Developing skills for introducing circular business models and digital technologies in olive oil sector

Deliverable 2.5
Guidelines for revising and/or developing professional profiles and qualifications

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Guidelines for revising and/or developing professional profiles and/or qualifications

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1. INTRODUCTION

1.1 About the project

The project "CIRCOLIVE - Developing skills for introducing circular business models and digital technologies in olive oil sector" (hereinafter CIRCOLIVE) aims to support the EU transition to the CE by improving/enhancing the circular business skills in the olive oil sector in Greece, Portugal, Italy, Spain, and Croatia in order to promote the adoption of circular entrepreneurial models for waste and by-product valorization of the whole olive oil value chain.

More specifically, it aims at:

1. Boosting adaptation of VET provision to emerging circular business skills needs by designing transnational curricula. This is important in shaping VET system responses to cope with CE transition of the olive sector.

2. Building small operators' skills on the implementation of circular business models and on deep tech domains in agrofood sector, and stimulating a sense of initiative entrepreneurial attitudes and mind-sets across the olive oil value chain, enabling them to become innovative and more competitive e.g. launching new services/products etc.

3. Facilitating the flow and co-creation of knowledge between higher education and vocational and training, research, the public sector and the business sector and/or other stakeholders, in Greece, Portugal, Italy, Spain, and Croatia to support/promote the development and implementation of holistic circular business models for olive waste and by-product valorisation for the transition of the olive oil sector to CE.

1.2. Purpose and objectives of the deliverable

The purpose of this deliverable is to provide comprehensive guidelines for revising and/or developing professional profiles or qualifications aimed at addressing the skills gaps identified in relation to the circular economy transition in the olive oil sector. Based on the findings from the research conducted under D2.3, which includes desk and field research on current and future skills needs across Greece, Portugal, Italy, Spain, and Croatia as well as the insights from D2.4, the Comparative Report on skills levels for the transition to a circular economy, this deliverable will outline a set of common guidelines for enhancing professional profiles in the countries involved. Based on the results, these guidelines will specifically focus on circular olive waste and by-product valorisation, ensuring that they align with the emerging needs of the sector and provide a strong foundation for future skill development. They will be drafted as a common framework, which will then be the base for the design of the transnational curricula.

The primary objective of this deliverable is to establish a clear set of professional profiles that will serve as the reference for the design and implementation of training programmes (Work packages 4 and 5) aimed at fostering the necessary skills in the olive oil sector to support the transition to a circular economy.

We highlight that based on the application these training programmes will target:

1. **350 Youngsters** on the topic of:

- Circular business skills in the olive oil sector, focusing on entrepreneurial mindsets and digital technologies (Duration: 40 hours).

2. **250 Employees/Entrepreneurs** on the topics of:
    - Circular business models and entrepreneurial mindsets across the value chain (Duration: 20 hours).
    - Deep tech domains in the agri-food sector (Duration: 20 hours).

By identifying these professional profiles, the deliverable will provide a strategic approach to bridging the skills gap in the olive oil sector transversally in the 5 countries involved, facilitating the adoption of circular business models and driving the industry toward a more sustainable and competitive future.

2. SKILLS GAPS AND NEEDS IN PROFESSIONAL PROFILES

2.1. Analysis of existing profiles and identification of gaps

Based on the findings of the research activities carried out under Tasks 2.1 and 2.2—specifically detailed in Deliverables 2.3 and 2.4—project partners conducted an **in-depth analysis of existing professional profiles within the olive oil sector** across the five participating countries (Italy, Spain, Portugal, Greece, and Croatia).

The following section presents a country-by-country overview of the skills gap analysis conducted by each partner, as outlined in Deliverables D2.3 and D2.4. Each national analysis explores the current professional profiles in the olive oil sector, identifies key gaps in competences related to circular economy practices, and highlights the specific needs and priorities emerging within each context. This comparative perspective provides valuable insights into both shared challenges and country-specific opportunities for capacity building in the transition toward circular olive oil production.

Greece

The Greek olive oil sector is one of the most important industries in the country and like many traditional sectors, it faces challenges related to modern business practices. Most of the olive oil producers in Greece are **small family-owned businesses with deep-rooted traditions in olive cultivation and oil extraction**. These producers typically possess strong expertise in agricultural practices, olive tree cultivation, harvesting, and oil production, but they often lack advanced business and marketing skills necessary for scaling up their operations. Although many of them have already adopted circular economy practices, such as waste reduction and by-product valorization, usage of eco-friendly packaging materials, renewable energy and techniques to reduce carbon footprint, there still exist stakeholders along the olive oil value chain that **lack sufficient awareness of circular economy principles** and how they can be integrated into their operations.

Among the challenges that the sector needs to face in order to incorporate a circular economy model the most crucial are financial constraints, limited knowledge of circular economy principles and lack of regulatory incentives. There is unfortunately limited specialized knowledge among many stakeholders in Greece, especially in relation to advanced technologies for waste recycling and resource recovery. There is thus a **need for more specialized training and support** for olive growers, mill owners, and entrepreneurs in circular business practices, especially at the rural or small-scale level.

Access to funding for circular initiatives also remains a significant challenge. Many small to medium-sized enterprises in the olive oil sector lack the capital to invest in technologies that support circularity. There is therefore a **need for financial instruments** (such as loans, grants, subsidies) that can incentivize the adoption of circular business models and help the sector's transition to more sustainable practices.

The Greek government and the EU have policies in place to encourage sustainability in agriculture, but specific policies targeting circular business models in the olive oil sector

remain still scarce.

Finally, although olive oil consumers in Greece increasingly care about the quality of the products they purchase, their awareness of circularity in the olive oil sector is still relatively low, and there is a limited consumer-driven demand for more sustainable practices and products. Entrepreneurs could benefit from more educated consumers who are actively seeking circular products and are willing to pay a premium for them.

Portugal

The most common professional profiles in the olive oil sector in Portugal are **- Agricultural Production Manager**. Despite the lack of specialised professionals in circular economy, there has been a great effort from the sector to implement some circular and sustainable practices and, for this reason, most of the respondents, representative of the olive oil sector, answered that they consider they have **good skills and knowledge about circular economy**, or acceptable skills, as well as knowledge about circular economy. The skills they consider to be the most likely to contribute to the sector's transition are : knowledge of **how to recover waste and by-products** and specialised knowledge of sustainable resource management.

Despite the previous indication from the respondents to the questionnaire and interviews with experts in the olive oil agri-food sector, they also identified the following skills gaps in professional profiles: limited knowledge of circular economy principles, i.e., a number of professionals in the sector do not have a fundamental understanding of how to carry out the transition from linear to circular production models; lack of technical skills for sustainable product methods; shortage of marketing and communication skills related to sustainability; lack of regulatory incentives; financial constraints as the main barrier to the transition to the circular economy and limited funding opportunities with regard to sustainable technology investment, especially for micro and small companies.

