



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

# D2.3 National Report on current and future skill levels for transition of the olive oil sector to circular economy

- CROATIA -

February 2025



Project  
management



Identification  
of olive sector



Holistic circular  
business



VET curricula



Education  
programmes



Communication  
strategy

Croatia | Italy | Greece | Spain | Portugal

02-2024 | 01-2027

[WWW.CIRCOLIVE.EU](http://WWW.CIRCOLIVE.EU)

Consortium



Sapere utile



Institut za poljoprivredu  
i turizam



Institute of Agriculture  
and Tourism



Co-funding





Name of the Project : Developing skills for introducing circular business models and digital technologies in olive oil sector

Acronym of the Project : CIRCOLIVE

Proposal Number : 101139912

Call : ERASMUS-EDU-2023-PI-ALL-INNO

Topic : ERASMUS-EDU-2023-PI-ALL-INNO-EDU-ENTERP

Type of action : ERASMUS Lump Sum Grants

Granting authority : European Education and Culture Executive Agency

Project Duration and start date : 36 Months - 01 February 2024

Lead partner/coordinator : Vakakis S.A. (Greece)

Partners : AGRICULTURAL UNIVERSITY OF ATHENS (Greece), ASSOCIAÇÃO CHECK-IN - COOPERAÇÃO E DESENVOLVIMENTO (Portugal), CLUST-ER AGROALIMENTARE (Italy), ISTITUTO FORMAZIONE OPERATORI AZIENDALI (Italy), CAMARA OFICIAL DE COMERCIO E INDUSTRIA DE LLEIDA (Spain), FUNDACIO EURECAT (Spain), INSTITUT ZA POLJOPRIVREDU I TURIZAM USTANOVA (Croatia), ALMA MATER STUDIORUM - UNIVERSITA DI BOLOGNA (Italy)

Contact : George Vardangalos

Email : [gvardangalos@vakakis.gr](mailto:gvardangalos@vakakis.gr)

Website : <http://circolive.eu/>

Title of Deliverable : D2.3 - National Report on current and future skills levels for transition of the olive oil sector to circular economy - Croatia

Objective of Deliverable : *The purpose of National Report is to identify current and future skill levels and/or professions in the olive oil sector in Croatia that will enable the full transition of the sector to circular economy.*

Deliverable Author/ : INSTITUT ZA POLJOPRIVREDU I TURIZAM USTANOVA (IPTPO)

Names of contributors : Karolina Brkić Bubola  
Iva Pastor  
Marin Krapac  
Ana Čehić Marić

Contact : Karolina Brkić Bubola

Email : [karolina@iptpo.hr](mailto:karolina@iptpo.hr)

Version of Deliverable : v.1

Date of Submission of Deliverable : 28 February 2025



Publicity Disclaimer

“Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor the granting authority can be held responsible for them.”

Copyright notice

© 2025 CIRCOLIVE Project. All rights reserved. Licensed to the European Union under conditions.



## National Report on current and future skills levels for transition of the olive oil sector to circular economy - Croatia

Deliverable No.:	D2.3	WP No.:	WP2
Work Package Title	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		
Status	Final Version 1		
Dissemination Level	PU - Public		
Due Date	28.02.2025		
Submission Date	28.02.2025		

### Contributors

Contributor		Date
Deliverable Leader	IPTPO	28.02.2025
Work Package Leader	IPTPO	28.02.2025
Final Review & Approval	IPTPO	28.02.2025

### History of Change

Release	Date	Reason for Change	Status



## Contents

National Report on current and future skills levels for transition of the olive oil sector to circular economy - Croatia .....	4
1. Executive Summary .....	6
2. Introduction .....	6
2.1. Purpose and Objectives .....	7
2.2. Key Findings .....	7
3. Methodology .....	8
3.1. Data collection methods .....	8
3.2. Data analysis methods .....	12
4. Current Skill Levels regarding Circular Economy in the Olive Oil Sector .....	12
5. Current Skill Gaps regarding Circular Economy in the Olive Oil Sector .....	17
6. Future Skill Needs and Emerging Professions for Transition of Olive Oil Sector to Circular Economy .....	22
7. Conclusions.....	26
8. Recommendations .....	28
9. References.....	29
10. Appendices.....	30
10.1. Survey Questionnaires and Interviews.....	30
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.....	30
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.....	36
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.....	39



## 1. Executive Summary

This “National 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 Croatia for occupations and skills in the context of circular economy. The research conducted as part of the CIRCOLIVE project includes surveys, interviews with experts from the agri-food sector and interviews with vocational education providers (VET) in Croatia, which provides insight into the challenges, opportunities and key competences needed for a sustainable transition to a circular economy in the olive oil sector.

The results show that certain circular economy practices are already present, especially in the segments of waste reduction and by-product valorization. However, there is significant room for progress in areas such as energy efficiency and the use of renewable energy sources. In addition, financial barriers, lack of regulatory incentives and limited demand for sustainable products represent key challenges facing this sector in Croatia.

Regarding the required skills, the greatest demand is identified in the areas of waste and by-product management, sustainable farming and resource optimization. Digital skills are not significantly recognized as a priority by experts from the agri-food sector, while VET providers emphasize their importance for business modernization. In addition, the need for the development of new professions that support the circular economy in the olive oil sector is recognized, in particular, waste valorization engineers and renewable energy experts.

In conclusion, the report highlights the importance of continuous education, institutional support and technological innovation in order for the olive oil sector in Croatia to achieve a successful transition to circular economy.

## 2. Introduction

Olive growing and olive oil production represent a significant segment of the agri-food sector in Croatia (Mesić, 2015). With an emphasis on sustainability and environmental protection, the olive oil sector faces challenges and opportunities arising from the concept of a circular economy. The transition to a circular economic model implies optimizing resource use, reducing waste, and implementing sustainable technologies and business practices.

This report analyzes the current state of skills within the olive oil sector in Croatia and identifies key competencies needed for a successful transition to a 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.



## 2.1. Purpose and Objectives

This 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 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 a 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 D2.3. (National Report on current and future skill levels for transition of the olive oil sector to circular economy- Croatia).

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 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 Croatia.

## 2.2. Key Findings

The results of the research conducted as part of the CIRCOLIVE project reveal important aspects of the current state and challenges of introducing circular economy in the olive growing and olive oil production sector in Croatia.

One of the most significant findings is that respondents from the sector are already implementing certain circular economy practices, with the most common practices being: waste reduction, valorization of by-products and the use of environmentally friendly packaging materials. On the other hand, practices that contribute to reducing carbon dioxide emissions, the use of renewable energy sources and water recycling are still underdeveloped, indicating the need for further improvements in these areas.

The key challenge for the olive oil sector in Croatia lies in financial constraints, insufficient regulatory incentives and low demand for sustainable products, which make it difficult to implement circular economy principles. Despite this, respondents do not perceive a lack of entrepreneurial spirit as an obstacle, but primarily emphasize the need for specific incentives and support to facilitate the transition to more sustainable business models.

When it comes to the skills needed to transition the sector to circular economy, the greatest emphasis is placed on waste and by-product management, organic farming and pest control techniques. Digital skills have divided opinions – while some of the survey respondents do not consider them essential, interviewed VET providers and experts in the agri-food sector see them as necessary for the modernization of the sector. These results show that the digitalization of the sector is still in its early stages and that there is room for improvement through education and awareness of the benefits of technology in optimizing business operations.

It is important to highlight that waste valorization engineers and renewable energy experts



are recognized as key professions of the future. In contrast, sustainability consultants are not sufficiently recognized as important occupation, despite the fact that the interviewed experts emphasize their role in strategic planning and sustainable development.

Based on these findings, it can be concluded that the olive oil sector in Croatia already shows a certain degree of integration of the circular economy, but there are still significant challenges and opportunities for improvement. Increased financial support, regulatory incentives, and greater education on digital and analytical tools could accelerate the transition to more efficient and sustainable operations in the sector.

