



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

D2.4 Comparative Research Report on current and future skill levels for transition of the olive oil sector to circular economy

March 2025



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Comparative Research Report on current and future skills levels for transition of the olive oil sector to circular economy

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1. Executive Summary

This “Comparative Research Report on current and future skills levels for transition of the olive oil sector to circular economy” explores the current skills levels and future needs of the olive oil sector in Spain, Italy, Greece, Portugal and Croatia for occupations and skills in the context of circular economy. The research conducted, as part of the CIRCOLIVE project, includes questionnaire and interviews with experts from the agri-food sector as well as interviews with vocational education providers (VET) in Spain, Italy, Greece, Portugal and Croatia, which provides insight into the challenges, opportunities and key competences needed for a sustainable transition to circular economy in the olive oil sector.

This research highlights growing awareness and partial adoption of circular practices, particularly in waste reduction and by-product valorization. While there is growing awareness of sustainability principles across all five countries, significant skill gaps, financial constraints, and regulatory barriers hinder widespread adoption of circular practices. The reliance on traditional methods, limited access to structured training, and financial constraints continue to hinder progress.

The growing demand for circular economy skills is driven by climate change adaptation, stricter environmental regulations, and shifting consumer preferences. According to obtained research results, new professional roles such as waste valorization engineers, renewable energy specialists, and circular economy managers are emerging to meet these demands. Additionally, it seems that expertise in marketing, supply chain management, and regulatory compliance will be crucial for businesses to remain competitive.

Each country presents unique challenges and opportunities, but generally, the olive oil sector in these five countries has the potential to advance sustainable agriculture practices. By addressing skill gaps, strengthening regulatory frameworks, and fostering financial incentives, the industry could enhance its competitiveness and long-term economic viability while contributing to global sustainability goals.

2. Introduction

The olive oil sector plays a vital role in the economies of Spain, Italy, Greece, Portugal, and Croatia, contributing to employment, exports, and cultural heritage. Transitioning to circular economy presents an opportunity to address existing challenges by reducing waste, improving resource efficiency, and integrating sustainable production practices.

This comparative research report analyzes the current state of skills within the olive oil sector in Spain, Italy, Greece, Portugal and Croatia while identifying key competencies needed for a successful transition to circular economy. Through the analysis of data obtained through surveys and interviews with experts in the agri-food sector and interviews with VET providers, the report provides insight into current practices, skills gaps, and future needs for adapting existing occupations and developing new skills related to the circular economy in the olive oil sector. The identification of key challenges and opportunities will enable the adoption of targeted recommendations for the development of competencies that will make the sector more competitive and environmentally responsible.



The findings highlight the importance of investing in education, financial incentives, and technological innovation to facilitate a smooth transition to circular economy practices. Collaboration between governments, businesses, and academic institutions will be essential in equipping professionals with the necessary skills and resources to drive this transformation. This report aims to provide a strategic framework for fostering a more resilient, resource-efficient, and environmentally sustainable olive oil industry in the years to come.

2.1. Purpose and Objectives

This comparative research report presents the research on the current and future skills levels and/or emerging professions for transition of the olive oil sector to circular economy in Spain, Italy, Greece, Portugal and Croatia. The report is a part of Work Package 2 (Identification of olive sector circular needs and emerging skills and/or professions for transition of the olive oil sector to circular economy in the 5 countries) of the CIRCOLIVE project (Developing skills for introducing circular business models and digital technologies in the olive oil sector) and represents deliverable D2.4 (Comparative Research Report on current and future skill levels for transition of the olive oil sector to circular economy).

The aim of this report is to investigate and analyze current skill levels, factors shaping the demand for skills, skill gaps and future skill needs and occupations related to the circular economy in olive growing sector. The review of the available literature and the analysis of the collected data determined current and future skills levels and/or emerging professions in Spain, Italy, Greece, Portugal and Croatia, which will be used as basis for further project activities and the creation of a curriculum for vocational education and training on circular business skills in the olive growing sector in the five countries.

2.2. Key Findings

The transition of the olive oil sector to circular economy varies across Spain, Italy, Greece, Portugal, and Croatia, with each country facing unique challenges while sharing common skill gaps and opportunities.

In Spain, awareness of circular economy principles is rising, but formal training remains limited, with producers relying on experience rather than structured education. Key barriers include regulatory complexity, financial constraints, and a mindset that views sustainability regulations as a burden rather than an opportunity.

Italy faces similar challenges, with limited digitalization and financial constraints slowing progress. However, stricter regulations and increasing consumer demand for sustainable products are pushing the sector forward, highlighting the need for waste valorization engineers and sustainability consultants.

Greece sees circular economy as a way to boost sustainability and profitability. The sector requires a broad skill set spanning technical, managerial, and entrepreneurial expertise, supported by collaboration among stakeholders, policy support, and innovation investment.



In Portugal, the transition is still in early stages, especially among small and micro-enterprises, despite the presence of some circular practices like by-product valorization, renewable energy use and wastewater recycling. Skills gaps remain in waste valorization, digitalization, and sustainable financing, while the sector shows growing interest in sustainability certifications. Emerging roles such as circular economy managers, agricultural digitalization specialists and waste valorization engineers are expected to drive future progress.

Croatia, while already implementing some circular economy practices, faces obstacles such as financial constraints, low regulatory incentives, and weak demand for sustainable products. Waste and by-product management skills are prioritized, but digitalization remains underdeveloped, with divided opinions on its necessity. Future priorities include increasing financial support, improving regulatory frameworks, and enhancing digital and analytical skills to modernize the sector.

Across all five countries, structured training, policy incentives, and investment in digitalization and sustainability-focused professions are essential to accelerate the transition to circular economy.

3. Methodology

The chapter "Methodology" describes the methods of data collection and their analysis. The aim of the chapter is to inform the reader about the methodology used and the possibility of repeating the study using the same methodology.

3.1. Data collection methods

The data was collected from two data sources: primary and secondary data sources.

Primary data collection involves the process of preparing tools for data collection and collecting data from a planned sample of respondents. Three data collection instruments were prepared for the purposes of this study: a questionnaire and two interview reminders. The questionnaire was designed with the aim of collecting quantitative data on a sample of professionals in the olive oil sector. The questionnaire (ANNEX 1 (D2.3): Online survey targeting MSMEs in the olive oil sector about current and future skills needs for transition of the olive oil sector to circular economy) contained multiple-choice questions, closed questions, open questions and questions in the form of a Likert scale. The questions related to current skill levels, factors shaping the demand for skills, skill gaps and future skill needs and occupations related to the circular economy in olive growing sector. ESCO occupation groups and skills were used, to the extent possible to identify the most demanded skills (Table 1, Table 2).



Table 1. Occupations from ESCO used in the questionnaire (ANNEX 1 (D2.3))

Occupations in the survey	ESCO occupations	ESCO occupation code
Agronomist	Agronomist	2132.2
Agricultural production manager	Agricultural and forestry production manager	1311
Agricultural labourer	Agricultural, forestry and fishery labourer	921
Environmental engineer	Environmental engineer	2143.1
Oil mill operator	Oil mill operator	7514.2
Food technologist	Food technologist	2145.1.4
Quality control and safety officer	Industrial quality control manager	1321.2.2
	Health safety and environmental manager	1213.7
Packaging production manager	Packaging production manager	2141.9
Logistics and supply chain manager	Supply chain manager	1324.8
	Logistics engineer	2149.2.6
Researcher and scientist in circular economy	Research engineer	2149.2.8
	Soil scientist	2133.11
Sustainability manager	Sustainability manager	1213.8
Alternative fuels engineer	Alternative fuels engineer	2149.9.1
Waste treatment engineer	Waste treatment engineer	2143.1.4
Recycling specialist	Recycling specialist	2143.1.3
Food technician	Food technician	3119.5
Product development engineering drafter	Product development engineering drafter	3118.3.12
Environmental programme coordinator	Environmental programme coordinator	2133.6

Table 2. Skills and knowledge from ESCO used in the questionnaire (ANNEX 1 (D2.3))

Skills in the survey	ESCO skills and knowledge	Concept URI
Knowledge of sustainable farming practices	Follow environmentally-sustainable work practices	http://data.europa.eu/esco/skill/a992f345-7c06-4982-8fc9-5fab55e316af
Knowledge of water and soil protection	Advise on soil and water protection	http://data.europa.eu/esco/skill/3e25fd3e-2bcd-4320-9587-0aadf7fb93b1
Organic farming and pest control techniques	Organic farming	http://data.europa.eu/esco/skill/186da517-9a3e-41cd-9158-4001e3694459
	Perform pest control	http://data.europa.eu/esco/skill/08881cb7-5331-4b11-9442-4d7c9fce749e



Understanding of food policies and regulations	Food policy	http://data.europa.eu/esco/skill/e591f458-93c4-4cc7-a441-2340545c33f3
	Control food safety regulations	http://data.europa.eu/esco/skill/4d7410df-51a9-42bc-83ec-363c201ee631
Waste and by-product management	Waste management	http://data.europa.eu/esco/skill/40f65a56-ccbe-4601-9f32-1cc6cdd24f28
	By-products	http://data.europa.eu/esco/skill/f2412a5c-8072-4cd7-8fa1-806864f91276
Energy efficiency in production	Energy efficiency	http://data.europa.eu/esco/skill/83fc0b2b-6cd2-46af-b1ff-d3fc83604c26
Supply chain management	Supply chain management	http://data.europa.eu/esco/skill/f929c89e-c363-4132-a918-e021d57b307c
Digital skills (e.g. data management, precision agriculture)	Product data management	http://data.europa.eu/esco/skill/e2d0daae-2aa1-40cc-99e2-b340b02f97d3
	Agriculture not further defined	http://data.europa.eu/esco/iscsd-f/0810
Produce sustainable products	Produce sustainable products	http://data.europa.eu/esco/skill/97725325-5287-4ebb-9f83-1ba2c38f465c
Develop and coordinate waste management processes	Develop waste management processes	http://data.europa.eu/esco/skill/114a79ef-1e62-475b-a862-954f5b4cca20
Develop recycling programs	Develop recycling programs	http://data.europa.eu/esco/skill/862920c8-f2d0-4058-8fb8-9f06fbfc2446
Renewable energy integration	Renewable energy	http://data.europa.eu/esco/skill/f8413360-6114-40de-a276-c59b764b9913
Product data management and digitalization	Product data management	http://data.europa.eu/esco/skill/e2d0daae-2aa1-40cc-99e2-b340b02f97d3
Ensure compliance with environmental legislation	Ensure compliance with environmental legislation	http://data.europa.eu/esco/skill/089ee650-297e-4716-87d1-440743b70a0d
Asses the life cycle of resources	Asses the life cycle of resources	http://data.europa.eu/esco/skill/4e87c852-602a-4a0e-b8d8-20709ce14ac5
Develop new food products	Develop new food products	http://data.europa.eu/esco/skill/090ae6b3-12ab-4c72-b98a-17b790cf416e
Plan digital marketing/digital skills	Plan digital marketing	http://data.europa.eu/esco/skill/736ef286-fbd3-4e5c-a4b4-d1e2008c9898
Implement marketing strategies	Implement marketing strategies	http://data.europa.eu/esco/skill/13e2378e-0d10-450d-843a-b3592575826e
Green marketing	Marketing principles	http://data.europa.eu/esco/skill/de03f4fd-c147-4477-a048-7109e5ba2d6f