Italy

According to the questionnaires administered to representatives of the olive oil supply chain, the most common professional profiles in the field and at the mill are primarily olive mill operators and agriculture product managers. Due to the l**ack of professionals specializing in the circular economy**, none of the respondents considered their company to have excellent knowledge of circular economy principles. This clearly highlights the absence of a dedicated role within the ecosystem of olive groves and mills to facilitate the implementation of circular practices.

According to olive growers and millers, regarding emerging professions considered crucial for the sector’s transition to a circular economy, the highest-ranked role is **waste valorization engineering**, further emphasizing the significance of waste management in the olive oil industry. This is followed by sustainability consultants, professionals in new product development, supply chain specialists for green logistics, and legal advisors on environmental regulations. Consistently with this trend, digital skills seem to be of lesser relevance, as the role of data analysts for sustainable agriculture was selected only 12.1% of the time, suggesting that the sector is not yet fully prepared or particularly inclined to prioritize digitalization in the implementation of circular economy practices.

Spain

The Spanish olive oil sector is evolving towards circular economy practices, yet there are notable gaps in professional skills related to entrepreneurship, digitalization, and deep tech applications. Existing profiles include agricultural production managers, agronomists, environmental engineers, oil mill operators, logistics managers, quality control officers, researchers, food technologists, and waste treatment engineers. However, these roles often lack structured training in circular business models and sustainability-driven entrepreneurship, limiting the adoption of innovative strategies.

In terms of digital technologies, Small and medium-sized enterprises (SMEs) particularly struggle with digital monitoring tools and sustainability reporting, which are crucial for integrating circular economy practices. Most professionals have minimal expertise in precision farming, data analytics, and digital sustainability monitoring. Traditional methods remain dominant, and digital tools for circular economic applications are underutilized. This gap is particularly relevant for logistics and quality control roles, where blockchain and AI-driven traceability solutions could enhance efficiency and sustainability compliance.

Regarding deep tech applications in the agri-food sector, professionals in food technology, packaging, and waste management lack advanced knowledge in AI, automation, and blockchain for supply chain optimization. Waste valorization is a critical challenge, yet expertise in bio-based solutions and circular innovations remains limited.

Deep tech adoption remains limited, with few specialists in AI, blockchain, or smart farming technologies. The sector lacks agricultural data analysts and experts in digital agriculture, which are essential for optimizing resource use and implementing predictive analytics. Financial constraints and a lack of training in advanced technologies further hinder the adoption of innovative solutions.

Croatia

Occupations that participated in CIRCOLIVE research (D2.3 – Croatia) from the Croatian olive oil sector represent diverse professions such as agricultural production managers, agronomists, and sales and marketing managers. The lowest representation included researchers, scientists, and oil mill operators. Additionally, agronomists, quality control managers, and higher education professors contributed insights on vocational education and training (VET).

Based on the research results (D2.3 – Croatia), the primary barriers to transitioning to a circular economy include financial constraints limiting investments in infrastructure and technologies. Additionally, respondents emphasized the need for stronger regulatory incentives. Half of the participants identified low market demand for sustainable products as a major challenge. Other gaps include limited knowledge of circular economy principles, insufficient understanding of renewable energy technologies, inadequate marketing and communication skills, and a lack of innovation and technical expertise for sustainable production.

Interestingly, respondents did not view a lack of entrepreneurial mindset as a limitation, indicating their readiness to innovate. Digital skills were also not seen as a significant barrier. Instead, experts highlighted financial constraints as the primary obstacle, preventing

investments in sustainable solutions like solar panels and wastewater processing technologies.

2.2. Key competencies required for circular economy roles

This chapter presents the **key competences required for emerging roles in circular business management within the olive oil sector**, based on survey data collected across the five countries—Spain, Italy, Greece, Portugal, and Croatia—as detailed in Deliverable D2.3. The findings highlight a strong consensus across countries on the importance of technical, environmental, and innovation-driven skills to support the transition to a circular economy.

Among the most widely recognised competences across all five countries is **by-product and waste management**, identified as essential by a significant majority of respondents, particularly in Croatia (93.3%), Portugal (86.4%), and Greece (85.0%). Producing sustainable products and developing waste management processes were also highlighted consistently, reflecting a shared prioritisation of sustainability and resource efficiency. In addition, skills such as renewable energy integration, creative thinking, and entrepreneurial mindset were acknowledged across countries as increasingly important, signaling the need for interdisciplinary and future-oriented training approaches.

The following sections present an analysis from each participating country, **outlining national priorities and the specific competences identified** as most relevant to their local olive oil sectors.

Greece

Professionals involved in the Greek olive sector should possess a blend of competencies that combine circularity with the traditional practices throughout the whole olive oil production chain. Among the key competencies required for implementing circular business models in the enterprises of the sector is by-products and waste management. Knowledge and skills related to converting the waste produced throughout the whole olive oil production process into valuable products are crucial for creating added value while minimizing waste.

Production of sustainable products and knowledge of sustainable farming practices are also critical skills for ensuring the transition of the sector into a circular economy model. Towards this direction it is important to have the ability to design products and processes with sustainability considering the entire lifecycle of the products, from production to disposal.

Implementation of circular economy principles in the Greek olive oil sector also involves the development and the coordination of effective recycling programs. Thus, the ability of creating systems for reusing waste, reducing environmental impact, and optimizing resource efficiency throughout the production and post-production processes, is required.

Furthermore, the integration of renewable energy into the olive oil sector in Greece as part of a circular economy model requires specialized skills that focus on energy efficiency, sustainable practices, and leveraging of local renewable resources. Moreover, assessing the

life cycle of available resources is crucial for adopting circular economic principles in the sector. This process involves analyzing the environmental impact, resource efficiency, and sustainability of every stage of production, from farming to processing and consumption. To effectively carry out such assessments, professionals need a combination of technical, analytical, environmental, and management skills.

Portugal

The competences considered critical for the sector's transition to circular economy, as identified by MSMEs in the olive oil sector and by experts/professionals in agri-food sector, are the following:

- By-product and waste management;
- Renewable energy integration;
- Produce sustainable products;
- Ensure compliance with environmental legislation;
- Green marketing;
- Knowledge of water and soil protection;
- Digital skills.

On the other hand, the following competences have been identified as less relevant to the sector's transition: Life cycle assessment of resources, digital marketing skills planning; and new food product development.

Italy

According to olive growers and millers, the most important competencies include creative and innovative thinking, followed by waste and by-product management and green marketing implementation. On the other hand, skills such as product data management and digitalization ranked the lowest and do not currently appear to be a priority for professionals in the olive oil industry.

From the interviews conducted with VET providers, it became evident that some of the most critical skills include by-product and waste management, compliance with environmental legislation, and an entrepreneurial mindset, supported by strong technological expertise.

