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Authors	
Main author name	Organization
Efstathia Koitsanou	UTH

Reviewers	
Reviewer name	Organization
XXXXXXXXXX	XXXXXXXXXX

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Glossary of Key Terms

The following terms and acronyms are used throughout this document. Readers who are new to European qualification frameworks are encouraged to consult this glossary before proceeding.

Term / Acronym	Definition
ACE-EX	Agriculture Circular Economy Expert – the Erasmus+ project and the qualification it develops.
CE	Circular Economy – an economic model that eliminates waste and continually reuses resources.
ECTS / CFU	European Credit Transfer and Accumulation System / Credit Formative Unit – units used to quantify learning workload in European higher education.
EQF	European Qualifications Framework – a common European reference framework that links different countries' national qualifications systems.
HEI / HE	Higher Education Institution / Higher Education – universities, polytechnics, and other post-secondary academic institutions.
LCA	Life Cycle Assessment – a methodology for evaluating the environmental impact of a product, process, or service throughout its lifecycle.
MOOC	Massive Open Online Course – an online course aimed at unlimited participation and open access.
NEET	Not in Education, Employment, or Training – a category of young people not engaged in any of these activities.
RPL	Recognition of Prior Learning – a process that identifies, assesses, and accredits knowledge, skills, and competences acquired through formal, non-formal, and informal learning.
SDG	Sustainable Development Goals – the 17 global goals established by the United Nations as part of the 2030 Agenda for Sustainable Development.
SKILLSCOURSES	The online MOOC platform hosting ACE-EX training content: https://skillscourses.eu/ace-ex/
SME	Small and Medium-sized Enterprise.
VET	Vocational Education and Training – education and training that equips people with the knowledge, skills, and competences required in particular occupations.
VR	Virtual Reality – in the ACE-EX context, refers to 2D interactive PC-based simulations (not head-mounted display experiences). No VR headsets are required.

1. Introduction

1.1 Purpose of this Document

The purpose of the present document is to serve as a practical guide for Vocational Education and Training (VET) providers and Higher Education Institutions (HEIs) to implement, adapt, and enrich the suite of training tools and programmes developed within the ACE-EX project. It aims to translate the intellectual outputs of the project, such as the Training Programmes, VR experiences, and Serious Game, into actionable steps for educators and administrators. The guidelines aim to ensure the effective deployment, contextual relevance, and long-term sustainability of the "Expert in applying Circular Economy processes in agriculture" training across diverse educational settings in Europe and beyond.

This document is structured into two main implementation sections, one for VET providers and one for HEIs, each following the same logical structure: curriculum integration, step-by-step implementation roadmap, deployment of digital tools, technical requirements, localisation strategies, assessment and RPL guidance, and quality assurance. Institutions may read only the section relevant to them or read both sections if they operate across both sectors.

1.2 The ACE-EX Project

The ACE-EX project was funded in 2023 by the Erasmus+ Programme with Project n. 101110547. ACE-EX project provides a multidisciplinary profession, the "Expert at applying Circular Economy processes in agriculture" and tools to guarantee quality of training, recognition, transferability and exploitation, guaranteeing a practical use of the knowledge in all EU contexts. The Expert guides agricultural and industrial enterprises towards more sustainable and environmentally friendly practices.

The project offers a contribution to the transformation of European agriculture through the integration of Circular Economy principles to promote a sustainable and environmentally friendly agricultural production model. The project is perfectly harmonious with the European Green Deal directives. It aims to minimise environmental impact, train highly qualified experts, engage in the fight against climate change and promote environmentally friendly economic growth. ACE-EX emphasises the importance of constantly updating skills in the agricultural and industrial sectors to keep pace with technological developments and the challenges imposed by climate change.

1.3 Project Background

ACE-EX acts in a context in which agricultural innovation plays a crucial role in responding to the challenges imposed by climate change and the need to protect biodiversity. The current method of agricultural production must use by-products to their full potential and necessitate a shift towards a more sustainable system. Projections underline the urgency to act by 2050: the impact of a failure to change current production methods could also translate into many lives lost each year.

In the face of rapid technological and climatic change, constantly updating the skills of those working in the sector is essential. ACE-EX emphasises the importance of the Circular Economy, a practice embraced in agriculture and industry and a driving force for professional training. It aligns with the Action Plan for the Circular Economy and the European Green Deal objectives, promoting sustainable and respectful economic growth. It recognises and addresses the issues of the small business sector, highlighting the need for specialised curricula to facilitate the adoption of Circular Economy practices.

The consortium's perspective focuses on the importance of designing innovative and targeted professional curricula that promote the adoption of circular and sustainable practices in the day-to-day activities of enterprises.

1.4 General Objectives

The overall objective of ACE-EX is to support the transition of the agricultural and industrial sectors towards Circular Economy practices, aligning with the European Green Deal guidelines for sustainable growth and actively contributing to the fight against climate change. It aims to support the agricultural and industrial sectors in the transition towards a Circular Economy and to facilitate the transition to 'green' chemistry by utilising and valorising agricultural waste, refuse and by-products. The project promotes high-quality, interactive, multidisciplinary training that encourages an innovative, sustainable, smart entrepreneurial mindset. It supports learners in developing skills, including digital skills, that are easily applicable in different sectors and thus represent an asset in their professional careers.

1.5 Specific Objectives

The project targets 4 Specific objectives:

1. To upskill professionals working in the agriculture and industrial sector, specifically production of oil, wine and cereals, in the reuse of agricultural production waste/surplus for the production of new business products and/or innovation of business processes by developing an innovative and multidisciplinary curriculum, also through V/R modules.
2. To provide Open Access and flexible training for a certification EQF 4 and 5, accessible virtually from professionals located in at least 9 EU and extra-EU countries, guaranteeing sustainability of contents, constant update and scalability to an EQF 6 Master. Developing horizontal digital and green skills applicable to other professional sectors.
3. To guarantee procedures for the RPL of professionals and link these arrangements with national accreditation authorities.
4. To certify experts at applying CE in agriculture by developing professional skills that, on one side, enhance individuals' employability and, on the other, are highly beneficial for agricultural firms, particularly wine, oil and cereals, since they provide them with the concrete opportunity of applying and benefit from CE practices.

1.6 Expected Results

ACE-EX works to renew the European agricultural and industrial sector by stimulating the assimilation of skills related to sustainable methodologies and the Circular Economy. The results the project pursues derive from an interdisciplinary method combining innovation, training and cooperation.

With the joint action of its international partners, ACE-EX is realising a training pathway that incorporates state-of-the-art technologies to address environmental challenges, promote sustainability and enhance the skills of professionals in the agricultural and industrial sectors, outlining a more efficient and sustainable future for the entire industry.

1. **Report on Circular Economy Practices:** The research examines in detail the current practices and needs of the agricultural and industrial sectors, with a particular focus on the concepts of Circular Economy and sustainability; it also carries out a critical evaluation of the educational offerings provided by the partners to identify specific improvements that meet the needs of the target audience. The report highlights deficiencies in existing training programmes, suggesting the introduction of new training modules that can fill these gaps, thus ensuring a more extensive and meaningful educational outcome.
2. **ACE-EX Qualification Matrix:** The Matrix of Qualifications is a crucial tool that defines the training standards for Circular Economy Specialists in the agricultural and industrial sectors. The matrix, developed through intensive collaboration, details the core competencies for EQF levels 4 and 5,



providing an indispensable reference point for trainers and practitioners. The document will be accessible in English and the nine partner countries' languages to ensure international availability.

