Addressing the current and Future skIll needs for sustainability, digitalization and the bio-Economy in agricuLture: European skills agenDa and Strategy

D2.2: Prioritized occupational profiles	
Document description	10 new occupational profiles, standardized for transferability
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1. Introduction

The objective of this task was to choose 10 profiles from those created in task 2.1 for further use in the context of this project. Since in task 2.1 only 10 profiles were created, it became obvious which profiles were required to be further developed in order to address the current and future skill needs for sustainability, digitalization and the bio-Economy in agriculture, so there was no longer a need to prioritise the profiles among themselves. Nevertheless, a methodology to rank the skills/knowledge in each profile was developed to be used in later stages of the FIELDS project.

Each defined occupational profile is composed of a set of skills and knowledge, some of them essential and others optional. These skills/knowledge were ranked as explained in section 2.

In section 3, the 10 profiles from D2.1 are presented, with the skills/knowledge evaluated according to the methodology described in section 2.

In Annex I, information stemming from FIELDS WP1, which has been used to support the evaluation of the occupational profiles, is presented.

2. Methodology

The ranking of skills and knowledge was based on a multi-criteria approach, in line with the following criteria (as already presented in the project description):
● **Criticality**. How the skill/knowledge is important to learn other skills and complete the occupational profile.
● **Impact**. How achieving a particular skill will positively impact the growth of the sector.
● **Time**. How much time it will take to achieve a skill through training activities.
● **Volume.** How many learners are potentially interested in the skill/knowledge.

Applying these criteria, each skill or knowledge was ranked either as: a) mandatory, b) important or c) nice to know, as described in table 1.

Table 1 – Criteria description to rank skills and knowledges

CRITERIA	Mandatory / Easiest to comply (for Time Criterion)	Important	Nice to know
Criticality	It is a core competence of the profile	Not a core competence, but important to complete the profile	Not important to complete the profile
Impact	It will have a strong impact on the growth of the sector	It will positively impact the growth of the sector	It will not impact the growth of the sector
Time	Short training time	Medium training time	Long training time

Volume	Major interest: There will be a high number of people interested in this skill	Medium interest: There will be a medium number of people interested in this skill	Low interest: There will be a low number of people interested in this skill

For each criterion except "time", the ranking of a skill/knowledge as "mandatory" means assigning a score of 3, "important" means a score of 2 and "nice to know", a score of 1.

For the "**time**" criterion, as it was considered a cost for participants, the decision was to classify it differently, as follows:

- easiest to comply: if it has a short training time (score: 1);

- important: if it has a medium training time (score: 2);

- nice to know: if it has a long training time (score: 3).

Following is described how the different criteria were evaluated:

- The classification of the criterion '**criticality'** was mainly based on the experience of consortium partners. To rank this criterion it was necessary to look at the whole profile and evaluate the importance of the skill/knowledge to complete that profile.
- The classification of the criterion '**impact'** was based on the results of task D1.8 (as shown in table A2. Identified trends in agriculture, forestry and food industry in Europe, in Annex I.1) and partners' contribution.
- The classification of the '**time'** criterion was based on the experience of consortium partners and the training time of comparable skills/knowledge in similar available training courses.

    It was considered that if the necessary time to learn the skill is:

    - less than 25 hours: it will be mandatory;
    - between 25 and 50 hours: it will be important;
    - more than 50 hours: it will be nice to know.
- The classification of the criterion '**volume'** is based on both the experience of contributing partners and the results of task 1.3 (focus groups) which are summarized in Annex I.2.

The prioritization of the profiles derives from the average of the score's classification of each skill/knowledge, no matter if it's optional or essential within the profile. Each skill or knowledge can be classified with the same weight, or with different weights regardless of whether it is optional or mandatory.

Concerning the soft skills and ICT Essentials skills (core digital skills and skills related to job safety: Safety of workers and health, Health and safety management), as these are common to all profiles, it was not considered as necessary to rank these skills in the profiles' prioritization process.

3. List of 10 new occupational profiles, with the skills/knowledges ranked

In this section, the classification of all skills/knowledge evaluated according to the methodology described in section 2, is presented for the 10 occupational profiles defined in D2.1 (EQF Level 4 and 5 Occupational Profiles).