### 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	<a href="http://data.europa.eu/esco/skill/a992f345-7c06-4982-8fc9-5fab55e316af">http://data.europa.eu/esco/skill/a992f345-7c06-4982-8fc9-5fab55e316af</a>
Knowledge of water and soil protection	Advise on soil and water protection	<a href="http://data.europa.eu/esco/skill/3e25fd3e-2bcd-4320-9587-0aadf7fb93b1">http://data.europa.eu/esco/skill/3e25fd3e-2bcd-4320-9587-0aadf7fb93b1</a>
Organic farming and pest control techniques	Organic farming	<a href="http://data.europa.eu/esco/skill/186da517-9a3e-41cd-9158-4001e3694459">http://data.europa.eu/esco/skill/186da517-9a3e-41cd-9158-4001e3694459</a>
	Perform pest control	<a href="http://data.europa.eu/esco/skill/08881cb7-5331-4b11-9442-4d7c9fce749e">http://data.europa.eu/esco/skill/08881cb7-5331-4b11-9442-4d7c9fce749e</a>
Understanding of food policies and regulations	Food policy	<a href="http://data.europa.eu/esco/skill/e591f458-93c4-4cc7-a441-2340545c33f3">http://data.europa.eu/esco/skill/e591f458-93c4-4cc7-a441-2340545c33f3</a>
	Control food safety regulations	<a href="http://data.europa.eu/esco/skill/4d7410df-51a9-42bc-83ec-363c201ee631">http://data.europa.eu/esco/skill/4d7410df-51a9-42bc-83ec-363c201ee631</a>
Waste and by-product management	Waste management	<a href="http://data.europa.eu/esco/skill/40f65a56-ccb-4601-9f32-1cc6cdd24f28">http://data.europa.eu/esco/skill/40f65a56-ccb-4601-9f32-1cc6cdd24f28</a>



	By-products	<a href="http://data.europa.eu/esco/skill/f2412a5c-8072-4cd7-8fa1-806864f91276">http://data.europa.eu/esco/skill/f2412a5c-8072-4cd7-8fa1-806864f91276</a>
Energy efficiency in production	Energy efficiency	<a href="http://data.europa.eu/esco/skill/83fc0b2b-6cd2-46af-b1ff-d3fc83604c26">http://data.europa.eu/esco/skill/83fc0b2b-6cd2-46af-b1ff-d3fc83604c26</a>
Supply chain management	Supply chain management	<a href="http://data.europa.eu/esco/skill/f929c89e-c363-4132-a918-e021d57b307c">http://data.europa.eu/esco/skill/f929c89e-c363-4132-a918-e021d57b307c</a>
Digital skills (e.g. data management, precision agriculture)	Product data management  Agriculture not further defined	<a href="http://data.europa.eu/esco/skill/e2d0daae-2aa1-40cc-99e2-b340b02f97d3">http://data.europa.eu/esco/skill/e2d0daae-2aa1-40cc-99e2-b340b02f97d3</a> <a href="http://data.europa.eu/esco/iscdf/0810">http://data.europa.eu/esco/iscdf/0810</a>
Produce sustainable products	Produce sustainable products	<a href="http://data.europa.eu/esco/skill/97725325-5287-4ebb-9f83-1ba2c38f465c">http://data.europa.eu/esco/skill/97725325-5287-4ebb-9f83-1ba2c38f465c</a>
Develop and coordinate waste management processes	Develop waste management processes	<a href="http://data.europa.eu/esco/skill/114a79ef-1e62-475b-a862-954f5b4cca20">http://data.europa.eu/esco/skill/114a79ef-1e62-475b-a862-954f5b4cca20</a>
Develop recycling programs	Develop recycling programs	<a href="http://data.europa.eu/esco/skill/862920c8-f2d0-4058-8fb8-9f06fbfc2446">http://data.europa.eu/esco/skill/862920c8-f2d0-4058-8fb8-9f06fbfc2446</a>
Renewable energy integration	Renewable energy	<a href="http://data.europa.eu/esco/skill/f8413360-6114-40de-a276-c59b764b9913">http://data.europa.eu/esco/skill/f8413360-6114-40de-a276-c59b764b9913</a>
Product data management and digitalization	Product data management	<a href="http://data.europa.eu/esco/skill/e2d0daae-2aa1-40cc-99e2-b340b02f97d3">http://data.europa.eu/esco/skill/e2d0daae-2aa1-40cc-99e2-b340b02f97d3</a>
Ensure compliance with environmental legislation	Ensure compliance with environmental legislation	<a href="http://data.europa.eu/esco/skill/089ee650-297e-4716-87d1-440743b70a0d">http://data.europa.eu/esco/skill/089ee650-297e-4716-87d1-440743b70a0d</a>
Asses the life cycle of resources	Asses the life cycle of resources	<a href="http://data.europa.eu/esco/skill/4e87c852-602a-4a0e-b8d8-20709ce14ac5">http://data.europa.eu/esco/skill/4e87c852-602a-4a0e-b8d8-20709ce14ac5</a>
Develop new food products	Develop new food products	<a href="http://data.europa.eu/esco/skill/090ae6b3-12ab-4c72-b98a-17b790cf416e">http://data.europa.eu/esco/skill/090ae6b3-12ab-4c72-b98a-17b790cf416e</a>
Plan digital marketing/digital skills	Plan digital marketing	<a href="http://data.europa.eu/esco/skill/736ef286-fbd3-4e5c-a4b4-d1e2008c9898">http://data.europa.eu/esco/skill/736ef286-fbd3-4e5c-a4b4-d1e2008c9898</a>
Implement marketing strategies	Implement marketing strategies	<a href="http://data.europa.eu/esco/skill/13e2378e-0d10-450d-843a-b3592575826e">http://data.europa.eu/esco/skill/13e2378e-0d10-450d-843a-b3592575826e</a>



Green marketing	Marketing principles	<a href="http://data.europa.eu/esco/skill/de03f4fd-c147-4477-a048-7109e5ba2d6f">http://data.europa.eu/esco/skill/de03f4fd-c147-4477-a048-7109e5ba2d6f</a>
Thinking creatively and innovatively	Thinking creatively and innovatively	<a href="http://data.europa.eu/esco/skill/e84d080a-ff6d-41a7-b7b9-133e97c7bf00">http://data.europa.eu/esco/skill/e84d080a-ff6d-41a7-b7b9-133e97c7bf00</a>
Entrepreneurial mindset	Show entrepreneurial spirit	<a href="http://data.europa.eu/esco/skill/bdcf429c-5ccf-4c3d-bb61-4c987573a35e">http://data.europa.eu/esco/skill/bdcf429c-5ccf-4c3d-bb61-4c987573a35e</a>
Deep tech knowledge	Principles of artificial intelligence	<a href="http://data.europa.eu/esco/skill/e465a154-93f7-4973-9ce1-31659fe16dd2">http://data.europa.eu/esco/skill/e465a154-93f7-4973-9ce1-31659fe16dd2</a>
	Internet of Things	<a href="http://data.europa.eu/esco/skill/f049d050-12da-4e40-813a-2b5eb6df6b51">http://data.europa.eu/esco/skill/f049d050-12da-4e40-813a-2b5eb6df6b51</a>

The planned sample size was 10 respondents, but data was collected from 15 respondents (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=15)

Variable	N	Percentage (%)
<b>Gender</b>		
Male	<b>10</b>	<b>66.7</b>
Female	<b>5</b>	<b>33.3</b>
<b>Age</b>		
Up to 36	<b>6</b>	<b>40</b>
37 - 56	<b>6</b>	<b>40</b>
57 and more	<b>3</b>	<b>20</b>
<b>Education</b>		
High school and lower	<b>2</b>	<b>13.3</b>
Bachelor degree	<b>4</b>	<b>26.7</b>
Master degree	<b>6</b>	<b>40</b>
PhD	<b>3</b>	<b>20</b>
<b>Enterprise size</b>		
Micro (<10 employees)	<b>11</b>	<b>73.3</b>
Small (<50 employees)	<b>4</b>	<b>26.7</b>
Medium sized (<250 employees)	<b>0</b>	<b>0</b>

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 in Croatia (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. The planned sample size was 2 respondents for experts in the agri-food sector and 2 respondents for providers of education. 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. When using this data, the source is always cited in the report 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

Circular economy in practice means reducing by-products and waste to a minimum. They can be used productively over and over again, thus creating added value ([Bourguignon, 2016](#)). Circular economy practices are increasingly being implemented in the olive oil sector due to the large amounts of by-products generated, such as pomace, pruning residues and wastewater, and the costs associated with their management and disposal ([Angeloni et al., 2024](#)). Circular economy in agriculture is certainly the future and the goal of developing the olive oil sector in Croatia, Europe and the world ([Katunar, 2025](#)).

The olive sector in Croatia shows significant interest in implementing circular economy practices, as is evident from the results of the research in the “National Report on current situation in the olive oil sector” within the CIRCOLIVE project ([CIRCOLIVE, D2.1 National Report – Croatia, 2024](#)) as well as in other researched countries ([CIRCOLIVE, D2.2. Comparative Report, 2024](#)), but there are still numerous challenges that require systematic changes and adaptations, which places emphasis on the development of skills related to the circular economy. This chapter analyses the current state of these skills among stakeholders in the sector. Understanding circular economy skills is crucial for the further development of



the sector and its alignment with sustainability goals.

As part of the research conducted for the CIRCOLIVE project for this National Report, 15 different experts in the olive oil sector were interviewed. As can be seen in Figure 1, the occupations/professions of the interviewed experts are diverse. A third (33.3%) of respondents are "Agricultural production managers" (olive farming), while 26.7% of respondents are currently employed as "Agronomists" or "Sales and marketing managers". The lowest percentages of respondents in this study were "Researchers and scientists" (6.7%) and "Oil mill operators" (6.7%).