3. **Training Programme:** A cutting-edge training programme that embraces different subject areas, interweaving theoretical and applied elements through state-of-the-art teaching technologies. The curriculum aims to equip professionals with the skills required to implement the principles of the Circular Economy within the agricultural sector, thus contributing to increased sustainability and efficiency. The teaching material will be available in English and the partner countries' languages for a total of ten language versions.
4. **Virtual Simulation:** An advanced Serious Game that employs immersive simulations and interactive scenarios to educate learners on the importance and modalities of transforming and valorising agricultural by-products into renewable resources. Using virtual reality to enrich the experience, the Serious Game intensifies learner engagement and ensures a deep, lifelong learning process. The game will be in English and the languages of the partner countries, thus ensuring international dissemination.
5. **ACE-EX Certification:** The certificate formally recognises completion and success in the ACE-EX training programme. The certificate enriches the professional profiles of participants, highlighting their specialised skills in Circular Economy. Recognition is essential to promoting sustainable and innovative agricultural and industrial practices.
6. **ACE Brand:** The ACE brand represents an innovative commitment to sustainable development, designed to be adopted by companies implementing Circular Economy processes through the ACE-EX training programme. The ACE Brand represents a benchmark in adopting sustainable practices and investment in human capital, emphasising the importance of a holistic approach to sustainability that values both the environment and the professional development of workers.
7. **MOOC platform with training modules:** Adopting a MOOC platform to distribute training content makes training accessible to a broader audience, overcoming geographical and language barriers. This strategy ensures that fundamental knowledge and innovations in the Circular Economy reach professionals and students worldwide, stimulating a global educational impact.

1.7 Project's applicant and consortium

ACE-EX has a prestigious partnership of 20 organisations, representing 9 European countries and over 200,000 companies.

The ITS Nuove Tecnologie della Vita (New Life Technologies) is the project applicant. It is the only Higher Technical Institute in the chemical field in Italy and trains professional technicians in strategic technological areas for economic development and competitiveness, particularly in the chemical, pharmaceutical, nutraceutical, environmental and elastomer sectors.

The project consortium includes	
1.	Wiener Institut Für Arbeitsmarkt-Und Bildugsforschung, Austria
2.	European Chemical Regions Network, Belgium
3.	Stredni Prumyslova Skola Chemicka Brno, Czechia
4.	Panepistimio Thessalias, Greece
5.	Epimelitirio Fthiotidas, Greece
6.	Opencom Issc, Italy
7.	Confederazione Generale dell'Agricoltura Italiana, Italy
8.	Beauty & Business Spa, Italy
9.	Softcare Studios Srls, Italy
10.	European Masters of Skilled Crafts, Norway
11.	Nti-Mmm As, Norway
12.	Innlandet Fylkeskommune, Norway
13.	Centrum Kooperacji Recyklingu – Not-for-profit System Sp Zoo, Poland
14.	Camara Oficial de Comercio, Industria, Servicios y Navegación de Valencia, Spain
15.	Ainia, Spain
16.	Fundación del Patrimonio Natural de Castilla y León, Spain
17.	IES Federico García Lorca, Spain
18.	National Qualifications Agency, Ukraine
19.	Simon Kuznets Kharkiv National University Of Economics, Ukraine

2. Target Groups

The project considers the current circumstances in Circular Economy Practices in agriculture and recognises the lack of a specific Framework of competences for the sector. While it appears that the concept of circular economy is starting to be known and widespread, the skills and human resources to apply it are lacking. This is the gap that our project aims to reduce. In our opinion, today more than ever, circular economy is a recovery opportunity and a challenge at the same time. In order to be able to enjoy its benefits, it needs to be supported by updated skills and by an innovative entrepreneurial mindset.

The general objective of the project is to support the agriculture sector's transition to a circular economy, fostering its compliance with the European Green Deal standards, its sustainable development and its contribution to fighting climate change. The Project aims to promote quality, multidisciplinary and interactive training. The Project also aims to promote an innovative, sustainable and smart entrepreneurial mindset, supporting students in the development of skills – including the digital ones - that are easily applicable to several other sectors, thus representing a career value for their professional life.

The main target groups and potential beneficiaries of the ACE-EX project are:

- Professionals working in the agriculture/ industrial sector, specifically in the production of oil, wine and cereal
- Professionals working in the production of new business products and/or innovation of business processes
- Students
- NEETs
- Agricultural Companies

The EQF levels that represent the target groups that will be considered for the project will be according to the European Union classification of qualifications and appear as follows (<https://europa.eu/europass/en/description-eight-efq-levels>):

Level 3: Knowledge of facts, principles, processes, and general concepts, in a work or study field; A range of cognitive and practical skills required for the accomplishment of tasks and solving of problems by selecting and applying basic methods, tools, materials, and information.

Level 4: Factual and theoretical knowledge in broad contexts within a field of study or work; A range of cognitive and practical skills required to conceive solutions addressed to specific problems in a field of work/study.

Level 5: Comprehensive, specifically designed, factual, and theoretical knowledge within a field of work/study that harbours an awareness of the limits of that knowledge; A comprehensive range of cognitive and practical skills required for developing creative responses to abstract problems.

Level 6: (Honours Bachelor): In-depth knowledge of a specific work/study field that demands an ever-involving critical comprehension of theories as well as principles and advanced skills, while demonstrating mastery and innovative spirit, for the tackling of complex and unpredictable problems that require a more specialised overview in certain fields of work/study.

Level 7: (master's degrees, postgraduate certificates, and diplomas): Sophisticated knowledge, where

it takes part at the forefront of learning in a field of work or study that underpins the capacity for original thinking and research; Development of critical awareness and particular problem-solving skills that are required in research and innovation that aims to develop new knowledge and procedures.

Level 8: (Doctorate degrees, PhDs): Knowledge that appears at its most advanced state of a field of work or study and at the juncture between fields and the most advanced and specialised skills and techniques that include the synthesis and evaluation, which are required for solving critical problems in research for the enlargement and redefinition of the existing professional practices.

The developed training programmes will focus on EQF4, EQF5 and EQF6. In particular, the activities will follow these directions:

- The design of a Technical Training Course EQF 5 Expert at applying circular economy processes in agriculture. This Course will contain modules as Math, Green Chemistry, Chemical plants, Production of Secondary raw material already designed and a New Innovative modules, to obtain a recognition of Credits for future EQF-6 Master of Skilled Crafts on Circular Economy in Agriculture on the following Macro area: a) Circular Economy Principle: Processes, Life Cycle assessment; b) Entrepreneurial mindset/ Digital skills / Soft skills/ Resilient skills; c) Circular Economy and Agriculture: focus on the re-use of waste/ surplus from Vinery; Oil and Cereal Sector; d) Application of circular economy practices: Cosmetic and Nutraceutical fields; Biopolymers also in 3D printing; Biofertilizers and Biogas. The idea is to develop at least 15 new modules.
- The design of a Training Course EQF 4, on Circular Economy principles, adapting the contents developed.
- The development of specific modules for the re-skilling of the agriculture workforce and students using the Micro-credential system to satisfy the different needs (8hours/ 16 hours), in the mentioned area (at least 20 modules).