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3.1 EQF Level 4 Occupational Profiles

3.1.1 Operator for bioeconomy in agriculture, food-industry and forestry

Operator for bioeconomy in agriculture, food-industry and forestry						
Essential Skills	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	**Without time**
Management of natural resources	3	2	2	2	5	7
Biomass production and transformation	3	3	2	2	6	8
Planning and coordinating production	2	2	2	2	4	6
Traceability	2	2	1	2	5	6
Efficient use of resources and logistics	2	3	2	2	5	7
Production, management of renewable energy and its use	2	3	2	3	6	8
By-products and co-products valorisation	2	3	2	3	6	8
Optional Skills	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	
Transportation & logistics implementation management	2	2	1	1	4	5
Application of circular economy and recycling practices	2	3	1	1	5	6
Essential Knowledge	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	
Bio-economy and circular economy principles	3	3	1	1	6	7
Biobased products and ecosystem services, re-use, recycling, nutrients circulation vs nutrients removal	3	3	2	2	6	8
Food waste reduction	2	3	1	2	6	7
Energy efficient production methods	2	3	2	3	6	8

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Knowledge about the forestry and agri-food production chain	3	2	2	2	5	7
Optional Knowledge	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	
Quality certification	2	2	2	2	4	6
New markets for bio-based products/construction/biomaterials	2	3	2	2	5	7

3.1.2 Operator for digitalization in agriculture, food-industry and forestry

Operator for Digitalisation in agriculture, food industry and forestry						
Essential Skills	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	**Without time**
Practical training with job-specific machinery/equipment and their maintenance	2	3	3	3	5	8
Use of robots/drones	2	3	2	3	6	8
Data handling and analysis, data exchange	3	3	2	2	6	8
Traceability	3	3	1	2	7	8
Weather forecast knowledge and tools	1	2	1	2	4	5
Optional Skills	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	
ICT: participation in peer groups / groups of same job area	1	2	1	1	3	4
E-commerce and e-marketing	1	3	1	3	6	7
Controlled environment for storage, heat/cold management	1	2	2	2	3	5
Essential Knowledge	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	
Knowledge of technical principles for digital agriculture, industry and forestry, smart systems and technologies introductory aspects	3	3	2	3	7	9
Basic remote sensing, GPS, GIS knowledge	2	3	2	2	5	7
Knowledge of Management Information Systems	3	3	1	2	7	8

	Criticality	Impact	Time	Volume	Overall	Without time
Knowledge about the forestry and agrifood production chain	2	2	2	2	4	6
Legal framework when using autonomous machinery	2	3	1	2	6	7
Industry 4.0	2	3	2	2	5	7
Circular manufacturing aspects	1	2	1	1	3	4
Optional Knowledge	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	
Knowledge of Decision Support Systems	1	2	1	1	3	4
Digital entrepreneurship	1	3	1	1	4	5

3.1.3 Operator for sustainability in agriculture, food-industry and forestry

Operator for sustainability in agriculture, food industry and forestry						
Essential Skills	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	**Without time**
Sustainable and multifunctional agriculture and forest management	3	3	2	3	7	9
Ecosystem services	3	3	3	3	6	9
Biodiversity, prevention and management of natural disturbances, adaptation and mitigation to climate change	3	3	2	2	6	8
Water management, management of natural resources	3	3	3	3	6	9
Soil nutrient health management	3	3	2	2	6	8
Traceability & food Production	2	3	2	2	5	7
Animal welfare	3	2	1	2	6	7
Optional Skills	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	
Crop protection, grassland management	2	3	2	1	4	6

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Weather forecast knowledge and/or tools	1	1	2	2	2	4
Essential Knowledge	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	
Renewable energy	2	3	2	3	6	8
Sustainable forest and agriculture management practices and planning	3	3	2	3	7	9
Environmental management aspects, GHGs' emissions reduction; climate change	3	3	2	2	6	8
Knowledge about the forestry and agri-food production chain	3	2	2	2	5	7
Standards and regulations	2	3	2	1	4	6
Optional Knowledge	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	
European environmental legislation/regulation, policies, subsidy and support programmes	1	2	1	2	4	5
Good agricultural practices: Crop diversification, conservation farming; agroforestry	2	2	2	2	4	6
Generational renewal	1	3	1	2	5	6
Sustainable Value Chains	2	3	2	2	5	7