One agronomist and one quality control and safety manager in olive oil production participated in the interviews with experts in the agri-food sector, while interviews with VET providers were conducted with 2 professors at different higher education institutions (universities and polytechnics) in Croatia.

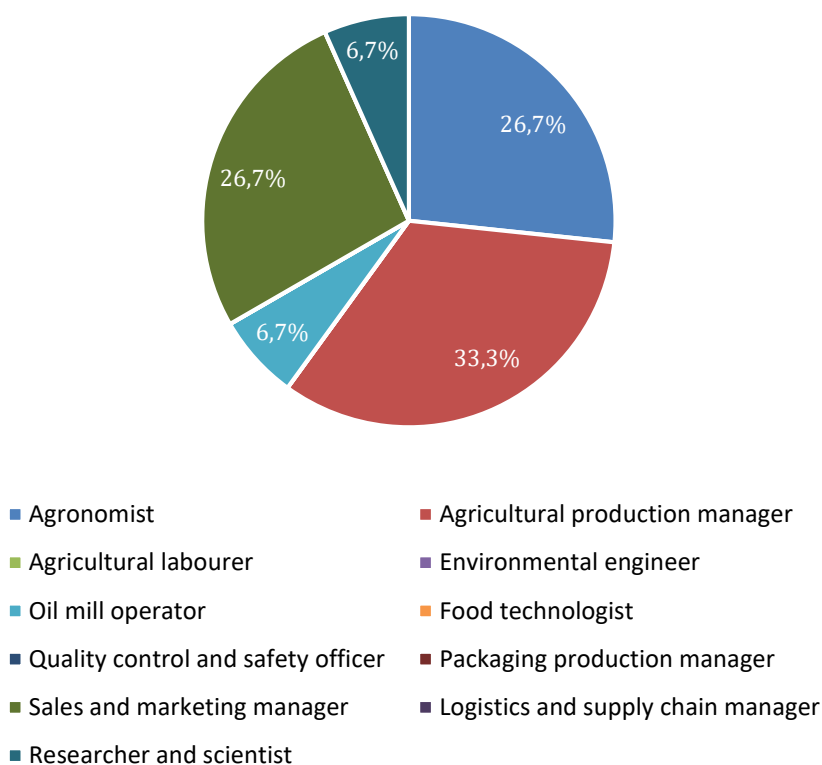


Figure 1. Current occupation/profession of respondents in the olive oil sector (N=15)

According to the survey results in Figure 2, a significant percentage of respondents (60%) practice "Waste reduction and by-product valorization", while 46.7% use "Eco-friendly packaging materials". A smaller proportion of respondents use "Sustainable transportation and logistics solutions" (33.3%) and "Renewable energy use" (26.7%). "Water recycling and its efficient usage in the olive oil production" is used by 20% of respondents, while the smallest share (13.3%) of respondents implements practices that contribute to "Carbon footprint reduction" (Figure 2). The survey results also agree with the information obtained through interviews with experts in the agri-food sector, who also emphasize the practice of waste reduction and product valorization and the use of recycled packaging materials in their business.

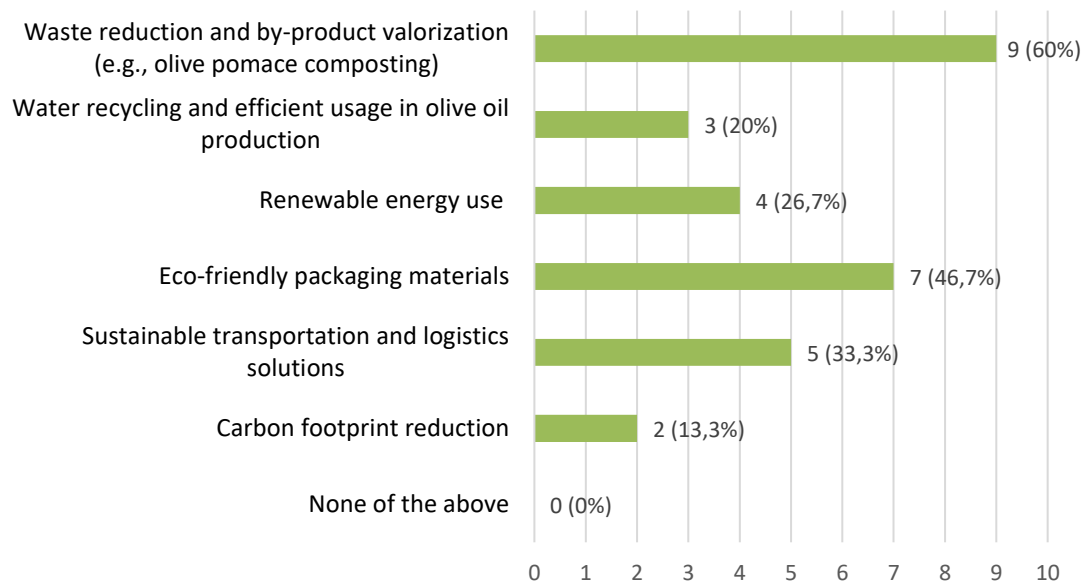


Figure 2. Circular economy practices currently used in the enterprise (N=15)

During the survey, for the purpose of preparing this National Report, survey respondents assessed their own knowledge and skills on the circular economy in the olive oil sector. The largest share of respondents (40%) considered their knowledge and skills to be at a limited or good level, while 13% of respondents considered these knowledge and skills to be acceptable. No expert in the olive oil sector considered their knowledge and skills on the circular economy to be at an excellent level, while only one respondent considered their knowledge and skills to be poor in the olive oil sector (Figure 3). The interviewed experts from the agri-food sector also considered their skills to be only acceptable or limited. This suggests that there is significant room for improvement of the olive oil sector's expertise on the circular economy. Although many experts already practice certain sustainable methods, their thorough understanding of the circular economy and the methods that accompany it is still not at a high level, which may be an obstacle to the wider implementation of these practices. From all of the above, it is evident that most experts are aware of the importance of circular economy principles, but they still lack the necessary knowledge.

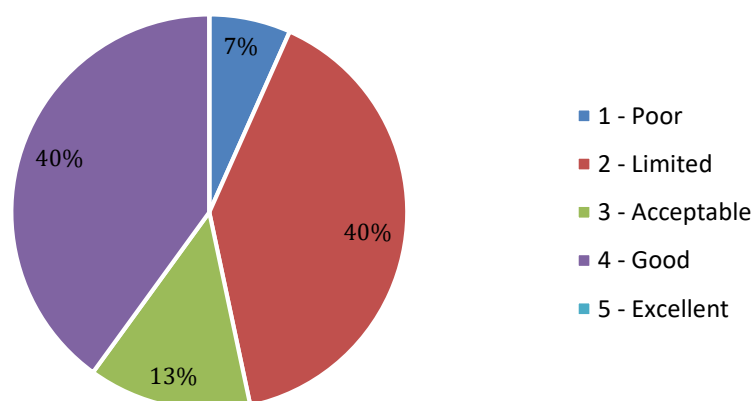


Figure 3. Respondents' self-assessment of knowledge and skills on the circular economy in the olive oil sector (N=15)



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 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. 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, including Croatian.

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 survey for the purposes of this National Report ([https://esco.ec.europa.eu/en/classification/skill\\_main](https://esco.ec.europa.eu/en/classification/skill_main)). The results showed that respondents considered the skills of “Waste and by-product management” and “Organic farming and pest control techniques” to be the most important. “Knowledge of sustainable farming practices”, “Energy efficiency in production” and “Supply chain management” were also considered important by the majority of respondents. On the other hand, “Digital skills” is the only option offered for which a third of respondents have a neutral opinion and do not consider this skill to be crucial for their business (Figure 4). Interviewed experts in the agri-food sector and VET providers highlighted the importance of knowledge of sustainable agricultural practices, knowledge of water and soil protection, organic farming and pest control techniques, in addition to digital skills, which they consider particularly important for the olive oil sector’s transition to a circular economy.

