transition of the agri-food sector. Meanwhile, training in climate smart-farming and regenerative agriculture equips participants with essential strategies to foster resilience and sustainability in response to climate challenges. Modules on energy cover crops for biogas production and Food Footprint further expand advisors' expertise in renewable energy systems and environmental impact management, directly aligning with the sector's shift toward greener and more efficient practices.

This curriculum not only meets the immediate training needs of agricultural advisors but also lays the foundation for long-term professional growth, aligning with the principles of lifelong learning. By enhancing advisors' ability to deliver tailored, innovative, and sustainable solutions, the program supports the broader transformation of the agricultural sector into one that is economically viable, environmentally responsible, and socially inclusive.

As outlined in this document, the Erasmus+ AGRIFOOD4FUTURE project is more than a response to today's challenges; it is a proactive investment in the future of European agriculture.

6. ANNEX

Curriculum files in the consortium's languages:

Agricultural Advisors Training Curriculum Portuguese

Agricultural Advisors Training Curriculum Italian

Agricultural Advisors Training Curriculum French

Agricultural Advisors Training Curriculum spanish

Agricultural Advisors Training Curriculum English

Agricultural Advisors Training Curriculum Greek