1. The development of a library of virtual reality (VR) experiences designed to replicate specific industrial processes involved in the processing of raw materials (oil, wine, etc.), based on the standard methodologies used by the selected industrial partners.

2. The development of a SERIOUS GAME that will attract many people and will improve awareness of the importance of Circular Economy in the Agriculture field.

3. The realisation of n. 3 videos with testimonials on the new experience of the Circular Economy applied in Agriculture

- The development of Guidelines for implementation for VET and Universities
- The training programmes' results that would guide the participants of the mentioned target groups in achieving the desirable skills and competences, as seen here:

Target Group	Expected Results
Students/ NEETs/ Agricultural Companies; Chambers of Commerce	Training Programme
Modules V/R	Students/ NEETs/ Agricultural Companies;
Serious game	Students/ NEETs/ Agricultural Companies
MOOC – pilot /certification process Students/ NEETs/ Agricultural Companies	Students/ NEETs/ Agricultural Companies

3. Project Outputs

As mentioned before, the main educational project outputs are the Training Programmes, Virtual Stimulation and Serious Game.

The Training Programmes include courses, modules, and lessons across various subject areas, blending theoretical and practical elements and using cutting-edge teaching technologies. The courses aim to develop professionals' skills needed to apply the principles of the Circular Economy in the agricultural sector, thereby enhancing sustainability and efficiency. The teaching materials are available in English and in the languages of partner countries, totalling ten language versions, and can be accessed as an OR on the SKILLSCOURSES training platform. Participants can register for and complete any course they choose and earn the ACE-EX Certificate.

The Virtual Simulation is an advanced Serious Game that uses immersive simulations and interactive scenarios to educate learners on the importance and methods of transforming and valorising agricultural by-products into renewable resources. By incorporating virtual reality to enhance the experience, the Serious Game boosts learner engagement and promotes deep, lifelong learning. The game will be available in English and the languages of the partner countries, ensuring international dissemination.

3.1 Training Programmes

The ACE-EX project supports the view that there is an urgent need to invest resources in education aimed at training individuals who can support the practical implementation and application of the circular economy within agricultural and industrial sectors. The training programmes developed during the project focus on competences, knowledge, and skills at EQF levels 4 and 5, with the potential to be further developed to EQF level 6. While the theoretical concept seems to be gaining widespread recognition, the same cannot be said for its practical applications and the specific business opportunities it presents. New and updated skills across all EQF levels are essential to address the challenges posed by climate change and the global market, particularly in small and medium-sized enterprises.

Training programmes were designed at two primary EQF levels, with explicit scalability to EQF 6:

- EQF 4: Foundational course (40–60 hours) covering CE Principles across five modules and targeting agricultural workers, farm technicians, and SME employees.
- EQF 5: Specialist qualification (180–360 guided learning hours, 1–2 semesters) targeting farm managers, junior agronomists, professionals with EQF 4 or relevant experience.
- EQF 6 (Pathway): The EQF 5 modules were explicitly designed for scalability into a Master of Skilled Crafts programme (Professional Bachelor). ITS, UTH, and KHNEU have jointly verified this scalability pathway.

In this context, the ACE-EX Training Programmes developed represent four key pillars of the project:

- A. Circular Economy Foundations
- B. Innovation and Business Development
- C. Organisational and Transversal Competences
- D. Technical and Sector-Specific Skills

The Training Programmes Developed can be seen in the following table:

Pillar	Topics Covered	EQF Levels
A – Circular Economy Foundations	CE Principles, Life Cycle Assessment, Regulatory Framework	4 & 5
B – Innovation & Business Development	Innovation Management, Business Model Adaptation, Marketing & Communication	4 & 5
C – Organisational & Transversal Competences	Organisational Skills, Leadership, Project Management, System Thinking, Change Management, Stakeholder Engagement, Resilience	4 & 5
D – Technical & Sector-Specific Skills	Energy Efficiency, Water Management, Waste Management, Biochemistry, Biogas, Biofertilizers, Nutraceuticals, 3D Printing, Technology & Resource Recovery, Agricultural Soil	5

All training materials are available on the SKILLSCOURSES platform <https://skillscourses.eu/ace-ex/> in 8 languages: English, Italian, Spanish, Greek, Czech, Polish, Ukrainian, and French.

3.1.1 Development of Learning Outcomes

During WP3, a Competence Matrix for the Agriculture Circular Economy Expert was developed. This document outlined the learning outcomes that the partnership has agreed to constitute the main aspects of the Agriculture Circular Economy Expert. The document consisted of two competence matrices with nine units each. Most of the content was provided through the work done in Work Package (WP) 2. The qualification matrices are based on the European Qualification Framework (EQF), using learning outcomes covering responsibility and autonomy, knowledge and skills. The learning outcomes acted as a part of the basis for the training programmes developed in WP 4, which is why there are two matrices, one for EQF level 4 and one for level 5. In addition to the learning outcomes.

During the development of the matrices, the Learning Outcomes were defined as they were the building blocks. For the Ace-Ex learning outcomes, the learning outcomes described from the Needs analysis were used first. This work outlined all the main areas of competence for the Expert. Based on this report, it was possible to extract all the units and most of the learning outcomes.

The Units of the Learning Outcomes (9) were organised based on their similarity or relevance to one another. For more information about the Learning Outcomes, please read the Competence Matrix document.

The main use of such a matrix is to create training programmes. One can use the units as a basis for modules and each learning outcome for lessons. Of course, the teaching material has to be adapted to the specific use, but the matrix can be a source of inspiration. More importantly, the matrix is crucial for the assessment procedure. A learner who has finished a training programme based on this matrix will have to have apprehended each learning outcome. Therefore, using the learning outcomes for assessment would ensure that all is covered.

Because the learning outcomes are statements of what a learner knows, they are excellent for the recognition of prior learning. This means that they can be used for self-assessment procedures,

validation of prior learning, proof of informal or non-formal learning, etc. In these cases, the “learner” will just have to use the learning outcomes as proof of competence, without having to go through formal learning procedures. In the Ace-Ex project, the matrices were used as a framework for the development of the training programmes.

