AGRIFOOD 4Future

D2.3

# Handbook with Best Practices in the VET and Higher Education Ecosystems in the Agrifood Sector

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**Abstract**

The Deliverable 2.3, the "Handbook with Best Practices in the VET and Higher Education Ecosystems in the Agrifood Sector" for the Agrifood4Future (AF4F) project, synthesizes key findings from a comprehensive survey involving 37 experts across six EU countries—Portugal, Spain, France, Belgium, Italy, Greece—and includes international perspectives from India and Georgia. This initiative seeks to modernize and enhance Vocational Education and Training (VET) and Higher Education curricula to meet the digital, decarbonization, and sustainability needs of the agrifood sector.

The handbook builds on insights drawn from a detailed questionnaire, leading to a SWOT analysis that identifies the sector's strengths, weaknesses, opportunities, and threats. It then transitions into a TOWS analysis, resulting in actionable strategies and solutions aimed at addressing identified challenges and leveraging opportunities to improve VET and Higher Education in smart and sustainable farming.

Strategic recommendations and specific actions derived from the TOWS analysis are highlighted in key sections, focusing on bridging professional expertise gaps, advancing technological adoption, and enhancing collaborative networks. These strategies aim to foster innovation and resilience, ensuring the sector's educational landscape aligns with the urgent shifts towards a more sustainable, efficient, and digitally adept agrifood ecosystem.

This handbook reflects the project's alignment with EU policy priorities, including the European Green Deal, the 'Farm to Fork' Strategy, and the EU Biodiversity Strategy for 2030, aiming to address the agrifood sector's evolving needs. In summary, Deliverable 2.3 offers a practical roadmap for stakeholders, outlining critical educational and training strategies for navigating the sector's challenges and enhancing the agrifood sector's appeal and sustainability as a career path.

# Table of content

**INTRODUCTION** **8**

1.1 Background 8
1.2 Objectives of the Handbook 8
1.3 Significance of Mapping VET Ecosystems 9
1.4 Methodology 9

**PART 1 : CATEGORIZATION AND STRATEGIC ALIGNMENT OF RESPONDENTS AND THEIR ORGANIZATIONS IN THE AGRI-FOOD SECTOR** **10**

- Question 1.1 - Type of your organization/institution 10
- Question 1.2 - Organization's primary location 11
- Question 1.3 - Which of the AGRIFOOD4FUTURE pillars does your institution/organization most align with? (You can select more than one). 12
- Question 1.4 - If you're a VET/Higher Education provider, which European Qualifications Framework (EQF) levels do you cater to? (You can select more than one). 13
- Question 1.5 - How many years has your organization/institution been active in the agri-food sector? 15
- Question 1.6 - Please specify your role within the organization? 15

**PART 2 : SKILLS GAP ANALYSIS** **17**

- Question 2.1 Key Skills: From the following list, please select the top 3 skills that your institution/organization places the most emphasis on or views as essential for the agri-food labour market 17
- Question 2.2 : Proficiency Assessment: For each of the skills listed above, please rate the current proficiency among students/workers (1 being the lowest and 5 being the highest) 19
- Question 2.3 : Identifying Future Skills Needs: Given the sector's evolution, especially in green and digital aspects, what new skills or competencies should we consider for curriculum inclusion? 20
- Question 2.4 : Transversal and Technical Skills: Considering recent reports on the importance of both technical and transversal skills, rate their importance in your institution/organization's context (1 being the lowest and 5 being the highest) 22
- Question 2.5 :Training and Curriculum Innovations - In view of the green transition, how well-prepared are current training systems for 'greenovation'? Indicate the required emphasis on the areas below. 23
- Question 2.6: Addressing the Ageing Workforce and Skill Shortages - Considering the ageing workforce in the agri-food sector and skill shortages, select strategies you believe would attract young talent and upskill the current workforce 24
- Question 2.7: Challenges in Continuous Vocational Education and Training (CVET) : Highlight the main challenges CVET faces in upskilling and reskilling the agri-food workforce 26
- Question 2.8: Recommendations for Skills Policies : Indicate which skills policies would benefit the agri-food sector in alignment with the European Commission’s Farm-to-fork

strategy 27
- Question 2.9: Final Remarks on Skills Gap Analysis : Share any additional thoughts on the skills gap and training requirements in agri-food. 29

**PART 3: BEST PRACTICES IN THE AGRI-FOOD SECTOR FOR SMART AND SUSTAINABLE FARMING 31**

- Question 3.1: Effective Teaching Methods : For each of the following areas, please list the top three teaching methods or didactical content (e.g., project-based learning, field trips, gamified tools) that you have found most effective: 31
  - a) Digital skills in agriculture; 31
  - b) Climate and energy-related skills in agriculture; 31
  - c) Sustainable and holistic management practices skills in agriculture 31
  - d) Entrepreneurial, financial & business management, and circular-economy related skills in agriculture 31
- Question 3.2 : Tools & Technologies for Transition (Digital) Name a tool or technology crucial for the Digital Transition in agri-food and its impact. 33
- Question 3.3 : Tools & Technologies for Transition (Green) Share one methodology or tool you've seen that promotes the Green Transition, especially in reducing environmental impact 34
- Question 3.4 : Challenges in Implementing New Practices: For each of the following categories, please briefly describe a key challenge or barrier your institution/organization has encountered when implementing new strategies or technologies: 36
- Question 3.5 : VET/CVET's Role in STEM and Digital Training: In your opinion, what role should VET (Vocational Education and Training) / CVET (Continuing Vocational Education and Training) play in promoting STEM education and digital training within the agri-food sector? 37
- Question 3.6 : Collaborative Potential in Agri-Food Industry: Could you elaborate on the importance of collaboration within the agri-food industry, especially in light of its interconnected value chains? 38
- Question 3.7 : Unmentioned Practices or Methodologies: Are there any specific practices or methodologies not previously mentioned in this questionnaire that you believe significantly contribute to the agri-food sector, aligning with the AGRIFOOD4EUROPE project's objectives? 39

**PART 4: TOWS ANALYSIS (THREATS, OPPORTUNITIES, WEAKNESSES, STRENGTHS) 41**

- Question 4.1 : Threats/ Challenges - Describe the main external challenges that might impact your program's success. Also, touch upon any broader trends in the agri-food and VET sector that could influence your institution in the future. 41
- Question 4.2 : Opportunities List the primary external opportunities you foresee. Consider factors like technological trends, government policies, or potential collaborations that could benefit your institution. 43
- Question 4.3 : Weaknesses : What are the main gaps or improvement areas in your institution's approach? Mention any critical resources or support you believe is missing. 44
- Question 4.4 : Strengths : Summarize the primary strengths of your institution or

program in smart and sustainable farming education. If possible, mention any significant success or milestone. 46

**PART 5 - TOWS: BRIDGING ANALYSIS WITH ACTIONABLE INSIGHTS 48**

**PART 6: FUTURE STRATEGIES AND SOLUTIONS 50**

- Question 6.1 : Mitigating Threats/ Addressing Challenges - What key strategy or initiative would you propose to counteract potential external threats/challenges to your program? (S/T) **50**
- Question 6.2 : Leveraging Strengths & Opportunities In a few sentences, how might your institution or program use its main strengths to capitalize on the identified opportunities? (S/O) 52
- Question 6.3 : Addressing Weaknesses : What is the primary action or measure you believe would directly address your institution's most significant weakness? (W/O) 53
- Question 6.4 : Future Vision - Briefly describe how you envision the future of your institution or program in the realm of smart and sustainable farming over the next 5 years. (W/T) 54

**PART 7: CONCLUDING ANALYSIS: FUTURE STRATEGIES AND SOLUTIONS FOR SMART AND SUSTAINABLE FARMING EDUCATION** 56

**CALL TO ACTION: SHAPING THE FUTURE TOGETHER 60**

**BIBLIOGRAPHY 61**

**ANNEX 1 - Detailed Responses to Question 2.3:**
Identifying Future Skills Needs in the Agri-Food Sector **63**

**ANNEX 2 - Detailed Responses to Question 2.9:**
Final Remarks on Skills Gap Analysis **66**

**ANNEX 3 - Detailed Responses to Question 3.2:**
Tools & Technologies for Transition (Digital)
Name a tool or technology crucial for the Digital Transition in agri-food and its impact **68**

**ANNEX 4 - Detailed Responses to Question 3.3:**
Tools & Technologies for Transition (Green) Share one methodology or tool you've seen that promotes the Green Transition, especially in reducing environmental impact **70**

**ANNEX 5 - Detailed Responses to Question 4.1:**
Threats/ Challenges: Describe the main external challenges that might impact your program's success. Also, touch upon any broader trends in the agri-food and VET sector that could influence your institution in the future **72**

**ANNEX 6 - Detailed Responses to Question 4.2:**

Opportunities List the primary external opportunities you foresee. Consider factors like technological trends, government policies, or potential collaborations that could benefit your institution **75**

**ANNEX 7 - Detailed Responses to Question 4.3:**
Weaknesses : What are the main gaps or improvement areas in your institution's approach? Mention any critical resources or support you believe is missing **78**

**ANNEX 8 - Detailed Responses to Question 4.4:**
Strengths : Summarize the primary strengths of your institution or program in smart and sustainable farming education. If possible, mention any significant success or milestone **80**

# List of figures

Figure 1. Type of Organization
Figure 2. Organizations' Primary Location
Figure 3. Organizations' Pillar Alignment
Figure 4. Seniority of Respondents' Roles Within Their Organizations
Figure 5. The Skills Most Valued by the Respondents' Organizations
Figure 6. Proficiency Assessment Among Students/Workders in Each Surveyed Organization
Figure 7. Importance of Technical and Transversal Skills in Each Surveyed Organization
Figure 8. Level of Preparation of Each Surveyed Organization in Key Areas for 'Greenovation'
Figure 9. Most Popular Strategies to Attract Young People and Upskill the Current Workforce
Figure 10. Main Challenges Faced by CVET in Upskilling and Reskilling the Agri-food Workforce
Figure 11. Skills Policy Recommendations for the Agri-food Sector Aligned with the F2F Strategy
Figure 12. TOWS Matrix - Explained

# List of tables

Table 1. Organizations' Alignment with EQF levels
Table 2. Respondents' Role in their Organization and Advantages of Their Contributions
Table 3. Key Technologies For Digital Transition in Agri-food
Table 4. Key Technologies for Green Transition in Agri-food
Table 5. Key Themes on Collaborative Potential in Agri-Food Industry
Table 6. SWOT Analysis
Table 7. Actionable Strategies Derived from TOWS Analysis

# List of abbreviation

| | |
|---|---|
| **AF4F** | AGRIFOOD4FUTURE |

| | |
|---|---|
| **CAP** | Commom Agricultural Policy |
| **CoVEs** | Centers of Vocational Excellence |
| **CVET** | Continuous Vocational Education and Training |
| **EC** | European Commission |
| **EQF** | European Qualifications Framework |
| **EU** | European Union |
| **F2F** | Farm to Fork |
| **STEM** | Science, technology, engineering, and mathematics |
| **SWOT** | Strenghts, Weaknesses, Opportunities, Threats (matrix to identify) |
| **TOWS** | Threats, Opportunities, Weaknesses, Stremghts (matrix to analyse) |
| **WP** | Work Package |
| **VET** | Vocational Education and Training |

# INTRODUCTION

## 1.1 Background

The agrifood sector stands at a critical juncture, grappling with unprecedented challenges that span environmental, economic, and socio-political realms. Escalating energy prices, the impact of geopolitical tensions, and the pressing threats of climate change and water scarcity are reshaping the landscape of food production in Europe and globally. As the global population trajectory points towards a growth of almost 10 billion by 2050, the demand for food, alongside high-quality crops and protein, is expected to surge by 60% (FAO, 2017). This projection, set against the backdrop of climate change-induced extremities, places the European Union (EU) before a dual challenge: to scale up agrifood production to meet increasing global demands while transitioning to economically viable and environmentally sustainable production systems.

The EU's agriculture and food industry, as the largest production and manufacturing sector, plays a pivotal role in the region's economy, contributing significantly to employment and GDP, especially in rural areas. Yet, the sector's sustainability is under scrutiny, driven by consumer shifts towards healthier, more sustainable food choices and increased awareness around fair trade and environmental impacts of food production. Recognizing these challenges, the EU has initiated strategies like the Farm to Fork, part of the European Green Deal, aiming for a fair, healthy, and environmentally-friendly food system.

To support this ambitious transition, upskilling and reskilling within the agrifood sector become paramount. The EU's proposal for a Skills Partnership for the Agri-Food Ecosystem underscores the need for innovative vocational education and training (VET) ecosystems that equip workers with advanced digital and green skills, critical for navigating the socio-economic and environmental challenges facing the sector.

## 1.2 Objectives of the Handbook

The handbook on "Best Practices in the VET Ecosystems" seeks to compile and analyze successful teaching methods, didactical content, and programs in smart and sustainable farming at both higher education and VET levels. Through a comprehensive mapping of existing practices, this handbook aims to identify, amplify, and transfer strengths across Europe, fostering innovation and excellence in agri-food sector education. This endeavor aligns with the AGRIFOOD4FUTURE project's mission to empower European farmers and agrifood workers, thereby facilitating a seamless transition to sustainable, smart agricultural practices.

## 1.3 Significance of Mapping VET Ecosystems

Mapping the VET and Higher Education ecosystems in smart and sustainable farming is crucial for understanding the current landscape of agri-food education and training. This exercise not only highlights prevalent practices but also uncovers gaps and opportunities for enhancing the sector's resilience and adaptability. By collating insights from across Europe, the project endeavors to create a knowledge base that supports the development of innovative, cross-border training programs, ultimately contributing to the sector's long-term sustainability.

## 1.4 Methodology

The data for this comprehensive analysis was gathered through a meticulously designed questionnaire distributed to professionals at the forefront of VET, higher education, and smart sustainable farming. The questionnaire, a crucial component of the AGRIFOOD4FUTURE project, aimed to collect in-depth insights into current practices and future needs within the sector. A total of 37 responses were received, providing a valuable dataset for conducting a TOWS analysis. This methodological approach enables the identification of effective strategies for leveraging strengths, addressing weaknesses, capitalizing on opportunities, and mitigating threats within the VET/ Higher Education ecosystems. The findings from this analysis will not only inform the development of future training programs but also contribute to the broader objective of advancing smart and sustainable farming practices across Europe.

# PART 1 : CATEGORIZATION AND STRATEGIC ALIGNMENT OF RESPONDENTS AND THEIR ORGANIZATIONS IN THE AGRI-FOOD SECTOR

The initial phase of our questionnaire analysis aimed at capturing a brief yet comprehensive profile of each respondent's organization within the agri-food sector. This section is crucial for several reasons: it allows us to categorize the types of respondents accurately, assess their levels of expertise, and understand their alignment with the AGRIFOOD4FUTURE project's pillars.

By gathering data on the organization's type, primary location, alignment with strategic pillars, European Qualifications Framework (EQF) levels catered to by VET/Higher Education providers, operational tenure in the agri-food sector, and the respondents' roles, we establish a foundation for a structured and meaningful analysis.

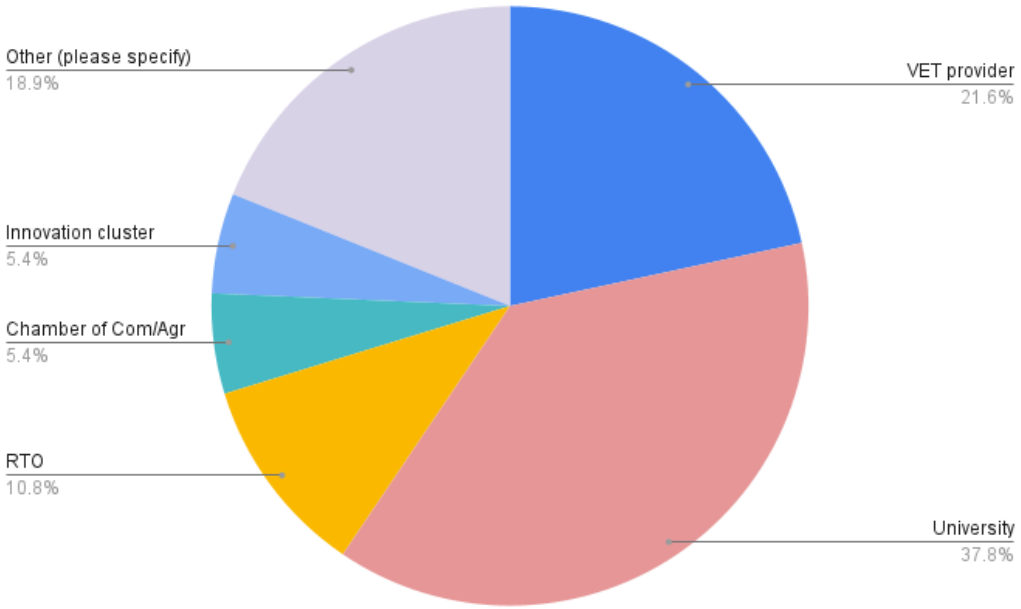
This structured approach ensures that our subsequent discussions and report outputs are informed by the specific contexts and needs of the sector, enabling us to tailor our recommendations effectively.

Understanding the diversity and depth of expertise among our respondents is vital for highlighting their contributions and identifying best practices in smart and sustainable farming that align with the AGRIFOOD4FUTURE project's mission to enhance agri-food sector education.

## Question 1.1 - Type of your organization/institution

The data reveals a **diverse array of respondent organizations,** predominantly comprising **Universities (14)** and **VET providers (8)**, followed by **Research & Technological Organizations (RTOs) (4)**, with notable mentions of **Chambers of Commerce/Agriculture (2)**, **Innovation Clusters (2)**, **and various entities** categorized as 'Other' **(7)**: a Vegetable Biodiversity Research organization, a Private Energy Consulting Company, an NGO, a Retail business, an Agency ascribed to the regional ministry of agriculture with functions related to management and innovation, a Professional Training Institution offering short courses and webinars, and an Agricultural Equipment Utilization Cooperative.