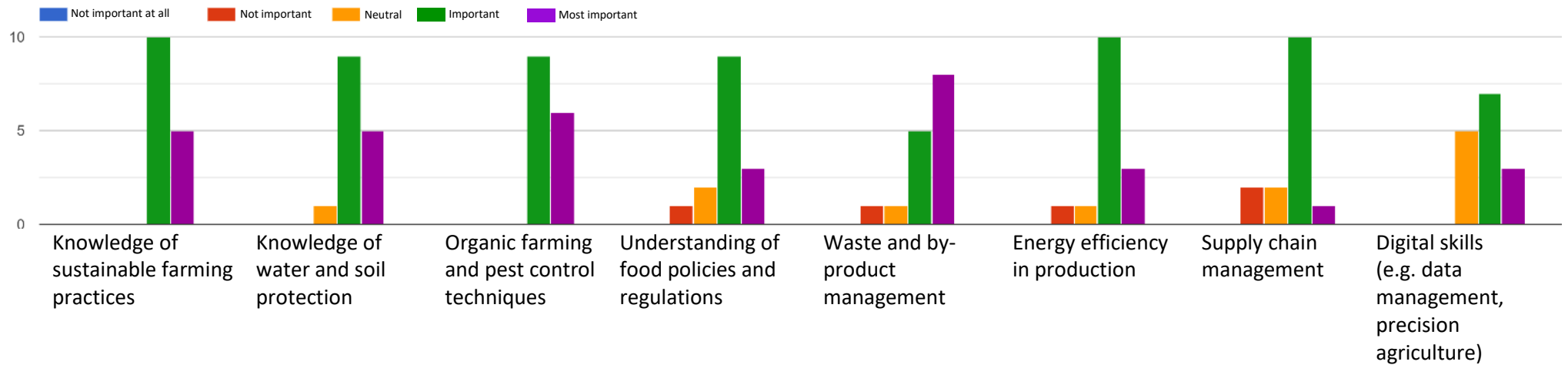


Figure 4. Key skills related to the circular economy in the olive oil sector (N=15)



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

Despite the growing awareness of the importance of the circular economy, the olive oil sector in Croatia still faces numerous challenges in implementing sustainable practices. A key problem lies in the lack of specific skills needed to effectively utilize by-products, reduce waste and optimize resources through circular business models. Limited professional knowledge, insufficient education and lack of technical and innovation capacities have been identified as the main obstacles to the wider application of the circular economy in this sector ([D2.1 - Croatia](#), [D2.2. - Comparative Report, 2024](#)). This section analyses the existing skills gaps related to the circular economy of stakeholders in the olive oil sector.

When survey respondents were asked which factors most influence the need for new skills in their company, the most significant factors were “Pressure to improve sustainability performance” (60%), “Adoption of circular economy models” (60%) and “Development of new technologies and innovations” (60%). Around half of the respondents consider “Economic changes” (53.3%) and “Resource scarcity and waste management needs” (46.7%) as important factors, while only 2 respondents consider “Global market demands and trade dynamics” as important factors influencing the need for new skills. “Environmental regulations and policies”; “Consumer demand for sustainable products”; and “Industry competition and performance improvement pressures” are identified as important factors by 26.7% of respondents (Figure 5). These results indicate that local challenges and innovations within the sector could have a greater impact on the need for new skills than external global factors.

The interviewed experts in the agri-food sector highlight, as the main factors influencing the need for new skills in their company, the development of new technologies, global market demands and environmental regulations and policies. On the other hand, interviewed vocational education and training providers emphasize sustainable development regulations and policies, new technologies and innovations, and economic factors, along with the need for additional education and training if olive and olive oil producers want to remain competitive on the market in the future.

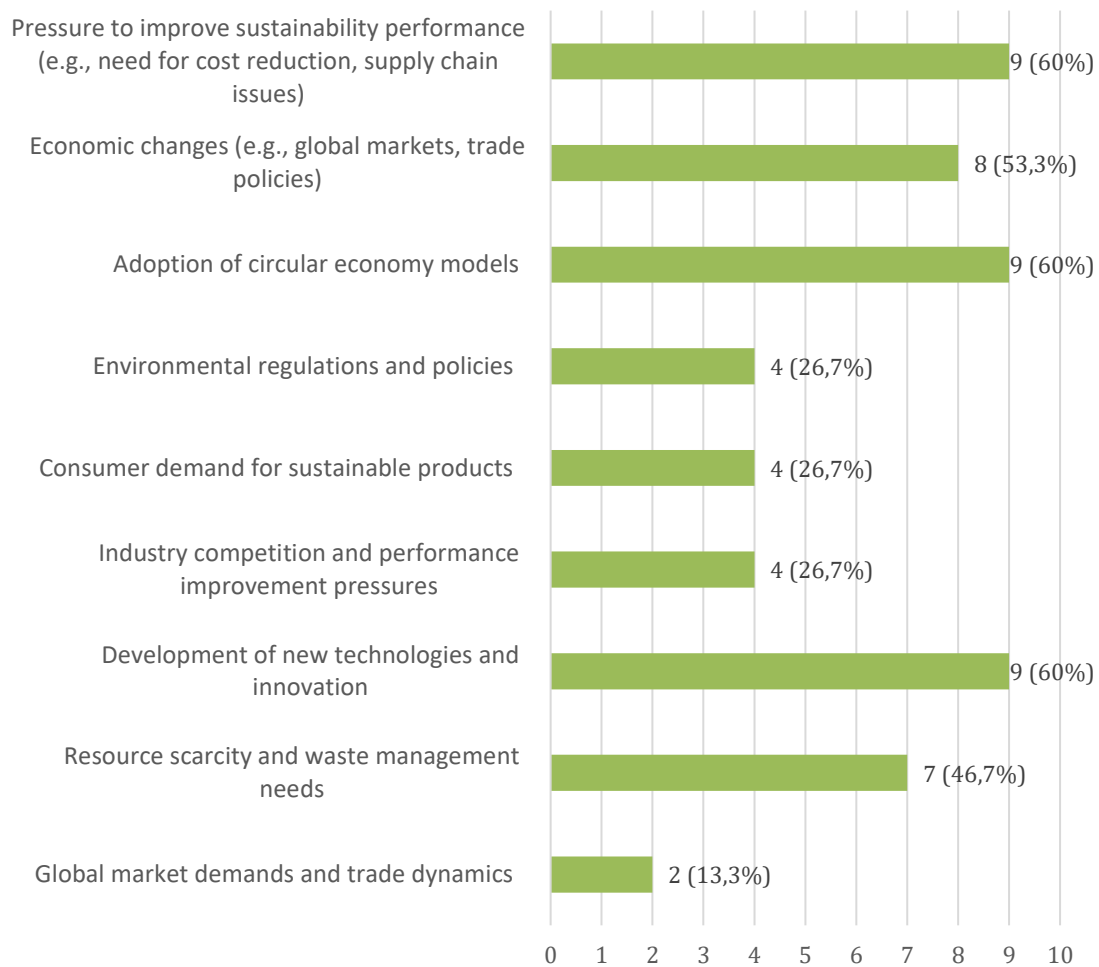


Figure 5. Factors influencing the need for new skills in the enterprise (N=15)

The skills gaps that limit professionals in the olive sector in Croatia in the transition to circular economy are numerous, as shown in Figure 6. The biggest challenge are “Financial constraints” that prevent greater investments in infrastructure and technologies that enable the transition to circular economy, which were identified by 60% of the respondents. Also, almost 27% of the respondents believe that regulatory incentives are crucial for the further development of sustainable practices in the sector. Half of the respondents point out “Insufficient market demand for sustainable products” as a gap (53.3%). A smaller proportion of respondents consider “Limited knowledge of circular economy principles” (33.3%); “Limited understanding of renewable energy technologies” (20%); “Shortage of marketing and communication skills related to sustainability” (13.3%); “Insufficient innovation skills (13,3%) and “Insufficient technical skills for sustainable production methods” (13,3%). It is important to highlight that none of the respondents considered “Lack of entrepreneurial mindset” as a limiting factor in the transition to circular economy, which suggests that experts in the olive sector in Croatia are ready to innovate and adapt, but they lack concrete conditions and incentives to implement these changes. Also, “Digital skills” were not considered an important limitation, which may indicate that experts in the sector have adequate knowledge or that such skills are not yet a key obstacle for them in this process.

Similar to the respondents surveyed, experts in the agri-food sector emphasized during the interviews that the biggest deficiency is not a lack of skills, but rather the limited financial



resources for investments such as installing solar panels or technologies for using wastewater in the processing process, and that such investments are unprofitable for micro-enterprises.

The key limitations for experts in the olive sector in Croatia in the transition to circular economy lie in financial issues, regulatory incentives and insufficient demand for sustainable products, which indicates the need for stronger state support in the form of legal frameworks that would encourage sustainable practices. The Ministry of Economy of the Republic of Croatia has committed to developing the “National Plan for the development of the circular economy of the Republic of Croatia for the period from 2026 to 2032” and the “Action Plan for the implementation of the National Plan”, which will implement activities and measures to achieve circular economy in Croatia (Ministry of Economy, 2025).