Learning Outcome Overview (EQF5)

U1 Circular economy principles 1.1: Communication and implementation of principles 1.2 Raising awareness and facilitating knowledge-sharing 1.3: Marketing and communication skills	U2 Innovation management 2.1: Innovation and implementation of practices 2.2: Creativity and teamwork	U3 Transversal skills 3.1: Interdisciplinary research skills 3.2: Project management 3.3: Data management 3.4: Sustainability Reporting and System Thinking 3.5: Risk Management 3.6: Change Management
U4 Technical skills 4.1: Implementing circular economy practices 4.2: Digital skills 4.3: Water management 4.4: Regenerative agriculture techniques 4.5: Agronomy, soil science, and engineering 4.6: Life cycle assessment 4.7: Waste management	U5 Regulatory frameworks 5.1: International cooperation 5.2: Supportive policies and incentives 5.3: Navigating policies at local, national and international levels 5.4: Adopting circular economy practices	U6 Implementing new business models 6.1: Resilience and diversification 6.2: Communication and partnerships 6.3: Strategic leadership 6.4: Implementation and sharing 6.5: Safety at work 6.6: Stakeholder engagement

U7 Energy Efficiency	U8 Organisational adaptations	U9 Benchmarking
7.1: Sustainable Energy Practices 7.2: Technology Integration 7.3: Adaptation to Energy Market Conditions	8.1: Passion and Motivation 8.2: Youth Engagement 8.3: Emotional Investment	9.1: Circular economy and business competitiveness 9.2: Market trends and analysis 9.3: Integration on national best practices 9.4: Integration of international best practices

3.1.2 Micro-credentials

According to the European Skills Agenda, it is of utmost importance that “A European Approach to micro-credentials is developed to assist in making learning opportunities more accessible as well as strengthening the role of higher and vocational education and training institutions in long-term learning by providing more flexible and modular learning opportunities.”

Micro-credentials have the potential to assist in certifying the outcomes of small, tailored learning experiences. They enable individuals to fill skill gaps necessary for success in a rapidly changing environment, without displacing traditional qualifications, and they allow the targeted, flexible acquisition of knowledge, skills, and competences to meet new and emerging needs in society and the labour market. They can supplement already-obtained credentials, adding value without weakening the fundamental idea of comprehensive degree programmes in initial education and training. Additionally, micro-credentials can be viewed as innovative tools that "can facilitate flexible learning pathways and support workers on the job or during professional transitions." Micro-credentials can be used as part of the education and training made available by VET and adult education providers, to people to support individual learning accounts.

The partners adapted the contents developed by applying the Micro credential system, and they prepared n. 23 Modules for MOOC that will be published on the Platform <https://skillscourses.eu/ace-ex/> in the following languages: EN - IT- ES- GR-CZ-PL-UA- FR.

3.2 VR Modules

As stated in the application, during WP4, 2 modules on V/R were developed that could be used with a PC (in 2 dimensions). The experiences were planned to be interactive (e.g. the ability for students to move around virtual space and interact with objects) and offer a moderate level of data tracking to quantify student performance. The Modules are currently implemented as a pilot (n. 2 simulated experiences), which is useful for validating the entire training model, the pipeline from the need assessment with partners to feedback collection from students and the institute. Over time, VR could be expanded with further content based on the methods and areas expected to be introduced during the course.

The two VR modules that were developed are:

- Module 1 | Water purification: Simulation of a water treatment plant

- Module 2 | Waste product transformation: Virtual lab for waste transformation

Module 1 | Water purification Simulation of water treatment plant

- Process: Reverse osmosis
- Membrane pressure regulation
- Quality parameter control
- Chlorine and oxygen monitoring

Applications: Reuse of process water, sustainable irrigation, reduced water consumption.

Module 2 | Waste product transformation Virtual lab for waste transformation

- Process: Mais → PLA (Bioplastic)
- Starch extraction
- Enzymatic conversion
- Lactic acid fermentation
- 3D filament extrusion

Applications: Reuse of process water, sustainable irrigation, reduced water consumption.

3.3 Serious Game

The game developed is a serious game type and is developed for desktop platforms to allow supervised use in schools and be more practical for each participant. From the home screen, the participant can access the two sections: 1) the game section, and 2) some information relating to the dynamics of reuse and circular agriculture that are used in the game dynamics. The goal of the game is to teach people how waste products, if properly processed, can become a resource. The game will be multilingual, with primary English, and translation files will be shared with the partners, which will then be integrated into the application.

Some of the technical features of the serious game are:

- **Platform:** <https://acefarmexpert.eu/>
- **Type:** Browser-based (no installation)
- **Languages:** 9 (EN, IT, ES, GR, NO, UA, PL, CZ, FR)
- **Device:** PC, tablet, smartphone

The objectives and the game activities include:

- **Certification:** Sowing, cultivation (vine/olive/hemp), irrigation, resource management, harvesting and processing
- **Waste valorisation:** Selecting recovery technologies, investing in circularity, monitoring impacts

The gameplay of the serious game is quite simple, as it includes:

- **Role:** Virtual Farmer/Entrepreneur
- **Mission:** Manage a sustainable circular farm

4. Guidelines for Vocational Education and Training (VET) Providers

This document aims to provide a comprehensive and practical framework for Vocational Education and Training (VET) providers and Higher Education Institutions (HEIs) to implement, adapt, and enrich the educational outputs of the ACE-EX project. The guidelines aim to translate the project's intellectual outputs—the EQF 4 & 5 Training Programmes, Micro-credentials, VR Modules, and Serious Game—into actionable strategies tailored to the distinct missions, structures, and learner profiles of VET and HE sectors.

The core purpose of the document is to ensure the effective, sustainable, and contextually relevant deployment of the "Expert at applying Circular Economy processes in agriculture" qualification across Europe. The guidelines are structured to:

- Provide a clear roadmap for integrating the ACE-EX outputs into existing curricula and training offers.
- Offer pedagogical and technical guidance on using innovative digital tools (VR, Serious Game, MOOC platform).
- Suggest pathways for improvement and enrichment, empowering institutions to localise content, address specific sectoral needs, and contribute to the evolution of the training framework.
- Support the project's strategic objectives of upskilling the workforce, providing flexible learning pathways, and enabling formal recognition (RPL, certification, and scalability to EQF 6).

4.1 Curriculum Integration

VET institutions are central to upskilling the current agricultural workforce, offering practice-oriented education, and ensuring direct labour market relevance. The ACE-EX tools are designed for modular, flexible, and competency-based integration, aligning perfectly with the objectives of modern VET as outlined in the European Centre for the Development of Vocational Training (Cedefop) principles of work-based learning and responsiveness to industry needs.

4.1.1 EQF 4 Course on Circular Economy Principles

The EQF 4 course provides foundational knowledge for agricultural professionals, farm workers, and SME employees. It is delivered as a short course of 40–60 hours, suitable as a stand-alone offering or embedded within existing EQF 3/4 programmes in Agriculture, Agri-business, or Environmental Technology.

The prerequisite knowledge for applicants should be Basic literacy and numeracy (minimum EQF Level 2). No prior knowledge of the circular economy is required. Digital access and the ability to use a web browser are necessary for the MOOC components.

Trainer/tutor prerequisite: Trainers should have a minimum of EQF Level 5 qualification in a relevant field (agriculture, environmental science, business) and familiarity with the SKILLSCOURSES platform. An orientation session (minimum 2 hours) on the platform is recommended before delivery.