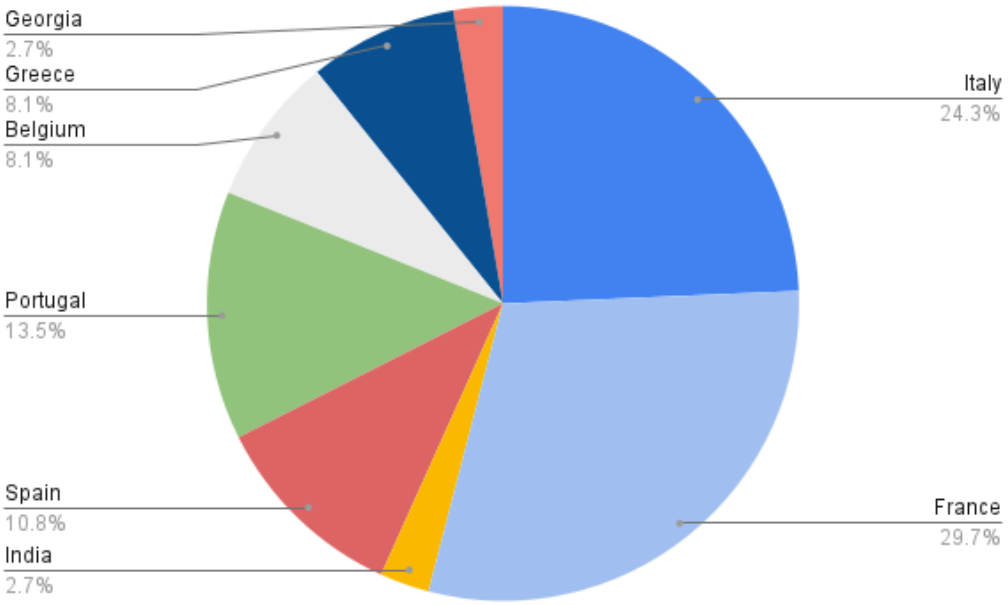
Figure 1 - Type of Organization




## Question 1.2 - Organization's primary location

The distribution of **respondent s' primary locations** reflects the focused scope of our survey within Europe, particularly highlighted by the significant contributions from **France (11)** and **Italy (9)**, underscoring their pivotal roles in the agri-food sector's educational and organizational frameworks. The survey further reveals comprehensive engagement from **Portugal (5)**, **Spain (4)**, **Belgium (3)**, and **Greece (3)**, in line with the AGRIFOOD4FUTURE (AF4F) project's geographic focus. Moreover, the inclusion of organizations from **India (1)** and **Georgia (1)** introduces valuable global perspectives, augmenting the dataset with insights into smart and sustainable farming practices from beyond Europe.

Figure 2 - Organizations' Primary Location




## Question 1.3: Which of the AGRIFOOD4FUTURE pillars does your institution/organization most align with? (You can select more than one).

The analysis of how respondent organizations align with the AGRIFOOD4FUTURE project's pillars highlights a strong commitment to sustainability and technological innovation within the sector:

- **Pillar 2: Green transition** is the most emphasized, with **29 entities** selecting it, indicating a sector-wide priority for eco-friendly practices.
- **Pillar 3: Resilience and sustainable food systems** follows closely, **chosen by 28 entities**, showcasing a commitment to enhancing the sustainability of food systems.
- **Pillar 1: Digital transition** is identified by **22 entities**, reflecting the sector's recognition of technology's vital role in achieving sustainability goals.
- **Pillar 4: Business sustainability**, though selected by fewer entities (**13**), still underscores the importance of economic viability in sustainable agri-food systems.

The selection pattern among organizations reveals a holistic engagement with the pillars:

- **8 organizations aligned with 1 pillar,** suggesting a focused area of priority or expertise.

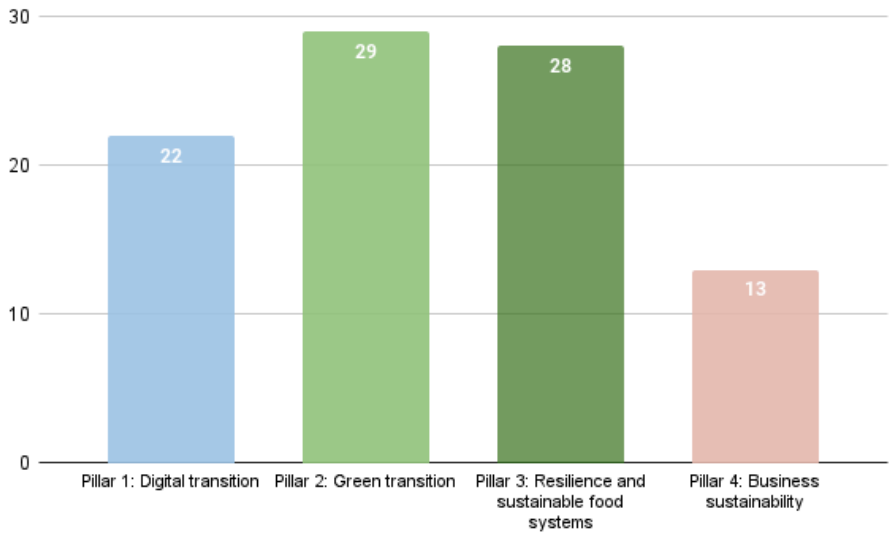
- **10 organizations chose 2 pillars**, indicating an interdisciplinary approach to sustainability and innovation.

- **12 organizations identified with 3 pillars**, demonstrating a broad commitment to integrating diverse aspects of sustainability.

- **7 organizations embraced all 4 pillars**, underscoring a comprehensive strategy for tackling challenges within the agri-food sector.

This distribution illustrates a broad acknowledgment of the pillars' interconnectedness, with a majority of organizations opting for a multidimensional approach. It suggests that many within the sector view these pillars not as isolated areas of focus but as integrated components of a cohesive strategy for achieving sustainable and resilient food systems.

Figure 3 - Organization's Pillar Alignment




## Question 1.4: If you're a VET/Higher Education provider, which European Qualifications Framework (EQF) levels do you cater to? (You can select more than one).

Question 4 explores the alignment of VET and Higher Education providers with the European Qualifications Framework (EQF) levels. The EQF serves as a comprehensive system to classify qualifications based on learning outcomes across 8 levels, facilitating the transparency and comparability of qualifications across Europe. This framework includes all types of

qualifications, from basic education to the highest academic achievements such as Doctorates, and is closely linked to the Bologna Process, which aligns higher education qualifications with EQF levels 6 (Bachelor), 7 (Master's), and 8 (Doctorate).

The responses to this question highlight the range of EQF levels catered to by the surveyed entities, as summarized in the table below:

Table 1. Organizations' Alignment with EQF levels

| EQF Levels | Number of Entities |
|---|---|
| Level 4 only | 1 |
| Level 5 only | 3 |
| Level 6 only (Bachelor) | 2 |
| Level 7 only (Master's) | 1 |
| Level 8 only (Doctorate) | 1 |
| Combination of EQF Levels 3, 4, 5 | 1 |
| Combination of EQF Levels 3-6 | 2 |
| Combination of EQF Levels 3-8 | 2 |
| Combination of EQF Levels 5, 6 | 1 |
| Combination of EQF Levels 5-7 | 1 |
| Combination of EQF Levels 5-8 | 2 |
| Combination of EQF Levels 6-8 | 5 |
| Not Applicable (N/A) | 15 |

This distribution showcases a **significant focus on mid to high-range EQF levels**, particularly highlighting a strong commitment to advanced academic and professional qualifications **(levels 6-8)**. Entities providing a wide range of EQF levels, especially those offering combinations from levels 3 through 8, demonstrate their dedication to offering comprehensive educational pathways. The inclusion of **15 N/A responses reflects the diversity of organizations participating in the survey**, many of which play crucial roles in the agri-food sector's educational and training ecosystem beyond direct qualification provision. This alignment with higher EQF levels underscores the sector's dedication to fostering in-depth knowledge, innovation, and professional expertise, aligning with the AGRIFOOD4FUTURE project's objectives to enhance education and training in smart and sustainable farming practices.

## Question 1.5: How many years has your organization/institution been active in the agri-food sector?

Question 5 addresses the years of experience that the respondent organizations have in the agri-food sector, thereby providing insights into their longevity and depth of engagement.

- **1 to 5 years**: 5 entities
- **5 to 10 years**: 4 entities
- **10 to 15 years**: 1 entity
- **More than 15 years**: 27 entities

The majority of respondents, 27 entities, have been active in the agri-food sector for more than 15 years, indicating a strong foundation of experienced organizations within the survey pool. This suggests that the sector is supported by a wealth of accumulated knowledge and expertise. On the other hand, the presence of organizations with 1 to 10 years of experience shows that new players are also entering the field, contributing fresh perspectives and innovations. The mix of longstanding and newer organizations might imply a sector that is both rich in tradition and open to innovation, and that can highly benefit from the interconnection between these distinct experiences.

## Question 1.6: Please specify your role within the organization?

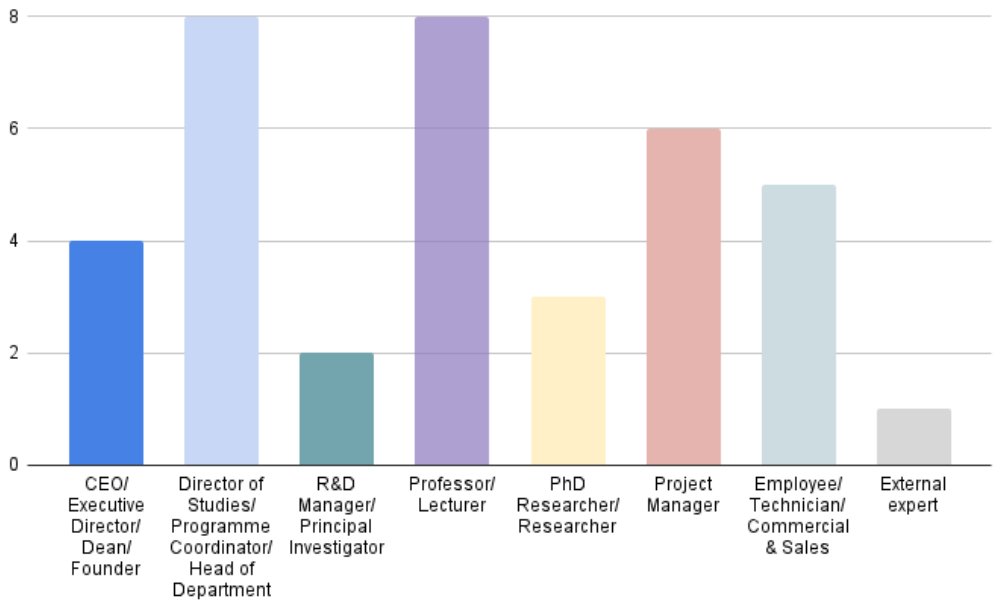
Analyzing the roles of respondents within their organizations offers insights into the seniority and scope of influence these individuals likely have in shaping practices and policies in the agri-food sector.

Table 2. Respondents' Role in Their Oorganization and Advantages of Their Contributions

| Role of the Respondents | Number of Respondents | Potential Advantages of Their Contributions |
|---|---|---|
| CEO/ Executive Director/ Dean/ Founder | 4 | Strategic oversight, decision-making power, and comprehensive understanding of organizational direction and sectoral challenges. |
| Director of Studies/ Programme Coordinator/ Head of Department | 8 | In-depth knowledge in curriculum design, program execution, and departmental management with a focus on education and training. |

| | | |
|---|---|---|
| R&D Manager/ Principal Investigator | 2 | Insights into innovative practices, technological advancements, and current research trends in the agri-food sector. |
| Professor/ Lecturer | 8 | Expert knowledge in their fields, ability to bridge theory and practical application, and influence on future professionals. |
| PhD Researcher/ Researcher | 3 | Cutting-edge research insights, identification of emerging trends, and contribution to academic and practical knowledge. |
| Project Manager | 6 | Practical experience in project implementation, coordination skills, and firsthand insights into operational challenges. |
| Employee/ Technician/ Commercial & Sales | 5 | Operational perspective, hands-on experience with technologies and strategies, and insights into day-to-day challenges. |
| External expert | 1 | Interdisciplinary viewpoints, and the ability to enrich discussions with broad, sector-spanning insights. |

Figure 4. Seniority of Respondents' Roles with Their Organizations



# PART 2 : SKILLS GAP ANALYSIS

Transitioning into Part 2, "Skills Gap Analysis," our questionnaire continues to build upon the foundational understanding established in Part 1, focusing now on delineating the skills gap within the agri-food sector. Through an array of nine questions, we engage with the intricacies of current skills emphasis, proficiency assessments, and the anticipation of future skills needs, alongside the exploration of training system preparedness for the sector's dual transition.

Structured to uncover vital insights into existing and prospective skills gaps, this section evaluates the alignment of training curricula with the sector's digital and green advancements, and scrutinizes strategies to rejuvenate the workforce and enhance continuous vocational education and training (CVET). The outcomes of this analysis are essential for shaping recommendations that aim to fortify the agri-food workforce in accordance with the AF4F's four pillars.

Part 2 not only enriches our understanding of the current landscape but also paves the way for targeted strategies to bridge the skills gap, ensuring the agri-food sector's resilience and adaptability in the face of future challenges.

## Question 2.1 Key Skills: From the following list, please select the top 3 skills that your institution/organization places the most emphasis on or views as essential for the agri-food labour market

Addressing the question on key skills reveals the priorities and perceived essential skills within the agri-food sector, as identified by the participating institutions and organizations:

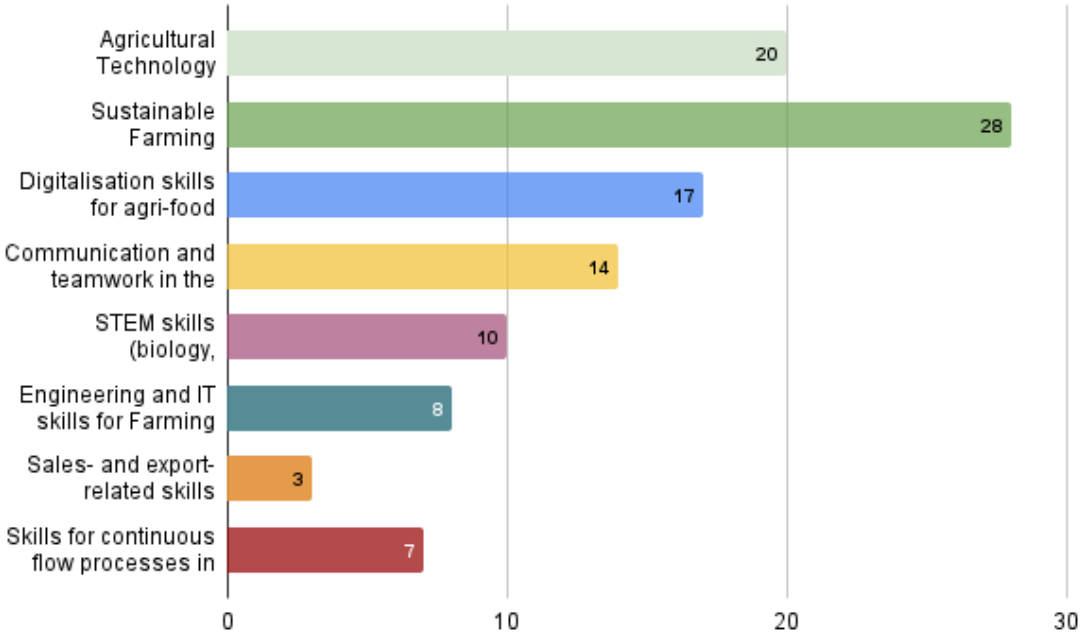
- **Sustainable Farming** emerges as the **foremost priority**, with **28 entities** recognizing it among the top three crucial skills;
- **Agricultural Technology** is emphasized by **20 respondents**, indicating the significance of technology in enhancing agricultural efficiency and productivity;
- **Digitalisation skills for agri-food systems** are identified by **17 entities** as key, reflecting the sector's urgent need to embrace digital transformations;

- **Communication and teamwork in the agri-food context** is chosen by **14 respondents**, underscoring the importance of interpersonal skills in fostering effective collaboration;
- **STEM skills (biology, biochemistry, and chemistry)**, vital for the scientific underpinnings of agriculture and food production, are prioritized by **10 organizations**;
- **Engineering and IT skills for Farming 4.0** receive attention from **8 entities**, pointing to the evolving technological landscape of modern agriculture;
- **Skills for continuous flow processes in food manufacturing** are highlighted by **7 respondents**, emphasizing the significance of process efficiency in food production;
- **Sales- and export-related skills** are seen as top priorities by only **3 entities**, suggesting these areas are currently less emphasized compared to other competencies.

It is noteworthy that 1 respondent selected only 1 option and 2 respondents chose just 2 options, potentially indicating a particularly strong emphasis or acute need in those selected skill areas.

This summary illustrates the sector's clear focus on sustainability and technological innovation, aligning strategically with the challenges and opportunities of the present day. The balance between technical, scientific, and soft skills demonstrates a comprehensive approach to skills development, addressing the diverse demands of the agri-food labor market.

Figure 5. The Skills Most Valued by the Respondents' Organizations



## Question 2.2 : Proficiency Assessment: For each of the skills listed above, please rate the current proficiency among students/workers (1 being the lowest and 5 being the highest)

The Proficiency Assessment question aimed to gauge the current proficiency levels among students/workers in the key skills relevant to the agri-food sector highlighted in 2.1. The responses, were categorized by proficiency level from 1 (lowest) to 5 (highest).

- **Agricultural Technology**: Majority of respondents see a **moderate level of proficiency (Level 3)** among students/workers, with a smaller group rating it higher (Levels 4 and 5). This suggests room for improvement in integrating technology in agriculture.

- **Sustainable Farming**: Similar to Agricultural Technology, most responses cluster around **moderate proficiency (Level 3)**, indicating a need for enhanced training and education in sustainable practices.

- **Digitalisation Skills for Agri-food Systems:** A significant number of respondents rate proficiency as **low to moderate (Levels 2 and 3)**, highlighting a critical area for development in the face of digital transformation.

- **Communication and Teamwork in the Agri-food Contex**t: Distribution leans towards **moderate to high proficiency (Levels 3 and 4)**, suggesting that soft skills are relatively well-developed among students/workers.

- **STEM Skills (Biology, Biochemistry, and Chemistry)**: Responses indicate a **moderate level of proficiency (Levels 3 and 4)**, with a balanced distribution that points to a solid foundation in scientific knowledge.