Thinking creatively and innovatively	Thinking creatively and innovatively	http://data.europa.eu/esco/skill/e84d080a-ff6d-41a7-b7b9-133e97c7bf00
Entrepreneurial mindset	Show entrepreneurial spirit	http://data.europa.eu/esco/skill/bdcf429c-5ccf-4c3d-bb61-4c987573a35e
Deep tech knowledge	Principles of artificial intelligence	http://data.europa.eu/esco/skill/e465a154-93f7-4973-9ce1-31659fe16dd2
	Principles of artificial intelligence	http://data.europa.eu/esco/skill/f049d050-12da-4e40-813a-2b5eb6df6b51

The planned sample size was 30 respondents in Spain and Italy, 20 respondents in Greece and Portugal and 10 respondents in Croatia. However, during investigation data was collected from 32 respondents in Spain, 33 respondents in Italy, 20 respondents in Greece, 22 respondents in Portugal and 15 respondents in Croatia (Table 3). The questionnaires were collected online via Google forms.

Table 3. Description of the sample of respondents who participated in the online questionnaire (N=122)

	Spain		Italy		Greece		Portugal		Croatia	
Variable	N	%	N	%	N	%	N	%	N	%
Number of respondents	32	100	33	100	20	100	22	100	15	100
Gender										
Male	24	75.00	20	60.60	18	90.00	16	72.70	10	66.70
Female	6	18.75	13	39.40	2	10.00	6	27.30	5	33.30
Prefer not to answer	2	6.25	0	0.00	0	0.00	0	0.00	0	0.00
Age										
Up to 36	5	15.60	9	27.30	0	0.00	3	13.64	6	40.00
37 - 56	19	59.30	9	27.30	9	45.00	14	63.64	6	40.00
57 and more	8	18.75	15	45.40	11	55.00	5	22.72	3	20.00
Education										
High school and lower	7	21.88	18	54.50	3	15.00	3	13.64	2	13.30
Bachelor degree	12	37.50	2	6.10	7	35.00	1	4.54	4	26.70
Licenciatura degree	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	15	68.18	n.a.	n.a.
Master degree	5	15.63	12	36.30	8	40.00	3	13.64	6	40.00
PhD	0	0	1	3.10	2	10.00	0	0.00	3	20.00



Other: Vocational training	8	25.00	0	0.00	0	0.00	0	0.00	0	0.00
Enterprise size										
Micro (<10 employees)	27	84.40	29	87.80	18	90.00	12	54.55	11	73.30
Small (<50 employees)	5	15.60	2	6.10	1	5.00	8	36.36	4	26.70
Medium sized (<250 employees)	0	0.00	2	6.10	1	5.00	2	9.09	0	0.00

Two interview reminders were also prepared for the qualitative data collection. One interview reminder was prepared for experts in the agri-food sector (ANNEX 2 (D2.3): Structured interview with circular business agro-food experts/professionals about current and future skills needs for transition of the olive oil sector to circular economy). The other one for providers of education (ANNEX 3 (D2.3): Structured interview with VET providers about current and future skills needs for transition of the olive oil sector to circular economy). The reminders contained open ended questions with a selection of possible answers to guide the conversation and conduct the interview as efficiently as possible. Planned sample size was 5 respondents in all countries except Croatia (2 respondents) for experts in the agri-food sector and 5 respondents in all countries except Croatia (2 respondents) for providers of education. All planned sample sized interviews were conducted, while Portugal collected one additional interview with expert in the agri-food sector. Interviews were conducted face-to-face with respondents and through an online meeting. The interviews were recorded and a transcript of the conversation was made. Each respondent has voluntarily and expressly consented to the collection and further processing of personal data and has voluntarily agreed to answer questions for the purpose of research within the CIRCOLIVE project. Each respondent has confirmed this with their signature in the documents: a) Statement related to giving consent for the processing of personal data and b) Information form for participation in research – personal informed consent.

Secondary data are ready-collected data that come from various sources, e.g: available studies, skills needs analysis, forecasts, etc., and the list of references used can be found in chapter 9 of this Report.

3.2. Data analysis methods

After the data collection was completed, the data analysis was carried out. Quantitative data collected through questionnaires were analysed using descriptive analysis and response frequencies. The data are presented in the form of tables, graphically through graphs and descriptively. The data collected through the interviews were processed through a content analysis.

4. Current Skill Levels regarding Circular Economy in the Olive Oil Sector

The following chapter explores the existing skill and knowledge levels, competencies and expertise in circular economy among stakeholders in the olive oil sector across different



countries (Spain, Italy, Greece, Portugal and Croatia).

As part of the research conducted for the CIRCOLIVE project for this Comparative Report, **122 different experts in the olive oil sector filled out the questionnaire in Spain, Italy, Greece, Portugal and Croatia.** As it can be seen in Figure 1, generally in all investigated countries majority of the respondents were “Agricultural production managers”. “Agronomists” also participated in the questionnaire in a high proportion, in Greece (25%), Portugal (27.3%), Croatia (26.7%), Italy (9.1%) and Spain (6.3%). “Sales and marketing managers” made up 26.7% of respondents in Croatia, and 18.8% in Spain. The lowest percentages of respondents in this study were “Researchers and scientists”, “Quality control and safety officers” and “Food technologists”. Agro-food experts with whom the interviews were conducted in Spain, Italy, Greece, Portugal and Croatia were mostly agronomists, agricultural production managers or farm and mill managers.

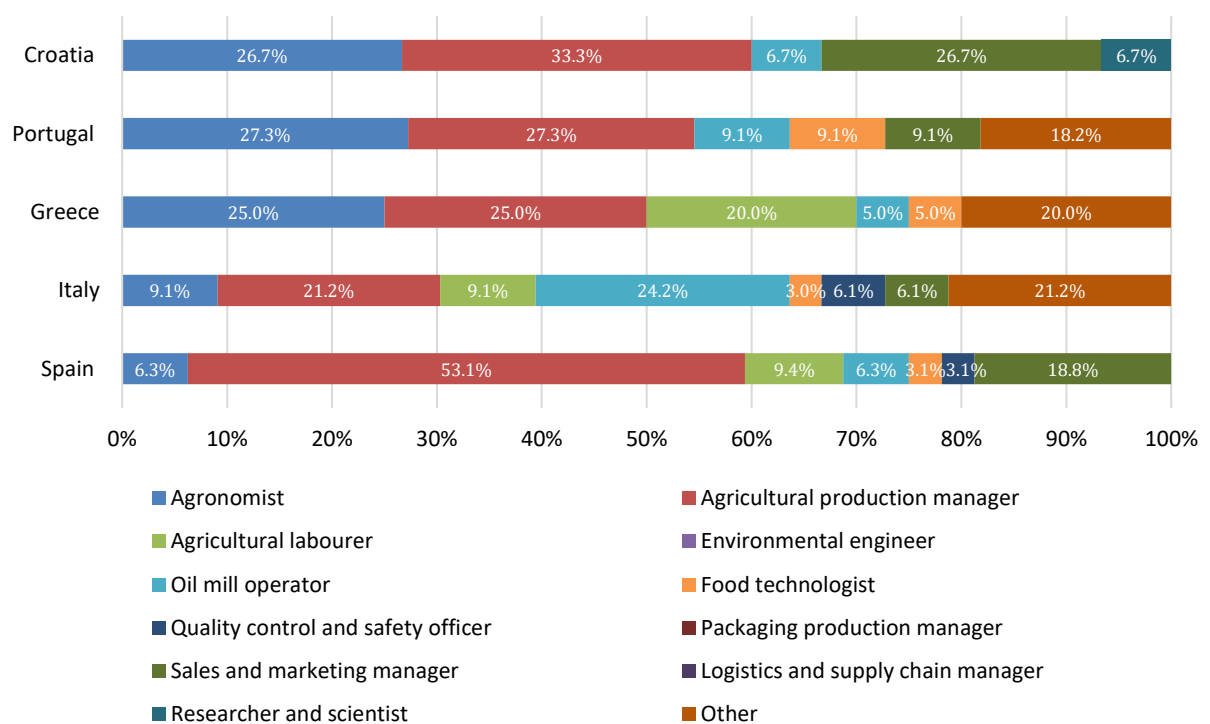


Figure 1. Current occupation/profession of respondents in the olive oil sector in Spain, Italy, Greece, Portugal and Croatia (N=122)

According to the questionnaire results in Figure 2, **a lot of different circular economy practices are currently implemented by respondents** in Spain, Italy, Greece, Portugal and Croatia. Majority of respondents in all investigated countries currently practice “Waste reduction and by-product valorization”: Spain (84.4%), Italy (48.5%), Greece (60%), Portugal (59.1%), Croatia (60%). “Renewable energy use” is also a practice quite represented in Portugal (59.1% of respondents) and Spain (59.4% of respondents). In Spain, four of the practices (“Waste reduction and by-product valorization”, “Water recycling and efficient usage in olive oil production”, “Renewable energy use”, “Eco-friendly packaging materials”) are implemented by more than 50% of the respondents which shows great engagement with circular economy principles, demonstrating a strong commitment to resource efficiency and environmental responsibility. Only some respondents from Greece (10%), Italy (12.1%) and



Spain (6.3%) stated that they do not implement any of the presented circular economy practices in their enterprise.

Insights from agro-food experts in the investigated countries reveal that majority of interviewees implement waste reduction and by-product valorization, water-saving techniques, renewable energy usage and usage of recycled packaging materials in their enterprises. In Italy, Greece and Portugal interviewees also mentioned the use of techniques to reduce their carbon footprint. In addition, one agro-food expert from Spain described how they experimented with olive pits as a moisture-retention method, reducing water loss and acting as a natural herbicide.