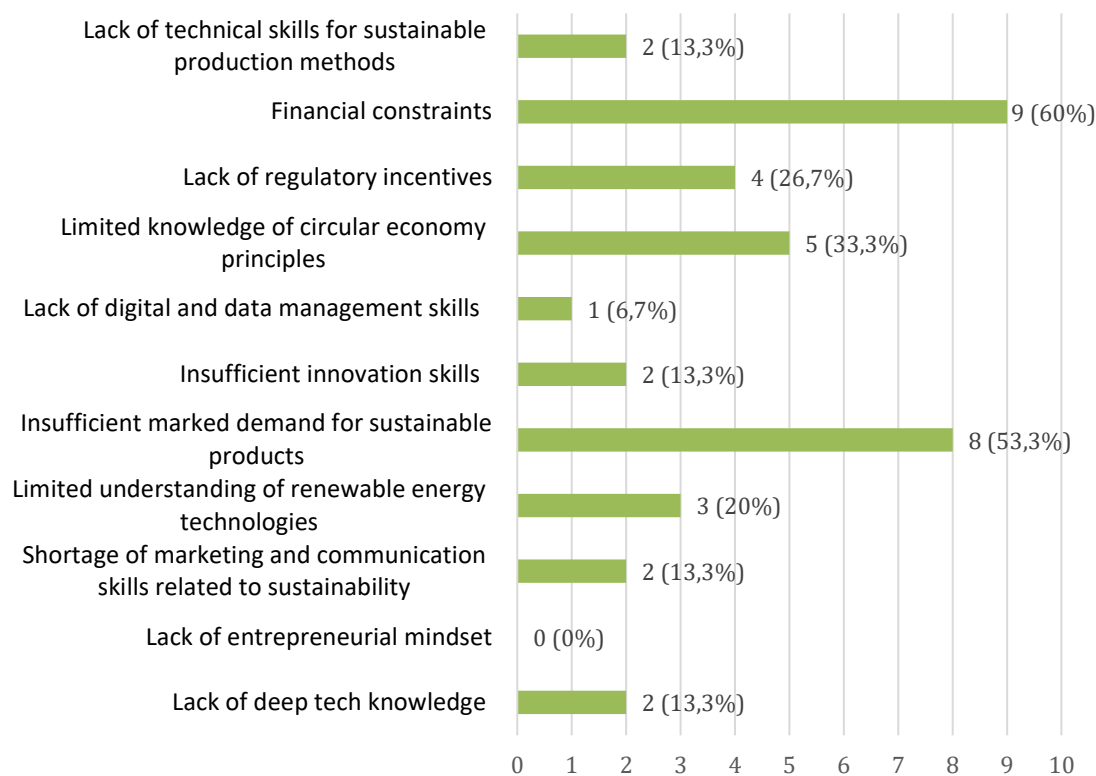


Figure 6. Lack of skills in the company that limit the transition to circular economy (N=15)

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](https://esco.ec.europa.eu/en/classification/skill_main)). During the survey, 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 survey respondents believe that “Recycling specialist” (93.3%), “Sustainability manager” (86.7%), “Environmental engineer” (86.7%), “Alternative fuels engineer” (80%), “Waste treatment engineer” (73.3%), “Food technologist” (66.7%) and “Environmental programme coordinator” (60%) need circular economy skills. Almost half of respondents (46.7%) believe



that circular economy skills are not required for the occupation “Product development engineering drafter” and 40% of respondents have the same opinion for the occupation “Food technician”. Also, 26.7% of respondents believe that circular economy skills are not required for either “Food technologist” or “Environmental programme coordinator” (Figure 7).

In addition to the occupations that ESCO associates with circular economy skills (Figure 7), the majority of experts in the olive oil sector in Croatia also stated that they consider circular economy skills to be essential for occupations such as “Agronomist” (93.3%), “Agricultural production manager” (80%), “Oil mill operator” (80%), “Quality control and safety officer” (80%) and “Researcher and scientist” (80%). Occupations such as “Packaging production manager”, “Sales and marketing manager” and “Logistics and supply chain manager” were met with divided opinions. An equal number of respondents believe that circular economy skills are necessary for these occupations, while another part of respondents disagreed (Figure 8).

During the interviews conducted for the CIRCOLIVE project, experts in the agri-food sector and VET providers highlighted agronomists, production managers, family farm owners, quality control officers, researchers and scientists, and oil mill operators as occupations for which they believe they should have circular economy skills. One interviewed expert stated that agronomic and economic knowledge are crucial for the successful implementation of circular economy practices and that it would be extremely beneficial for those involved to have education in both areas. A VET provider highlighted during the interview that all participants in the agri-food chain, from producers to consumers, should have a clear understanding of circular economy practices in order to enable sustainable and environmentally friendly resource management.

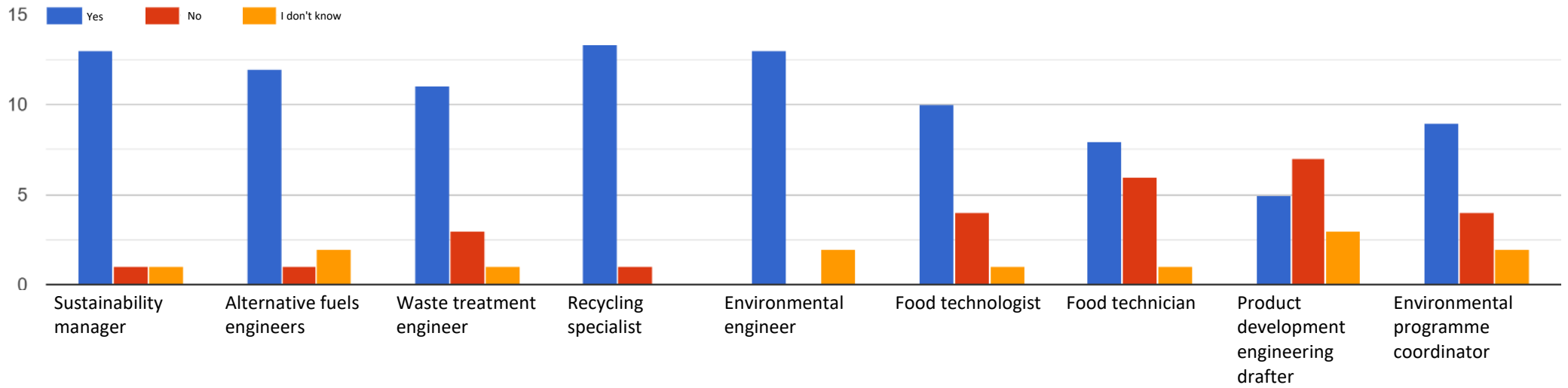


Figure 7. The demand for circular economy skills in different occupations according to ESCO (N=15)

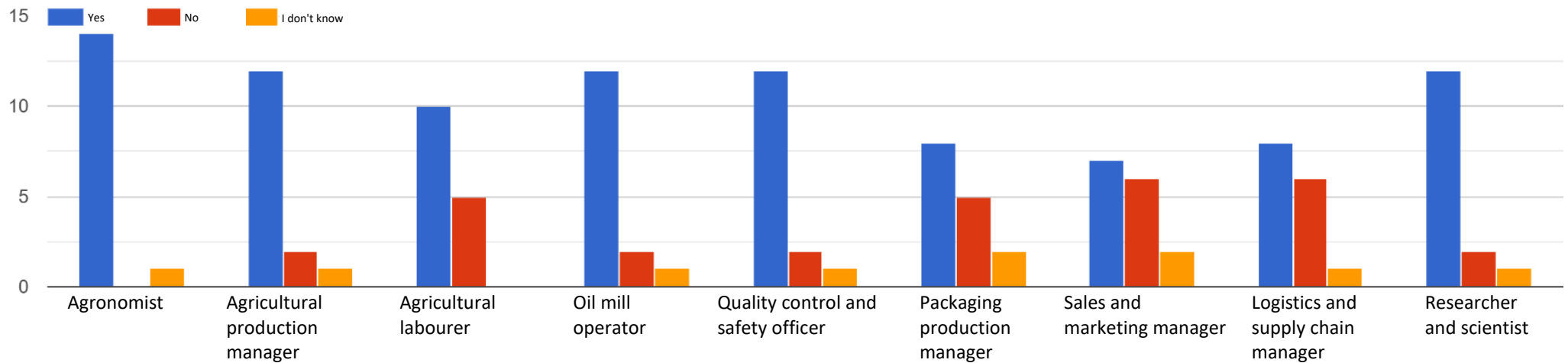


Figure 8. The demand for circular economy skills in occupations not recognized by ESCO (N=15)



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

The transition of the olive oil sector in Croatia to circular economy will require the development of new skills and the adaptation of existing professions to exploit the opportunities for sustainable business. The increasing emphasis on circular economy practices creates a need for professionals who understand the principles of the circular economy and who will be able to integrate circular practices into all stages of the production chain – from cultivation and harvesting, to processing and distribution. This chapter analyses which future skills and new professions will be key in the future for the transition of the olive oil sector in Croatia to circular economy.