The five modules of the EQF 4 course are:

Module	Content Summary	Suggested Duration
Module 1: What is the Circular Economy?	Principles of CE, environmental and economic benefits, key frameworks (Ellen MacArthur Foundation model).	8 hours
Module 2: Economic Importance and Benefits of the CE	CE supports economic growth, job creation, and cost reduction through waste reduction and resource efficiency.	8 hours
Module 3: CE Strategies and Their Hierarchy	Waste prevention, reuse, recycling, and energy recovery strategies across industries, especially agriculture.	10 hours
Module 4: Key Value Chains for the CE	Priority value chains in the EU CE Action Plan: systemic approaches for transformation.	8 hours
Module 5: Key Actors and Resources of the CE Ecosystem in Europe	Networks, policies, funding opportunities, and support structures at the EU level.	8–12 hours

4.1.2 EQF 5 Technical Training Course: Agriculture Circular Economy Expert

The EQF 5 course is a specialist qualification for learners who have completed EQF Level 4 qualifications or who have relevant professional experience (e.g., farm managers, junior agronomists). It is offered as a specialist postgraduate VET certificate of 1–2 semesters (180–360 guided learning hours).

The Learning Outcome units can be adapted into dedicated micro-credentials for use as a flexible upskilling route for agricultural employees and managers. The table below maps micro-credentials to their targeted competences:

Pillar	Module / Micro-credential	Key Competences Developed
A – CE Foundations	Circular Economy Principle (EQF 5)	Core CE concepts, eco-design, reuse, recycling, and regenerative practices in the wine, oil, and cereal sectors.
	Circular Economy Principle (EQF 4)	Resource efficiency, waste reduction, and product life cycle management.
	Life Cycle Assessment	Evaluating environmental impacts across product lifecycles; applying LCA methodologies to support sustainability decision-making.

	Regulatory Framework	EU, national, and local CE legislation; SDG alignment; international CE cooperation.
D – Technical Skills	Waste Management	Waste hierarchy, recycling processes, waste stream diagnostics, and circular solutions in agriculture.
	Technology and Resource Recovery	Precision farming, digital tools, closed-loop systems, waste-to-energy solutions.
	Water Management	Water conservation and treatment in agricultural contexts.
	Biogas	Biogas production systems, renewable energy integration, and circular low-carbon economy.
	Biofertilizers	Bio-based fertiliser formulation, sustainable soil management, and reducing chemical inputs.
B – Business & Innovation	Business Model Adaptation	Transition from linear to circular business models; EU policy alignment; economic resilience.
	Innovation Management	Driving innovation for CE; interdisciplinary research; digital transformation; critical thinking.
C – Transversal Competences	Leadership	Sustainability Officer roles; circular initiative strategy; resource efficiency governance.
	Project Management, Risk & Change Management	Leading circular economy projects; risk anticipation; change control in agro-industrial contexts.
	Marketing & Communication	Raising awareness of CE impacts, stakeholder engagement, and ethical communication strategies.

4.2 Step-by-Step Implementation Roadmap for VET Providers

VET institutions should follow this phased approach when adopting the ACE-EX training outputs:

Step 1: Institutional Preparation (Weeks 1–4)

- Identify a designated ACE-EX coordinator within the institution (preferably a department head or quality manager).
- Review the ACE-EX Competence Matrix (available on the [ACE EX website](#)) and map it against your institution's existing curriculum.
- Identify gaps in your current provision that ACE-EX modules can fill.
- Confirm that your institution meets the minimum technical requirements for the MOOC platform and VR modules (see Section 4.4).
- Register your institution on the SKILLSCOURSES platform at <https://skillscourses.eu/ace-ex/>.

Step 2: Trainer Preparation (Weeks 3–8)

- Select trainers/tutors who meet the prerequisite qualifications (EQF Level 5 or above in a relevant field).
- Enroll selected trainers in a 2-hour orientation session on the SKILLSCOURSES platform (self-paced, available online).
- Trainers should complete at least the first two modules of the EQF 4 course as learners before delivering them.
- Download and review the [ACE-EX Trainer Guide](#) (available on the SKILLSCOURSES platform) for facilitation techniques, debriefing strategies for the Serious Game, and VR session management.

Step 3: Programme Design (Weeks 5–10)

- Select the modules most relevant to your learner profile (EQF 4 stand-alone, EQF 5 specialist, or individual micro-credentials).
- Design a delivery schedule using the recommended module durations in Section 4.1.
- Determine the blended learning model: self-directed online MOOC (SKILLSCOURSES) plus facilitated in-person or virtual sessions for application, discussion, and assessment.
- Integrate the Serious Game session(s) into the schedule as an introductory or mid-course engagement activity.
- Schedule at least one VR module session in a computer lab environment (see Section 4.4 for requirements).
- Prepare learner-facing materials: course schedules, login instructions for SKILLSCOURSES, and assessment rubrics derived from the Competence Matrix learning outcomes.

Step 4: Delivery (Ongoing)

- Deliver online modules via the SKILLSCOURSES platform. Learners access content independently at their own pace.
- Facilitate in-person or virtual sessions for debriefing, group discussion, and applied exercises aligned with each module's learning outcomes.
- Run the Serious Game (acefarmexpert.eu) in computer lab sessions. Follow with a structured debrief connecting game decisions to real-world CE principles.
- Run VR module sessions in the computer lab. Assign pre-reading/watching materials before the session and conduct a post-session discussion on process safety and optimisation.
- Monitor learner progress using the SKILLSCOURSES platform's tracking features.

Step 5: Assessment and Certification (End of Module / Course)

- Use the Competence Matrix learning outcomes as the basis for all assessment tasks.
- Assessment should combine online self-assessment quizzes (via SKILLSCOURSES), a practical project or case study, and a facilitator observation checklist.
- Upon successful completion, issue the ACE-EX Certificate of Completion via the SKILLSCOURSES platform.
- For learners seeking formal RPL recognition, map completed learning outcomes against the national qualification framework (see Section 4.5).

Step 6: Review and Improvement (After Each Cohort)

- Collect learner feedback using the platform's built-in feedback forms.
- Review completion rates, assessment results, and feedback themes.
- Identify content gaps or delivery challenges and adapt the local delivery accordingly.
- Share best practices and challenges with ACE-EX partner organisations through the project's community of practice.

4.3 Deploying Innovative Digital Tools in VET

4.3.1 The ACE-EX Serious Game

The [Serious Game](#) is used as a highly engaging introductory and mid-course activity. It should be deployed in a facilitated session in a computer lab or with BYOD devices (tablets/smartphones are supported).

Recommended Deployment Approach

1. Pre-Game: Introduce the CE principles to be explored (15 minutes).
2. Game Session: Allow learners to play freely for 30–45 minutes.
3. Debrief (30 minutes): Facilitate a structured discussion using these questions: 'What circular decisions did you make? What was the economic impact? How does this mirror real-world agricultural challenges?'
4. Connect to Module: Link game outcomes directly to the relevant SKILLSCOURSES module content.

4.3.2 VR Modules

The [VR modules](#) are 2D interactive simulations running on a standard PC. They are used as virtual practical simulations to visualise complex industrial processes without the need for specialist equipment or safety infrastructure.

Recommended Deployment Approach

1. Pre-Lab Preparation: Learners complete the relevant SKILLSCOURSES module (e.g., 'Water Management' or 'Waste Management') before the VR session.
2. VR Session (45–60 minutes): Learners navigate the virtual simulation, interact with equipment, and make process decisions.
3. Reflection Exercise (20 minutes): Learners document observations and answer guided questions on safety protocols, resource efficiency, and process optimisation.
4. Discussion: Trainer facilitates a debrief comparing the simulated process with real-world examples (can include local case studies — see Section 4.6).