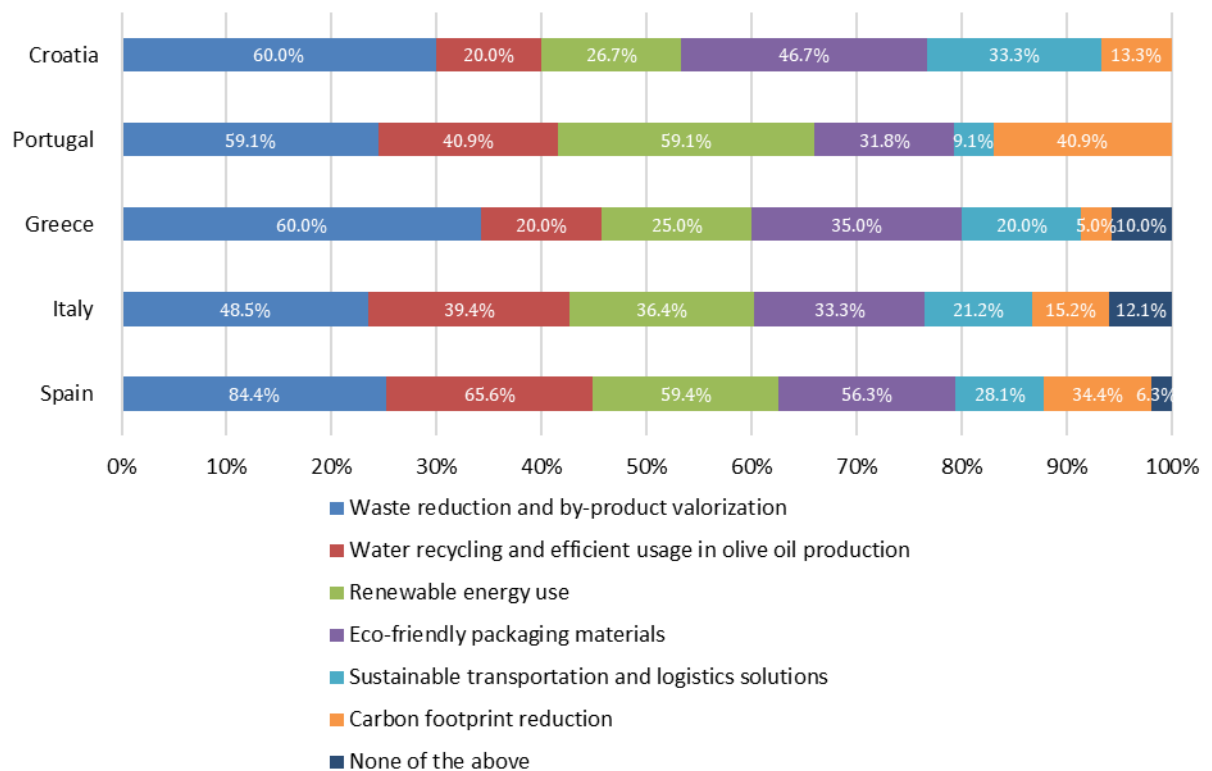


Figure 2. Circular economy practices currently used in the enterprise in Spain, Italy, Greece, Portugal and Croatia (N=122)

When asked to assess their **knowledge and skills regarding circular economy in the olive oil sector**, respondents from Spain, Italy, Greece, Portugal and Croatia expressed similar knowledge levels (Figure 3). Respondents in all countries surveyed generally consider their knowledge and skills regarding circular economy to be “Limited”, “Acceptable” or “Good”. In Italy and Croatia none of the respondents think their knowledge and skills are “Excellent”, while in Portugal none of the respondents consider their knowledge and skills on the circular economy to be “Poor”. These findings agree with the information gathered during interviews with agro-food experts in Spain, Italy, Greece, Portugal and Croatia. They mostly consider their knowledge and skills to be “Acceptable” or “Good”, with some of the interviewees from Greece which consider their knowledge to be “Excellent”. One interviewee from Spain highlighted that while they personally have a strong background in sustainability, most of their team lacks awareness or engagement in circular economy

principles. Portuguese interviewed agro-food experts identified resistance on the part of their production workers to adopting some of the circular economy practices indicated, thus requiring constant monitoring of practices in the field.

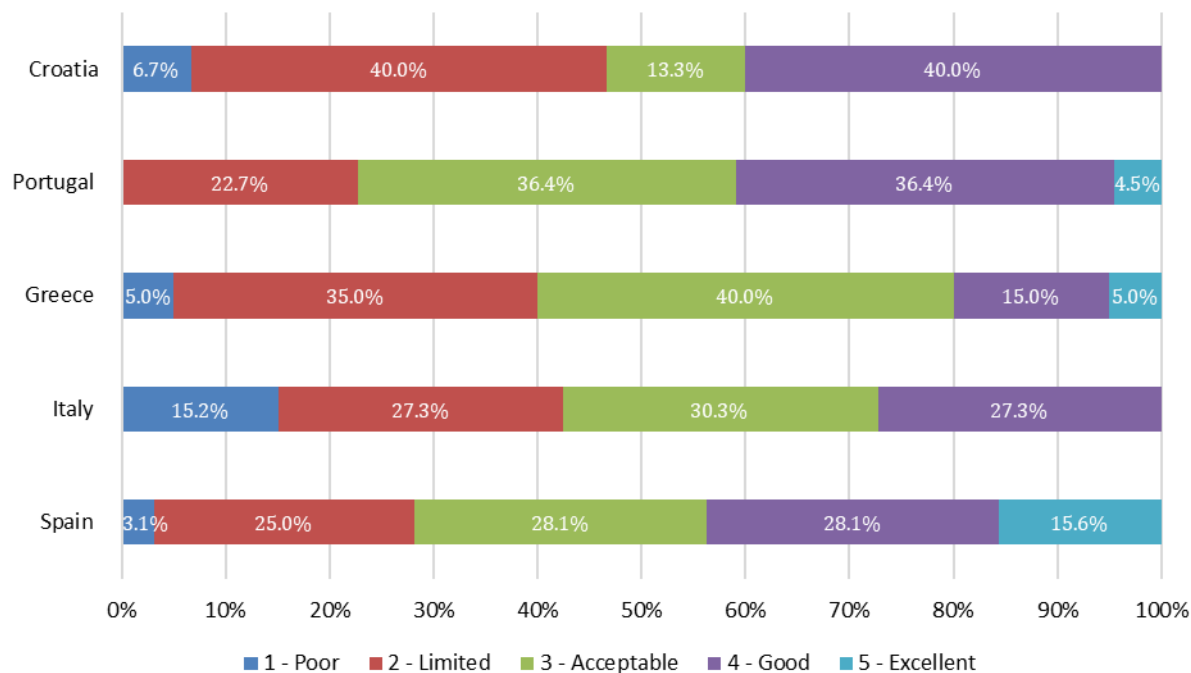


Figure 3. Respondents' self-assessment of knowledge and skills on the circular economy in the olive oil sector in Spain, Italy, Greece, Portugal and Croatia (N=122)

In order to gain insight into the current and future skills and current skills gaps related to the circular economy in the olive oil sector in Spain, Italy, Greece, Portugal and Croatia, the ESCO classification was used. ESCO is a multilingual classification that identifies and categorizes skills, competences, qualifications and occupations relevant to the European labour market and education and training (<https://esco.ec.europa.eu/en/classification>). The classification is structured in 3 pillars (occupations; knowledge, skills and competences; qualifications), interconnected to organize the terminology for the European labour market and the education/training sector in a usable, transparent and consistent way (COM, 2019) and to help individuals, employers, universities and training providers by providing them with up-to-date and standardized information on skills (Chiarello et al., 2021). After a decade of development, the ESCO classification currently contains information on 3,039 different occupations and 13,939 skills and is available in 28 languages.

Circular economy skills identified by ESCO such as “Knowledge of sustainable farming practices”; “Knowledge of water and soil protection”; “Organic farming and pest control techniques”; “Understanding of food policies and regulations”; “Waste and by-product management”; “Energy efficiency in production”; “Supply chain management”; and “Digital skills” were used in the questionnaire for the purposes of this Comparative Report (https://esco.ec.europa.eu/en/classification/skill_main).

According to the questionnaire results, all investigated countries have very similar results when it comes to the **key skills related to circular economy**, which the respondents consider the most important in the olive oil sector. “Waste and by-product management”,



“Knowledge of sustainable farming practices” and “Knowledge of water and soil protection” seem to be the most important skills to the respondents in Spain, Italy, Greece, Portugal and Croatia. While majority of respondents from Spain and Portugal consider “Digital skills” also important, respondents from Italy, Greece and Croatia have mostly neutral opinion about their importance in the olive oil sector for their enterprise. In general, almost none of these skills are considered unimportant by the respondents.

Generally, during interviews with agro-food experts and VET providers, the experts emphasized that knowledge of sustainable farming practices, water and soil protection and also waste and by-product management are very important for the adoption of circular economy principles, along with organic farming techniques, and pest control within the sector. In addition, experts from Portugal and Croatia highlighted digital skills, which they consider particularly important for the olive oil sector’s transition to circular economy.

5. Current Skill Gaps regarding Circular Economy in the Olive Oil Sector

The transition to circular economy in the olive oil sector is gaining momentum, but significant skill gaps remain a major barrier to full implementation. While producers and industry professionals recognize the importance of sustainability, many lack the necessary expertise in waste management, digitalization, regulatory compliance, and sustainable business models. These deficiencies not only slow down the adoption of circular practices but also limit the sector’s ability to innovate and remain competitive. The following chapter will address these gaps found during CIRCOLIVE research in order to ensure a successful and lasting transition to a more sustainable olive oil industry in the future.

When it comes to **the factors influencing the need for new skills** in the enterprise, as can be seen in Figure 4, is quite similar in all investigated countries. The biggest factor is shown to be “Pressure to improve sustainability performance” in Greece (75%), Italy (51.5%) and Croatia (60%). Spanish respondents recognized “Consumer demand for sustainable products” as the biggest factor for them (50%) while Portuguese respondents consider “Global market demands and trade dynamics” as the biggest factor influencing the need for new skills. Generally, for all countries participating in this research, other significant factors include “Economic changes”, “Adoption of circular economy models”, “Environmental regulations and policies” and “Development of new technologies and innovation”.

The interviewed experts in the agri-food sector from Spain, Italy, Greece, Portugal and Croatia highlight, as the main factors influencing the need for new skills in their company, the development of new technologies, global market demands, environmental regulations and policies, along with climate change and trade dynamics.

