



# ReGrow

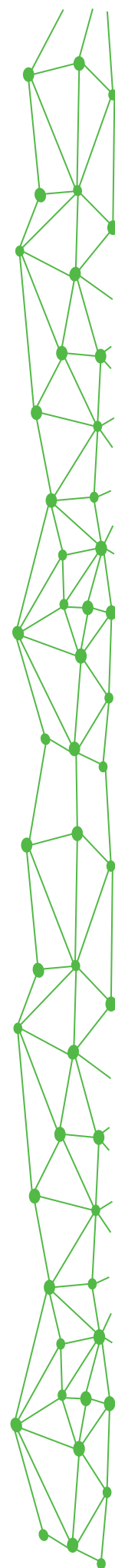
Rebuilding Growth in Agriculture in  
Post-Conflict Ukraine & Transitioning Georgia

## **D3.1: Comparative Analysis and Recommendations for Precision Agriculture Curricula**

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## Executive Summary

The “Comparative Analysis and Recommendations for Precision Agriculture Curricula” report (D3.1) is the first deliverable of WP3 of the ReGrow project. This report synthesizes Precision Agriculture curricula from Ukrainian, Georgian, and European institutions, identifying best practices and educational gaps. It aims to shape innovative curricula tailored to the agricultural sector’s needs, with input from all project partners. The purpose of this deliverable is to act as an inventory and a guiding tool for the synthesis of relevant courses in PA, setting the stage for future curriculum development.

Key insights of the deliverable include the findings from the first two Tasks of WP3. On the one hand, Task T3.1 “Identification of MSc Programmes in Precision Agriculture in HEIs in Ukraine and Georgia” introduces the mapping of existing Precision Agriculture (PA) courses in Ukraine and Georgia and a skills gap analysis on Higher Education Institutes (HEI), including both desk and field research. On the other hand, Task T3.2 “Identification of MSc Programmes in Precision Agriculture in HEIs in Europe” encompasses the mapping of similar curricula in Europe and the identification of best practices in PA. Finally, this deliverable presents a comparative analysis and recommendations for PA curricula.

The analysis reveals that while both Georgian and Ukrainian HEIs offer PA-related programmes, significant gaps remain, particularly in digital skills, practical training, modern equipment, and interdisciplinary content. Ukrainian programmes are more technical but lack hands-on and data-driven components, while Georgian programmes are broader but missing advanced digital tools. In contrast, EU programmes highlight best practices such as integrated digital modules, strong industry links, and field-based learning.

The report concludes with recommendations to support the development of a modern, flexible, and practice-oriented MSc curriculum in PA, aligned with local needs and European standards.



## Glossary of terms and abbreviations used

List of Abbreviations and Description	
HEI	Higher Education Institute
PA	Precision Agriculture
MSc	Master programme
ECTS	European Credit Transfer and Accumulation System
UAV	Unmanned Aerial Vehicle
API	Application Programming Interface
AI	Artificial Intelligence
VRT	Variable Rate Technology
NDVI	Normalized Difference Vegetation Index
RTK	Real-Time Kinematic positioning
IT	Information Technology
GPS	Global Positioning System
GIS	Geographic Information System
IoT	Internet of Things
UA	Ukraine
GE	Georgia
EU	European Union
N/A	Not Applicable
USD	US Dollar
GPA	Grade Point Average
NGOs	Non-Governmental Organizations
SSM	Site-Specific Management
EQF	European Qualifications Framework
GNSS	Global Navigation Satellite System
CGPA	Cumulative Grade Point Average
UN	United Nations
NQF	National Qualifications Framework
RPL	Recognition of Prior Learning
ICT	Information and Communication Technology
OECD	Organisation for Economic Co-operation and Development
AMS	Automated Milking Systems
FMIS	Farm Management Information Systems
AFS	American Farm School
VET	Vocational Education and Training
IPM	Integrated Pest Management
SaaS	Software-as-a-Service
GSD	Ground Sampling Distance
EFSA	European Food Safety Authority
PCvPL	Practice Centre for Precision Agriculture
NIR	Near-Infrared
DSMS	Digital Soil Map of Sweden
ASSAP	Agricultural Sustainability Support and Advisory Programme
KPI	Key Performance Indicator
CAP	Common Agricultural Policy



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# 1. Introduction

The ReGrow project, an Erasmus+ initiative, addresses the pressing need for modernized agricultural education in Georgia and Ukraine. By fostering innovative curricula, establishing PA methodologies and promoting cross-border collaboration, the project aims to bridge existing educational and professional gaps.

## 1.1. Purpose of the Deliverable

The purpose of this deliverable is to serve as both an inventory and a guiding tool for the synthesis of relevant courses in PA, setting the groundwork for future curriculum development. It consolidates the outcomes from the identification of PA Masters programmes (MSc) in Ukrainian, Georgian, and European HEIs, which were conducted with an extended mapping and desk research. Moreover, it presents the skills gap analysis on Ukrainian and Georgian HEIs, including both desk and field research. Finally, it encompasses the identification of PA best practices in European countries. The report aims to highlight in a comparative analysis the strategic recommendations for the development of a new PA curricula.

## 1.2. Document Structure

The structure of this document is designed as follows:

- Chapter 1: **Introduction** - This chapter introduces the purpose and structure of the report.
- Chapter 2: **Task T3.1 Identification of MSc Programmes in Precision Agriculture in HEIs in Ukraine and Georgia** – This chapter outlines the findings of two actions, a) mapping of existing PA courses in Ukraine and Georgia, and b) skills gap analysis on Ukrainian and Georgian HEIs.
- Chapter 3: **Task T3.2 Identification of MSc Programmes in Precision Agriculture in HEIs in Europe** – This chapter presents the outcomes of two actions, a) mapping of existing PA courses in Europe, and b) identification of best practices in PA in Europe.
- Chapter 4: **Comparative analysis and recommendations for Precision Agriculture curricula** – This chapter describes the comparative analysis and make recommendations for the development of a new PA curricula in all participated countries.
- Chapter 5: **Conclusions** – This final chapter summarizes the key points of the report, emphasizing its role to the ReGrow project.



## 2. Task T3.1 Identification of MSc Programmes in Precision Agriculture in HEIs in Ukraine and Georgia

The first Task of WP3 aims to identify MSc Programmes in PA Ukrainian and Georgian HEIs. The 6 Georgian partners responsible are GFA, TABCO, GTU, SJSU, ZSSU, and MOESYGE, and the 5 Ukrainian partners are IACD, SNAU, NGOED, PU, and KHNU. Task T3.1 includes 2 actions, Action 3.1.1, the mapping of existing curricula in Ukraine and Georgia and A3.1.2 the skills gap analysis on HEIs in Ukraine and Georgia. The synthesized findings will provide a pathway to bridge the gap between current educational offerings and industry requirements.

### 2.1. Action 3.1.1: Conduct Mapping of Existing Precision Agriculture Courses in UA and GE

The goal of this Activity was the thorough examination of existing MSc programmes in PA across Georgian and Ukrainian HEIs. All Georgian and Ukrainian partners, conducted a detailed desk research for documenting the current curricula, utilizing a reporting template.

Table 1 presents existing MSc programmes in PA offered by Georgian and Ukrainian HEIs. In countries where there is no MSc programme specifically dedicated to PA, relevant programmes that include PA-related disciplines have been included in the database. Three MSc programmes were identified in Georgia, and two MSc programmes in Ukraine.

**Table 1 - Existing MSc programmes in PA across Georgian and Ukrainian HEIs**

GEORGIA	
<b>Academic Institution</b>	Georgian Technical University
<b>Faculty</b>	Agricultural sciences and biosystem engineering
<b>City</b>	Tbilisi
<b>Country</b>	Georgia
<b>Name of Programme</b>	Agrotechnology
<b>Type of Programme</b>	MSc
<b>Duration</b>	4 semesters
<b>Programme description</b>	<p>2 years MSc program implemented under the agricultural sciences and biosystems engineering faculty. The program is adequately staffed with qualified human resources.</p> <p>Based on the specifics of a learning course, the appropriate activities listed below are employed, reflected in the relevant learning courses (syllabi).</p> <p>Taking international experience into account, the educational program incorporates mandatory and recommended teaching and learning methods, based on the specific nature of individual course syllabi. These methods are embedded within theoretical courses in the form of practical components, independent practical modules, or other relevant formats.</p> <p>The applied teaching and learning methods include:</p> <ul style="list-style-type: none"> <li>• Discussion/Debat</li> <li>• Group (Collaborative) Work</li> <li>• Case Study</li> <li>• Demonstration</li> </ul>



	<ul style="list-style-type: none"> <li>• Induction</li> <li>• Deduction</li> <li>• Analysis</li> <li>• Verbal (Oral) Communication</li> <li>• Written Assignments</li> <li>• Laboratory Work</li> <li>• Practical Work</li> <li>• Explanation and Clarification</li> <li>• Action-Oriented Learning</li> <li>• Preparation of Practice Reports</li> <li>• Project Development and Presentation</li> </ul>
<p><b>Programme structure</b></p>	<p>The program is structured according to the European Credit Transfer and Accumulation System (ECTS), where 1 credit equals 25 hours of work, including both contact hours and independent study. Each semester consists of 20 weeks, with 15 weeks dedicated to academic instruction. The academic calendar is issued by the Rector of Georgian Technical University (GTU) before the start of each semester and is published on the university's official website.</p> <p>The Master's degree program in Agricultural Technologies comprises a total of 120 ECTS credits, distributed as follows:</p> <ul style="list-style-type: none"> <li>• 40 credits – mandatory core courses</li> <li>• 10 credits – specialty elective courses</li> <li>• 30 credits – elective modules</li> <li>• 40 credits – research component</li> </ul> <p>The research component involves independent research work, designed to develop the master's student's ability to reason analytically and draw well-founded conclusions.</p> <p>Detailed information about the Master's degree program and guidelines for preparing and submitting a thesis can be found at the following links to the Regulations of the GTU on Master's Degree:</p> <p><a href="https://gtu.ge/apply/masters.php">https://gtu.ge/apply/masters.php</a>  <a href="https://gtu.ge/students/edu/regulatory-documents/masters.php">https://gtu.ge/students/edu/regulatory-documents/masters.php</a></p>
<p><b>Programme goals</b></p>	<p>The goal of the program is to teach students the latest methods of managing and enhancing soil fertility; caring for and cultivating agricultural crops; obtaining and storing high-quality seeds and harvests; protecting crops from harmful organisms and weeds; understanding the characteristics of natural and artificial ecosystems; breeding and researching new varieties and hybrids; and applying modern, innovative approaches to the production of environmentally friendly products.</p> <p>The program also aims to prepare competitive specialists in higher agricultural education who meet both national and international standards and align with the demands of the labour market.</p>
<p><b>Course Topics</b></p>	<p><b>1st semester – 30 credits:</b> Business communication (French, English, German, Russian); Plant biochemistry, Plant cytology and physiology, Forecasting methods for the water demand of agricultural crops,</p>



	<p>Selection-genetics of crops, (Elective courses of the specialty: intensive agronomy, organic agronomy, agrobiotechnology)</p> <p><b>2nd semester – 30 credits:</b> Experimental Methods in Agronomy, Methodology of Experimental Work, Integrated course in Agronomy, Biosafety and Plant Protection, Theory and Practice of Specialized Text Translation (English, French, German, Russian), (Elective courses of the specialty: Soil ecology, Entrepreneurial and Technological Innovation Management, Electrical Equipment of Horticultural Enterprises)</p> <p><b>3rd semester – 20 credits:</b> Selective module “Agrotechnology”: innovative technologies in plant science, (Elective courses of the specialty: Ecological and varietal agro technologies of field crops, Technology of Food Crop Production , Soil fertility management), Agro expertise, Field practise in agrotechnology, Selective module – “Agrichemistry-soil science”: Soil and Non-Root Nutrition of Plants, Elective courses of the specialty – soil and technogenesis, Fundamentals of Fertilizer and Pesticide Application, agro expertise, field practise in agrochemistry- soil science, Innovative technology in plant science, filed practice in plant protection, Selective module “Plant protection”: biological protection of plants, plant integrated protection, agro expertise, field practice in plant protection.</p> <p><b>4th semester – research component (all components) – 40 credits</b>  <u>Total ECTS are 120</u></p>
<p><b>Admissions requirements</b></p>	<p>Eligibility for enrolment in the Master’s program in Agricultural Technologies is granted to individuals holding a bachelor’s degree or an equivalent academic qualification in the following fields:</p> <p>0811 – Crop and Animal Production          0819 – Agriculture, Not Further Classified          0821 – Forestry          0511 – Biology (specifically: Biodiversity – 0511.2.1)          0521 – Environmental Science          0721 – Food Processing</p> <ul style="list-style-type: none"> <li>- Admission to the Master’s program is based on the results of the Unified National Master’s Examinations and additional exam(s) as defined by the GTU. The content and test materials for these examinations will be published on the GTU Teaching Department’s website at <a href="http://www.gtu.ge/study/index.php">http://www.gtu.ge/study/index.php</a> at least one month prior to the examination date.</li> <li>- Admission without taking the Unified Master’s Examinations is possible under the rules and procedures established by the Ministry of Education and Science of Georgia.</li> <li>- Applicants are required to present a certificate or official document confirming proficiency in a foreign language (English, German, French, or Russian) at a B2 level.</li> </ul>



	<ul style="list-style-type: none"> <li>- Applicants who have received their education abroad (i.e., have completed a foreign-language program) are exempt from submitting a certificate or taking the language exam.</li> <li>- Applicants who cannot present a valid certificate must undergo language testing in one of the aforementioned foreign languages (English, German, or French) at GTU’s Computer Center.</li> </ul> <p><b>Student Mobility</b></p> <p>External Mobility: Admission through mobility from another higher education institution is also allowed in accordance with the regulation “Rule on Transfer from One Higher Education Institution to Another”, approved by the Minister of Education and Science of Georgia by Order No. 10/N dated February 2, 2010.</p> <p>Internal Mobility: Students may also enrol in the program through internal mobility. The deadlines and procedures for internal mobility are determined by the university’s legal acts and published on the official university website.</p> <p><b>Accessibility and Contact Information</b></p> <ul style="list-style-type: none"> <li>- The educational program is publicly accessible to all interested individuals. Information regarding the admission processes and procedures is available both in the news section and on the Teaching Department page of the GTU website. The full educational programs, including admission prerequisites and content, are also published on the faculty’s web page.</li> <li>- Contact information for both the Teaching Department and the Quality Assurance Office, as well as for the faculty, is available on their respective web pages. Interested individuals may receive information and consult on any issue either by phone or via email.</li> </ul>
<p><b>Career outcomes</b></p>	<ul style="list-style-type: none"> <li>- Describes the characteristics of natural and artificial ecosystems based on modern scientific achievements and advanced technologies, with a focus on enhancing soil fertility and producing environmentally friendly agricultural products</li> <li>- Understands modern agro- and biotechnological research methods for developing new plant varieties and hybrids</li> <li>- Assesses the soil fertility potential, considering morphological and physicochemical properties, and determines appropriate soil reclamation, conservation, agro-technical, and land improvement measures</li> <li>- Analyzes cultivation and maintenance technologies for crops and forage production on natural pastures and arable lands</li> <li>- Evaluates the damage caused by harmful organisms and weeds and implements plant protection measures</li> <li>- Develops innovative technologies and research methods for plant protection and agricultural crop management through diverse methodological approaches, incorporating scientifically validated agronomic schemes</li> <li>- Makes well-founded decisions to achieve scientifically and practically significant results</li> </ul>



	<ul style="list-style-type: none"> <li>- Ensures the effective operation of agricultural production aimed at obtaining ecologically clean products based on research outcomes</li> <li>- Adheres to ethical and professional responsibility standards, possesses thorough knowledge of discipline-specific terminology, and prepares professional documentation that contributes to the development of the field</li> <li>- Presents well-justified conclusions to academic and professional communities, based on analysis of research outcomes aligned with modern practical demands</li> </ul>
<b>URL</b>	Georgian language program: <a href="https://gtu.ge/pdf/programs/masters/agro/file2.pdf">https://gtu.ge/pdf/programs/masters/agro/file2.pdf</a>
<b>Keywords</b>	Agriculture, plant, soil, protection, expertise, practice, genetics
<b>Field</b>	Agriculture
<b>GEORGIA</b>	
<b>Academic Institution</b>	Georgian Technical University
<b>Faculty</b>	Agricultural sciences and biosystem engineering
<b>City</b>	Tbilisi
<b>Country</b>	Georgia
<b>Name of Programme</b>	Viticulture and enology (Georgian and English language)
<b>Type of Programme</b>	MSc
<b>Duration</b>	4 semesters
<b>Programme description</b>	<p>Viticulture and enology Msc programs implemented under the faculty of Agricultural sciences and biosystem engineering. GTU is the member of the EMAVE-consortium, so the English language program presents degree program. The program is developed according ECTS system, 1 credit equals 25 hours which includes both contact and independent working hours. The distribution of credits is presented in the curriculum of the program.</p> <p>The program lasts 2 years (4 semesters) and includes 120 credits:          Study component – 75 credits; Research Component - 45 credits including Master’s thesis / Prospectus - 5 credits, Theoretical / Experimental Research / Colloquium - 10 credits, Thesis Completion and Defense - 30 credits. One semester covers 20 weeks, out of which the teaching process takes 15 weeks.</p> <p>The academic calendar will be issued and published on the web-page by the Rector of GTU before the beginning of the semester.</p> <ul style="list-style-type: none"> <li>- In the first semester of the first year the master studies 6 major specialty courses: 2 disciplines with 5 credits of each and 4 disciplines with 4 credits of each. In addition, with 4 credits, master chooses a discipline among Elective Courses. Total: 30 credits</li> <li>- In the second semester of the first year, the master studies 4 major specialty courses – among those 2 disciplines with 6 credits of each, 1 discipline with 5 credits and 1 discipline with 4 credits. In addition, with 4 credits, master chooses a discipline among Elective Courses. In this semester the students also has a master’s research project / prospectus which includes 5 credits. Total: 30 credits</li> </ul>



	<p>- In the first semester of the second year, the master studies 4 major specialty courses with 5 credits of each. It also has a theoretical / experimental research / colloquium covering 10 credits. Total: 30 credits</p> <p>- In the second semester of the second year, the master completes and defends the master thesis. Total 30 credits.</p> <p>Detailed information on the Master’s Regulations is available on the GTU Web site: <a href="https://gtu.ge/Learning/debuleba_magistraturis_sesaxeб.php">https://gtu.ge/Learning/debuleba_magistraturis_sesaxeб.php</a></p> <p>The Master Research Project / Prospectus Evaluation Criteria and Scales are set out in the Evaluation Rule for the Research Component of the Master’s Degree Program, which is available on the GTU Web site: <a href="https://gtu.ge/Learning/debuleba_magistraturis_sesaxeб.php">https://gtu.ge/Learning/debuleba_magistraturis_sesaxeб.php</a></p> <p>Instructions for completing a master’s degree are available at the GTU web site: <a href="https://gtu.ge/Learning/debuleba_magistraturis_sesaxeб.php">https://gtu.ge/Learning/debuleba_magistraturis_sesaxeб.php</a></p> <p>Criteria and scoring criteria for qualification are given in the evaluation section of the research component of the Master’s Degree Program on the GTU web site: <a href="https://gtu.ge/Learning/debuleba_magistraturis_sesaxeб.php">https://gtu.ge/Learning/debuleba_magistraturis_sesaxeб.php</a></p> <p>Detailed information on the evaluation of the research component of the MA program is available at the GTU web site: <a href="https://gtu.ge/Learning/debuleba_magistraturis_sesaxeб.php">https://gtu.ge/Learning/debuleba_magistraturis_sesaxeб.php</a></p>
<p><b>Programme structure</b></p>	<p>Based on the specifics of a learning course, the appropriate activities listed below are employed, reflected in the relevant learning courses (syllabi):</p> <p>Taking international experience into account, the educational program incorporates mandatory and recommended teaching and learning methods, based on the specific nature of individual course syllabi. These methods are embedded within theoretical courses in the form of practical components, independent practical modules, or other relevant formats.</p> <p>The applied teaching and learning methods include:</p> <ul style="list-style-type: none"><li>• Discussion/Debate</li><li>• Group (Collaborative) Work</li><li>• Case Study</li><li>• Demonstration</li><li>• Induction</li><li>• Deduction</li><li>• Analysis</li><li>• Verbal (Oral) Communication</li><li>• Written Assignments</li><li>• Laboratory Work</li><li>• Practical Work</li><li>• Explanation and Clarification</li><li>• Action-Oriented Learning</li></ul>



	<ul style="list-style-type: none"> <li>• Preparation of Practice Reports</li> <li>• Project Development and Presentation</li> </ul>
<p><b>Programme goals</b></p>	<p>The goal of the program is to teach students the historical stages of the spread and development of vines and wine in global viticulture and winemaking; traditional and modern methods of vineyard cultivation and care based on the varietal diversity of grapevines worldwide; and the complete cycle of agro-technological processes conducted in vineyards, including management practices.</p> <p>The program incorporates international regulations and guidelines in viticulture and winemaking, along with both traditional and innovative technologies for grape processing used in the production of wine and grape-based alcoholic beverages. Students will explore industry trends, current microbiological and physico-chemical processes, laboratory methods for wine quality control using modern analytical techniques, and the selection and planning of appropriate research methodologies.</p> <p>Additionally, the curriculum covers international standards for the quality and sensory evaluation of wine and beverages, practical quality control systems, common wine diseases, their causes, and prevention methods. Students will also study current trends in global wine tourism, including the planning, development, and promotion of tourism packages—such as "Wine Roads"—in line with international trends.</p> <p>The program aims to prepare graduates with both theoretical knowledge and practical skills in accordance with international standards, producing Masters in Viticulture and Enology who are competitive and highly qualified specialists capable of managing the entire wine production chain—from vineyard cultivation to the final product.</p>
<p><b>Course Topics</b></p>	<p><b>1st semester – 30 credits:</b>            Viticulture and vineyard management systems, grapevine physiology, Elective courses of speciality: Regulation of viticulture and wine production, Agroinsurance, Wine grapes and world grape growing regions), Grapevine pests, diseases and integrated pest management, Integrated soil and water management for vineyards, Intensive course in wine microbiology, Enochemistry.</p> <p><b>2nd semester – 30 credits:</b>            Wine production and winery systems, Vineyard establishment and Maintenance, Field Practice in viticulture, Methods of must and wine analyses, (Elective courses of specialty: Wine and beverage marketing, World wines and winemaking Techniques, Sparkling wine production; Master Research project/prospectus.</p> <p><b>3rd semester – 30 credits:</b>            Wine tourism, Production of distilled spirituous beverages of grape origin, sensory evaluation of wine, Enterprise practice in winery, Theoretical/experimental research/colloquium.</p> <p><b>4th semester – 30 credits:</b>            Accomplishment and defence of Master’s Thesis</p> <p><u>Total ECTS 120</u></p>



<p style="text-align: center;"><b>Admissions requirements</b></p>	<p>The studying rights on a Master’s program is entitled person who has at least (01) Bachelor of Agrarian Science, (05) Bachelor of Science / Natural Sciences or equivalent academic degree, and has English knowledge in the level B2, that must be approved by an appropriate Certificate from an Institution with special Accreditation, or tests providing by the University. The person will be enrolled according on the results of the master’s exams (general master’s exam and the exam / exams / in specialization, English language tests provided by the GTU). The exam questions / tests will be posted on the GTU Department of Education website at <a href="http://gtu.ge/Study-Dep/News/?ELEMENT_ID=12830">http://gtu.ge/Study-Dep/News/?ELEMENT_ID=12830</a> at least one month before the exams begin. Admission to the program without passing the master's exams is possible according to the procedure established by the Ministry of Education, Science, Culture and Sport of Georgia.</p>
<p style="text-align: center;"><b>Career outcomes</b></p>	<p><b>Learning Outcomes / Competencies (General and Professional)</b></p> <ul style="list-style-type: none"> <li>• Describes the fundamental principles of organizational and seasonal vineyard management; the main seasonal phases of vine development and the physiological processes occurring in the plant; the influence of agro-climatic conditions on grape and wine quality; effective and sustainable systems of integrated soil and water management in vineyards; key processes related to current trends in the field; common diseases and pests affecting vineyards; and evaluates integrated plant protection systems aimed at prevention. Independently plans vineyard care and cultivation operations in accordance with modern standards, identifies potential issues during plant growth and development, and develops strategies for their resolution.</li> <li>• In pursuit of the desired final product, assesses the suitability of soil resources, determines the optimal harvest date, plans appropriate technology, and organizes the alcoholic fermentation process. Analyzes seasonal operations and manages grape cultivation and enological processes in compliance with existing regulations.</li> <li>• Demonstrates critical understanding of global viticulture and winemaking, including appellations of origin, grape varieties, and agrotechnological practices. Evaluates the characteristics of traditionally, classically, and innovatively produced products in accordance with current legislative requirements.</li> <li>• Describes methods for grape and wine analysis, the chemical and physical processes occurring during grape processing, and discusses necessary decisions and their implementation throughout these processes.</li> <li>• Identifies wine diseases, analyzes their causes, and develops strategies for their elimination. Plans wine and alcoholic beverage tastings in line with international standards and requirements.</li> <li>• From a marketing perspective, analyzes global trends in the alcoholic beverage market, modern tools for market research, company structures, and international trade opportunities.</li> </ul>



	<p>Independently plans market research and develops strategies to attract satisfied customers in line with business, brand, and product development goals.</p> <ul style="list-style-type: none"> <li>• From a tourism perspective, evaluates wine as an ancient cultural product and a key contributor to the development of wine tourism (enotourism). Analyzes global wine tourism requirements and plans necessary events and activities to increase awareness.</li> <li>• Plans and conducts independent research using modern methods and approaches. Based on critical analysis, formulates conclusions, perspectives, and innovative proposals related to viticulture and winemaking issues. Constructs well-founded arguments when communicating with academic and professional audiences.</li> <li>• Embraces and upholds norms of ethical and professional responsibility, and presents both existing and innovative perspectives within the field of viticulture and winemaking in a substantiated manner.</li> </ul>
<b>URL</b>	<p>English language program:  <a href="https://gtu.ge/pdf/programs/masters/agro/file8.pdf">https://gtu.ge/pdf/programs/masters/agro/file8.pdf</a>            Georgian language program:  <a href="https://gtu.ge/pdf/programs/masters/agro/file6.pdf">https://gtu.ge/pdf/programs/masters/agro/file6.pdf</a></p>
<b>Keywords</b>	Grape, planting, wine, production, degustation, marketing, tourism
<b>Field</b>	Viticulture and enology
<b>GEORGIA</b>	
<b>Academic Institution</b>	Georgian Technical University
<b>Faculty</b>	Agricultural sciences and biosystem engineering
<b>City</b>	Tbilisi
<b>Country</b>	Georgia
<b>Name of Programme</b>	Forestry
<b>Type of Programme</b>	MSc
<b>Duration</b>	4 semesters
<b>Programme description</b>	<p>The program is designed in accordance with the (ECTS). One ECTS credit corresponds to 25 hours of student workload, which includes both contact hours and independent study. The distribution of credits is outlined in the curriculum plan.</p> <p>The program duration is 2 years (4 semesters) and comprises a total of 120 ECTS credits. Each semester spans 20 weeks, of which 15 weeks are dedicated to academic instruction.</p> <p>Prior to the beginning of each semester, the Rector of the University issues an official decree concerning the academic schedule. This document is available on the official university website: <a href="https://gtu.ge/apply/masters.php">https://gtu.ge/apply/masters.php</a>, and includes detailed information about semester timelines, minimum thresholds, and important academic deadlines.</p> <p>For the Master’s Educational Program in Forestry, the 120 ECTS credits are allocated as follows:</p> <ul style="list-style-type: none"> <li>• 80 ECTS are assigned to academic coursework:               <ul style="list-style-type: none"> <li>- 70 ECTS for compulsory courses</li> </ul> </li> </ul>



	<ul style="list-style-type: none"> <li>- 10 ECTS for elective courses</li> <li>• 10 ECTS are allocated for practical training in forestry</li> <li>• 40 ECTS are dedicated to the research component</li> </ul> <p>The research component includes independent research activities aimed at developing the student’s ability to conduct independent theoretical and practical analysis, and to formulate well-substantiated conclusions. Detailed information regarding the master’s program, including the official formatting guidelines for the Master’s Thesis, is available at the following link:  <a href="#">Georgian Technical University – Regulation on Master’s Studies</a></p>
<p><b>Programme structure</b></p>	<p><b>Teaching and Learning Methods</b></p> <p>Depending on the specific characteristics of each course, a variety of teaching and learning methods are employed during the learning process. These methods are detailed in the individual course syllabi and include the following:</p> <ul style="list-style-type: none"> <li>• Discussion/Debates</li> <li>• Collaborative (Group) Work</li> <li>• Case Study Analysis</li> <li>• Demonstration</li> <li>• Inductive Reasoning</li> <li>• Laboratory Work</li> <li>• Practical Work</li> <li>• Analytical Thinking</li> <li>• Synthesis</li> <li>• Written Assignments</li> <li>• Deductive Reasoning</li> <li>• Verbal Communication</li> <li>• Explanation and Clarification</li> <li>• Action-Oriented Learning</li> <li>• Field Practice</li> <li>• Project Development and Presentation</li> </ul>
<p><b>Programme goals</b></p>	<p>Prepare graduates for a Master’s degree in Forestry, equipping them to apply innovative methods in accordance with international forestry standards, be competitive in the labour market, and meet global professional requirements.</p> <p>Develop the ability to manage the forestry sector, engage in innovative practices, conduct independent research, think critically, and plan and envision the development of the sector in new and original ways.</p> <p>Provide graduates with opportunities for continuous professional growth, enabling them to contribute effectively to the advancement and efficient functioning of the forestry sector through the knowledge and education they acquire.</p>
<p><b>Course Topics</b></p>	<p><b>1st semester – 30 credits:</b></p> <p>Forest ecology and climate changing, Forest fund accounting - assessment using modern methods of taxation, Pests of forest plants; Case study methodology, (Specialization elective courses: Forest botany and ecophysiology; Forest energy resources, Soil ecology, Forestry</p>