According to the data obtained in the survey conducted for the CIRCOLIVE project, the skill that as many as 94% of professionals in the olive oil sector consider most important for the future success of their company is “By-product and waste management” (93.3%). “Sustainable product production” (66.7%), “Renewable energy integration” (60%) and “Green marketing” (46.7%) are the next most important skills needed for the future success of their company. Skills such as “Product data management and digitalization”, “Life cycle assessment of resources”, “Digital skills” and “Implementation of marketing strategies” are considered important by only 20% of respondents in this regard (Figure 9).

During the interviews, experts in the agri-food sector emphasized that the future success of their companies will be most influenced by the use of renewable energy sources, by-product and waste management, the production of sustainable products and an entrepreneurial mindset, which is also agreed by the interviewed vocational education and training providers.

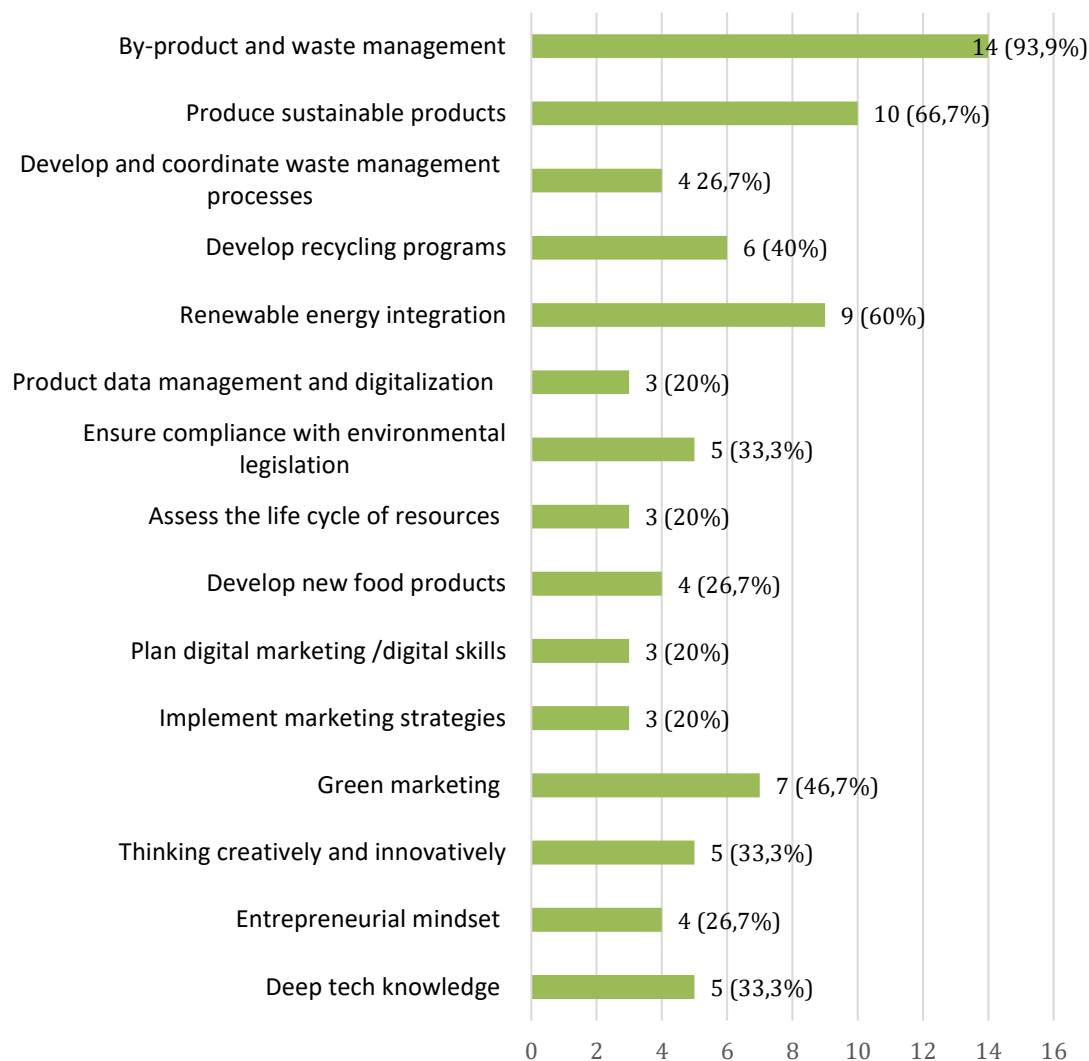


Figure 9. Skills needed for future success of enterprises in adopting circular economy practices (N=15)

When asked which new professions respondents expect to become important in the future of the olive oil sector in the transition to circular economy, olive oil sector experts could select 3 professions that they consider relevant. As many as 80% of respondents believe that these will be “Waste valorization engineers” and 73.3% of respondents believe that these will be “Renewable energy specialists”. Only 26.7% of respondents see “Data analysts for sustainable agriculture”, “Marketing professionals for eco-friendly products” and “Legal advisors on environmental regulations” as key stakeholders in the future of the olive oil sector in the transition to circular economy (Figure 10). It is important to note that only one surveyed expert believes that a “Sustainability consultant” will be an important profession in the future, which is in contrast to the results of the interviewed experts from the circular business in the agri-food sector and VET providers. All interviewed experts highlighted professions such as sustainability consultants as a key profession in the future of the olive sector. They believe that consultants as external collaborators could provide adequate and high-quality information to clients in the olive oil sector.

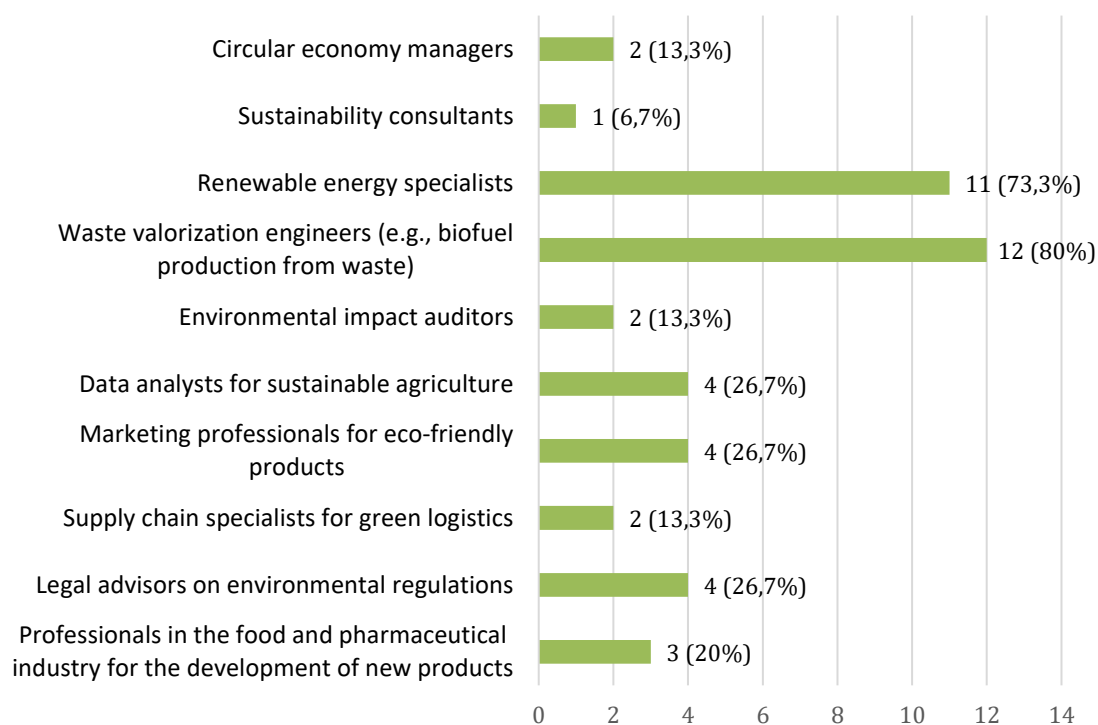


Figure 10. Emerging occupations in the olive oil sector in the transition to circular economy (N=15)

Furthermore, survey respondents also selected 3 skills that they consider to be key for new occupations in the olive oil sector related to the circular economy. “Knowledge of waste and by-products valorization” is considered a key skill by as many as 86.7% of respondents. “Renewable energy technology expertise” is considered an important skill by 46.7% of survey respondents, and “Expertise in sustainable resource management” is considered an important skill by 33%. Skills such as “Agricultural planning with a focus on regenerative and holistic practices”, “Deep-tech skills”, “Innovative problem-solving skills”, “Specific skills in soil regeneration and carbon sequestration” are considered important by only one respondent. Furthermore, “Data science and analytics for optimizing production” is a skill that no olive oil sector expert considers to be key for new occupations in the olive oil sector (Figure 11).