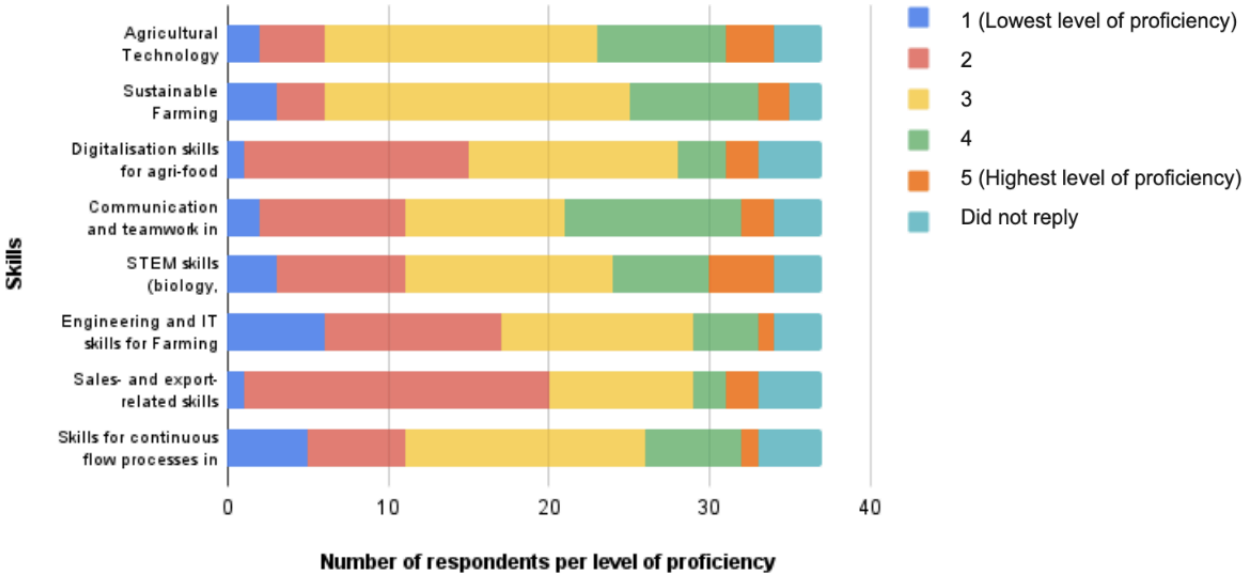
- **Engineering and IT Skills for Farming 4.0**: Proficiency is perceived as **low to moderate (Levels 2 and 3)**, underscoring the need for enhanced training in engineering and IT to support advanced farming technologies.

- **Sales- and Export-related Skills:** The majority of respondents rate these skills as **low (Level 2)**, signaling a significant gap in commercial competencies within the sector.

- **Skills for Continuous Flow Processes in Food Manufacturing:** Responses suggest a **moderate level of proficiency (Level 3)**, with a notable number rating it lower, indicating potential for improvement in process efficiency skills.

The presence of "No answer" responses across all skills indicates some respondents may have felt unable to accurately judge proficiency levels or found the question inapplicable to their context. This analysis provides critical insights into the current state of skills proficiency within the agri-food sector, pinpointing areas where targeted training and education efforts can significantly bolster workforce capabilities, particularly in digitalisation, sustainable farming practices, and commercial skills.

Figure 6. Proficiency Assessment Among Students/ Workers in Each Surveyed Organization




## Question 2.3 : Identifying Future Skills Needs: Given the sector's evolution, especially in green and digital aspects, what new skills or competencies should we consider for curriculum inclusion?

In assessing the 37 replies received regarding future skills needs within the agri-food sector, we observed a range of response depths and focuses, reflecting the diverse perspectives and priorities of our respondents. Among these, only 1 respondent did not provide specific suggestions, while approximately 30-35% offered only brief statements. In contrast, the majority of responses were notably detailed, demonstrating these participants' strong willingness to thoroughly convey their insights on this crucial topic.

Annex 1 will present a table detailing the full array of responses. However, this summary aims to distill the main ideas and tendencies, organized by the most relevant thematic areas highlighted by the respondents:

**Main Thematic Areas Identified:**

- **Sustainability and Environmental Management:** A significant number of responses emphasized the importance of skills related to sustainable farming practices, environmental stewardship, and the application of green technologies. This includes specific mentions of life cycle analysis, biodiversity preservation, sustainable water management, and strategies for reducing carbon footprint in food production.

- **Digital Transformation and Technological Integration:** Many respondents pointed to the necessity of digital skills, including data analysis, artificial intelligence, the use of IoT technologies in agriculture, and proficiency in digital applications and systems as crucial competencies for the future workforce.

- **Innovation and Entrepreneurship:** Skills that foster innovation and entrepreneurship within the agrifood value chain were frequently mentioned, suggesting a need for curriculum inclusion that supports creative thinking, business acumen, and the development of new advisory methodologies.

- **Soft Skills and Multidisciplinary Knowledge:** Communication, teamwork, and the ability to engage in multidisciplinary efforts were highlighted as essential. Respondents advocate for a balanced approach that combines theoretical knowledge with practical, hands-on experience.

- **Technical Skills and Scientific Knowledge:** Specific technical competencies, such as sensors and robotics in agriculture, integrated pest management, and advanced understanding of soil biology, were identified as critical areas of expertise necessary for modern agriculture.

- **Management and Operational Skills:** Skills related to supply chain management, bioenergy production, and systemic analysis indicate a growing recognition of the need for managerial and operational capabilities in addressing the complexities of the agri-food sector.

This assessment reveals a keen interest among respondents in broadening the agri-food curriculum to include a wide array of skills that are responsive to the sector's evolving green and digital aspects. The detailed responses underscore a collective effort to prepare the future workforce for the multifaceted challenges and opportunities ahead, aligning with the overarching goals of the AGRIFOOD4FUTURE project to promote smart and sustainable farming through enhanced education and training.

## Question 2.4 : Transversal and Technical Skills: Considering recent reports on the importance of both technical and transversal skills, rate their importance in your institution/organization's context (1 being the lowest and 5 being the highest)

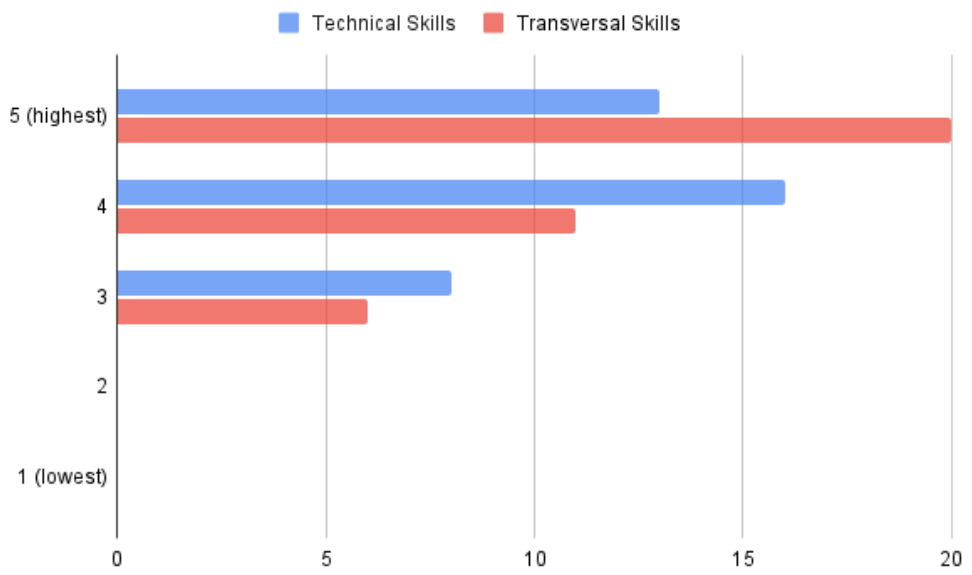
Question 2.4 addresses the evaluation of transversal and technical skills within the context of each respondent's institution or organization, highlighting their perceived importance on a scale from 1 (lowest) to 5 (highest). The responses indicate a strong affirmation of the value of both skill sets in the agri-food sector, with a particular emphasis on their critical role in the current educational and organizational frameworks.

- **Technical Skills:** No respondents rated these skills as low importance, with a notable lean towards higher importance (Levels 4 and 5). Specifically, **16 respondents** rated technical skills as **very important (Level 4)**, and **13 respondents** deemed them of **highest importance (Level 5)**, showcasing a recognition of the essential role technical knowledge plays in the sector.

- **Transversal Skills:** Similarly, transversal skills received no low importance ratings, with an even stronger emphasis on their critical role. **20 respondents** rated these skills as of **highest importance (Level 5)**, and **11 respondents** considered them **very important (Level 4)**, reflecting a significant acknowledgment of the value of soft skills such as communication, teamwork, and problem-solving in the agri-food context.

This assessment underscores a widespread recognition among respondents of the crucial role both technical and transversal skills play in fostering a skilled and adaptable workforce in the agri-food sector. The higher ratings for transversal skills suggest a particularly strong appreciation for the versatility and adaptability they bring to professionals in this field, complementing the technical expertise required for success.

Figure 7. Importance of Technical and Transversal Skills in Each Surveyed Organization



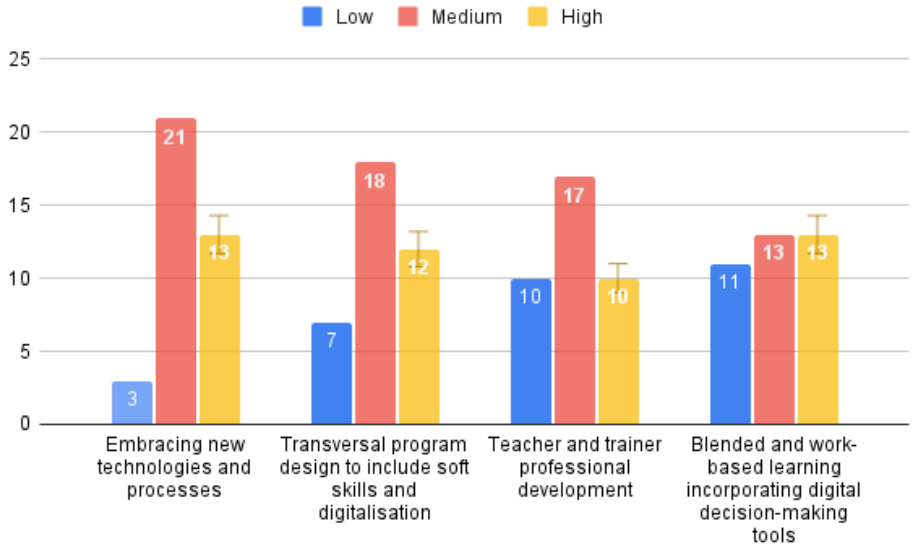

## Question 2.5 :Training and Curriculum Innovations - In view of the green transition, how well-prepared are current training systems for 'greenovation'? Indicate the required emphasis on the areas below.

These responses provide a snapshot of how education and training programs are aligning with the evolving needs of the agri-food sector's green transition, focusing on four key areas:

- **Embracing New Technologies and Processes:** Majority see moderate readiness (21 medium), with optimism reflected by 13 high responses, and minimal concern (3 low).
- **Transversal Program Design:** Incorporation of soft skills and digitalization is perceived as moderately prepared (18 medium), with 12 high and 7 low responses, indicating a need for more integrated approaches.
- **Teacher and Trainer Professional Development:** There's a balanced view on professional development readiness, with a tilt towards needing enhancement (17 medium, 10 high, 10 low).
- **Blended and Work-based Learning**: Responses are evenly split between medium and high preparedness (13 each) for integrating digital tools, showing potential for improvement (11 low).

Overall, the responses to Question 2.5 highlight an acknowledgment of the steps being taken toward integrating 'greenovation' into training and curriculum, though with varying degrees of optimism. A common theme across all areas is the need for further development and emphasis, particularly in enhancing the digital and soft skills components of programs, as well as in the professional development of teachers and trainers.

Figure 8. Level of Preparation of Each Surveyed Organization in Key Areas for 'Greenovation'




## Question 2.6: Addressing the Ageing Workforce and Skill Shortages - Considering the ageing workforce in the agri-food sector and skill shortages, select strategies you believe would attract young talent and upskill the current workforce

Question 2.6 delves into strategies for attracting young talent and upskilling the current workforce in the agri-food sector, against the backdrop of an aging workforce and skill shortages. 33 out of 37 respondents selected from a list of pre-defined strategies, while 4 provided personalized responses.

**Pre-selected Answers Analysis:**

- **Integration of Classroom-based and Practical Learning**: Emerges as the **leading strategy with 12 selections**, highlighting the critical role of hands-on experience in education.

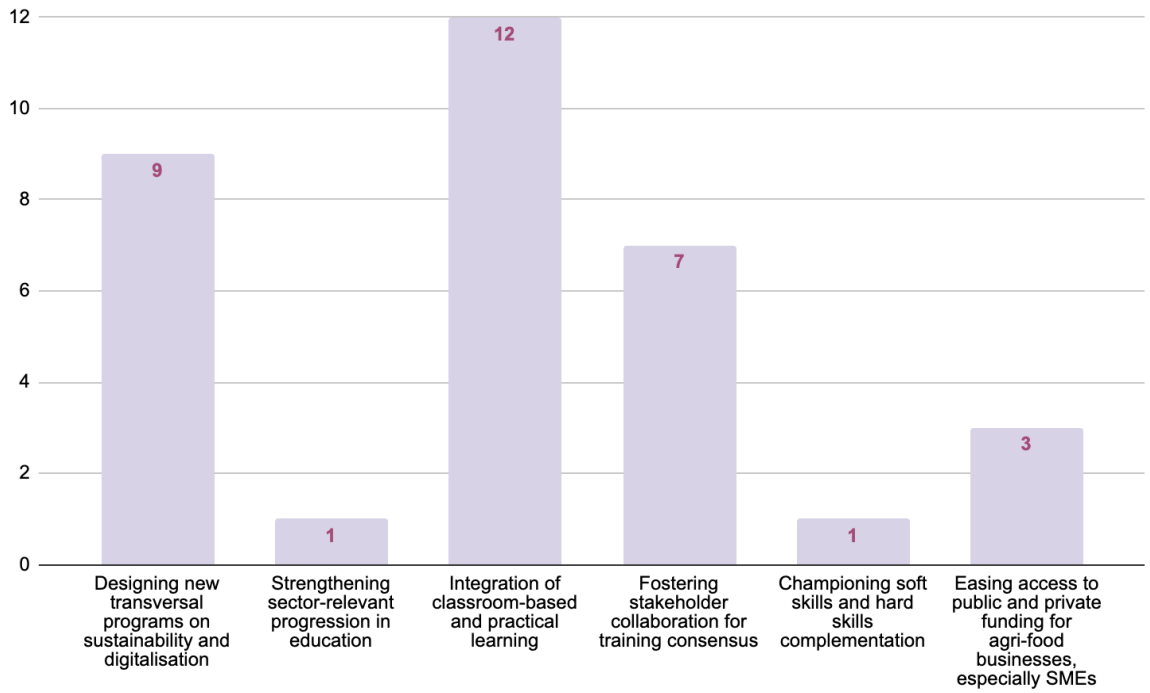
- **Designing New Transversal Programs on Sustainability and Digitalisation:** Chosen by **9 respondents**, emphasizing the need for curricula updates to meet current and future sector challenges.

- **Fostering Stakeholder Collaboration for Training Consensus:** Attracts **7 selections**, pointing towards the benefit of collaborative approaches in training and skill development.

- **Easing Access to Public and Private Funding for Agri-food Businesses, Especially SMEs**: Identified by **3 respondents**, underscoring the importance of financial support in fostering sector growth and innovation.

- Less emphasis was placed on **Strengthening Sector-relevant Progression in Education and Championing Soft Skills** and **Hard Skills Complementation**, each receiving **1 vote**, suggesting areas for potential further exploration or emphasis.

Figure 9. Most Popular Strategies to Attract Young People and Upskill the Current Workforce




**Personalized Answers:**

Four respondents opted to provide more personal insights into addressing the aging workforce and skill shortages:

1. Highlighting the need to **improve job attractiveness** through positive communication and revalorization of salaries.
2. Emphasizing the importance of **addressing the specific needs of women** in the student population and workforce, including training, inclusion, and combating greenwashing.
3. Advocating for **revalorizing wages and working conditions** to make the sector more appealing.
4. Suggesting an **improvement in the image of the agri-food sector** to counter perceptions of it being outdated and disconnected from modern realities.

These responses collectively underscore the importance of a diverse approach in making the agri-food sector more attractive to young talent and ensuring the current workforce is well-equipped for the challenges ahead. The personal answers add depth to the discussion, offering distinct perspectives on enhancing sector appeal and inclusivity.

## Question 2.7: Challenges in Continuous Vocational Education and Training (CVET) : Highlight the main challenges CVET faces in upskilling and reskilling the agri-food workforce

Question 2.7 delves into the main challenges faced by Continuous Vocational Education and Training (CVET) in upskilling and reskilling the agri-food workforce. Participants were asked to choose the most pressing challenge from a list of pre-programmed options, highlighting key areas for improvement:

- **Customizing Training to Local or Regional Needs**: Stands out as the most selected challenge, with 17 participants identifying the need for training programs to be adaptable to the specific demands of different locales within the agri-food sector.

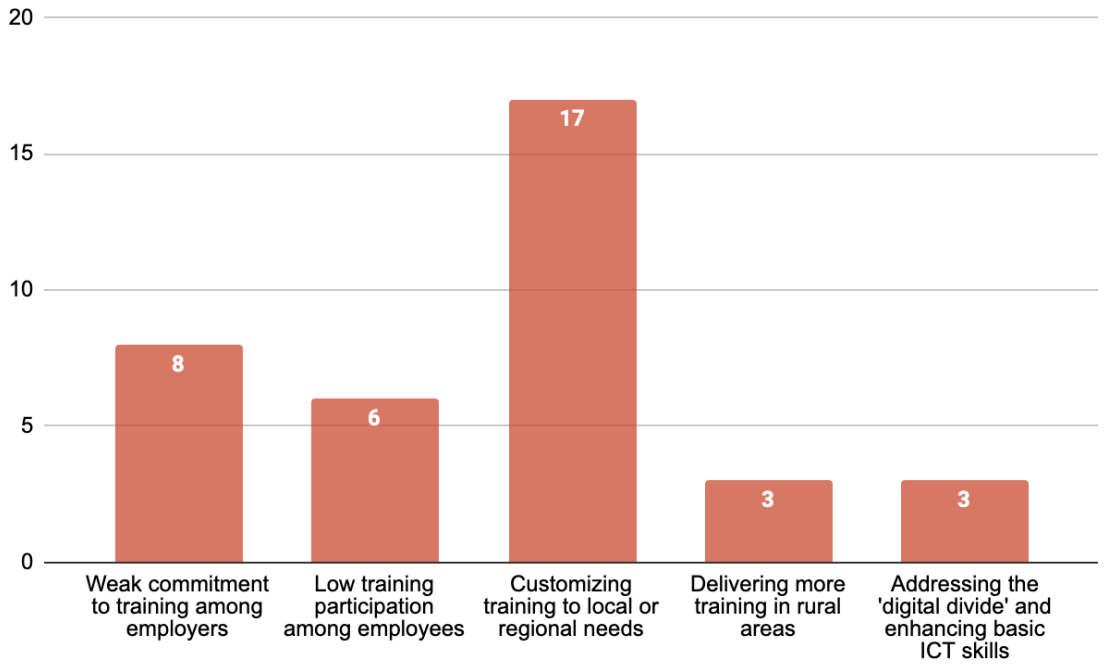
- **Weak Commitment to Training Among Employers**: This challenge, chosen by 8 participants, suggests a gap in the support and prioritization of continuous training from the employer's side.