4.3.3 SKILLSCOURSES MOOC Platform

The [SKILLSCOURSES](#) platform serves as the primary digital delivery vehicle for theoretical content and self-assessment. Trainers should set up a clear blended learning schedule where learners complete online modules independently between facilitated sessions. The platform's tracking features allow trainers to monitor module completion and quiz scores.

4.4 Technical Requirements and Specifications

Institutions must verify that their infrastructure meets the following minimum requirements before deploying ACE-EX digital tools:

Tool	Minimum Technical Requirements	Recommended Setup
SKILLSCOURSES MOOC Platform	Internet connection: min. 5 Mbps per concurrent user. Device: PC, tablet, or smartphone. Browser: Chrome 90+, Firefox 88+, Edge 90+, Safari 14+. No installation required.	Stable broadband (25 Mbps+). Dedicated computer lab for facilitated sessions or BYOD policy for self-study.
ACE-EX Serious Game (acefarmexpert.eu)	Internet connection: min. 5 Mbps per device. Device: PC, tablet, or smartphone. Browser: Chrome 90+, Firefox 88+. No installation required.	Computer lab with one device per learner for facilitated group sessions.
VR Modules (PC-based, 2D)	OS: Windows 10 or later / macOS 11 or later / Ubuntu 20.04+. RAM: minimum 4 GB (8 GB recommended). CPU: Intel Core i5 or equivalent. Graphics: Integrated graphics are sufficient (dedicated GPU not required). Browser:	Computer lab with 8 GB RAM per machine. Stable internet or local network deployment. One machine per learner.

Chrome 90+ or downloadable application. Internet connection: min. 10 Mbps.

Note on VR terminology: The ACE-EX VR modules are delivered as 2D interactive simulations on a standard PC screen, not as head-mounted VR (HMD) experiences. No VR headsets, special glasses, or motion controllers are required. The '2D VR' format was chosen to ensure maximum accessibility across diverse institutional infrastructures.

4.5 Assessment, RPL, and Certification

The ACE-EX Competence Matrix (9 units, EQF 4 and EQF 5) serves as the backbone for both formative and summative assessment. Each learning outcome in the matrix represents a verifiable competence that can be assessed, formally recognised, or used as evidence in an RPL process.

Recommended assessment strategy for VET providers:

- Online quizzes via SKILLSCOURSES (knowledge verification, automated).
- Practical project: design and present a basic CE transition plan for a local agricultural business.
- Facilitator observation during VR and Serious Game sessions.
- Reflective log: learners document how course concepts connect to their professional experience.

For RPL procedures, VET providers should:

1. Map learner prior experience against the Competence Matrix learning outcomes using the RPL self-assessment tool available on the SKILLSCOURSES platform.
2. Document evidence of prior learning (work records, certificates, employer statements).
3. Submit RPL evidence to the designated certification authority in your country (refer to the SKILLSCOURSES platform for the current list of national validating bodies).
4. Issue the ACE-EX Certificate of Completion or Certificate of Addendum upon successful RPL validation.

4.6 Localisation and Contextual Adaptation

Content adaptation is essential for ensuring the ACE-EX materials are maximally relevant to local learners. Trainers are expected to supplement platform content with locally relevant examples, case studies, and regulatory references. The following adaptation framework should be applied:

Adaptation Area	Guidance	Examples
Agricultural Context	Replace generic examples in the training materials with locally relevant crops, sectors, and waste streams.	Mediterranean context: olive oil pomace valorisation, grape marc biogas. Nordic context: cereal straw biofuels, cold-climate biogas systems. Eastern European context: sunflower and beet by-product recovery.
Regulatory Context	In each module covering the regulatory framework, supplement	National transposition of the EU Waste Framework

	EU-level regulation with the national and regional regulations applicable in your country. Use the regulatory framework module's structure to identify relevant national equivalents.	Directive. National CE Action Plans. Country-specific subsidies for renewable energy in agriculture.
Case Studies	Replace or supplement the case studies in each module with locally relevant examples. Where possible, involve local companies or Chambers of Commerce as guest speakers or field visit partners.	Partner with a local winery or olive oil mill to provide a real-world CE application case. Invite a local biogas operator to present to learners.
Language	All SKILLSCOURSES content is available in 8 languages. Where the learner's language is not covered, trainers should provide supplementary materials (glossaries, guided notes) in the local language. Translation of locally developed supplementary materials is the responsibility of the implementing institution.	Deliver the debrief discussion in the local language even if the platform content is in English. Provide a bilingual glossary for technical terms.

4.7 Quality Assurance and Continuous Improvement

VET providers are expected to implement a quality cycle for each cohort of ACE-EX delivery. The following minimum quality assurance actions are required:

- Collect learner satisfaction and self-assessed learning gain data using the SKILLSCOURSES platform's feedback forms (at module end and course end).
- Review trainer/tutor effectiveness using peer observation or learner feedback on facilitation quality.
- Report outcomes (completion rates, certification rates, learner feedback themes) to the ACE-EX partner organisation in your country.
- Participate in the annual ACE-EX Community of Practice exchange (online, facilitated by the project consortium) to share experiences, adaptations, and improvements.

5. Guidelines for Higher Education Institutions (HEIs)

Higher Education Institutions play a critical role in advancing knowledge, fostering systemic thinking, and training the future leaders and innovators of the circular economy. The ACE-EX outputs provide a ready-made, applied curriculum that can modernise existing degrees, foster interdisciplinarity, and create pathways to advanced study, in line with the European Universities Initiative goals of innovation and relevance. This section provides equal depth of guidance to the VET section, addressing the specific needs and structures of HEIs.

5.1.1 Integration into Bachelor's Programmes (EQF 6)

The EQF 5 course modules are designed to integrate seamlessly into Bachelor's programmes at EQF Level 6. They should be incorporated as:

- A specialisation track or minor within Bachelor's programmes in Agricultural Sciences, Environmental Engineering, Industrial Biotechnology, Chemistry, or Sustainable Business.
- A mandatory or elective module cluster (equivalent to 6–12 ECTS, depending on the depth of integration).
- A graduate certificate programme for students who complete the full EQF 5 module set.

Prerequisite knowledge for HEI learners: Learners should have completed at least one year of a relevant Bachelor's programme (EQF Level 5/6 entry). Familiarity with basic chemistry, agronomy, or environmental science is beneficial but not mandatory for all modules. Module-specific prerequisites are noted in the course-level table below.