	<p>ecological expertise, monitoring and audit, Forestry engineering, Technology of primary wood processing, Technology of use of forest residues)</p> <p><b>2nd semester – 30 credits:</b> Forms of forest management, Organization of forest use, Forest cultivation and forest nurseries, Forest protection, Practice in forestry.</p> <p><b>3rd semester - 20 credits:</b> International Forest Policy, Georgian Forests and Forest Policy, Methods for Conserving Forest Biodiversity, Theory and Practice of Sectoral Text (English, French, German, Russian), Business Communication in a Foreign Language (English, French, German, Russian).</p> <p><b>4 semester - 40 credits</b> Research Component</p> <p><u>Total ECTS 120</u></p>
<p style="text-align: center;"><b>Admissions requirements</b></p>	<p>Eligibility for admission to the Master’s programme is granted to applicants holding a Bachelor’s degree or an equivalent academic qualification in accordance with the following fields as classified by the National Qualifications Framework:</p> <ul style="list-style-type: none"> <li>• 082 Forestry</li> <li>• 081 Agriculture</li> <li>• 051 Biological and Related Sciences (Detailed Field: 0511 Biology)</li> <li>• 052 Environment</li> <li>• 061 Information and Communication Technologies (ICTs)</li> <li>• 071 Engineering and Engineering Trades (Detailed Field: 0712 Environmental Protection Technology)</li> </ul> <p>Admission is based on the results of the Unified Master’s Examination, as well as one or more additional examinations defined by the GTU. Information about examination topics and/or tests will be published on the GTU official website <a href="https://gtu.ge/apply/masters.php">https://gtu.ge/apply/masters.php</a> at least one month prior to the start of examinations.</p> <p>Enrolment in the program following the successful completion of entrance examinations is conducted in accordance with the procedures established by the Ministry of Education and Science of Georgia.</p> <p>Applicants are required to submit a certificate/document verifying English language proficiency at B2 level.</p> <p>Applicants who have received their education abroad through an English-medium program are exempt from submitting a certificate or taking an English proficiency exam. Applicants unable to provide the required certificate must take an English language proficiency test administered by the GTU Computer Center.</p> <p><b>External Mobility:</b> Admission to the program is also possible through external mobility procedures, in accordance with Order №10/N of February 2, 2010, issued by the Minister of Education and Science of Georgia, which regulates student transfers between higher education institutions.</p>



	<p><b>Internal Mobility:</b></p> <p>The program also admits students through internal mobility. The terms and procedures for internal mobility are determined by a legal act of the university and published on the official university website.</p> <p>The educational program is publicly accessible to all interested individuals. Relevant information about the admission processes and procedures is published on the GTU website under both the News Section and the Department of Academic Affairs.</p> <p>The faculty website provides access to detailed educational program descriptions, including admission prerequisites and content structure.</p> <p>Contact details of the Department of Academic Affairs, the Quality Assurance Office, and the relevant Faculty are available on their respective web pages. Interested parties may obtain consultation and support on all related matters via telephone or email.</p>
<p><b>Career outcomes</b></p>	<ul style="list-style-type: none"> <li>- Possesses deep and systematic knowledge in the field of forestry, including practical skills in forest maintenance, protection, restoration, and ensuring sustainable forest management.</li> <li>- Demonstrates detailed understanding of different forms of forest ownership, legal frameworks, political and institutional arrangements, as well as the current requirements of pan-European cooperation; is familiar with the main legislative acts and regulatory documents in the forestry sector, including the principles, indicators, and criteria of sustainable forest management.</li> <li>- Identifies and critically analyzes best international practices related to sustainable forest management and develops relevant recommendations in alignment with national needs.</li> <li>- Conducts independent research using modern methodologies and approaches.</li> <li>- Plans and implements forest management activities in accordance with the principles of sustainable forest management planning.</li> <li>- Uses modern field research tools and Geographic Information Systems (GIS) to collect and process data, create databases, and prepare relevant documentation.</li> <li>- Analyzes processes occurring within forest ecosystems, assesses changes caused by natural and anthropogenic factors, and performs risk forecasting.</li> <li>- Based on critical analysis, formulates well-grounded conclusions regarding complex problems, synthesizes information innovatively using the latest data, and effectively communicates conclusions and arguments to both academic and professional audiences.</li> <li>- Based on self-assessment and peer-assessment, strategically plans learning and professional activities both for self-development and the development of others in the field of forestry.</li> <li>- Carries out learning and professional activities through both individual and collaborative work, applying principles of teamwork.</li> </ul>
<p><b>URL</b></p>	<p><a href="https://gtu.ge/pdf/programs/masters/agro/file4.pdf">https://gtu.ge/pdf/programs/masters/agro/file4.pdf</a></p>
<p><b>Keywords</b></p>	<p>Forestry, management, pathology</p>



<b>Field</b>	Agriculture, forestry
<b>UKRAINE</b>	
<b>Academic Institution</b>	Sumy National Agrarian University
<b>Faculty</b>	Faculty of Engineering and Technology
<b>City</b>	Sumy
<b>Country</b>	Ukraine
<b>Name of Programme</b>	Precision farming systems
<b>Type of Programme</b>	MSc
<b>Duration</b>	1 year and 4 months
<b>Programme description</b>	<p>The educational and professional program "Precision Agriculture Systems" is designed to train masters in the specialty H7 Agroengineering, capable of researching, improving, implementing and effectively using technologies, machines and means of mechanizing agricultural production and working with technical means and companies. Graduates will be prepared for production tasks in the field of high technologies that are rapidly developing and implementing in precision agriculture systems.</p> <p>This educational and professional program provides for the acquisition of theoretical and practical professional knowledge and specialized professional knowledge based on practice, which is implemented at agricultural facilities, machine-building enterprises, agricultural companies that use precision farming systems or their components. In the context of constant changes in modern agricultural production, the content of the educational and professional program is periodically updated based on current trends in its development and the formation of soft skills related to activities in the industry.</p>
<b>Programme structure</b>	<p>Student-centered learning, technology of problem-based and differentiated learning, technology of intensification and individualization of learning, technology of programmed learning, information technology, technology of developmental learning, credit-transfer system of organizing learning, e-learning in the Moodle system, self-study, research-based learning, learning through practice.</p> <p>Teaching is carried out in the form of: lectures, multimedia lectures, interactive lectures, practical classes, self-study based on textbooks, notes and Internet resources, consultations with teachers, preparation of a master's qualification work (thesis).</p> <p><b>Structure of the educational and professional programme</b></p> <p>General training cycle (25 credits):</p> <ol style="list-style-type: none"> <li>1. Mandatory components of the educational and professional programme - 20 credits.</li> <li>2. Elective components of the educational and professional programme - 5 credits.</li> </ol> <p>Special (professional) training cycle (65 credits):</p> <ol style="list-style-type: none"> <li>1. Mandatory components of the educational and professional programme - 45 credits.</li> <li>2. Elective components of the educational and professional programme - 20 credits.</li> </ol>



	<p>The total amount of mandatory components is 65 credits (780 hours of classroom instruction), including: 390 hours of lectures, 390 hours of laboratory work and practical classes, 1170 hours of independent work. The total amount of elective components is 25 credits (300 hours of classroom instruction), including: 150 hours of lectures, 150 hours of laboratory work and practical classes, 450 hours of independent work.</p> <p>The total number of credits in the educational and professional programme is 90 ECTS credits (1080 hours of classroom instruction), including: 540 hours of lectures, 540 hours of laboratory work and practical classes, 1620 hours of independent work.</p>
<p><b>Programme goals</b></p>	<p>Training of specialists capable of improving and developing new mechanized energy-saving, environmentally friendly technologies for the production and transportation of agricultural products.</p> <p>Mastering the methodology of using innovative technologies of PA in the agricultural sector by higher education students.</p> <p>The ability of higher education students to analyze information, choose optimal solutions and implement innovations in the field of agricultural production and PA.</p> <p>Practical application by higher education students of knowledge and skills in the field of agricultural production and PA to specific business conditions.</p>
<p><b>Course Topics</b></p>	<p><b>List of components of the educational and professional programme</b></p> <p>GENERAL TRAINING CYCLE (25 credits) Mandatory components of the educational and professional programme (20 credits):</p> <ul style="list-style-type: none"> <li>- Theory and technology of scientific research (5 credits, 1st Semester of Study).</li> <li>- Quality management and intellectual property (5 credits, 1st Semester of Study).</li> <li>- Technical and economic support of agricultural production (5 credits, 1st Semester of Study).</li> <li>- Communications in the international environment and higher education pedagogy (5 credits, 2nd Semester of Study).</li> </ul> <p>Selective components of the educational and professional programme (5 credits) from general university catalogue.</p> <p>SPECIALISED (PROFESSIONAL) TRAINING CYCLE (65 credits) Mandatory components of the educational and professional programme (45 credits):</p> <ul style="list-style-type: none"> <li>- Agrotechnology systems (5 credits, 1st Semester of Study).</li> <li>- Hardware and machinery in precision farming systems (10 credits, 1st and 2nd Semester).</li> <li>- Occupational safety and environmental friendliness of agro-industrial production activities (5 credits, 1st Semester of Study).</li> </ul>



	<ul style="list-style-type: none"><li>- Information technologies, artificial intelligence and precision farming systems (5 credits, 2nd Semester of Study).</li><li>- Engineering management. Justification of engineering solutions (5 credits, 3rd Semester of Study).</li><li>- Pre-graduate practice (5 credits, 3rd Semester of Study).</li><li>- Preparation and defence of a qualifying master's thesis (10 credits, 3rd Semester of Study)</li></ul> <p>Elective components of the educational and professional programme (25 credits):</p> <p>Elective Component 1 (5 credits, 3rd Semester of Study):</p> <ul style="list-style-type: none"><li>- Philosophy of science</li><li>- Time management</li><li>- Engineering networks and structures in agro-industrial production</li><li>- Assessment of the effectiveness of engineering solutions</li></ul> <p>Elective Component 2 (5 credits, 2nd Semester of Study)</p> <p>Elective Component 3 (5 credits, 2nd Semester of Study)</p> <p>Elective Component 4 (5 credits, 2nd Semester of study)</p> <p>Elective Component 5 (5 credits, 3rd Semester of study)</p> <p>Elective components 2 through 5 are selected from the following list:</p> <ul style="list-style-type: none"><li>- 3d engineering of unmanned systems</li><li>- Data analysis in precision farming systems</li><li>- Agroscouting</li><li>- Adaptation of the latest mechatronic systems and technologies in agricultural production</li><li>- UAVs in agricultural production</li><li>- Economics of production with the use of innovative technologies in crop production</li><li>- Ergonomics of workplaces</li><li>- Green mechatronics</li><li>- Innovative technologies for primary processing of agricultural products</li><li>- History of the development of physical and mathematical thought in Ukraine</li><li>- Machine learning and neural networks</li><li>- Management of acrocyanoses</li><li>- International regulatory requirements in the agricultural sector</li><li>- Microprocessor systems</li><li>- Optimization of technological complexes and systems of agro-industrial production</li><li>- Forecasting and modelling of your own agribusiness</li><li>- Design of automated systems</li><li>- Design of technological processes in PA</li><li>- Service and adjustment of equipment for PA</li><li>- Technogenic and ecological safety</li></ul> <p><u>Total ECTS are 90</u></p>
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<p><b>Admissions requirements</b></p>	<p>Admission requirements are determined by the presence of a higher education degree of "Bachelor", "Specialist" or "Master" and the "Admission Rules for Higher Education at Sumy National Agrarian University".</p>
<p><b>Career outcomes</b></p>	<p>Activities in the field of agro-industrial production, education and science. Consultative and advisory activities in the field of production. Administrative, research and teaching activities.</p> <p>According to the current edition of the National Classifier of Ukraine: Classifier of Occupations (DK 003:2010) and the International Standard Classification of Occupations 2008 (ISCO-08), a graduate with the professional qualification "Master in Agricultural Engineering" <b>can be employed in positions with the following professional job titles:</b> 1311 director (manager) of a small agricultural enterprise (firm)); 1221 heads of production units; 1221.2 chief engineer; 1221.2 head and foreman of a production unit; 1210.1 director (head) of an organization (design, project), 1210.1 director (head, other manager) of an enterprise; 1210.1 Head of advanced training courses, 2145.2 Mechanical engineer; 2145.2 Machine and tractor fleet operation engineer; 2145.1 Research engineer in agricultural mechanization, 2149.2 Design engineer of agricultural machinery and equipment; 3115 Mechanic; 2149.2 Operation and repair engineer; 1221.2 Chief mechanic (mechanization of land reclamation works); 1222.2 Foreman in operation and repair of machines and mechanisms; 1222.2 Head of mechanized granary; 1237.2 Head of the department of mechanization and automation of production processes; 2145.1 Research engineer in agricultural mechanization; 2145.2 Machine and tractor fleet operation engineer; 2145.2 Mechanization and automation of production processes engineer; 2149.2 Engineer-designer of agricultural machinery and equipment; 6131 Worker in complex maintenance of agricultural production; 6190 Foreman at the main production sites (other agricultural workers and fishermen); 7231 Adjuster of agricultural machinery and tractors; 7233 Assembler of agricultural equipment; 8331 Controller of the technical condition of motor vehicles (agricultural and forestry installations); 8331 Tractor driver-driver of agricultural (forestry) production; 8339 Master in operation, repair and maintenance of agricultural machinery.</p> <p>A specialist is able to perform professional work, the list of which is given in accordance with the classifier of professions DK 003:2010 and can hold the following primary positions: engineer, research engineer, design engineer.</p> <p><b>Place of employment:</b> agro-industrial production enterprises, agricultural machinery manufacturing enterprises, structural divisions of the Ministry of Agrarian Policy and Food of Ukraine, research, design and technological institutions, agro-technical higher education institutions, colleges and other institutions and organizations.</p>
<p><b>URL</b></p>	<p><a href="https://itf.snau.edu.ua/agroinzheneriya/drugij-magisterskij-riven-vishho%20%D1%97-osviti-opp-sistemi-tochnogo-zemlerobstva-2/">https://itf.snau.edu.ua/agroinzheneriya/drugij-magisterskij-riven-vishho%20%D1%97-osviti-opp-sistemi-tochnogo-zemlerobstva-2/</a></p>



	<a href="https://itf.snau.edu.ua/wp-content/uploads/2024/02/%D0%9E%D0%9F_208_%D0%BC%D0%B0%D0%B3_24-25_%D0%A1%D0%A2%D0%97.pdf">https://itf.snau.edu.ua/wp-content/uploads/2024/02/%D0%9E%D0%9F_208_%D0%BC%D0%B0%D0%B3_24-25_%D0%A1%D0%A2%D0%97.pdf</a>  <a href="https://snau.edu.ua/inzhenemo-texnologichnij-fakultet-4/">https://snau.edu.ua/inzhenemo-texnologichnij-fakultet-4/</a>
<b>Keywords</b>	Technical means, machine units, operation, diagnostics, agricultural technologies, effective use, implementation, improvement, research, precision agriculture systems
<b>Field</b>	PA
<b>UKRAINE</b>	
<b>Academic Institution</b>	National University of Life and Environmental Sciences of Ukraine
<b>Faculty</b>	Faculty of Agricultural Sciences
<b>City</b>	Kyiv
<b>Country</b>	Ukraine
<b>Name of Programme</b>	Agrochemical service in precision agricultural production
<b>Type of Programme</b>	Master's degree, Educational and professional
<b>Duration</b>	90 ECTS credits, duration of study 1 year and 4 months
<b>Programme description</b>	<p>A master's degree holder has the right to continue their studies to obtain a third (educational and scientific) level. Acquisition of additional qualifications in the adult education system. <a href="https://nubip.edu.ua/node/46601">https://nubip.edu.ua/node/46601</a></p> <p>The purpose of the educational and professional programme is to develop a highly qualified specialist in the field of innovative agrochemical services, including precision agriculture, who is able to solve complex and non-standard tasks and problems (applied, scientific and innovative) in the field of crop production, have knowledge and skills in technologies and tools for integrated agrochemical monitoring using GIS technologies and the development and implementation of differentiated ways of using agricultural resources in production.</p> <p>The educational and professional programme is focused on mastering modern approaches to above-ground and below-ground soil monitoring and agrophytocenosis potential, analysing various data layers related to site conditions and crop cultivation technologies, implementing differentiated fertiliser and other agricultural resources to make effective management decisions for efficient agrochemical services in precision agriculture.</p>



	<p>The programme includes problem-based lectures, laboratory and practical classes, and practical training in real-world production.</p>
<p><b>Programme structure</b></p>	<p>Student-centred learning, technology of problem-based and differentiated learning, technology of intensification and individualisation of learning, technology of programmed learning, information technology, technology of developmental learning, credit transfer system of learning, e-learning in the Elearn (Moodle) system, self-study, research-based learning.</p> <p>Teaching is conducted in the form of: lectures, multimedia lectures, interactive lectures, seminars, practical classes, laboratory work, self-study based on textbooks and notes, consultations with teachers, preparation of a master's thesis (project).</p> <p style="text-align: center;"><b>Structure of the educational and professional programme</b></p> <p style="text-align: center;"><b>General training cycle (27 credits):</b></p> <ol style="list-style-type: none"> <li>1. Mandatory components of the educational and professional programme - 19 credits.</li> <li>2. Elective components of the educational and professional programme - 8 credits.</li> </ol> <p style="text-align: center;"><b>Special (professional) training cycle (63 credits):</b></p> <ol style="list-style-type: none"> <li>1. Mandatory components of the educational and professional programme - 47 credits.</li> <li>2. Elective components of the educational and professional programme - 16 credits.</li> </ol> <p><i>The total amount of mandatory components is 66 credits (480 hours of classroom instruction), including: 210 hours of lectures, 210 hours of laboratory work, 60 hours of practical classes, 1080 hours of independent work.</i></p> <p><i>The total amount of elective components is 24 credits (240 hours of classroom instruction), including: 120 hours of lectures, 90 hours of laboratory work, 60 hours of practical classes, 480 hours of independent work.</i></p> <p><i>The total number of credits in the educational and professional programme is 90 credits (720 hours of classroom instruction), including: 330 hours of lectures, 300 hours of laboratory work, 90 hours of practical classes, 1560 hours of independent work.</i></p>
<p><b>Programme goals</b></p>	<p>The purpose of the educational and professional programme is to form a highly qualified specialist in the field of innovative agrochemical service, including precision agriculture, who is able to solve complex and non-standard tasks and problems (applied, scientific and innovative) in the field of crop production, have knowledge and skills in technologies and tools for integrated agrochemical monitoring using GIS technologies and the development and implementation of differentiated ways of using agricultural resources in production.</p>
<p><b>Course Topics</b></p>	<p style="text-align: center;"><b>List of components of the educational and professional programme</b></p> <p style="text-align: center;"><b>GENERAL TRAINING CYCLE (27 credits)</b></p>



	<p><b>Mandatory components of the educational and professional programme (19 credits):</b></p> <ol style="list-style-type: none"> <li>1. Technological support of agrochemical service (5 credits, 1st Semester of Study).</li> <li>2. Spatial heterogeneity of soil cover (6 credits, 1st Semester of Study).</li> <li>3. Agrochemical service in crop production (8 credits, 1st Semester of Study).</li> </ol> <p><b>Selective components</b> of the educational and professional programme (8 credits) from general university catalogue (<a href="https://nubip.edu.ua/node/67362">https://nubip.edu.ua/node/67362</a>)</p> <p style="text-align: center;"><b>SPECIALISED (PROFESSIONAL) TRAINING CYCLE (63 credits)</b></p> <p><b>Mandatory components of the educational and professional programme (47 credits):</b></p> <ol style="list-style-type: none"> <li>1. Physiology and diagnostics of plant nutrition (9 credits, 1st Semester of Study).</li> <li>2. Agrochemical soil monitoring (6 credits, 2nd Semester).</li> <li>3. Remote monitoring of agrophytocenoses (6 credits, 2nd Semesters of Study).</li> <li>4. GIS in agrochemical service (6 credits, 2nd Semester of Study).</li> <li>5. Differentiated application of agrochemical resources (6 credits, 2nd Semester of Study).</li> <li>6. Practical training (10 credits, 2nd Semester of Study).</li> <li>7. Preparation and defence of a qualifying master's thesis (4 credits, 3rd Semester of Study)</li> </ol> <p><b>Elective components of the educational and professional programme (16 credits):</b></p> <p><i>Elective Component 1</i> (4 credits, 3rd Semester of Study):</p> <ul style="list-style-type: none"> <li>- Software solutions in agrochemical services.</li> <li>- Information technology in plant nutrition.</li> <li>- Digitalization of agrochemical service.</li> </ul> <p><i>Elective Component 2</i> (4 credits, 3rd Semester of Study):</p> <ul style="list-style-type: none"> <li>- Logistics of fertilizer application.</li> <li>- In-soil and foliar fertilization.</li> <li>- Tactics for using liquid fertilizers.</li> </ul> <p><i>Elective Component 3</i> (4 credits, 3rd Semester of Study):</p> <ul style="list-style-type: none"> <li>- Nutrition strategies in the risky farming zone</li> <li>- Fertility and irrigation</li> <li>- Information technologies for moisture supply and plant nutrition</li> </ul> <p><i>Elective Component 4</i> (4 credits, 3 semesters of study):</p> <ul style="list-style-type: none"> <li>- Fertilizer market potential.</li> <li>- Potential risks of using counterfeit fertilizers.</li> </ul> <p>Fertilizers in precision agriculture.</p>
<p style="text-align: center;"><b>Admissions requirements</b></p>	<p>Admission conditions are determined by the "Rules of Admission to the National University of Life and Environmental Sciences of Ukraine" approved by the Academic Council. Availability of basic higher education.</p>
<p style="text-align: center;"><b>Career outcomes</b></p>	<p>National Qualifications Framework of Ukraine - level 7, FQ-ENEA - second cycle, EQF-LLL - level 7.</p>



	<p>Specialized higher education in field of study 20 "Agricultural Sciences and Food", speciality 201 "Agronomy". Educational and professional programme "Agrochemical service in precision agricultural production".</p> <p>According to the current edition of the National Classifier of Ukraine: Classifier of Occupations (DK 003:2010), a graduate with the educational qualification "Master of Agronomy" can be employed in positions with the following professional titles</p> <p>types of work: agronomist (2213.2); researcher (agronomy) (2213.1); agrochemist (2213.2); head of laboratory (production), research) (1237.2); assistant (2310.2); teacher of a higher education institution (2310.2), research agronomist (2213.1), researcher in agrochemistry and soil science (2213.1) or perform primary occupations of agrotechnician (3212); department agronomist (brigade, agricultural plot, farm, workshop) (3212), soil technician (3212); airfield agronomist (2213.2); agroforestry reclamer (2213.2). Graduates can be employed in commercial institutions that provide agrochemical services to agricultural enterprises, conduct comprehensive agrochemical and plant nutrition diagnostics as agrochemical managers, promoter managers, agrochemical analysts, plant nutrition consultants, specialists in precision farming, etc.</p>
<b>URL</b>	<p><a href="https://nubip.edu.ua/node/146442">https://nubip.edu.ua/node/146442</a></p> <p><a href="https://nubip.edu.ua/sites/default/files/u284/201_opp_agrohimservis_mag_2024.pdf">https://nubip.edu.ua/sites/default/files/u284/201_opp_agrohimservis_mag_2024.pdf</a></p>
<b>Keywords</b>	<p>Agrochemical service, soil cover, spatial heterogeneity, nutrition diagnostics, nutrition physiology, agrochemical monitoring, remote monitoring, agrochemical resources, GIS, technological agrochemical service, differentiated fertilizer application</p>
<b>Field</b>	<p>PA</p>

## 2.2. Action 3.1.2: Conduct Skills Gap Analysis on HEIs

Desk research and 12 multi-stakeholder focus-groups carried out between February and June 2025, and revealed that, while both Ukraine and Georgia already host Master’s programmes relevant to PA, none of them yet deliver the full blend of digital, agronomic, data-analytic, and sustainability competences demanded by a rapidly modernising farm sector. Ukrainian provision is technologically stronger but still too theoretical and short of “big-data” content. Georgian provision is broader and research-oriented but lacks advanced digital agriculture altogether. Common cross-country gaps include limited practical training, obsolete laboratory equipment, weak industry links, and under-developed soft skills.

### 2.2.1. Desk research on Ukraine and Georgia

#### Ukraine

Over the past five years, the Ukrainian government has issued five policy papers and two presidential decrees that explicitly encourage digitalisation of agriculture, yet the allocation of capital expenditure to universities remains largely symbolic—averaging 1.200€ per student in engineering faculties versus 7.400€ in comparable EU agrotech programmes. This fiscal mismatch translates into laboratories equipped with single license freeware GIS, scattered RTK base stations that cover no more than 40% of arable land, and



drone fleets limited to low end quadcopters unsuitable for multispectral surveys. Faculty age demographics exacerbate the problem: 53% of academic staff in agro engineering chairs are over 55, delaying the infusion of coding and data science-oriented pedagogy.

Curriculum reviews show that less than one quarter of master level contact hours are practical, and those practical hours are still dominated by traditional soil sampling and tractor maintenance exercises rather than sensor integration, API scripting, or real time data dashboards. Accreditation rules stipulate an 18 month cycle for any substantive syllabus change, discouraging rapid incorporation of emerging subjects such as cloud-based farm management or AI powered pest detection. Furthermore, the ongoing war has imposed periodic campus closures: three of the six surveyed HEIs spent at least 11 % of the 2023/24 academic year online only, curtailing access to field plots and smart machinery.

Industry consultation confirms that employers routinely invest 6–8 months in re-training graduates before they can confidently run variable rate equipment, prepare VRT shapefiles, or interpret NDVI trends. Although Ukraine hosts national initiatives such as the Digital Agriculture Week and Agro Hub hackathons, university participation is ad hoc rather than embedded in curricular credit systems, limiting the systematic transfer of innovation to degree programmes.

### Georgia

Georgia's higher education legislation was revised in 2022 to align with the Bologna Process, theoretically permitting modular, stackable micro-credentials. In practice, however, none of the 18 audited agri related MSc syllabi exploit this flexibility. Only two HEIs have designated Digital Agriculture coordinators, and neither position has a budget line for upgrading equipment or staff training. The Research & Innovation Foundation (SRNSF) disbursed an average of 50.000€ per university for aggrotech in 2024—sufficient for a handful of weather stations but far short of the estimated 4 million € required to establish a national smart farm demonstration network.

Georgian institutions face a triple bottleneck: 1) high licence costs for advanced agronomic software in a small credit economy; 2) fragmented language competence—most global documentation is in English while many students and instructors are primarily Georgian speaking; 3) slow accreditation; new modules must pass ministerial review plus the National Quality Agency, a process that averages 24 months. Consequently, state of the art courses on AI agronomy or traceability blockchain remain stalled at the concept stage.

### Cross Country Synthesis

Despite different macro contexts (post conflict reconstruction versus transition economy), both countries exhibit structural weaknesses that suppress modern PA education:

- capital intensive infrastructure deficit – drones, RTK towers, and high throughput soil sensors are either missing or monopolised by single flagship faculties, hindering cross disciplinary access
- siloed governance structures – agriculture, IT, and environmental sciences reside in separate faculties with limited credit portability, preventing holistic competency maps
- lagging faculty upskilling – sabbatical schemes and industry secondments exist on paper but are used by fewer than 8% of academics annually
- weak feedback loops – national competency frameworks do not yet embed employer validated learning outcomes; regular labour market tracer studies are absent

These gaps collectively slow the diffusion of digital agriculture innovations and widen the skills divide between early adopting commercial farms and the graduate labour pool.



### 2.2.2. Field research – Focus groups on Ukraine and Georgia

The analysis of 12 focus group discussions conducted across various Ukrainian and Georgian regions has revealed profound gaps in the preparation of specialists in PA within HEIs. Despite the growing demand from the agri-food sector for professionals skilled in digital technologies, automation, and data-driven decision-making, current academic programs remain largely outdated and theoretical. Graduates often lack the ability to work with essential tools such as GPS navigation systems, automated seeder and sprayers, UAVs, and smart irrigation platforms. Furthermore, students are generally unfamiliar with modern agricultural software like John Deere Operations Center, Climate FieldView, or Cropwise, making it difficult for them to transition smoothly into practical roles on modern farms.

A significant shortcoming lies in the lack of competencies related to data analysis and geospatial intelligence. Many students are not exposed to hands-on training in collecting, interpreting, and applying spatial data, which is fundamental for the implementation of site-specific farming practices. The absence of programming and analytical modules—especially in Python, R, and GIS—within curricula hinders students' capacity to convert data into actionable agronomic solutions. Remote sensing, satellite imagery analysis, IoT sensor integration, and yield mapping technologies are scarcely represented in educational settings, contributing to a mismatch between academic output and field requirements.

The problem is further exacerbated by the scarcity of practical experience offered to students. Institutions rarely provide access to demo fields, experimental farms, or simulator-based learning environments, meaning that graduates enter the job market with little to no hands-on exposure to precision farming equipment. Employers express concern over the lack of soft skills among graduates, including project management, communication, and entrepreneurial thinking. This disconnect between technical expertise and business-oriented application is particularly problematic for small and medium-sized farms that require multi-skilled professionals capable of integrating technology into operational workflows.

Another pressing issue is the inadequate infrastructure and outdated teaching resources within HEIs. Many universities do not possess agrodrones, RTK stations, licensed satellite data, or real-time monitoring equipment. Moreover, faculty often lack direct experience in digital farming, further limiting the quality of instruction students receive. Dual education models, internships, and partnerships with agribusinesses are not widely implemented or structured, despite their potential to bridge the knowledge gap.

Finally, the absence of cross-disciplinary training that combines agronomy, IT, engineering, and environmental sustainability remains a major barrier. The development of new MSc in PA must therefore prioritize technological integration, field-based learning, modern laboratory equipment, and active collaboration with agribusiness stakeholders. Without strategic reforms in curricula, infrastructure, and institutional cooperation, Ukrainian HEI risk falling further behind the evolving demands of the agricultural sector.

Table 2 provides a summary of the skills gap analysis in Georgia and Ukraine.

**Table 2 – Skills gap analysis in Georgia and Ukraine**

Competence domain	Demand (2025–30)	Current supply	Gap severity	Illustrative evidence
Remote sensing & UAV operations	Very high	Intro lectures only	Severe	Only 17–19 % of UA farms use differential spraying despite drone scouting uptake



GIS & geospatial data science	Very high	Basic mapping labs	Severe	HEI courses focus on static cartography, not geostatistical modelling
AI / ML yield & risk prediction	Emerging-high	Absent	Critical	No master's module covers Python/R for PA analytics
Smart-equipment diagnostics & ISOBUS	High	Limited simulators	Severe	Field trainers cite zero-day student familiarity with CAN-bus logs
Sustainability metrics & life-cycle assessment	Rising	Fragmented	Moderate	Programmes treat climate-smart topics as electives
Project management & entrepreneurship	High	Occasional electives	Moderate	Focus groups flag weak soft-skill preparedness



### 3. Task T3.2 Identification of MSc Programmes in Precision Agriculture in HEIs in Europe

The second Task of WP3 aims to identify MSc Programmes in PA in European HEIs. The 4 European partners responsible are AUTH, MC, HSWT, and BK. Task T3.2 includes 2 main actions, Action 3.2.1, the mapping of existing curricula in EU and A3.2.2 the identification of best practices in PA in EU. The findings will serve as a reference point for ensuring the uniqueness and innovation of the ReGrow MSc programme to be developed.

#### 3.1. Action 3.2.1: Conduct Mapping of Existing Precision Agriculture Courses in EU

The goal of this Activity was the thorough examination of existing MSc programmes in PA across European HEIs. The 4 partners, AUTH, MC, HSWT, and BK, conducted a detailed desk research for documenting the current curricula, utilizing a reporting template. The research methodology was conducted per group: each of the four EU partners was assigned to a cluster of 7 EU member States to map,

- **AUTH:** Greece, Bulgaria, Romania, Slovenia, Malta, Hungary, Slovakia
- **MC:** Cyprus, Italy, Spain, Portugal, Croatia, France, Luxembourg
- **HSWT:** Germany, Austria, Belgium, Latvia, Lithuania, Netherlands, Czechia
- **BK:** Sweden, Finland, Estonia, Ireland, Poland, Denmark

Table 3 presents existing MSc programmes in PA offered by European HEIs. In countries where there is no MSc programme specifically dedicated to PA, relevant programmes that include PA-related disciplines have been included in the database. At least one MSc programme was identified in each country, except for Germany, which offer two programmes. No MSc programmes related to PA were identified in Bulgaria. There was only one but it never started because it lacked participants.