Among the emerging professions expected to gain importance are sustainability consultants, engineers specializing in waste and by-product valorization, and circular economy managers—key roles in driving the transition toward more sustainable practices. The essential skills required for these new occupations include waste and by-product valorization, proficiency in renewable energy technologies, and expertise in marketing and selling green products.

Spain

Key competencies required for circular business management and circular economy roles in the olive oil sector encompass a blend of technical expertise, strategic thinking, and digital proficiency. One of the most critical competencies is waste and by-product management, as circular economy models rely on optimizing resource use and repurposing production residues into valuable products. Additionally, sustainable resource management is essential, including knowledge of water conservation, renewable energy integration, and soil protection techniques. Regulatory compliance and policy awareness are also fundamental, as businesses must navigate environmental laws opportunities to implement circular practices effectively.

Given the increasing role of technology in agriculture, digital skills and data analytics are becoming indispensable, particularly in areas such as precision agriculture, product traceability, and sustainability monitoring. Professionals in circular business management must also possess entrepreneurial and innovation-driven mindsets, enabling them to identify business opportunities within sustainability challenges and drive the adoption of circular economy principles across the value chain.

Another key competency is strategic supply chain management, ensuring that circular economic principles are integrated at every stage, from production to distribution. This includes expertise in green logistics, sustainable packaging, and product lifecycle assessment to reduce waste and enhance efficiency. Marketing and sustainability communication skills are also crucial, as businesses need to effectively promote their eco-friendly practices and products while avoiding greenwashing. The ability to develop circular business models, incorporating elements such as eco-design, product-as-a-service models, and extended producer responsibility, is particularly relevant for companies looking to innovate within the circular economic framework.

Furthermore, deep tech knowledge, including artificial intelligence, blockchain for supply chain transparency, and automation in waste valorization, is becoming increasingly relevant for the future of circular economy roles in the olive oil sector.

Croatia

The key competences required for circular economy roles in the Croatian olive oil sector according to the research (D2.3 – Croatia) focus on sustainability, environmental protection, and resource optimization. The most important skills identified by respondents include “Waste and by-product management” and “Organic farming and pest control techniques.” Additionally, “Knowledge of sustainable farming practices,” “Energy efficiency in production,” and “Supply chain management” were widely considered essential.

Over 90% of professionals in the sector regard “By-product and waste management” as the most critical skill for their company’s future success. Other essential competencies include “Sustainable product production”, “Renewable energy integration”, and “Green marketing”. However, skills such as “Product data management and digitalization,” “Life cycle assessment

of resources," and "Implementation of marketing strategies" were considered important by only 20% of respondents.

Interviewed experts in the agri-food sector and VET providers (D2.3 – Croatia) emphasized that the future success of companies will depend on adopting renewable energy sources, waste management, sustainable product production, and an entrepreneurial mindset. While digital skills were not rated as highly important by many respondents, all interviewed experts and VET providers acknowledged their significance in advancing the circular economy. The divergence in opinions may be due to the traditional nature of olive production in Croatia, where digital technologies are not yet widely integrated, despite their potential benefits in efficiency and business optimization.

Circular economy skills were primarily recognized as crucial for roles related to sustainability, waste disposal, and environmental protection. In contrast, technical occupations such as product development engineering drafter and food technician were perceived as less relevant in this context. Overall, the emphasis remains on waste management, sustainable production, and renewable energy, while the potential of digital technologies is yet to be fully acknowledged.

3. GUIDELINES FOR REVISING OR DEVELOPING THE PROFESSIONAL PROFILES

3.1. Tailoring professional profiles to the sectoral/country needs

Each partner country presents its perspective on why certain professional profiles are especially **relevant for supporting the transition to circularity in the olive oil sector**. These reflections consider factors such as industry structure, policy context, labour market demands, and the maturity of circular economy practices at the national level.

The following sections provide a country-by-country overview, illustrating how professional roles—both shared and country-specific—can be developed and adapted to effectively meet local challenges and opportunities in the sector's green transformation.

Greece

Circular Economy Managers can help with the adoption of circular economy models by exploring options for converting waste into valuable by-products and by adopting more sustainable packaging materials, such as recyclable glass bottles, biodegradable plastics, bulk packaging options. Moreover, these Managers can foster collaboration between olive oil producers, local farmers, municipalities, and the rest stakeholders of the sector into partnerships that help in closing material loops, for example by creating networks to recycle waste materials or by exchanging surplus resources like olive branches or olive stones. They can also guide producers in obtaining certifications that showcase their commitment to sustainability, such as the EU Organic Label or Circular Economy Certification, helping to increase consumer trust and marketability. By using data and feedback loops, Circular Economy Managers can help producers track the progress of their circular economic initiatives and continuously improve practices over time. Finally, they will be able to help the stakeholders of the sector to raise campaigns for the awareness of the consumers for more sustainable products.

Waste Valorization Engineers can also play a key role in integrating circular economy principles into the sector by focusing on transforming waste materials into valuable by-products. Given the significant environmental impact and waste generated in the olive oil production process in Greece, these engineers are crucial in finding innovative solutions for the reuse, recycling, and upcycling of the waste by designing closed-loop production systems. For example, they can implement systems in olive oil mills where waste products such as pomace, olive stones, and wastewater are reused or processed into valuable products, reducing the need for raw materials. By integrating waste-to-energy solutions within the olive oil mills, engineers can create systems in which the energy needed for production is partially sourced from the waste generated by the process itself. They could also become the intermediates for the transfer of knowledge from the research level to the field and challenge the stakeholders of the sector

for further applying circular economy principles, by facilitating, for example pilot projects to test new products and by-product uses that can be scaled up to create new revenue streams for olive oil producers. They can also assist olive oil producers in communicating their waste valorization efforts to consumers (eg. through product labeling, sustainability reports, or consumer outreach campaigns), helping to build a more sustainable and informed customer base.

Portugal

Portugal has become one of the main olive oil producers in Europe, with a strong concentration in the south of the country, in Alentejo region, as a result of the expansion of intensive and super-intensive olive groves. This expansion has brought productivity gains, but also new environmental, social and technological challenges, requiring more qualified, multidisciplinary professionals orientated towards sustainable and circular innovation. Therefore, the following are the reasons why there is the need to create 2 new professional profiles in the Portuguese olive sector:

i. **Olive By-Products and Circular Economy Manager** - Portugal is one of the largest European Union olive oil producers, but it still wastes a large part of the olive campaign's by-products (pomace, pits, wastewater). The transition to a circular bioeconomy model requires professionals capable of creating value from this waste, whether in the form of solid biofuels, biofertilisers, compost, or cosmetic and nutraceutical ingredients. This profile will contribute to the imperative of decarbonising the agro-industry; it will create new local value chains, especially in areas of the interior of Portugal with demographic challenges; it will boost the creation of circular-based cooperatives and start-ups linked to olive groves.

ii. **Olive grove digitalisation and monitoring technician** (AgriTech) - The advance of agriculture 4.0 is already transforming Portuguese olive growing, with the integration of sensors, drones, DSS-Decision Support Systems and IoT to optimise irrigation, predict pests and manage the harvest. Specialised technicians in digital tools applied to olive groves will become key to increasing productivity and reducing the use of inputs (water, fertilisers and phytopharmaceuticals). This profile will contribute to promoting the operational efficiency of farms, especially in the regions of Alqueva dam in Alentejo; it will respond to the shortage of skilled labour in the field by automating processes; it will facilitate access to precision agricultural insurance and data-based financing (smart farming).

