



Agricultural Drone Technology Awareness Training for industry professionals

WP3 - A Competence Framework and Competence Assessment Indicators

1. Definitions

In this document, we shall adopt the following definitions:

EQF (European Qualifications Framework): A classification system based on learning outcomes for all types of qualifications, designed to facilitate the comparison of national qualification systems and frameworks across Europe. Its goal is to enhance the clarity and portability of qualifications across different countries and educational systems.

Knowledge: It is the result of absorbing information via learning. It encompasses the collection of facts, principles, theories, and methodologies relevant to a particular area of expertise or study. In the European Qualifications Framework context, knowledge is described as theoretical and factual.

Skill: Skills are the capacity to utilize acquired knowledge and expertise to accomplish tasks and address challenges. Within the European Qualifications Framework, skills are cognitive, logical, intuitive, and creative thinking, or practical, involving manual skills and using various methods, materials, tools, and instruments.

Competence: Competence is the demonstrated capability to effectively employ knowledge, skills, and personal, social, or methodological aptitudes within professional, academic, and personal developmental contexts. Within the European Qualifications Framework, competence is characterized by responsibility and autonomy.



Key competencies: Key competencies are essential skills needed for personal development, employability, social inclusion, sustainability, peaceful coexistence, health-conscious living, and active citizenship. They are developed throughout life via formal, non-formal, and informal learning in various settings.

Qualification: Qualification is the official result of an assessment and validation procedure, granted when a competent authority confirms that an individual has attained specific learning outcomes to predetermined standards.

Learning outcome: A learning outcome describes what a learner has acquired in terms of knowledge, understanding, and abilities upon completing a learning activity. It encompasses the learner's attainment of knowledge, skills, and competence.

Digital competencies: Digital competencies are the skills, knowledge, and attitudes needed to succeed in digital environments. They include digital literacy, communication, collaboration, critical thinking, cybersecurity awareness, and responsible digital citizenship.

Digital Education: Digital education involves the cultivation of digital competencies among both learners and educators and encompasses the pedagogical integration of digital technologies to enhance the processes of learning and teaching.

Drone technology: Drone technology involves the use of unmanned aerial vehicles (UAVs) equipped with cameras and sensors for tasks like surveillance, photography, mapping, and delivery across various industries. In agriculture, drone technology employs unmanned aerial vehicles (UAVs) with cameras and sensors to monitor crops, soil, and field conditions, enabling farmers to optimize operations and increase yields.

2. Introduction

Part of the project «AgroPro - Agricultural Drone Technology Awareness Training for Industry Professionals», co-funded by Erasmus+ under the Vocational Education and Training sector, is the preparation of the Work Package with the topic «Competence Framework and Competence Assessment Indicators». Partner countries for the project are Greece, Cyprus, and Portugal.



The EU agriculture and food sector, employing over 44 million, faces challenges like extreme weather. Drones offer solutions for boosting productivity with precise soil analysis, crop monitoring, and health tracking. However, skill shortages hinder adoption. The AgroPro project aims to bridge this gap by educating and supporting professionals in drone use, thus connecting them to growing job opportunities in this evolving market.

This document outlines the integration of competencies from various frameworks into the AgroPro Competencies Framework. It acknowledges the diversity of existing frameworks across Europe, focusing on five relevant systems. The framework will primarily draw from the e-CF and DigComp frameworks, aiming to align with DigComp2 for sustainability. It will be tailored to specific stakeholders, facilitating pilot programs and long-term impact.

Within this context, in the following chapters, the discussed topics are:

- The approach of the e-Competence Framework (e-CF).
- The approach of the DigiComp Framework 2 (DigiComp2).
- The DigiComp in the VET environment.
- The identified DigiCompEdu competencies for the development of the AgroPro Framework.
- The AgroPro Framework for VET teachers and students.
- What professions apply to the selected competencies for the AgroPro framework?
- In which professions related to VET teachers/trainers, the AgroPro Competence Framework is applicable?