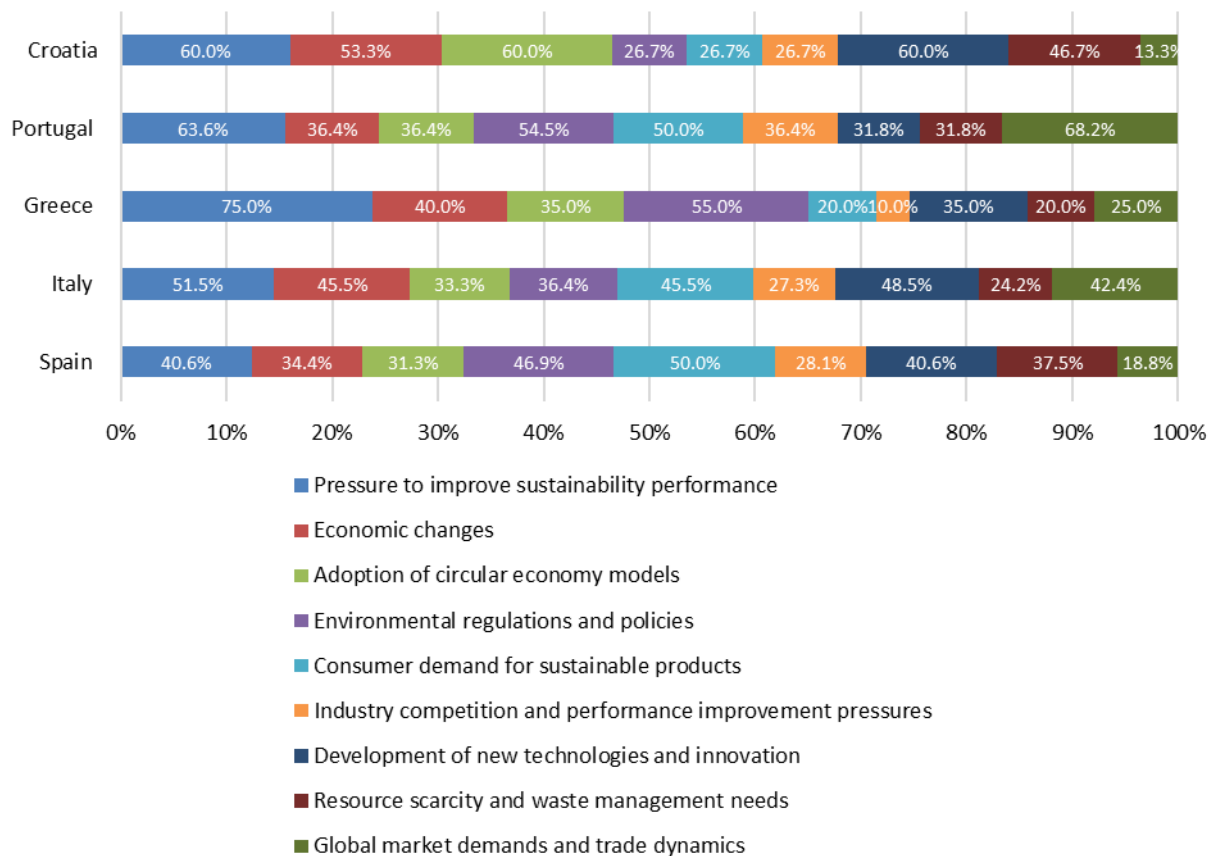


Figure 4. Factors influencing the need for new skills in the enterprise in Spain, Italy, Greece, Portugal and Croatia (N=122)

The bar chart in Figure 5 illustrates **the main skill-related barriers limiting the transition to circular economy** in companies across five countries: Spain, Italy, Greece, Portugal and Croatia. For questionnaire respondents across all countries, financial constraints are a major obstacle. Greece (80%) reports the highest concern, followed by Spain (78.1%), Croatia (60%), Italy (54.5%), and Portugal (50%). Portugal (72.7%) and Italy (54.5%) have a high percentage of respondents indicating a lack of regulatory incentives as a barrier. Limited knowledge of circular economy principles is another concern, especially in Greece (60%) and Croatia (33.3%). Shortage of marketing and communication skills related to sustainability are highlighted as an issue across countries, with Spain (40.6%) and Portugal (31.8%) showing notable concern. While all countries expressed insufficient market demand for sustainable products, Croatia shows the biggest concern in this part (53.3%).

Interviews conducted in Spain, Italy, Greece, Portugal and Croatia highlighted that financial constraints are the primary barrier to transitioning to circular economy in the olive oil sector, with limited funding opportunities making investments in sustainable technologies unfeasible, particularly for micro and small enterprises. Beyond financial challenges, a lack of technical knowledge and digital skills further hinders sustainability efforts. In Spain, producers struggle with understanding circular economy regulations, accessing funding, and utilizing digital tools to track sustainability metrics, while in Italy and Greece, gaps in technical expertise and knowledge of sustainable production methods were significant concerns. Additionally, Portuguese professionals pointed out the limited regulatory



incentives and insufficient market demand for sustainable products, as well as the lack of collaboration between academia and businesses in the sector. Marketing and communication deficiencies were also noted, with producers in Spain particularly emphasizing the challenge of effectively promoting their sustainability efforts without engaging in greenwashing. Across all countries, the need for better education, technical training, and financial support emerged as crucial for facilitating the sector’s transition to circular economy.

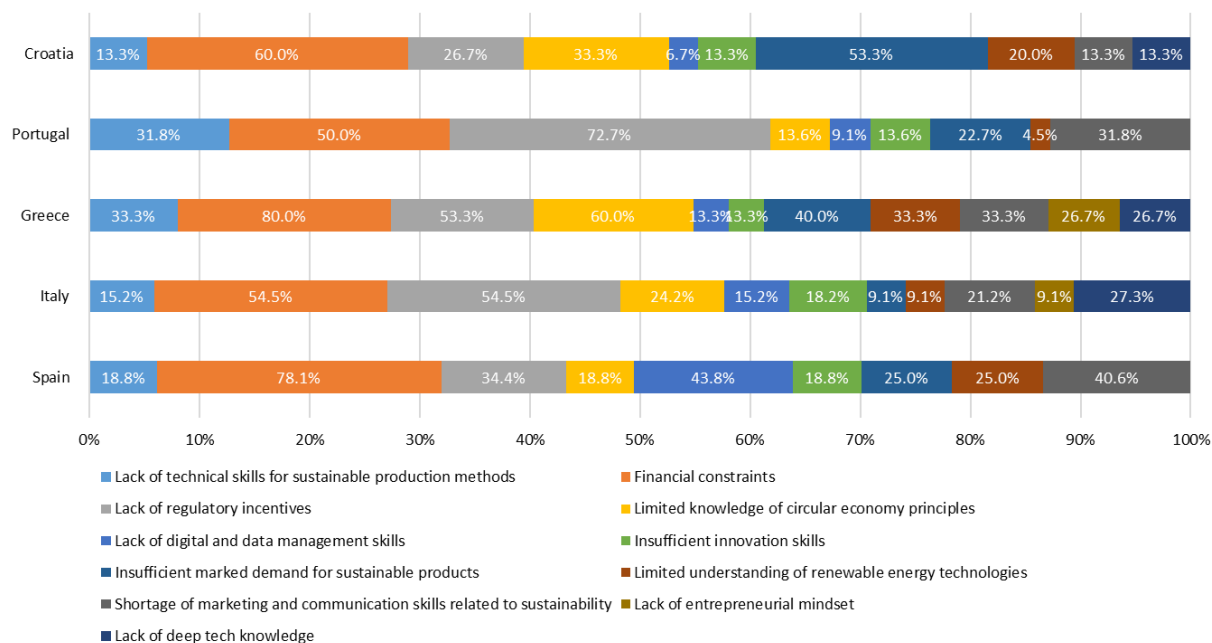


Figure 5. Lack of skills in the company that limit the transition to circular economy in Spain, Italy, Greece, Portugal and Croatia (N=122)

In the ESCO classification, the skills of certain occupations include circular economy skills, such as: “Sustainability manager”, “Alternative fuels engineer”, “Waste treatment engineer”, “Recycling specialist”, “Environmental engineer”, “Food technologist”, “Food technician”, “Product development engineering drafter” and “Environmental programme coordinator” (https://esco.ec.europa.eu/en/classification/skill_main). During the questionnaire, respondents had the opportunity to assess whether they agreed with the ESCO classification regarding circular economy skills for the listed occupations. The vast majority of respondents from all investigated countries believe that the occupations such as “Waste treatment engineer”, “Sustainability manager” and “Recycling specialist” require circular economy skills. In Greece and Croatia respondents are the most uncertain about “Product development engineering drafter” and “Food technician”, while in Portugal respondents expressed uncertainty about the following occupations: “Food technologist”, “Alternative fuels engineer” and “Food technician”.

In addition to the occupations that ESCO associates with circular economy skills, questionnaire respondents could also express their opinions about other occupations in the olive oil sector such as “Agronomist”, “Agricultural production manager”, “Agricultural labourer”, “Oil mill operator”, “Quality control and safety officer”, “Packaging production manager”, “Sales and marketing manager”, “Logistics and supply chain manager” and “Researcher and scientist”.



Generally, majority of respondents in all countries agree that “Agronomists”, “Agricultural production managers” and “Researcher and scientists” need circular economy skills in the olive oil sector. Respondents from Portugal also highlighted additional occupations not provided in the questionnaire such as financial managers, political managers and decision-makers, while respondents from Italy recognized olive producers’ association managers as occupation in need of circular economy skills in the olive oil sector.

Across the investigated countries, there is a shared recognition that various key occupations in the olive oil sector should acquire circular economy skills to support sustainability transitions. Croatia and Greece emphasize agronomists, production managers, and researchers. Italy identifies a wide range of roles, including logistics, marketing, and food technologists. Portugal reinforced the idea that all professions in the sector are interconnected, stressing the absence of an official olive oil specialist role. Overall, while specific occupational focuses vary, all countries agree on the necessity of targeted training and upskilling across the olive oil sector to foster circular economy.

6. Future Skill Needs and Emerging Professions for Transition of Olive Oil Sector to Circular Economy

As the olive oil sector moves toward circular economy, the demand for new skills and specialized professions is becoming increasingly evident. Advancements in sustainable production, technology, and resource efficiency require a workforce equipped with expertise in waste valorization, renewable energy, and circular business models. This chapter explores the key future skill needs and emerging professions that will play a crucial role in driving the sector’s transition toward a more sustainable and resilient model which were found during the CIRCOLIVE project.