Italy

In Italy, the olive oil sector faces challenges in the transition to a circular economy, especially in terms of digitalization and financial constraints. However, the growing demand for sustainable products and stricter environmental regulations are driving the sector towards circular practices. Key skill gaps identified include waste valorization and sustainability consultancy, with increasing demand for waste valorization engineers and sustainability consultants to address the need for efficient waste management and sustainable resource use.

Emerging roles in Italy, such as renewable energy specialists and circular economy managers, align with the country's focus on renewable energy and sustainability. Furthermore, marketing professionals for eco-friendly products are gaining recognition, although their importance is still underappreciated despite the growing market for green products. Digital and precision agriculture skills are also increasingly needed to advance agricultural practices that promote sustainability, yet there is limited structured education in circular economy practices. The transition also highlights the need for interdisciplinary expertise across various roles, including agronomy, environmental management, and supply chain management. A key concern is the lack of comprehensive education programs focused on circular economy, with Italy's vocational education and training (VET) institutions emphasizing organic farming and sustainability but offering limited specialized modules on circular economy practices.

Spain

The development of Circular Economy Manager and Waste Valorization Engineer profiles is particularly relevant for the Spanish olive oil sector, which faces growing environmental challenges, regulatory pressures, and market demands for sustainability. Spain is the world's leading olive oil producer, generating significant organic waste and by-products that, if properly managed, could become valuable resources rather than environmental liabilities. However, the lack of structured expertise in circular economy strategies and waste valorization prevents many businesses from capitalizing on these opportunities.

The Circular Economy Manager role is crucial in Spain, as most olive oil producers, particularly small and medium-sized enterprises (SMEs), lack structured knowledge and resources to implement sustainable business models. This professional can drive the integration of circular economy principles into production, optimize resource use, and improve regulatory compliance, which is becoming increasingly complex under EU sustainability directives. Furthermore, this role is vital in changing the industry's mindset, shifting from perceiving sustainability as a regulatory burden to recognizing it as a business opportunity that enhances competitiveness and economic resilience.
The Waste Valorization Engineer is equally critical, as Spain's olive oil sector produces large volumes of olive pomace, wastewater, and pruning residues that are often underutilized. Developing technical expertise in transforming these by-products into biofuels, fertilizers, and sustainable packaging solutions could significantly reduce waste and create new revenue streams. However, financial constraints and a lack of innovation-driven skills hinder these advancements, making this profile indispensable for driving technological solutions and aligning the sector with EU circular economy goals.

Tailoring these profiles to the sector's needs in Spain requires structured training, financial incentives, and cross-sector collaboration to bridge skill gaps and accelerate the transition toward a more sustainable and competitive olive oil industry.

Croatia

Agronomist is the occupation that respondents (D2.3 – Croatia) consider the most in need of circular economy skills. Agronomists with circular economy skills are crucial for sustainable agricultural practices in Croatia. As experts in soil management, crop production, and sustainable farming techniques, agronomists play a key role in optimizing resource use, minimizing waste, and ensuring environmentally friendly agricultural methods. Their expertise is particularly relevant in promoting regenerative farming practices, water conservation strategies, and the responsible use of fertilizers and pesticides, all of which contribute to the circular economy framework in Croatia's olive oil sector.

Given the Croatia's reliance on agriculture, particularly the olive oil sector, waste management and renewable energy solutions are crucial for improving efficiency and reducing environmental impact.

Waste valorization engineers play a critical role in transforming agricultural by-products into valuable resources. In the olive oil sector, waste such as olive pomace and wastewater can be repurposed for biofuel production, composting, or other sustainable applications. Their expertise is essential in creating circular value chains that minimize waste and maximize resource efficiency.

Renewable energy specialists are equally important, as Croatia continues to invest in sustainable energy sources. In the olive oil industry, integrating solar power, biomass energy, and other renewable solutions can reduce reliance on non-renewable resources, lower production costs, and enhance sustainability. The expertise of renewable energy specialists is vital for implementing innovative energy solutions that align with national and EU sustainability goals.

The increasing recognition of these professional profiles underscores the need for targeted education and policy support to encourage their integration into the olive oil sector and broader agri-food industry.

3.2. Identification/revision of the professional profiles based on ESCO

We explore hereby the **alignment between emerging roles in the circular olive oil economy and the professional profiles defined within the European ESCO** (European Skills, Competences, Qualifications and Occupations) framework. Each partner country—Spain, Italy, Greece, Portugal, and Croatia—has examined the relevance of existing ESCO profiles to the circular transition and identified potential gaps or updates needed to better reflect the evolving demands of the sector.

Across all countries, there is broad agreement that existing occupations such as **Waste Treatment Engineer** (ESCO code: 2143.1.4), **Sustainability Manager** (ESCO code: 1213.8), **and Recycling Specialist** (ESCO code: 2143.1.3) rightly include circular economy-related skills. Respondents also consistently recognised the need to equip traditional roles in the olive oil sector with circular competences—particularly Agronomists, Agricultural Production

Managers, and Researchers and Scientists —to support sustainability efforts. However, national perspectives revealed some variation. For instance, Greece and Croatia expressed more uncertainty about the circular relevance of roles such as Product Development Engineering Drafter and Food Technician, while Portugal highlighted gaps in profiles like Alternative Fuels Engineer and Food Technologist.

The following provide a detailed analysis from each partner country, offering insights into national perspectives on profile relevance, skill gaps, and workforce development priorities aligned with circular economy objectives.

Greece

The transition of Greece's olive oil sector to a circular economy model requires skills and emerging professions to promote sustainability, resource efficiency, and waste reduction. To facilitate this shift, the sector will need a workforce equipped with a variety of technical, managerial, and entrepreneurial skills. Among the emerging professions that would be needed the most important are Sustainability /Circular Economy Managers and Waste Valorization Engineers. Knowledge of sustainability principles, life cycle analysis, waste management, resource efficiency, sustainable agricultural practices, circular product design and eco-packaging are important to Circular Economy Managers who should be able to help olive oil producers to design and implement circular practices, from farming and processing to packaging and disposal, customized to their needs.