3.2 EQF Level 5 Occupational Profiles

3.2.1 Technician for agricultural digitalization

Technician for agricultural digitalisation						
Essential Skills	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	**Without time**
Communication tools: peer groups for innovative farmers	2	2	2	3	5	7
Logistics management	3	2	1	1	5	6
Traceability, quality signs and labels	2	3	1	1	5	6
Weather forecast knowledge and/or tools	3	3	2	2	6	8
Digital entrepreneurship	1	3	2	1	3	5
Precision farming: remote sensing, GPS, GIS, Automated farming,	3	3	3	3	6	9
Pest control: Pest and diseases models and recognition from sensors, imagery, etc	3	3	3	3	6	9
Implementation of crop specific FMIS + Implementation of a data transfer system	2	3	2	2	5	7
Use of Field operation management systems	3	3	2	3	7	9
Implementation of livestock specific FMIS + Implementation of a data transfer system	2	3	2	2	5	7
Precision animal health system	3	3	3	3	6	9
Farmhouse platforms, local product online markets	1	3	2	3	5	7
Optional Skills	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	
Use of robots & drones	2	3	1	3	7	8
Arable crops: practical training with specific machinery (weeding machine, combined harvester)	1	2	3	3	3	6

	Criticality	Impact	Time	Volume	Overall	
Livestock farming: feeding optimisation, traceability, FIS, specific machinery (e.g. milking robot, autonomous feeding machine)	2	3	3	2	4	7

Essential Knowledge	Criticality	Impact	Time	Volume	Overall	
Knowledge about general agriculture principles (whole production chain)	3	2	3	1	3	6
General technical principles and options for digital agriculture	3	2	2	2	5	7
Legal framework for operating a farm	1	3	1	1	4	5
Legal framework when using autonomous machinery	1	2	1	1	3	4
Introduction to machinery with digitalisation tools; advantages and disadvantages of each available technology (assessment criteria)	2	3	2	2	5	7
Basic knowledge on GPS and GIS	3	2	2	2	5	7
Basic knowledge on FIS	2	3	2	2	5	7

Optional Knowledge	Criticality	Impact	Time	Volume	Overall	
Use of LCA tools (examples of commercial software tools)	1	2	2	1	2	4
Basic programming knowledge	2	2	2	1	3	5
Data analysis, data exchange	3	3	2	2	6	8
e-commerce	1	3	2	2	4	6

3.2.2 Technician for agriculture in bioeconomy

Technician for agriculture in bioeconomy						
Essential Skills	Criticality	Impact	Time	Volume	Overall	Without time
Planning and coordinating productions	3	2	2	3	6	8

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	Criticality	Impact	Time	Volume	Overall	
Performing farming operations in line with bioeconomy principles	3	2	2	2	5	7
Production techniques for non-food products (biobased products)	3	3	2	3	7	9
Industrial crops	2	3	1	2	6	7
Crop diversification and crop rotation	2	2	1	2	5	6
Production and Management of renewable energy	2	3	2	3	6	8
Organic productions techniques	2	2	2	3	5	7
Treatment and reuse of reclaimed water	2	3	2	3	6	8
Inorganic waste management practices	1	2	1	1	3	4
Agricultural valorisation of organic fertilizers	2	3	2	3	6	8
Management of slurry in livestock farms	2	3	3	2	4	7
Optional Skills	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	
Direct distribution and marketing skills	1	2	2	2	3	5
Controlled Environment Agriculture, horticulture, urban farming	1	3	2	2	4	6
Plant/animal breeding resilience	1	3	2	3	5	7
Essential Knowledge	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	
Bio-economy and circular economy principles	3	3	1	2	7	8
Basic environmental and climate change introduction	2	2	1	1	4	5
Biomass production	3	3	2	3	7	9
Biodegradable compostable materials	3	2	2	1	4	6
Reuse and recycling and valorisation of raw materials	3	3	2	3	7	9
Biodiversity	2	3	2	3	6	8
Optional Knowledge	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	

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Product traceability	2	3	1	2	6	7
Information & adoption about climate changes	1	2	1	1	3	4
Labelling of products/packaging	1	2	1	1	3	4
Food ethics	1	2	1	1	3	4