**Table 3 - Existing MSc programmes in PA across European HEIs**

GREECE	
<b>Academic Institution</b>	Agricultural University of Athens (AUA)
<b>Faculty</b>	School of Environment and Agricultural Engineering Department of Natural Resources Development and Agricultural Engineering
<b>City</b>	Athens
<b>Country</b>	Greece
<b>Name of Programme</b>	MSc in Digital Technologies and Smart Infrastructure in Agriculture
<b>Type of Programme</b>	MSc
<b>Duration</b>	3 semesters
<b>Programme description</b>	Its objective is the specialization in the scientific domain of smart technologies and infrastructure across the agri-food supply chain and the protection of the environment. It allows the graduates to be trained in new knowledge and acquire skills in modern agriculture, which are of high importance globally. They obtain a good combination of hard and soft skills that will better prepare them for their future professional careers as experts in many critical operations of the agricultural sector in the digital era.



<p><b>Programme structure</b></p>	<p>The program spans three semesters, which include compulsory and elective courses, as well as the elaboration of a thesis during the third semester. In parallel, students will have the opportunity to follow an internship, of one to three months, in companies of the agri-food sector, in order to become familiar with the real market trends and challenges and to practice on the knowledge acquired during the previous two semesters.</p>
<p><b>Programme goals</b></p>	<p>Through this MSc, students will acquire skills related with innovative technologies reshaping the agricultural processes, like PA, IoT, robotics, automation, optimization and machine learning, cyber-physical system design, reduction and replacement of fossil fuels in agriculture and introduction of renewable energy. Furthermore, they will build capacities toward a more efficient management of resources and of supply chain processes, and they will be encouraged to develop a better understanding of controlled environment agriculture or deploy enhanced agricultural machines and structures.</p>
<p><b>Course Topics</b></p>	<p><b>1st Semester</b></p> <ol style="list-style-type: none"> <li>1. Smart Sensors and Internet of Things</li> <li>2. Elective course from Group A</li> <li>3. Elective course from Group A</li> <li>4. Elective course from Group A</li> <li>5. Elective course from Group A</li> </ol> <p><u>Total 30 ECTS (6 per course)</u></p> <p>The elective courses of Group A are presented below:</p> <ol style="list-style-type: none"> <li>1. Management of Distributed Energy Production and Smart Grids.</li> <li>2. Design, Management and Environmental Control of Greenhouses.</li> <li>3. Indoor Environmental Control for Animal Facilities.</li> <li>4. Non-destructive Evaluation Techniques for Analysis of Agricultural Products Quality.</li> <li>5. Enhanced and Autonomous Machinery and Vehicles.</li> <li>6. Precision Inputs Management.</li> <li>7. Remote Sensing in Agriculture.</li> <li>8. Electricity and Power Production from Renewable Energy Technologies.</li> <li>9. Programming Languages for Applications.</li> </ol> <p><b>2nd Semester</b></p> <ol style="list-style-type: none"> <li>1. Embedded and Real-Time Systems</li> <li>2. Elective course from Group B</li> <li>3. Elective course from Group B</li> <li>4. Elective course from Group B</li> <li>5. Elective course from Group B</li> </ol> <p><u>Total 30 ECTS (6 per course)</u></p> <p>The elective courses of Group B are presented below:</p> <ol style="list-style-type: none"> <li>1. Cyber-Physical Systems and Smart Infrastructures.</li> <li>2. Computational Intelligence and Machine Learning.</li> <li>3. Optimization of Energy Efficiency Technologies (and Smart Energy Management) in Agricultural Enterprises.</li> <li>4. Advanced Technologies in Hydroponics Systems.</li> </ol>



	<p>5. Waste Management and Circular Economy Systems.          6. Traceability and Supply Chain Management.          7. Data Aggregation and Analysis in Precision Agriculture.          8. Bio-Energy.</p> <p>During the <b>3rd Semester</b> is the elaboration of the Postgraduate Thesis.  <u>Total 30 ECTS</u></p>
<b>Admissions requirements</b>	<p><b>Documents:</b></p> <ul style="list-style-type: none"> <li>• Application Form</li> <li>• Copy of degree or Certificate of completion of studies</li> <li>• Transcripts</li> <li>• Curriculum Vitae</li> <li>• Scientific publications in peer-reviewed journals (if any)</li> <li>• Proof of professional or research activity (if any)</li> <li>• Photocopy of both sides of ID</li> <li>• ID Photo</li> <li>• Certificate of competency in English</li> <li>• Two letters of recommendation</li> </ul> <p>This MSc is in English and the cost of attending the Program is estimated at 2,500€ for native students or students from the EU and 4,000€ for non-EU students.</p>
<b>Career outcomes</b>	<p>This program is designed to equip students with the knowledge and skills necessary to excel in the field of PA, combining theoretical understanding with practical application.</p> <p>The educational curriculum of this MSc incorporates various interdisciplinary activities in order to encourage the learners to participate in the design, implementation, and testing stages of actual systems. Thus, the students of this MSc will be able to understand the way that smart systems operate, in order to become better prepared for their role in a digitally transformed agricultural sector.</p>
<b>URL</b>	<p><a href="https://smartag.aua.gr/">https://smartag.aua.gr/</a>  <a href="https://masters.minedu.gov.gr/Masters/viewMaster/en/1853">https://masters.minedu.gov.gr/Masters/viewMaster/en/1853</a></p>
<b>Keywords</b>	<p>Precision agriculture, Internet of Things, robotics, automation, optimization, machine learning, cyber-physical system design, reduction and replacement of fossil fuels, renewable energy</p>
<b>Field</b>	<p>Agriculture</p>
<b>BULGARIA</b>	
<b>Academic Institution</b>	<p>Agricultural University of Plovdiv (AUP)</p>
<b>Faculty</b>	<p>Agricultural Sciences and Veterinary Medicine</p>
<b>City</b>	<p>Plovdiv</p>
<b>Country</b>	<p>Bulgaria</p>
<b>Name of Programme</b>	<p>Innovative technologies in precision farming</p>
<b>Type of Programme</b>	<p>MSc</p>
<b>Duration</b>	
<b>Programme description</b>	



<b>Programme structure</b>	This MSc course "Innovative Technologies in Precision Farming" was offered, but it never started because it lacked participants.
<b>Programme goals</b>	
<b>Course Topics (modules per semester, ECTS credits)</b>	
<b>Admissions requirements</b>	
<b>Career outcomes</b>	
<b>URL</b>	<a href="https://www.au-plovdiv.bg/en/admission-agricultural-university/%D0%BE%D0%BA%D1%81-%D0%BC%D0%B0%D0%B3%D0%B8%D1%81%D1%82%D1%8A%D1%80/%D1%81%D0%BF%D0%B5%D1%86%D0%B8%D0%B0%D0%BB%D0%BD%D0%BE%D1%81%D1%82%D0%B8">https://www.au-plovdiv.bg/en/admission-agricultural-university/%D0%BE%D0%BA%D1%81-%D0%BC%D0%B0%D0%B3%D0%B8%D1%81%D1%82%D1%8A%D1%80/%D1%81%D0%BF%D0%B5%D1%86%D0%B8%D0%B0%D0%BB%D0%BD%D0%BE%D1%81%D1%82%D0%B8</a>
<b>Keywords</b>	N/A
<b>Field</b>	N/A
<b>ROMANIA</b>	
<b>Academic Institution</b>	University of Agronomic Sciences and Veterinary Medicine of Bucharest (USAMV)
<b>Faculty</b>	Faculty of Agriculture
<b>City</b>	Bucharest
<b>Country</b>	Romania
<b>Name of Programme</b>	Sustainable Agriculture
<b>Type of Programme</b>	MSc
<b>Duration</b>	4 semesters
<b>Programme description</b>	The mission of this study program is to provide specific knowledge, skills and competencies for the specialization and improvement of specialists in the field of agriculture in the highly topical and interesting issue represented by sustainable agriculture.
<b>Programme structure</b>	This MSc programme structure is divided into compulsory and optional subjects (courses), in both years of training. The first year has 10



	compulsory and 4 optional courses. The second year has 11 compulsory and 1 optional course.
<b>Programme goals</b>	This MSc programme's goal is to train students in the issue of sustainable exploitation of resources in the agricultural production process, alternative agricultural systems (organic agriculture, PA), integrated agricultural production technologies, environmental protection and conservation and ensuring the sustainability of the agricultural holding and the rural environment of which it is part.
<b>Course Topics</b>	<p><b>Year I (Compulsory subjects)</b></p> <ul style="list-style-type: none"> <li>• Agricultural ecosystems</li> <li>• Sustainable use of land</li> <li>• Alternative energies in agriculture</li> <li>• Environmental protection in agriculture</li> <li>• Integrated technologies in plant culture I</li> <li>• Integrated technologies in plant culture II</li> <li>• Fertilization principles and rules</li> <li>• Tillage systems</li> <li>• Alternative agricultural crops</li> <li>• Harvest formation and evaluation</li> </ul> <p><b>Year I (Optional subjects)</b></p> <ul style="list-style-type: none"> <li>• Resource management in agricultural systems</li> <li>• The impact of climate change on agriculture</li> <li>• Sustainable development strategies</li> <li>• Biological material in plant agricultural production</li> </ul> <p><b>Year II (Compulsory subjects)</b></p> <ul style="list-style-type: none"> <li>• Weed management in sustainable agriculture</li> <li>• Disease management in sustainable agriculture</li> <li>• Pest management in sustainable agriculture</li> <li>• Livestock systems in sustainable agriculture</li> <li>• Agrosilvopastoral resources</li> <li>• Project development and management</li> <li>• Agricultural product preservation and processing techniques</li> <li>• Quality and traceability of agricultural products</li> <li>• Agribusiness</li> <li>• Ethics and academic integrity</li> <li>• Harvest formation and evaluation</li> </ul> <p><b>Year II (Optional subjects)</b></p> <ul style="list-style-type: none"> <li>• Dissertation defence (dissertation exam)</li> </ul> <p><u>Total ECTS credits: 120</u></p>
<b>Admissions requirements</b>	The admission criteria are, 10% written test (essay)/online and 90% average years of undergraduate studies. This MSc programme has 35 budget seats and 160 fee-based places.



<b>Career outcomes</b>	Graduates of this study program will be able to find jobs in the field of agricultural research and development, education, agricultural administration, as well as in all institutions/companies operating in the agricultural or related fields.
<b>URL</b>	<a href="https://agro-bucuresti.ro/agricultura-durabila/">https://agro-bucuresti.ro/agricultura-durabila/</a>
<b>Keywords</b>	Precision agriculture, environment, integrated technologies, resources management, agribusiness
<b>Field</b>	Agriculture
<b>SLOVENIA</b>	
<b>Academic Institution</b>	University of Ljubljana
<b>Faculty</b>	Biotechnical Faculty - Department of Agronomy
<b>City</b>	Ljubljana
<b>Country</b>	Slovenia
<b>Name of Programme</b>	Agronomy
<b>Type of Programme</b>	MSc
<b>Duration</b>	4 semesters
<b>Programme description</b>	The mission of this MSc programme is to create cutting-edge knowledge in the fields of biotechnical sciences and transfer this knowledge and technologies into practice. Providing knowledge of biological laws, understanding the relationship between environment and society, protecting the environment and landscape, protecting natural heritage, using sustainable natural resources, and developing modern biotechnology are the lasting goals of this MSc.
<b>Programme structure</b>	This Master includes both compulsive and elective courses each semester.
<b>Programme goals</b>	The basic aim of the study programme is to deepen knowledge and methods from the area of the natural foundations and technological procedures of crop production, inseparably linked with integral management of the agricultural space and environmental conservation.
<b>Course Topics</b>	<p><b>Courses Year I</b></p> <p><u>1st semester</u></p> <p>Ecophysiology of Higher Plants (5 ECTS)</p> <p>Elective Subject(s) (3 ECTS)</p> <p>Genetics, plant breeding and biotechnology (9 ECTS)</p> <p>Phytomedicine II (9 ECTS)</p> <p>Statistics II (4 ECTS)</p> <p><u>2nd semester</u></p> <p>Agroecosystems and Environmental Protection (5 ECTS)</p> <p>Crop Production (6 ECTS)</p> <p>Elective Subject(s) (3 ECTS)</p> <p>Grassland and Forage Crops Production (6 ECTS)</p> <p>Integrated Agricultural Land Management (6 ECTS)</p> <p>Master's Thesis (part 1) (4 ECTS)</p> <p><b>Elective courses (Year I) (3 ECTS each one)</b></p>



	<p>Digital Technologies in Agriculture          GIS tools in agroecosystems          Geographic Information System          Orchard Planning          Biogenic Waste Management          Biological Control          Biotechnological protocols for plant propagation          Fruit Cultivar Lists          Landscape Horticulture          Lawns for Ornamental, Recreational and Sport Usage          Management of agricultural production processes          Organic Farming          Plant Molecular Diagnostics          Quarantine Pests and Diseases          Remote sensing in agriculture          Scientific and Technical Information          Sociology of Agriculture, Food and Natural Resources          Soil biodiversity in agroecosystems</p> <p><b>Courses Year II</b>  <u>3rd semester</u>          Biometeorology (5 ECTS)          Environmental Monitoring and Information (3 ECTS)          Land Use and Soil Protection (5 ECTS)          Master’s Thesis (part 2) (8 ECTS)          Soil Chemigation with Introduction to Ecotoxicology (5 ECTS)          Sustainable Agriculture (4 ECTS)  <u>4th semester</u>          Elective Subject(s) (12 ECTS)          Master’s Thesis (part 2) (18 ECTS)</p> <p><b>Elective courses (Year II) (3 ECTS)</b>          Practicum (Practical Training)</p> <p><u>Total 120 ECTS (Students are required to complete 60 ECTS each year)</u></p>
<p><b>Admissions requirements</b></p>	<p>Access to the master’s study programme Agronomy is granted to candidates who completed one of the following study programmes:</p> <ul style="list-style-type: none"> <li>a) a first cycle Bologna study programme in the field of life sciences or biotechnical sciences, completed at the Biotechnical faculty or other faculties.</li> <li>b) a first cycle Bologna study programme in other professional fields, worth at least 180 ECTS, provided that the candidates complete other study requirements needed for further study (i.e. courses of the first cycle study programme Agriculture – Agronomy). These requirements are set for each student individually by the competent Studies Committee and comprise from 10 to 60 ECTS. Candidates can complete these study</li> </ul>



	<p>requirements during their first cycle studies or by passing exams prior to enrolment in the master's study programme.</p> <p>c) a pre-Bologna professional study programme in the fields of life sciences or biotechnical sciences, completed at the Biotechnical faculty or other faculties.</p> <p>d) a pre-Bologna professional study programme in other fields, provided that the candidates complete other study requirements needed for further study (i.e. courses of the first cycle study programme Agriculture – Agronomy). These requirements are set for each student individually by the competent Studies Committee, and comprise from 10 to 60 ECTS. Candidates can complete these study requirements during their first cycle studies or by passing exams prior to enrolment in the master's study programme.</p> <p>Admission to the programme is also granted to candidates who have completed equivalent education abroad, and who enrol under the same requirements which apply for candidates who completed their education in Slovenia. Prior to enrolment in the study programme they must complete the procedure for recognition of education for the purpose of further study.</p> <p>The requirement for progression from Year 1 to Year 2 is the completion of all exercises and study requirements in a total amount of at least 45 ECTS. The competent Studies Committee may exceptionally approve the progression from Year 1 to Year 2 for a student who has gained at least 30 ECTS in Year 1, if the student can provide justifiable reasons in accordance with the Statutes of the University of Ljubljana.</p> <p>Conditions for repeating a year: Students can repeat a year provided that they complete study requirements in a total amount of at least 30 ECTS.</p> <p>During their course of study students may only once repeat a year or change their study programme owing to non-fulfilment of requirements.</p>
<b>Career outcomes</b>	The graduate obtains in depth knowledge of natural sciences, which is the basis of modern technologies of agricultural production and environmental conservation, professional competences in the sphere of field and forage crops, and professional and methodological knowledge for managing the agricultural space and protection of the environment.
<b>URL</b>	<a href="https://www.bf.uni-lj.si/en/study/study-programmes/2020091415355179/agronomy">https://www.bf.uni-lj.si/en/study/study-programmes/2020091415355179/agronomy</a>
<b>Keywords</b>	Agronomy, sustainability, environmental conservation, technologies, integrated management
<b>Field</b>	Agronomy
<b>MALTA</b>	
<b>Academic Institution</b>	L-Università ta' Malta (UM)
<b>Faculty</b>	Institute of Earth Systems



<b>City</b>	Msida
<b>Country</b>	Malta
<b>Name of Programme</b>	Master of Science in Environmental Management and Sustainability
<b>Type of Programme</b>	MSc
<b>Duration</b>	3 semesters
<b>Programme description</b>	<p>This programme describes how humanity has changed the functioning of Earth Systems with reference to planetary boundaries. It discusses how supranational treaties and other legal arrangements affect sustainability and the environment and outlines the principles of regenerative agriculture and identify ways in which these can be applied.</p> <p>Also it uses causal loop diagrams and an appropriate narrative to articulate system structure and feedback dynamics. Finally, it articulates the impacts of the separation of human and environment in the context of contemporary issues from local to global scales.</p>
<b>Programme structure</b>	<p>As a registered student enrolled in this programme, one semester will be spent at the James Madison University campus in Virginia, USA, and one semester at the University of Malta campus, with a third semester spent working on an independent project at a location of your choice.</p> <p>Students have compulsory units and elective courses in each semester. They should choose between 2 groups of elective courses.</p>
<b>Programme goals</b>	<p>With this programme students will gain technical knowledge to address complex, natural and/or anthropogenic problems that impact the environmental condition with a multi-disciplinary, systems approach. By developing a broad international perspective that is culturally balanced, they will be able to:</p> <ul style="list-style-type: none"> <li>• Analyse and solve real-world human problems;</li> <li>• Integrate social, political, legal and cultural aspects into technology solutions with systems approach;</li> <li>• Develop a technical skill set that addresses concepts of data measurement and mining, application of GIS, and modelling and simulation of complex systems;</li> <li>• Embrace lifelong learning and creative critical thinking.</li> </ul>
<b>Course Topics</b>	<p><b>Semester 1</b></p> <p><u>Compulsory Units</u></p> <ul style="list-style-type: none"> <li>• Sustainability, Society and Change (6 ECTS)</li> <li>• Introduction to Systems Dynamics (6 ECTS)</li> <li>• Earth Systems (5 ECTS)</li> <li>• Human-Environment Dynamics (6 ECTS)</li> <li>• Analytical Methods and Techniques in Geographic Information Systems (6 ECTS)</li> </ul> <p><u>Elective courses A: Living resources</u></p> <ul style="list-style-type: none"> <li>• Biodiversity Conservation 1: Key Concepts (6 ECTS)</li> <li>• Regenerative Agriculture and Food Systems 1: Key Concepts (6 ECTS)</li> </ul> <p><u>Elective courses B: Technological innovation</u></p> <ul style="list-style-type: none"> <li>• Industrial Ecology and Sustainable Industrial Systems 1: Key Concepts (6 ECTS)</li> </ul>



	<ul style="list-style-type: none"> <li>Sources and Sinks: Energy, Water and Air 1: Key Concepts (6 ECTS)</li> </ul> <p><b>Semester 2</b></p> <p><u>Compulsory Units</u></p> <ul style="list-style-type: none"> <li>Capstone Project (20 ECTS)</li> <li>Field study (5 ECTS)</li> <li>Sustainability Policy and Law (6 ECTS)</li> <li>Analytical Methods and Techniques in Data Science (6 ECTS)</li> </ul> <p><u>Elective courses A: Living resources</u></p> <ul style="list-style-type: none"> <li>Biodiversity Conservation 2: Applied Science for Management (6 ECTS)</li> <li>Regenerative Agriculture and Food Systems 2: Small Scale and Urban Contexts (6 ECTS)</li> </ul> <p><u>Elective courses B: Technological innovation</u></p> <ul style="list-style-type: none"> <li>Industrial Ecology and Sustainable Industrial Systems 2: Development and Assessment Techniques (6 ECTS)</li> <li>Sources and Sinks: Energy, Water and Air 2: Modelling and Monitoring (6 ECTS)</li> </ul> <p><u>Total ECTS: 90</u></p>
<b>Admissions requirements</b>	<p>The Course shall be open to applicants in possession of a first cycle degree in Earth Systems, Science or Engineering or in another area of study which the Board considers as appropriate, provided that the first cycle degree is obtained with a Second Class (Honours) or better classification, or an equivalent classification.</p> <p>Local/EU/EEA Applicants: Applicants resident and domiciled in Virginia, USA for a minimum of one year prior to application: Tuition Fees: US\$22,500 + Field-Trip Costs: \$2,750 All other applicants: Tuition Fees: US\$23,500 + Field-Trip Costs: \$2,750</p>
<b>Career outcomes</b>	<p>Graduates of this Master course will be able to seek employability in a variety of local and international settings. Graduates of the programme have gone on to pursue careers as environment protection officers, project managers, systems engineers, geologists, operations officer, managers, sustainability consultants, and development coordinators, among various other examples.</p>
<b>URL</b>	<a href="https://www.um.edu.mt/courses/overview/pmscemsft5-2025-6-o/">https://www.um.edu.mt/courses/overview/pmscemsft5-2025-6-o/</a>
<b>Keywords</b>	Sustainability, environmental management, regenerative agriculture, biodiversity, conservation
<b>Field</b>	Environment
<b>HUNGARY</b>	
<b>Academic Institution</b>	University of Debrecen
<b>Faculty</b>	Agricultural and Food Sciences and Environmental Management
<b>City</b>	Debrecen
<b>Country</b>	Hungary
<b>Name of Programme</b>	Agricultural Water Management Engineering
<b>Type of Programme</b>	MSc



<b>Duration</b>	4 semesters
<b>Programme description</b>	<p>The aim of the Master is to train agricultural water management engineers who are able to use creative engineering in the field of sustainable integrated water management within the field of agricultural water management with the knowledge gained in master’s degree. With their qualifications they are able to cooperate at a high level in solving domestic and international problems related to their field of expertise. They are suitable for the design and development of engineering, research and leadership positions. They are ready to continue their studies in doctoral training.</p>
<b>Programme structure</b>	<p>The structure of this programme is 48% lectures, seminars and 52% practice. Students should complete a 4-week summer field practice.</p>
<b>Programme goals</b>	<p>Agricultural water management engineers will have competences on,</p> <ul style="list-style-type: none"> <li>• developing and implementing climate adaptation solutions</li> <li>• using and further developing the latest agricultural water management technologies and processes</li> <li>• coordinating the professional task of agricultural water management</li> <li>• orientating and providing a professionally based opinion on domestic and international economic policy and social events related to the agricultural economy</li> <li>• independently interpreting and applying legislation related to its professional activity</li> <li>• defining, planning and organizing the activity of the field of expertise</li> <li>• forming its own position and defending it in a debate about general social, agricultural economics, and special issues related to the field</li> <li>• following a thorough, analytical approach to the relevant international literature of its field of expertise</li> <li>• providing the necessary conditions for the implementation of the specified activities, to continuously manage and control the implementation, and to organize it</li> <li>• practicing the various functions of leadership activities, motivating them, evaluating their performance, and legitimate and effective handling of conflicts</li> <li>• developing a project team, actively participating in research and development projects</li> <li>• analysing the different areas of the ideas that form the knowledge system of the given field of expertise, and of exploring the complex and specific contexts</li> <li>• identifying the professional problems, their versatile, interdisciplinary approach, and the detailed, conceptual and practical background needed to solve it</li> <li>• agrarian analyses, which can be transposed across sectors, contexts, complex formulas and evaluations</li> <li>• applying state-of-the-art IT tools, professional and effective oral and written communication</li> <li>• engineering and environmental friendly solutions that support individuals and the health of society.</li> </ul>
<b>Course Topics</b>	<p><b>Year 1</b>  Applied Hydrology and Hydraulics, Climatology, Hydrogeography, Hydrobiology, Water Chemistry, Soil Physics, Melioration and Land</p>



	<p>Consolidation, Pond Culture and Fisheries Management, Irrigated Crop Production, Floodplain Management, Irrigation for Horticultural Production, Wastewater and Slurry Management, Management and Utilization of Aquatic Habitats, Water Resource Protection – Environmental Damage Prevention, Remote Sensing and GIS in Hydrology, Farm Irrigation Machines, Irrigation Technology</p> <p><b>Year 2</b></p> <p>Precision Agriculture, Drought Management, Integrated Water Management and Monitoring, Water Economics, Excess Water Management, Agricultural Water Supply Systems, Agricultural Water Management Planning and Implementation, Water Policy, Water Law and Sectoral Public Administration, Thesis</p> <p><u>Total ECTS: 120</u></p>
<b>Admissions requirements</b>	<p>Language requirements: English language proficiency (TOEFL 547 /IELTS 6.0 /oral examination)</p> <p>Academic requirements: Bachelor’s degree in environmental science, agricultural engineering, horticulture engineering, crop production engineering, agrobusiness and rural development engineering, rural development engineering.</p> <p>Tuition fee: 8,000 USD/year</p> <p>Other fees: application fee 150 USD, entrance procedure fee 350 USD</p>
<b>Career outcomes</b>	<p>Postgraduates are qualified for the design and development of engineering, research and leadership positions. They may continue their studies in doctoral training.</p>
<b>URL</b>	<p><a href="https://edu.unideb.hu/p/agricultural-water-management-engineering-msc">https://edu.unideb.hu/p/agricultural-water-management-engineering-msc</a></p>
<b>Keywords</b>	<p>Water management, precision agriculture, engineering, integrated water management, remote sensing, GIS in Hydrology</p>
<b>Field</b>	<p>Agricultural Science</p>
<b>SLOVAKIA</b>	
<b>Academic Institution</b>	<p>Slovak University of Agriculture in Nitra</p>
<b>Faculty</b>	<p>Faculty of Agrobiolgy and Food Resources</p>
<b>City</b>	<p>Nitra</p>
<b>Country</b>	<p>Slovakia</p>
<b>Name of Programme</b>	<p>Sustainable Agriculture and Rural Development</p>
<b>Type of Programme</b>	<p>MSc</p>
<b>Duration</b>	<p>4 semesters</p>
<b>Programme description</b>	<p>This program covers various aspects of sustainable agriculture, environmental policy, and regional planning, providing a comprehensive understanding of the field.</p>
<b>Programme structure</b>	<p>This program’s method of study is attendance to the courses.</p>
<b>Programme goals</b>	<p>This program is designed to equip students with the knowledge and skills necessary to address challenges in sustainable agriculture and the development of rural areas.</p>



<b>Course Topics</b>	Specific course details for this program and number of ECTS are not readily available online. Courses cover various aspects of agriculture, sustainability, environmental policy, rural development and regional planning.
<b>Admissions requirements</b>	Applicants should hold a Bachelor's degree in a related field. Proficiency in the language of instruction is required. Courses are primarily taught in Slovak. This program requires interview as a form of entrance exam. Education in Slovak is free for all students, including international students.
<b>Career outcomes</b>	Graduates are prepared for positions as top-managers in all types of institutions and subjects of agricultural sector, agri-food sector, state, private and public institutions, self-government organisations, regional offices for environmental issues, development of tourism and others.
<b>URL</b>	<a href="https://www.portalvs.sk/en/studijny-program/udrzatelne-polnohospodarstvo-a-rozvoj-vidieka0#details-jobopportunities">https://www.portalvs.sk/en/studijny-program/udrzatelne-polnohospodarstvo-a-rozvoj-vidieka0#details-jobopportunities</a>
<b>Keywords</b>	Sustainable agriculture, rural development, agri-food sector, technology
<b>Field</b>	Agriculture and Landscape
<b>CYPRUS</b>	
<b>Academic Institution</b>	Cyprus International University (CIU)
<b>Faculty</b>	Agricultural Sciences and Technologies
<b>City</b>	North Nicosia
<b>Country</b>	Turkish Republic of Northern Cyprus
<b>Name of Programme</b>	MSc in Plant Sciences and Technologies
<b>Type of Programme</b>	MSc
<b>Duration</b>	4 semesters
<b>Programme description</b>	The scope of the particular MSc is to equip students with knowledge and practical skills in plant breeding, biotechnology, and the application of modern technologies in agriculture. The program focuses on creating new types of plants that can better withstand environmental challenges. It also includes research and working with international experts to help students learn about the latest agricultural technologies.
<b>Programme structure</b>	The Programme is composed of four semesters and comprises courses such as Plant Growth Regulators, Special Plant Breeding, Water Management in Agriculture, Logistics in Agriculture, Salinity Problems in Agricultural Lands, Modern Fruit Production Techniques, Plant Tissue Culture Techniques, and New Developments in Greenhouse Production. Students have the opportunity to engage in research and applied education
<b>Programme goals</b>	<ul style="list-style-type: none"> <li>• To provide comprehensive knowledge in plant sciences and modern agricultural technologies.</li> <li>• To foster research skills through collaboration with international experts.</li> <li>• To prepare graduates for addressing environmental challenges in agriculture through innovative solutions.</li> </ul>



<b>Course Topics</b>	<ul style="list-style-type: none"> <li>• Advanced Plant Breeding Techniques</li> <li>• Plant Biotechnology and Genetic Engineering</li> <li>• Agricultural Biotechnology Applications</li> <li>• Environmental Stress Physiology</li> <li>• Research Methodologies in Plant Sciences</li> <li>• Seminars on Current Trends in Agricultural Technologies</li> </ul>
<b>Admissions requirements</b>	<ul style="list-style-type: none"> <li>• A bachelor's degree in Plant Sciences, Agricultural Sciences, or a related field.</li> <li>• A minimum GPA as specified by the university's admission criteria.</li> <li>• Proof of English proficiency, if applicable.</li> <li>• Submission of a completed application form along with necessary documents (transcripts, recommendation letters, etc.).</li> </ul>
<b>Career outcomes</b>	<ul style="list-style-type: none"> <li>• Agricultural Research Institutions</li> <li>• Biotechnology and Agritech Companies</li> <li>• Government Agricultural Departments</li> <li>• Environmental Consultancy Firms</li> <li>• Non-Governmental Organizations (NGOs) focusing on agricultural development</li> <li>• Academia and Teaching Positions</li> </ul>
<b>URL</b>	<a href="https://ciu.edu.tr/en/programs/postgraduate/plant-sciences-and-technologies-msc">https://ciu.edu.tr/en/programs/postgraduate/plant-sciences-and-technologies-msc</a>
<b>Keywords</b>	Plant Sciences, Agricultural Technologies, Biotechnology, Environmental Challenges, MSc
<b>Field</b>	Agriculture and Technologies
<b>ITALY</b>	
<b>Academic Institution</b>	University of Bologna
<b>Faculty</b>	Agricultural Sciences
<b>City</b>	Bologna
<b>Country</b>	Italy
<b>Name of Programme</b>	MSc in Precision and Sustainable Agriculture
<b>Type of Programme</b>	MSc
<b>Duration</b>	4 semesters
<b>Programme description</b>	This program trains experts in applying precision and sustainable agriculture techniques, focusing on advanced agronomic technologies and practices.
<b>Programme structure</b>	<p>First Year: Core Modules Second Year: Specialization Tracks</p> <p>Delivery methods:</p> <ul style="list-style-type: none"> <li>• Traditional lectures combined with interactive exercises and practical activities.</li> <li>• Use of GIS and other digital tools for data analysis and decision-making in agriculture.</li> <li>• Group projects, case studies, and seminars with industry experts to bridge theoretical knowledge with practical applications.</li> </ul>