Experts in the agri-food sector and vocational education and training providers highlight knowledge of waste and by-product valorization, expertise in sustainable resource management, and digital and innovation skills as the most important skills.

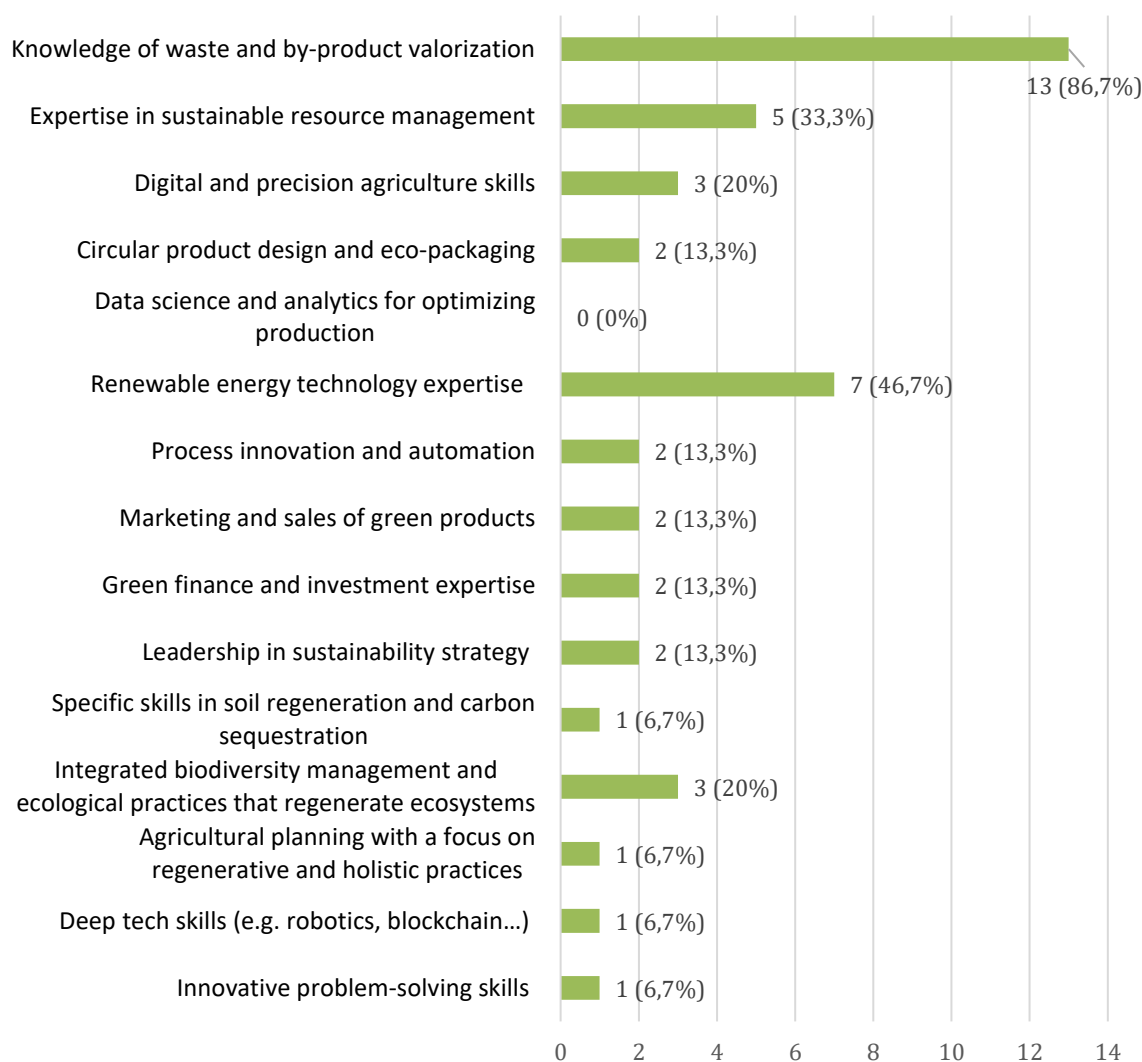


Figure 11. Skills required for emerging occupations in the olive oil sector (N=15)

Since no educational programs providing education on the circular economy were found in Croatia, the interviewed VET providers mentioned a form of lifelong learning or micro-qualifications as possible forms of implementing education on the circular economy in their institutions in the future.

Micro-qualifications represent short forms of learning that are less extensive than traditional qualifications. They flexibly and specifically help participants acquire the knowledge, skills and competences they need for personal and professional development (COM, 2024). Lifelong learning is the concept of systematizing learning in all life stages and in all forms in which it is achieved. Adult education is an important component of the lifelong learning system (ASOO, 2025). The Adult Education Act (ZOO, NN, No. 144, 2021) in Croatia regulates formal education that is carried out in institutions that have a registered adult education activity. The entire system of qualifications at all educational levels in the Republic of Croatia is regulated by the Croatian Qualifications Framework (HKO - <https://hko.srce.hr/registar/>) through qualification standards based on learning outcomes and aligned with the needs of the labor market, the individual and society as a whole (<https://www.kvalifikacije.hr/hr/node/4>). The HKO also enables the linking of qualification levels in the Republic of Croatia with the qualification levels of the European Qualifications



Framework (<https://europass.europa.eu/en/europass-digital-tools/european-qualifications-framework>) for lifelong learning. Adult education in Croatia can take place in 3 ways: in the form of formal, non-formal and informal learning (ZOO, NN, No. 144, 2021). Formal learning includes the organized implementation of approved education programs for the purpose of acquiring and improving competences and is evidenced by a certificate, diploma or other public document, while non-formal learning includes the implementation of informal education programs that are not evidenced by a public document. Informal learning refers to an unorganized activity of acquiring competences from everyday experiences for personal, social and professional needs (The Croatian Qualifications Framework Act, NN, No. 20, 2021).

Regarding the competences that VET providers believe that participants should have before attending training on the topic of the circular economy, they emphasize that these requirements should not be too strict, and that some forms of prior non-formal or informal education in the field of olive growing would be sufficient.

## 7. Conclusions

The majority of respondents in this survey for the CIRCOLIVE project were agricultural production managers (olive growing and olive oil production), agronomists and sales and marketing managers involved in the olive and olive oil sector. The interviews were conducted with experts in the agri-food sector (an agronomist and a manager of quality control and safety in olive oil production) and two professors from higher education institutions as providers of vocational education and training.

The currently **most common circular economy practices in Croatia**, according to the data obtained in the survey conducted for the CIRCOLIVE project, are **waste reduction and valorization of by-products** and the **use of environmentally friendly packaging materials**. This indicates that the surveyed stakeholders in the olive oil sector in Croatia are already actively engaged in sustainable practices, which is a positive indicator for the transition to a circular economy.

Furthermore, a smaller share of respondents is implementing solutions such as sustainable transport, the use of renewable energy sources or water recycling. This suggests that although there are initiatives, there is still room for further orientation of the sector towards the full implementation of circular economy principles, especially in terms of reducing carbon dioxide emissions and energy efficiency. Survey respondents and interviewed experts in the agri-food sector generally **consider their knowledge and skills on the circular economy to be limited or at a good level**, while no respondent considers their knowledge and skills to be excellent.

**The most important skills** in the olive oil sector **with regard to the circular economy** in Croatia are considered to be **waste and by-product management skills**, as well as **organic farming and pest control techniques**, indicating that fundamental skills related to sustainability, environmental protection and resource optimization are key to the transition to circular economy in this sector. Opinions regarding **digital skills** are the most divergent, with some of the survey respondents considering these skills neither important nor



unimportant in relation to the circular economy, while all interviewed experts in the agri-food sector and VET providers consider them to be essential. Overall, digital skills were not considered essential, which may be a result of the specificities of the olive sector in Croatia, where traditional production is still very present and where digital technologies may not be as integrated, although they could bring additional benefits in terms of efficiency and business optimization.

The **most significant factors influencing the need for new skills** in companies, according to survey and interview respondents in Croatia, are the **pressure to improve sustainability**, the **adoption of circular economy models**, and the **development of new technologies and innovations**. This indicates that experts recognize that environmental requirements and technological innovations are the main drivers of change in the sector. Half of the respondents also highlight economic changes and the need for waste management as key factors, which underlines the importance of adapting to new market and resource conditions. VET training providers emphasize the importance of education and additional training for olive and olive oil producers in order to maintain their place in the market in the future.