3. The European e-Competence Framework (e-CF)

The European e-Competence Framework (e-CF) establishes a common language for competencies, skills, and proficiency levels at the European level. Competencies in the e-CF are organized according to Information and Communication Technology (ICT) business areas and are related to the European Qualifications Framework (EQF). Developed by experts and stakeholders and maintained by the European Committee for Standardization Technical Committee 428 (CEN/TC-428) on ICT Professionalism and Digital Competencies, the e-CF classifies 40 competencies relevant to ICT professionals.

These competencies are organized into five ICT business areas: Plan, Build, Run, Enable, and Manage. Each competency is mapped to one of these areas,



providing a clear structure for understanding the skills required in various ICT roles.

Aligned with the European Qualifications Framework (EQF), the e-CF ensures consistency and compatibility with broader European standards for qualifications and competencies. It is a valuable resource for developing the European Skills, Competencies, Qualifications, and Occupations (ESCO) framework.

The e-CF's standardized language facilitates communication and understanding among professionals, employers, educators, and policymakers across Europe. It is utilized by the Sectoral Reference Group for ICT service activities to define specific competencies and skill requirements within the sector.

3.1 The 4 Dimensions of e-CF

The structure of the European e-Competence Framework is based on four dimensions.

Dimension 1: 5 e-Competence areas, derived from the ICT business processes
PLAN - Encompasses strategic planning, architecture, and service management
BUILD - Covers system and software development, deployment, and implementation.

RUN - Focuses on service operation and user support.

ENABLE - Includes areas that support the other dimensions, such as training, improvement, and communication.

MANAGE - Relates to governance, project, and service management.

Dimension 2: A set of e-competences for each area; It includes: i) the competence title, ii) a general description, iii) requirements per e-CF level, iv) knowledge examples, and v) skills examples.

Dimension 3: Attribution of the e-competencies at one of the 5 levels corresponding to EQF levels 3-8.

Each Competence is attributed to one of five e-CF levels, which correspond to the European Qualifications Framework (EQF) levels 3 to 8.

1. Level 1 (EQF 3): Basic level, requiring basic knowledge and skills.
2. Level 2 (EQF 4): Intermediate level, involving some autonomy and responsibility.
3. Level 3 (EQF 5): Advanced level, with comprehensive skills and partial supervision.
4. Level 4 (EQF 6): Expert level, involving full autonomy and responsibility.



5. Level 5 (EQF 7-8): Mastery level, requiring high-level expertise and leadership.

Dimension 4: Samples of knowledge and skills for each e-competence.

EQF LEVEL 8	ACADEMIC LEVEL	DOCTORATE	MAINTENANCE MANAGERS AND SUPERVISORS, VOCATIONAL TEACHERS
EQF LEVEL 7		MASTER	
EQF LEVEL 6	POST UPPER SECONDARY LEVEL	BACHELOR	
EQF LEVEL 5		HIGHER NATIONAL DIPLOMA	MAINTENANCE TECHNICIANS
EQF LEVEL 4	UPPER SECONDARY LEVEL	HIGHER NATIONAL CERTIFICATE, UPPER SECONDARY DIPLOMA	MAINTENANCE MECHANICS
EQF LEVEL 3	SECONDARY LEVEL	SECONDARY DIPLOMA OR VOCATIONAL DIPLOMA	
EQF LEVEL 2	PRIMARY LEVEL	SECONDARY SCHOOL WITH NO DIPLOMA	
EQF LEVEL 1		PRIMARY SCHOOL	

4. The European Digital Competence Framework

DigComp provides a standardized framework that enables the assessment of digital competence across various domains, including agriculture. DigComp is widely recognized and adopted by various organizations, educational institutions, and policymakers. By leveraging DigComp, we ensure that our work aligns with recognized guidelines and best practices in evaluating digital skills and competencies.

4.1 The 5 areas of DigiComp2

The DigComp framework is divided into 5 different modules, which are the following:

1. Information and Data Literacy:



Information and data literacy involves the ability to express information needs and effectively locate and retrieve digital data, information, and content. It also entails the skill of evaluating the relevance and credibility of sources and their content. Additionally, being able to store, manage, and organize digital data, information, and content is crucial for efficient use and retrieval.