3.2.3 Technician for food-industry bioeconomy

Technician for Food-industry Bioeconomy						
Essential Skills	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	**Without time**
Quality management assurance control	3	3	3	3	6	9
Food safety management, hygiene and control	2	2	2	3	5	7
Continuous improvement	1	2	1	2	4	5
Production operations and management	2	3	2	2	5	7
Traceability	2	3	1	3	7	8
Food waste reduction	2	3	1	3	7	8
Product development	2	3	2	2	5	7
Optional Skills	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	
Development of new proteins and new protein fractions	1	3	1	3	6	7
Sustainable transportation & logistics management	1	3	2	2	4	6
Essential Knowledge	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	
Sustainability: food ethics , water reuse, side stream valorisation (from food industry, from farm) and co-products	3	3	3	3	6	9
Bio-economy and circular economy principles	3	3	2	3	7	9
Energy efficient production methods	2	3	2	2	5	7
Regulations, food security, labelling and ingredients, bioeconomy regulation framework	2	2	1	3	6	7

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	Criticality	Impact	Time	Volume	Overall	
Health & safety management (specific risks on top of the main curriculum)	1	1	1	2	3	4
Emerging technologies	1	3	2	3	5	7
Plant based food; biobased products	1	3	1	3	6	7
Biomass transformation	1	3	1	3	6	7
Packaging, bio-based food packaging	1	3	1	3	6	7
Renewable energy production and use	2	3	1	3	7	8
Optional Knowledge	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	
Energy efficiency	1	3	1	2	5	6
Carbon sequestration and carbon balance	1	3	1	2	5	6

3.2.4 Technician for food-industry digitalisation

Technician for food-industry digitalisation						
Essential Skills	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	**Without time**
Integration of information from FMIS	2	3	2	3	6	8
Data handling and analysis, data exchange	3	2	2	3	6	8
E-commerce and e-marketing	1	2	1	2	4	5
Logistics, warehousing, transportation	1	2	1	2	4	5
Decision Support System	1	1	3	1	0	3
Sourcing of raw materials and agricultural products	1	1	1	1	2	3
Circular manufacturing aspects / food industry 4.0	2	2	2	3	5	7
Optional Skills	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	
Big data handling and processing	1	2	2	2	3	5
Traceability/blockchain	2	3	1	3	7	8
Automated warehousing/robots	1	3	1	2	5	6
High-Tech logistics & transportation: robots, drones	1	3	2	2	4	6

	Criticality	Impact	Time	Volume	Overall	
Controlled environment for storage, heat/cold management	1	1	1	2	3	4
Digital entrepreneurship	1	3	1	3	6	7
Essential Knowledge	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	
Food processing, automated food processing	2	3	2	3	6	8
Packaging, automated packaging	1	2	1	2	4	5
Quality management	3	2	2	2	5	7
Optional Knowledge	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	
Food processing, reducing waste	1	2	2	2	3	5
Sustainable packaging	1	2	1	2	4	5
Sourcing of sustainable agricultural products	1	1	1	1	2	3

3.2.5 Technician for sustainability, digitalisation and bioeconomy in forestry

Technician for sustainability, digitalisation and bioeconomy in forestry						
Essential Skills	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	**Without time**
Sustainable and multifunctional Forest management	3	3	3	3	6	9
Ecosystem services	2	3	2	3	6	8
Biodiversity	3	3	3	3	6	9
Prevention and management of natural disturbances	2	3	2	2	5	7
Mitigation to climate change	1	2	1	2	4	5
Water management	2	3	2	2	5	7
Management of natural resources	3	3	3	3	6	9
Production and extraction of Products of forestry	2	3	2	2	5	7
By-products and co-products valorisation	2	3	1	3	7	8

	Criticality	Impact	Time	Volume	Overall	
Soil nutrient health management	3	3	2	3	7	9
Reforestation, afforestation & restoration of forest ecosystems	3	3	2	2	6	8
New markets for bio-based products/construction/biomaterials	2	3	1	2	6	7
Protection against fires/fire detention	2	3	2	2	5	7
Forest disease control and prevention	2	3	2	2	5	7
Forest equipment/machinery and maintenance	3	2	2	2	5	7
Optional Skills	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	
ICT: participation in peer groups / groups of same job area	2	1	2	3	4	6
Implementation of Forest Management Information Systems	2	3	3	2	4	7
Use of robots/drones	1	1	1	1	2	3
Wood processing, heat generation & services	2	2	2	1	3	5
Practical training with specific machinery	2	1	3	2	2	5
Essential Knowledge	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	
Knowledge of general forestry principles	3	3	2	2	6	8
Knowledge of technical principles for digital forestry; Forestry smart systems and technologies introductory aspects	3	3	3	3	6	9
Basic GIS knowledge, precision forestry knowledge	2	3	3	3	5	8
Basic forestry legislation (national and EU)	3	1	1	3	6	7
Process operations	3	2	1	1	5	6
Weather forecast knowledge and/or tools	1	2	1	1	3	4
Wood technology	2	1	2	1	2	4
Renewable energy	2	3	1	2	6	7
Sustainable forest management practices and planning	3	3	2	3	7	9
Climate change-resilient and stress-tolerant forests	3	3	2	3	7	9
Biomass production and transformation	3	3	1	1	6	7
Biobased products and ecosystem services, re-use, recycling and valorisation of raw materials, by-	3	3	2	3	7	9

