Agricultural Drone Technology

AgroPro

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AgroPro Course Curriculum

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Course Overview

Introduction

The agricultural sector across Europe faces a broad array of challenges that threaten its stability. Diverse and heterogeneous risks are inherent in European agriculture, ranging from in-field impacts such as pest infestations that impact the livelihood of single farmers, to environmental factors that lead to production losses on a regional level and create volatile market states. Unoccupied Aerial Vehicles (UAVs, widely referred to as "Drones") are remotely piloted platforms that have become popular to agricultural professionals due to their flexibility in addressing various challenges within the sector. Nevertheless, leveraging on this new technology in an agricultural setting, requires that farmers, advisors or other relevant stakeholders across the agri-food chain become familiar and competent with the overall spectrum of these novel components related to their business and adopt a methodological approach and ways to efficiently implement and manage these tools. The AgroPro Course is going to respond to the emerging challenge of Farmers' resilience by equipping target groups with inclusive and innovative approaches based on methodologies and principles for the use of Drones in agriculture. The purpose of the AgroPro Course is to introduce European farmers to the concept of Risk Management, allowing them to improve their competences, perception, knowledge and skills in risk management and resilience.

The AgroPro Course will be divided into four (4) learning modules, which will be designed to fully cover the whole spectrum of knowledge and competence on Drones in agricultural operations and management. The course aims to provide agricultural professionals with a flexible self-directed approach to learning and its content will tailored to their needs and interests while also considering their educational background, digital literacy, skills and knowledge on the topic (modular structure). To this end, the contents of each Module will be adjusted based on the current level of trainees and the level they want to pursue by the end of the learning process, thus enabling two different "levels" of training materials each trainee can follow.

Learning objectives

- Learn about critical challenges throughout the European agricultural sector, and understand how Drones can assist in strengthening the overall resilience of the agri-food chain.
- Improve knowledge on the use of Drones and various payload sensors, building related skills.
- Enhance risk and disaster management preparedness in drone-related task planning, and enable the efficient implementation of risk mitigation strategies.
- Improve aptitude in data handling, (pre-) processing tasks and ultimately analysis of drone collected data through familiarisation with novel tools and data analysis pipelines.
- Maintain an up-to-date occupational profile following the latest regulatory changes.

Target Groups

The target groups that the AgroPro project focuses towards are the following:

Main target groups

- Small and medium individual farmers
- Agricultural cooperatives
- Agricultural consultants

- Employees at agri-food enterprises

Secondary target groups

- Academic personnel and students of European agricultural and engineering universities and research institutes
- Members of non-profit environmental organizations

Structure

The AgroPro course contains four individual modules, with each module being further divided into smaller submodules. The main objective of the course's structure is to enable an efficient and customizable route towards drone usage knowledge for each trainee, as they are redirected to relevant modules and/or submodules based on individual background and existing skills. The course covers all fundamental theoretical aspects of drone regulations, preparatory "good practices" and drone data acquisition, management and analysis. An overview of the structure can be seen below:

- Module 1 – Introduction to Critical Agricultural Challenges
- Module 2 – Drones and Aerial Sensors in Agriculture
- Module 3 – Flight Risk and Disaster Preparedness
- Module 4 – Regulatory Framework and Legislations across Europe

The materials that will be developed within each module and its respective submodules will include, but not be limited to online presentations, technical manuals, self-assessment quizzes and practical exercises, as well as any other multimedia (e.g. videos, article/publications, websites etc.) that the author of each module chooses to incorporate.

Content Details

Module 1 – Introduction to Critical Agricultural Challenges

Summary

Module 1 will serve as an introduction to several major challenges of the European agricultural sector. It will offer an overview of prevalent issues and challenges encountered in various production systems across the continent. Additionally, it will introduce the concepts of automation, efficiency, and safety associated with drone usage in addressing these challenges.