**Key gaps** for experts in the Croatian olive sector in the transition to a circular economy lie in **financial issues, regulatory incentives and insufficient demand for sustainable products**, which indicates the need for stronger state support in the form of legal frameworks that would encourage sustainable practices. The lack of a strong demand for sustainable products is also an important factor, as it shows that the market is not yet sufficiently developed in this direction, which may hinder the motivation to implement circular practices. Surprisingly, respondents in Croatia **do not consider the lack of an entrepreneurial mindset to be an obstacle**, which suggests that experts in the Croatian olive sector are ready to innovate and adapt, but they **lack concrete conditions and incentives to implement sustainable practices**. This was also confirmed during the interviews, where experts in the agri-food sector emphasized that their **biggest gap is not a lack of skills but a lack of financial resources to invest in circular economy practices**. Also, **digital skills were not considered an important limitation**, which may indicate that experts in the olive growing sector have adequate knowledge or that such skills are not yet a key obstacle for them in this process.

According to respondents, **circular economy skills** were recognized **as key for occupations related to sustainable development, waste disposal and environmental protection**, while technical occupations such as product development engineering drafter and food technician were rated as less relevant for these skills. This reflects the perception that circular economy skills are primarily focused on occupations with a direct impact on the environment, while technical occupations, according to the respondents, are not yet connected to the circular economy.

Respondents from the olive oil sector in Croatia also recognize the importance of circular economy skills for a number of occupations that are not associated in the ESCO classification with circular economy skills, including **agronomists, quality controllers and scientists**, but opinions are divided when it comes to occupations such as sales, marketing and logistics managers. These results show that the sector sees the immediate importance of the circular economy for operational and production roles, while its application in the wider value chain is still not clearly recognized, despite its potential for long-term sustainability. A VET provider in Croatia highlights that **circular economy skills are needed by all actors in the agri-food**



**sector to enable sustainable and environmentally friendly resource management.**

**The management of by-products and waste** was highlighted as the most important **skill for future success in the olive oil sector**, along with the **production of sustainable products**, the **integration of renewable energy sources and green marketing**. On the other hand, digital skills and data management were rated as less relevant. This perception points to the importance of solving the problem of waste and optimizing resources, while the potential of digital technologies is still not fully recognized, which may represent a missed opportunity to increase efficiency and sustainability.

**Waste valorization engineers** and **renewable energy experts** were identified as **key emerging occupations** by surveyed experts in the olive oil sector, while **sustainability consultants** remained insufficiently recognized, despite their importance according to interviewed experts from the food and agriculture sector and VET providers. This suggests that the olive oil sector emphasizes technical solutions for sustainability, while the role of advisory services and strategic planning is still not sufficiently appreciated, indicating the need to raise awareness of their value.

**Knowledge about the valorization of waste and by-products** was recognized as a **key skill for emerging occupations**, while analytical and digital skills were rated as the least important. This reflects the sector's current focus on practical resource management challenges, while the potential of innovative technologies and analytics is still not perceived as crucial, indicating the need for additional education and awareness-raising about their role in the modernization and sustainability of the sector.

## 8. Recommendations

Based on the research conducted as part of the CIRCOLIVE project for this “National Report on current and future skill levels for the transition of the olive oil sector to circular economy – Croatia”, it is clear that the olive sector in Croatia is already taking some steps towards sustainability, but there is significant room for further progress. The olive sector in Croatia already recognizes the importance of waste management and valorization of by-products, but additional **investment is needed in innovative methods of utilizing by-products and waste** from olive processing and olive oil production. Given that a small number of survey respondents are currently implementing measures to reduce carbon dioxide emissions, a **greater focus on the use of renewable energy sources** such as solar panels is recommended. The **introduction of financial incentives and subsidies** could facilitate investments in these technologies, while education of producers on energy efficiency would increase awareness of the long-term benefits of such investments.

The development of the olive oil sector in accordance with the principles of the circular economy **requires the adaptation of existing professions**, and the **development of new professions** that will support the aforementioned circular practices. According to the results of the research conducted for the purpose of this National Report, these professions could be “**waste valorization engineers**” who would develop and implement strategies for the utilization of by-products and waste in olive processing and olive oil production, “**renewable energy experts**” who would work on the implementation of renewable energy sources in agricultural production, and “**sustainability consultants**” who would help olive growers and olive oil producers adopt circular economy practices through advisory



services.

Although respondents do not consider digital skills to be crucial for the circular economy, VET providers and experts from agri-food sector emphasized their importance. In order for the sector to fully exploit the potential of the circular economy, it is necessary to **develop educational programs that will enable farmers to use digital tools to monitor production, optimize resources and increase business efficiency.**

Most respondents consider their knowledge and skills on the circular economy to be limited or at a good level, while no one rates them as excellent. Therefore, it is crucial **to introduce additional education and training programs in order to expand the understanding of sustainable practices and facilitate their implementation in the olive sector.**

In conclusion, **for a successful transition to circular economy, it will be necessary to provide better financial support, adjust regulatory frameworks and develop a market for sustainable products, while simultaneously investing in education about sustainable practices.**

## 9. References

Agency for Vocational Education and Training and Adult Education (ASOO) <https://www.asoo.hr/obrazovanje/strukovno-obrazovanje/opis-sustava-strukovnog-obrazovanja-i-osposobljavanja/> Accessed: 23.1.2025.

Angeloni, G., Spadi, A., Corti, F., Calcabrina, M., Carpi, G., Maioli, F., Parenti, A., Masella, P. 2024. *Advancing Circular Economy in Olive Oil Production: Comparing Maturation Systems for Vermicompost Creation from Olive Pomace*. *Biomass*, 4(4), 1178-1190. <https://doi.org/10.3390/biomass4040065>

Bourguignon, D. 2016. *Closing the loop – new circular economy package*. EPRS, European Parliament.

Chiarello, F., Fantoni, G., Hogarth, T., Giordano, V., Baltina, L., Spada, I., 2021. *Towards ESCO 4.0 – Is the European classification of skills in line with Industry 4.0? A text mining approach*. *Technological Forecasting and Social Change*, 173, 121177. <https://doi.org/10.1016/j.techfore.2021.121177>

Developing skills for introducing circular business models and digital technologies in the olive oil sector (CIRCOLIVE) - D2.1 National Report on the current situation in the olive oil sector – Croatia, 2024

Developing skills for introducing circular business models and digital technologies in the olive oil sector (CIRCOLIVE) - D2.2 Comparative Research Report on the current situation in the olive oil sector, 2024

European Commission (COM), 2024. <https://education.ec.europa.eu/education-levels/higher-education/micro-credentials> Accessed: 3.2.2025.

European Commission (COM): Directorate-General for Employment, Social Affairs and



Inclusion, *ESCO handbook – European skills, competences, qualifications and occupations*, Publications Office, 2019, <https://data.europa.eu/doi/10.2767/451182>

ESCO (European Skills, Competences, Qualifications and Occupations), 2025. Skills and competences. [https://esco.ec.europa.eu/en/classification/skill\\_main](https://esco.ec.europa.eu/en/classification/skill_main) Accessed: 21.11.2024.

EQF (European Qualifications Framework) <https://europass.europa.eu/en/europass-digital-tools/european-qualifications-framework> Accessed: 2.2.2025.

Croatian Qualification Framework (HKO), 2025. <https://www.kvalifikacije.hr/hr/node/4> Pristupljeno: 24.1.2025.

Katunar, H. 2025. *Cirkularna ekonomija u poljoprivredi*, u Katunar, J., Vrenetar, N., Jardas Antičić, J. (ur.), *Poljoprivreda u perspektivi održivosti*, Sveučilište u Rijeci, Ekonomski fakultet, Rijeka.

Mesić, Ž., Lončar, H., Dolić Z., Tomić, M. 2015. *Analiza svjetskog i hrvatskog tržišta maslinovog ulja*, Agronomski glasnik, Hrvatsko agronomsko društvo, Zagreb. 4-6.

Ministry of Economy, 2025. *Odluka o pokretanju postupka izrade Nacionalno plana razvoja kružnog gospodarstva Republike Hrvatske za razdoblje od 2026. do 2032. godine i Akcijskog plana za provedbu Nacionalnog plana*.

Croatian Qualifications Framework Act, Official Gazette No. 22/13, 41/16, 64/18, 47/20, 20/21. Available at: <https://www.zakon.hr/z/566/Zakon-o-Hrvatskom-kvalifikacijskom-okviru>

Adult Education Act, Official Gazette, No. 144/2021. Available at: [https://narodne-novine.nn.hr/clanci/sluzbeni/2021\\_12\\_144\\_2460.html](https://narodne-novine.nn.hr/clanci/sluzbeni/2021_12_144_2460.html)

## 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 (CIRCULIVE)”*, 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 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...)

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?





[WWW.CIRCOLIVE.EU](http://WWW.CIRCOLIVE.EU)

Consortium



Sapere utile



Co-funding