2. Communication and Collaboration:

Communication and collaboration in digital environments are essential skills, encompassing the ability to interact, communicate, and collaborate using various digital technologies. It is important to be mindful of cultural and generational diversity while engaging in digital interactions. Active participation in society through public and private digital services, along with practicing participatory citizenship, enables individuals to contribute effectively to their communities. Managing one's digital presence, identity, and reputation is also an important aspect of this competency.

3. Digital Content Creation:

Digital content creation involves the creation and editing of various forms of digital content, such as documents, images, videos, and presentations. This competency also encompasses the skill of improving and integrating information and content into an existing body of knowledge while adhering to copyright and licensing guidelines. Furthermore, understanding how to provide clear and understandable instructions for computer systems is crucial for effective digital content creation.

4. Safety:

Safety in digital environments encompasses several aspects. It involves protecting devices, content, personal data, and privacy from unauthorized access or malicious activities. Additionally, individuals need to be mindful of their

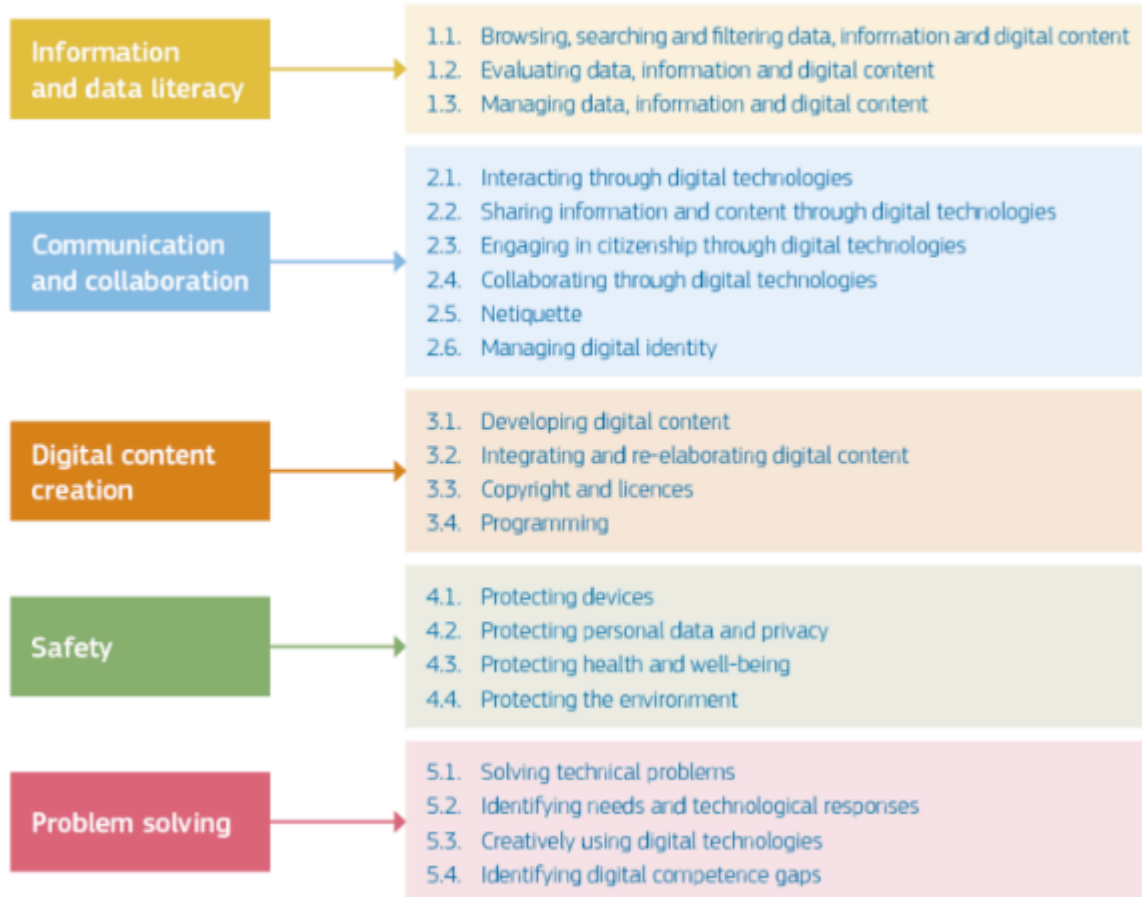


physical and psychological well-being while engaging with digital technologies. Being aware of digital technologies that promote social well-being and social inclusion is important. Lastly, understanding the environmental impact of digital technologies and making responsible choices regarding their use contributes to this competency.

5. Problem Solving:

Problem-solving in digital environments involves the ability to identify and address needs and problems effectively. This competency includes resolving conceptual problems and tackling problem situations using digital tools and resources. Utilizing digital tools for innovation helps individuals find creative solutions and improve processes and products. Keeping up to date with the digital evolution and being open to continuous learning is essential for adapting to new challenges and advancements in the digital realm.





4.2 Selection of DigiComp2 competencies for the development of AgroPro Framework

DigComp offers a comprehensive set of descriptors for digital competence, encompassing the knowledge, skills, and attitudes necessary for individuals to effectively operate in a digital society. There is an association between the DigComp categories and the digital competencies required for utilizing drones in agricultural practices, for this reason, the framework has been deployed for the design of our preliminary survey to ensure that all relevant aspects of the topic are covered.



AgroPro uses this well-established framework to enhance the credibility of the outputs and ensure that our assessment aligns with existing initiatives in digital competence development.