<b>Programme goals</b>	<ul style="list-style-type: none"> <li>• Develop advanced skills in agronomic technologies.</li> <li>• Implement precision methods in agricultural practices.</li> <li>• Promote sustainability in plant and animal production.</li> </ul>
<b>Course Topics</b>	Curriculum A: Crop production Curriculum B: Animal production
<b>Admissions requirements</b>	<ul style="list-style-type: none"> <li>• Bachelor's degree (Italian listed classes or recognized foreign degree)</li> <li>• Curricular ECTS (Chem, Bio, Math, Agri) 6 + 6 + 6 + 36 = 54 ECTS</li> <li>• English B2 proficiency</li> <li>• Adequacy of preparation (GPA <math>\geq</math> 90/110 or interview)</li> <li>• Committee assessment (Pending case by case)</li> <li>• Application via Studenti Online (Documents + uploads per intake deadline)</li> <li>• Graduation (if pending) Degree by 31 Dec 2025</li> </ul>
<b>Career outcomes</b>	<ul style="list-style-type: none"> <li>• Consultancy/Management (Farm Manager, Agricultural Consultant)</li> <li>• Agri-Tech &amp; Innovation (Field Specialist, Smart Farming Project Manager)</li> <li>• Policy &amp; NGOs (Sustainability Coordinator, Policy Analyst, Advisor)</li> <li>• Research/Academia (Research Scientist, Lecturer, Extension Officer)</li> <li>• Environmental Sector (Resource Manager, Green Project Lead)</li> </ul>
<b>URL</b>	<a href="https://corsi.unibo.it/2cycle/PreciseSustainableAgriculture">https://corsi.unibo.it/2cycle/PreciseSustainableAgriculture</a>
<b>Keywords</b>	Precision Agriculture, Sustainable Practices, Agronomic Technologies, MSc
<b>Field</b>	Agricultural Sciences
<b>SPAIN</b>	
<b>Academic Institution</b>	Polytechnic University of Valencia
<b>Faculty</b>	School of Agricultural Engineering and the Environment
<b>City</b>	Valencia
<b>Country</b>	Spain
<b>Name of Programme</b>	Master's Degree in Agricultural Engineering
<b>Type of Programme</b>	MSc
<b>Duration</b>	3 semesters
<b>Programme description</b>	This program trains professionals in agricultural technologies, focusing on improving production efficiency and sustainability. It combines engineering principles with agricultural practices to address modern challenges in food production and resource management.
<b>Programme structure</b>	<p><b>Year 1</b></p> <ul style="list-style-type: none"> <li>• Introduction to Agricultural Engineering</li> <li>• Advanced Irrigation Systems and Technology</li> <li>• Agricultural Machinery and Automation</li> <li>• Precision Agriculture Techniques</li> <li>• Environmental Management and Sustainability in Agriculture</li> <li>• GIS and Remote Sensing in Agriculture</li> </ul> <p><b>Year 2</b></p>



	<ul style="list-style-type: none"> <li>• Research Project or Thesis</li> <li>• Advanced Data Analytics for Precision Agriculture</li> <li>• Smart Irrigation and Water Management</li> <li>• Application of GPS and GIS in Agriculture</li> <li>• Elective Modules (e.g., Robotics in Agriculture, Advanced VRT Systems, Sustainability in Agri-food Systems)</li> </ul>
<b>Programme goals</b>	<ul style="list-style-type: none"> <li>• Develop advanced skills in agronomic technologies.</li> <li>• Implement precision methods in agricultural practices.</li> <li>• Promote sustainability in plant and animal production.</li> </ul>
<b>Course Topics</b>	ECTS Credits: Approximately 60 ECTS per year, totaling 120 ECTS for the entire program.
<b>Admissions requirements</b>	<ul style="list-style-type: none"> <li>• Bachelor's degree in Agricultural Engineering or related fields.</li> <li>• Proof of Spanish or English proficiency (depending on language of instruction).</li> <li>• Minimum GPA as specified by the university.</li> <li>• Required documents: application form, transcripts, recommendation letters</li> </ul>
<b>Career outcomes</b>	<ul style="list-style-type: none"> <li>• Agricultural Research Institutions</li> <li>• Agritech Companies</li> <li>• Government Agricultural Departments</li> <li>• Environmental Consultancy Firms</li> <li>• Non-Governmental Organizations (NGOs)</li> <li>• Academia and Teaching Positions</li> </ul>
<b>URL</b>	<a href="https://www.upv.es/">https://www.upv.es/</a>
<b>Keywords</b>	Precision Agriculture, Agricultural Engineering, Sustainability, GIS, GPS, Remote Sensing, Smart Irrigation, VRT, Robotics in Agriculture, Data Analytics, Yield Mapping, Environmental Management, Agricultural Machinery, Sustainability in Agri-food Systems, Research Project, Thesis
<b>Field</b>	Agricultural Sciences
<b>PORTUGAL</b>	
<b>Academic Institution</b>	Instituto Superior de Agronomia (ISA), University of Lisbon
<b>Faculty</b>	Agronomy
<b>City</b>	Lisbon
<b>Country</b>	Portugal
<b>Name of Programme</b>	Master's Degree in Agricultural Engineering
<b>Type of Programme</b>	MSc
<b>Duration</b>	4 semesters
<b>Programme description</b>	ISA offers a comprehensive program in Agricultural Engineering, integrating modern technologies and sustainable practices in agriculture.
<b>Programme structure</b>	<p><b>Curriculum Components:</b></p> <ul style="list-style-type: none"> <li>Core Courses</li> <li>Specialization Areas</li> <li>Practical Training</li> </ul> <p><b>Delivery methods:</b></p> <p>The program is primarily taught in Portuguese.</p>



	Blend of teaching methods: lectures, laboratory work, field studies, and project-based learning.
<b>Programme goals</b>	To develop professionals capable of applying engineering solutions to agricultural challenges, focusing on innovation and sustainability.
<b>Course Topics</b>	<ul style="list-style-type: none"> <li>• Agricultural Machinery and Automation</li> <li>• Irrigation Systems and Water Management</li> <li>• Environmental Impact Assessment</li> <li>• GIS and Remote Sensing in Agriculture</li> <li>• Data Management and Analysis in Agriculture</li> <li>• Sustainable Agricultural Practices</li> </ul> Total of 120 ECTS over the program duration.
<b>Admissions requirements</b>	<ul style="list-style-type: none"> <li>• Bachelor's degree in Agricultural Engineering or related fields.</li> <li>• Proof of English proficiency.</li> <li>• Satisfactory academic performance.</li> <li>• Submission of application documents as specified by ISA.</li> </ul>
<b>Career outcomes</b>	<ul style="list-style-type: none"> <li>• Agricultural Engineering Firms</li> <li>• Environmental Agencies</li> <li>• Research and Development Institutions</li> <li>• Educational and Training Organizations</li> </ul>
<b>URL</b>	<a href="https://bemvindo.isa.ulisboa.pt/?gad_source=1&amp;gclid=CjwKCAjwvr--BhB5EiwAd5YbXuLpc4IzjiwufvWZwlhmFLJ6TKmgW6vFxQ_BeQqukHLkDWFuf--EpxoC2ggQAvD_BwE">https://bemvindo.isa.ulisboa.pt/?gad_source=1&amp;gclid=CjwKCAjwvr--BhB5EiwAd5YbXuLpc4IzjiwufvWZwlhmFLJ6TKmgW6vFxQ_BeQqukHLkDWFuf--EpxoC2ggQAvD_BwE</a>
<b>Keywords</b>	Precision Agriculture, Agricultural Engineering, Sustainability, GIS, GPS, Remote Sensing, Smart Irrigation, VRT, Robotics in Agriculture, Data Analytics, Yield Mapping, Environmental Management, Agricultural Machinery, Sustainability in Agri-food Systems, Research Project, Thesis
<b>Field</b>	Agricultural Sciences
<b>CROATIA</b>	
<b>Academic Institution</b>	University of Zagreb Faculty of Agriculture
<b>Faculty</b>	Agriculture
<b>City</b>	Zagreb
<b>Country</b>	Croatia
<b>Name of Programme</b>	MSc in Digital Agriculture
<b>Type of Programme</b>	MSc
<b>Duration</b>	4 semesters
<b>Programme description</b>	The focus of the programme is to integrate digital technologies into agriculture, emphasizing data-driven decision-making and precision farming techniques.
<b>Programme structure</b>	The first year comprises 14 mandatory courses totalling 60 ECTS. The second year allows students to specialize in areas like Crop Production or Animal Production, with additional mandatory and elective courses, culminating in a Master's thesis.
<b>Programme goals</b>	The utilization of digital tools and data analytics to enhance agricultural productivity and sustainability.



<b>Course Topics</b>	<ul style="list-style-type: none"> <li>• Digital Agriculture Technologies</li> <li>• Data Analytics in Agriculture</li> <li>• Precision Farming Techniques</li> <li>• Remote Sensing Applications</li> <li>• Agricultural Robotics</li> </ul> <p><u>Total of 120 ECTS</u></p>
<b>Admissions requirements</b>	<ul style="list-style-type: none"> <li>• Bachelor's degree in Agricultural Engineering, Computer Science, or related fields.</li> <li>• Proof of English proficiency.</li> <li>• Meeting the university's GPA criteria.</li> <li>• Submission of application form, academic transcripts, and recommendation letters.</li> </ul>
<b>Career outcomes</b>	<ul style="list-style-type: none"> <li>• Agritech Companies</li> <li>• Data Analytics Firms</li> <li>• Government Agricultural Agencies</li> <li>• Research Institutions</li> <li>• Consultancy Firms</li> </ul>
<b>URL</b>	<a href="https://ict-agriculture.com/wp-content/uploads/2022/09/Digital-Agriculture-INFO.pdf">https://ict-agriculture.com/wp-content/uploads/2022/09/Digital-Agriculture-INFO.pdf</a>
<b>Keywords</b>	GPS, GIS, Drones, Remote Sensing, VRT, Yield Mapping, Soil Mapping, Telemetry, Smart Irrigation, Sensors, Data Collection, Data Analytics, Site-Specific Management (SSM), Integrated Pest Management (IPM), IoT, UAV, Sustainability
<b>Field</b>	Agricultural Sciences
<b>FRANCE</b>	
<b>Academic Institution</b>	Institut Agro Montpellier
<b>Faculty</b>	Agricultural Sciences
<b>City</b>	Montpellier
<b>Country</b>	France
<b>Name of Programme</b>	Master of Science in Agricultural Engineering
<b>Type of Programme</b>	MSc
<b>Duration</b>	4 semesters
<b>Programme description</b>	The focus of the programme is to train general engineers in life sciences, enabling them to understand scientific, technical, socioeconomic, human, and cultural factors to make informed decisions in a changing environment.
<b>Programme structure</b>	<p>Sustainable Food Formulation: September to March (30 ECTS)</p> <p>Vinifera Euromaster: September to January (27 ECTS) or September to December (20 ECTS)</p> <p>Junior Research Lab for Agricultural Transition (JRL-AT): September to December (26 ECTS) or September to January (30 ECTS)</p> <p>Agroecology: September to January (30 ECTS)</p> <p>In the spring semester, students engage in a Research Project from February/March to July (30 ECTS).</p>
<b>Programme goals</b>	<ul style="list-style-type: none"> <li>• Develop expertise in agricultural engineering with a focus on sustainable practices.</li> <li>• Equip students with the skills to address global challenges in agriculture and food systems.</li> </ul>



	<ul style="list-style-type: none"> <li>• Provide interdisciplinary training combining scientific, technical, and socioeconomic knowledge.</li> </ul>
<b>Course Topics</b>	<ul style="list-style-type: none"> <li>• Sustainable Food Formulation: September to March (30 ECTS)</li> <li>• Vinifera Euromaster: September to January (27 ECTS) or September to December (20 ECTS)</li> <li>• Junior Research Lab for Agricultural Transition (JRL-AT): September to December (26 ECTS) or September to January (30 ECTS)</li> <li>• Agroecology: September to January (30 ECTS)</li> <li>• In the spring semester, students engage in a Research Project from February/March to July (30 ECTS)</li> </ul>
<b>Admissions requirements</b>	<ul style="list-style-type: none"> <li>• Bachelor's degree in Agricultural Sciences, Environmental Sciences, or related fields.</li> <li>• Minimum GPA as specified by the university's admission criteria.</li> <li>• Submission of a completed application form along with necessary documents (transcripts, recommendation letters, etc.)</li> </ul>
<b>Career outcomes</b>	<ul style="list-style-type: none"> <li>• Agricultural engineering</li> <li>• Food industry</li> <li>• Environmental management</li> <li>• Research and development</li> <li>• Policy and advisory roles in agriculture and food systems</li> </ul>
<b>URL</b>	<a href="https://en.institut-agro-montpellier.fr/programs/degree-programs/engineering-master-degree/agricultural-engineering-msc">https://en.institut-agro-montpellier.fr/programs/degree-programs/engineering-master-degree/agricultural-engineering-msc</a>
<b>Keywords</b>	Agricultural Engineering, Sustainable Food Formulation, Vinifera Euromaster, Agroecology, Research Project, Montpellier
<b>Field</b>	Agricultural Sciences, Engineering
<b>LUXEMBOURG</b>	
<b>Academic Institution</b>	University of Luxembourg
<b>Faculty</b>	Humanities, Education and Social Sciences
<b>City</b>	Luxembourg
<b>Country</b>	Luxembourg
<b>Name of Programme</b>	Master in Geography and Spatial Planning
<b>Type of Programme</b>	MSc
<b>Duration</b>	4 semesters
<b>Programme description</b>	This program combines spatial theory, policy, and practice to explore sustainable transitions in the built environment. It covers key issues at the intersection of society, environment, and economy, providing a comprehensive understanding of geography and spatial planning.
<b>Programme structure</b>	<p><u>Semester 1:</u>            Key concepts in human geography            Global change in the Anthropocene            Research design and methods            Spatial data analysis</p> <p><u>Semester 2:</u>            Urban and regional planning            Sustainable development policies</p>



	<p>Geographical information systems (GIS) Remote sensing applications</p> <p><u>Semester 3:</u> Elective courses (e.g., advanced GIS, spatial data science) Fieldwork project</p> <p><u>Semester 4:</u> Master's thesis</p>
<b>Programme goals</b>	<ul style="list-style-type: none"> <li>Equip students with theoretical and practical knowledge in geography and spatial planning.</li> <li>Develop skills in GIS, remote sensing, and spatial data analysis.</li> <li>Prepare students to address challenges related to sustainable development and urban planning.</li> </ul>
<b>Course Topics</b>	<p>Semester 1:</p> <ul style="list-style-type: none"> <li>Key concepts in human geography (4 ECTS)</li> <li>Global change in the Anthropocene (4 ECTS)</li> <li>Research design and methods (4 ECTS)</li> <li>Spatial data analysis (4 ECTS)</li> </ul> <p>Semester 2:</p> <ul style="list-style-type: none"> <li>Urban and regional planning (4 ECTS)</li> <li>Sustainable development policies (4 ECTS)</li> <li>Geographical information systems (GIS) (4 ECTS)</li> <li>Remote sensing applications (4 ECTS)</li> </ul> <p>Semester 3:</p> <ul style="list-style-type: none"> <li>Elective courses (8 ECTS)</li> <li>Fieldwork project (4 ECTS)</li> </ul> <p>Semester 4:</p> <ul style="list-style-type: none"> <li>Master's thesis (30 ECTS)</li> </ul>
<b>Admissions requirements</b>	<ul style="list-style-type: none"> <li>A bachelor's degree in geography, spatial planning, environmental sciences, or a related field.</li> <li>Proficiency in English (IELTS or TOEFL scores may be required).</li> <li>Relevant work experience or internships in geography or planning are advantageous.</li> </ul>
<b>Career outcomes</b>	<ul style="list-style-type: none"> <li>Urban and regional planning</li> <li>GIS and remote sensing analysis</li> <li>Environmental consultancy</li> <li>Spatial data science</li> <li>Policy development in sustainable urban development</li> </ul>
<b>URL</b>	<p><a href="https://www.uni.lu/fhse-en/study-programs/master-in-geography-and-spatial-planning/">https://www.uni.lu/fhse-en/study-programs/master-in-geography-and-spatial-planning/</a></p>
<b>Keywords</b>	<p>Geography, Spatial Planning, Geographical Information Systems (GIS), Remote Sensing, Spatial Data Analysis, Sustainable Development</p>
<b>Field</b>	<p>Geography and Spatial Planning</p>
<b>GERMANY</b>	
<b>Academic Institution</b>	<p>Weihenstephan-Triesdorf University of Applied Sciences (HSWT)</p>
<b>Faculty</b>	<p>Department of Sustainable Agriculture and Energy Systems</p>



<b>City</b>	Campus Weihenstephan, Freising
<b>Country</b>	Germany
<b>Name of Programme</b>	Master of Science (MSc), Digital Farming
<b>Type of Programme</b>	MSc
<b>Duration</b>	4 semesters
<b>Programme description</b>	The Master's programme in Digital Farming at HSWT integrates modern digital technologies, such as artificial intelligence (AI) and robotics, with agricultural sciences. It aims to equip students with the skills necessary to address contemporary challenges in agriculture by leveraging digital solutions to enhance efficiency, sustainability, and animal welfare. The curriculum combines theoretical knowledge with practical applications, preparing graduates for expert and leadership roles in the evolving field of digital agriculture.
<b>Programme structure</b>	The programme employs modern teaching approaches, including interactive seminars and project-based learning, to ensure a comprehensive educational experience.
<b>Programme goals</b>	<ul style="list-style-type: none"> <li>• Integrate Digital Technologies: Equip students with the ability to apply AI, robotics, and data analytics to agricultural practices.</li> <li>• Enhance Sustainability: Promote resource-efficient and environmentally friendly farming methods through digital solutions.</li> <li>• Develop Leadership Skills: Prepare graduates for leadership roles in the global digital agriculture sector.</li> <li>• Foster International Competence: Cultivate intercultural skills to address global agricultural challenges effectively.</li> </ul>
<b>Course Topics</b>	<p><b>1st Semester:</b></p> <ul style="list-style-type: none"> <li>• Plant Production (5 ECTS)</li> <li>• Animal Production &amp; Welfare (5 ECTS)</li> <li>• Foundations of Programming (5 ECTS)</li> <li>• Data Literacy &amp; Sensors (5 ECTS)</li> <li>• International Agricultural Production Systems &amp; Markets (5 ECTS)</li> <li>• Elective (5 ECTS)</li> </ul> <p><b>2nd Semester:</b></p> <ul style="list-style-type: none"> <li>• Artificial Intelligence 1 (5 ECTS)</li> <li>• Agricultural Robotics (5 ECTS)</li> <li>• Precision Livestock Farming (5 ECTS)</li> <li>• Precision Arable Farming (5 ECTS)</li> <li>• Project Management &amp; Scientific Work (5 ECTS)</li> <li>• Elective (5 ECTS)</li> </ul> <p><b>3rd Semester:</b></p> <ul style="list-style-type: none"> <li>• Artificial Intelligence 2 (5 ECTS)</li> <li>• Project Applied Digital Farming (10 ECTS)</li> <li>• Seminar Digital Farming (5 ECTS)</li> <li>• Electives (2 x 5 ECTS)</li> </ul> <p><b>4th Semester:</b></p> <ul style="list-style-type: none"> <li>• Master's Thesis including Colloquium (30 ECTS)</li> </ul>
<b>Admissions requirements</b>	<p>Educational Background: A Bachelor's degree (minimum 180 ECTS or six semesters) in fields such as:</p> <ul style="list-style-type: none"> <li>• Computer Science</li> <li>• Electrical Engineering</li> <li>• Mechatronics</li> </ul>



	<ul style="list-style-type: none"> <li>• Agricultural Engineering</li> <li>• Agricultural Sciences</li> <li>• Agribusiness</li> <li>• Horticulture</li> <li>• Agriculture</li> <li>• Or equivalent programmes</li> </ul> <p>Language Proficiency: Proof of English proficiency at B2 level (e.g., IELTS, TOEFL) is required.</p>
<b>Career outcomes</b>	<ul style="list-style-type: none"> <li>• Research and Development: Innovating and developing new digital solutions for agriculture.</li> <li>• Product Management: Overseeing the development and implementation of agricultural technologies.</li> <li>• Marketing and Sales: Promoting and selling digital farming tools and technologies.</li> <li>• Public Administration: Advising on policy and implementing digital strategies in agriculture.</li> <li>• International Organizations: Working on global projects focused on sustainable and digital agriculture</li> </ul>
<b>URL</b>	<a href="https://www.hswt.de/en/study/study-offer/master/digital-farming#c10257">https://www.hswt.de/en/study/study-offer/master/digital-farming#c10257</a>
<b>Keywords</b>	Digital Farming, Precision Agriculture, Artificial Intelligence, Agricultural Robotics, Sustainable Agriculture, Data Analytics in Farming, Smart Farming, Agribusiness
<b>Field</b>	Agricultural Science, Digital Technologies, Environmental Sustainability
<b>GERMANY</b>	
<b>Academic Institution</b>	Weihenstephan-Triesdorf University of Applied Sciences (HSWT)
<b>Faculty</b>	Department of Sustainable Agriculture and Energy Systems
<b>City</b>	Triesdorf
<b>Country</b>	Germany
<b>Name of Programme</b>	Green Digital Engineering
<b>Type of Programme</b>	MSc
<b>Duration</b>	4 semesters
<b>Programme description</b>	The Master's programme in Green Digital Engineering at HSWT focuses on leveraging digital technologies to promote sustainability and resource conservation in sectors such as agriculture, environmental protection, and renewable energies. The curriculum emphasizes the entire data value chain: from data acquisition and transfer to data analysis and process optimization using sensor technology. Students will gain expertise in developing, evaluating, and implementing digital processes aimed at enhancing sustainability across various industries.
<b>Programme structure</b>	The programme offers flexibility with both full-time and part-time study options, allowing students to start in either the winter or summer semester. For part-time students, the modules are distributed over additional semesters to accommodate a reduced course load per term.
<b>Programme goals</b>	<ul style="list-style-type: none"> <li>• <b>Data Acquisition and Management:</b> Equip students with skills to capture, transfer, and store data using advanced sensor technologies.</li> </ul>



	<ul style="list-style-type: none"> <li>• <b>Data Analysis and Evaluation:</b> Develop competencies in evaluating and assessing data based on technical criteria, including the application of machine learning techniques.</li> <li>• <b>System Development:</b> Train students in developing sensor and data transmission systems tailored to applications in agriculture, environmental protection, and related fields.</li> <li>• <b>Sustainability Focus:</b> Emphasize the application of digital technologies to promote sustainable practices and resource conservation.</li> </ul>
<p><b>Course Topics</b></p>	<p>Winter Semester Modules:</p> <ul style="list-style-type: none"> <li>• Software Development (5 ECTS)</li> <li>• Data Sources &amp; Data Transfer (5 ECTS)</li> <li>• Remote Sensing &amp; NIRS Applications in Agricultural &amp; Environmental Sciences (5 ECTS)</li> <li>• Advanced Application of Geographic Information Systems (5 ECTS)</li> <li>• Project Studies (5 ECTS)</li> <li>• Compulsory Elective Module (5 ECTS)</li> </ul> <p>Summer Semester Modules:</p> <ul style="list-style-type: none"> <li>• Data Analysis &amp; Machine Learning (5 ECTS)</li> <li>• Applied Data &amp; Data Flow Management (5 ECTS)</li> <li>• Sensors &amp; Automation in Agriculture, Food, and Environment (5 ECTS)</li> <li>• Applied Project Management &amp; Agile Development Methods (5 ECTS)</li> <li>• Project Studies (5 ECTS)</li> <li>• Compulsory Elective Module (5 ECTS)</li> </ul> <p>Third Semester:</p> <ul style="list-style-type: none"> <li>• Master's Thesis and Colloquium (25 ECTS)</li> <li>• Masterkolleg (Scientific Work, Lectures on Master's Thesis) (5 ECTS)</li> </ul>
<p><b>Admissions requirements</b></p>	<ul style="list-style-type: none"> <li>• Bachelor's degree from Weihenstephan-Triesdorf University of Applied Sciences or an equivalent degree from a domestic or foreign university or college in the field of applied life sciences or green engineering, computer science, mechatronics or related fields.</li> <li>• Bachelor's degree with at least 180 ECTS or without ECTS if this is equivalent</li> <li>• German language skills (foreign students whose native language is not German): language certificate B2</li> </ul>
<p><b>Career outcomes</b></p>	<p>The students will acquire an application-oriented, scientifically sound degree that will enable them to fulfil qualified specialist and management functions in these areas:</p> <ul style="list-style-type: none"> <li>• Agribusiness</li> <li>• Horticulture</li> <li>• Forest &amp; Forestry</li> <li>• Environmental protection</li> <li>• Landscape ecology</li> <li>• Renewable energies</li> <li>• Regional planning</li> <li>• Food processing</li> <li>• Nutrition &amp; supply</li> </ul> <p>This applies in particular to,</p>



	<ul style="list-style-type: none"> <li>• companies that use, produce or develop digital solutions,</li> <li>• planning and consulting companies and</li> <li>• research institutes, authorities and associations related to applied life sciences and green engineering.</li> </ul>								
<b>URL</b>	<a href="https://www.hswt.de/en/study/study-offer/master/green-digital-engineering#c8822">https://www.hswt.de/en/study/study-offer/master/green-digital-engineering#c8822</a>								
<b>Keywords</b>	Digital Farming, Precision Agriculture, Artificial Intelligence, Agricultural Robotics, Sustainable Agriculture, Data Analytics in Farming, Smart Farming, Agribusiness								
<b>Field</b>	Agricultural Science, Digital Technologies, Environmental Sustainability								
<b>AUSTRIA</b>									
<b>Academic Institution</b>	University of Natural Resources and Life Sciences, Vienna (BOKU)								
<b>Faculty</b>	Faculty of Agriculture and Forestry								
<b>City</b>	Vienna								
<b>Country</b>	Austria								
<b>Name of Programme</b>	University Continuing Education Program “Advanced technologies in smart crop farming”								
<b>Type of Programme</b>	Continuing Education Certificate Course (EQF Level 7 – equivalent to MSc level learning outcomes)								
<b>Duration</b>	6 ECTS (150 hours)								
<b>Programme description</b>	The Advanced Technologies in Smart Crop Farming certificate programme provides specialized training in the use of modern digital tools in agriculture. It focuses on GIS, remote sensing, machine automation, and variable rate technologies to enhance crop production efficiency. The course combines theoretical foundations with practical skills, offering participants expertise in spatial data analysis, GNSS systems, biosensors, and field robotics.								
<b>Programme structure</b>	<ul style="list-style-type: none"> <li>• Total Credits: 6 ECTS</li> <li>• Course Delivery: A mix of e-learning, face-to-face lessons, and hands-on practical exercises</li> <li>• Assessment: Online tests, multiple-choice exams, reflective protocols, group assignments, and a final paper</li> </ul>								
<b>Programme goals</b>	<ul style="list-style-type: none"> <li>• Understand and apply GIS, remote sensing, and GNSS-based systems in PA</li> <li>• Use and evaluate biosensors and other data acquisition tools</li> <li>• Apply spatial data analysis for better decision-making in crop production</li> <li>• Integrate and develop robotic and automation technologies for field use</li> <li>• Improve agricultural efficiency through data-driven and site-specific approaches</li> </ul>								
<b>Course Topics</b>	<table border="1"> <thead> <tr> <th>Module</th> <th>ECTS</th> </tr> </thead> <tbody> <tr> <td>Introduction to Smart Crop Farming</td> <td>0.5</td> </tr> <tr> <td>GNSS, Biosensors, Steering Systems</td> <td>2.0</td> </tr> <tr> <td>GIS, Remote Sensing, Spatial Data Management</td> <td>2.5</td> </tr> </tbody> </table>	Module	ECTS	Introduction to Smart Crop Farming	0.5	GNSS, Biosensors, Steering Systems	2.0	GIS, Remote Sensing, Spatial Data Management	2.5
Module	ECTS								
Introduction to Smart Crop Farming	0.5								
GNSS, Biosensors, Steering Systems	2.0								
GIS, Remote Sensing, Spatial Data Management	2.5								



	Variable Rate Tech, Robotics, On-field Automation	1.0
<b>Admissions requirements</b>	<ul style="list-style-type: none"> <li>• Bachelor's degree in natural resources, life sciences, technical sciences, or an advanced technical college diploma</li> <li>• Alternatively, relevant professional experience in agriculture or a related field</li> <li>• Basic knowledge in agriculture, IT, math, physics, chemistry, and geography</li> <li>• Adequate English language skills</li> </ul>	
<b>Career outcomes</b>	<p>Graduates are qualified for roles in:</p> <ul style="list-style-type: none"> <li>• Smart farming technology implementation</li> <li>• Agricultural consulting and innovation</li> <li>• Public sector (e.g. Ministries of Agriculture)</li> <li>• Technical sales and advisory</li> <li>• Research and development in AgriTech sectors</li> <li>• Farm management and GIS/data roles</li> </ul>	
<b>URL</b>	<a href="https://www.boku.ac.at">https://www.boku.ac.at</a>	
<b>Keywords</b>	Precision Farming, Smart Crop Farming, Remote Sensing, GIS, GNSS, Variable Rate Technology, Spatial Data, Biosensors, Agricultural Automation, Robotic Agriculture, Digital Agriculture, AgriTech, BOKU Vienna	
<b>Field</b>	Agricultural Sciences / Smart & Precision Agriculture / AgriTech / Digital Farming	
<b>BELGIUM</b>		
<b>Academic Institution</b>	KU Leuven	
<b>Faculty</b>	Faculty of Bioscience Engineering	
<b>City</b>	Leuven	
<b>Country</b>	Belgium	
<b>Name of Programme</b>	Agro- and Ecosystems Engineering	
<b>Type of Programme</b>	MSc	
<b>Duration</b>	4 semesters	
<b>Programme description</b>	<p>This master's program provides in-depth knowledge of the functioning and management of natural and production-oriented ecosystems. Students can specialize in one of four domains:</p> <ol style="list-style-type: none"> <li>1. Plant Production Systems</li> <li>2. Agricultural and Resource Economics</li> <li>3. Soil and Water Systems</li> <li>4. Forest, Nature, and Landscape Systems</li> </ol> <p>The program emphasizes sustainable management, design, and engineering of agro- and natural ecosystems, integrating both biophysical and socio-economic perspectives</p>	
<b>Programme structure</b>	This Master includes core modules, specialization modules, an integrated filed project, and the master's thesis.	
<b>Programme goals</b>	<ul style="list-style-type: none"> <li>• Equip students with comprehensive knowledge of agro- and ecosystems.</li> <li>• Develop skills to analyze and manage biological production systems.</li> <li>• Foster sustainable environmental management practices.</li> </ul>	