products and waste, nutrients circulation vs nutrients removal						
Knowledge of Forest Management Information Systems	3	2	2	2	5	7
Optional Knowledge	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	
European environmental legislation/regulation	1	2	1	3	5	6
Environmental policies, regulation, subsidy and support programmes	1	2	1	3	5	6
LCA aspects	2	1	1	1	3	4
New technologies in pulp and paper manufacturing	2	2	2	1	3	5
Knowledge of Circular economy; application to Circular economy and recycling in the pulp and paper industry	1	2	1	1	3	4
Residues and industrial side new technologies in pulp and paper manufacturing	1	2	1	1	3	4
Use data analytics	3	2	3	2	4	7
Knowledge of Decision Support Systems	2	1	2	1	2	4
Urban green spaces/forests	2	2	2	3	5	7

3.2.6 Technician for sustainable Agriculture

Technician for sustainable Agriculture						
Essential Skills	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	**Without time**
Soil health management	3	3	2	3	7	9
Crop rotation and new crop technics	3	3	2	3	7	9
Water/groundwater management	3	3	2	3	7	9
Adaptation and mitigation to climate change	3	3	2	3	7	9

	Criticality	Impact	Time	Volume	Overall	
Efficient use of resources; Waste prevention and valorisation of by-products	3	3	2	3	7	9
Agri-environmental practices	3	3	1	3	8	9
Low emission spreading/spraying equipment and practices	2	3	2	3	6	8
Integrated pest and disease management	3	3	3	3	6	9
Sustainable feed sources and animal nutrition (sustainable sourcing, reducing emissions)	3	3	2	2	6	8
Energy management: energy efficiency and renewable energy	3	3	2	3	7	9
Optional Skills	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	
Minerals and emission accounting	1	2	1	2	4	5
Zero waste management practices	2	3	2	3	6	8
Corporate social responsibility	1	3	2	2	4	6
Renewable energy production: generation, storage and use of renewable energies	2	3	2	2	5	7
Precision animal health	1	3	1	2	5	6
Slurry management and valorisation	2	3	2	2	5	7
Ecommerce and short supply chains	1	3	2	2	4	6
Essential Knowledge	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	
Good agricultural practices: crop diversification, conservation farming, agroforestry, biodiversity, crop protection, grassland management	3	2	3	2	4	7
Circular economy: Traceability and LCA aspects	1	2	2	2	3	5
Environmental management aspects; GHGs' emission reduction, climate change	2	2	2	2	4	6
Legislation regarding the issue of water, protected areas, sustainable land use measures and regulatory framework and environmental licensing	2	2	2	2	4	6

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	Criticality	Impact	Time	Volume	Overall	
Smart farming introductory aspects	2	3	1	3	7	8
Soil nutrients and fertility	2	3	2	2	5	7
Work/Life Balance	2	1	1	2	4	5
Optional Knowledge	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	
Indoor vertical farming (horticulture)	1	3	1	2	5	6
Animal welfare, well-being and health	2	3	2	3	6	8
New grasslands such as mixed species swards	2	2	1	2	5	6
Weather forecast knowledge and/or tools	2	3	2	2	5	7
Generational renewal	1	2	1	1	3	4

3.2.7 Technician for sustainable food-industry

Technician for Sustainable Food Industry						
Essential Skills	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	**Without time**
Efficient use of resources: Water treatment and reuse, Waste prevention and valorisation of by-products; Energy efficiency (Generation, Storage and use of renewable Energies)	2	3	2	3	6	8
Sustainable Packaging: sourcing and efficient use of materials, reusability/recyclability, eco-design, life cycle	1	3	1	3	6	7
Manufacturing technologies: energetic optimisation of production plants - optimisation of manufacturing processes; industry 4.0; lean manufacturing; Preventive maintenance	3	2	3	2	4	7
Sustainable origin of raw material (Sustainable sourcing / efficient use of resources)	2	3	1	2	6	7
Optional Skills	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	
LCA digital tools	1	2	1	3	5	6