Moreover as most of the waste in Greece is currently used for low or medium-value products (Circolive Project) and only a small percentage of the Greek olive oil mills follow a standard in environmental management (ISO14001), Waste Valorization Engineers should be expertised in waste management and upcycling in order to help the stakeholders involved in the sector to adopt techniques for reusing or valorizing waste to high added value products. Skills such as management of agricultural waste, knowledge of circular economy principles in waste handling and transformation of olive oil production waste into valuable products (e.g., fertilizers, biogas) are required in order to set a closed-loop waste management system in the terms of circular economy.

Portugal

Portugal's olive sector has been making remarkable progress in adopting sustainable practices, but its full transition to the circular economy is still limited by existing skill levels. While many professionals are familiar with basic waste management, water efficiency and environmental compliance, there is still a lack of specialised knowledge in waste recovery, renewable energy integration and precision agriculture. For this reason, it is important, in Portugal's context, to start by improving two existing professional profiles, i.e. Agricultural Production Manager, and Agronomist/ Olive Mill Operator.

To fully embrace circularity, the sector must also strengthen skills in by-product processing, soil regeneration, carbon capture and sustainable management of production factors.

A deeper understanding of closed-circuit production systems and eco-innovation is essential to ensure long-term economic viability, resource efficiency and environmental management in olive growing and processing. It is also important to develop three other professional profiles: Olive By-Products and Circular Economy Manager; Specialist in Regenerative Agriculture applied to Olive Groves; Technician in Digitalisation and Monitoring of Olive Groves (AgriTech).

Italy

As highlighted in the Italian national report, technicians in the olive oil supply chain identify key circular economy skills essential for the future success of companies in the sector. According to olive growers and millers, the most important competencies include creative and innovative thinking, followed by waste and by-product management and green marketing implementation. On the other hand, skills such as product data management and digitalization ranked the lowest and do not currently appear to be a priority for professionals in the olive oil industry. Regarding emerging professions considered crucial for the sector's transition to a circular economy, the highest-ranked role is waste valorization engineer, further emphasizing the significance of waste management in the olive oil industry. This is followed by sustainability consultants, professionals in new product development, supply chain specialists for green logistics, and legal advisors on environmental regulations.

Consistently with this trend, digital skills seem to be of lesser relevance, as the role of data analysts for sustainable agriculture was selected only 12.1% of the time, suggesting that the sector is not yet fully prepared or particularly inclined to prioritize digitalization in the implementation of circular economy practices.

Insights gathered from interviews with VET providers highlight several key skills as essential for the olive oil sector's transition toward circularity. Among the most critical are by-product and waste management, understanding and complying with environmental legislation, and fostering an entrepreneurial mindset, all underpinned by strong technological competencies. Emerging professions identified as increasingly relevant include sustainability consultants, engineers focused on waste and by-product valorization, and circular economy managers. These roles are seen as pivotal in promoting sustainable practices across the sector. The skills most commonly associated with these new occupations include waste and by-product valorization, proficiency in renewable energy technologies, and expertise in marketing and selling green products.

Spain

The transition of the Spanish olive oil sector towards a circular economy is both a necessity and an opportunity. The analysis presented in this document, based on the CIRCOLIVE project's research, confirms that the sector faces significant skill gaps in circular business management, waste valorisation, and the application of digital and deep-tech solutions. These gaps, particularly acute among SMEs, are limiting the sector's capacity to comply with evolving EU regulations and to capitalize on new market opportunities linked to sustainability and

resource efficiency. As a response to these needs, two profiles have been identified for the Spanish olive oil sector: The Circular Economy Manager and the waste valorisation engineer.

The Circular Economy Manager is responsible for developing and implementing circular business strategies within olive oil production companies. This role requires expertise in sustainability management, resource efficiency, regulatory compliance, and supply chain optimization. Given the sector's growing focus on sustainability, professionals in this position must have a deep understanding of circular business models, including waste minimization, eco-design, and extended producer responsibility. Additionally, entrepreneurial and digital skills are crucial for integrating new technologies, such as blockchain for traceability and data-driven decision-making tools, to enhance the sector's sustainability practices.

The Waste Valorization Engineer plays a pivotal role in optimizing the reuse and transformation of by-products generated in the olive oil industry, such as olive pomace, wastewater, and pruning residues. This profession requires technical expertise in bio-economy solutions, renewable energy integration, and process engineering. The ability to develop innovative waste-to-resource solutions, such as biofuels, organic fertilizers, and alternative food products, is key for driving the sector's transition to a circular economy. In addition, knowledge of environmental regulations, sustainability certifications, and emerging deep tech solutions like AI and automation for waste processing is becoming increasingly relevant.

Croatia

The identification and revision of professional profiles based on the ESCO classification (D2.3 – Croatia) highlight the importance of circular economy skills across various occupations. According to survey results, respondents strongly agreed that roles such as "Recycling specialist", "Sustainability manager", "Environmental engineer", and "Alternative fuels engineer" require circular economy skills. However, nearly half of respondents disagreed that these skills are necessary for "Product development engineering drafter," and 40% shared the same opinion for "Food technician."

In addition to ESCO-designated roles, experts in the Croatian olive oil sector (D2.3 – Croatia) identified other key occupations that require circular economy skills. These include "Agronomist", "Agricultural production manager", "Oil mill operator", "Quality control and safety officer", and "Researcher and scientist". Opinions were divided on whether "Packaging production manager," "Sales and marketing manager," and "Logistics and supply chain manager" should also possess these skills.

Interviews with agri-food sector experts and VET providers (D2.3 – Croatia) reinforced the importance of circular economy knowledge for agronomists, production managers, family farm owners, quality control officers, researchers, and oil mill operators. One expert emphasized the need for both agronomic and economic education to implement circular economy practices effectively. Another noted that all participants in the agri-food chain should understand circular economy principles for sustainable resource management.

Regarding future professional profiles, 80% of respondents (D2.3 – Croatia) identified "Waste

valorization engineers" as key, followed by "Renewable energy specialists". However, sustainability consultants were undervalued despite their recognized importance by interviewed experts. This suggests a sectoral focus on technical solutions while overlooking the role of advisory services and strategic planning, indicating a need for greater awareness of their value.

Emerging professional profiles

In addition to evaluating current profiles, partners also identified emerging professional roles considered essential to the circular transformation of the olive oil sector. Among the most recognised future occupations across countries were:

- Waste Valorisation Engineers (closely related to 2143 - Environmental engineers and 2143.1.4 - waste treatment engineer),
- Renewable Energy Specialists (2143 – Environmental Engineer, with overlap in 2149.9 - energy engineer),
- Circular Economy Managers (currently no dedicated ESCO profile; the closest one could be n. 1213.8 - Sustainability Manager),
- Sustainability Consultants (2133.6 - environmental programme coordinator).