- **Low Training Participation Among Employees**: Noted by 6 participants, this indicates difficulties in motivating employees to engage in ongoing education and training efforts.

- **Delivering More Training in Rural Areas & Addressing the 'Digital Divide' and Enhancing Basic ICT Skills**: Each highlighted by 3 participants, these challenges point to geographic and technological barriers that limit access to CVET.

The selection of these challenges underscores the complexity of effectively implementing CVET in the agri-food sector, particularly emphasizing the necessity for more flexible and accessible training solutions that can meet local and regional needs. Additionally, the issues of engagement from both employers and employees, along with the infrastructural and digital gaps, are critical areas that require attention to enhance the overall impact of CVET initiatives.

Figure 10.. Main challenges faced by CVET in Upskilling and Reskilling the Agri-food Workforce




## Question 2.8: Recommendations for Skills Policies : Indicate which skills policies would benefit the agri-food sector in alignment with the European Commission's Farm-to-fork strategy

In addressing recommendations for skills policies that would support the agri-food sector and align with the European Commission's Farm-to-fork strategy, participants were asked to select the policies they believe would be most beneficial:

- **Establishing a Culture of Lifelong Learning and Reskilling Opportunities:** Clearly emerges as the predominant choice, with 28 selections, highlighting the critical need for continuous learning and adaptability within the sector.

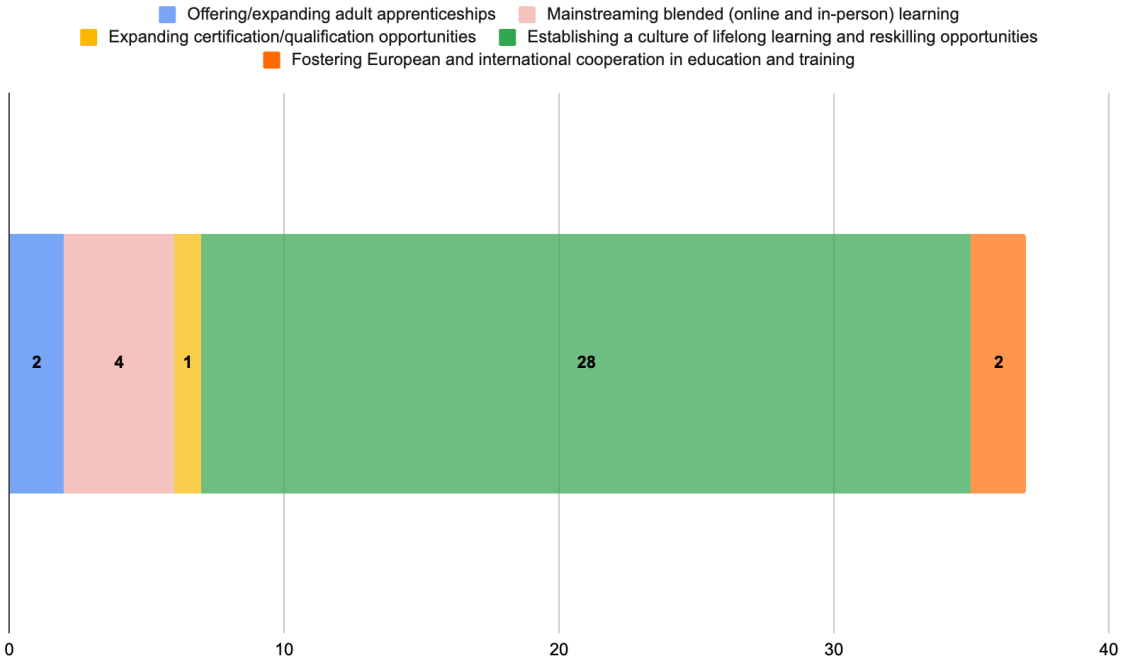
- **Mainstreaming Blended (Online and In-Person) Learning:** Chosen by 4 participants, this policy emphasizes the importance of flexible learning modes that can accommodate various learning preferences and situations.

- **Offering/Expanding Adult Apprenticeships & Fostering European and International Cooperation in Education and Training:** Each received 2 votes, indicating a recognition of the value of practical learning experiences and collaborative efforts across borders in enhancing agri-food education and training.

- **Expanding Certification/Qualification Opportunities:** Received 1 vote, suggesting a need for more accessible pathways to formal recognition of skills and competencies in the sector.

The overwhelming preference for establishing a culture of lifelong learning and reskilling opportunities reflects a broad consensus on the importance of ongoing development and flexibility in the workforce to meet the evolving demands of the agri-food sector.

Figure 11. Skills Policy Recommendations for the Agri-food Sector Aligned with the Farm to Fork Strategy (F2F)



## Question 2.9: Final Remarks on Skills Gap Analysis : Share any additional thoughts on the skills gap and training requirements in agri-food.

In assessing the 37 replies to qualitative question 2.9 (complete answers in Annex 2), several key thematic areas emerged, reflecting the diverse and complex challenges and opportunities within this evolving field. Respondents offered a range of insights that underline the multifaceted nature of addressing skills gaps and enhancing training frameworks to better align with industry needs and future directions.

**Most Highlighted Thematic Areas:**

- **Cultural and Perception Shift:** A notable concern is the need for a cultural and economic reevaluation of the agriculture sector. This includes overcoming stereotypes of farming as an unattractive career choice and improving the sector's image to attract young and educated individuals.

- **Bridging Theory and Practice**: The gap between theoretical training and practical application was highlighted, emphasizing the importance of hands-on, field-based learning to better prepare individuals for the realities of the sector.

- **Enhancing Industry Attractiveness:** Several responses focused on making the sector more appealing to younger generations through better communication, salary revalorization, and improving working conditions. Addressing gender inclusivity and combating greenwashing were also mentioned as strategies to enhance the sector's appeal.

- **Flexibility in Training and Support:** The need for more adaptable training programs and financial support mechanisms was identified, particularly to facilitate training in rural areas and for SMEs.

- **Comprehensive Skill Development:** Emphasizing the integration of digital and soft skills alongside technical agricultural knowledge to meet the demands of modern agriculture. This includes fostering a culture of lifelong learning and resilience among professionals in the sector.

- **Stakeholder Collaboration**: The importance of collaboration among educational institutions, industry bodies, and government agencies in developing relevant training programs and policies.

- **Sustainable and Technological Advances:** Training programs need to incorporate sustainable farming practices and eco-friendly technologies, alongside digital literacy and proficiency in advanced technologies like AI, GIS, and remote sensing, to prepare the workforce for green and digital transitions.

The responses collectively call for a holistic approach to training and education in the agri-food sector, one that addresses current deficiencies while anticipating future demands. By fostering a more attractive, inclusive, and adaptive training ecosystem, the sector can better equip its workforce to navigate the challenges and opportunities of sustainable and technologically driven agriculture.

# PART 3: BEST PRACTICES IN THE AGRI-FOOD SECTOR FOR SMART AND SUSTAINABLE FARMING

As we advance into Part 3 of our questionnaire analysis, our focus shifts to identifying and gathering insights into the most effective practices, methodologies, tools, and technologies currently deployed within the agri-food sector. This crucial phase of our study is instrumental in contributing to the AF4F project's overarching goal of mapping out exemplary practices within the Vocational Education and Training (VET) ecosystem that bolster smart and sustainable farming.

By soliciting detailed input on the innovative approaches and solutions being utilized across the sector, this section aims to highlight initiatives and strategies that have demonstrated success in addressing the challenges of modern agriculture. Our exploration is guided by the project's four core pillars: Digital Transition, Green Transition, Resilience & Sustainable Food Systems, and Business Sustainability, ensuring a comprehensive understanding of practices that support these fundamental areas of focus.

This section is designed not only to compile a repository of best practices but also to analyze their impact and applicability within the broader context of the agri-food sector's advancement towards sustainability and technological innovation.

## Question 3.1: Effective Teaching Methods : For each of the following areas, please list the top three teaching methods or didactical content (e.g., project-based learning, field trips, gamified tools) that you have found most effective:

**a) Digital skills in agriculture;**

**b) Climate and energy-related skills in agriculture;**

**c) Sustainable and holistic management practices skills in agriculture**

**d) Entrepreneurial, financial & business management, and circular-economy related skills in agriculture**

Upon reviewing the responses to Question 3.1 regarding effective teaching methods in agriculture, it is clear that despite the question not being as straightforward as intended, **respondents displayed distinct individual preferences for teaching methods across the specified areas**: digital skills, climate and energy-related skills, sustainable practices, and entrepreneurial skills in agriculture. This diversity reflects the varied nature of the agri-food sector's educational needs and highlights the importance of a multifaceted approach to teaching and learning. As part of a comprehensive questionnaire, these insights contribute to a broader understanding of educational strategies within the sector rather than serving as a definitive conclusion.

**Consolidated Analysis:**

- **Digital Skills in Agriculture:** Blended Learning Approach incorporating e-learning tools like MOOCs, gamification, and VR simulations, alongside traditional problem-based learning, offers a dynamic and interactive educational experience tailored to digital literacy.

- **Climate and Energy-Related Skills in Agriculture:** Practical Field Exercises and Module-Based Learning focus on hands-on climate-smart farming and adaptation strategies, emphasizing the importance of direct engagement with sustainable practices.

- **Sustainable and Holistic Management Practices in Agriculture:** Preferences for Field Trips and Project-Based Learning suggest a strong inclination towards experiential learning, complemented by serious games and workshops for deeper understanding of sustainable agriculture.

- **Entrepreneurial, Financial & Business Management, and Circular-Economy Related Skills in Agriculture:** A Learner-Centered Approach, featuring team working, project work, and international mobility, prepares students for the global challenges of agricultural entrepreneurship and sustainability.

These responses, while revealing individual preferences, collectively emphasize the sector's evolving educational strategies toward more hands-on, interactive, and collaborative learning environments. This analysis, as part of our questionnaire, aids in painting a comprehensive picture of current and emerging teaching methodologies in the agri-food sector, pointing towards innovative, learner-centered education that equips students for both present and future challenges in agriculture.

## Question 3.2 : Tools & Technologies for Transition (Digital) Name a tool or technology crucial for the Digital Transition in agri-food and its impact.

Reviewing the solicited input on the most relevant tool or technology crucial for the Digital Transition in agri-food, it becomes evident that respondents provided a diverse array of answers, reflecting their varied perceptions and experiences. Despite this diversity, a consolidated analysis of these responses reveals a significant focus on the following key trends:

- **Precision Agriculture Technologies** like GPS, sensors, and drones, which underscore the sector's move towards more accurate and efficient farming practices;
- **Artificial Intelligence (AI) and Data Management Tools** emerge as critical for analyzing vast amounts of agricultural data, facilitating smarter farming decisions and operations;
- **The importance of Internet of Things (IoT) and Blockchain** highlights a growing inclination towards interconnected devices and secure, transparent supply chains.

Together, these trends reflect a strategic consensus on the pivotal role of technology in driving sustainable, efficient, and data-driven agriculture, pointing towards a future where digital innovation is integral to the sector's growth and resilience.

Below is a table summarizing the key technologies and tools highlighted by the respondents. The full responses from all 37 respondents can be found in Annex 3.

Table 3. Key Technologies For Digital Transition In Agri-food

| Respondent Number | Crucial Tool or Technology | Impact |
|---|---|---|
| 4 | Implements and tractors based data collection systems | Enhances precision and efficiency in farming operations. |
| 5 | Global Navigation Satellite System (GNSS) | Facilitates accurate positioning for precision agriculture. |
| 7 | Digitization Strategy (Spain) | Provides a strategic framework for digital transformation. |
| 8 | Sensors for monitoring parameters | Enables precise monitoring and management of agricultural conditions. |
| 9 | Sensors with irrigation recommendations | Improves water management through precise irrigation. |

| | | |
|---|---|---|
| 10 | IoT, Blockchain, AI, Cloud Computing, Big Data Analytics | Drives interconnected operations, secure data exchange, and intelligent decision-making. |
| 11 | Hyperspectral imaging | Allows detailed observation of crops for better management. |
| 13 | Digital dashboarding | Offers real-time data visualization for improved decision-making. |
| 14 | Artificial Intelligence (AI) | Analyzes large datasets to enhance farming practices. |
| 15 | Farm management information systems | Integrates various data sources for comprehensive farm management. |
| 19 | AI combined with smart farming | Optimizes agricultural processes through intelligent automation. |
| 20 | Nanotechnology | Innovates at the molecular level for agri-food applications. |
| 21 | Precision farming | Employs various technologies for enhanced crop management and productivity. |
| 23 | Integrated Precision Irrigation System | Automates irrigation management, merging IT with agricultural practice. |
| 24 | MesParcelles (traceability solution) | Ensures regulatory compliance and manages farming practices. |
| 33 | Precision Farming Technologies: GPS, sensors, drones, data analytics | Collects and analyzes data for precision agriculture practices. |

## Question 3.3 : Tools & Technologies for Transition (Green) Share one methodology or tool you've seen that promotes the Green Transition, especially in reducing environmental impact

Reviewing the respondents' contributions to Question 3.3 on tools and methodologies for promoting the Green Transition in agriculture, a dual pattern emerges: a broad spectrum of tools and methodologies aimed at reducing environmental impact is identified, alongside convergent approaches for their integration within the sector. This dynamic is encapsulated in the following key trends:

- **Life Cycle Assessment (LCA)** is notably mentioned as a critical tool for evaluating the environmental impact of agricultural practices from cradle to grave, indicating a

strategic approach to understanding and mitigating environmental footprints.

- **Renewable Energy Investments and Carbon Management Strategies,** such as integrating solar panels in agriculture and carbon farming, highlight the sector's move towards renewable resources and carbon mitigation efforts.

- **Biocontrol Agents and Agroecological Practices** are identified for their role in promoting sustainable pest management and farming practices that harmonize with natural processes, reducing chemical inputs.

- **Innovative Technologies and Methodologies like vertical farming, smart packaging to decrease food waste,** and automated mechanical weeding with sensing systems demonstrate the sector's inclination towards technologies that optimize resource use and minimize environmental impact.

The table below captures a selection of the diverse methodologies and tools identified by respondents as pivotal for facilitating the Green Transition in agri-food. Each entry not only underscores the sector's innovative approaches towards sustainability but also highlights the strategic initiatives undertaken to minimize environmental impacts through advanced practices and technologies. The full responses from all 37 respondents can be found in Annex 4.

Table 4. Key Technologies for Green Transition in Agri-food

| Respondent Number | Tool or Methodology | Impact |
|---|---|---|
| **2** | Carbon credit | Encourages emission reduction by enabling carbon offsetting and trading. |
| **4** | Manure treatment | Reduces pollution and recycles waste in livestock farming. |
| **5** | Serious Game on climate change | Educates on climate impact through interactive learning. |
| **8** | Solar PV panels in agriculture | Integrates renewable energy into farming operations. |
| **10** | Vertical farming and "simapro" for LCA | Promotes efficient land use and assesses environmental impact. |
| **11** | Biocontrol agents | Offers sustainable alternatives to chemical pest control. |
| **13** | Extensive farming with a viable business model | Encourages less resource-intensive agriculture. |
| **14** | Fresque du Climat | Provides comprehensive understanding of climate change issues. |

| | | |
|---|---|---|
| **19** | Carbon farming | Focuses on sequestering carbon within agricultural lands. |
| **20** | Smart packaging | Aims to reduce food waste through innovative packaging solutions. |
| **22** | Life Cycle Assessment (LCA) | Assesses the environmental footprint of farming practices. |
| **24** | CAP'2ER® for ruminant farming | Evaluates and reduces the environmental impact of ruminant livestock. |
| **27** | Composting | Enhances soil health and reduces waste through organic recycling. |
| **33** | Agroecological practices | Promotes biodiversity and sustainable farming ecosystems. |
| **35** | Multicriteria environmental impact assessment tools | Evaluates farming practices on multiple environmental parameters. |

## Question 3.4 : Challenges in Implementing New Practices: For each of the following categories, please briefly describe a key challenge or barrier your institution/organization has encountered when implementing new strategies or technologies:

The responses to Question 3.4 unveil distinct patterns of challenges faced by respondents, highlighting issues such as technological adoption difficulties, economic viability concerns, cultural resistance to change, and constraints in educational resources across the four pillars of the AF4F project. The table below categorizes these key challenges by project pillar, offering a detailed overview of the obstacles encountered in advancing towards a more sustainable, resilient, technologically adept, and business-driven agri-food sector.

| Pillar | Challenges |
|---|---|
| **Digital Transition** | • Gaining interest among agricultural entrepreneurs is key.<br>• Overcoming basic digital skill gaps, like PC use and programming.<br>• Effective teaching resources are lacking.<br>• Fear of surveillance by the administration.<br>• There's a need for updated skills and greater technical expertise.<br>• Resistance to change due to conservative attitudes or lack of digital skills. |

| | |
|---|---|
| **Green Transition** | • Economic advantages must be identified to promote green transitions, even in urban environments or among varied supplier readiness levels.<br>• Confidence in technical results<br>• Overcoming resistance to change<br>• Navigating legislation changes<br>• Ensuring viable business models. |
| **Resilient & Sustainable Food Systems** | • Conveying a holistic vision of the agri-food system<br>• Integrating new techniques<br>• Combating misinformation and defensive attitudes among farmers.<br>• Addressing complex system transparency<br>• Developing strategies for minimal soil disturbance, cover crops, and crop rotation. |
| **Business Sustainability** | • Learning to utilize European funds effectively<br>• Managing market uncertainties.<br>• Conflicting priorities<br>• High costs associated with sustainability practices pose challenge<br>• Adapting curricula and teaching activities to the diverse needs of the sector.<br>• Cultural barriers related to risk aversion.<br>• Rapid changes in the economic and social environment . |

## Question 3.5 : VET/CVET's Role in STEM and Digital Training: In your opinion, what role should VET (Vocational Education and Training) / CVET (Continuing Vocational Education and Training) play in promoting STEM education and digital training within the agri-food sector?