The graph in Figure 6 presents the percentage of questionnaire respondents across five countries—Spain, Italy, Greece, Portugal and Croatia - that recognize **specific skills essential for successfully adopting circular economy practices in the future**. The most highly valued skill in all countries is “By-product and waste management”, with Croatia (93.3%), Portugal (86.4%), and Greece (85.0%) reporting the highest demand. Spain (62.5%) and Italy (45.5%) also consider it important, though at relatively lower levels. “Producing sustainable products” is another widely recognized skill, particularly in Spain (78.1%) and Greece (75.0%). Meanwhile, “Developing and coordinating waste management processes” is emphasized significantly in Spain (56.3%), Portugal (40.9%), and Greece (40.0%). Skills related to “Renewable energy integration” and “Developing recycling programs” also show strong relevance in some countries, especially in Greece (65.0% for recycling) and Portugal (68.2% for renewable energy). “Thinking creatively and innovatively”, “Entrepreneurial mindset”, and “Deep tech knowledge” are also acknowledged across different countries, with varying levels of importance. Overall, the data highlights a strong focus on waste management and sustainability-related competencies across all countries, with variations in emphasis on digitalization, marketing, and innovation depending on national priorities.

Interviews across all countries emphasized that the future success of olive oil enterprises in adopting circular economy practices will depend on key skills such as by-product and waste management, the production of sustainable products, and the integration of renewable energy sources. Croatia and Greece highlighted the importance of an entrepreneurial



mindset, while Spain and Portugal stressed the need for advanced digital skills, including data management, precision farming, and blockchain innovation. Regulatory knowledge was also identified as crucial, particularly in Spain and Portugal, where compliance with environmental legislation and access to sustainability incentives were major concerns. Italy and Greece further pointed to the need for recycling programs and resource lifecycle assessment, while Spain emphasized packaging innovation to meet consumer demands. Overall, the interviews revealed a strong demand for technical expertise, digitalization, and regulatory knowledge to drive sustainability and profitability in the sector.

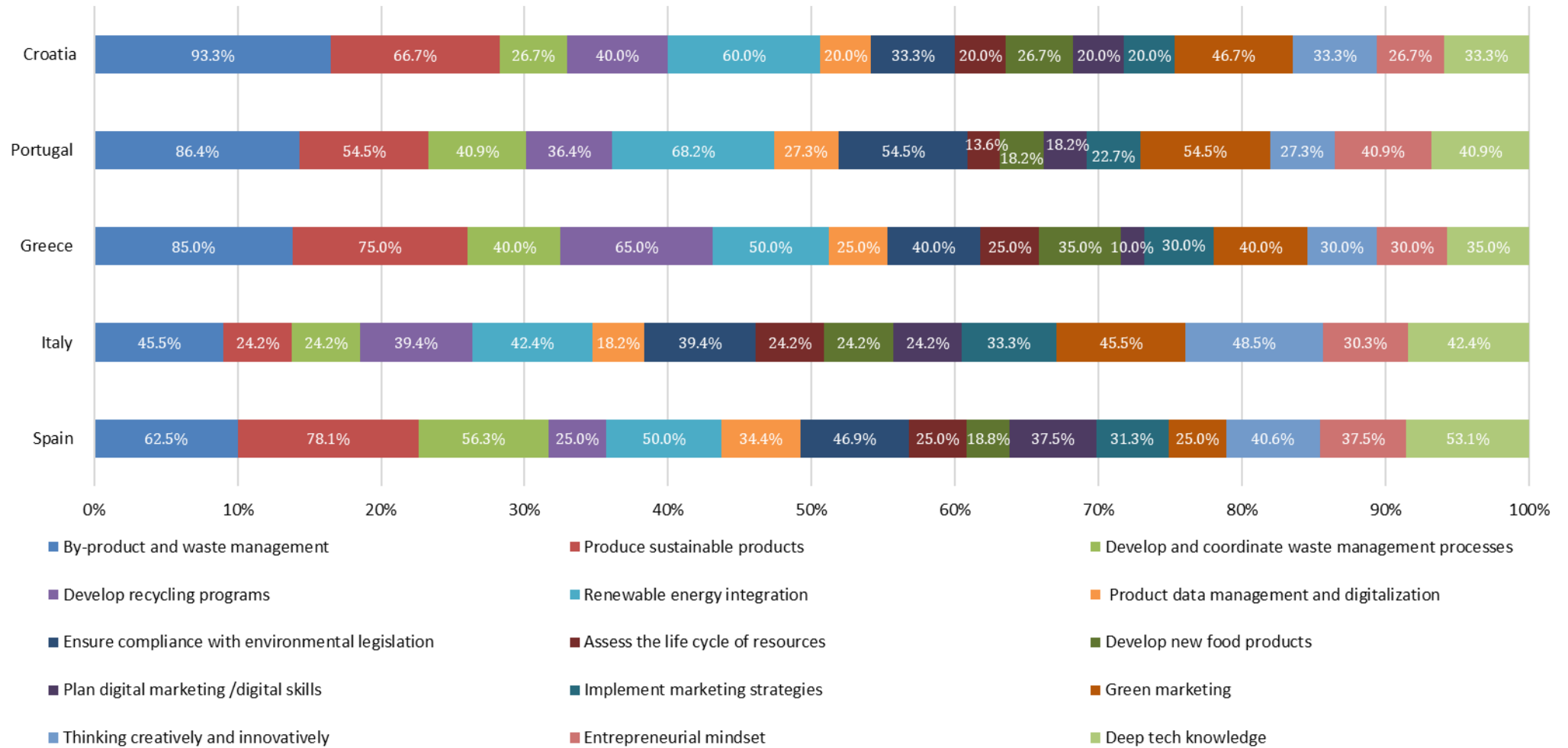


Figure 6. Skills needed for future success of enterprises in adopting circular economy practices in Spain, Italy, Greece, Portugal and Croatia (N=122)



The Figure 7 highlights **the emerging occupations in the olive oil sector for the transition to circular economy**. The most recognized roles, amongst questionnaire respondents, include “Waste valorization engineers”: in Croatia (80.0%), Portugal (63.6%), Greece (55.0%), Italy (51.5%) and Spain (46.9%); as well as “Renewable energy specialists”, especially in Croatia (73.3%) and Italy (48.5%). “Circular economy managers” are also highly recognized, especially in Greece (55.0%) and Portugal (54.5%), along with “Sustainability consultants”, notably in Spain (43.8%) and Italy (39.4%).

However, some important roles appear underrecognized by respondents. “Environmental impact auditors” receive relatively low recognition, with only 15.0% in Greece and 28.1% in Spain acknowledging their importance. Similarly, “Supply chain specialists for green logistics” are also not recognized as that important, with only 9.1% of respondents in Portugal and 13.3% in Croatia identifying them as necessary. “Marketing professionals for eco-friendly products” also receive low recognition, despite their role in promoting sustainable practices, with just 9.4% in Spain and 18.2% in Portugal emphasizing their need.

Overall, the sector is focusing heavily on technical and engineering roles, while marketing, legal, and environmental auditing professions remain undervalued, despite their critical role in regulatory compliance and market adaptation.

Interviews across all countries highlighted several emerging occupations essential for the olive oil sector's transition to circular economy. Sustainability consultants were widely recognized as key future professionals, particularly in Croatia, Spain, Italy, and Portugal, where they are expected to provide expertise on waste management, resource optimization, and regulatory compliance. Waste valorization engineers, crucial for repurposing by-products like olive pits and pulp, were identified as important in Spain, Italy, Greece, and Portugal. The need for circular economy managers was emphasized in Greece and Portugal, while Spain and Italy pointed to the rising demand for digital agriculture specialists and policy advisors. Legal advisors on environmental regulations, marketing professionals for eco-friendly products, and renewable energy experts were also highlighted as essential roles. Overall, the findings indicate a growing need for highly specialized professionals with expertise in waste management, digitalization, regulatory compliance, and sustainable marketing to drive the circular economy transition in the olive oil sector.

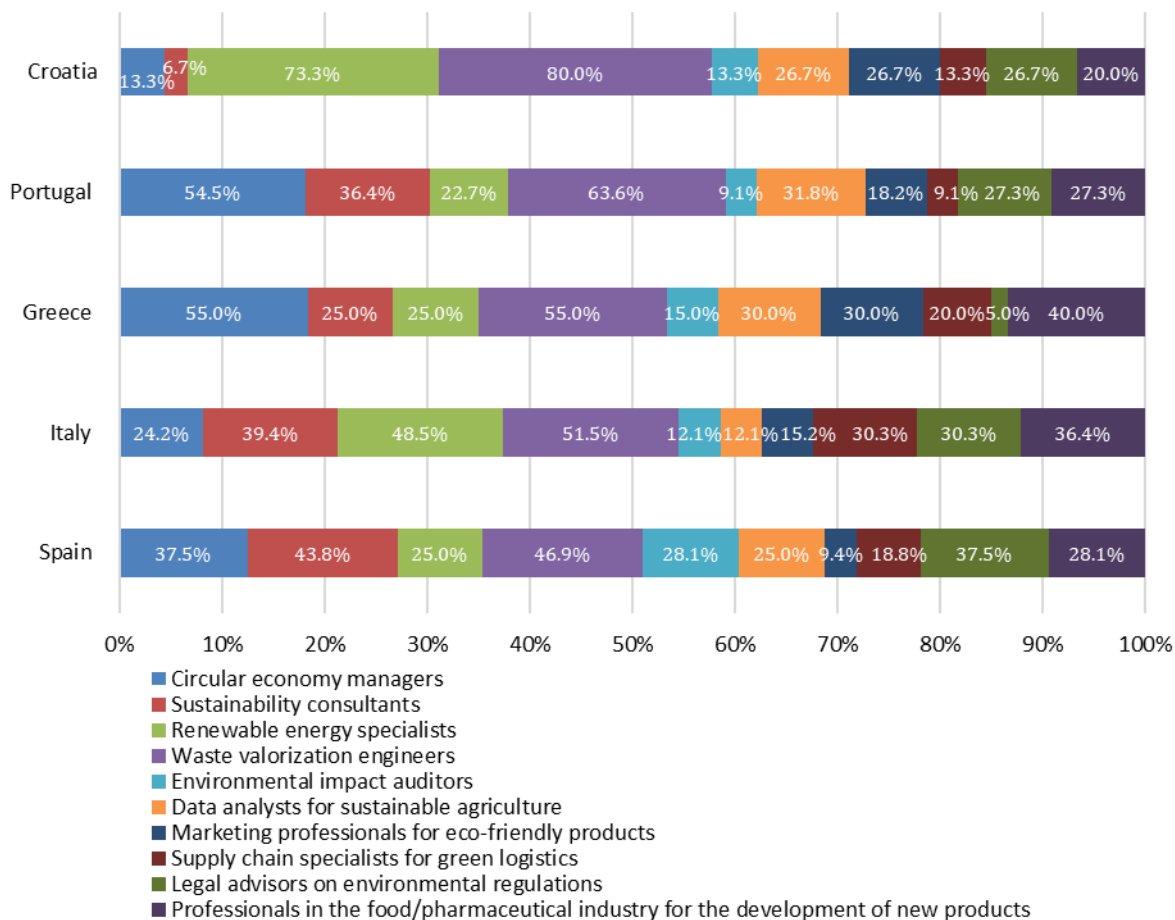


Figure 7. Emerging occupations in the olive oil sector in the transition to circular economy in Spain, Italy, Greece, Portugal and Croatia (N=122)

Furthermore, questionnaire respondents also selected **skills that they consider to be key for new occupations in the olive oil sector related to the circular economy** across Spain, Italy, Greece, Portugal and Croatia (Figure 8).