5.1.2 Pathway to EQF 6/7 Master's Programme

The ACE-EX EQF 5 outputs are explicitly designed for scalability to EQF Level 6 and EQF Level 7. ITS, UTH, and KHNEU are jointly verifying the scalability of the courses into an EQF 6 Master of Skilled Crafts degree (Professional Bachelor). The following table presents the ACE-EX courses that are recommended for integration into an EQF 6/7 Master's programme, with guidance on linking them to Master 's-level competences:

Course	Developed by	Suggested Integration	Link to Master's Competences
Biochemistry	ITS (Italy)	Core module in Agricultural/Industrial Biotechnology or Chemistry programmes.	Metabolic pathways, enzyme activity, — fermentation — foundational for CE applications in food/pharma/Nutraceuticals.
Project Management	Opencom (Italy)	Elective in Business/Management programmes; recommended for Agriculture or Environmental Science students with leadership ambitions.	Circular project leadership, multi-disciplinary team coordination, and risk management aligned with CE principles.
Biogas	AINIA (Spain)	Core technical module	Renewable energy systems,

		in Energy Engineering, Environmental Science, or Agri-Industrial programmes.	organic waste processing, biorefinery concepts, and sustainable development.
Business Model Adaptation	Cámara Valencia (Spain)	Core module in Sustainable Business, Agri-food Innovation, or Environmental Economics programmes.	Circular business model design, LCA integration, closed-loop supply chain management, policy impact assessment.
Marketing & Communications	Kharkiv National University (Ukraine)	Core module in Business or Communication programmes; elective for Agriculture or Environmental students.	Strategic marketing for sustainability, CE narrative building, stakeholder engagement, ROI and KPI tracking.
Stakeholder Engagement, Marketing and Communication Skills	Kharkiv National University (Ukraine)	Advanced elective for Master's students in Sustainability Management or Agricultural Policy.	Collaborative stakeholder relationships, sustainable marketing strategy, youth inclusion, and ethical CE communication.

5.2 Step-by-Step Implementation Roadmap for HEIs

HEIs should follow this phased approach when incorporating ACE-EX outputs into their academic programmes:

Step 1: Institutional Assessment and Approval (Months 1–3)

- Assign a faculty champion (academic coordinator) responsible for the ACE-EX integration.
- Conduct a curriculum audit using the [ACE-EX Competence Matrix](#): identify which units (U1–U9) are currently covered in the institution's curriculum and which are absent.
- Identify the degree programmes and faculties where ACE-EX modules can add the most value.
- Submit a formal module/course proposal to the relevant faculty curriculum committee, using the ACE-EX module descriptions and learning outcomes as the basis.
- Obtain institutional approval for the new module/course offering, including credit allocation (see ECTS guidance in Step 3).

Step 2: Faculty Preparation (Months 2–5)

- Identify faculty members who will deliver the ACE-EX content. Preferred profiles: expertise in sustainability, agronomy, environmental science, business, or chemistry.
- Faculty members should complete the full EQF 5 SKILLSCOURSES programme (or the relevant subset) as learners before teaching it.
- Organise a faculty development workshop (minimum half-day) on the ACE-EX pedagogical approach, use of the Serious Game and VR modules in academic settings, and research extension possibilities.
- Explore opportunities to connect ACE-EX content with ongoing research projects in the department.

Step 3: Programme Design and Credit Allocation (Months 3–6)

- Allocate ECTS credits based on learning workload: 1 ECTS = approximately 25–30 hours of student workload (contact + self-study + assessment). A typical micro-credential module (8–16 hours guided learning) should be allocated 1–2 ECTS.
- Design the module syllabus aligned with the ACE-EX learning outcomes, supplemented with academic readings, research papers, and case studies appropriate for EQF Level 6/7.
- Integrate the SKILLSCOURSES platform content as the core knowledge base, supplemented by academic lectures, seminars, and research discussions.
- Design assessment at an appropriate academic level: analytical essays, research reports, literature-based case studies, or experimental projects (see Section 5.5 for assessment guidance).
- Ensure that module descriptors clearly reference the ACE-EX Competence Matrix, enabling future stackability and RPL recognition.

Step 4: Delivery (Each Academic Semester)

- Deliver core content through a flipped classroom model: students complete SKILLSCOURSES modules independently, and lecture/seminar time is used for critical analysis, debate, and applied projects.
- Run the Serious Game as a simulation exercise for economics or environmental science analysis. Assign students the task of analytically evaluating the game's model, identifying feedback loops, and proposing policy interventions.
- Deploy the VR modules as pre-lab assignments: students explore the virtual simulation before attending real laboratory sessions on biomass conversion or water treatment.
- Invite industry partners (agricultural companies, CE startups) as guest lecturers to connect academic content to real-world practice.
- Facilitate research seminars where students present critical analyses of CE applications in the agricultural sector, using the ACE-EX cases as starting points.

Step 5: Assessment and Certification (End of Module)

- Assessment must be aligned with the EQF Level 6/7 descriptors: knowledge, skills, and responsibility/autonomy.
- Recommended assessment methods: analytical case study report (40%), group project with presentation (30%), and critical reflection portfolio (30%).
- For students who complete the full ACE-EX module cluster, issue the ACE-EX Certificate of Completion alongside the institutional degree credit.
- Clearly document how completed modules relate to RPL and national accreditation frameworks (see Section 5.5).

Step 6: Research and Innovation Extension (Ongoing)

- Use the [ACE-EX training](#) as the core content and context for student innovation hubs, hackathons, and start-up incubator activities.
- Develop thesis and dissertation topics around CE applications in agriculture, using the ACE-EX case studies and Competence Matrix as a framework.
- Explore applied research partnerships with agricultural companies, industry chambers, and national CE platforms identified through the ACE-EX network.
- Contribute to the ACE-EX Community of Practice by sharing research outputs, adaptations, and innovations developed at your institution.

5.3 Deploying Innovative Digital Tools in Higher Education

5.3.1 The ACE-EX Serious Game

In an HEI context, the Serious Game moves beyond awareness-raising into an analytical tool. It should be used in economics, environmental science, and systems dynamics courses as a simulation for modelling real-world CE systems.

Recommended Academic Deployment Approach

1. Pre-Game Assignment (Before Session): Students read 2–3 academic papers on CE systems dynamics and agricultural policy. They are asked to identify key variables they expect to encounter in the game.
2. Game Session (45–60 minutes): Students play with defined analytical objectives (e.g., 'maximise resource circularity while achieving financial sustainability').
3. Post-Game Analysis Assignment: Students submit a 500-word analytical report addressing: (a) identification of feedback loops in the game's model, (b) comparison of their in-game decisions with real-world CE strategies, and (c) a proposed policy intervention (e.g., subsidy, carbon tax) and its modelled impact.
4. Seminar Discussion: Students present their analyses and debate the most effective policy interventions.

5.3.2 VR Modules

An updated and more detailed version of the VR modules can be utilised in Chemical Engineering, Process Engineering, or Industrial Design courses. The 'Waste Transformation' VR lab is particularly suitable as a pre-lab assignment for actual laboratory work on biomass conversion.

Recommended Academic Deployment Approach

1. Pre-Lab VR Session (Week N): Students complete the VR module independently, taking structured notes on the process steps, safety protocols, and equipment interactions.
2. Experimental Design (Week N+1): In a seminar, students use their VR observations to design an actual experiment, defining parameters, safety measures, and expected outcomes.
3. Laboratory Session (Week N+2): Students execute the designed experiment using real materials and equipment, referencing their VR observations for process comparison.
4. Post-Lab Report: Students analyse deviations between the simulated and real-world process, discussing the role of VR as a learning tool and identifying the limitations of digital simulation.