Based on the responses to Question 3.5 regarding VET/CVET's role in promoting STEM education and digital training within the agri-food sector, several key trends can be identified:

- **Bridging the Gap Between Theory and Practice:** Many respondents emphasized the importance of VET/CVET in connecting theoretical knowledge with practical applications, particularly in **adopting new technologies and integrating them into the agri-food sector**. This involves **using real-life examples, case studies, and hands-on training** to make learning more relevant and applicable.

- **Lifelong Learning and Adaptability:** Another significant trend is the focus on lifelong learning and adaptability. Respondents suggest that VET/CVET should equip individuals with the skills to continuously update their knowledge and adapt to new technologies and changes within the sector. This includes fostering a culture of innovation and entrepreneurship.

- **Collaboration with Industry:** There is a clear consensus on the need for VET/CVET programs to **collaborate closely with industry players**. This collaboration can ensure that the training remains up-to-date and relevant, addressing the actual needs of the agri-food sector and its workforce.

- **Promoting Digital Literacy:** Digital literacy is identified as a critical area of focus. Respondents believe that VET/CVET should play a pivotal role in promoting STEM education and digital training, **preparing the workforce for the digital transformation** of the agri-food sector.

- **Addressing Skill Gaps:** Lastly, the responses highlight the role of VET/CVET in identifying and addressing skill gaps within the sector, particularly in relation to new technologies and sustainable practices. This involves developing curricula that integrate STEM disciplines with agricultural educatio**n** and emphasizing the importance of **skills in precision agriculture, sensor technology, data analytics, and sustainable farming practices**.

These trends underscore the multifaceted role that VET/CVET can play in enhancing STEM education and digital training within the agri-food sector, from providing foundational knowledge and skills to fostering a continuous learning mindset and ensuring the workforce is equipped to meet the challenges of the future.

## Question 3.6 : Collaborative Potential in Agri-Food Industry: Could you elaborate on the importance of collaboration within the agri-food industry, especially in light of its interconnected value chains?

Based on the responses to Question 2.6 regarding the importance of collaboration within the agri-food industry, several core themes emerge, reflecting the sector's recognition of the interconnected nature of its value chains and the benefits of collaborative efforts:

- **Enhancing Efficiency and Innovation:** Respondents highlight collaboration as key to sharing skills, good practices, and new technologies across the agri-food value chain. This exchange not only reduces the costs associated with the design and testing of new practices but also fosters innovation and productivity improvements.

- **Addressing Systemic Challenges:** The need for collaborative efforts to tackle broad systemic challenges, such as climate change, market fluctuations, and the implementation of sustainable practices, is emphasized. Collaboration among different

stakeholders—ranging from farmers to financial institutions—ensures a comprehensive approach to solving these issues.

- **Improving Training and Education:** The role of collaboration in enhancing VET/CVET programs by closely aligning them with industry needs is highlighted. Partnerships between educational institutions and industry can lead to the development of tailored training programs that equip the workforce with relevant skills and knowledge.

- **Facilitating Market Access and Sustainability:** Collaboration is seen as crucial for providing market access, particularly for smaller players, and for advancing sustainability and environmental stewardship within the industry. By working together, stakeholders can achieve a more sustainable, competitive, and resilient agri-food sector.

Table 5. Key Themes on Collaborative Potential in Agri-Food Industry

| Theme | Key Points |
|---|---|
| **Enhancing Efficiency and Innovation** | Sharing skills, good practices, and new technologies; fostering innovation and productivity. |
| **Addressing Systemic Challenges** | Collaborative efforts to tackle climate change, market fluctuations, and sustainable practices. |
| **Improving Training and Education** | Aligning VET/CVET programs with industry needs through partnerships between educational institutions and industry. |
| **Facilitating Market Access and Sustainability** | Providing market access for smaller players and advancing sustainability and environmental stewardship within the industry. |

These responses underscore the critical role of collaboration in promoting a more integrated, efficient, and sustainable value chain within the agri-food industry. By fostering partnerships and cooperative efforts, the sector can address its challenges more effectively and ensure its long-term viability and success.

## Question 3.7 : Unmentioned Practices or Methodologies: Are there any specific practices or methodologies not previously mentioned in this questionnaire that you believe significantly contribute to the agri-food sector, aligning with the AGRIFOOD4EUROPE project's objectives?

Based on the responses to Question 3.7 about specific practices or methodologies that significantly contribute to the agri-food sector and align with the AF4F project's objectives, it is clear that while many respondents did not specify new practices beyond those already discussed, a few highlighted areas worth noting:

- **Effective Communication and Consumer Engagement:** The importance of conveying to the public that **food is a primary good deserving of protection and respect** is emphasized. Additionally, engaging consumers and educating them on sustainable practices and the value of food can drive demand for sustainable products and practices.

- **Participatory Activities and Empowerment:** Some responses point to the benefits of participatory activities, such as **cross-observation, co-development workshops, and participatory learning methodologies**, in empowering stakeholders throughout the supply chain and enhancing information sharing and innovation.

- **Innovative Networks and Experimental Farms:** Mention of **networks like F@rm XP, which focus on anticipation, transmission, and innovation through experimental farming**, illustrates the sector's effort to tackle industry challenges through practical, on-the-ground research and development.

- **Policy Advocacy and Subsidies Based on Ecosystem Services:** A few responses suggest that agricultural policies, including subsidies and taxes, should be aligned with ecosystem services and carbon management, underscoring the **need for policy reforms that support sustainable practices**.

- **Ethical Considerations in Training:** Ethical considerations, especially concerning animal welfare in educational settings, are becoming increasingly important. The transition to alternative teaching methods, such as the use of videos instead of real animal organs in practical exercises, highlights **evolving ethical standards in agri-food education**.

# PART 4: TOWS ANALYSIS (THREATS, OPPORTUNITIES, WEAKNESSES, STRENGTHS)

This progression into Part 4 stands on the insights gathered from earlier sections, where we established a detailed understanding of the respondent profiles, their roles within the agri-food sector, and the current skills landscape. Now, by focusing on SWOT/TOWS analysis, we aim to draw connections between the previously identified skills gaps and the strategic approaches needed to address them, thereby paving the way for actionable strategies that align with the overarching goals of the AF4F project.

A **TOWS analysis** expands upon the traditional SWOT framework by not only identifying strengths, weaknesses, opportunities, and threats but also by systematically examining how these elements can be strategically aligned. Specifically, **it explores how strengths can be used to seize opportunities and counteract threats, how weaknesses can be addressed to mitigate threats, and how opportunities can be leveraged to overcome weaknesses**.

This methodical approach helps in creating robust strategies that enhance the institution's ability to support smart and sustainable farming education effectively. By integrating the TOWS insights with the foundational data collected, this section is instrumental in formulating comprehensive recommendations that will guide stakeholders in making informed decisions for the advancement of the agri-food sector.

## Question 4.1 : Threats/ Challenges - Describe the main external challenges that might impact your program's success. Also, touch upon any broader trends in the agri-food and VET sector that could influence your institution in the future.

In response to Question 4.1, we analyzed the perspectives of the surveyed stakeholders to understand the primary external challenges and broader trends within the agri-food and VET sectors.

Thus, this question sought insights on factors that could potentially impact the success of the stakeholders programs and influence future directions.

Drawing from the contributions of 37 respondents, **our analysis has categorized these insights into five main segments of challenges**. This approach offers a comprehensive view of the hurdles faced, aligning with the AGRIFOOD4EUROPE project's mission to enhance smart and sustainable farming education.

**Main Segments of Challenges:**

- **Funding and Resource Limitations:** Responses highlight concerns over reduced training funds and the challenges posed by increased farm sizes, which strain employee availability. A recurring theme is the reliance on temporary subsidies, which hampers long-term strategic planning.

- **Technological and Skills Gap:** Stakeholders identified a significant digital skills gap and a conservative mindset among professionals as barriers to adopting new technologies. This gap underscores the need for programs that not only bridge these divides but also foster a culture of continuous learning and adaptability.

- **Regulatory and Policy Challenges:** The dynamic nature of agricultural regulations and the impact of broader economic and political changes were noted as key challenges. Respondents pointed out the difficulty of adapting to constantly evolving policies, which could influence institutional strategies and program success.

- **Social and Cultural Factors:** The perception of farming as a non-intellectual activity with a negative environmental impact, coupled with the sector's lack of attractiveness, poses significant challenges in drawing new students and attendees to the agri-food sector.

- **Environmental and Climate Concerns:** The need to adapt farming systems to climate change and the critical importance of soil health were highlighted. Additionally, the impact of high production costs on consumer consumption emphasizes the sector's role in addressing environmental sustainability.

**Broader Trends Influencing the Future:**

- The increasing importance of **sustainability and climate resilience** in agricultural practices;
- The growing **integration of digital technologies** in farming;
- The **shifting demographic profile** of the agricultural workforce;
- The **crucial role of innovation in** addressing **global food security** challenges;
- The **potential impact of global events** and crises on sectoral stability.

The above summary highlights the diversity and complexity of challenges and trends faced by institutions and organizations within the agri-food and VET sectors. These challenges underscore the importance of a strategic and collaborative approach in addressing the obstacles to success in agri-food education and training programs. By understanding and categorizing these challenges, the AF4F project can better tailor its recommendations and

strategies to meet the specific needs and overcome the hurdles identified by the respondents. The full answers can be found in Annex 5.

## Question 4.2 : Opportunities - List the primary external opportunities you foresee. Consider factors like technological trends, government policies, or potential collaborations that could benefit your institution.

In response to Question 4.2 of the AF4F survey, participants were asked to identify primary external opportunities that could positively influence their programs and institutions within the agri-food sector. The contributions from the 37 respondents have been analyzed to distill the key opportunities that resonate across the board, showcasing a dynamic interplay of technology, policy support, societal trends, and collaborative potential that could shape the future of agri-food education and training.

**Main Opportunities Identified:**

- **Technological Innovation and Digitalization:** The emergence of digital technologies like artificial intelligence (AI) and precision agriculture is revolutionizing agricultural practices and education. These innovations facilitate more efficient educational content delivery and promote innovative business models in the agri-food sector, enhancing both productivity and learning.

- **Government Policies and Support:** Government policies and initiatives, like the EU's Green Deal, are pivotal in promoting sustainable agriculture and integrating these practices into education. These policies, alongside financial incentives for technology adoption and sustainability, play a crucial role in driving growth within the agri-food sector..

- **International Collaboration and Partnerships:** Enhancing collaborations and partnerships between educational institutions, industry, and research entities broadens the educational scope, making VET/CVET programs more globally relevant and impactful. Such collaborations can bring fresh perspectives and innovations into the curriculum..

- **Positive Societal and Market Trends:** The increasing societal emphasis on sustainability in food production aligns with educational goals, reflecting a market trend towards environmentally responsible practices. This societal shift towards sustainability,

coupled with the sector's technological advancements, shapes the demand for relevant education and training.

- **Employment Opportunities and Sector Attractiveness:** The agri-food sector offers significant employment opportunities, highlighting its importance in environmental sustainability and making it an attractive field for new talent. This potential for job creation underscores the sector's appeal to students and professionals alike..

- **Interdisciplinary and Innovative Approaches:** Adopting interdisciplinary approaches and focusing on social challenges can significantly reduce knowledge gaps, fostering a holistic understanding of sustainability in agriculture. This comprehensive approach encourages innovation and prepares students for the complexities of the agri-food sector.

**Broader Trends/ Policies/ Collaborations Influencing the Future:**

- Emphasis on the **diversity of opportunities and overarching trends** shaping the agri-food sector's trajectory;
- Importance of **technological trends**, **supportive government policies**, and an increasing emphasis on **sustainability and digital literacy**;
- The **critical role of collaborations within the sector** and with external partners to enhance VET/CVET program quality and relevance;
- **Alignment with broader objectives** to foster innovation and sustainability in agriculture.

By aligning educational programs with identified external opportunities, the AF4F project can enhance institutional capacities for advancing smart and sustainable farming education. This approach not only ensures the agri-food sector's continued leadership in innovation and resilience but also sets the stage for further analysis in our questionnaire, aiming to comprehensively address the sector's evolving needs. The full answers can be found in Annex 6.

## Question 4.3 : Weaknesses : What are the main gaps or improvement areas in your institution's approach? Mention any critical resources or support you believe is missing.

In focusing on the specific context of the agri-food sector, the 37 participants pinpointed key areas for improvement within their institutions, as well as critical resources or support they found to be lacking. This analysis of responses highlights common themes and specific improvement needs, revealing internal challenges that could impact the effectiveness and success of their programs.

**Main Weaknesses/ Gaps or Improvement Areas in Your Institution's Approach:**

The analysis of responses unveils several key areas where institutions believe improvements are crucial. These encompass a broad spectrum of internal challenges, including:

- **Professional Expertise and Teacher Preparedness:** Many institutions face difficulties in finding qualified professionals to teach, pointing to a need for enhanced professional development and better alignment of teaching content with current industry standards.

- **Managerial and Language Barriers:** Challenges such as competition with other sectors for workforce and a lack of managerial skills among farmer-employers are highlighted. Furthermore, the necessity of adopting language and communication strategies that resonate more effectively with the target audience, particularly farmers, is emphasized.

- **External Collaboration and Policy Support:** The responses underline a significant gap in technical expertise related to food production and processing, suggesting a greater need for collaboration with external professionals and universities. Political and economic support to facilitate transitions within farming systems is also deemed critical.

- **Technological and Systemic Limitations:** Access to and the adoption of advanced technologies, as well as integrating these into educational programs, are identified as areas needing attention. Respondents call for more agile decision-making processes to keep pace with technological advancements.

**Critical Resources or Support Believed to be Missing:**

- Need for enhancing the agri-food sector's **attractiveness to younger generations** and **correcting misconceptions** about farming and agriculture.
- **Importance of bureaucratic agility**, **competitive retail strategies**, and **adaptive policy approaches;** emphasizing **collaboration between academia and the business sector** for effective bridging.
- Concerns over the **scarcity of human resources and funding**; highlighting the challenge of mobilizing teachers for contemporary issues and adapting to students' evolving perspectives.

By distinguishing between these internal gaps and the external resources needed to overcome them, this analysis aims to provide a clear roadmap for enhancing the capacity of institutions in the agri-food sector. Addressing these challenges through targeted strategies and support mechanisms can pave the way for more effective and responsive educational programs, ultimately contributing to the sector's growth and sustainability. The full answers can be found in Annex 7.

## Question 4.4 : Strengths : Summarize the primary strengths of your institution or program in smart and sustainable farming education. If possible, mention any significant success or milestone.

For the analysis of Question 4.4 on strengths in smart and sustainable farming education, based on the contributions of the 37 respondents, it is clear that diverse strengths across various institutions contribute significantly to the sector's growth and innovation. These strengths are foundational in driving smart and sustainable farming education forward, showcasing a diverse expertise, innovation, and collaboration that contributes to the sector's resilience and adaptability.

**Main Strengths Identified:**

- **Industry Connections and Reputation:** Many institutions boast **strong connections with the food industry and agriculture sectors**, alongside well-established reputations for quality and engagement in sustainable farming practices. This includes significant achievements in **innovation groups and projects** that demonstrate their commitment and impact in the field.

- **Educational Quality and Innovation:** Respondents highlighted their **competent, experienced trainers, and adapted teaching methods** as key strengths. Several institutions have successfully integrated **smart agriculture** into their programs, reflecting a close link to research and development centers that further enrich the learning experience.

- **Technological and Research Capabilities:** The **adoption of technology and a strong focus on research** were frequently mentioned. This includes the ability to address renewable technologies knowledge gaps and leverage research capabilities for awareness campaigns, funding acquisition, and action-oriented projects.

- **Collaboration and Network:** The **emphasis on collaboration,** whether through partnerships with **technology providers**, **research entities**, or within the agri-food

value chain, underscores the sector's collaborative strength. These partnerships enhance educational offerings and ensure that programs remain relevant and impactful.

- **Recognition and Specialization:** Several responses highlighted **specific programs and projects as milestones of success**, underscoring the institutions' roles in fostering new educational pathways and addressing the evolving needs of the agri-food sector.

**Critical Enablers for Future Success:**

- Emphasizing the **development of digital and sustainable agriculture skills** in curricula.
- Enhancing **partnerships** between educational institutions, industry, and research entities to foster innovation.
- Addressing the need for professional development to **align teaching content with industry standards**.
- Leveraging **strong industry connections and research capabilities** to innovate and adapt to emerging trends.

The detailed responses from all 37 respondents can be found in Annex 8, offering a comprehensive view of the strengths that underpin the agri-food sector's educational efforts. This analysis not only celebrates the achievements and capabilities within the sector but also sets the stage for leveraging these strengths in addressing the challenges and opportunities outlined in the AF4F project's broader objectives.

# PART 5 - TOWS: BRIDGING ANALYSIS WITH ACTIONABLE INSIGHTS

This section acts as a crucial bridge, transitioning from the analysis of the contributions of diversified 37 Agri-food Experts and Key Opinion Leaders, provided in Part 4, to the strategic and actionable solutions that will be developed in Part 6.

As explained in the Methodology, we are conducting a TOWS analysis, which is an extension of the SWOT analysis framework, examining the interplay between External Opportunities (O) and Threats (T), as well as Internal Strengths (S) and Weaknesses (W). Therefore, more than a static evaluation, it aims to identify actionable strategies to:

- Reduce threats;
- Take advantage of opportunities;
- Exploit strengths;
- Remove weaknesses.