Environmental Management Systems	2	3	2	2	5	7
	Criticality	**Impact**	**Time**	**Volume**	**Overall**	
<u>Sustainability</u>: Climate Change; GHGs; Water management	3	3	2	3	7	9
<u>Circular economy</u>: Circular manufacturing / Industry 4.0 aspects;	2	3	2	3	6	8
Traceability & Food Production; Food waste reduction	2	3	2	3	6	8
Improved agri-food production (energetic optimisation of production plants - optimisation of manufacturing processes); Logistics; Sustainable metrics (KPIs); Labelling	2	2	3	2	3	6
Consumer Trends / Demands	1	2	1	2	4	5
General legal framework for industry, environmental licensing	1	2	1	2	4	5
Optional Knowledge	**Criticality**	**Impact**	**Time**	**Volume**	**Overall**	
Corporate Social Responsibility	1	2	1	2	4	5
Sustainable Value Chains	2	3	1	3	7	8

4. Final remarks

This ranking exercise will support the structure and organization of the training modules in the next steps of the project. It can also be useful in future tasks of the project.

● Annex I. Support information

● Annex I.1. Information obtained from Deliverable 1.8 to measure the criterion **impact** of the skills/knowledge in the sector

Table A.2 - Identified trends in agriculture, forestry and the food industry in Europe Source: FIELDS' Deliverable 1.8

Identified trends in Agriculture, Food industry and Forestry	
Sustainability	**Agriculture:** Integrated pest management, Integrated nutrient management, Agriculture pollution and GHG emissions, Organic farming and extensive production systems, Animal welfare, Scarcity of natural resources (land, nutrients), Pressure on water resources, Biodiversity and conservation of eco-systems, Food waste and loss, **Forestry:** Large scale forest disturbances (droughts, heat waves, etc.), Impact of climate change on tree species and biomass characteristics, Biodiversity challenges, Illegal logging, Fragmentation of ownership, Health and safety challenges **Food Industry:** Technologies to deal with food waste and loss, Circular production, Energy efficiency, Environmental footprint, Smart logistics systems, Clean and ''green'' label, Consumer diets
Bio-economy	**Agriculture:** Biomass production and transformation, Renewable energy, Biobased products, Resource-efficient technologies and reduction of losses, Circularity of production, Biodiversity **Forestry:** Biomass production and transformation, Renewable energy, Biobased products and eco-system services, Increasing demands for wood, Urban green spaces/forests **Food Industry:** Use of food waste, Circular production, Energy efficiency, Biomass transformation, Bio-based products, Bio-based packaging, New proteins

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Digitalisation	**Agriculture:** On-farm applications (combined technologies), Integrated FMIS, Big Data analysis and Agriculture 4.0, Traceability of produce, Supply Chain information systems, New customer relationships
	Forestry: In-forest applications (combined technologies), Mechanised harvesting, Timber transport and traceability, Forestry management information systems
	Food Industry: Food processing control, Food supply-chain monitoring, Factory design and industry 4.0, Robotics, Digital twins and augmented reality, 3D Printing/additive manufacturing, New technologies in processing and packaging,
Business Models	**Agriculture:** Changes in farm structure, Multi-functional farms, Urban farming and Indoor cultivation systems, Health and food consciousness of consumers, Traceability, Short food supply chains and Local/regional products,
	Forestry: Economic importance of forests, Urban green spaces, Fragmented ownerships, Lack of forest entrepreneurships, Weak infrastructure and technology
	Food industry: Complex consumer demands and new diets, Interaction with consumers, New logistics and e-commerce, Short food supply chains, Novel foods, New packaging

● Annex I.2. Information obtained from Task 1.3 to measure the criterion **volume** of the skills/knowledge in the sector

The first column of the table below indicates the number of times each skill was included in the top 10 rankings during the focus groups of FIELDS' task 1.3. It was considered, for the present task, that a greater number of references to a particular competence would correspond to a greater interest in having training in that competence.