	<ul style="list-style-type: none"> <li>• Prepare students for interdisciplinary collaboration in ecosystem management.</li> </ul>
<b>Course Topics</b>	<ul style="list-style-type: none"> <li>• Core Modules:             <ul style="list-style-type: none"> <li>○ Agro-Systems</li> <li>○ Biodiversity and Ecosystem Services</li> <li>○ Environmental and Resource Economics</li> <li>○ Global Biogeochemical Cycles</li> <li>○ Earth Observation</li> </ul> </li> <li>• Specialization (Major) Modules: <i>(Examples based on chosen major)</i> <ul style="list-style-type: none"> <li>○ Plant Production Systems: Crop Production, Plant Nutrition, Soil Fertility Management</li> <li>○ Agricultural and Resource Economics: Agricultural Economics, Development in an International Perspective</li> <li>○ Soil and Water Systems: Agricultural Water Management, Applied Soil and Aquatic Chemistry</li> <li>○ Forest, Nature, and Landscape Systems: Silviculture, Urban Ecology, Green Management</li> </ul> </li> <li>• Integrated Field Project: Practical experience in temperate or tropical environments, focusing on applying theoretical knowledge to real-world scenarios</li> <li>• Master's Thesis: Research project in the chosen specialization area. <u>Total ECTS are 120</u></li> </ul>
<b>Admissions requirements</b>	<ul style="list-style-type: none"> <li>• Academic Qualifications: Bachelor's degree in bioscience engineering, agriculture, biology, or related fields.</li> <li>• Language Proficiency: Proof of English proficiency (e.g., TOEFL, IELTS) for non-native speakers.</li> </ul>
<b>Career outcomes</b>	<p>Graduates are prepared for roles in:</p> <ul style="list-style-type: none"> <li>• Public sector organizations (national and international)</li> <li>• Non-governmental organizations (NGOs)</li> <li>• Private companies</li> <li>• Technical, research, policy, or management positions</li> <li>• PhD research opportunities</li> </ul> <p>In Belgium, graduates are entitled to use the professional title of "Bio-ingenieur" ("Bioscience Engineer").</p>
<b>URL</b>	<p><a href="https://www.vub.be/en/studying-vub/all-study-programmes-vub/bachelors-and-masters-programmes-vub/sustainable-land-management">https://www.vub.be/en/studying-vub/all-study-programmes-vub/bachelors-and-masters-programmes-vub/sustainable-land-management</a></p>
<b>Keywords</b>	<p>Agro-ecosystems, Sustainable agriculture, Environmental management, Bioscience engineering, Ecosystem services</p>
<b>Field</b>	<p>Bioscience Engineering, Environmental Science, Agricultural Science</p>
<b>LATVIA</b>	
<b>Academic Institution</b>	Latvia University of Life Sciences and Technologies (LBTU)
<b>Faculty</b>	Faculty of Engineering
<b>City</b>	Jelgava
<b>Country</b>	Latvia
<b>Name of Programme</b>	Master's in Agricultural Engineering
<b>Type of Programme</b>	MSc
<b>Duration</b>	4 semesters



<p><b>Programme description</b></p>	<p>The Master’s programme in Agricultural Engineering at LBTU is designed to equip students with advanced knowledge and skills in engineering applications within the agricultural sector. The program offers four specialization options:</p> <ol style="list-style-type: none"> <li>1. Vehicles and Service</li> <li>2. Agricultural Technologies and Techniques</li> <li>3. Energetics</li> <li>4. Machine Designing and Manufacturing</li> </ol> <p>Each specialization focuses on integrating modern technologies and innovative solutions to enhance agricultural productivity and sustainability.</p>
<p><b>Programme structure</b></p>	<ul style="list-style-type: none"> <li>• Duration: 2 years (4 semesters)</li> <li>• Credits: 120 ECTS</li> <li>• Language of Instruction: English</li> </ul>
<p><b>Programme goals</b></p>	<ul style="list-style-type: none"> <li>• Develop advanced competencies in agricultural engineering.</li> <li>• Promote innovative and sustainable agricultural practices.</li> <li>• Prepare students for leadership roles in the agricultural sector.</li> <li>• Foster research and development skills in AgriTech and precision farming.</li> </ul>
<p><b>Course Topics</b></p>	<p>Specialization: Agricultural Technologies and Techniques</p> <ul style="list-style-type: none"> <li>• Year 1: <ul style="list-style-type: none"> <li>○ Semester 1: <ul style="list-style-type: none"> <li>▪ Philosophy of Science</li> <li>▪ English for Master Students</li> <li>▪ Fundamentals of Logistics</li> <li>▪ Study of Patenting</li> <li>▪ Ergonomics and Industrial Design</li> <li>▪ Alternative Energetics</li> <li>▪ Energy Economics in Agriculture</li> <li>▪ Conformity and Certification of Electrical Equipment</li> </ul> </li> <li>○ Semester 2: <ul style="list-style-type: none"> <li>▪ Modelling of System Dynamics</li> <li>▪ Intelligent Technologies and Systems</li> <li>▪ Mobile Systems Electric Equipment</li> <li>▪ Reliability of Electrical Devices</li> <li>▪ Automation of Technological Processes</li> <li>▪ Power Supply for Rural Objects</li> <li>▪ Vehicle Diagnostics and Service</li> <li>▪ Testing and Calculating of Vehicles</li> </ul> </li> </ul> </li> <li>• Year 2: <ul style="list-style-type: none"> <li>○ Semester 3: <ul style="list-style-type: none"> <li>▪ Computer-aided Measuring Systems</li> <li>▪ Agricultural Engineering and the Environment</li> <li>▪ Energy Carriers and Energy Resources</li> <li>▪ Research in Agricultural Engineering</li> </ul> </li> </ul> </li> </ul>



	<ul style="list-style-type: none"> <li>▪ Traffic Control and Modelling</li> <li>▪ Quality Assurance Systems</li> <li>▪ CNC Machine Tools</li> <li>▪ Computer-Aided Design of Mechanisms</li> </ul> <ul style="list-style-type: none"> <li>○ Semester 4: <ul style="list-style-type: none"> <li>▪ Master's Thesis</li> </ul> </li> </ul> <p>Note: The above structure is indicative and may vary based on the latest curriculum updates.  <u>Total ECTS: 120</u></p>
<b>Admissions requirements</b>	<ul style="list-style-type: none"> <li>• Academic Qualifications: Bachelor’s degree in Engineering, Computer Sciences, Mathematics, Physics, or related fields.</li> <li>• Language Proficiency: IELTS score of 6.0 or TOEFL iBT score of 76.</li> </ul>
<b>Career outcomes</b>	<p>Graduates can pursue careers as:</p> <ul style="list-style-type: none"> <li>• Agricultural Engineers</li> <li>• AgriTech Specialists</li> <li>• Precision Farming Consultants</li> <li>• Agricultural Machinery Designers</li> <li>• Energy Managers in Agriculture</li> <li>• Researchers or Academicians in Agricultural Engineering</li> </ul> <p>They are equipped to work in both public and private sectors, including research institutions, agricultural machinery companies, and consultancy firms.</p>
<b>URL</b>	<a href="https://www.educations.com/institutions/lbtu/master-in-agricultural-engineering?redirectSource=masterstudies">https://www.educations.com/institutions/lbtu/master-in-agricultural-engineering?redirectSource=masterstudies</a>
<b>Keywords</b>	Agricultural Engineering, AgriTech, Precision Farming, Smart Farming, Sustainable Agriculture, Agricultural Technologies, Agricultural Machinery, Energy Management in Agriculture
<b>Field</b>	Agricultural Engineering, AgriTech
<b>LITHUANIA</b>	
<b>Academic Institution</b>	Vytautas Magnus University Agriculture Academy (VMU Agriculture Academy)
<b>Faculty</b>	Faculty of Agronomy
<b>City</b>	Kaunas
<b>Country</b>	Lithuania
<b>Name of Programme</b>	Agronomy
<b>Type of Programme</b>	MSc
<b>Duration</b>	4 semesters
<b>Programme description</b>	<p>The Agronomy Master’s Programme at VMU Agriculture Academy is designed to deepen students’ understanding of crop production, plant nutrition, and protection through science-driven and sustainable practices. The program combines biological, ecological, and technological knowledge to optimize yield and resource efficiency, integrating modern agricultural technologies suitable for precision farming.</p> <p>Students can choose among specializations such as:</p> <ul style="list-style-type: none"> <li>• Crop Production</li> <li>• Plant Protection and Nutrition</li> <li>• Horticulture</li> </ul>



	<p>The program offers a solid base for careers in modern agriculture, research, and agribusiness, especially in contexts embracing digital agriculture and smart solutions.</p>
<b>Programme structure</b>	<ul style="list-style-type: none"> <li>• Delivery: Full-time on-campus study (face-to-face)</li> <li>• Credits: 120 ECTS over 4 semesters</li> <li>• Master's Thesis: Conducted in final semester with research in chosen specialization</li> </ul>
<b>Programme goals</b>	<ul style="list-style-type: none"> <li>• Train highly qualified professionals in agronomy and crop management</li> <li>• Promote sustainable and innovative agricultural practices</li> <li>• Provide knowledge and tools aligned with precision farming, soil health monitoring, and resource optimization</li> <li>• Prepare students for research-based, data-informed decision-making</li> </ul>
<b>Course Topics</b>	<p>Year 1:</p> <ul style="list-style-type: none"> <li>• Intensive Pomology</li> <li>• Biological Productivity of Horticultural Plants</li> <li>• Orchard and Garden Plant Nutrition</li> <li>• Pest Management in Orchards and Olericulture</li> <li>• Plant Growing in Closed Soil (greenhouse tech)</li> <li>• Scientific Research Methods</li> <li>• Electives &amp; Project Work</li> </ul> <p>Year 2:</p> <ul style="list-style-type: none"> <li>• Master's Graduation Thesis</li> <li>• Research Seminars</li> <li>• Internship or applied field research (depending on specialization)</li> </ul> <p>Note: The actual module availability may vary by specialization.</p>
<b>Admissions requirements</b>	<ul style="list-style-type: none"> <li>• Bachelor's degree in Agronomy, Agriculture, Biology, or a related field</li> <li>• English proficiency: Minimum B2 level (IELTS, TOEFL, or equivalent)</li> <li>• Motivation letter</li> <li>• Strong background in science disciplines (biology, chemistry, plant sciences)</li> </ul> <p>Evaluation Criteria (Weighting):</p> <ul style="list-style-type: none"> <li>• English proficiency: 60%</li> <li>• Motivation letter: 20%</li> <li>• Average of Bachelor's coursework: 20%</li> </ul>
<b>Career outcomes</b>	<p>Graduates can work as:</p> <ul style="list-style-type: none"> <li>• Agronomists in advanced agricultural operations</li> <li>• Plant protection or crop advisors</li> <li>• PA specialists</li> <li>• Greenhouse or orchard managers using smart systems</li> <li>• Agricultural researchers or PhD candidates</li> <li>• Government and NGO consultants in agriculture and sustainability</li> </ul>



	They can also start AgriTech-oriented ventures or join startups focused on digital agriculture.
<b>URL</b>	<a href="https://www.vdu.lt/en/studiju-programa/agronomy/">https://www.vdu.lt/en/studiju-programa/agronomy/</a>
<b>Keywords</b>	Agronomy, Precision Agriculture, Smart Farming, Plant Nutrition, Crop Protection, Greenhouse Technology, Sustainable Agriculture, AgriTech, Horticulture, Digital Agriculture
<b>Field</b>	Agricultural Sciences
<b>NETHERLANDS</b>	
<b>Academic Institution</b>	Wageningen University & Research (WUR)
<b>Faculty</b>	Laboratory of Geo-Information Science and Remote Sensing
<b>City</b>	Wageningen
<b>Country</b>	The Netherlands
<b>Name of Programme</b>	MSc in Geo-Information Science
<b>Type of Programme</b>	MSc
<b>Duration</b>	2 years (120 ECTS)
<b>Programme description</b>	The MSc in Geo-Information Science at WUR focuses on addressing complex spatial problems using GIS, remote sensing, and data science. The program integrates geo-information science methods, technologies, and applications within environmental and life sciences, aiming to equip students with the skills to collect, manage, analyze, and present spatial data effectively.
<b>Programme structure</b>	<p>The MSc Geo-Information Science is a two year programme taught in English. Starting in September, the first year consists of 40 weeks of course work, consisting of several compulsory subjects, restricted optional subjects and optional subjects from any relevant MSc course offered at Wageningen University or another academic institution. In the second year you work on your major thesis and an academic internship</p> <p><b>Programme Structure:</b></p> <ul style="list-style-type: none"> <li>• <b>Year 1:</b> 40 weeks of coursework comprising compulsory subjects, restricted optional subjects, and electives. <ul style="list-style-type: none"> <li>○ <b>Compulsory Courses:</b> <ul style="list-style-type: none"> <li>▪ Geo-information Science in Context</li> <li>▪ Geoscripting</li> <li>▪ Academic Consultancy Training: Remote Sensing and GIS Integration</li> </ul> </li> <li>○ <b>Restricted Optional Courses:</b> <ul style="list-style-type: none"> <li>▪ Remote Sensing</li> <li>▪ Geo-information Tools</li> </ul> </li> <li>○ <b>Electives:</b> Students can choose relevant master’s courses offered at WUR or other academic institutions to tailor their learning experience.</li> </ul> </li> <li>• <b>Year 2:</b> Focus on major thesis research and an academic internship. <ul style="list-style-type: none"> <li>○ <b>Major Thesis:</b> Conducted under the supervision of the Laboratory of Geo-Information Science and Remote Sensing, allowing specialization in areas such as Sensing &amp; Measuring, Modelling &amp; Visualization, Integrated Land Monitoring, Human-space Interaction, or Empowering &amp; Engaging Communities.</li> </ul> </li> </ul>



	<ul style="list-style-type: none"> <li>○ <b>Internship:</b> Academic internship at an external institute or company, providing practical experience and professional exposure.</li> </ul>
<b>Programme goals</b>	<ul style="list-style-type: none"> <li>• Develop proficiency in geo-information science methods and technologies</li> <li>• Apply GIS and remote sensing techniques to solve spatial problems in environmental and life sciences</li> <li>• Enhance skills in data collection, management, analysis, and presentation</li> <li>• Foster critical scientific thinking, research capabilities, and effective communication and teamwork</li> </ul>
<b>Course Topics</b>	<p>Course Topics (Modules per Semester, ECTS Credits):</p> <ul style="list-style-type: none"> <li>• Semester 1: <ul style="list-style-type: none"> <li>○ Geo-information Science in Context (6 ECTS)</li> <li>○ Remote Sensing (6 ECTS)</li> <li>○ Geo-information Tools (6 ECTS)</li> <li>○ Electives (12 ECTS)</li> </ul> </li> <li>• Semester 2: <ul style="list-style-type: none"> <li>○ Geoscripting (6 ECTS)</li> <li>○ Advanced Earth Observation (6 ECTS)</li> <li>○ Spatial Modelling and Statistics (6 ECTS)</li> <li>○ Academic Consultancy Training: Remote Sensing and GIS Integration (12 ECTS)</li> </ul> </li> <li>• Semester 3: <ul style="list-style-type: none"> <li>○ Major Thesis Research (36 ECTS)</li> </ul> </li> <li>• Semester 4: <ul style="list-style-type: none"> <li>○ Academic Internship (24 ECTS)</li> </ul> </li> </ul>
<b>Admissions requirements</b>	<ul style="list-style-type: none"> <li>• Academic Background: Bachelor's degree in fields such as Environmental Sciences, Social Sciences, ICT, or related areas. Applicants should have completed at least 6 ECTS in two of the following topics: Geo-information sciences (GIS), Remote sensing, or Programming skills</li> <li>• Language Proficiency: Proof of English proficiency (e.g., TOEFL, IELTS) for non-native speakers</li> </ul>
<b>Career outcomes</b>	<ul style="list-style-type: none"> <li>• Environmental Management: Utilizing spatial data for conservation and resource management</li> <li>• Urban Planning: Applying geo-information techniques for sustainable city development</li> <li>• Agriculture: Implementing precision farming practices using GIS and remote sensing</li> <li>• Research and Academia: Conducting advanced studies in geo-information science and related fields</li> <li>• Private Sector: Working with companies specializing in geospatial data analysis and application development</li> </ul>
<b>URL</b>	<a href="https://www.wur.nl/en/education-programmes/master/msc-programmes/msc-geo-information-science.htm">https://www.wur.nl/en/education-programmes/master/msc-programmes/msc-geo-information-science.htm</a>
<b>Keywords</b>	Geo-information Science, GIS, Remote Sensing, Spatial Data Analysis, Environmental Sciences, Data Science
<b>Field</b>	Field: Geo-information Science, Environmental Science
<b>CZECH REPUBLIC</b>	
<b>Academic Institution</b>	Czech University of Life Sciences Prague (CULS)
<b>Faculty</b>	Agricultural Machinery



<b>City</b>	Prague
<b>Country</b>	Czech Republic
<b>Name of Programme</b>	Precision farming
<b>Type of Programme</b>	MSc
<b>Duration</b>	4 semesters
<b>Programme description</b>	The Master’s programme in Precision Farming at the Czech University of Life Sciences Prague (CZU) is a two-year, full-time course conducted in Czech. It aims to equip students with the knowledge and skills necessary for modern, technology-driven agriculture, focusing on the application of advanced technologies to optimize agricultural practices.
<b>Programme structure</b>	<p>The programme emphasizes the integration of various advanced technologies into agriculture, including:</p> <ul style="list-style-type: none"> <li>• Sensors: Utilized for precise monitoring of soil conditions, crop health, and environmental factors.</li> <li>• Drones: Employed for aerial surveillance, crop mapping, and real-time data collection.</li> <li>• AI: Applied to analyze data, predict outcomes, and enhance decision-making processes.</li> <li>• GIS: Used for spatial analysis and management of agricultural lands.</li> </ul> <p><b>Course Delivery Methods:</b></p> <ul style="list-style-type: none"> <li>• Lectures: Theoretical foundations and advanced concepts in precision farming technologies.</li> <li>• Laboratory Work: Hands-on experience with sensors, drones, and other technological tools.</li> <li>• Field Exercises: Practical application of technologies in real agricultural settings.</li> <li>• Seminars and Workshops: Discussions on current trends, case studies, and research developments.</li> <li>• Research Projects: Opportunities to engage in research, often leading to a Master’s thesis.</li> </ul>
<b>Programme goals</b>	The goal of the Master’s Programme is to equip students with advanced theoretical knowledge and practical competencies in the application of modern technologies in agriculture.
<b>Course Topics</b>	<p><b>Core Thematic Modules Related to Precision Agriculture</b></p> <p><b>1. Precision Agriculture (Core Focus Area)</b></p> <ul style="list-style-type: none"> <li>• Principles, assumptions, technical possibilities</li> <li>• Satellite guidance, GPS, and navigation systems</li> <li>• Spatial variability of yields, soil, and agrochemical properties</li> <li>• Sensors for yield mapping and soil variability</li> <li>• Telematics, data acquisition, and machine monitoring</li> </ul> <p><b>2. Soil and Water Management</b></p> <ul style="list-style-type: none"> <li>• Physical properties and measurement of soil (cone index, porosity, bulk density)</li> <li>• Infiltration and hydraulic conductivity</li> <li>• Soil erosion, compaction, and conservation tillage</li> <li>• Impact of tillage on soil properties and runoff</li> </ul> <p><b>3. Robotics and Electrification</b></p> <ul style="list-style-type: none"> <li>• Electrification of tractors and agricultural machinery</li> </ul>



	<ul style="list-style-type: none"> <li>• Electric drives: architectures, advantages, and expected performance</li> <li>• Field robotics: use cases, limitations, and electrification potential</li> </ul> <p><b>4. Smart Plant Establishment</b></p> <ul style="list-style-type: none"> <li>• Evolving technologies in cereal planting</li> <li>• Effects of tillage on seed establishment</li> </ul> <p><b>Technical and Business Complementary Modules</b></p> <p><b>5. Business Economics and Management</b></p> <ul style="list-style-type: none"> <li>• Market segmentation, targeting, and marketing mix</li> <li>• Business strategy: mission, SWOT, SMART goals</li> <li>• Legal framework in Czech Republic and EU</li> <li>• Financial management: balance sheets, income statements, profit/loss</li> </ul> <p><b>6. Design &amp; Management of Technological Processes</b></p> <ul style="list-style-type: none"> <li>• Technology optimization</li> <li>• Use of organic matter in farming systems</li> <li>• Machinery configuration for plant production</li> </ul> <p><b>7. Crop Production Machinery &amp; Systems</b></p> <ul style="list-style-type: none"> <li>• Tillage, planting, harvesting equipment</li> <li>• Combine harvester designs (tangential vs axial)</li> <li>• Machinery optimization and capacity planning</li> </ul> <p><b>8. Data &amp; Sensor Technology</b></p> <ul style="list-style-type: none"> <li>• Sensor design and use in agri-tech</li> <li>• Yield monitoring, field variability assessment</li> <li>• Remote sensing: satellite &amp; aerial imagery interpretation</li> </ul> <p><b>Structure &amp; Estimation (ECTS &amp; Semesters)</b>            CZU follows the standard European Credit Transfer and Accumulation System (ECTS). Assuming a standard 120 ECTS across 4 semesters (2 years), here's a likely breakdown:</p> <table border="1"> <thead> <tr> <th>Semester</th> <th>Focus Area</th> <th>ECTS (est.)</th> </tr> </thead> <tbody> <tr> <td>Semester 1</td> <td>Core technical knowledge (soil, sensors, data systems)</td> <td>30 ECTS</td> </tr> <tr> <td>Semester 2</td> <td>Advanced machinery, robotics, digital systems</td> <td>30 ECTS</td> </tr> <tr> <td>Semester 3</td> <td>Applied research, business &amp; law, project work</td> <td>30 ECTS</td> </tr> <tr> <td>Semester 4</td> <td>Master's thesis + final state exam</td> <td>30 ECTS</td> </tr> </tbody> </table>	Semester	Focus Area	ECTS (est.)	Semester 1	Core technical knowledge (soil, sensors, data systems)	30 ECTS	Semester 2	Advanced machinery, robotics, digital systems	30 ECTS	Semester 3	Applied research, business & law, project work	30 ECTS	Semester 4	Master's thesis + final state exam	30 ECTS
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Semester 4	Master's thesis + final state exam	30 ECTS														
<p><b>Admissions requirements</b></p>	<p>Prospective students must hold a bachelor's degree in agricultural, technical, economics, or natural sciences. For foreign applicants, it is necessary to provide recognition of the acquired level of education, such as a "notification" or a recognition certificate issued by CULS Prague.</p>															
<p><b>Career outcomes</b></p>	<ul style="list-style-type: none"> <li>• Precision Agriculture Specialist – implementing data-driven solutions on farms to optimize crop production and resource use.</li> </ul>															



	<ul style="list-style-type: none"> <li>• AgriTech Consultant – advising agricultural enterprises on the adoption of new technologies and smart farming practices.</li> <li>• GIS and Remote Sensing Analyst – using spatial data and drone imagery to support agricultural decision-making.</li> <li>• Farm Manager or Technical Advisor – applying precision tools to enhance farm performance and sustainability.</li> <li>• R&amp;D or Innovation Specialist – working in technology companies or research institutions focused on agricultural innovation.</li> <li>• Environmental or Sustainability Officer – contributing to climate-smart and resource-efficient agricultural systems.</li> </ul>
<b>URL</b>	<a href="https://www.tf.czu.cz/en/r-9402-study/r-9490-study-programmes/r-19844-precision-farming">https://www.tf.czu.cz/en/r-9402-study/r-9490-study-programmes/r-19844-precision-farming</a>
<b>Keywords</b>	Precision Farming, Precision Agriculture, Digital Agriculture, Sustainable Agriculture, Agricultural Technologies, Remote Sensing, GIS in Agriculture, Drone Technology, Sensor-Based Farming, Data-Driven Agriculture, Agricultural Innovation, Smart Irrigation, Artificial Intelligence in Farming, Soil Monitoring
<b>Field</b>	Agriculture
<b>SWEDEN</b>	
<b>Academic Institution</b>	Swedish University of Agricultural Sciences (SLU)
<b>Faculty</b>	Faculty of Natural Resources and Agricultural Sciences (NJ Faculty)
<b>City</b>	Uppsala
<b>Country</b>	Sweden
<b>Name of Programme</b>	Agroecology – Master’s Programme
<b>Type of Programme</b>	MSc
<b>Duration</b>	4 semesters
<b>Programme description</b>	Focusing on the role of agriculture, the programme covers topics such as how biological and social processes interact and influence the sustainability of farming and food systems. Using case studies and field experience the programme also covers the complexity and potential multifunctionality of land use and explores interdisciplinary solutions to problems in the current food system.
<b>Programme structure</b>	<ul style="list-style-type: none"> <li>- The programme is based on learning through experience, which means that the complexity of real life situations is the starting point for study activities.</li> <li>- The programme uses authentic case material to help students test and train the knowledge and skills they will acquire during the programme.</li> <li>- The programme uses the theoretical bases and methodologies for agroecological and interdisciplinary analyses needed to contribute to sustainable development of livelihoods based on local renewable resources.</li> <li>- The programme emphasises the relationship between biological resources and human societies.</li> <li>- The programme has an international focus based upon partnerships between SLU and universities in Ethiopia and Uganda. Students</li> </ul>



	<p>come from diverse cultural and academic backgrounds, which enriches the overall learning process and leads to a constructive exchange of experiences and ideas.</p> <p>Full programmatic content can be find here: <a href="https://www.slu.se/en/study/programmes-courses/masters-programmes/agroecology/">https://www.slu.se/en/study/programmes-courses/masters-programmes/agroecology/</a></p>
<p><b>Programme goals</b></p>	<p>Studying agroecology will provide knowledge and training in integrating different perspectives and combining e.g. experiential, scientific and traditional knowledge and modern technologies in multi-actor collaborations – with the overall aim to facilitate the transition towards more sustainable food systems.</p>
<p><b>Course Topics</b></p>	<p>Two years - 120 ECTS credits</p> <p><b>Courses in the programme:</b> Main subject area: TD = Horticultural science, BI = Biology, FÖ = Business Administration, LB = Agricultural science, LK = Landscape Architecture, FS = Food studies</p> <p><b>Year 1</b> Agroecology Basics (1), 15 credits (LB/TD, A1N); Agroecology and Sustainability of Production Systems (1), 15 credits (LB/BI, A1N); Environmental Economics and Management (2), 15 credits (FÖ/LB, A1N); Project Management and Process Facilitation (2), 15 credits (LB/TD, AXX)</p> <p><b>Year 2</b> (required course in bold) Integrated Pest Management in Sustainable Production Systems, 15 hp (BI/TD, A1N); Foodscapes 1, 15 hp (FS/LK, A1N); Scientific Methods, Tools and Thesis Writing (2), 15 hp (LB/TD, A1N); Environmental Issues in Crop Production, 15 hp (BI/TD, A1N); Project based advanced course in Horticulture and Agriculture, 15 hp (TD/LB, A1F); Food Planning, 15 hp (FS/LK, A1N); Horticultural Production Physiology, 15 hp (BI/TD, A1N); Urban Ecology for the Development of Sustainable Living, 15 hp (BI/LK, A1N); Project Based Research Training, 15 hp (LB/TD, A1F); Advanced Practice, 15 hp (LB, A1F);</p> <p><b><i>Independent Project in Agricultural Science (1), 30 credits (LB, A2E)</i></b></p>



	<p>(1) Required for a Master’s degree in agricultural science, specialising in agroecology, (2) Elective programme courses, at least 15 credits required for a Master’s degree in agricultural science specialising in agroecology.</p> <p>The courses offered may change during the course of the programme. Decisions on the courses offered are taken well in advance of the next academic year.</p> <p>For each course on the programme, there is a course syllabus which specifies the details of the course. Information on when courses are offered is available on the SLU student web.</p> <p>During certain study periods (parts of the semester), SLU offers several program courses that the student can choose from. The student is guaranteed a place on one of these courses, given that the entry requirements are met, and that the student has applied on time.</p>
<b>Admissions requirements</b>	<p>Admission to the Agroecology Master’s programme requires a first-cycle qualification of at least 180 credits in natural sciences, social sciences or technology. These requirements can also be met by applicants who have a corresponding qualification from abroad or have obtained the equivalent knowledge in another way.</p> <p>In addition, knowledge equivalent to the Swedish upper secondary course English 6 is required. According to a local SLU decision, this requirement is fulfilled by applicants who have a first-cycle degree (180 credits) from a Swedish university or have completed 120 credits at SLU. The English 6 requirement can also be obtained in other ways, more information is available at: <a href="http://antagning.se/universityadmissions.se">antagning.se/universityadmissions.se</a>.</p> <p>There are specific entry requirements for each course included in the programme. These are described in the respective course syllabus.</p>
<b>Career outcomes</b>	<p>A Master’s degree with a major in agricultural science provides the opportunity to work with both national and international development projects. Graduates can work with public authorities, counselling, teaching and consulting assignments. Employers may be authorities, NGOs, educational organisations and consulting businesses. Students can also continue on to further studies.</p>
<b>URL</b>	<p><a href="https://www.slu.se/en/education/programmes-courses/masters-programmes/agroecology">https://www.slu.se/en/education/programmes-courses/masters-programmes/agroecology</a></p>
<b>Keywords</b>	<p>Agriculture science, biotechnology, agroecology, sustainability</p>
<b>Field</b>	<p>Agriculture science</p>
<b>FINLAND</b>	
<b>Academic Institution</b>	<p>University of Helsinki  <i>*Promotes itself as the only university in Finland offering academic education in this field</i></p>
<b>Faculty</b>	<p>Faculty of agriculture and Forestry</p>
<b>City</b>	<p>Helsinki</p>



<b>Country</b>	Finland
<b>Name of Programme</b>	The Master's Programme in Agriculture Sciences (AGRI)
<b>Type of Programme</b>	MSc
<b>Duration</b>	4 semesters
<b>Programme description</b>	The scope of the master's Program in Agriculture Sciences comprises four study tracks: plant production sciences, animal science, agrotechnology or environmental science. Students may select one of the specializations.
<b>Programme structure</b>	<p>With a scope of 120 credits (ECTS), the Master's programme in Agricultural Sciences can be completed in two academic years. The degree comprises:</p> <ul style="list-style-type: none"> <li>• 90 credits of advanced studies in the selected study track, including Master's thesis (30 credits)</li> <li>• 30 credits of other studies from the curriculum of own or other degree programmes</li> </ul> <p>The study tracks collaborate across disciplinary boundaries to construct thematic modules around important topical issues: the bioeconomy, the recycling of nutrients, food systems, and the production and exploitation of genomic information.</p> <p>Various teaching methods are used in the programme, including lectures, practical exercises, practical laboratory and field courses, practical training, seminars, project work and independent study.</p> <p>The study structure for 2023-2026 is available here: <a href="https://www.helsinki.fi/en/degree-programmes/agricultural-sciences-masters-programme">https://www.helsinki.fi/en/degree-programmes/agricultural-sciences-masters-programme</a></p> <p>The language of instruction is English, but you can complete your studies in Finnish, Swedish or English.</p>
<b>Programme goals</b>	<p>After the studies students become expert in plant production sciences, animal science, agrotechnology, or environmental soil science, depending on your interests and previous studies.</p> <p>Gain knowledge and skills in food and energy production, animal welfare, clean soil, environmental issues, the newest methods in biological and genetic engineering, automation and robotics in agriculture.</p> <p>Upon completing master's degree, students should be:</p> <ul style="list-style-type: none"> <li>• able to assess the sustainability and environmental impact of food and energy production</li> <li>• capable of applying biosciences, ecology, chemistry, physics, or statistics, depending on your study track, to the future needs of agriculture</li> </ul>