Before we proceed to Part 6, we present a visual representation of the TOWS analysis, followed by a comprehensive SWOT that stem from the respondents answers to Questions 4.1 to 4.4:

Figure 12. TOWS Matrix - Explained

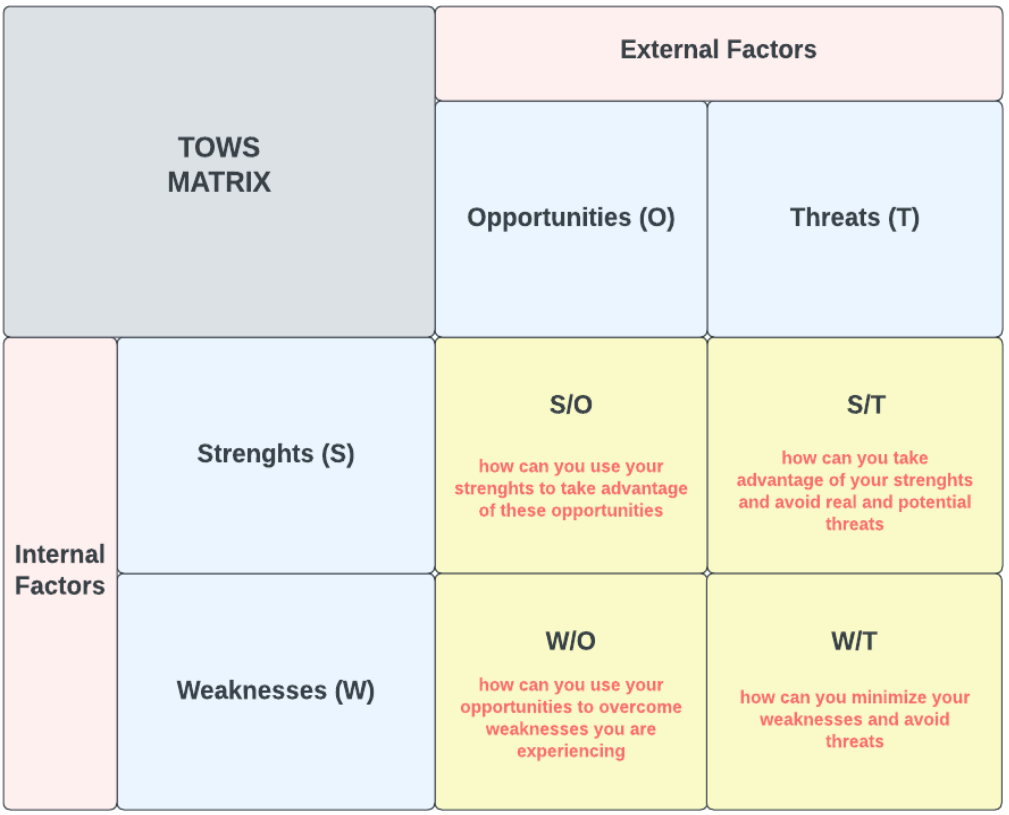


Table 12. SWOT Analysis

| STRENGTHS (internal) | WEAKNESSES (internal) |
|---|---|
| **Industry Connections and Reputation:** Institutions have strong ties with the food industry and agriculture sectors, alongside notable reputations for their engagement and impact in sustainable farming.<br><br>**Educational Quality and Innovation:** The quality of training, characterized by experienced trainers and adapted methods, stands out. Many programs successfully integrate smart agriculture, reflecting their alignment with current industry standards.<br><br>**Technological and Research Capabilities:** A focus on adopting technology and emphasizing research enables institutions to address the knowledge gap in renewable technologies and leverage capabilities for impactful projects.<br><br>**Collaboration and Network:** Collaborative efforts within the agri-food value chain highlight the sector's strength in partnership, significantly enhancing the educational impact. | **Professional Expertise and Teacher Preparedness:** A recurring challenge is the difficulty in attracting qualified professionals to teach, underlining the need for better professional development.<br><br>**Managerial and Language Barriers:** Competition with other sectors and a lack of managerial skills among farmer-employers emerge as significant barriers, alongside the need for effective communication strategies.<br><br>**External Collaboration and Policy Support:** Gaps in technical expertise and the need for political support are critical for facilitating transitions within farming systems.<br><br>**Technological and Systemic Limitations:** The adoption of advanced technologies and their integration into educational programs requires more agile decision-making. |
| **OPPORTUNITIES (external)** | **THREATS/ CHALLENGES (external)** |
| **Technological Innovation and Digitalization:** Emerging digital technologies offer new avenues for enhancing agricultural practices and education, promising innovative business models in the agri-food sector.<br><br>**Government Policies and Support:** Initiatives like the EU's Green Deal provide a solid foundation for sustainable agriculture, crucial for sector growth.<br><br>**International Collaboration and Partnerships:** Enhancing global relevance through partnerships can bring fresh innovations into the curriculum.<br><br>**Positive Societal and Market Trends:** The societal shift towards sustainability shapes the demand for relevant education, reflecting a trend towards environmentally responsible practices. | **Funding and Resource Limitations:** Financial uncertainties and reliance on temporary subsidies highlight the need for sustainable financial planning.<br><br>**Regulatory and Policy Challenges:** Adapting to a rapidly evolving regulatory environment poses significant challenges for institutional strategies.<br><br>**Environmental and Climate Concerns:** The urgency to adapt farming systems to climate change underscores the need for integrating sustainable practices.<br><br>**Socio-cultural Perception and Attractiveness:** Public perceptions that view farming as non-intellectual and environmentally harmful, along with a general lack of attractiveness, hinder the sector's ability to draw in new talent and professionals. |

# PART 6: FUTURE STRATEGIES AND SOLUTIONS

Transitioning to Part 6: Future Strategies and Solutions, we proceed with the final stage of our questionnaire analysis. This segment is pivotal, as it translates the collective insights from the SWOT analysis into strategic actions and solutions for the agri-food sector's challenges. It emphasizes the creation of practical and strategic responses to the opportunities and threats identified, leveraging the sector's strengths and addressing its weaknesses.

This phase utilizes the comprehensive feedback from agri-food experts and key opinion leaders to finalize our TOWS analysis. It is here that we synthesize the information into strategic initiatives aimed at advancing Vocational Education and Training (VET) in smart and sustainable farming. By meticulously examining the suggestions from respondents, we are not just reviewing findings but actively seeking to propose actionable strategies that emerge from the foundational SWOT analysis.

Part 6 is instrumental in developing recommendations that highlight the critical role of targeted education and training in propelling the agri-food sector towards a future marked by sustainability, efficiency, and resilience. Through this strategic lens, we aim to forge a path that not only addresses current needs but also positions the sector to successfully navigate future challenges.

## Question 6.1 : Mitigating Threats/ Addressing Challenges - What key strategy or initiative would you propose to counteract potential external threats/challenges to your program? (S/T)

For Question 6.1, we delve into the strategies and initiatives proposed by respondents to mitigate external threats and challenges facing their programs in the agri-food sector. The diversity of responses showcases a wide range of strategic approaches to enhance resilience against external factors that may impede program success.

**Strategic Approaches to Mitigate Threats:**

- **Innovative Teaching Methods:** Several respondents emphasize the need for innovative, informal, and practical teaching methods, including laboratory-based instruction, to make learning more engaging and relevant.

- **Community Engagement:** Building trust within the community through more physical training events and European Digital Hubs is seen as vital. This approach aims to strengthen community bonds and foster a supportive learning environment.

- **Adaptation and Awareness:** Keeping abreast of changing policies and market conditions through continuous environmental scanning and closer contacts with policymakers is highlighted as crucial for staying ahead of potential regulatory changes and market shifts.

- **Skill Development:** A significant focus is placed on developing courses tailored to the specific needs of learners, particularly in addressing the digital skills gap. Advertising these courses across various platforms is considered essential for reaching a wider audience.

- **Strengthening Collaboration:** The development of a dynamic, adaptive ecosystem for CVET programs, based on multi-stakeholder collaboration, is advocated. This includes agile curriculum development and fostering partnerships for knowledge exchange.

- **Communication and Marketing:** Effective communication strategies to attract the right audiences and raise awareness of sensitive issues in the agri-food sector are deemed important. This involves providing factual information and marketing actions to highlight the sector's value and opportunities.

- **Supporting Transition:** Supporting the transition process and communicating the benefits achieved to consumers is seen as key. This involves being proactive in identifying opportunities with commercial and financial institutions to engage more deeply in the sector's transformation.

- **Positive Industry Representation:** Positive communication about the variety and richness of jobs in the agri-food sector is suggested to enhance the sector's attractiveness. This includes partnerships with prep schools and taking a stance in science and society debates to address misconceptions.

These strategic approaches reflect a consensus among respondents on the importance of innovative education methods, strong community and industry engagement, continuous adaptation to external changes, and effective communication. By implementing these strategies, institutions can better position themselves to counteract external threats and challenges, ensuring the resilience and sustainability of their programs in the agri-food sector.

## Question 6.2 : Leveraging Strengths & Opportunities - In a few sentences, how might your institution or program use its main strengths to capitalize on the identified opportunities? (S/O)

For Question 6.2, participants were asked to consider how their institution or program might utilize its main strengths to seize identified opportunities within the agrifood sector. The responses provide a wide array of strategies, showcasing how institutions aim to use their inherent advantages to leverage external opportunities effectively.

**Strategies for Leveraging Strengths and Opportunities:**

- **Visibility and Engagement:** Several institutions plan to use events and activities to enhance visibility around sustainability in the agrifood sector, promoting their initiatives and strengths to a broader audience.
- **Data Analysis and Scenario Creation:** Institutions are looking to analyze and collect data across related sectors to create innovative scenarios and strategies that align with emerging opportunities.

- **Close Relationships with Farmers:** Emphasizing the importance of being closer to farmers, responding to their needs promptly, and adapting organizational models to better serve the agricultural community.

- **Communication and Network Utilization:** Leveraging existing networks to reach potential students and develop relevant courses is highlighted as a key strategy. This includes identifying financing channels for continuous training and promoting science and technology acceptance in the agrifood sector.

- **Collaborative Partnerships:** Establishing collaborative partnerships with industry stakeholders to tailor CVET programs specifically to agricultural challenges, integrating cutting-edge technologies into curricula, and promoting innovation through research initiatives.

- **Digital Training Development:** Significantly develop digital training programs, leveraging expertise in agriculture to improve dissemination and accessibility of training content.

- **Innovative Program Development:** Utilizing comprehensive training frameworks and innovative program development to forge international partnerships, enhance global impact, and facilitate knowledge exchange.

- **Positive Communication Strategies:** Developing positive communication strategies to highlight the excellence of research and the meaningful impact on the agrifood sector. This involves strengthening links with the agrifood ecosystem and engaging the public through modern communication tools.

These strategies reflect a collective acknowledgment of the importance of innovative education methods, strong industry relationships, effective communication, and digital transformation. By leveraging their inherent strengths, institutions can capitalize on the myriad of opportunities present within the agrifood sector, enhancing their contribution to the sector's transition towards sustainability and digitalization. This strategic alignment between internal strengths and external opportunities underscores the sector's potential for growth, innovation, and resilience.

## Question 6.3 : Addressing Weaknesses : What is the primary action or measure you believe would directly address your institution's most significant weakness? (W/O)

To analyze this set of responses to Question 6.3, we will continue the established approach, highlighting primary actions or measures institutions believe would directly address their most significant weakness. This reflects a collective ambition to enhance the effectiveness and responsiveness of their programs in the agri-food sector.

**Direct Measures to Address Institutional Weaknesses**

- **Professional Development and Engagement:** Several institutions emphasize the importance of raising awareness among industry professionals about dedicating time to train the younger generation and finding passionate staff to address staffing challenges.

- **External Collaboration and Expertise:** Inviting external teachers or collaborators from within existing networks for subjects outside of the institution's expertise is seen as a strategy to fill knowledge gaps and bring in fresh perspectives.

- **Curriculum and Program Development:** Some responses indicate a need for continuous dialogue with funding authorities and industry partners to center farmers in their actions, reduce bureaucratic obstacles, and allow for experimental approaches to teaching and curriculum development.

- **Innovative Solutions and Policy Engagement:** Creating training programs and innovative actions, as well as making propositions to policymakers, are suggested as

ways to develop new tools and methods that directly respond to the sector's challenges.

- **Infrastructure and Technological Updates:** Addressing the need for updated training and equipment to advance technological and adult education innovations is highlighted, alongside implementing a dynamic, industry-responsive training curriculum that adapts to evolving labor market demands.

- **Governance and Operational Efficiency:** A less bureaucratic form of governance and enhancing collaboration with R&D, local authorities, and businesses are seen as crucial steps to improve operational efficiency and program relevance.

- **Human Resources Reinforcement:** The necessity to reinforce human resources, improve working conditions for teachers, and enhance institutional and societal recognition are identified as critical areas needing immediate action.

These insights from the agri-food sector's educators and professionals underscore a broad spectrum of internal weaknesses that, once addressed, can significantly enhance the quality and impact of VET programs. The suggested measures reflect a keen understanding of the complexities and evolving needs of the sector, indicating a proactive approach towards cultivating a more robust and adaptive educational ecosystem.

## Question 6.4 : Future Vision - Briefly describe how you envision the future of your institution or program in the realm of smart and sustainable farming over the next 5 years. (W/T)

Given the extensive and varied responses to Question 6.4, we aim to synthesize these visions into key themes that represent the collective aspirations and strategic directions for institutions in the realm of smart and sustainable farming over the next five years. The contributions highlight a broad spectrum of ambitions, from expanding collaborations and networks to embracing technological advancements and innovative educational approaches.

**Envisioning the Future: Strategic Directions for Smart and Sustainable Farming Education**

- **Expanding Collaborations and Networks:** Institutions aspire to build and leverage extensive collaboration networks, enabling students to gain hands-on experience with the latest technologies and sustainable practices directly in the field.

- **Embracing Technological Advancements:** A significant number of responses focus on integrating smart agriculture and precision farming into academic curricula and

vocational training programs, reflecting a commitment to keeping pace with technological evolution.

- **Fostering Innovative and Flexible Education:** The desire to develop training in various modalities and for diverse audiences underlines a shift towards more adaptable and inclusive educational models that can respond to the evolving needs of the agrifood sector.

- **Enhancing Industry and Research Integration:** Envisioned futures include strengthening the connections between education, industry, and research to facilitate the transfer of innovation, support development, and create synergies that foster sustainable agricultural practices.

- **Promoting Sustainability and Resilience:** Many institutions aim to be key players in supporting farmers and communities in transitioning to more sustainable and resilient agricultural systems, emphasizing the role of education in facilitating this shift.

- **Adapting to and Influencing Market Trends:** Institutions anticipate playing a crucial role in shaping the future of agriculture through strategic focus on topics like bioenergy, circular economy, and sustainable food production models that offer equitable value distribution along the food chain.

- **Modernizing Educational Practices:** There's a strong inclination towards modernizing training programs, moving away from traditional lecture-based methods towards more practical, project-based, and student-centered approaches that reflect the realities and challenges of modern farming.

- **Achieving Recognition as Leading VET Providers:** Aspiring to become reference points in the field of agri-food education, institutions aim to maintain close ties with national and European partners, thereby contributing to the sector's evolution at a broader level.

These insights reflect an optimistic and forward-looking stance among institutions, signaling a readiness to adapt, innovate, and lead in the transformation of the agri-food sector towards a more sustainable, efficient, and technologically advanced future. The emphasis on collaboration, innovation, and responsiveness to industry needs suggests a strategic alignment with the broader objectives of advancing smart and sustainable farming practices across Europe.

# PART 7: CONCLUDING ANALYSIS: FUTURE STRATEGIES AND SOLUTIONS FOR SMART AND SUSTAINABLE FARMING EDUCATION

The expertise of the 37 stakeholders surveyed provided a comprehensive vision for the future of vocational education and training (VET) in smart and sustainable farming. Moreover, these interviwees, - comprising a broad spectrum of roles from universities, VET providers, research organizations, and other key entities -, hold the collective capability to steer educational initiatives and technology transfer actions towards a future that aligns with the sector's evolving needs.

**The Journey Through the Questionnaire to SWOT and TOWS**

The progression from capturing a snapshot of current practices to identifying strategic pathways through SWOT and TOWS analyses underscores the critical importance of this exercise. It has illuminated internal strengths and weaknesses, alongside external opportunities and threats, guiding respondents to reflect on actionable strategies for advancing VET and Higher Education in the agri-food sector. This reflective process has paved the way for delineating actionable insights that can effectively respond to both present challenges and future possibilities.

**From SWOT Insights to Actionable Strategies**

The SWOT analysis provided a foundational understanding, highlighting the sector's robust connections with industry, innovative educational practices, and technological prowess. However, it also shed light on areas needing attention, such as the need for professional development, managerial skills enhancement, and technological integration. These insights have been crucial in steering the discussions towards developing strategic solutions that leverage strengths to capitalize on opportunities while addressing weaknesses and mitigating threats.

**Envisioning Actionable Strategies for Educational Transformation**

To shake the educational status quo and align with the EU's ambitious policy priorities—such as the Green Deal, Farm to Fork Strategy, and the EU Biodiversity Strategy 2030—the following actionable strategies emerge as pivotal:

- **Forge Robust Industry-Education Partnerships**
    - **Joint Curriculum Development:** Collaborate with industry stakeholders to co-create curricula that include real-world case studies, ensuring that courses are directly relevant to current industry challenges and innovations.

- **Industry Internship Programs:** Establish structured internship programs with agri-food companies to provide students with hands-on experience, fostering a deeper understanding of the sector's practical challenges and opportunities.
- **Annual Agri-food Innovation Forums:** Organize forums where educators, students, and industry professionals can showcase recent advancements, discuss emerging trends, and explore potential collaborative projects.

- **Embrace Digital and Green Skills**

  - **Digital Agriculture Workshops:** Implement workshops and short courses focused on precision farming, data analysis, and the use of agricultural drones, emphasizing the practical application of digital tools in farming.
  - **Sustainability Certification for Agri-food Courses:** Develop certification programs in sustainable farming practices, such as crop rotation, organic farming, and water management, that students can complete alongside their regular studies.
  - **Green Tech Competitions:** Host annual competitions for students to design sustainable agricultural solutions, with mentoring from industry experts and potential for real-world implementation.

- **Adopt Flexible Learning Models**

  - **Online Learning Platforms: I**mplement learner-centered and flexible educational models, such as online platforms that offer modular courses in smart farming and sustainability, allowing students to learn at their own pace and according to their individual interests.
  - **Blended Learning Initiatives:** Integrate traditional classroom instruction with online and experiential learning, including virtual reality (VR) simulations of farming scenarios, to enhance the learning experience.
  - **Microcredentials in Agri-food Specializations:** Offer microcredentials or badges in specific areas like agri-food technology, sustainable practices, or farm management, enabling professionals to upskill or reskill flexibly.

- **Enhance Professional Development**

  - **Educator Workshops on Emerging Technologies:** Conduct regular workshops for teachers on the latest agri-food technologies and teaching methodologies, ensuring they remain at the forefront of agricultural education.
  - **Cross-sector Professional Exchanges:** Facilitate exchange programs where educators can spend time in the agri-food industry (and vice versa), fostering mutual learning and understanding of sector challenges and opportunities.
  - **Online Professional Development Networks:** Create online forums and networks for educators to share resources, best practices, and innovations in

agri-food education, encouraging continuous professional growth, and ensuring that VET remains at the cutting edge of agricultural education.

- **Champion Interdisciplinary Approaches**
    - **Collaborative Research Projects:** Encourage joint research projects between students from agricultural sciences, environmental studies, and technology disciplines to address complex sustainability challenges in the agri-food sector.
    - **Interdisciplinary Course Modules:** Introduce course modules that require students to work on cross-disciplinary teams, solving problems that combine elements of technology, sustainability, and business in agriculture.
    - **Community Engagement Projects:** Launch projects that involve students, educators, and local communities in developing and implementing sustainable farming practices, enhancing the real-world impact of educational programs.