As previously mentioned, when developing the questions for the third block, careful consideration was given to the DigComp framework. The aim was to align the questions with the competencies outlined in DigComp to assess the respondent's technological skills and knowledge.

The following table demonstrates the alignment of the DigComp Areas with the topics addressed in the AgroPro exploratory analysis of professionals' needs in skills acquisition and training.

DigComp module	Questions starting with "Future agriculture professionals will need to be able to...":
1	Identify current and potential Drone applications in agriculture
1	Identify the relevant drone data for agriculture
1	Access and retrieve data from drones
1	Perform the interpretation and evaluation of drone data
1	Transform raw data into agricultural process variables
1	Routinely organize drone data in a structured environment
2	Easily operate the drone and its adjustments to weather conditions and mission
2	Share information retrieved from a drone through a variety of appropriate tools with the data restrictions that apply
2	Communicate the benefits and engage other agricultural professionals in drone use
2	Use digital tools and platforms to share data with agricultural stakeholders
2	Adapt communication strategies to an audience so that I can explain a drone implementation plan



2	Explain the more appropriate ways to protect stakeholders' identity
3	Indicate software and tools to create, edit, and analyze drone footage and/or data
3	Integrate and re-elaborate different data into interactive formats
3	Understand how licenses and regulations apply to drone usage and data
3	To list instructions for drone software so that the program provides the desired results
4	Select certain safety and security measures to protect organizations and drone integrity
4	Differentiate risks and threats for drone software and tools
4	Take actions to be fully GDPR compliant in deploying Drones
4	Manage and store drone data securely
4	Design services with no human health and well-being damage from Drone use
4	Explain and design services that ensure minimum environmental impacts of drones in agriculture
5	Maintain and troubleshoot drone hardware and software in agriculture
5	Identify drone technologies applied in agriculture available in the market.
5	Identify organizational needs and suitable technologies to satisfy them
5	Quickly list the benefits and concerns of drone deployment in agriculture.
5	Identify tools and software that can be innovatively used with drones to solve problems in agriculture
5	Self-diagnose and update on competencies required for them and other agro-drone professions
-	Be aware of national legislation and regulations on drone deployment



-	Hold a certification to be able to use drones in agriculture
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6. Applying competencies for the AgroPro Framework to VET teachers and students