	<ul style="list-style-type: none"> <li>● mastering the key issues and future development trends of your field</li> <li>● mastering state-of-the-art research and analysis methods and techniques</li> <li>● able to engage in international activities, project work and communication</li> <li>● able to acquire and interpret scientific research information in your field and present it orally and in writing</li> <li>● entitled to an honorary title "Agronomist".</li> </ul>
<p><b>Course Topics</b></p>	<p>The degree comprises:</p> <ul style="list-style-type: none"> <li>● 90 credits of advanced studies in the selected study track, including Master's thesis (30 credits) thus Plant production science, animal science agrotechnology or environmental science</li> <li>● 30 credits of other studies from the student own curriculum of or other degree programmes.</li> </ul>
<p><b>Admissions requirements</b></p>	<p>A total of 80 students is admitted yearly: Plant Production Sciences (quota of 30 students), Animal Science (quota of 25 students), Agrotechnology (quota of 12 students) and Environmental Soil Science (quota of 5 students).</p> <p>Who can enrol:</p> <ol style="list-style-type: none"> <li>a. an option right from the relevant UH Bachelor's programmes (Agricultural Sciences, Biology, Environmental Sciences and Molecular Biosciences). Then student studies during the BSc degree influence the determination of study track.</li> <li>b. a separate admission process from other UH Bachelor's programmes than those listed above or other universities in Finland or abroad.</li> </ol> <p>Eligibility criteria:</p> <p>Learners can apply to the Master's Programme in Agricultural Sciences if they meet the following criteria:</p> <ol style="list-style-type: none"> <li>1. completed a first- or second-cycle (bachelor's or master's) degree or a postgraduate degree at a higher education institution in Finland or abroad or will do so by 1<sup>st</sup> of September 2025.</li> <li>2. sufficient skills in Finnish, Swedish or English.</li> </ol> <p>All information on admission and related requirements can be found here:  <a href="https://opintopolku.fi/konfo/en/hakukohde/1.2.246.562.20.0000000000000000051699/valintaperuste">https://opintopolku.fi/konfo/en/hakukohde/1.2.246.562.20.0000000000000000051699/valintaperuste</a></p>
<p><b>Career outcomes</b></p>	<p>As a graduate, students can pursue postgraduate studies in a doctoral programme or a career as an expert or entrepreneur.</p>



<b>URL</b>	<a href="https://www.helsinki.fi/en/degree-programmes/agricultural-sciences-masters-programme">https://www.helsinki.fi/en/degree-programmes/agricultural-sciences-masters-programme</a>
<b>Keywords</b>	Agriculture science, animal science, agrotechnology, environmental science
<b>Field</b>	Agriculture science
<b>ESTHONIA</b>	
<b>Academic Institution</b>	Estonian University of Life Science
<b>Faculty</b>	Institute of Forestry and Engineering
<b>City</b>	Tartu
<b>Country</b>	Estonia
<b>Name of Programme</b>	MSc in Planning and analysis of Multifunctional Forestry
<b>Type of Programme</b>	MSc
<b>Duration</b>	4 semesters
<b>Programme description</b>	The Master’s programme aims to provide students with the knowledge and skills necessary to plan and analyze sustainable land use, with a strong focus on forestry. The program is designed to prepare professionals who can integrate ecological, economic, and social aspects into land management decisions. Students will be able to manage natural resources and enhance biodiversity while considering socio-economic factors, making them capable of working in both the public and private sectors.
<b>Programme structure</b>	<p>Year 1:</p> <ul style="list-style-type: none"> <li>• Core Modules focusing on forestry science, landscape ecology, and sustainable forest management.</li> <li>• Practical Skills Development through laboratory work, field studies, and workshops.</li> <li>• Introduction to GIS and spatial analysis techniques for land and forest planning.</li> </ul> <p>Year 2:</p> <ul style="list-style-type: none"> <li>• Advanced Modules on forest and land management, forest policy, environmental impact assessment, and rural development.</li> <li>• Elective Courses providing flexibility to specialize in areas like environmental economics, biodiversity conservation, and forest ecosystem services.</li> <li>• Master’s Thesis Project, where students work on practical research, applying what they have learned to real-world scenarios. This is often done in collaboration with industry partners or research institutes.</li> </ul>
<b>Programme goals</b>	The program aims to equip students with the expertise to plan and analyze multifunctional forestry, emphasizing sustainable and strategic decision-making processes. Graduates will gain comprehensive knowledge of planning and analysis, including legal, social, and economic frameworks. They will learn to make strategic decisions aligned with sustainable development principles. Key learning



	outcomes include proficiency in information systems, statistical data analysis, mathematical modelling, environmental assessment, and remote sensing. Students will develop strong communication skills, enabling them to articulate professional ideas and engage in discussions effectively. The course also emphasises independent research, ethical principles, and teamwork in multicultural settings.
<b>Course Topics</b>	<ul style="list-style-type: none"> <li>• Speciality module 79 ECTS</li> <li>• Speciality elective subjects modules 6 ECTS</li> <li>• Optional subjects 5 ECTS</li> <li>• Master's thesis 30 ECTS</li> </ul> <p>Detailed programmatic content can be find here: <a href="https://ois.emu.ee/pls/ois/ltere.tulemast?naita_ka_alternatiive=1&amp;cb_naita_ka_alternatiive=1&amp;leht=OK.BL.PU&amp;id_a_oppekava=1362&amp;kordi_pealehel=9&amp;systemi_seaded=3,2,12,1,&amp;viida_kaudu=1&amp;session=0">https://ois.emu.ee/pls/ois/ltere.tulemast?naita_ka_alternatiive=1&amp;cb_naita_ka_alternatiive=1&amp;leht=OK.BL.PU&amp;id_a_oppekava=1362&amp;kordi_pealehel=9&amp;systemi_seaded=3,2,12,1,&amp;viida_kaudu=1&amp;session=0</a></p>
<b>Admissions requirements</b>	Applicants must hold a bachelor's degree or its equivalent from a recognized and accredited university. To qualify for the studies at the Estonian University of Life Sciences, an applicant has to have at least 60% of the highest possible CGPA (cumulative grade point average) during his/her last studies.
<b>Career outcomes</b>	<p>Graduates of this program can pursue careers in:</p> <ul style="list-style-type: none"> <li>• Forestry and land management organizations.</li> <li>• Environmental and rural development agencies.</li> <li>• Consultancy and research in sustainable resource management.</li> <li>• NGOs working on land use and conservation.</li> </ul>
<b>URL</b>	<a href="https://www.emu.ee/en/planning-and-analysis-in-multifunctional-forestry">https://www.emu.ee/en/planning-and-analysis-in-multifunctional-forestry</a>
<b>Keywords</b>	Forestry, sustainable forest management, Data management, sustainability, rural development, biodiversity conservation
<b>Field</b>	Forestry and Engineering
<b>IRELAND</b>	
<b>Academic Institution</b>	University College Dublin
<b>Faculty</b>	UCD School of Biosystems and Food Engineering
<b>City</b>	Dublin
<b>Country</b>	Ireland
<b>Name of Programme</b>	MSc in Digital Technology for Sustainable Agriculture
<b>Type of Programme</b>	MSc
<b>Duration</b>	2 semesters
<b>Programme description</b>	The MSc in Digital Technology for Sustainable Agriculture equips students with essential skills to enhance food production through advanced technologies in farming. This course covers key areas such as computer programming, data processing, the IoT, and machine learning. Students will gain hands-on experience in state-of-the-art labs



	<p>and conduct applied research at the Lyons Research Farm. The course aligns with the UN Sustainable Development Goals, reflecting UCD's commitment to addressing global challenges.</p>
<b>Programme structure</b>	<p>This programme is primarily delivered face to face but will also include some fully online modules and blended delivery models. All modules are optional, and students will be able to take themed clusters of modules (e.g. three modules of precision farming, three modules of sensing technology, three modules of computers and electronics, three modules of data science) to reflect specific technical interests or needs for upskilling.</p> <p>Individual Modules: For students that are not able to take on the full programme a number of the modules on this programme can be taken individually.</p>
<b>Programme goals</b>	<p>The MSc programme provides students with an understanding of the “Digital Technology” tools that digitize data capture relating to the environment and activity (sensors circuits, systems and programming), move the data (accumulation networks), store the data (databases), analyze data to gain insights (models and AI), share the resulting information along the agricultural value chain (distribution networks) and provide actors and stakeholders access to the digital chain (interfaces).</p>
<b>Course Topics</b>	<p>The course consists of 90 credits, including 60 credits from taught modules and a 30-credit research project. Students can customize their learning by choosing themed clusters of modules, focusing on areas like precision farming, sensing technology, and data science.</p> <p>Modules cover specifically: Hyperspectral imaging, soil technology, computers &amp; electronics in Ag, remote sensing and GIS, Advances in CropMechanisation, Data Prog with Python, PA, sensors and sensing systems, numerical methods for agriculture, precision livestock management, optical spectroscopy, IoT enabled Agrifood production, thesis.</p>
<b>Admissions requirements</b>	<p>Applicants must hold a bachelor’s degree with a minimum upper second-class honour (NFQ level 8) or international equivalent in agriculture, biological science, physical science, environmental related, engineering, computer science or other appropriate discipline.</p> <p>Where an applicant has no formal qualification encompassing agriculture/biology, practical knowledge of, and experience in, agriculture will be required.</p> <p>Applicants whose first language is not English must also demonstrate English language proficiency of IELTS 6.5 (no band less than 6.0 in each element), or equivalent.</p> <p>Applicant may be eligible for Recognition of Prior Learning (RPL), as UCD recognizes formal, informal, and/or experiential learning.</p> <p>RPL may be awarded to gain Admission and/or credit exemptions on a programme.</p>



	More information can be find here: <a href="https://www.ucd.ie/registry/prospectivestudents/admissions/policiesandgeneralregulations/recognitionofpriorlearning/">https://www.ucd.ie/registry/prospectivestudents/admissions/policiesandgeneralregulations/recognitionofpriorlearning/</a>
<b>Career outcomes</b>	Graduates can advance their career in the areas of precision farming, decision support in agriculture, IoT, smart sensors, intelligent algorithms, data, and predictive analytics.
<b>URL</b>	<a href="https://hub.ucd.ie/usis!/W_HU_MENU.P_PUBLISH?p_tag=PROG&amp;MAJR=T385&amp;utm_source=findamasters&amp;utm_campaign=courseid[71764]&amp;utm_medium=featcourselisting&amp;utm_content=button">https://hub.ucd.ie/usis!/W_HU_MENU.P_PUBLISH?p_tag=PROG&amp;MAJR=T385&amp;utm_source=findamasters&amp;utm_campaign=courseid[71764]&amp;utm_medium=featcourselisting&amp;utm_content=button</a>
<b>Keywords</b>	Digital technology, sustainable agriculture, precision farming
<b>Field</b>	Sustainable Agriculture
<b>POLAND</b>	
<b>Academic Institution</b>	Poznań University of Life Sciences
<b>Faculty</b>	Faculty of Agronomy, Horticulture and Bioengineering
<b>City</b>	Poznan
<b>Country</b>	Poland
<b>Name of Programme</b>	Agronomy
<b>Type of Programme</b>	MSc
<b>Duration</b>	4 semesters
<b>Programme description</b>	The Master's studies programme comprises over 1535 hours of lectures, laboratory classes, seminars, field trips and inspections, e.g. visits at pesticide manufacturing plants both in Poland and other EU countries. The programme is focused on broadly understood issues connected with agriculture in various management systems (conventional farming, organic farming, sustainability farming). The curriculum is based on a module system making it possible to intensify and rationalize the teaching and learning system.
<b>Programme structure</b>	The programme of studies consists of <u>compulsory subjects</u> : crop management, data processing and experimental design, sustainable crop plants fertilization, economic and legal aspects of the company's activities, biotechnology in modern agriculture, plant breeding, instrumental analysis, soil biology and chemistry, diagnostics of plant nutritional disorders, integrated pest management, biomass production and management, crop protection; and <u>facultative subjects</u> with being part of a specialization selected individually by each student: <ul style="list-style-type: none"> <li>1. Module I – biomass and bioenergy, seed grain quality, drying and storage, crop irrigation, crop technologies, forage plant cultivation on arable land,</li> <li>1. Module II – weed biology and control, principles of breeding for resistance, plant disease epidemiology, physiological foundations for plant resistance to pathogens and pests,</li> <li>2. Module II – sustainable systems of crops fertilizing, diagnostics of crop plants nutritional disorders, nutrient management,</li> </ul>



	<p>3. Module III – non-fodder utilization of grasses and grass communities, grassland management, grassland phytochemistry, optimization of forage production on grassland, biodiversity of agricultural ecosystems, forage seed production</p> <p>4. Module IV – ecology of microorganisms, plant tissue and cell culture, genetic engineering, microbiology of natural environment, microbiology of plant and animal products</p> <p>Obligatory subjects comprise about 35% of the programme of studies, and the rest are selected from specialization subjects.</p>
<b>Programme goals</b>	<p>Interdisciplinary studies include the latest advances in theory and practice in the field of Agronomy and Agriculture, making it possible for our graduates to acquire skills and qualifications needed to work within the broadly understood agricultural sector, particularly plant breeding and seed production, plant protection against aerophagies, renewable energy sources or plant nutrition.</p>
<b>Course Topics</b>	<p>Course is divided into compulsory and facultative subjects as presented in the program. Main modules cover:</p> <ul style="list-style-type: none"> <li>● Agrobiotechnology,</li> <li>● Methodology of agricultural experiments,</li> <li>● Environmental management,</li> <li>● Instrumental analyses</li> </ul> <p>Full description can be found here: <a href="http://msc-bsc.puls.edu.pl/wp-content/uploads/2021/07/Agronomy.pdf">http://msc-bsc.puls.edu.pl/wp-content/uploads/2021/07/Agronomy.pdf</a></p>
<b>Admissions requirements</b>	<p>Entry requirements, Bachelor degree in:</p> <ul style="list-style-type: none"> <li>● Agriculture Sciences</li> <li>● Agricultural Biotechnology</li> <li>● Animal Sciences</li> <li>● Agricultural Engineering</li> <li>● Biology</li> </ul>
<b>Career outcomes</b>	<p>Graduate agronomists have many career paths, but their careers are generally focused on increasing the quality and amount of food produced for the nation's food supply. They can be teachers, agricultural business consultants or researchers, they might work on farms or in agricultural labs and mills.</p> <p>The graduates will be required to write a Master's thesis and pass the examination.</p>
<b>URL</b>	<a href="https://study.gov.pl/poznan-university-life-sciences-0">https://study.gov.pl/poznan-university-life-sciences-0</a>
<b>Keywords</b>	Agriculture science, biotechnology, agricultural engineering, environmental management, agrobiotechnology
<b>Field</b>	Agriculture
<b>DENMARK</b>	
<b>Academic Institution</b>	University of Copenhagen
<b>Faculty</b>	Faculty of Science
<b>City</b>	Copenhagen



<b>Country</b>	Denmark
<b>Name of Programme</b>	Master of Science (MSc) in Agriculture
<b>Type of Programme</b>	MSc
<b>Duration</b>	4 semesters
<b>Programme description</b>	The MSc in Agriculture is a broad programme targeted at students who are interested in the potentials of plants for the benefit of humans and in agriculture as a human activity. The programme is offered in English.
<b>Programme structure</b>	<p>Students specialize in either Plant Science or Production &amp; Environment.</p> <p>Students follow compulsory courses depending on their specialisation, as well as restricted elective and elective courses. In the second year of study they write their thesis. Most courses include a combination of lectures, exercises, group or individual projects, individual readings, excursions, and field work. In both specialisations student starts the programme by following a compulsory course.</p> <p>During the programme, student will gain both scientific and professional competencies. There is a long tradition for close contact between students and teachers and their research groups.</p>
<b>Programme goals</b>	The main objective of the program is to educate graduates who, based on a theoretical and method-oriented knowledge of biological sciences and digital literacy are capable of professionally conducting research, developing sustainable solutions and improving systems within the fields of plant science, production systems, natural resource use and environmental impacts.
<b>Course Topics</b>	<p>In total 120 ECT credits</p> <p>Whole programme is available here: <a href="https://science.ku.dk/studerende/studieordninger/kandidat/agriculture/s_to_agriculture.pdf/">https://science.ku.dk/studerende/studieordninger/kandidat/agriculture/s_to_agriculture.pdf/</a></p>
<b>Admissions requirements</b>	<p>To apply for admission to this master's degree programme, student must have completed, or expect to complete, a qualifying bachelor's degree or a similar Danish or international degree programme which is assessed to be relevant.</p> <p>Applicants with one of the following Bachelor's degrees or Professional Bachelor's degrees automatically fulfil the academic requirements for admission: Natural resources with the specialization in Plant Science from University of Copenhagen, Natural resources from University of Copenhagen, Plant and Food Science from Aarhus University.</p> <p>Applicants with a Bachelor's degree, Professional Bachelor's degree or equivalent form Danish or international universities other than listed above are qualified for admission if the program includes 7.5 ECTS in the area of Plant Science and two of the three following areas: biology or ecology, natural resources, economics or regulation.</p>



	More on admission can be find here: <a href="https://science.ku.dk/studerende/studieordninger/kandidat/agriculture/s_to_agriculture.pdf/">https://science.ku.dk/studerende/studieordninger/kandidat/agriculture/s_to_agriculture.pdf/</a>
<b>Career outcomes</b>	Students can find employment within a wide range of fields: <ul style="list-style-type: none"> <li>• in research, innovation, and product development of plants, plant protection, and environmental technologies – in public institutions, private businesses, or in your own enterprise</li> <li>• within policy development, implementation, and administration related to plant production, nature conservation, environment and related technologies in the public sector – e.g., in ministries and municipalities and in private stakeholder organisations, including international NGOs</li> <li>• within national and international advising and consultancy in crop production, nature and environment, in the horticultural, and agricultural sector</li> <li>• in teaching and communication in universities, agricultural schools, or to the broader public.</li> </ul>
<b>URL</b>	<a href="https://www.ku.dk/studies/masters/agriculture">https://www.ku.dk/studies/masters/agriculture</a>
<b>Keywords</b>	Plant science, production, and environment, sustainable agriculture
<b>Field</b>	Agriculture

### 3.2. Action 3.2.2: Conduct Skills Gap and Best Practice Analysis in EU MSc Programmes

As part of Activity 3.2.2, a desk research was conducted to identify and document best practices in the field of PA by reviewing relevant projects and applications. The research is based on bibliography, academic papers, project websites, articles, and official methodological guides. Below are presented the findings from an in-depth review of PA initiatives in selected European countries. The objective was to identify at least 20 best practices, and partners managed to identify 28.

The same research methodology was followed as Activity 3.2.1: each of the four EU partners was assigned to a cluster of 7 EU member States,

- **AUTH:** Greece, Bulgaria, Romania, Slovenia, Malta, Hungary, Slovakia
- **MC:** Cyprus, Italy, Spain, Portugal, Croatia, France, Luxembourg
- **HSWT:** Germany, Austria, Belgium, Latvia, Lithuania, Netherlands, Czechia
- **BK:** Sweden, Finland, Estonia, Ireland, Poland, Denmark

The report seeks to illustrate concrete examples where these technologies have been successfully implemented, delivering measurable improvements and aligning with recognized best practice criteria.



### Best Practice in Precision Agriculture

According to Wageningen University & Research (WUR)\*, PA — also referred to as smart farming — means that plants or animals receive exactly the treatment they need, determined with great accuracy thanks to the latest technology.

A wide range of technologies are used to achieve this, including GPS, sensor systems, information and communication technology (ICT), and robotics. Technology supports both strategic decision-making at the farm level and operational actions at the level of individual plants or animals. This enables optimized production processes and contributes to the development of more sustainable crop and livestock farming.

The key difference compared to classical agriculture is that, instead of determining the necessary actions for an entire field or farm, PA allows interventions to be made per square meter, per plant, or even per individual animal.

Best Practice refers to a method, technique, or process that has consistently shown through research, experience, and evaluation to achieve superior results compared to other approaches. It is widely recognized as a benchmark standard and is recommended for adoption because it leads to improved performance, efficiency, quality, and/or sustainability in a particular field or industry.

Best practices in PA include data-driven technologies like VRT, drones, wearable livestock monitors, precision feeding, and farm management systems, all of which demonstrate superior effectiveness, efficiency, impact, and sustainability according to OECD DAC evaluation criteria (Table 4).

**Table 4 – Best practices in PA in Europe**

Best Practice in PA	Area	Why It Qualifies
Variable Rate Technology (VRT)	Crops	Highly effective in optimizing input use (fertilizer, pesticides) → proven yield increase and cost savings (Efficiency, Effectiveness, Sustainability)
Remote Sensing & Drones for Monitoring	Crops	Early detection of plant stress, pests, or nutrient deficiencies → prevents large losses (Effectiveness, Impact, Efficiency)
Soil Mapping and Precision Nutrient Management	Crops	Site-specific fertilization reduces overuse of fertilizers → protects environment and improves soil health (Relevance, Sustainability, Impact)
Automated Milking Systems (AMS)	Livestock (dairy)	Increases milk yield, improves animal welfare, reduces labor costs → backed by numerous studies (Efficiency, Effectiveness, Sustainability)
Wearable Health Monitors for Livestock	Livestock	Early disease detection through real-time monitoring of vital signs → improves survival rates, reduces veterinary costs (Impact, Effectiveness, Relevance)
Precision Feeding Systems	Livestock	Tailored rations reduce feed waste and optimize animal growth → proven to improve feed conversion ratios and profitability (Efficiency, Sustainability)
IoT Environmental Monitoring (Barn Climate Control)	Livestock	Keeps optimal temperature and humidity for animal welfare and productivity, reduces mortality (Sustainability, Effectiveness)
Data Integration Platforms (Farm Management Information Systems, FMIS)	Crops & Livestock	Integrates all field and animal data for decision support → increases operational efficiency and traceability (Efficiency, Coherence, Effectiveness)



\* Wageningen University & Research – Dossier Precision Agriculture: <https://www.wur.nl/en/research-results/research-institutes/plant-research/show-wpr/dossier-precision-agriculture.htm>

### Selection Criteria for Best Practices

Each best practice was selected based on clear criteria aligned with international evaluation standards (especially OECD DAC Criteria), including:

- **Effectiveness:** Proven positive impact on agricultural productivity or sustainability
- **Efficiency:** Optimal use of resources with demonstrable cost-benefit
- **Innovation:** Application of new or significantly improved technologies or methods
- **Replicability:** Potential to adapt the practice to other contexts or regions
- **Sustainability:** Long-term environmental, economic, or social benefits
- **Scientific validation:** Supported by data, evaluations, or expert recognition

Table 5 below presents the 28 best practices that were identified across EU from the research.

**Table 5 – Best practices in Precision Agriculture across Europe**

GREECE	
Title	Smart Greenhouse at the American Farm School
Description of the practice	<p>The American Farm School (AFS) in Thessaloniki partnered with Cisco, Dataways S.A., and Green Project S.A. to establish a fully digitized smart greenhouse, integrating cutting-edge precision agriculture technologies. The initiative is part of a broader effort to modernize agricultural education and demonstrate how smart technologies can enhance sustainability and productivity.</p> <p>Technologies used are a) IoT sensors for real-time monitoring of temperature, humidity, light, and CO<sub>2</sub> levels, b) automated irrigation and ventilation systems controlled by environmental data, c) data analytics platforms to optimize crop performance, d) remote access systems to allow monitoring and control via mobile or web.</p> <p>The objectives of this best practice are to provide a hands-on learning environment for students, serve as a pilot demonstration for farmers and agribusiness professionals, and promote digital transformation in Greek agriculture.</p>
Results and Impacts	<ul style="list-style-type: none"> <li>• 30% increase in crop yield through precise climate and irrigation management</li> <li>• Up to 40% water savings by using sensor-based irrigation scheduling</li> <li>• Reduced energy consumption through optimized ventilation and lighting</li> <li>• Enhanced data literacy and technical skills among students and local farmers</li> <li>• Encouraged the adoption of smart farming practices in the surrounding region</li> </ul> <p>The success of the project has led to increased interest from other educational institutions and agricultural cooperatives in Greece. The model is being explored for replication in rural areas where resource efficiency is crucial.</p>



	The project also contributes to climate resilience and sustainability goals by minimizing resource inputs and maximizing productivity.
<b>References and Sources</b>	<a href="https://green-projects.gr/smart-and-digital-greenhouse/">https://green-projects.gr/smart-and-digital-greenhouse/</a> <a href="https://blogs.cisco.com/our-corporate-purpose/smart-greenhouse-greece">https://blogs.cisco.com/our-corporate-purpose/smart-greenhouse-greece</a>
<b>GREECE</b>	
<b>Title</b>	AGRARIAN Project – Drone-Based Livestock Monitoring in Crete
<b>Description of the practice</b>	<p>This pilot project employs UAVs equipped with hyperspectral cameras to monitor livestock health and location in mountainous terrains. It aims to enhance livestock tracking and health monitoring for breeders, providing targeted services to small and medium-sized farmers.</p> <ul style="list-style-type: none"> <li>• Integration of UAVs (Drones): <ul style="list-style-type: none"> <li>- Use of unmanned aerial vehicles for real-time surveillance and monitoring of livestock.</li> <li>- Equipped with cameras and sensors to track animal movement, health, and behavior.</li> </ul> </li> <li>• Geospatial Technology: <ul style="list-style-type: none"> <li>- Application of GPS and GIS tools for mapping grazing areas and planning livestock management.</li> <li>- Helps in detecting land overuse and optimizing pasture rotation.</li> </ul> </li> <li>• Automation &amp; AI Analysis: <ul style="list-style-type: none"> <li>- Implementation of AI algorithms for recognizing animal species, counting them, and detecting anomalies (e.g., injuries, isolation).</li> <li>- Reduces human labour and improves the accuracy of monitoring.</li> </ul> </li> <li>• Environmental &amp; Welfare Monitoring: <ul style="list-style-type: none"> <li>- Monitoring of terrain, vegetation, and water sources to ensure sustainable grazing.</li> <li>- Ensures animal welfare by detecting distress or injuries early.</li> </ul> </li> </ul>
<b>Results and Impacts</b>	<ul style="list-style-type: none"> <li>• Improved Livestock Management: <ul style="list-style-type: none"> <li>- Enhanced ability to track and manage herds remotely, reducing the need for physical checks.</li> <li>- Enables early intervention in case of illness or injury.</li> </ul> </li> <li>• Operational Efficiency: <ul style="list-style-type: none"> <li>- Reduced labour and time costs for farmers and herders.</li> <li>- Real-time data allows better decision-making.</li> </ul> </li> <li>• Environmental Benefits: <ul style="list-style-type: none"> <li>- Helps prevent overgrazing and land degradation.</li> <li>- Promotes sustainable agricultural practices by optimizing grazing patterns.</li> </ul> </li> <li>• Data-Driven Decisions: <ul style="list-style-type: none"> <li>- Continuous data collection supports long-term planning and policy development.</li> <li>- Empowers smallholder farmers with technology for precision livestock farming.</li> </ul> </li> </ul>



<b>References and Sources</b>	<a href="https://agrarian-project.eu/sample-page/">https://agrarian-project.eu/sample-page/</a>
<b>BULGARIA</b>	
<b>Title</b>	Zlatia Agro and NIK's Precision Agriculture Project
<b>Description of the practice</b>	<p>Zlatia Agro, one of Bulgaria's largest agricultural enterprises, in collaboration with NIK, a leading provider of precision farming solutions, implemented the country's most extensive PA project. The initiative focused on integrating advanced technologies to optimize crop production and resource management.</p> <p>Technologies used are a) soil sampling and analysis: comprehensive soil testing to determine nutrient levels and variability across fields, b) Variable-Rate Fertilization: application of fertilizers at varying rates based on specific soil needs, enhancing efficiency, and c) GPS-guided machinery: utilization of GPS technology for precise planting, fertilization, and harvesting operations.</p>
<b>Results and Impacts</b>	<ul style="list-style-type: none"> <li>• Improved Crop Yields: The adoption of variable-rate fertilization led to noticeable increases in crop productivity.</li> <li>• Resource Efficiency: Optimized use of fertilizers reduced input costs and minimized environmental impact.</li> <li>• Data-Driven Decisions: Enhanced decision-making capabilities through detailed field data analysis.</li> </ul> <p>This project serves as a benchmark for large-scale implementation of precision agriculture in Bulgaria, demonstrating the tangible benefits of technology-driven farming practices.</p>
<b>References and Sources</b>	<a href="https://nik.bg/en/useful/zlatia-agro-and-nik-complete-the-biggest-precision-agriculture-project-in-bulgaria/">https://nik.bg/en/useful/zlatia-agro-and-nik-complete-the-biggest-precision-agriculture-project-in-bulgaria/</a>
<b>ROMANIA</b>	
<b>Title</b>	Farmonaut's Satellite-Based Farm Management
<b>Description of the practice</b>	<p>Farmonaut, an agricultural technology company, provides satellite-based crop health monitoring and farm management solutions. In Romania, these technologies have been adopted to enhance sustainable farming practices and optimize resource utilization.</p> <p>Technologies Implemented:</p> <ol style="list-style-type: none"> <li>a) Satellite-Based Crop Health Monitoring: Utilizing multispectral satellite imagery to assess vegetation health through indices like NDVI, enabling early detection of crop stress and diseases.</li> <li>b) Soil Moisture Analysis: Providing accurate data on soil moisture levels to inform precision irrigation strategies.</li> <li>c) Weather Forecast Integration: Incorporating local weather forecasts to assist farmers in planning agricultural activities effectively.</li> <li>d) AI-Powered Advisory System: Delivering personalized recommendations for crop management based on real-time data analysis.</li> </ol>