**Table 7. Actionable Strategies Derived from TOWS Analysis**

| Strategy Field | Action Plans Derived from TOWS Analysis | TOWS Alignment |
|---|---|---|
| **Industry-Education Collaborative Development** | - Joint curriculum development initiatives with industry stakeholders<br>- Structured internship programs offering real-world experience.<br>- Innovation forums for collaborative project ideation. | S/T: Utilize strengths to mitigate threats by fostering industry partnerships that address misconceptions and enhance the sector's attractiveness. |
| **Digital and Green Skill Empowerment** | - Workshops on precision agriculture and digital tool application.<br>- Courses offering sustainability certifications.<br>- Competitions for green technology solutions. | S/O: Apply strengths to seize opportunities through the development of digital training and international collaboration. |
| **Flexible Learning Environments** | - Launch of online learning platforms for wider accessibility.<br>- Blended learning initiatives for diverse educational engagement<br>- Micro-credentialing for targeted upskilling. | W/O: Overcome weaknesses by leveraging opportunities, such as tailoring courses to specific needs and broadening reach. |
| **Professional Growth and Exchange** | - Emerging technology workshops for teachers.<br>- Cross-sector exchange programs to broaden perspectives.<br>- Professional development networks for continuous learning. | W/T: Address weaknesses and avoid threats through innovative teaching and community engagement to make learning more engaging and relevant. |

| | | |
|---|---|---|
| **Interdisciplinary Integration and Engagement** | - Collaborative research projects across different fields.<br>- Interdisciplinary course modules to broaden knowledge bases.<br>- Community engagement projects for practical experience. | S/T & W/O: Leverage strengths and address weaknesses by promoting interdisciplinary approaches and engaging with community and industry partners. |

# Call to Action: Shaping the Future Together

The insights and strategies outlined herein call for a concerted effort among all stakeholders in the agri-food sector to collaboratively address the identified challenges and opportunities. By acting on these recommendations, the AF4F consortium and its broader community can significantly contribute to shaping a future where the agri-food sector thrives through innovation, sustainability, and resilience.

As we move forward, let us embrace this collective vision, leveraging the rich tapestry of expertise, experiences, and ideas shared through this analysis. Together, we can pioneer educational and technological transformations that will empower the next generation of farmers and agri-food professionals, ensuring a sustainable and prosperous future for all.

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# ANNEX 1
# Detailed Responses to Question 2.3: Identifying Future Skills Needs in the Agri-Food Sector[1]

| Response Number | Skills/Competencies Suggested |
|---|---|
| **1** | How to calculate the LCA of a product, how to draw up a sustainability report, how to use weather data |
| **2** | Environmental attention |
| **3** | Multidisciplinary skills not only theoretical but also practical and industry-specific. We need young people who are willing to put their hands to work. |
| **4** | Proficiency in digital app and systems, data exploitation and interpretation, communication |
| **5** | Know how to listen and talk to farmers, and employees of cuma. Knowing how to express, knowing how to bring out new projects |
| **6** | No answer |
| **7** | Is important to enhance the development of the innovation and the entrepreneurship in the agrifood value chain. |
| **8** | Integration of renewable energy technologies into agriculture |
| **9** | De-risking strategies for a green transition |
| **10** | Traceability and data management |
| **11** | Digitalisation skills for agri-food systems as advanced users |
| **12** | Skills related to the circular economy, and we must not forget soft skills |
| **13** | Zero emission technology; circular economy |
| **14** | Biodiversity preservation / Sustainable Water Management / Carbon footprint measurement method, ecodesign and ecomanagement of food-process |
| **15** | Systemic approach, scientific procedure, economics of the farming system |
| **16** | Sensors and Robotics in agriculture / Integrated defense management / Management of chemical and biological soil fertility |

[1] For Annex 1 - Detailed Responses to Question 2.3: Identifying Future Skills Needs in the Agri-Food Sector, and all subsequent annexes, participant responses have been anonymized to maintain confidentiality and privacy. This ensures the integrity and anonymity of contributions from experts across the VET and Higher Education ecosystems in the agrifood sector.

| | |
|---|---|
| **17** | Come back to fundamental competency: basic agronomical competency which unfortunately is disappearing. Integrative skills also to take into account all aspects in agronomic reasoning. |
| **18** | Soil biology |
| **19** | Smart farming |
| **20** | Digitalisation skills for agri-food systems as advanced users |
| **21** | IoT technologies for agriculture and agroforestry |
| **22** | Regenerative agriculture |
| **23** | No-Till Farming Techniques/Understanding and implementing farming practices that minimize soil disturbance. Crop Rotation Strategies/Competence in planning and executing crop rotation for sustainable agriculture. Composting and Biofertilizers Use/Skills in organic waste management and biofertilizer application for soil health. Carbon, Water, Nitrogen, and Mineral Management/Proficiency in managing essential elements for farm sustainability. Holistic Farm Management/Broad skills in managing all aspects of a farm with a focus on sustainability. Reducing Carbon Footprint in Food Production/Techniques to minimize carbon emissions in food production and transformation. Circular Economy Principles in Agriculture/Knowledge of circular economy concepts and their application in the agrifood sector. Waste Management in Agriculture/Competencies in managing agricultural waste effectively. Entrepreneurial Skills/Fostering business acumen and entrepreneurship in the agrifood sector. Digital Skills/Mastery of essential digital tools and technologies, including AI and GIS. Earth Observation Techniques/Utilizing satellite and remote sensing data for agriculture. Problem-Solving Skills/Ability to address complex challenges in the agrifood sector. Critical Thinking and Creativity/Developing innovative solutions for sustainable and energy-efficient agriculture. |
| **24** | The new skills expected are linked to the following points: - fundamental agricultural knowledge (basic foundation in agronomy, plant production and zootechnics) - digital tools (basic mastery) - business management (accounting, economic and financial management, HRM) - knowledge of the overall environment of the farm - technical skills - interpersonal skills |
| **25** | Entrepreneurship, teamwork, mindset, transversal skills in general; quantitative tools (e.g., statistical) |
| **26** | Artificial intelligence, data sciences, green energy |
| **27** | Team working, Ability to public discussion, Multidisciplinary skills on environmental and agricultural ecosystems, Decision making's skill |
| **28** | Impact of sustainable farming on food quality (nutritional, nutraceutical, epigenetic, flavor aspects) |
| **29** | Robotic |
| **30** | Management and entrepreneurship |
| **31** | New advisory methodologies based on peer to peer learning and in practice such based in Horizon Europe thematic networks and in the AKIS (Agriculture Knowledge and Innovation Systems) concept |
| **32** | Life cycle analysis, eco-conception, green packaging, food-industry 4.0 |

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|---|---|
| **33** | Precision farming; Climate-smart agriculture; Supply chain management, Crop diversity and genetic engineering |
| **34** | Bioenergy production, circular economy |
| **35** | Systemic analysis, bioeconomy |
| **36** | Data analysis, immersion practices in training |
| **37** | Entrepreneurship, crisis communication |

# ANNEX 2
# Detailed Responses to Question 2.9:
# Final Remarks on Skills Gap Analysis

| Response Number | Final Remarks on Skills Gap Analysis |
|---|---|
| **1** | Throughout history, farmers have always been identified as "the poor and uneducated of society". It is necessary to undertake a cultural and economic change that overturns this conception of the primary sector. |
| **2** | Theoretical training very distant from practice, theory in the field would be needed. |
| **3** | Our experience shows that many young people do not believe that agriculture can be a rewarding and remunerative industry. Few young people have the desire to work in an industry so full of contingencies and challenges. I would integrate listening and confrontation paths with specialized psychologists into the training courses. |
| **4** | Rules for public aid for training should be more flexible and allow higher costs and limited audiences in rural when operated in rural areas. |
| **5** | Financial support for training should be improved. |
| **6-11, 13-14, 17, 19, 21, 23, 29-30** | No suggestions / Non applicable. |
| **8** | Nexus between agri-food ecosystem and other business. |
| **12** | Combine digital with soft skills. |
| **15** | Approaches are different for people originating from an agri-food system family and people that have not grown and progressed in this context. It has to be taken into account. |
| **16** | Stakeholder involvement and collaboration in training is crucial. |
| **18** | Importance of resilient soils. |
| **20** | Experienced professionals working in agriculture tend to reject new technologies and/or methodologies. There is an idea that the traditional is better because it is older. On the other hand, there is a belief that new technologies do not promote sustainable and quality agriculture. |
| **22** | Training programs should cover sustainable farming practices, resource management, and the use of eco-friendly technologies to meet the demand for environmentally conscious agriculture. |
| **23** | "The agri-food sector is rapidly evolving with new technologies. This change requires a workforce that is not only proficient in current technologies but also adaptable to future innovations. With the integration of digital technologies like AI, GIS, and remote sensing in agriculture, there is a growing demand for digital literacy and advanced technological skills. There is also an increasing emphasis on sustainable and climate-smart agricultural practices. Skills in areas such as sustainable water management, organic farming, and renewable |

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| | energy integration are becoming critical. Beyond technical competencies, soft skills such as problem-solving, critical thinking, creativity, and entrepreneurial skills are essential for the modern agri-food workforce. The dynamic nature of the sector necessitates a culture of lifelong learning. Continuous upskilling and reskilling are essential to keep pace with industry changes. Concerning training programs, they need to be inclusive, catering to diverse groups such as aging workers, unskilled labor, and individuals with lower levels of formal education. Training must be also tailored to local and regional agricultural practices and needs, acknowledging the diversity in agricultural methods and crops across different regions. Collaboration between educational institutions, government bodies, and industry players is crucial for this direction, developing relevant and effective training programs." |
| **24** | Lack of skills and training requirements in human resources management (work organisation, working conditions, recruitment, retention, integration of new employees, etc.), business management (administrative management, marketing, steering, etc.) |
| **25** | Skills and training need to be designed consistently with policies and having better in mind a) the starting point and motivation of the attendees; b) the innovation in learning. |
| **26** | Recirculating aquaculture systems (RAS). |
| **27** | "Lack of general cultural investment, crucial for achieving education quality and for to have professional figures able to manage the greater degree of complexity of a system in an increasingly rapid and continuous evolution of knowledge of the processes and technologies associated. To link sustainability knowledge to action that takes also into account both the global dimension, both the "local" dimension including the specific context. The involvement of farmers in the development of strategies toward a sustainable agriculture starting from their practices communication on responsible and sustainable management of chemicals in agriculture. Capacity to involve and really connect farmers and producers to the world of research through adequate figures capable of translating research results." |
| **28** | Support and share results from practical case studies. |
| **31** | The adequate training and qualification of the required professionals need the development of the whole innovation and digitization ecosystem, so it is very important to identify and align with other local and regional initiatives as Digital Innovation Hubs, etc. |
| **32** | Provide training for all teachers regarding these aspects. |
| **33** | Adapt the contents to small farmers so that they are more open to use new technologies. |
| **34** | The main challenge is job attractiveness in the agrifood sector. |
| **35** | In recommendations for skills policies, offering/expanding adult apprenticeships is also an interesting option. |
| **36** | Challenges in CVET : also low training participation among employees. Recommendations for skills policies : need for apprenticeship during working hours. Also : there is little adequation between the training which is needed at one precise moment and the moment when the training is finally available. |
| **37** | The lack of participation by employees to training programs is due to interest and budget (it costs a lot to get good training). There is also a gap between training needs and training programs. |

# ANNEX 3
# Detailed Responses to Question 3.2:
# Tools & Technologies for Transition (Digital)
# Name a tool or technology crucial for the Digital Transition in agri-food and its impact

| Respondent Number | Tools & Technologies for Transition |
|---|---|
| **1** | N/A |
| **2** | composting |
| **3** | N/A |
| **4** | Implements and tractors based data collection systems |
| **5** | Use of Global Navigation Satellite System (GNSS) |
| **6** | N/A |
| **7** | In Spain, the Digitization Strategy for the Agri-Food and Forestry Sector and Rural Areas defines the strategic lines and measures necessary for digital transformation. More information: https://www.mapa.gob.es/images/en/digitisationstrategy_tcm38-513192.pdf |
| **8** | Monitoring of parameters by sensors |
| **9** | Sensors with irrigation recommendations |
| **10** | Technologies such as Internet of Things, Blockchain, Artificial Intelligence, Cloud Computing, and Big Data Analytics |
| **11** | hyperspectral imaging |
| **12** | blockchain at the service of agri-food |
| **13** | Digital dashboarding |
| **14** | Artificial Intelligence (AI) Analyze big amount of data. |
| **15** | Farm management information systems |
| **16** | User-friendly decision support systems |
| **17** | Decision support system |
| **18** | N/A |
| **19** | Artificial intelligence combined with smart farming |
| **20** | Nanotechnology applied to agri-food. |

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| **21** | Precision farming |
| **22** | Data-Driven Decision-Making. |
| **23** | Integrated Precision Irrigation System "Ardeusi" by AGENSO. More information: https://play.google.com/store/apps/details?id=gr.agenso.ardeusigr |
| **24** | MesParcelles: a traceability solution for regulatory and practice management. |
| **25** | AI |
| **26** | Smartphone |
| **27** | Remote sensing |
| **28** | Data availability and integration |
| **29** | Robotic and management |
| **30** | Having practical and real tools during the teaching |
| **31** | Smartphones and their growing capacities and portability |
| **32** | IoT |
| **33** | Precision Farming Technologies: GPS, sensors, drones, and data analytics |
| **34** | Tools for data management, crucial for farm work based on data use. |
| **35** | Multidimensional data analysis tools, data mining tools |
| **36** | Frugal, low energy consuming tools. |
| **37** | Data management tools |

# ANNEX 4 - Detailed Responses to Question 3.3: Tools & Technologies for Transition (Green) Share one methodology or tool you've seen that promotes the Green Transition, especially in reducing environmental impact

| Respondent Number | Tools & Technologies for Transition |
|---|---|
| **1** | N/A |
| **2** | Carbon Credit |
| **3** | Self-Food Production |
| **4** | Manure Treatment in Livestock and Field |
| **5** | Serious Game [Link] |
| **6** | N/A |
| **7** | The Iberian Cluster Initiative |
| **8** | Integrating Solar PV Panels in Agriculture |
| **9** | Microbiome Soil Analysis |
| **10** | Vertical Farming, Circular Economy, Simapro for LCA |
| **11** | Biocontrol Agents |
| **12** | Recycle, Circular Economy |
| **13** | Going Extensive Rather Than Intensive |
| **14** | Fresque du Climat |
| **15** | Co-design Workshops |
| **16** | Development of Improved/Efficient Crop Varieties |
| **17** | Situational Awareness |
| **18** | Subsidise Agriculture According to Ecosystem Services Provided |
| **19** | Carbon Farming |
| **20** | Smartpackaging to Decrease Food Waste |
| **21** | Life Cycle Assessment |

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| **22** | Life Cycle Assessment (LCA) |
| **23** | Investment in Renewable Energy Technologies |
| **24** | CAP'2ER® for Environmental Performance in Ruminant Farming |
| **25** | LCA, Green Business Models |
| **26** | Automated Mechanical Weeding with Sensing System |
| **27** | Composting |
| **28** | Use of Precise, Targeted, and Ultra Low Volume Application Methods |
| **29** | I Do Not Know |
| **30** | Examples from Business, Showing the Need and Benefits |
| **31** | People Awareness and Tools Aimed at It |
| **32** | ISO14001, ISO26000 |
| **33** | Agroecological Practices |
| **34** | Decision Aid Tools and Systemic Approaches |
| **35** | Tools for Multicriteria Environmental Impact Assessment |
| **36** | Decarbonation and Circularity Tools |
| **37** | Environmental Assessment Methods |

# ANNEX 5

## Detailed Responses to Question 4.1 : Threats/ Challenges: Describe the main external challenges that might impact your program's success. Also, touch upon any broader trends in the agri-food and VET sector that could influence your institution in the future

| Respondent Number | Threats/Challenges |
|---|---|
| **1** | School/University dropout |
| **2** | Globalisation |
| **3** | Increased employment in the agricultural sector and the establishment of new enterprises |
| **4** | Training for farmers has two main drivers: 1) public funds and 2) be mandatory. The success or failure of programs and training courses receiving public contribution are strictly related to the rules of the financing authorities: readiness of the courses, duration, number of participants allowed, kind of training allowed, risks of controls and fines, limits related to regional boundaries, intensity of the contribution are the key elements that influence the success of training and of the training centers. This is one of the matters where operational details are more important than the policy underneath or of the amount of funding in influencing the success. |
| **5** | Reduction in training funds. Less availability of employees end farmers due to increased working hours (linked to the increase in the size of farms |
| **6** | N/A |
| **7** | [W]e do not implement education and training activities in smart and sustainable farming, so we do not have a good vision on the actual external challenges that can impact a program's success. Nonetheless, several points should be taken into account: Estimulate the curiosity and creativity of the student body through the study and investigation. Implement specific attention to educational support for students through the implementation and dissemination of curricular adaptations and/or materials that they may need. Promote the development of lines of research among VET researchers and teachers. Promote training plans in new educational trends aimed at students and practicing education professionals. |
| **8** | Our business is not directly correlated with the agri-food and VET sector. The main external challenge is to be able to provide an expertise that can be considered an added value. |