Resources/Medium

- Up to 40-50 presentation slides presented online

Aim and Learning Outcomes

Module 1 aims to help trainees learn about inherent threats or peculiarities of the agricultural sector, and teach them how Drones have the potential to tackle these challenges. To this end, the trainees will be introduced to several challenges and critical topics, such as limitations of traditional field scouting and surveying techniques, inherent variability instances in plant and soil conditions, challenges related to timely pest identification and treatment, difficulty in identifying treatment areas using a data-driven plan, optimizing resources, and differences in planting, tending, and harvesting techniques across crops.

Self-Assessment

5 questions in the form of a multiple choice/True-False quiz

Module 2 – Drones and Aerial Sensors in Agriculture

Summary

The 2nd Module will cover essential topics such as the role of Drones in crop monitoring, precision agriculture techniques, and the collection of aerial data for farm management. Trainees will learn how Drones equipped with various sensors, including thermal and multispectral cameras, can provide valuable insights into crop health, soil conditions, and pest infestations.

Resources/Medium

- Up to 40-50 presentation slides presented online

Aim and Learning Outcomes

By the end of this training Module, trainees will have achieved a comprehensive understanding of the fundamental principles behind drone technology and its applications in agriculture. To this end, they will learn about the various types of sensors used in aerial data acquisition, and understand their applications and advantages or disadvantages in various crop monitoring and management tasks. Additionally, trainees will acquire practical skills in operating Drones alongside their payload (sensors) for surveying operations, including flight planning, data acquisition, and data processing techniques. Furthermore, trainees will explore effective data acquisition strategies, such as flight path optimization and image analysis methods, to maximize the utility of aerial data in farm decision-making processes. Ultimately, trainees will be equipped with the knowledge and skills necessary to leverage Drones and numerous types of aerial sensing systems in agricultural tasks, promoting efficiency, safety and sustainability.

Self-Assessment

10 questions in the form of a multiple choice/True-False quiz

Module 3 – Flight Risk and Disaster Preparedness

Summary

Throughout the 3rd Module, trainees will develop a comprehensive understanding of the key factors contributing to flight risks, including environmental conditions, airspace regulations, and equipment malfunctions. They will also explore strategies for assessing and mitigating these risks to ensure safe and effective drone operations. Additionally, trainees will learn proactive disaster preparedness measures to safeguard both equipment and data in the event of emergencies such as adverse weather conditions or equipment failure.

Resources/Medium

- Up to 40-50 presentation slides presented online

Aim and Learning Outcomes

The objective of this Module is to enhance the capacity of trainees in identifying and mitigating potential risks associated with drone flights and their payload in agriculture. By the end of the module, trainees will be able to assess flight risks, implement safety measures (such as designing pre-flight checklists and risk registries), and prepare for emergencies in case a hazard occurs, ensuring safe and effective drone operations across various agricultural settings.

<u>Self-Assessment</u>

10 questions in the form of a multiple choice/True-False quiz

Module 4 – Regulatory Framework and Legislations across Europe

<u>Summary</u>

The 4th and final Module provides trainees with an understanding of the regulatory framework governing drone operations (both in agriculture but also civil usage) across Europe. Trainees will explore key regulations, legal requirements, and compliance standards necessary for conducting drone-based activities in agricultural settings. By the end of the module, trainees will be equipped with the knowledge to navigate legal complexities and ensure regulatory compliance in drone operations.

<u>Resources/Medium</u>

- Up to 40-50 presentation slides presented online

<u>Aim and Learning Outcomes</u>

This module aims to familiarize trainees with the regulatory landscape governing drone operations (primary) in agriculture across Europe, providing insights into legal requirements and compliance standards. By the end of Module 4, the trainees will have obtained the following capacity:

- Understand the regulatory framework governing drone operations in agriculture.
- Identify key regulations and legal requirements applicable to drone use in agricultural settings.
- Navigate legal complexities and ensure compliance with regulatory standards.
- Interpret and apply legislative guidelines to drone-based activities in agriculture.
- Develop strategies for maintaining regulatory compliance in drone operations within Europe.

<u>Self-Assessment</u>

10 questions in the form of a multiple choice/True-False quiz