<p><b>Results and Impacts</b></p>	<ul style="list-style-type: none"> <li>• <b>Water Usage Reduction:</b> Farmonaut’s satellite monitoring system has led to up to a 30% reduction in agricultural water usage while maintaining or improving crop yields.</li> <li>• <b>Enhanced Crop Yields:</b> The adoption of PA techniques has resulted in improved farm productivity.</li> <li>• <b>Early Stress Detection:</b> Satellite imagery enables the detection of crop stress up to two weeks earlier than traditional visual inspections, allowing for timely interventions.</li> <li>• <b>Resource Optimization:</b> Data-driven insights have facilitated more efficient use of fertilizers and pesticides, reducing input costs and environmental impact.</li> </ul>
<p><b>References and Sources</b></p>	<p><a href="https://farmonaut.com/europe/smart-farming-solutions-boost-crop-health-with-farmonaut">https://farmonaut.com/europe/smart-farming-solutions-boost-crop-health-with-farmonaut</a></p>
<p><b>SLOVENIA</b></p>	
<p><b>Title</b></p>	<p>Smart Farming 4.0 All – Erasmus+ Strategic Partnership</p>
<p><b>Description of the practice</b></p>	<p>The Smart Farming 4.0 project aimed to bridge the gap between modern agricultural technologies and traditional farming practices. In Slovenia, the project emphasized the integration of smart farming methods into educational curricula and practical applications, fostering a new generation of tech-savvy farmers and agripreneurs.</p> <p>Key Activities:</p> <ul style="list-style-type: none"> <li>• <b>Educational Integration:</b> Development of training modules and curricula tailored for vocational education and training (VET) institutions, focusing on smart farming techniques such as PA, hydroponics, and aquaponics.</li> <li>• <b>Research and Analysis:</b> Comprehensive field and desk research to assess the current state of smart farming practices in Slovenia, identifying gaps and opportunities for improvement.</li> <li>• <b>Stakeholder Engagement:</b> Collaboration with local farmers, educational institutions, and policymakers to promote the adoption of smart farming technologies.</li> </ul>
<p><b>Results and Impacts</b></p>	<ul style="list-style-type: none"> <li>• <b>Enhanced Educational Resources:</b> Creation of comprehensive training materials and handbooks that have been integrated into the curricula of several Slovenian educational institutions.</li> <li>• <b>Increased Awareness:</b> Raised awareness among Slovenian farmers and students about the benefits and applications of smart farming technologies.</li> <li>• <b>Policy Influence:</b> Insights from the project have informed local agricultural policies, encouraging support for the adoption of precision agriculture practices.</li> </ul>
<p><b>References and Sources</b></p>	<p><a href="https://smartfarmingproject.eu/en/">https://smartfarmingproject.eu/en/</a></p>
<p><b>MALTA</b></p>	
<p><b>Title</b></p>	<p>AgriHub Project for Integrated Pest Management</p>
<p><b>Description of the practice</b></p>	<p>In response to concerns over high pesticide residue levels in food, the Maltese Ministry for Agriculture, Fisheries and Animal Rights (MAFA)</p>



	<p>launched the AgriHub project in 2020. The initiative aimed to reduce chemical pesticide use by promoting Integrated Pest Management (IPM) and PA techniques.</p> <p>Key Measures:</p> <ul style="list-style-type: none"> <li>• Pest Monitoring: Utilization of digital tools to monitor and predict the distribution and density of five key pest species affecting Maltese crops.</li> <li>• Data-Driven Decision Making: Implementation of precision agriculture technologies to inform targeted pest control measures, minimizing unnecessary pesticide applications.</li> </ul>
<b>Results and Impacts</b>	<ul style="list-style-type: none"> <li>• Reduced Pesticide Use: The project contributed to a decrease in pesticide applications, addressing public health concerns related to pesticide residues in food.</li> <li>• Enhanced Crop Protection: Improved pest management strategies led to better crop health and potentially higher yields.</li> </ul>
<b>References and Sources</b>	<p><a href="https://www.eea.europa.eu/publications/how-pesticides-impact-human-health/agrihub-project-for-integrated-pest">https://www.eea.europa.eu/publications/how-pesticides-impact-human-health/agrihub-project-for-integrated-pest</a></p>
<b>HUNGARY</b>	
<b>Title</b>	Proofminder – AI-Based Crop Monitoring
<b>Description of the practice</b>	<p>Established in 2023, Proofminder offers a Software-as-a-Service (SaaS) platform that integrates high-resolution drone imagery with advanced AI algorithms. This combination allows for detailed analysis of crop health at the individual plant level, providing actionable insights throughout the growing season. Proofminder offers an AI platform for PA, providing crop and leaf monitoring services. The platform is designed for large agricultural enterprises, seed producers, and fruit tree growers, enhancing crop management through AI-driven insights.</p> <p>Key Technologies and Features:</p> <ul style="list-style-type: none"> <li>• High-Resolution Drone Imagery: Captures images with a ground sampling distance (GSD) of less than 0.5 cm per pixel, enabling detailed visualization of plant conditions.</li> <li>• AI-Powered Analysis: Processes visual data to identify stress factors, diseases, weeds, and other anomalies at the leaf level.</li> <li>• Comprehensive Crop Monitoring: Supports various agricultural needs, including stand counting, weather damage assessment, nitrogen analysis, and flowering detection.</li> <li>• User-Friendly Interface: Provides growers with easy-to-interpret reports and prescription maps, facilitating timely interventions without requiring specialized technical knowledge.</li> </ul>
<b>Results and Impacts</b>	<ul style="list-style-type: none"> <li>• Enhanced Yield Predictions: Achieves up to 95% accuracy in performance predictions at any growth stage, allowing for better planning and resource allocation.</li> <li>• Resource Optimization: Enables up to 70% reduction in the use of irrigation water, fertilizers, and pesticides by targeting applications precisely where needed.</li> <li>• Labor Efficiency: Saves up to 200 hours of fieldwork by automating data collection and analysis processes.</li> </ul>



	<ul style="list-style-type: none"> <li>• Sustainable Farming Practices: Supports the EU’s Farm to Fork strategy by reducing chemical usage and promoting environmentally friendly agriculture.</li> </ul>
<b>References and Sources</b>	<a href="https://proofminder.com/">https://proofminder.com/</a> <a href="https://www.root.camp/blog/proofminder-interview-">https://www.root.camp/blog/proofminder-interview-</a>
<b>SLOVAKIA</b>	
<b>Title</b>	Exata Group’s Implementation of Precision Agriculture
<b>Description of the practice</b>	<p>Exata Group manages over 27,000 hectares of land in Slovakia, focusing on both plant and animal production. Recognizing the potential of PA to optimize operations, the company initiated a comprehensive PA program.</p> <p>Key Technologies and Practices:</p> <ul style="list-style-type: none"> <li>• GPS-Guided Machinery: Utilized for precise planting, fertilization, and harvesting, reducing overlaps and input waste.</li> <li>• VRT: Allows for the application of inputs like fertilizers and seeds at varying rates across a field, based on specific needs.</li> <li>• Data Analytics Platforms: Employed to collect and analyze field data, facilitating informed decision-making.</li> </ul>
<b>Results and Impacts</b>	<ul style="list-style-type: none"> <li>• Cost Savings: Exata Group reported savings of 26€ per hectare on fertilizers and seeds after implementing PA practices.</li> <li>• Enhanced Efficiency: The adoption of PA technologies led to more efficient resource utilization and improved crop yields.</li> <li>• Strategic Expansion: Encouraged by the positive outcomes, Exata Group plans to extend PA practices across its entire portfolio.</li> </ul>
<b>References and Sources</b>	<a href="https://www.cleverfarm.ag/reference/precision-farming-exata-group">https://www.cleverfarm.ag/reference/precision-farming-exata-group</a>
<b>CYPRUS</b>	
<b>Title</b>	Digital Subsidy Management & Remote Sensing for Precision Agriculture
<b>Description of the practice</b>	<p>Cyprus has pioneered the integration of AI and satellite remote sensing in its agricultural subsidy system. The Cyprus Agricultural Payments Organisation (CAPO) utilizes an advanced digital platform integrating OCR, AI-based fraud detection, and geospatial analytics. Farmers receive precise irrigation and fertilization guidance via mobile dashboards, supported by NDVI analysis from satellite and drone imagery. This system reduced subsidy processing time by 50%, enhanced EU compliance, and supported early detection of pest outbreaks.</p> <p>Key practices:</p> <ul style="list-style-type: none"> <li>• The Cyprus Agricultural Payments Organisation (CAPO) launched a digital platform for EU agricultural subsidies, integrating AI for document processing and fraud detection.</li> <li>• Introduction of remote sensing (satellite and drone imagery) to monitor field conditions, crop health, and compliance with EU greening measures.</li> <li>• Farmers receive targeted recommendations for irrigation and fertilization, boosting productivity while conserving resources.</li> </ul>



<b>Results and Impacts</b>	<ul style="list-style-type: none"> <li>• Processing time for subsidies reduced by 50%, improving transparency.</li> <li>• Early detection of pest infestations and crop diseases.</li> <li>• Supports compliance with EU sustainability policies.</li> </ul>
<b>References and Sources</b>	<p>Farmonaut: Cyprus Agriculture Digital Innovations: <a href="https://farmonaut.com/europe/revolutionizing-cyprus-agriculture-eu-subsidies-and-digital-innovations-boost-farm-modernization">https://farmonaut.com/europe/revolutionizing-cyprus-agriculture-eu-subsidies-and-digital-innovations-boost-farm-modernization</a></p> <p>CAPO Official Website: <a href="https://www.capo.gov.cy">https://www.capo.gov.cy</a></p>
<b>ITALY</b>	
<b>Title</b>	eSIM Technology & Smart Irrigation Systems
<b>Description of the practice</b>	<p>Italian farms are adopting eSIM-enabled IoT systems to enhance water efficiency. These devices provide real-time monitoring of soil moisture, weather data, and crop stress indicators. Paired with machine learning models, the systems automate irrigation, achieving water savings of up to 30%. This innovation is vital for Italy’s adaptation to increasing drought risks under climate change scenarios.</p> <p>Key practices:</p> <ul style="list-style-type: none"> <li>• Use of eSIM-connected sensors for real-time monitoring of soil moisture, weather, and crop status.</li> <li>• Automated irrigation systems deliver water based on precise plant needs, reducing waste.</li> <li>• Integration with farm management software for comprehensive data analysis and reporting.</li> </ul>
<b>Results and Impacts</b>	<ul style="list-style-type: none"> <li>• Up to 30% water savings in pilot farms.</li> <li>• Reduced manual labour and improved decision-making.</li> <li>• Enhanced crop yields and lower environmental impact.</li> </ul>
<b>References and Sources</b>	<p>GlobalYo: eSIM in Italian Smart Agriculture: <a href="https://www.globalyo.com/blog/esim-technology-powering-italys-transition-to-smart-agriculture-and-sustainable-farming">https://www.globalyo.com/blog/esim-technology-powering-italys-transition-to-smart-agriculture-and-sustainable-farming</a></p>
<b>SPAIN</b>	
<b>Title</b>	Digital Field Notebook (Cuaderno de Campo Digital)
<b>Description of the practice</b>	<p>Spain’s “Cuaderno de Campo Digital” is a government-mandated tool for digital record-keeping of all farm activities. It enables traceable, GPS-tagged entries for pesticide use, fertilization, irrigation, and harvesting. Linked with mobile apps and EFSA databases, it enhances compliance and data transparency. Training programs increase adoption, particularly among smallholder farmers, improving traceability in food supply chains.</p> <p>Key practices:</p> <ul style="list-style-type: none"> <li>• Nationwide adoption of digital record-keeping tools for crop management, chemical applications, irrigation, and harvesting.</li> <li>• Integration with mobile apps and farm management platforms.</li> <li>• Facilitates compliance with EU regulations on traceability and sustainability.</li> </ul>
<b>Results and Impacts</b>	<ul style="list-style-type: none"> <li>• Improved traceability and reporting.</li> <li>• Enhanced transparency and data-driven farm decisions.</li> </ul>



	<ul style="list-style-type: none"> <li>Greater efficiency in meeting regulatory requirements.</li> </ul>
<b>References and Sources</b>	<p>AYDI: Benefits of Digital Field Notebook: <a href="https://www.aydi.com/blog/exploring-the-benefits-of-the-digital-field-notebook-a-digital-transformation-in-spanish-agriculture">https://www.aydi.com/blog/exploring-the-benefits-of-the-digital-field-notebook-a-digital-transformation-in-spanish-agriculture</a></p> <p>Spanish Ministry of Agriculture: <a href="https://www.mapa.gob.es/es/agricultura/temas/medios-de-produccion/">https://www.mapa.gob.es/es/agricultura/temas/medios-de-produccion/</a></p>
<b>PORTUGAL</b>	
<b>Title</b>	Wisecrop – Smart Farm Management Platform
<b>Description of the practice</b>	<p>Wisecrop, an integrated farm management platform, provides modular services for monitoring climate, soil, crop health, and operational planning. Used heavily in viticulture and fruit farming, it offers predictive analytics for irrigation, disease risks, and harvest timing. By integrating IoT devices and historical data, it boosts resilience to climate volatility and increases productivity by up to 20%.</p> <p>Key practices:</p> <ul style="list-style-type: none"> <li>Centralized digital platform collects data from weather stations, soil sensors, irrigation controllers, and drones.</li> <li>Farmers can remotely monitor, plan, and automate key operations, including irrigation, pest management, and crop scheduling.</li> <li>Offers decision-support tools for optimizing resource use and boosting profitability.</li> </ul>
<b>Results and Impacts</b>	<ul style="list-style-type: none"> <li>Farms using Wisecrop report up to 20% increases in productivity and significant reductions in water and fertilizer usage.</li> <li>Enhanced climate resilience due to timely alerts and forecasts.</li> </ul>
<b>References and Sources</b>	Wisecrop Official Site: <a href="https://www.wisecrop.com/">https://www.wisecrop.com/</a>
<b>CROATIA</b>	
<b>Title</b>	Smarter Farming with Digital Tools
<b>Description of the practice</b>	<p>In Croatia, farmers are starting to use modern technology to make farming more efficient and eco-friendlier. With the help of GPS, drones, and data analysis, they are finding better ways to grow crops and manage their fields.</p> <p>Key Practices:</p> <ul style="list-style-type: none"> <li>GPS-guided tractors for accurate planting and spraying.</li> <li>Drones to spot crop health problems early and check soil quality.</li> <li>Digital tools that help decide exactly how much fertilizer and water to use.</li> </ul>
<b>Results and Impacts</b>	<ul style="list-style-type: none"> <li>Better crop yields and reduced waste.</li> <li>Cost savings on inputs like water and fertilizer.</li> <li>Helps protect the environment by avoiding overuse of chemicals.</li> </ul>
<b>References and Sources</b>	Croatia Week: <a href="https://www.croatiaweek.com/precision-agriculture-modernising-croatian-farming/">https://www.croatiaweek.com/precision-agriculture-modernising-croatian-farming/</a>
<b>FRANCE</b>	
<b>Title</b>	Farmonaut AI-Powered Precision Farming



<p><b>Description of the practice</b></p>	<p>Farmonaut collaborates with French farms to deliver AI-based analysis of satellite imagery for monitoring soil and crop health. The platform generates zoning maps for variable-rate input application and detects stress patterns using neural networks. It contributes to France’s Ecophyto goals by reducing nitrogen use by 5–10%, supporting sustainable intensification.</p> <p>Key practices:</p> <ul style="list-style-type: none"> <li>• Satellite imagery is analyzed with AI to provide detailed maps of crop health, soil moisture, and vegetation indices.</li> <li>• Recommendations are generated for variable-rate fertilizer and pesticide application.</li> <li>• Focus on reducing nitrogen runoff and environmental footprint.</li> </ul>
<p><b>Results and Impacts</b></p>	<ul style="list-style-type: none"> <li>• Farms using Farmonaut’s system reduced nitrogen fertilizer use by 5–10%, with no yield loss.</li> <li>• Better detection of crop stress and disease.</li> <li>• Supports France’s goals for digital and ecological transition in agriculture.</li> </ul>
<p><b>References and Sources</b></p>	<p>Farmonaut: Precision Farming in France: <a href="https://farmonaut.com/precision-farming/ai-smart-farming-boost-sustainable-agriculture-2025">https://farmonaut.com/precision-farming/ai-smart-farming-boost-sustainable-agriculture-2025</a>  <a href="https://farmonaut.com/precision-farming/precision-farming-boost-sustainable-agriculture-with-smart-risk-management">https://farmonaut.com/precision-farming/precision-farming-boost-sustainable-agriculture-with-smart-risk-management</a>          French Ministry of Agriculture: <a href="https://agriculture.gouv.fr/">https://agriculture.gouv.fr/</a></p>

**LUXEMBOURG**

<p><b>Title</b></p>	<p>Digital Pilot Farms and Smart Solutions</p>
<p><b>Description of the practice</b></p>	<p>Luxembourg is using technology and research to help farmers reduce chemical use and grow food more sustainably. With support from research institutions, farmers are testing smart systems on pilot farms.</p> <p>Key practices:</p> <ul style="list-style-type: none"> <li>• Expert systems that give advice on when and where to use herbicides.</li> <li>• Drones and special sensors that scan fields and collect detailed data.</li> <li>• Software that helps farmers make smarter decisions based on real-time information.</li> </ul>
<p><b>Results and Impacts</b></p>	<ul style="list-style-type: none"> <li>• Reduced use of chemicals like herbicides.</li> <li>• More efficient and eco-friendly farming.</li> <li>• Better crop quality and healthier soil.</li> </ul>
<p><b>References and Sources</b></p>	<p>Luxembourg Institute of Science and Technology: <a href="https://www.list.lu/en/environment/project/digital-pilot-farms/">https://www.list.lu/en/environment/project/digital-pilot-farms/</a>          University of Luxembourg: <a href="https://www.uni.lu/fstm-en/research-projects/precision/">https://www.uni.lu/fstm-en/research-projects/precision/</a></p>

**GERMANY**

<p><b>Title</b></p>	<p>BayWa AG’s Smart Farming Solutions</p>
<p><b>Description of the practice</b></p>	<p>Germany is one of Europe’s leaders in agricultural technology adoption. Rising input costs and the demand for more sustainable farming</p>



	<p>practices have accelerated the development of data-driven farm management approaches.</p> <p>BayWa AG provides a suite of smart farming tools, including satellite-based crop monitoring, GPS-guided machinery, and AI-driven decision support systems. These help farmers monitor crop health, apply inputs precisely, and plan field operations more effectively.</p> <p>To enhance yield and profitability through data-driven decision-making, while reducing the environmental footprint of crop production.</p>
<p><b>Results and Impacts</b></p>	<ul style="list-style-type: none"> <li>• Farmers reported up to 30% increases in crop yields and 25% reductions in input costs (fertilizers, pesticides, fuel). The system is being widely adopted across Bavaria and beyond.</li> <li>• Key factors include strong industry-agriculture collaboration, accessible digital tools, farmer training, and support from BayWa’s advisory services.</li> </ul> <p>Initial equipment and subscription costs can be high for smaller farms. Digital infrastructure limitations (e.g., poor internet access in rural areas) may restrict effectiveness.</p> <p>The system is scalable and already applied in multiple regions. The technology can be adapted to various crops and geographies with minor localization.</p> <p>By optimizing input use and reducing waste, BayWa’s solutions contribute to more environmentally sustainable farming. The system also promotes soil health and reduces greenhouse gas emissions.</p>
<p><b>References and Sources</b></p>	<p>Farmonaut: <a href="https://farmonaut.com/europe/precision-farming-technologies-revolutionizing-agricultural-restructuring-in-bavaria-and-austria">https://farmonaut.com/europe/precision-farming-technologies-revolutionizing-agricultural-restructuring-in-bavaria-and-austria</a></p>
<p><b>GERMANY</b></p>	
<p><b>Title</b></p>	<p>NEXT Farming by BayWa AG</p>
<p><b>Description of the practice</b></p>	<p>NEXT Farming is a digital farm management platform developed by BayWa AG (via FarmFacts GmbH) to support precision agriculture practices. As of 2023, the platform manages approximately 30% of Germany’s agricultural land, reflecting strong adoption across the country.</p> <p>NEXT Farming offers a comprehensive suite of digital tools, including satellite data integration, GPS field mapping, soil and yield analysis, crop planning, and variable rate application. It enables farmers to manage farm operations down to sub-field level.</p> <p>To optimize agricultural inputs, increase yields, reduce environmental impacts, and support data-driven decision-making across all levels of farm management.</p>
<p><b>Results and Impacts</b></p>	<ul style="list-style-type: none"> <li>• Widespread use by German farmers, managing 30% of the national agricultural land. Reported benefits include increased efficiency, better crop health monitoring, and reduced input waste.</li> <li>• Strong market positioning, user-friendly digital interface, partnership with agronomists, integration with precision machinery, and continued support from BayWa’s service and consulting teams.</li> </ul>



	<p>High initial learning curve for non-digital native users. Limited availability outside Germany. As of 2023, the software unit was sold to AGCO, raising questions about its future integration strategy.</p> <p>The platform is scalable and has potential for replication across Europe. Future growth expected through AGCO’s international distribution and digital strategy.</p> <p>Supports sustainable farming by reducing excess input use, minimizing environmental risks, and promoting efficient resource allocation.</p>
<b>References and Sources</b>	<p>BayWa Press Release (Nov 2023): <a href="https://www.baywa.com/en/pressinformation/05223en_baywa_farmfacts">https://www.baywa.com/en/pressinformation/05223en_baywa_farmfacts</a></p>
<b>GERMANY</b>	
<b>Title</b>	smaXtec Health Monitoring System for Dairy Cows
<b>Description of the practice</b>	<p>smaXtec is an Austrian-based but Germany-active company offering a sophisticated health monitoring solution for dairy cows. It addresses the need for early disease detection and optimized herd management by providing continuous, internal physiological data from the cow's rumen. The system uses a smart bolus placed in the cow’s reticulum to continuously monitor internal body temperature, rumination, drinking behavior, activity, and optionally, rumen pH. Data is transmitted to a cloud-based platform where AI-driven analysis detects early signs of disease or reproductive events.</p> <p>The objectives are detecting diseases like mastitis days before clinical signs, reduce antibiotic use through early intervention, improve fertility and calving management, and enhance overall herd health and farm sustainability.</p>
<b>Results and Impacts</b>	<ul style="list-style-type: none"> <li>• The system can detect mastitis and other diseases up to 4 days before symptoms occur. It has helped reduce antibiotic use by up to 70% and improved pregnancy rates and calving interval efficiency. Farmers report significantly better animal health and productivity.</li> <li>• Internal sensor placement allows unmatched precision</li> <li>• Continuous data and real-time alerts</li> <li>• AI-backed analysis via user-friendly app and browser platform</li> </ul> <p>Some challenges and limitations are initial costs of bolus system and setup, it requires training to interpret and act on data, and infrastructure dependency on connectivity and data management.</p> <p>Used in over 20 countries and scalable across small and large dairy operations. Replicable where digital infrastructure and animal welfare compliance exist.</p> <p>By improving health monitoring and reducing unnecessary treatments, the system lowers methane emissions per liter of milk and supports responsible use of antibiotics.</p>
<b>References and Sources</b>	<p>smaXtec Official Site: <a href="https://smaxtec.com/en">https://smaxtec.com/en</a></p> <p>Customer feedback and case studies: <a href="https://smaxtec.com/en/reliable-health-monitoring/">https://smaxtec.com/en/reliable-health-monitoring/</a></p> <p>smaXtec Function Overview: <a href="https://smaxtec.com/en/how-it-works">https://smaxtec.com/en/how-it-works</a></p>



<b>BELGIUM</b>	
<b>Title</b>	Klimrek Project – Climate-Resilient Agriculture in Flanders
<b>Description of the practice</b>	<p>Initiated in 2019 by VLAIO (Flemish Agency for Innovation and Entrepreneurship), in collaboration with ILVO (Institute for Agricultural and Fisheries Research) and Boerenbond (the Flemish Farmers’ Union), the Klimrek project aimed to support farmers in adopting climate-friendly and climate-robust agricultural practices. The project developed a "climate scan" tool to assess and enhance the climate resilience of farming operations.</p> <p>Key Technologies and Practices:</p> <ul style="list-style-type: none"> <li>• <b>Satellite-Based Monitoring:</b> Utilization of Sentinel-2 satellite imagery to derive vegetation indices such as NDVI and fAPAR, enabling precise monitoring of crop health and growth.</li> <li>• <b>Remote Sensing Platforms:</b> Implementation of tools like WatchITgrow for real-time crop monitoring, facilitating data-driven decision-making.</li> <li>• <b>Climate Adaptation Strategies:</b> Promotion of practices like cover cropping, crop rotation, and optimized input application to enhance climate resilience.</li> </ul>
<b>Results and Impacts</b>	<ul style="list-style-type: none"> <li>• <b>Resource Efficiency:</b> Farmers reported significant reductions in fertilizer and pesticide usage through targeted application based on remote sensing data.</li> <li>• <b>Climate Resilience:</b> Adoption of climate adaptation strategies improved soil health and biodiversity, enhancing the long-term sustainability of farming operations.</li> <li>• <b>Economic Feasibility:</b> The climate scan tool provided farmers with tailored recommendations that balanced environmental benefits with economic viability.</li> </ul>
<b>References and Sources</b>	<a href="https://blog.vito.be/remotesensing/klimrek">https://blog.vito.be/remotesensing/klimrek</a>
<b>LITHUANIA</b>	
<b>Title</b>	UAB iAGRO’s Precision Agriculture Consultancy
<b>Description of the practice</b>	<p>UAB iAGRO, a Lithuanian agricultural consultancy, has been instrumental in promoting precision agriculture across the Baltic states. They utilize EOSDA Crop Monitoring, a satellite-based platform, to provide farmers with insights into crop health, soil conditions, and optimal input application.</p> <p>Key Technologies and Practices:</p> <ul style="list-style-type: none"> <li>• <b>Satellite Imagery Analysis:</b> Employing high-resolution multispectral satellite images to monitor field conditions.</li> <li>• <b>Productivity Mapping:</b> Creating productivity maps to identify zones requiring specific interventions.</li> <li>• <b>Soil Sampling Guidance:</b> Advising on soil sampling locations and depths to assess nutrient levels accurately.</li> <li>• <b>VRA:</b> Implementing VRA for fertilizers and pesticides to optimize usage and reduce costs.</li> </ul>



<p><b>Results and Impacts</b></p>	<ul style="list-style-type: none"> <li>• Yield Improvement: Farmers reported increased yields by adjusting inputs based on satellite data.</li> <li>• Cost Reduction: Significant savings on fertilizers and pesticides due to targeted application.</li> <li>• Sustainability: Enhanced soil health and reduced environmental impact through precise input management.</li> </ul>
<p><b>References and Sources</b></p>	<p><a href="https://eos.com/blog/uab-iagro-pioneers-precision-agritech-in-lithuania/">https://eos.com/blog/uab-iagro-pioneers-precision-agritech-in-lithuania/</a></p>
<p><b>NETHERLANDS</b></p>	
<p><b>Title</b></p>	<p>Practice Centre for Precision Agriculture (PCvPL)</p>
<p><b>Description of the practice</b></p>	<p>The Netherlands is renowned for its advanced agricultural sector. The Practice Centre for Precision Agriculture (PCvPL) was established to bridge the gap between research and practical farming, with a focus on helping small and medium-sized farms adopt PA techniques. PCvPL is a collaborative initiative where farmers, researchers, and tech providers work together to test and demonstrate PA techniques. It offers practical experiences with technologies like GPS-guided tractors, drones, and data analysis platforms. The objectives are demonstrate the practical benefits of PA, facilitate knowledge sharing between stakeholders, and support adoption of sustainable practices among farmers.</p>
<p><b>Results and Impacts</b></p>	<ul style="list-style-type: none"> <li>• PCvPL has increased awareness and adoption of precision farming among local farmers. Demonstrations and training sessions have led to more efficient resource use and measurable improvements in farm management practices</li> <li>• Strong cooperation between academia (e.g., Wageningen UR), private sector, and farmers</li> <li>• Focus on field-tested, practical applications</li> <li>• Tailored support for smaller farms</li> </ul> <p>Some challenges and limitations are maintaining consistent funding and long-term operational support and addressing diverse farm needs across different regions and crop types. The PCvPL model is adaptable and can be replicated in other regions by adjusting to local agricultural contexts and ensuring multi-stakeholder engagement. PCvPL promotes sustainable agriculture by reducing overuse of inputs and enhancing knowledge on efficient resource management. Long-term impact is strengthened by education and community building.</p>
<p><b>References and Sources</b></p>	<p>FarmDemo Case Study: <a href="https://farmdemo.eu">https://farmdemo.eu</a> Wageningen University: <a href="#">Smart Farming National Pilot Overview</a></p>
<p><b>NETHERLANDS</b></p>	
<p><b>Title</b></p>	<p>Duijvestijn Tomatoes: High-Tech Greenhouse Farming</p>
<p><b>Description of the practice</b></p>	<p>Located near The Hague, Duijvestijn Tomatoes is a Dutch family-owned greenhouse farm renowned for its sustainable, high-tech tomato production. The farm integrates geothermal energy, hydroponics, and</p>



	<p>digital monitoring to set global standards in efficient greenhouse agriculture.</p> <p>The farm operates climate-controlled greenhouses with hydroponic systems and real-time monitoring of key variables such as temperature, humidity, nutrient levels, and CO<sub>2</sub>. It uses geothermal heating, precision irrigation, and sensor-guided automation to optimize growing conditions.</p> <p>Objectives are maximize productivity and sustainability, minimize resource consumption and emissions, and use data to guide real-time management of greenhouse environments.</p>
<p><b>Results and Impacts</b></p>	<ul style="list-style-type: none"> <li>• Produces over 100 million tomatoes per year in just 14 hectares. Energy consumption reduced by 85% compared to traditional systems. Recognized globally as a leader in sustainable greenhouse farming.</li> <li>• Use of renewable energy (geothermal)</li> <li>• Collaboration with Wageningen University &amp; Research</li> <li>• Strong focus on automation, monitoring, and efficiency</li> </ul> <p>Some challenges and limitations are high upfront investment costs, skilled personnel and technical knowledge, and infrastructure and geothermal availability may not be replicable everywhere.</p> <p>The model has been replicated in various regions using geothermal or solar energy. With adaptations, it is applicable to other high-tech greenhouse operations globally.</p> <p>Drastically lowers emissions and water usage. Promotes circular production and urban farming principles. Operates with minimal pesticide input.</p>
<p><b>References and Sources</b></p>	<p>World Economic Forum (2019): <a href="#">'Why Dutch greenhouses are the most efficient in the world'</a></p> <p>Wageningen UR: <a href="#">Greenhouse innovation reports</a></p> <p>Duijvestijn Tomatoes: <a href="https://duijvestijntomaten.nl">https://duijvestijntomaten.nl</a></p>
<p><b>NETHERLANDS</b></p>	
<p><b>Title</b></p>	<p>On-Site Soil Analysis with NIR and Deep Learning</p>
<p><b>Description of the practice</b></p>	<p>Wageningen University &amp; Research (WUR) developed an innovative approach to soil scanning, addressing the need for faster, more accessible, and accurate soil analysis for PA. This approach reduces dependence on lab-based testing and supports sustainable farming decisions.</p> <p>WUR's method combines Near-Infrared (NIR) spectroscopy with remote sensing data and deep learning models to enable real-time, on-site analysis of soil properties. It measures key parameters like soil texture, pH, carbon content, and nutrient levels directly in the field.</p> <p>Objectives are to enable rapid and accurate soil diagnostics, minimize reliance on lab-based soil testing, and provide high-resolution soil data for precision agriculture applications.</p>
<p><b>Results and Impacts</b></p>	<ul style="list-style-type: none"> <li>• The approach demonstrated high predictive accuracy (<math>R^2 &gt; 0.8</math>) for several key soil properties. With sensor fusion and transfer learning,</li> </ul>