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| **9** | International collaboration can be a great potential opportunity and empowerment of local communities. Language is always a huge barrier. |
| **10** | Since an in-depth analysis is required for which a tailor-made study would have to be carried out, it is not possible to answer this question. |
| **11** | Age of the growers. Low technical knowledge. Low Growers/Technicians availability to follow the programs. |
| **12** | I would not know. |
| **13** | Society perceives farming as a non-intellectual activity with highly negative impact on the environment. |
| **14** | Climate change / Increase of the difficulty to employ and retain workers in farms and agri-food industries. |
| **15** | Adaptation of farming systems to new consumer demand. Adaptation to climate change. Adaptation to farming system (linked with less or different workforce). |
| **16** | External challenges: global events and crises, technological infrastructure, labor market dynamics. Trends: economic conditions, demographic changes, social and cultural factors could influence the institution. |
| **17** | Regulations in agriculture are constantly evolving, making it difficult to adapt training courses. The need for profitability on the part of certain economic players (supposed to support farmers) is distancing training needs from the agronomic sectors, which are nonetheless essential for supporting farmers in the agricultural transition. |
| **18** | We are too dependent on temporary subsidies that get in the way of a long-term vision. |
| **19** | Especially the new laws in agriculture may pose a challenge to our institution. |
| **20** | Decrease the use of fertilizers. Decrease food wastage. Optimize agri-food production adapted to the environment. |
| **21** | Environmental uncertainties. |
| **22** | Economic crisis affects household's budget. Plenty of providers offer adult education, training, and online programs. Low mindset and culture of the industry to invest in staff development. Frequent change of political and economic landscape. Rural population shrinking (less potential clients in the future). |
| **23** | The success of programs in the agri-food and VET sector faces significant external challenges, primarily the existing digital skills gap, which hinders the effective adoption of emerging technologies for efficient and sustainable production methods. The conservative mindset and limited technical and soft skills among farming professionals create barriers to implementing sustainable practices such as smart farming and precision agriculture on a large scale. Additionally, the sector's slow transition to decarbonized energy sources, exacerbated by recent energy price surges and supply instability in Europe, underscores the need for greater knowledge and practical skills in adopting green energy solutions. These challenges are compounded by broader industry trends towards sustainable, climate-smart agriculture and the integration of digital technologies, necessitating a proactive and adaptive approach in VET/CVET to continuously update educational content and training methods to meet these evolving needs. |

| | |
|---|---|
| **24** | The main external challenges that might impact our program's success and the trends in the agri-food and VET sector that could influence our institution in the future are the recruitment difficulties and the generational renewal, the competition from other agricultural structures and the changes in training funding conditions. |
| **25** | Fake news and info from non-accredited sources; well-marketed initiatives disconnected by actual research. |
| **26** | Attract new students and attendees. |
| **27** | Agricultural innovation often comes from outside the agricultural industry. The role of social interaction has to be taken more into account to achieve a successful transition vs sustainability. Data collected and provided by Authorities should better focus on context-specific research questions. |
| **28** | High production costs that will be reflected in high prices for consumers and consumption reduction. |
| **29** | Soils activity and importance. |
| **30** | Although we are engaged in the process the involvement and awareness from the business's side is low about the topic; policy decisions sometimes make it difficult. |
| **31** | Agrifood is a complex sector that involves biological and alive organisms that is very influenced by climate and by climate change which is a very important problem. |
| **32** | Not applicable as we are not training in the field smart and sustainable farming education. |
| **33** | Technological Advancements; Evolving Regulatory Landscape; Globalization and Market Dynamics; Climate Change and Sustainability; Changing Demographics and Workforce Needs. The costs of new technologies. |
| **34** | Lack of attractiveness of the sector (low wages compared to other sectors); environmental challenges and perception of the environmental impacts of the sector by the general public; low competitiveness of agricultural activities. |
| **35** | Collapse of livestock farming, bad image of some businesses (greenwashing), loss of credibility of institutions and research. |
| **36** | Deconnexion between reality and the perception by the general public on the agri-food sector, risk of delegating too much training to the private sector, risk of losing critical perspective, a lot of questioning in the animal production sector. |
| **37** | Attractiveness of jobs in the agri-food sector. Fewer people interested by the sector. Image of livestock and agriculture (sustainability issues). |

# ANNEX 6

# Detailed Responses to Question 4.2 : Opportunities List the primary external opportunities you foresee. Consider factors like technological trends, government policies, or potential collaborations that could benefit your institution

| Respondent Number | External Opportunities |
|---|---|
| 1 | Greater sensitivity related to green transition issues |
| 2 | in the future, technical figures will be created in companies responsible for monitoring corporate sustainability |
| 3 | We will need to produce food in new environmental and social scenarios |
| 4 | The goals agriculture has to reach impose to the farmers and workers to have training. The future need of foreigner workers will increase the need of operational training. |
| 5 | more direct contact with cuma employees |
| 6 | |
| 7 | According to ICEX Trade and Investment, a publicly owned business-oriented entity of the Ministry of Economy, Trade and Business's Secretary of State for Commerce, the Spanish agri-food industry is the country's main manufacturing activity, with revenue close to €140 bn and employing more than 440,000 people.<br><br>The industry is undergoing a disruptive and decisive transformation towards digitalisation and sustainability to face new challenges in the form of climate change and adapting to new consumer trends. Spanish Technology Centres are world leaders in specific areas ranging from developing new ingredients to new high-quality protein sources, enhancing nutritional properties and precision agriculture. In recent years, Spain has become one of the few "foodtech" nations, developing an enterprising ecosystem across the entire agri-food value chain. |
| 8 | Nowadays agrivoltaic, the integration of photovoltaic in agriculture, has been supporting through EU policies and those projects constitute an important target for EU governments. This technological and policy trend can benefit out company |
| 9 | Climate change and technologies developed to mitigate change are a faciliator for change. Change in the EU policy (e.g. new Cap; new Soil Law). Economical context is favourable to change |

| | |
|---|---|
| **10** | Since an in-depth analysis is required for which a tailor-made study would have to be carried out, it is not possible to answer this question |
| **11** | Government policies for promoting courses of upskilling and reskilling related to +Digital in the Agricultural sector<br><br>Growers are realizing the potential of novel smart Agriculture tools |
| **12** | we follow the last part of the supply chain, i.e. catering. All the innovative aspects in agricultural production arrive on the plate, more ethical, sustainable products flow into a better restaurant industry, in line with market demands |
| **13** | technology may make the agro sector more attractive |
| **14** | Technological trends : Artificial Intelligence (new tools/attractiveness training and jobs) |
| **15** | National regulation around pesticides use. European regulation about fertilisers and pesticides use and traceability. |
| **16** | Advancements in technology, government funding and support, industry partnerships and collaboration, flexible learning models. |
| **17** | - the enhancing of training activity after COVID period<br>- The need of new approach, of new paradigme in order to succeed in agricultural transition objectives |
| **18** | ? |
| **19** | Potential collaborations with the other partners in the consortium.<br><br>Ensure that we can offer training/a course to our farmers on a regular basis. |
| **20** | - Society concerned about the origin and quality of food products, specially young people.<br>- Young people is the main target of the estudents in our organization which are more maleable and open mindedness to change. |
| **21** | Rapid adoption of emerging technologies in agriculture, Government policies and initiatives supporting education and sustainable agriculture provide an opportunity for institutions. |
| **22** | Wide availability of free tools and resources for educational methodology and educational design to building online offerings<br>New communication channels (new ways of communication and social media, e.g. Tik Tok)<br>Growing demand for skill development on novel techniques due to climate change, technological advancements, green transformation, and market trends |
| **23** | - Designing and implementing VET internationalization strategies<br>- Building entrepreneurial and soft skills through incubation programs for startups and SMEs<br>- Establishing durable partnerships between VET providers, businesses, and research entities across borders |
| **24** | Development/opening up of the training offer to employees and to audiences other than farmers<br>Development of distance learning/change in teaching methods |

| | |
|---|---|
| | Development of renewable energies on farms<br>Raising the political stakes in environmental and climate issues<br>Training to cope with the increasing complexity of the global environment and to manage farms more effectively |
| **25** | Collaboration between research and education; fast technological trends and uncertainty about the future is pushing more companies to ask support by universities and to value high level graduates |
| **26** | Include students and professionnals coming from other sectors and disciplines |
| **27** | integration into the research analysis of social challenges and stakeholders perceptions related to topics as climate–water–food energy<br><br>Our university collaborate in a multidisciplinary perspective, with national and international authorities representatives and industry representatives to reduce the knowledge gap and to take advantage respect other science-driven research activities and/or of the results provided by other scientists |
| **28** | Healthy food trends. Transition on production methods due to political and funding framework. |
| **29** | Carbon credits |
| **30** | technological trends and modern business examples |
| **31** | The main opportunity are the existing synergies among the digital and green transition since the digital technologies can contribute to the efficiency in the use of resources and in the monitoring of the environmental services and impact of agrifood sector.<br>Also the EU common agricultural policy and the policies and strategies adopted by the UE like the Green Deal and the Data Strategy are a important contribution to the change. |
| **32** | Not applicable as we are not training in the field smart and sustainable farming education |
| **33** | More training offers; new markets; New funding. Interdisciplinary approaches. New European projects |
| **34** | There are many jobs in this industry ; the industry is more than ever indispensable ; the sector has a strong link to environmental issues (in particular : farming has environmental impacts but it is also part of the solution to environmental issues) |
| **35** | There are many jobs, ability to project oneself in the future |
| **36** | There are many jobs |
| **37** | general awareness of the population on the necessity of agroecology practices |

# ANNEX 7

## Detailed Responses to Question 4.3 - Weaknesses : What are the main gaps or improvement areas in your institution's approach? Mention any critical resources or support you believe is missing.

| Respondent Number | Internal weaknesses and lacking resources |
|---|---|
| 1 | Little willingness to find professionals to teach |
| 2 | pulman to visit companies or fields |
| 3 | Young people have no confident outlook on the agricultural sector and lack the imaginative ability to dream about the agricultural sector in an innovative and different way from the current one. |
| 4 | Lack of internal technical expertise, low rate of external teacher turnover and few prepared teacher (for farmers level), new actors starting to provide training in a more appealing way usually related to provider of innovation or technology or consultancy |
| 5 | competition with sectors of activity such as construction. The lack of managerial skills of farmer-employers as team managers |
| 6 | |
| 7 | As indicated previously (...) we do not implement education and training activities in smart and sustainable farming, so we cannot bring information about gaps or improvement areas in our institution's approach. It is not applicable. |
| 8 | Matching the agri-food sector with energy sector. Finding a common starting point to develop projects |
| 9 | Farmers' language. We´re too research oriented at times |
| 10 | Since an in-depth analysis is required for which a tailor-made study would have to be carried out, it is not possible to answer this question |
| 11 | HR are limited |
| 12 | internally we do not have expertise in purely technical subjects related to food production, therefore we turn to external professionals or from the university world. We have knowledge in food processing, in final processing. |
| 13 | economical perspective for farmers |
| 14 | Access to decision support tools/ sofwares, applications in order to simplify their use by actors (farmers, food industries employees, consultancy, advisors..) not necessarily experts in the climate change/environment and digital technologies fields. |
| 15 | Political support to changes of farming systems. Including economic support. |
| 16 | Alignment with industry needs, flexibility and adaptability, integration of technology, teacher professional development, public perception. |

| | |
|---|---|
| **17** | - poor quality of agronomical basic skills of teachers/professors. We are too much concentrate on transversal skills in order to focus more on basic skills<br>- poor ability of teachers/ professors to teach the impacts of transversal approach, of the use of multicriterial assesment. |
| **18** | Mind you, it is completely impossible to speak for my entire institution, but in general I believe that (...) is too much bottem up (although I like this!), but to make big changes, like the green transition, more top-down decisions are needed. |
| **19** | / |
| **20** | Lack of contact with workers in the primary sector. |
| **21** | Agroforestry systems not that many promoted |
| **22** | Need for updated training and equipment for advancing technological and adult education innovations; Need for needs assessments and outreach plans for reaching new clients/stakeholders; The expertise of staff and programs is not utilized effectively. |
| **23** | alignment of VET ecosystems with the labor market's needs, especially in terms of digitalization and innovation. slow adoption of decarbonized energy sources in agriculture, driven by a lack of knowledge and practical skills. |
| **24** | Slow decision-making<br>Discrepancy with the way the private sector operates<br>Training offer not focused and clear enough |
| **25** | we need mucjh more flexibility in education design and focus on advanced pedagogical preparation of teachers |
| **26** | Skills in changing context |
| **27** | Burocracy could limit the time of adoption of innovation |
| **28** | Retail is a very competitive sector |
| **29** | I don't know. |
| **30** | small scale agro food businesses |
| **31** | We are not an education institution, but we support agrifood sector to some extent and can contribute to the policy design. A wide knowledge of the context and trends influencing the sector is very important. |
| **32** | Not applicable as we are not training in the field smart and sustainable farming education |
| **33** | Lack of human resources |
| **34** | Difficulties to take well into account the demands/needs of some of the students of the new generation (which have more radical point of views on the agri-food sector and are more disconnected from the sector than before). Difficulties to speak the same language. Difficulties to mobilize teachers beyond their comfort area (to attract them to topics such as technological innovation in the farming sector, for example), teachers very busy. |
| **35** | gap between students and businesses, european policies not pertinent, hard to answer alone to complexity / lack of collaboration at a territorial level with public institutions and industries |
| **36** | working conditions not very good, a lot of strenuous work, lack of communication between actors, lack of free time for teachers |
| **37** | need to make known what we do, we are not proud enough of what we do well |

# ANNEX 8

## Detailed Responses to Question 4.4 - Strengths : Summarize the primary strengths of your institution or program in smart and sustainable farming education. If possible, mention any significant success or milestone.

| Respondent Number | Internal weaknesses and lacking resources |
|---|---|
| 1 | strong connection with the food industry sector |
| 2 | people with other skills have passed the art gardener exam |
| 3 | We manage to enthuse many young people by telling our story, our passion and of course our projects |
| 4 | Reputation. A really engaged staff. A success can be seen in the participation in more than 80 Innovation groups for the training activity, of which more than 50% are in the area of sustainable farming |
| 5 | Competent and experienced trainers; Adapted teaching methods |
| 6 | |
| 7 | N/A |
| 8 | As technology providers, we can help to reduce the renewable technologies knowledge gap |
| 9 | Research, access to funding, capability to run awaress campaigns and follow on actions |
| 10 | Since an in-depth analysis is required for which a tailor-made study would have to be carried out, it is not possible to answer this question |
| 11 | (...)<br><br>A new Course in Smart Agriculture will be included teaching program of our Master in Agriculture Engineening<br><br>Well recognized/ranked University in the field of Agriculture and Food Sciences<br><br>Close link to the R&D Centre in Sustainable Agrifood Production |
| 12 | our institution trains professionals or new professionals for the catering sector. Knowledge of agricultural production leads to more informed choices in the choice of kitchen products and in the construction of menus.<br>we have managed IFTS related to knowledge in the kitchen, thus spreading not only new technical skills but also a new culture within the catering sector |
| 13 | technological and scientific backbone |
| 14 | Network and diversity of members and profiles (VET providers, VET users..)<br>[We have] an effective know-how in collaboration between companies, startups, research, technical advisors , higher schools... |

| | |
|---|---|
| **15** | Transversality of our competences. Research and development. Partnerships. Strong link with farmers and agri-food organisations. |
| **16** | Farm management and sustainability practices, networking and knowledge sharing. Milestones are increased crop yield, resource efficiency, and establishment of farming demonstration projects. |
| **17** | - digital training, as developed in the agrifood4future project, will enhance the ability to massively distribut efficient training course<br>- Teachers at the limit of agriculture knowledge due tu there research activity |
| **18** | strong sientific knowledge |
| **19** | Within (...) we do a lot of research. The research is agriculture wide and deals with many different things. Consequently, we have a very large network that we can reach and very many experts across different fields. |
| **20** | Online and onsite teaching to a wide range of students profile. |
| **21** | Expertise on agroforestry and sustainable farming practices. |
| **22** | Educational Farm-Living Laboratory<br>Committed (...) Alumni and Alumni network<br>On-site training mentoring and consulting history<br>Existing real economy highly functioning collaborative networks |
| **23** | [Some] strengths in smart and sustainable farming education are evident in diverse European projects, addressing different aspects of sustainable agriculture and education.<br><br>POEASE - Promote Online Education for Agriculture in a Sustainable Environment: This project, funded under the Erasmus+ KA2 program, focuses on improving digital education in agriculture. Its objectives include reinforcing the ability of ATVET (Agricultural Technical and Vocational Education and Training) providers to deliver high-quality, inclusive digital education, developing digital content and innovative e-teaching methods, and promoting networking among ATVET providers. The expected results are a better understanding of the needs of ATVET teachers and trainers, easier access to training modules for their upskilling, and the creation of 21 Open Educational Resources (OER) modules.<br><br>RegAgri4Europe - Upgrading the Agricultural Sector with Skills in Regenerative Agriculture: This project aims to address the gap in agricultural education by providing web-based training on regenerative agriculture. It intends to close the skills gap in agriculture education, inform VET authorities and policymakers about regenerative agriculture, and integrate the course content into the curricula of agricultural VET providers. The expected main results include the acquisition of new skills on regenerative agriculture, improved digital competencies of educators and learners, and a better perception and awareness of regenerative agriculture/permaculture among various stakeholders.<br><br>Free Online Course on Regenerative Agriculture: This course is accessible through the RegAgri4Europe Virtual Learning Environment, offering video lessons, reading materials, learning activities, and a virtual library. It is designed to teach practices that enhance soil fertility, biodiversity, water cycles, resilience to climate change, and carbon sequestration. Participants can learn innovative and sustainable cultivation methods like cover cropping, mulching, and key line design. The course is available in English, German, Greek, and French, and is accredited, offering 3 Credit Points in cooperation with universities. |
| **24** | Our strengths: the network and partnership between Chambers. The experimental stations can be used to monitor needs and suggest solutions/methods. Research projects contribute to innovation and the Chamber allows to be trained, so it is a complete cycle.<br>Our internal expertise is recognized and we take action on local area with farmer groups. |

| | |
|---|---|
| | (...) is an annual event (Open Days in June on farms that are innovating in line with sustainable development) and a milestone in terms of experience feedback. The farms, selected by a professional committee, must be technically, environmentally and economically efficient. In November, students are also invited to benefit from the (...) feedback. |
| **25** | Background from cutting edge research, including strong international collaboration; wide team of young researchers |
| **26** | High level selection students at the national level throught a competitive exam |
| **27** | 3 campus, in minor but historical city, optimal teacher/student ratio that allows constant interaction, high-level research guaranteed by the results and patents obtained by the university's researchers<br>High level of applied research guaranteed by the various laboratories, thematic experimental fields and zootechnics 4.0<br>Some degree courses are taught entirely in English.<br>In addition to traditional teaching and research, the so-called "Third Mission" is a direct engagement with society to generate knowledge outside academic environments. |
| **28** | Wide supplier web, possibility of influence on all agrifood chain from production to consume |
| **29** | Applied investigation/research |
| **30** | team, qualification, network |
| **31** | We are not an education institution, but we support agrifood sector to some extent and can contribute to the policy design. We have a wide presence in the [Spanish region], with 92 offices distributed throughout the region and about 2,500 specialized workers (60% higher or medium technicians).We have also 60 District Agricultural Offices, in which there is an extensive knowledge of the territories in which they are located, their strengths, weaknesses, challenges faced and opportunities. They also play an important role in the promotion of innovation, advisory and transfer to the different subsectors |
| **32** | Not applicable as we are not training in the field smart and sustainable farming education |
| **33** | Close relation with the core partners in the agrifood sector |
| **34** | Long history, thorough knowledge and strong skills in sustainable farming. Strong collaborations with research (within mixed research units with INRAE, in particular). Strong network of businesses in the whole farming and food sector. |
| **35** | students are aware of sustainability issues |
| **36** | High technicity of the institution, high level of expertise |
| **37** | good collaboration with professionals of the agri-food sector, strong link with research units, large panel of varied research and education topics, reactivity |