“Knowledge of waste and by-product valorization” is the most recognized skill, particularly in Croatia (86.7%), Greece (80.0%), and Portugal (68.2%), highlighting the industry’s focus on waste reduction and sustainability. “Renewable energy technology expertise” is also a crucial skill, with high recognition in Croatia (46.7%), Italy (30.3%), and Spain (31.3%), reflecting the sector’s transition to cleaner energy sources.

Additionally, “Digital and precision agriculture skills” are emphasized in Greece (30.0%), Portugal (22.7%), and Spain (31.3%), indicating a growing need for technological advancements in farming practices. “Agricultural planning with a focus on regenerative and holistic practices”, which can drive efficiency, sees significant demand in Italy (33.3%) and Portugal (22.7%). “Marketing and sales of green products”, however, appear underrecognized, with the highest acknowledgment in Greece (35.0%) and Italy (21.2%), despite its crucial role in promoting sustainable olive oil products.

Other underappreciated yet valuable skills include “Green finance and investment expertise”, “Leadership in sustainability strategy”, and “Deep tech skills (e.g., robotics, blockchain)”, with relatively low percentages across all countries. This suggests that while



technical and environmental skills are prioritized, financial, strategic, and technological expertise remain undervalued despite their potential to enhance the industry's sustainability and innovation.

According to the CIRCOLIVE research results from interviews across countries identified key skills required for emerging occupations in the olive oil sector's transition to circular economy. Croatia, Italy, Portugal and Greece emphasized expertise in waste and by-product valorization as essential, while Italy and Greece also highlighted compliance with environmental legislation and sustainable resource management. Renewable energy technology knowledge was considered crucial in Italy and Greece, alongside digital and precision agriculture skills. Marketing and sales of eco-friendly products were also recognized as important, particularly in Italy and Greece. Additionally, Greece pointed to the need for circular product design, eco-packaging expertise, and environmental impact auditors. Across all countries, advanced technological skills, process innovation, automation, leadership in sustainability, and problem-solving abilities were seen as vital for professionals leading the circular economy transition in the olive oil sector.

Regarding the **possible future education programs about circular economy** in Spain, Italy, Greece, Portugal, and Croatia, the findings reveal a shared recognition of the importance of integrating circular economy education into the olive oil sector, yet significant disparities exist in the current availability and structure of such training programs. While Spain's training providers express an intent to incorporate circular economy education in the future, they highlight challenges in attracting young people to agricultural careers, which could hinder workforce development. Italy's education professionals emphasize the need for knowledge in agri-food sustainability, waste management, and organic farming, but structured courses on circular economy practices remain limited, with only a few institutions offering relevant modules.

Portugal demonstrates a more structured approach, with universities and polytechnic institutes gradually incorporating circular economy topics into existing agricultural programs. Upcoming initiatives, such as a doctorate in Circular Economy in Agriculture and micro-credential courses aimed at non-higher education participants, suggest a proactive effort to address skill gaps. Similarly, Greek institutions express a strong willingness to provide training, with proposals for mixed-learning models and live demonstrations tailored to industry professionals and stakeholders. Croatia, as well, currently lacks formal educational programs on circular economy in the olive oil sector, with VET providers suggesting lifelong learning and micro-qualification programs as potential future solutions.

Across all five countries, the need for accessible, flexible, and practical training approaches is evident. Hybrid learning formats, short-term courses, and sector-specific micro-credentials are seen as key to bridging skill gaps, particularly for farmers and industry professionals with varying levels of prior education. Overcoming the obstacles will require collaborative efforts between educational institutions, industry stakeholders, and policymakers to ensure a skilled workforce capable of driving the sector's transition to circular economy.

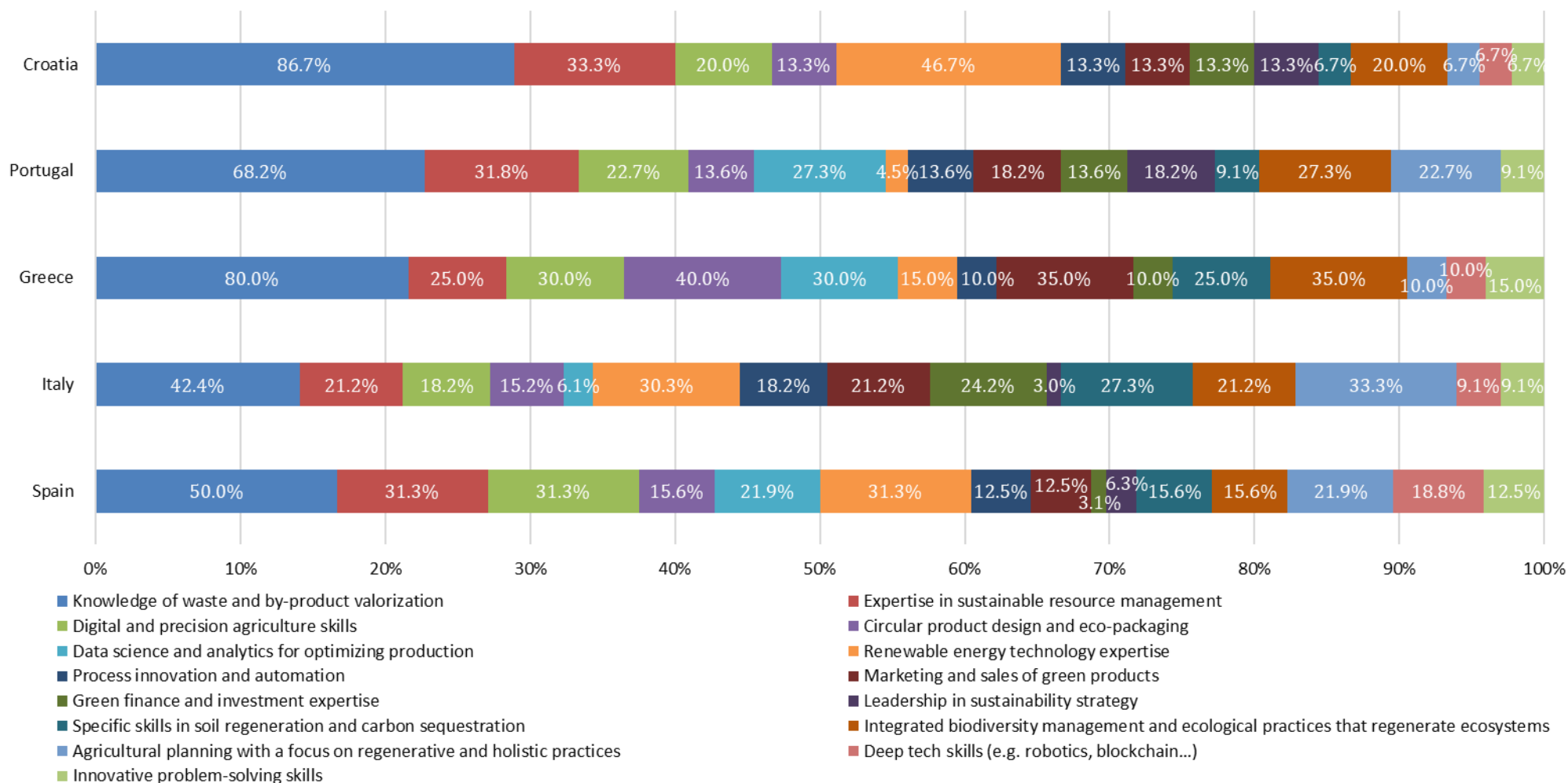


Figure 8. Skills required for emerging occupations in the olive oil sector in Spain, Italy, Greece, Portugal and Croatia (N=122)



7. Conclusions

The transition to circular economy presents both challenges and opportunities for the olive oil sector. The findings from the CIRCOLIVE project research across Spain, Italy, Greece, Portugal and Croatia reveal a growing awareness and some adoption of circular economy practices within the olive oil sector, but highlight several common challenges in fully implementing these practices.

Regarding circular economy practices, waste reduction and by-product valorization are widely adopted across all investigated countries, demonstrating a strong industry commitment to minimizing waste. The considerable use of renewable energy, particularly in Spain and Portugal, indicates a shift towards sustainable energy sources. However, the transition remains uneven, with significant gaps in skills, financial resources, and regulatory support limiting broader adoption. While sustainability efforts are evident in certain areas, key challenges such as insufficient integration of renewable energy, water recycling, and digital technologies persist. Many producers rely on traditional methods, and while they acknowledge the need for sustainable transformation, they often lack structured education and training in circular economy practices.

The most crucial skills identified for the sector's transition include waste and by-product management, organic farming, and energy efficiency. However, digitalization, data analytics, and sustainability marketing remain undervalued despite their potential to enhance efficiency and competitiveness. Limited knowledge of regulatory frameworks, circular business models, and financial mechanisms further hinders progress, making it difficult for producers to navigate sustainability certifications and access funding for green investments. Additionally, a lack of demand for sustainable products in some markets weakens the motivation to adopt circular practices.

Financial constraints are a recurring barrier, as many sustainability improvements require substantial investments that small and medium-sized producers struggle to afford. Without stronger policy incentives, access to green financing, and better regulatory guidance, the sector's ability to fully implement circular economy models remains restricted. There is also a need for greater collaboration between businesses, training institutions, and policymakers to develop structured education programs that equip workers with the necessary skills to drive this transformation.