Despite their importance, roles such as Environmental Impact Auditors, Green Logistics Specialists, and Marketing Professionals for Eco-friendly Products remain significantly underrecognized. Their low visibility in responses points to a wider challenge in understanding the broader ecosystem of roles needed to support circularity—not only technical but also strategic, regulatory, and consumer-focused positions.

The interviews and survey findings collectively highlight the need to update existing professional profiles and to recognise new, emerging roles that are essential for supporting the transition to a circular olive oil economy. Based on the above data and the direct agreement with all project partners for the purposes of Circolive project we identified two key professional profiles as common and particularly relevant across countries:

- **Circular Economy expert of the olive oil supply chain** (closely related to ESCO n.1213.8) focuses on the practical implementation of sustainability practices and circular economy principles within businesses, particularly in the olive oil and agri-food sectors. This profile involves analyzing operational processes, implementing resource efficiency strategies, optimizing waste management, and promoting sustainable practices across the value chain. They work directly with businesses to integrate circular practices, from production to disposal, and analyze data to optimize operations for sustainability.
- **Olive Mill by-products/Waste Valorisation Specialist** (closely related to ESCO n.2143) is an expert in transforming waste and by-products from production processes into valuable resources, aligning with circular economy principles. In the olive oil sector,

this includes finding innovative ways to reuse by-products like olive pomace, wastewater, and pruning residues. This role requires technical knowledge in waste management, upcycling, and developing processes that turn waste into products with high added value, such as fertilizers, biofuels, and alternative food products.

These professional profiles reflect the sector's growing need for expertise in sustainable resource management, digital tools, circular business models and environmental compliance.

3.3. Key competencies and learning outcomes needed for the circular economy

Building on the analysis of relevant professional profiles in the olive oil sector, this chapter focuses on identifying the **key competencies and learning outcomes required to support the transition toward a circular economy across the five partner countries**. Each national partner has explored the core skills needed for emerging and evolving roles, particularly those most relevant to the circular transformation of the olive oil value chain.

This analysis combines insights from the ESCO occupational framework with the results of national surveys and interviews, enabling the identification of current skill gaps and future training needs. Partners also completed a dedicated table for their country, mapping the competencies and learning outcomes linked to professional profiles, as well as the critical skills needed to foster innovation, sustainability, and resilience in the sector.

The following sections present country-specific findings, detailing the professions prioritized by each partner, and outlining how these competencies are being addressed at national level to support workforce transformation in the olive oil sector.

Greece

For the successful implementation of Circular Economy in the Greek olive oil sector, occupations such as Circular Economy Managers and Waste Valorization Engineers are needed. These experts should be according to Circolive findings equipped with skills among which the most crucial are considered to be: by-product and waste management, production of sustainable products, development and coordination of recycling programs and renewable energy integration. To ensure this, there is a need for developing specialized training programs focused on circular economy practices, waste valorization, digitalization, and sustainability management that will equip professionals with the necessary skills. Such programs can help towards the enhancement of the sector's sustainability, the waste reduction and overall the boosting of its economic and environmental performance.

A specialized training program focused on circular economy practices in the Greek olive oil sector should cover both the theoretical and practical aspects of sustainability, resource optimization and waste reduction. Such a program should offer an overview of the olive oil production process while aligning with circular economy principles.

By attending such programs the participants can be taught about the available methods for treating waste and by-products of the olive oil sector or the best practices to reduce waste at every stage of production, from harvesting to bottling, aligning with circular economy principles. These programs should also aim to raise their awareness about the environmental benefits (such as reduction of carbon footprint, water conservation and soil health improvement) and the economic advantages, such as production of high value products, cost savings of efficient resource use, enhancement of the sector's competitiveness, as well. Knowledge on sustainable packaging solutions, supply chain optimization methods, required digital tools and the regulatory framework as well should be provided. Moreover, practical workshops (with for example group activities for the development of circular strategies) or field visits to enterprises that have successfully implemented circular economy practices should also be conducted during these training programs.

Portugal

In more recent years, the Portuguese olive sector has undergone a major transformation through the expansion of intensive and super-intensive olive groves. This transformation, heavily concentrated in the south of the country, more specifically in Alentejo region, has placed Portugal among the leading olive oil producers in Europe. With this modernisation comes the need to strengthen some existing professional profiles, as well as to create new ones. The aim is to move increasingly towards a sustainable, circular and regenerative olive sector. Thus, through the respondents and interviewees (D2.3 - Portugal), 2 professional profiles to be improved were identified: Agricultural production manager; Agronomist and olive mill operator. Olive By-Products and Circular Economy Manager; Specialist in Regenerative Agriculture applied to Olive Groves; Olive Grove Digitalisation and Monitoring Technician are the 3 professional profiles to be created.

In the professional profile of **agricultural production manager**, with a focus on more sustainable and efficient management, there is a need to strengthen or provide more technical skills, such as the use of digital agricultural management tools and environmental skills, such as the integration of regenerative practices, since their biggest gaps are: low digital literacy; lack of knowledge of ecological financing instruments.

Regarding the professional profile of **agronomist and olive mill operator**, with the need to integrate circular economy practices with a focus on by-product valorisation, energy and water efficiency in olive mills and compliance with environmental standards, the main gaps are the undervaluation of by-products and technological obsolescence in small and medium-sized olive mills. There is therefore a need to strengthen skills in the bioeconomy of waste, sustainable technologies and digitalisation applied to quality control and traceability.

Olive By-Products and Circular Economy Manager

This new professional profile, focused on the valorisation of by-products from the olive-

growing season and the implementation of circular economy strategies in the agro-industry, combines knowledge in bioeconomic, environmental management and circular business design. The aim is to fill gaps such as: low technological incorporation of by-products; the need for specific skills in valorisation technologies; and the integration of digital solutions. This profile will also allow for greater articulation with industries such as cosmetics, pharmaceuticals and energy.

Specialist in Regenerative Agriculture applied to Olive Groves

This professional profile aims to train people in the sector in soil conservation techniques, functional biodiversity and carbon sequestration, combined with skills in implementing agro-ecological practices and assessing positive environmental impacts. The gaps to be overcome include a lack of knowledge about regenerative certifications and difficulties in quantifying ecological indicators.

Olive Grove Digitalisation and Monitoring Technician

This professional profile is designed to provide technicians specialising in olive grove digitalisation and monitoring technologies, something that responds to the growing incorporation of 4.0 agricultural tools in Portugal. The technician must operate sensors, drones, decision support systems (DSS) and digital agricultural management platforms. The aim is to overcome gaps such as: low digital literacy among agricultural teams; low adoption of remote monitoring tools. The desired future skills centre on data integration, automating agronomic decisions and the interoperability of digital agricultural systems.