	<p>performance of field-state samples approaches that of lab-dried samples. Results are published in Geoderma (Kok et al., 2024).</p> <ul style="list-style-type: none"> <li>• Strong research infrastructure at WUR</li> <li>• Integration of multiple advanced technologies</li> <li>• Application in both research and farm-level pilots</li> </ul> <p>Some challenges and limitations are upfront cost of technology and training, performance may vary across soil types and regions, and it requires technical expertise for interpretation.</p> <p>Designed to be globally applicable with portable tools and transferable deep learning models. Suitable for scaling through training programs and local data adaptation.</p> <p>Improves input efficiency, supports soil health monitoring, and reduces overuse of fertilizers through precise diagnostics—contributing to more sustainable and environmentally friendly agriculture.</p>
<b>References and Sources</b>	<p>Kok et al. (2024). On-site soil analysis: A novel approach combining NIR spectroscopy, remote sensing and deep learning. Geoderma, 446, Article 116903. <a href="https://research.wur.nl/en/publications/on-site-soil-analysis-a-novel-approach-combining-nir-spectroscopy">https://research.wur.nl/en/publications/on-site-soil-analysis-a-novel-approach-combining-nir-spectroscopy</a></p>
<b>SWEDEN</b>	
<b>Title</b>	Digital Soil Mapping for Nutrient Optimization
<b>Description of the practice</b>	<p>Digital Soil Map of Sweden (DSMS) integrates gamma-ray spectrometry, LiDAR data and satellite imagery to create high-resolution soil property maps with 50m resolution, enabling precise fertilizer application planning.</p> <p>SITES Spectral Infrastructure: Network of 10 measurement stations collecting continuous spectral data on soil and vegetation using drones and sensor towers, with AI-driven analysis for soil health indicators.</p> <p>Long-term field experiments: 24 permanent sites managed by the Swedish University of Agricultural Sciences (SLU) providing data for nutrient cycling analysis and fertilizer recommendations.</p>
<b>Results and Impacts</b>	<ul style="list-style-type: none"> <li>• 15-20% reduction in nitrogen leaching while maintaining crop yields</li> <li>• Enhanced soil carbon sequestration (0.3% annual increase in pilot regions)</li> <li>• Supports Sweden’s goal to reduce agricultural GHG emissions by 30% by 2030</li> </ul>
<b>References and Sources</b>	<p>Digital soil mapping: Evolution, current state and future directions of the science. In: Encyclopedia of Soils in the Environment, Second Edition, Volume 4, Editors: M.J. Goss, M. Oliver, Elsevier, 2023, pp. V4-684–V4-695. <a href="https://research.wur.nl/en/publications/digital-soil-mapping-evolution-current-state-and-future-direction">https://research.wur.nl/en/publications/digital-soil-mapping-evolution-current-state-and-future-direction</a></p> <p>Swedish University of Agricultural Sciences (2024). "SITES Spectral – A national infrastructure for ecosystem spectral measurements." <a href="https://www.slu.se/en/environment/statistics-and-environmental-data/environmental-data-catalogue/sites-spectral/#:~:text=The%20SITES%20Spectral%20infrastructure%20ca%20carri,vegetation%20conditions%20over%20targeted%20areas">https://www.slu.se/en/environment/statistics-and-environmental-data/environmental-data-catalogue/sites-spectral/#:~:text=The%20SITES%20Spectral%20infrastructure%20ca</a></p>



FINLAND	
<b>Title</b>	IoT-Enabled Smart Dairy Farming
<b>Description of the practice</b>	<p>Anicare Healtag System: Solar-powered ear sensors using NB-IoT technology to monitor cattle vital signs (pulse, temperature) and optimize estrus detection, developed through the Smart Agri Hubs project.</p> <p>Milk quality sensors: Real-time analysis of milk components (fat, protein) using optical sensors developed by VTT and Natural Resources Institute Finland.</p> <p>IoF2020 Dairy Trial: Cloud-based integration of herd data for feed optimization and methane emission reduction.</p>
<b>Results and Impacts</b>	<ul style="list-style-type: none"> <li>• 12% increase in milk yield through early disease detection</li> <li>• 18% reduction in veterinary costs on pilot farms</li> <li>• 7-10% decrease in methane emissions through optimized feeding</li> </ul>
<b>References and Sources</b>	<p>Anicare Animal Tracking Systems <a href="https://anicare.fi/en/research/">https://anicare.fi/en/research/</a></p> <p>VTT Technical Research Centre of Finland (2024). "Use of smart solutions in dairy farms improves quality and productivity." <a href="https://www.vttresearch.com/en/news-and-ideas/use-smart-solutions-dairy-farms-improves-quality-and-productivity">https://www.vttresearch.com/en/news-and-ideas/use-smart-solutions-dairy-farms-improves-quality-and-productivity</a></p> <p>Internet of Food &amp; Farm (IoF2020 Project, 2023). "Dairy Trial: Data-driven decisions for productivity." <a href="https://www.iof2020.eu/trials/dairy">https://www.iof2020.eu/trials/dairy</a></p>
ESTONIA	
<b>Title</b>	Autonomous Farming Systems with 5G Connectivity
<b>Description of the practice</b>	<p>FLEXIGROBOTS Project: Heterogeneous robot fleets (drones + ground vehicles) for precision seeding and weed management, with field trials at Estonian University of Life Sciences (EMÜ, 2024).</p> <p>GPS-RTK guidance: ±2cm accuracy using Galileo multi-GNSS receivers for autonomous tractors.</p> <p>Paul-Tech soil sensors: Real-time nutrient availability measurement providing fertilizer recommendations, saving up to 55,000€ per field in input costs.</p>
<b>Results and Impacts</b>	<ul style="list-style-type: none"> <li>• 25% lower fuel consumption through optimized route planning</li> <li>• 30% faster planting cycles in cereal farms</li> <li>• 5G network coverage in 95% of Estonian agricultural areas by 2025</li> </ul>
<b>References and Sources</b>	<p>Flexigrobots Project <a href="https://flexigrobots-h2020.eu/">https://flexigrobots-h2020.eu/</a></p> <p>Paul-Tech (2023). "Real-time soil analysis for precision agriculture." <a href="https://paul-tech.ee/soil-sensors">https://paul-tech.ee/soil-sensors</a></p> <p>SmartCap Green Fund (2024). "NextGenerationEU funding for agricultural innovation." <a href="https://smartcap.ee/green-fund">https://smartcap.ee/green-fund</a></p>
IRELAND	
<b>Title</b>	Data-Driven Agri-Environmental Platform (ACRES)
<b>Description of the practice</b>	Integrated digital platform: Combines Sentinel-2 satellite imagery, field sensors, and blockchain for transparent tracking of biodiversity and water quality metrics.



	<p>Agricultural Sustainability Support and Advisory Programme (ASSAP): 36 advisors supporting farmers across 190 priority water catchment areas in implementing sustainable practices.</p> <p>Machine learning models: Prediction of biodiversity changes through AI analysis of land use patterns.</p>
<b>Results and Impacts</b>	<ul style="list-style-type: none"> <li>• Over 40,000 farms enrolled, achieving a 10% average reduction in synthetic fertilizer use</li> <li>• 15% improvement in water quality in pilot catchments</li> <li>• Direct payments to farms achieving sustainability KPIs under CAP eco-schemes</li> </ul>
<b>References and Sources</b>	<p>ACRES: Agri-Climate Rural Environment Scheme." <a href="https://www.gov.ie/en/service/f5a48-agri-climate-rural-environment-scheme-acres/">https://www.gov.ie/en/service/f5a48-agri-climate-rural-environment-scheme-acres/</a></p> <p>ASSAP Programme. <a href="https://www.teagasc.ie/publications/2021/assap-interim-report-2.php">https://www.teagasc.ie/publications/2021/assap-interim-report-2.php</a></p> <p>Department of Agriculture, Food and the Marine (Ireland). (2025, January 13). The CAP Strategic Plan 2023-2027. <a href="https://www.gov.ie/en/department-of-agriculture-food-and-the-marine/publications/the-cap-strategic-plan-2023-2027/">https://www.gov.ie/en/department-of-agriculture-food-and-the-marine/publications/the-cap-strategic-plan-2023-2027/</a></p>
<b>POLAND</b>	
<b>Title</b>	Robotics for Small-Scale Precision Farming
<b>Description of the practice</b>	<p>Farmonaut robots: Solar-powered devices with computer vision for weed identification (93% accuracy) and targeted micro-spraying, suitable for farms as small as 2 hectares.</p> <p>AgroIntelli Robotti 150D: Autonomous field robot conducting seeding, fertilizing, and weeding operations, adapted for Poland’s smaller farm structures.</p> <p>Agrirobo systems: Developed by Polish startup combining GPS navigation with interchangeable tools (sprayers, mowers) for orchard management.</p>
<b>Results and Impacts</b>	<ul style="list-style-type: none"> <li>• 50% reduction in herbicide use through precision application</li> <li>• 20% labour cost savings in pilot farms</li> <li>• Addresses fragmented farm structure (15 hectares average) with cost-effective solutions</li> </ul>
<b>References and Sources</b>	<p>Agrirobo Systems, Science in Poland. (2014, January 24). Agribot to help growers. Project by Agrirobo at Wrocław Technology Park. <a href="https://scienceinpoland.pl/en/news/news,398896,agribot-to-help-growers.html">https://scienceinpoland.pl/en/news/news,398896,agribot-to-help-growers.html</a></p> <p>AgroIntelli (2024). Robotti field trials and deployment in Central and Eastern Europe. <a href="https://www.agrointelli.com/cases">https://www.agrointelli.com/cases</a></p> <p>Farmonaut <a href="https://farmonaut.com/">https://farmonaut.com/</a></p> <p>Interreg Central Europe. (2023). AGRI-DIGITAL GROWTH: Empowering agricultural innovation and precision farming in Poland. <a href="https://www.interreg-central.eu/projects/agri-digital-growth/">https://www.interreg-central.eu/projects/agri-digital-growth/</a></p> <p>National Centre for Research and Development (2023). "Robotics in Polish agriculture: Adaptation strategies for small farms.</p>



<a href="https://ec.europa.eu/national-centre-research-and-development-ncrd-poland_en">https://ec.europa.eu/national-centre-research-and-development-ncrd-poland_en</a>
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The best practices identified across all countries illustrate the dynamic progress and diversity of PA in Europe. These cases demonstrate how the integration of advanced digital technologies—such as high-resolution soil mapping, IoT-based livestock monitoring, autonomous machinery, data-driven sustainability platforms, and robotics—can significantly enhance agricultural productivity, resource efficiency, and environmental stewardship.

The critical success factors include,

- **Data standardization** like unified data formats, enable seamless integration and effective use of digital tools across farms and regions.
- **Broadband infrastructure** and importance of reliable broadband networks for enabling real-time data transfer and autonomous operations in rural areas.
- **Knowledge transfer**, highlighting the value of targeted training and cross-border collaboration in accelerating the adoption of smart farming practices.
- **Policy alignment:** All highlighted initiatives are closely linked with EU policy frameworks, notably the Common Agricultural Policy (CAP) and the European Green Deal, ensuring that technological advancements support broader sustainability and climate objectives.

Collectively, these examples underline the importance of an integrated approach that combines technological innovation, supportive policy, and stakeholder engagement. By building on these success factors, EU member states can continue to drive the digital transformation of agriculture, fostering a sector that is both competitive and resilient in the face of future challenges.



## 4. Comparative analysis and recommendations for Precision Agriculture curricula

This report provides a comparative analysis of selected higher education programmes across Georgia, Ukraine, and Europe with a focus on digital agriculture, smart farming, and PA technologies. The objective is to evaluate how these programmes align with EU curricula standards, pedagogical approaches, and identify key strengths and gaps.

### 4.1. Comparative analysis on MSc in Georgia, Ukraine, and Europe

Within the analyses the following agricultural universities and programs have been selected based on their relation to PA:

- Georgia: Georgian Technical University
  - Master “Agrotechnology”, with a focus on environmental sustainability through energy efficiency and water management, it offers a comprehensive, traditional agricultural curriculum, including crop genetics, agronomy, plant protection, and soil management.
- Georgia: Georgian Technical University
  - Master “Viticulture and enology”, with a focus on viticulture, a niche agricultural sector, its potential for digital transformation and sustainability is significant but underdeveloped. It offers a specialized pathway into viticulture and winemaking with solid scientific and technological foundations.
- Georgia: Georgian Technical University
  - Master “Forestry”, with a focus on sustainable forest management, biodiversity conservation, and environmental monitoring.
- Ukraine: Sumy National Agrarian University
  - Master “Precision farming systems”, with a focus to address modern agricultural needs, integrating advanced digital technologies such as GIS, GPS, drones, remote sensing, and decision support systems.
- Ukraine: National University of Life and Environmental Sciences of Ukraine
  - Master “Agrochemical service in precision agricultural production”, with a focus on mastering modern approaches to above-ground and below-ground soil monitoring and agrophytocenosis potential, analysing various data layers related to site conditions and crop cultivation technologies.
- Greece: Agricultural University of Athens
  - Master “Digital Technologies and Smart Infrastructure in Agriculture”, with a focus on smart technologies and infrastructure across the agri-food supply chain and the protection of the environment.
- Romania: University of Agronomic Sciences and Veterinary Medicine of Bucharest
  - Master “Sustainable Agriculture”, with a focus on sustainable exploitation of resources in the agricultural production process, agricultural production technologies, environmental protection, sustainability, and conservation.
- Slovenia: University of Ljubljana
  - Master “Agronomy”, with a focus on technological procedures of crop production, inseparably linked with integral management of the agricultural space and environmental conservation.
- Malta: L-Università ta' Malta



- Master “Environmental Management and Sustainability”, with a focus on sustainability, environment and principles of regenerative agriculture.
- Hungary: University of Debrecen
  - Master “Agricultural Water Management Engineering”, with a focus on sustainable integrated water management.
- Slovakia: Slovak University of Agriculture in Nitra
  - Master “Sustainable Agriculture and Rural Development”, with a focus on sustainable agriculture, environmental policy, and regional planning.
- Cyprus: Cyprus International University
  - Master “Plant Sciences and Technologies”, with a focus on agricultural technologies.
- Italy: University of Bologna
  - Master “Precision and Sustainable Agriculture”, with a focus on PA techniques, advanced agronomic technologies and practices.
- Spain: Polytechnic University of Valencia
  - Master “Agricultural Engineering”, with a focus on agricultural technologies.
- Portugal: Instituto Superior de Agronomia, University of Lisbon
  - Master “Agricultural Engineering”, with a focus on modern technologies and sustainable practices in agriculture.
- Croatia: University of Zagreb Faculty of Agriculture
  - Master “Digital Agriculture”, with a focus on digital technologies, data-driven decision-making and precision farming techniques.
- France: Institut Agro Montpellier
  - Master “Agricultural Engineering”, with a focus on digital agriculture.
- Luxembourg: University of Luxembourg
  - Master “Geography and Spatial Planning”, with a focus on sustainable transitions in the built environment.
- Germany: HSWT
  - Master “Digital Farming” (Freising), with a focus on smart agriculture systems, AI, robotics, and sensors.
  - Master “Green Digital Engineering” (Triesdorf), with a focus on sustainability, IoT, data analysis, and sensors.
- Austria: University of Natural Resources and Life Sciences, Vienna
  - University Continuing Education Program “Advanced technologies in smart crop farming”, with a focus on precision crop management, GIS, remote sensing, and robotics.
- Belgium: KU Leuven
  - Master “Agro- and Ecosystems Engineering”, with a focus on sustainability of agro-ecosystems, GIS, and modelling.
- Latvia: Latvia University of Life Sciences and Technologies
  - Master “Agricultural Engineering”, with a focus on agri-mechanical systems.
- Lithuania: Vytautas Magnus University Agriculture Academy
  - Master “Agronomy”, with a focus on crop protection and soil management.
- The Netherlands: Wageningen University & Research
  - Master “Geo-Information Science”, with a focus on spatial data and environmental science, GIS, remote sensing, and modelling.
- Czech Republic: Czech University of Life Sciences Prague
  - Master “Precision Farming”, with a focus on PA, AI, drones and sensors.
- Sweden: Swedish University of Agricultural Sciences



- Master “Agroecology”, with a focus on sustainability of farming and food systems.
- Finland: University of Helsinki
  - Master “Agriculture Sciences”, with a focus on plant production sciences, animal science, agrotechnology or environmental science.
- Estonia: Estonian University of Life Science
  - Master “Planning and analysis of Multifunctional Forestry”, with a focus on forestry, land management, Big data, remote sensing in forestry, and spatial analysis.
- Ireland: University College Dublin
  - Master “Digital Technology for Sustainable Agriculture”, with a focus on digital technology tools for data collecting, storage and analyses.
- Poland: Poznań University of Life Sciences
  - Master “Agronomy”, with a focus on environmental management, agrobiotechnology, and instrumental analyses.
- Denmark: University of Copenhagen
  - Master “Agriculture”, with a focus on plant science as well as production and environment.

The selected programs differ in content and approach toward agriculture-oriented education. In some countries, such as Sweden and Denmark the focus lies on sustainability aspects for example related to food production chain or plant science. On the other hand, countries like Ireland demonstrate a technology-oriented approach offering specialized courses such as MSc in environmental drone remote sensing. University College Dublin (UCD) offers an MSc in Digital Technology for Sustainable Agriculture, integrating data science and cutting-edge digital technology. MSc programmes that incorporate digital agriculture elements, in Austria (FHWN), Czech Republic (CULS), and Germany (HSWT) showing strong technological integration. Traditional agronomy-focused curricula (e.g., Lithuania) are less digitally embedded. Ukrainian MSc programme is highly technical and engineering-oriented, fulfilling standards of agroengineering training with room to expand its digital and sustainability components, while Georgian programmes offer a comprehensive agro-biological education, more grounded in ecological sustainability and research, aligning with broader agricultural sciences curricula. Some MSc programmes explicitly integrate PA elements, others focus more broadly on sustainable agriculture, agroecology, or related fields. Nonetheless the MSc programmes specifically titled PA are uncommon. Relevant topics are often embedded within broader agricultural curricula.

### **Pedagogical Approaches**

In terms of program modules certain universities offers compulsory modules completed with specialisation. In some universities students may for instance take a few of the modules on the MSc programme if are not able to attend the whole one. Programmes vary in the balance between theoretical vs applied learning.

Pedagogical approaches vary nonetheless practical experience is being prioritized.

- **Project-based Learning:** Almost all universities provide opportunities for internships and hands-on experience. Moreover, the universities of Bologna and Montpellier offer opportunities for international training by either providing networking activities, or chances of internship in international environments. Strongly present in HSWT (Germany), FHWN (Austria), WUR (Netherlands) with real-world applications and internships. The Agroecology Master’s Programme in SLU (Sweden) includes an Independent Project in Agricultural Science, allowing students to engage in research projects that may encompass precision agriculture topics.
- **Research Orientation:** All universities offer research orientation opportunities. Evident in KU Leuven (Belgium), WUR (Netherlands), and CULS (Czech Republic) master’s theses and collaborative research modules.



- **Practical Training:** Many programs offer practical training experience as students engage in field classes, study visits, and inspections. SLU (Sweden) emphasizes that their programme “is based on learning through experience”. Practical Skills Development through laboratory work, field studies, and workshops is also core of the program offered by the Estonian University for Life and Science. BOKU (Austria) emphasize hands-on labs and field modules.
- **E-learning Elements:** Limited integration, most courses remain face-to-face or hybrid with occasional digital components.

#### **Alignment with EU Educational Standards (e.g., Bologna Process)**

- **ECTS Compliance:** All programmes comply with ECTS structure.
- **Learning Outcomes:** Generally aligned with EQF level descriptors.

Structural alignment is consistent, but content adaptation for digital competencies is variable.

**Georgia’s programmes** are strong in foundational and sector-specific agricultural sciences, with deep practical and research components. However, they lag in integrating modern digital tools, PA, and sustainability as a cross-cutting theme. Despite GTU's diverse offerings in agriculture-related disciplines, none of the existing programmes sufficiently cover the full scope of PA. Therefore, Georgia needs a standalone MSc in PA that:

- is interdisciplinary, merging agronomy, environmental science, and data analytics,
- equips graduates with hands-on experience in digital tools like GIS, GPS, UAVs, remote sensing, sensors, and AI-based platforms,
- addresses sustainability and inclusivity, including smart solutions for smallholders, climate-smart agriculture, and gender-responsive innovation.

Such a programme would align Georgia with international trends, enhance its agricultural competitiveness, and empower future professionals to lead the country’s agricultural digital transformation in a sustainable way.

The considered **Ukrainian** MSc program "Precision Agriculture Systems" is aimed at training engineers for agricultural production. Despite the general compliance with the requirements of modern agricultural production, the analysis of the program revealed insufficient number of credits allocated to the components of professional training, lack of in-depth study of Big Data and artificial intelligence in PA, and limited use of modern digital platforms for agricultural data management. Therefore, Ukraine needs MSc programs in PA that:

- strengthen the practical component of training (increase the volume of professional training disciplines, in particular, practical classes with real machines and equipment; improve existing and create new training laboratories using modern technology and software),
- update educational modules on digital technologies (increase the scope of studying data analysis, machine learning and process automation; introduce educational cases using IoT devices in agriculture).

MSc programmes offered by **European** universities equip students with knowledge and skills to apply modern technologies to optimize agricultural production. Curricula combine several fields of study which include agronomy, data science, remote sensing, and GIS within the spatial decision support systems for enhancing the decision making in farming. Various universities in Europe address sustainable development issues related to environmental monitoring and the use of artificial intelligence in agriculture, including UK, Netherlands, Germany, Spain and other countries. Students are trained in the operation of advanced



tools in drones, sensors, and precision instruments which equip them for agricultural consultancy, research, and technological development. Therefore, Europe needs MSc programmes specifically focused in PA that:

- develop hands-on labs and field-based training using precision tools,
- train students to navigate regulatory frameworks and innovation pathways in agriculture,
- include core subjects in agronomy, soil science, crop physiology, and environmental science,
- integrate in more depth technology-driven modules such as, GIS and remote sensing, data analytics, machine learning, IoT, sensor systems in agriculture, robotics and automation in farming,
- offer specializations in regenerative agriculture and climate-smart farming,
- give emphasis on the EU Green Deal and CAP goals by integrating sustainable land management, water conservation, and carbon footprint reduction practices,
- teach programming basics (e.g., Python, R) for data analysis,
- include modules on funding opportunities and grant proposal development.

## 4.2. Recommendations for innovative curricula

The following recommendations are structured to address cross-cutting gaps identified in the Ukrainian and Georgian HEI ecosystems, while, in parallel, guiding the design of a flexible, modern and context-sensitive MSc programme in PA, which will be under the umbrella of WP4. All proposals derive from the comparative analysis in Sections 2, 3 and 4.1 and reflect best practices observed across European HEIs.

### 1. Integration of Digital Agriculture Modules

Future curricula should incorporate dedicated modules on Geospatial Data Science, UAV operations, and API-based data management, as these skills are severely underrepresented in Georgian and Ukrainian programmes (see Table 2, Section 2.2.2). In contrast, programmes such as the MSc in *Digital Technologies and Smart Infrastructure in Agriculture* at the Agricultural University of Athens (Greece) and the MSc in *Precision Farming* at Weihenstephan-Triesdorf University of Applied Sciences (Germany) embed these technologies in both coursework and practical assignments (Section 3.2.2).

### 2. Emphasis on Practical Training and Field-Based Learning

Curricula must adopt hands-on learning environments, including access to demo farms, simulator-based labs, and dual education schemes. This recommendation is in direct response to the lack of practical exposure highlighted in Ukrainian and Georgian HEIs (Section 2.2.2 – Field Research). The Austrian model, where universities partner with technology suppliers and co-develop precision demo farms, is a transferable best practice (Section 3.2.2).

### 3. Interdisciplinary and Modular Structure

Curricula should adopt a modular and interdisciplinary structure, allowing for the combination of agronomy, ICT, engineering, and sustainability components. While EU curricula, such as those in Slovenia and Finland, offer modular micro-credentials aligned with the Bologna Process, Georgian HEIs have not yet capitalised on this framework (Section 2.2.1). We recommend the development of elective blocks that allow vertical or horizontal specialisation in key areas such as AI agronomy or traceability systems.

### 4. Incorporation of Soft Skills and Entrepreneurial Competences

To address the weakness in soft skill development observed across all institutions (Section 2.2.2 – Field Research), the MSc programme should include modules on project management, communication, business model design, and entrepreneurship in agriculture. For instance, several European MSc programmes, such as the one offered by USAMV Bucharest (Romania), integrate “project development and management” as a core subject (Section 3.2.1).

### 5. Engagement with Industry and Innovation Ecosystems



Institutional partnerships with agri-tech firms, advisory services, and innovation hubs should be institutionalised. The lack of industry integration and employer-validated learning outcomes remains a key limitation in UA and GE (see Cross Country Synthesis in Section 2.2.2). Models from Germany and the Netherlands, where companies co-design modules or offer credit-bearing internships, are highly relevant (Section 3.2.2).

## 6. Infrastructure and Staff Upskilling

Given the infrastructure deficit and ageing faculty profile in both countries (Section 2.2.1), institutional reforms are needed to upgrade lab facilities (e.g., UAVs, RTK towers, licensed GIS software) and support academic staff training in digital agriculture. EU examples from Estonia and Sweden show that targeted investment in teaching infrastructure, coupled with sabbatical schemes and industry immersion, can catalyse pedagogical transformation.

## 7. Alignment with National and EU Policy Frameworks

Curricula must be designed in alignment with both national agricultural innovation strategies and broader EU frameworks such as the Green Deal, CAP 2023–2027, and Digital Education Action Plan. The inclusion of sustainability and climate-smart agriculture should be core, not peripheral, as highlighted in the Slovenian and Romanian programmes (Section 3.2.1).

These curriculum guidelines will serve as a reference framework, based on which the ReGrow Consortium will build upon in the context of WP4, where the design of a joint MSc curriculum will be co-developed and piloted, incorporating partner feedback and national accreditation constraints.

Finally, the following table (Table 6) provides a visual summary of the main curriculum development gaps, relevant EU best practices and proposed recommendations, as elaborated in the analysis above. It is intended to serve as a decision-support tool in the design phase of the ReGrow MSc curriculum (WP4).

**Table 6 – Curriculum gaps, EU best practices, and proposed recommendations**

Identified Gap	EU Best Practice	Proposed Recommendation	Reference Section
Lack of modules on UAVs, geospatial tools, APIs	MSc in Digital Agriculture (Greece, Germany) includes courses on UAVs and digital farm infrastructure	Integrate modules on UAVs, geospatial analytics, and digital infrastructures	Section 2.2.2; Section 3.2.2
Minimal hands-on experience, no demo farms	Austria: university-industry demo farms, dual education	Adopt demo farms, simulators, and industry-linked practical training	Section 2.2.2 (Field Research); Section 3.2.2
Non-modular and mono-disciplinary curricula	Slovenia/Finland: modular micro-credential-based structures	Develop interdisciplinary, modular curricula with elective specialisations	Section 2.2.1; Section 3.2.2
Weakness in soft skills and entrepreneurship training	Romania: project management and entrepreneurship integrated into curricula	Introduce modules on communication, project design, business modelling	Section 2.2.2; Section 3.2.1



Identified Gap	EU Best Practice	Proposed Recommendation	Reference Section
Low engagement with industry, no co-developed courses	Netherlands/Germany: employer-designed modules, internships	Institutionalise co-creation with agri-tech firms and credit-based placements	Section 2.2.2 (Cross Country); Section 3.2.2
Ageing staff and outdated infrastructure	Estonia/Sweden: upskilling schemes and infrastructure investments	Invest in teaching infrastructure and staff upskilling (sabbaticals, training)	Section 2.2.1; Section 3.2.2
Misalignment with EU and national policies	Romania/Slovenia: integration of Green Deal and CAP priorities	Align curricula with CAP, Green Deal and national innovation strategies	Section 4.1; Section 3.2.1



## 5. Conclusions

The mapping of the existed MSc programmes on PA offered by universities in Georgia, Ukraine, and European countries identified notable variations in curriculum design, specialization areas, and alignment with international standards. Additionally, it revealed a noticeable lack of MSc programmes that address the rapidly evolving domain of PA. Despite the increasing importance of digital technologies, data-driven decision-making, and sustainability in the agricultural sector, few academic offerings adequately prepare graduates to meet these challenges.

Existing Master's programmes remain fragmented, overly theoretical, and under aligned with the digital transformation currently underway in agriculture worldwide. HEIs still rely heavily on traditional classroom-based learning, with practical application of smart technologies such as drones, GIS, and AI systems rarely exceeding pilot level. Simultaneously, there is limited engagement with industry in curriculum design, which hampers the responsiveness of universities to evolving labour market demands.

The stakeholder consultations held during the focus groups in Georgia and Ukraine reveal a strong appetite for reform among educators, employers, and policymakers alike. Farmers and agri-businesses express frustration with graduates who lack essential digital and operational competencies, while academic staff acknowledge the urgency of modernising course content but lack access to adequate resources or training opportunities. Ministries of Education in both countries have explicitly identified dual education, equipment renewal, and interdisciplinary curricula as strategic priorities, yet implementation is inconsistent and slow. The future of agriculture in Ukraine and Georgia will be shaped not only by post-conflict recovery efforts or Europe integration trajectories, but critically by how well both countries are able to harness the potential of PA through modernised, inclusive, and innovation-driven higher education systems. The findings of this report make it abundantly clear that although isolated examples of excellence exist—such as specific modules on geoinformatics or partnerships with equipment providers—these are exceptions rather than the norm.

This report recommends a shift from sectoral, discipline-specific education towards an integrated, systems-based model of learning. This entails the urgent need to design a new, interdisciplinary MSc curriculum that integrates core principles of agriculture with cutting-edge technologies such as GIS, remote sensing, IoT, and data analytics, thereby equipping future professionals with the skills required for modern, efficient, and sustainable agricultural management. Crucially, such a programme must not exist in isolation: it should be embedded within a broader architecture of lifelong learning, stackable micro-credentials, and regional cooperation with vocational schools, SMEs, and farmer associations.

Infrastructure investment is equally essential. Without access to working drones, RTK-GNSS networks, cloud platforms for geospatial data analysis, and real-time IoT simulations, any theoretical module on PA risks remaining abstract and detached from professional practice. Joint university, industry demonstration farms, and mobile tech-labs should be established to serve not only university students, but also early-career professionals and farmers undergoing retraining.

Finally, reform must be both sustainable and inclusive. Curricula should be explicitly aligned with the goals of the EU Green Deal and Climate-Smart Agriculture, incorporating modules on environmental impact assessment, life-cycle analysis, and circular economy principles. Gender equity and rural youth participation should be mainstreamed into programme design, with outreach activities tailored to underrepresented regions and groups.

In sum, the development of a new generation of digitally skilled, environmentally conscious and entrepreneurially-minded agricultural professionals requires systemic, not incremental, change. This report provides the evidence base and roadmap for such a transformation.