The demand for circular economy skills is being driven by external pressures such as climate change adaptation, lack of labour, stricter environmental regulations, and shifting consumer preferences toward sustainable products. The identified emerging roles reflect the evolving skill needs of the olive oil sector as it transitions to circular economy. The highest demand is observed for waste valorization engineers, renewable energy specialists, and circular economy managers, suggesting a strong focus on sustainability, energy efficiency, and waste reduction. Additionally, the need for marketing, supply chain, and legal expertise highlights the importance of market adaptation and regulatory compliance. Addressing these workforce needs will be crucial for fostering a sustainable and resource-efficient olive oil industry in these countries. To accelerate progress, investment in education, technological innovation, and business model restructuring will be essential.



Overall, the olive oil sector in Spain, Italy, Greece, Portugal and Croatia is at different stages in its transition to circular economy. While there is increasing awareness and some adoption of sustainable practices, significant skill gaps, financial limitations, and regulatory challenges remain. Addressing these gaps through targeted education, financial incentives, and technological innovations will be essential to ensure the sector's successful transition to a more sustainable and circular model.

8. Recommendations

To ensure the successful transition of the olive oil sector to circular economy in Spain, Italy, Greece, Portugal and Croatia, a comprehensive strategy encompassing education, financial support, technological innovation, and policy adaptation is essential. Developing specialized training programs focused on circular economy practices, waste valorization, digitalization, and sustainability management is crucial for equipping professionals with the necessary skills. Collaboration between industry, academia, and policymakers should be strengthened to bridge the gap between theoretical knowledge and real-world applications, while sustainability education should be introduced at various levels to build long-term awareness.

Financial incentives and regulatory support must be enhanced to encourage businesses to invest in circular practices. Governments should provide grants, tax benefits, and streamlined regulatory frameworks to facilitate compliance and promote green investments. Technological innovation, including the adoption of smart farming, digital traceability, and renewable energy solutions, should be prioritized to improve resource efficiency and waste management. Greater emphasis should be placed on by-product valorization, transforming waste materials into valuable resources such as biofuels, biofertilizers, and sustainable packaging.

Industry collaboration and knowledge-sharing networks are vital to drive innovation and establish sustainability benchmarks. Cross-sector partnerships, particularly between research institutions and producers, can accelerate the adoption of best practices. Moreover, consumer engagement strategies should be developed to raise awareness of sustainable olive oil production, ensuring that marketing efforts reflect transparency and ethical branding.

A shift in workforce development is also necessary, with emerging roles such as waste valorization engineers, renewable energy specialists and circular economy managers becoming increasingly important. Training programs should focus on equipping professionals with interdisciplinary skills in agronomy, data science, green finance, and sustainable business models. Moreover, programs for exchanging know-how and good practices between farmers and experts from different countries would be of high value. Digital literacy must be improved to enable the use of technology for sustainability monitoring, precision agriculture, and supply chain optimization.

Finally, restructuring business models and expanding market opportunities for sustainable olive oil products will ensure long-term resilience and competitiveness. Investments in green supply chains, eco-friendly logistics, and international certifications will help differentiate sustainable products in the global market. A collective effort involving producers, industry stakeholders, policymakers, and educators is necessary to integrate circular economy



principles fully, ensuring environmental sustainability, economic growth, and long-term sectoral transformation.

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10. Appendices

10.1. Survey Questionnaires and Interviews

10.1.1. Annex 1 (D2.3) – Online Survey targeting MSMEs in the Olive Oil Sector about Current and Future Skills Needs for Transition of the Olive Oil Sector to Circular Economy



ANNEX 1 (D2.3): Online Survey targeting MSMEs in the Olive Oil Sector about Current and Future Skills Needs for transition of the Olive Oil Sector to Circular Economy

This survey is launched as the second consultation activity of the project *“Developing skills for introducing circular business models and digital technologies in olive oil sector (CIRCOLIVE)”*, a three-year project co-funded by the European Union under the Erasmus+ Programme.

The project aims to support the EU transition to the Circular Economy by improving/enhancing the circular business skills in the olive oil sector in Spain, Italy, Greece, Portugal and Croatia, in order to promote the adoption of circular entrepreneurial models for waste and by-product valorization of the whole olive value chain.

The answers to this survey will help us in the identification of skills for developing VET curricula on circular business models and digital technologies in olive oil sector.

In this survey definition of **Circular Economy** presents methods and possibilities of using olive by-products and waste in the olive oil sector. **ESCO** (European Skills, Competences, Qualifications and Occupations), the European multilingual classification of Skills, Competences, Qualifications and Occupations, was used to identify and select existing occupations and skills relevant to circular economy in the olive oil sector.

The survey takes **about 10 minutes**. Responses will be treated **anonymously** and the results will be used for **CIRCOLIVE project purposes only**.

Your answer is valuable to us and we thank you in advance for your time and effort.

Part 1: General Information

- 1) Respondent's gender
 - a) Male
 - b) Female
 - c) I prefer not to answer

- 2) Respondent's age _____ years old

- 3) Enterprise size:
 - a) Micro (<10 employees)
 - b) Small (<50 employees)
 - c) Medium sized (<250 employees)
 - d) Large size (>250 employees)

- 4) Respondent's education



- a) High school and lower
- b) Bachelor degree
- c) Licenciatura degree
- d) Master degree
- e) PhD
- f) Other _____

5) Which segment of the olive oil sector does your enterprise operate in?

- Olive growing
- Olive oil production
- Olive growing and olive oil production
- Other (Please specify): _____

6) Which of the following best describes your **current occupation/profession*** in the olive oil sector? (Select the most relevant)

*selected occupations from ESCO relevant to olive oil sector. ESCO - the European multilingual classification of Skills, Competences, Qualifications and Occupations

- Agronomists
- Agricultural production managers
- Agricultural labourers
- Environmental engineers
- Oil mill operators
- Food technologists
- Quality control and safety officers
- Packaging production managers
- Sales and marketing managers
- Logistics and supply chain managers
- Researchers and scientists
- Other (Please specify): _____

Part 2: Current Skill Levels

7) Which of the following **circular economy practices** are you currently implementing or aware of in your enterprise? (Select all that apply)

- Waste reduction and by-product valorization (e.g., olive pomace composting)
- Water recycling and efficient usage in olive oil production
- Renewable energy use
- Eco-friendly packaging materials
- Sustainable transportation and logistics solutions
- Carbon footprint reduction



- None of the above

8) How do you **rate skills and knowledge** about circular economy (methods and possibilities of using olive by-products and waste in olive sector) in your enterprise?

- a) 1 - Poor
- b) 2 - Limited
- c) 3 - Acceptable
- d) 4 - Good
- e) 5 - Excellent

9) According to your opinion, which of the following **skills*** are most significant in the olive oil sector regarding circular economy? (Rank in order of importance, 1 not important at all to 5 being the most important)

* selected skills from ESCO adapted to olive oil sector. ESCO - the European multilingual classification of Skills, Competences, Qualifications and Occupations

- Knowledge of sustainable farming practices
- Knowledge of water and soil protection
- Organic farming and pest control techniques
- Understanding of food policies and regulations
- Waste and by-product management
- Energy efficiency in production
- Supply chain management
- Digital skills (e.g. data management, precision agriculture)

Part 3: Factors Shaping Skills Demand

10) In your opinion, which of the following **factors** are most influencing **the demand for new skills** in your enterprise? (Select all that apply):

- Pressure to improve sustainability performance (e.g., need for cost reduction, supply chain issues)
- Economic changes (e.g., global markets, trade policies)
- Adoption of circular economy models
- Environmental regulations and policies
- Consumer demand for sustainable products
- Industry competition and performance improvement pressures
- Development of new technologies and innovation
- Resource scarcity and waste management needs
- Global market demands and trade dynamics



Part 4: Skill Gaps

11) Are there any noticeable **skills gaps** in your enterprise that limit your ability to transition to a circular economy? (Select all that apply)

- Lack of technical skills for sustainable production methods
- Financial constraints
- Lack of regulatory incentives
- Limited knowledge of circular economy principles
- Lack of digital and data management skills
- Insufficient innovation skills
- Insufficient marked demand for sustainable products
- Limited understanding of renewable energy technologies
- Shortage of marketing and communication skills related to sustainability
- Lack of entrepreneurial mindset
- Lack of deep tech knowledge (e.g. artificial intelligence, smart farming technologies...)

12) Do you think that the following **occupations, identified by ESCO, need circular economy skills** in the olive oil sector? (Yes/No/I don't know)

- Sustainability manager
- Alternative fuels engineer
- Waste treatment engineer
- Recycling specialist
- Environmental engineer
- Food technologist
- Food technician
- Product development engineering drafter
- Environmental programme coordinator

13) In the olive oil sector, do you think that following **occupations*** would also **need circular economy skills**? (Yes/No/I don't know)

*selected occupations from ESCO relevant to olive oil sector. ESCO - the European multilingual classification of Skills, Competences, Qualifications and Occupations

- Agronomists
- Agricultural production managers
- Agricultural labourers
- Oil mill operators
- Quality control and safety officers
- Packaging production managers
- Sales and marketing managers



- Logistics and supply chain managers
- Researchers and scientists

14) If you think that any other occupation in olive oil sector not listed above would also need circular economy skills, please list them below:

Part 5: Future Skill Needs and Occupations

15) Which of the following **skills*** are most critical for your company's **future** success in adopting circular economy practices? (Select all that apply):

*skills from ESCO adapted to olive oil sector. ESCO - the European multilingual classification of Skills, Competences, Qualifications and Occupations

- By-product and waste management
- Produce sustainable products
- Develop and coordinate waste management processes
- Develop recycling programs
- Renewable energy integration
- Product data management and digitalization
- Ensure compliance with environmental legislation
- Assess the life cycle of resources
- Develop new food products
- Plan digital marketing /digital skills
- Implement marketing strategies
- Green marketing
- Thinking creatively and innovatively
- Entrepreneurial mindset
- Deep tech knowledge (e.g. artificial intelligence, smart farming technologies...)