Italy

In Italy, the transition to a circular economy within the olive oil sector is significantly influenced by the European Skills, Competences, Qualifications and Occupations (ESCO) framework. The ESCO classification identifies various key competencies required for professionals involved in the sector, focusing particularly on waste and by-product management, sustainable farming practices, and energy efficiency in production. These competencies align with Italy's needs for professionals skilled in resource management and sustainability.

Several ESCO-related occupations have been highlighted as essential for Italy's circular economy shift. These include waste treatment engineers, sustainability managers, and recycling specialists. These roles are increasingly critical as Italy's olive oil sector faces challenges such as financial constraints and regulatory complexities, which hinder the wider adoption of circular practices. The demand for skilled professionals in these areas is amplified by the growing pressure from both regulatory standards and consumer expectations for sustainability.

Moreover, emerging roles such as waste valorization engineers and renewable energy specialists are also seen as essential. These professionals will support the development of circular business models by turning by-products like olive pits and pulp into valuable resources, further reducing waste and improving the sector’s sustainability performance.

However, despite the importance of these roles, Italy faces significant skill gaps. A lack of specialized training in circular economy practices, digitalization, and waste management skills remains a key barrier. Respondents from the olive oil sector report a need for more structured educational programs that integrate circular economy principles into Italy's vocational education and training (VET) systems. This includes the incorporation of new skills such as digital agriculture, which would help optimize the sector's environmental footprint and increase productivity. In conclusion, Italy's olive oil sector requires targeted investment in education and professional training to equip workers with the necessary skills for the circular economy transition. The ESCO framework provides a clear structure to identify critical competencies, guiding the development of training programs and policies aimed at enhancing sustainability within the sector.

Spain

In Spain, an analysis based on the ESCO classification highlights the key competencies, skill gaps, and future training needs for two emerging professional profiles in the circular economy: the Circular Economy Manager and the Waste Valorization Engineer. These roles are essential for advancing sustainable practices and innovation in alignment with national and EU environmental goals.

For the Circular Economy Manager (ESCO: Sustainability Manager), key competencies include circular business strategy development, regulatory compliance, digital skills, and sustainable supply chain management. However, the analysis identifies gaps such as a lack of structured training in circular business models and limited knowledge of sustainability regulations. Future skill needs emphasize advanced training in digital sustainability tools, policy guidance, and integration of AI and blockchain for sustainability monitoring.

For the Waste Valorization Engineer (ESCO: Waste Treatment Engineer), crucial competencies involve waste and by-product management, bio-economy integration, process engineering for waste valorisation, and carbon footprint assessment. The main gaps include insufficient expertise in waste-to-product technologies and limited knowledge of deep tech applications such as AI and IoT. Future needs focus on training in deep tech applications, smart waste tracking systems, and circular bio-economy expertise to enhance innovation and business scalability in the sector.

Croatia

The survey conducted for the CIRCOLIVE project (D2.3 – Croatia) highlights the essential skills required for the olive oil sector to transition to a circular economy. The most critical competence, recognized by 94% of professionals, is “by-product and waste management”. Other key skills include “sustainable product production”, “renewable energy integration”,

and “green marketing”, while digital skills and marketing strategies were considered less critical by respondents.

Experts from the agri-food sector and vocational education and training (VET) providers (D2.3 – Croatia) emphasized that future success in the industry will be influenced by expertise in renewable energy, waste management, sustainable production, and an entrepreneurial mindset. In selecting competencies for emerging professions, knowledge of waste and by-product valorisation and renewable energy technology expertise were identified as priorities. However, digital and data analytics skills were rated as least important, indicating a sector-wide focus on practical resource management rather than technological innovations.

While experts recognize the importance of sustainability skills, key gaps hinder implementation. Financial constraints, lack of regulatory incentives, and insufficient market demand for sustainable products present major obstacles. Experts do not perceive an entrepreneurial mindset as a limiting factor, suggesting that professionals are ready to innovate but lack the necessary conditions for change. Furthermore, digital skills were not seen as a barrier, possibly reflecting either existing proficiency or a lack of emphasis on technology in the olive oil sector.

To strengthen the circular economy transition, targeted education and training programs must prioritize waste valorisation, renewable energy expertise, and sustainable resource management, while also raising awareness of the benefits of digital skills and innovative technologies for long-term sector modernization.

Based on the **inputs each country has provided** and the **two professional profiles** outlined above we identified the key transversal competencies and learning outcomes needed:

1. Circular Economy Expert of the olive oil supply chain

Key Competencies:

- Regulatory compliance and green policy integration in the olive oil sector
- Olive oil mill by-products and waste: aspect of composition and shelf-life-
- Olive oil mill by-product and waste management
- Examples of re-use in the olive oil sector: from water to energy and valuable molecules production
- Circular business strategy and eco-design
- Digital literacy (ERP, DSS, IoT, GIS) and practical applications
- Olive oil supply chain optimization and sustainability (circular networks)
- Life cycle assessment and carbon footprint evaluation
- Communication and stakeholder engagement

Learning Outcomes:

- Circular interaction capacity for the creation of new products or ingredients from by-products and olive oil extraction waste
- Understanding sustainability principles and resource saving practices (energy, water) in the olive oil sector
- Competence in circular business models and ecological impact analysis
- Application of digital tools for decision-making and traceability
- Elements of green finance, subsidies, and regulatory incentives

2. Olive Mill By-products/Waste Valorization Specialist

Key Competencies:

- Valorization of olive oil mill waste (pits, pomace, wastewater): policies, state of art, innovative case studies
- Bioeconomy integration and circular technology strategies
- Renewable energy system implementation
- Advanced process engineering/technologies for by-products and waste management (in collaboration with oil plant/biogas/related producers)
- Smart by-products/waste management and tracking and digital competences and tools
- Identifying market needs for new products and active molecules

Learning Outcomes:

- Co-creative competences: from technology to market needs
- By product and waste composition and stability
- Competence in navigating policy and funding structures for innovation
- Skills in waste-to-resource technologies

3.4. Designing training pathways

The design and implementation of training pathways within the CIRCOLIVE project aim to equip **young adults and small-scale operators** in the olive oil sector with the skills and competencies required to adopt **circular business models**, foster **entrepreneurial mindsets**, and integrate **innovative technologies** into their operations.

To ensure the project's key target groups, **young adults (e.g., students, unemployed)** and **employees/entrepreneurs** in the olive oil sector, acquire relevant and future-oriented competencies, the training pathways will be developed based on the professional profiles, key competencies, and learning outcomes identified through prior research and analysis.