6.1 Selection of relevant professions according to ESCO

The European Skills, Competences, Qualifications, and Occupations (ESCO) framework acts as a comprehensive taxonomy that delineates, identifies, and classifies professional occupations and associated skills relevant to the European Union (EU) labour market and education and training systems. ESCO facilitates improved communication between employers, educators, and job seekers by standardising terminology and classifications across sectors. Within the scope of the AgroPro framework, ESCO is utilised to pinpoint the professions that necessitate specific competencies in drone technology and precision agriculture. To determine the professions relevant to the AgroPro competencies, we employed a systematic methodology focused on professions that blend agricultural expertise with advanced technological applications, particularly drone technology. This selection process involved a detailed review of the ESCO classification system to ensure alignment with the competencies outlined in the AgroPro framework.

The identified professions include:

- **Agricultural Technicians ([ISCO 3142](#))**
 - Competencies: Precision farming techniques, drone operation and management, agricultural data collection, and analysis.
 - Rationale: These professionals utilise technological tools, including drones, to enhance agricultural productivity and efficiency. Their role involves the implementation of innovative farming practices and the analysis of agricultural data to inform decision-making.
- **Field crop and vegetable growers ([ISCO 6111](#))**
 - Competencies: Crop health monitoring, pest management using drones, soil analysis, and nutrient management.
 - Rationale: These workers are integral to the day-to-day operations of crop production, and the adoption of drone technology enhances their ability to monitor crop conditions and implement timely interventions.



- **Agricultural and Forestry Production Managers** ([ISCO 1311](#))
 - Competencies: Strategic planning, resource allocation, large-scale implementation of drone technology, and regulatory compliance.
 - Rationale: Managers in this field are responsible for overseeing agricultural operations, making strategic decisions, and ensuring compliance with industry standards and regulations. Drones provide them with accurate data to optimize production processes.
- **Agricultural Machinery Operators** (Mobile farm and forestry plant operators) ([ISCO 8341](#))
 - Competencies: Operation and maintenance of agricultural machinery, including drones, troubleshooting technical issues, and ensuring optimal equipment performance.
 - Rationale: These operators need to be skilled in handling various types of machinery, and the integration of drones into their toolkit requires specific technical expertise.

Each of the identified professions aligns closely with the core competencies outlined in the AgroPro framework. For instance, Agricultural Technicians require proficiency in drone operation and data analysis, which are fundamental to precision farming. Crop Production Workers benefit from drone technology through improved pest management and crop monitoring, enhancing their traditional agricultural skills with advanced technological capabilities. Agricultural and Forestry Production Managers use drones to gather strategic data for planning and resource management, thus integrating technology into high-level decision-making processes. Agricultural Machinery Operators must be adept at maintaining and troubleshooting drones, ensuring that these tools are used effectively within agricultural operations. This careful alignment ensures that the AgroPro framework comprehensively addresses the competency needs of modern agricultural professions.

7. Aligning AgroPro competencies to ESCO professionals related to VET teachers and trainers

Aligning the AgroPro competencies with ESCO professions related to VET teachers and trainers is essential for modernising vocational education. This alignment ensures that VET programs remain relevant and are equipped to meet the current technological and agricultural advancements. By doing so, it provides professionals with the necessary skills and knowledge to be prepared for the demands of the contemporary agricultural sector.

The AgroPro framework identifies critical competencies necessary for the effective integration of drone technology in agricultural practices. Mapping these



competencies to relevant ESCO professions ensures that VET teachers and trainers can incorporate them into their teaching curricula, thereby enhancing educational outcomes. The following table illustrates the mapping of AgroPro competencies to specific ESCO professions relevant to VET teachers and trainers:



Type	AgroPro Competencies	ESCO Professions
Transversal competence	Working with numbers and measures	Agricultural Technicians (ISCO 3142), Crop Production Workers (ISCO 6111), Agricultural Machinery Operators (ISCO 8341), Agricultural and Forestry Production Managers (ISCO 1311)
Transversal competence	Working with digital devices and applications	Agricultural Technicians (ISCO 3142), Crop Production Workers (ISCO 6111), Agricultural Machinery Operators (ISCO 8341), Agricultural and Forestry Production Managers (ISCO 1311)
Transversal competence	Processing information, ideas and concepts	Agricultural Technicians (ISCO 3142), Crop Production Workers (ISCO 6111), Agricultural Machinery Operators (ISCO 8341), Agricultural and Forestry Production Managers (ISCO 1311)
Transversal competence	Taking a proactive approach	Agricultural Technicians (ISCO 3142), Crop Production Workers (ISCO 6111), Agricultural Machinery Operators (ISCO 8341), Agricultural and Forestry Production Managers (ISCO 1311)
Transversal competence	Maintaining a positive attitude	Agricultural Technicians (ISCO 3142), Crop Production Workers (ISCO 6111), Agricultural Machinery Operators (ISCO 8341), Agricultural and Forestry Production Managers (ISCO 1311)
Transversal competence	Demonstrating willingness to learn	Agricultural Technicians (ISCO 3142), Crop Production Workers (ISCO 6111), Agricultural Machinery Operators (ISCO 8341), Agricultural and Forestry Production Managers (ISCO 1311)
Agricultural competence	Pest identification	Crop Production Workers (ISCO 6111)
Agricultural competence	Identify plant conditions	Crop Production Workers (ISCO 6111)
Agricultural competence	Identify soil conditions	Agricultural Technicians (ISCO 3142), Crop Production Workers



		(ISCO 6111)
Agricultural competence	Identify areas that need treatment	Agricultural Technicians (ISCO 3142), Agricultural and Forestry Production Managers (ISCO 1311), Crop Production Workers (ISCO 6111)
Agricultural competence	Field monitoring	Agricultural Technicians (ISCO 3142), Agricultural and Forestry Production Managers (ISCO 1311), Crop Production Workers (ISCO 6111)
Agricultural competence	Cost control	Agricultural Technicians (ISCO 3142), Agricultural and Forestry Production Managers (ISCO 1311), Crop Production Workers (ISCO 6111)
Agricultural competence	Resources reduction	Agricultural and Forestry Production Managers (ISCO 1311)
Agricultural competence	Identify weed, insect, and disease issues	Crop Production Workers (ISCO 6111)
Agricultural competence	Familiarity with different crops, their planting, tending, and harvesting techniques	Agricultural Technicians (ISCO 3142), Crop Production Workers (ISCO 6111)
Agricultural competence	Safety regulations on farms	Agricultural and Forestry Production Managers (ISCO 1311)
Agricultural competence	Organise product transport	Agricultural Technicians (ISCO 3142), Crop Production Workers (ISCO 6111)
Drones competence	Safety protocols and regulations related to drone operations	Agricultural Technicians (ISCO 3142)
Drones competence	Checking weather conditions	Agricultural Technicians (ISCO 3142)
Drones competence	Adjusting sensors	Agricultural Technicians (ISCO 3142), Agricultural Machinery



		Operators (ISCO 8341)
Drones competence	Identifying drone models and know how to operate them	Agricultural Technicians (ISCO 3142), Agricultural Machinery Operators (ISCO 8341)
Drones competence	Ensuring proper certification	Agricultural Technicians (ISCO 3142), Agricultural and Forestry Production Managers (ISCO 1311)
Drones competence	Knowledge of technical terms	Agricultural Technicians (ISCO 3142), Crop Production Workers (ISCO 6111)
Drones competence	Knowledge of how and what data to collect	Agricultural Technicians (ISCO 3142), Crop Production Workers (ISCO 6111)
Drones competence	Knowledge of different camera types and their output	Agricultural Technicians (ISCO 3142), Crop Production Workers (ISCO 6111)
Drones competence	Knowledge of flight limitations	Agricultural Technicians (ISCO 3142), Crop Production Workers (ISCO 6111)
Drones competence	Identifying areas of operation	Agricultural Technicians (ISCO 3142)
Drones competence	Preparing and understanding a flight plan	Agricultural Technicians (ISCO 3142)
Drones competence	Check equipment conditions	Agricultural Technicians (ISCO 3142), Agricultural Machinery Operators (ISCO 8341)
Drones competence	Avoiding possible hazards	Agricultural Technicians (ISCO 3142)
Drones competence	Performing basic maintenance	Agricultural Technicians (ISCO 3142), Agricultural Machinery Operators (ISCO 8341)