16) In your opinion, what **emerging occupations** do you expect will become important in the **future** in the olive oil sector **for transition to circular economy?** (Please, select 3)

- Circular economy managers
- Sustainability consultants
- Renewable energy specialists
- Waste valorization engineers (e.g., biofuel production from waste)
- Environmental impact auditors
- Data analysts for sustainable agriculture
- Marketing professionals for eco-friendly products
- Supply chain specialists for green logistics
- Legal advisors on environmental regulations



- Professionals in the food and pharmaceutical industry for the development of new products

17) In your opinion, which **future skills**, regarding circular economy, will be critical for these emerging **occupations** in the olive oil sector? (Please, select 3)

- Knowledge of waste and by-product valorization
- Expertise in sustainable resource management
- Digital and precision agriculture skills
- Circular product design and eco-packaging
- Data science and analytics for optimizing production
- Renewable energy technology expertise
- Process innovation and automation
- Marketing and sales of green products
- Green finance and investment expertise
- Leadership in sustainability strategy
- Specific skills in soil regeneration and carbon sequestration
- Integrated biodiversity management and ecological practices that regenerate ecosystems
- Agricultural planning with a focus on regenerative and holistic practices
- Deep tech skills (e.g. robotics, blockchain...)
- Innovative problem-solving skills

18) Dear respondent,

Thank you for your time and contribution to CIRCOLIVE project

19) I consent to have the information stated above used by the CIRCOLIVE project partners solely for meeting the purposes of this survey.

Yes – No

20) In case you want receive information about the project and activities, please enter your e-mail_____

10.1.2. Annex 2 (D2.3) – Structured Interview with Circular Business Agro-food Experts/professionals about Current and Future Skills Needs for transition of the Olive Oil Sector to Circular Economy

Instructions for Structured interview

General information:

- useful tool of quantitative research and social surveys
- standardized interview schedule



- each interviewee gets the same questions, in the same way and order
- minimizes variation between interviews

Conducting structured interviews:

- Introduce the research

(identify yourself, general information about CIRCOLIVE project, purposes of research and procedure of interview)

- Ethical issues

(GDPR, recording interview) – need to be signed

ANNEX 2 (D2.3): Structured Interview with Circular Business Agro-food Experts/professionals about Current and Future Skills Needs for transition of the Olive Oil Sector to Circular Economy

In this interview definition of **Circular Economy** presents methods and possibilities of using olive by-products and waste in olive sector. **ESCO** (European Skills, Competences, Qualifications and Occupations), the European multilingual classification of Skills, Competences, Qualifications and Occupations, was used to identify and select existing occupations and skills relevant to circular economy in the olive oil sector.

Part 1. General Information

Date:

Location:

Interviewees' years:

Interviewees' educational level:

Enterprise name:

Enterprise email address (in case you want receive further information about the Circolive project):

Enterprise size:

- Micro (< 10 employees)
- Small (< 50 employees)
- Medium sized (< 250 employees)
- Large size (> 250 employees)

Which segment of the olive oil sector does your enterprise operate in?

- Olive growing
- Olive oil production
- Olive growing and olive oil production
- Other (Please specify): _____

1. What is your **occupation/profession** in the olive oil sector?

- For e.g. agronomist, agricultural production manager, agricultural labourer, environmental engineer, oil mill operator, food technologist, quality control and safety officer, etc.



Part 2. Current Skill Levels

2. Which **circular economy practices** are you currently implementing, or aware of in your enterprise?
 - For e.g. waste reduction and by-product valorization, water recycling and efficient usage in olive oil production, renewable energy use, eco-friendly packaging materials, sustainable transportation and logistics solutions, carbon footprint reduction

3. How would you **rate skills and knowledge** about circular economy in your enterprise?
 - 1 - Poor
 - 2 - Limited
 - 3 - Acceptable
 - 4 - Good
 - 5 - Excellent

4. According to your opinion, which **skills** are most significant in the olive oil sector regarding circular economy?
 - For e.g. knowledge of sustainable farming practices, knowledge of water and soil protection, organic farming and pest control techniques, understanding of food policies and regulations, waste and by-product management, energy efficiency in production, supply chain management, digital skills

Part 3. Factors Shaping Skills Demand

5. In your opinion, which **factors** are influencing **the demand for new skills** in your enterprise the most?
 - For e.g. pressure to improve sustainability performance, economic changes, adoption of circular economy models, environmental regulations and policies, consumer demand for sustainable products, industry competition and performance improvement pressures, development of new technologies and innovation, resource scarcity and waste management needs, global market demands and trade dynamics

Part 4. Skill Gaps

6. Are there any noticeable **skills gaps** in your enterprise that limit your ability to transition to a circular economy?
 - For e.g. lack of technical skills for sustainable production methods, financial constraints, lack of regulatory incentives, limited knowledge of circular economy principles, lack of digital and data management skills, insufficient innovation skills, insufficient market demand for sustainable products, limited understanding of renewable energy technologies, shortage of marketing and communication skills



related to sustainability, lack of entrepreneurial mindset, lack of deep tech knowledge (e.g. artificial intelligence, smart farming technologies...)

7. In the olive oil sector, which **occupations** do you think would need circular economy skills?
- For e.g. agronomists, agricultural production managers, agricultural labourers, oil mill operators, quality control and safety officers, packaging production managers, sales and marketing managers, logistics and supply chain managers, researchers and scientists in circular economy

Part 5. Future Skill Needs and Occupation

8. In your opinion, which **skills** are most critical for your company's **future** success in adopting circular economy practices?
- For e.g. by-product and waste management, produce sustainable products, develop and coordinate waste management processes, develop recycling programs, renewable energy integration, product data management and digitalization, ensure compliance with environmental legislation, assess the life cycle of resources, entrepreneurial mindset, deep tech knowledge
9. What **emerging occupations** do you expect will become important in the **future** in the olive oil sector **for transition to circular economy**?
- For e.g. circular economy managers, sustainability consultants, renewable energy specialists, waste valorization engineers, environmental impact auditors, data analysts for sustainable agriculture, marketing professionals for eco-friendly products, supply chain specialists for green logistics, legal advisors on environmental regulations, professionals in the food/pharmaceutical industry for the development of new products
10. In your opinion, which **future skills**, regarding circular economy, will be critical for these emerging **occupations** in the olive oil sector?
- For e.g. knowledge of waste and by-product valorization, expertise in sustainable resource management, digital and precision agriculture skills, circular product design and eco-packaging, data science and analytics for optimizing production, renewable energy technology expertise, process innovation and automation, marketing and sales of green products, green finance and investment expertise, leadership in sustainability strategy, deep tech skills, innovative problem-solving skills

10.1.3. Annex 3 (D2.3) – Structured Interview with VET Providers about Current and Future Skills Needs for transition of the Olive Oil Sector to Circular Economy

Instructions for Structured interview

General information:

- useful tool of quantitative research and social surveys



- standardized interview schedule
- each interviewee gets the same questions, in the same way and order
- minimizes variation between interviews

Conducting structured interviews:

- Introduce the research - (identify yourself, general information about CIRCOLIVE project, purposes of research and procedure of interview)
- Ethical issues - (GDPR, recording interview) – need to be signed

ANNEX 3 (D2.3): Structured Interview with VET Providers about Current and Future Skills Needs for transition of the Olive Oil Sector to Circular Economy

In this interview definition of **Circular Economy** presents methods and possibilities of using olive by-products and waste in olive sector. **ESCO** (European Skills, Competences, Qualifications and Occupations), the European multilingual classification of Skills, Competences, Qualifications and Occupations, was used to identify and select existing occupations and skills relevant to circular economy in the olive oil sector.

Part 1. General Information

Date:

Location:

VET name:

VET email address (in case you want receive further information about the CIRCOLIVE project): _____

Interviewees' years:

Interviewees' educational level:

Type of Education/VET Institution:

1. University
2. Polytechnic
3. Institute
4. Public Open University
5. VET provider
6. Private VET provider
7. Other (specify): _____

Interviewees' role:

1. Executive
2. Manager
3. Lecturer
4. VET specialist
5. Other _____

Main information about educational/VET provider

- Length of business
- Number and type of employees by role (teaching, training, administrative...)
- Area of expertise/subject provided (agronomy, forestry, economy, other)
- Other information



Part 2. Current Skill Levels

11. According to your opinion, which **skills** are most significant in the olive oil sector regarding circular economy?
- For e.g. knowledge of sustainable farming practices, knowledge of water and soil protection, organic farming and pest control techniques, understanding of food policies and regulations, waste and by-product management, energy efficiency in production, supply chain management, digital skills

Part 3. Factors Shaping Skills Demand

12. In your opinion, which **factors** are influencing **the demand for new skills** in the olive oil sector?
- For e.g. pressure to improve sustainability performance, economic changes, adoption of circular economy models, environmental regulations and policies, consumer demand for sustainable products, industry competition and performance improvement pressures, development of new technologies and innovation, resource scarcity and waste management needs, global market demands and trade dynamics

Part 4. Skill Gaps

13. In the olive oil sector, which **occupations** do you think **would need** circular economy skills?
- For e.g. agronomists, agricultural production managers, agricultural labourers, oil mill operators, quality control and safety officers, packaging production managers, sales and marketing managers, logistics and supply chain managers, researchers and scientists

Part 5. Future Skill Needs and Occupation

14. In your opinion, which **skills** are generally most critical for **future** success in adopting circular economy practices in the olive oil sector?
- For e.g. by-product and waste management, produce sustainable products, develop and coordinate waste management processes, develop recycling programs, renewable energy integration, product data management and digitalization, ensure compliance with environmental legislation, assess the life cycle of resources, entrepreneurial mindset, deep tech knowledge
15. What **emerging occupations** do you expect will become important in the **future** in the olive oil sector **for transition to circular economy**?



- For e.g. circular economy managers, sustainability consultants, renewable energy specialists, waste valorization engineers, environmental impact auditors, data analysts for sustainable agriculture, marketing professionals for eco-friendly products, supply chain specialists for green logistics, legal advisors on environmental regulations, professionals in the food/pharmaceutical industry for the development of new products
16. In your opinion, which **future skills**, regarding circular economy, will be critical for these **emerging occupations** in the olive oil sector?
- For e.g. knowledge of waste and by-product valorization, expertise in sustainable resource management, digital and precision agriculture skills, circular product design and eco-packaging, data science and analytics for optimizing production, renewable energy technology expertise, process innovation and automation, marketing and sales of green products, green finance and investment expertise, leadership in sustainability strategy, deep tech skills, innovative problem-solving skills

Part 6. Education

17. Does your institution currently provide courses on circular economy practices in the olive oil sector?
- If YES, in what format? If NO, go to question 8.
18. In your opinion, do you think your institution could implement courses on circular economy practices in the olive oil sector?
- If YES, in what format?
19. In your opinion, which competences should the participant/student have before attending a course about circular economy?



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