Table A3 – Number of times that skills related with sustainability were referred in the focus group of task 1.3

Sustainability Skills	
29	Mitigation and adaptation to climate change incl.
24	By-products and co-products valorisation
20	Good Agricultural Practices
18	Efficient use of resources and logistics
18	Soil Nutrient and Health Management
17	Water management

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13	National, EU and international environmental policies, regulation, subsidy and support programmes
11	Active management of natural resources
10	Generation, storage and use of renewable energies
9	Corporate social responsibility associated with sustainability reporting/press releases
8	Biodiversity
8	Multifunctional forests and ecosystem-services
6	Improved agrifood system productivity
6	Sustainable metrics and certification
5	Integrated pest management
4	Environmental Management Systems (EMS)
3	Identification of renewable energy systems suitable for the farm / business enterprise
2	Impact of timber harvesting and other forest management practices in wildlife populations and habitats
1	Identification of energy consumption and demand on the farm / business enterprise
1	Analysis of contaminants
0	Identification of raw materials and waste for energy production in the farm/business enterprise
0	National and EU Energy Market
0	Protective role of forests and their management in mountainous areas
0	Organic production requirements
0	Sustainable packaging
213	**TOTAL**

Table A.4 – Number of times that skills related with digitalization were referred in the focus group of task 1.3

Digitalisation Skills	
33	Everyday usage of digital technology to communicate
18	Data handling and analysis
13	Farm Management Information Systems (FMIS)
9	E-commerce and e-marketing
7	Field operations management systems
6	Digital information and services
6	Robot and drone technology
5	Data protection
5	Smart connected devices
5	Decision support systems (DSS)
5	Digital irrigation control systems
3	Digital entrepreneurship
3	Warehouse management systems
3	Digital food traceability systems
3	Digital pest control systems
2	Precision animal health and productivity management systems
2	Robot and drone technology in agriculture

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1	Cloud technology
1	Weather data management systems/software
1	Climate control systems
0	Digital supplier management systems
0	Digital product quality management systems
0	Digital reversed logistics systems
0	Digital soil nutrient control systems
131	**TOTAL**

Table A.5 – Number of times that skills related with bioeconomy were referred in the focus group of task 1.3 in relation to agriculture

Bioeconomy - Agriculture	
12	Planning and coordinating production
12	Conventional versus /and Organic farming
10	New industrial crops and bioproducts for the bioeconomy
9	Performing farming operations
8	Calculating, handling and managing risk
8	Livestock efficiency/ management/ biosecurity
7	Crop diversification and rotation
6	Product traceability
4	Logistics and storage
4	Urban, peri urban and rural area agriculture
4	Agricultural biodiversity
3	Controlled Environment Agriculture
3	Genetically Modified Crops
3	Plant and animal breeding for resilience and robustness
2	Equipment maintenance
2	Health and safety management and operations
2	Plant new breeding techniques
2	Animal care and animal welfare during transport and production
2	Integrated pest/disease management
1	Biofertilizers, compost, bio digestates
1	Crop protection
105	**TOTAL**

Table A.6 – Number of times that skills related with bioeconomy were referred in the focus group of task 1.3 in relation to food industry

Bioeconomy – Food-Industry	
12	Quality management, quality assurance and quality control
7	Ethics for food
4	Food safety management, food hygiene and food safety control

4	Continuous improvement
4	Food security
3	Production operations and management
3	Transportation (modalities and planning) & logistics management
3	Traceability
3	Emerging technologies
2	Health & safety management
2	Risk assessment and management
2	Food fraud
1	Engineering maintenance
1	Supply to production and supplier management
1	Management of inventories
1	Food Labelling/Certifications
0	Cleaning and preparation
0	Preservation and packaging
0	Shop floor control and other control operations
0	Food defence
53	**TOTAL**

Table A.7 – Number of times that skills related with bioeconomy were referred in the focus group of task 1.3 in relation to forestry

Bioeconomy - Forestry	
20	Sustainable forest management practices and planning
7	Forest disease control and prevention
6	Prevention and management of natural disturbances
4	Reforestation, afforestation and restoration of forest ecosystems
4	Products of forestry
4	Safety and health in the pulp, paper, timber and cork industry
3	Forest equipment/machinery and maintenance
3	Calculating, handling and managing risk
2	Health and safety management and operations
2	Process operations in the pulp, paper, timber and cork industry
1	New technologies in pulp, paper, timber and cork manufacturing
1	Water quality in forests
0	Characteristics of forests, geographical differences and ownership patterns
0	Equipment/machinery and maintenance in the pulp, paper, timber and cork industry
0	Automation in the pulp, paper timber and cork industry
0	Seedling damages
57	**TOTAL**