Drones competence	Using specific data treatment software	Agricultural Technicians (ISCO 3142)
Drones competence	Identifying and interpreting software reports	Agricultural Technicians (ISCO 3142)
Drones competence	Identifying problems that arise and solving them	Agricultural Technicians (ISCO 3142)
Drones competence	Relating with stakeholders	Agricultural Technicians (ISCO 3142), Crop Production Workers (ISCO 6111), Agricultural Machinery Operators (ISCO 8341), Agricultural and Forestry Production Managers (ISCO 1311)
Drones competence	Comply with regulations	Agricultural Technicians (ISCO 3142), Crop Production Workers (ISCO 6111), Agricultural Machinery Operators (ISCO 8341), Agricultural and Forestry Production Managers (ISCO 1311)
Drones competence	Extract drone data	Agricultural Technicians (ISCO 3142)
Drones competence	Transfer drone data	Agricultural Technicians (ISCO 3142)



Aligning AgroPro competencies with ESCO professions has profound implications for VET education. This alignment ensures that educators are not only up-to-date with the latest technological advancements but also capable of imparting these competencies to their students. It supports the integration of digital and technological skills and competencies into traditional agricultural education, fostering a more innovative and efficient agricultural sector.

For instance, VET teachers and trainers equipped with knowledge of drone technology can offer practical training sessions on drone operations, data analysis, and the application of these technologies in agriculture. This hands-on experience is invaluable for students, preparing them for real-world scenarios and enhancing their employability. Additionally, understanding safety protocols and regulatory compliance ensures that students are well-versed in the legal and ethical aspects of using drone technology in agriculture.

By embedding these competencies into the VET curriculum, educators can provide a comprehensive education that combines traditional agricultural practices with modern technological skills. This approach enhances the employability of VET graduates and contributes to the overall advancement of the agricultural sector by introducing the adoption of technologies such as drones. This alignment ultimately bridges the gap between educational outcomes and industry needs, ensuring that the workforce is well-prepared to tackle the challenges and opportunities of precision agriculture.

8. References

“DigComp Framework.” Joint-Research-Centre.ec.europa.eu, https://joint-research-centre.ec.europa.eu/digcomp/digcomp-framework_en. Accessed 3 July 2024.

“DigCompEdu.” Joint-Research-Centre.ec.europa.eu, https://joint-research-centre.ec.europa.eu/digcompedu_en. Accessed 3 July 2024.

“JRC Publications Repository.” Publications.jrc.ec.europa.eu, <https://publications.jrc.ec.europa.eu/repository/handle/JRC107466>. Accessed 3 July 2024.

“Vocational Education Teachers.” Esco.ec.europa.eu, <https://esco.ec.europa.eu/en/classification/occupation?uri=http://data.europa.eu/esco/isco/C232>. Accessed 3 July 2024.



“Agricultural Technicians.” Esco.ec.europa.eu, <https://esco.ec.europa.eu/en/classification/occupation?uri=http://data.europa.eu/esco/isco/C3142>. Accessed 3 July 2024.

“Agricultural Technicians.” Esco.ec.europa.eu, <https://esco.ec.europa.eu/en/classification/occupation?uri=http://data.europa.eu/esco/isco/C6111>. Accessed 3 July 2024.

“Agricultural Technicians.” Esco.ec.europa.eu, <https://esco.ec.europa.eu/en/classification/occupation?uri=http://data.europa.eu/esco/isco/C1311>. Accessed 3 July 2024.

“Agricultural Technicians.” Esco.ec.europa.eu, <https://esco.ec.europa.eu/en/classification/occupation?uri=http://data.europa.eu/esco/isco/C8341>. Accessed 3 July 2024.