As outlined in the project, the training offer is divided into two tailored programmes:

A. Training programme for young adults/unemployed

Title: *Circular Business Skills in the Olive Oil Sector: Entrepreneurial Mindset and Digital Technologies*
Target Group: 350 participants (students, job seekers, young professionals) across the five partner countries
Duration: 40 hours
Professional Profile Addressed: Circular economy expert of the olive oil supply chain

This programme, part of the work package 4 of the project, will develop transversal and sector-specific competencies essential for sustainability and innovation in small-scale olive oil production. The following key competencies and learning outcomes identified in the relevant professional profile will be taken into consideration:

Key competencies	Learning Outcomes
• By-product and waste management • Production of sustainable products • Circular business strategy and eco-design • Digital literacy (ERP, DSS, IoT, GIS) • Regulatory compliance and integration of green policies • Supply chain optimization and sustainability • Life cycle assessment (LCA) and carbon footprint evaluation • Communication and stakeholder engagement	• Understanding sustainability principles in the agri-food sector • Applying circular business models and ecological impact analysis • Using digital tools for decision-making and traceability • Implementing energy-efficient and resource-saving practices • Integrating renewable energy and regenerative agriculture methods • Navigating green finance, subsidies, and regulatory incentives.

B. Training programmes for employees/entrepreneurs

Titles:

1. *Circular Business Models and Entrepreneurial Mindsets along the Value Chain: Waste Valorization Engineer*
2. *Deep Tech Domains in the Agri-Food Sector*

Target Group: 250 participants (employees and entrepreneurs in the olive oil sector)
Duration: 20 hours per each training programme
These programmes, part of the work package 5 of the project, will aim to strengthen the practical and technological skills of professionals working within olive oil enterprises, focusing on circular innovation and the valorization of olive by-products.
Professional Profile Addressed: *Olive mill by-products/waste valorization specialist*

The following key competencies and learning outcomes identified in the relevant professional profile will be taken into consideration:

Key competencies	Learning Outcomes
• Valorization of agri-waste (pits, pomace, wastewater) • Bioeconomy integration and adoption of circular technologies • Implementation of renewable energy systems • Advanced process engineering for waste management • Smart waste tracking and digital sustainability tools • Market development for upcycled products	• Mastery of bio-based circular solutions • Proficiency in waste-to-resource technologies and life cycle assessment • Understanding of industrial decarbonization strategies • Development of business models integrating sustainability and circularity • Ability to navigate policy frameworks and funding opportunities for innovation

All training programmes will be delivered in a **blended learning format** to ensure broad accessibility and flexibility. This approach foresees **in-person sessions**, **online learning or a mix of both**, making it possible for participants coming from remote or rural areas to fully engage. Based on the country needs the partners can select the best modality to put in place. The training content will be hosted on the **project's e-learning platform**, developed under WP4, using an open-source LMS (e.g., Moodle) to support interactive, user-friendly, and mobile-compatible access.

By aligning the training design with the defined professional profiles and the evolving needs of the olive oil sector, these pathways will support the development of a skilled, resilient, and innovative workforce capable of driving the transition to a circular economy across Spain, Italy, Greece, Portugal, and Croatia.

3.5 Assessment of competencies

The assessment of competences will follow a structured and practical approach to ensure that participants in both vocational and continuous education programmes acquire the necessary skills to support the circular transition of the olive oil sector. The assessment aims to:

- Measure the extent to which learners achieve the intended **learning outcomes** defined for each module.
- Evaluate the development of practical competences in **circular business models**, **waste and by-product valorisation**, **entrepreneurial mindset**, and **smart technologies**.
- Provide **evidence** through certificates and digital badges.
- Ensure feedback loops for **programme improvement** during piloting and replication.

The development of the assessment framework will follow these steps:

1. **Define Assessment Criteria - f**or each training module, clear assessment criteria will be developed based on the learning outcomes, using a constructive alignment approach.
2. **Select Assessment Methods - a** combination of practical and knowledge-based tools will be used such as:
    - **Case studies** or real-world problem-solving tasks
    - **Mini-project works** simulating circular strategies in the olive oil sector
    - **Practical exercises**
    - **Quizzes or short written tests** to verify knowledge retention
    - **Self-assessment and peer review** to promote reflection
3. **Design Assessment Tools - t**emplates and checklists will be developed and shared with partners to ensure uniformity in delivery and evaluation.

Assessment activities will be embedded within the training flow—either as part of the modules (formative) or as final evaluations (summative). A blended learning format will allow for both in-person and online assessment, facilitated through the project's e-learning platform (Moodle).

During the pilot phase in each partner country:

- Learners will complete assessments at designated points during the training.
- Trainers will use the agreed tools and criteria to evaluate participant's performance.
- For each participant, assessment records will be compiled to track achievement of learning outcomes.

Upon successful completion:

- Learners will receive a **certificate of attendance or completion**.
- Digital open badges demonstrating the achievement of learning outcomes will be issued.

All partners will monitor the quality and consistency of the assessment process. This will include:

- **Trainer debriefings about Circolive project before the training delivery.**
- **Review of assessment outputs and learner performance data**.
- **Feedback from learners and trainers** through post-training questionnaires and debriefing sessions.

The results of the assessment implementation will feed into the evaluation activities under tasks 4.3 and 5.3. Based on the findings, **adjustments or refinements to the assessment tools and processes** will be proposed to enhance their effectiveness and applicability.

To promote wider recognition of the competences developed:

- The assessment system will be aligned, where and if possible, with existing **standards.**
- Assessment tools and methods will be documented and made available for adaptation and reuse in other sectors or countries.

4. CONCLUSIONS

The findings presented in this report mark a significant step forward in aligning the olive oil sector with the principles of sustainability and circular economy. Through extensive research, including national analyses, stakeholder consultations, and validation of skill needs, the project has successfully identified two emerging professional profiles that are essential for supporting the sector's green transition:

- the **Circular economy expert of the olive oil supply chain,** and
- the **Olive mill by-products/Waste valorization specialist**.

These profiles encapsulate the evolving demands of the olive oil industry in the five participating countries—Italy, Spain, Greece, Portugal, and Croatia—where environmental challenges, technological innovation, and circular business practices are reshaping the landscape. The Sustainability and Circular Economy Operator reflects the growing need for integrated competencies in green strategy, digital literacy, and regulatory compliance, while the Waste Valorization Specialist responds to the increasing importance of turning by-products into high-value resources through bioeconomy and technological innovation.

By establishing a shared framework of key competencies and learning outcomes for these roles, the project lays the groundwork for tailored training pathways and capacity-building strategies. These profiles will also directly inform the design of the three training courses under Work Packages 4 and 5, ensuring that education and upskilling initiatives are closely matched to labour market needs and the priorities of a circular economy.

Overall, this report underlines the necessity of redefining and enriching professional roles in the olive oil sector to support a sustainable future. The cross-country collaboration has made it possible to highlight both common ground and specific national needs, offering a robust foundation for the development of a skilled workforce equipped to drive innovation, reduce waste, and enhance environmental performance across the value chain.

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