5.3.3 SKILLSCOURSES Platform and Competence Matrix

The SKILLSCOURSES platform and the Competence Matrix are used to 'flip' large lecture courses and to audit curriculum coverage. Academic staff should use the Competence Matrix (9 units, EQF 4 and 5) to map and audit existing course offerings across the faculties of Agriculture, Science, and Business. Units that are underrepresented (e.g., U8: Organisational Adaptations or U9: Benchmarking) should be targeted for ACE-EX module integration.

5.4 Technical Requirements and Specifications

The technical requirements for HEIs are identical to those specified for VET institutions (Section 4.4). In addition to these baseline requirements, HEIs are encouraged to explore the following enhanced deployment options:

- Integration with the institution's Learning Management System (LMS): SKILLSCOURSES content can be linked or embedded into institutional LMS platforms (Moodle, Canvas, Blackboard) via LTI or standard web links.
- Enhanced VR deployment: For institutions with access to VR headset infrastructure, the ACE-EX team can discuss enhanced module versions. Contact the project coordinator for information.
- API access for research: Institutions wishing to use SKILLSCOURSES data for learning analytics research should contact the platform administrators.

5.5 Assessment, RPL, and Certification in HEI Contexts

The analytical and research-oriented nature of EQF Level 6/7 learning. The following principles should guide assessment design:

- Align all learning outcomes with the ACE-EX Competence Matrix descriptors, supplemented with the additional depth required at EQF Level 6/7 (critical comprehension, advanced application, independent research).
- Employ authentic assessment: real-world projects, case analyses, and research contributions that go beyond recall and comprehension.
- Ensure that all assessments are explicitly mapped to both the institutional curriculum and the ACE-EX learning outcomes, enabling clear documentation for accreditation and RPL purposes.

For RPL procedures in HEI contexts:

1. Students or professionals seeking RPL recognition should submit a portfolio of evidence mapped based on the ACE-EX Competence Matrix learning outcomes.
2. The HEI's RPL committee reviews the portfolio against the institutional module learning outcomes.
3. Upon successful RPL, the ACE-EX Certificate of Addendum is issued alongside formal institutional credit.
4. Institutions should liaise with national accreditation and qualification authorities to ensure the ACE-EX certificate is formally recognised within the national framework.

Credit stackability: HEIs are encouraged to formalise a 'stackability ladder' by which sets of completed ACE-EX micro-credentials can count towards a Postgraduate Certificate, Diploma, or Master's degree. This requires a formal institutional decision and documentation of the credit equivalence, but provides significant added value to learners by creating a flexible progression pathway from EQF 5 to EQF 8.

5.6 Localisation and Contextual Adaptation

HEIs should contextualise ACE-EX content to their regional agricultural sectors, national regulatory frameworks, and research traditions. The localisation framework from Section 4.6 applies equally to HEIs. In addition, HEIs are expected to:

- Connect case studies and project assignments to regional agricultural sectors and local company partnerships.
- Supplement the EU regulatory framework content with national transpositions and any specific regional CE policies or incentive structures.
- Develop locally relevant capstone projects or applied research assignments that extend the ACE-EX content into original student inquiry.

Best Practice Example: HEI Adaptation in Ukraine

Simon Kuznets Kharkiv National University of Economics (KHNEU) integrated the 'Marketing and Communications' and 'Stakeholder Engagement' ACE-EX modules into their Master's programme in Agri-Business Economics. Lecturers supplemented the SKILLSCOURSES content with Ukrainian regulatory context (national CE legislation, agri-food export regulations) and replaced international case studies with Ukrainian agricultural company examples. Students completed their final assessment as a real-world stakeholder engagement strategy for a regional agricultural cooperative, which was subsequently used as a research paper submitted for publication. The university is now exploring formal credit equivalence between the ACE-EX micro-credentials and their existing Master's modules.

5.7 Quality Assurance and Continuous Improvement

HEIs should embed ACE-EX quality assurance within their standard academic quality cycles. The following minimum actions are required:

- Include ACE-EX module evaluations within the institution's standard student module feedback process.
- Conduct annual curriculum reviews to assess the continued relevance and currency of ACE-EX content in the context of evolving EU CE policy and technological developments.
- Engage with the ACE-EX Community of Practice to share research outputs, pedagogical innovations, and curriculum adaptations.
- Establish partnerships with local agricultural companies, Chambers of Commerce, or national CE platforms that can validate the relevance of the curriculum and contribute to applied learning activities.
- Where possible, link ACE-EX delivery to institutional research projects, creating a research-teaching nexus that benefits both learner quality and institutional research output.

6. Integration, Validation, and External Support

6.1 Organisations Supporting Implementation

Institutions implementing the ACE-EX training outputs are encouraged to connect with the following types of organisations for validation, support, and partnership:

Organisation Type	Role in ACE-EX Implementation
National Qualification Authorities	Validate RPL processes and formal recognition of the ACE-EX certificate within national frameworks. Contact the ACE-EX national partner in your country for the relevant authority.
Chambers of Commerce and Industry Associations	Provide industry validation, connect institutions with agricultural companies for case studies and guest lectures, and support the relevance audit of curriculum content.
National CE Platforms and Networks	Provide connections to CE policy developments, funding opportunities, and peer learning networks.
Agricultural Companies and Cooperatives	Provide real-world case study material, host learner visits, serve as guest lecturers, and offer applied project partnerships.
ACE-EX Consortium Partners	Provide technical support for platform use, content adaptation, and participation in the Community of Practice. Contact information is available at the project website.
European Qualification Agencies	Validate EQF level assignments and support cross-border recognition of ACE-EX certificates. Reference: https://europa.eu/europass/en/description-eight-efq-levels

6.2 Certification Process

The ACE-EX Certification mechanism provides formal recognition of learning through two instruments:

Certificate Type	Awarded When	Issued By	Process
Certificate of Completion	Upon successful completion of all assessed modules in the EQF 4 or EQF 5 programme.	SKILLSCOURSES platform (automatically).	Learner completes all modules and passes all assessments. Certificate issued automatically via SKILLSCOURSES. Institution downloads and distributes using the standard template.
Certificate of Addendum	In RPL contexts, a learner demonstrates prior learning equivalent to the	Issuing institution in partnership with the ACE-EX national partner.	Learner submits RPL portfolio mapped to the Competence Matrix. HEI/VET RPL committee reviews. Upon successful validation, the institution issues



	ACE-EX qualification.		a Certificate of Addendum using the standard template on SKILLSCOURSES.
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The certificate references the ACE-EX Competence Matrix and the EQF level achieved. Institutions should issue certificates using the standard templates provided on the SKILLSCOURSES platform and should clearly communicate to learners how the certificate relates to national qualifications frameworks and RPL schemes in their country.

6.3 ACE-EX Brand

Institutions that adopt and implement the ACE-EX training programme are eligible to use the ACE Brand, which signals their commitment to sustainable agricultural development and investment in human capital. Contact the project lead partner (ITS Nuove Tecnologie della Vita) for brand usage guidelines.



7. Dissemination Guide and Sustaining the Project Beyond Funding

The long-term impact of the ACE-EX project depends not only on institutions delivering the training, but on every stakeholder, such as institutions, businesses, VET providers, students, workers, and alumni, actively spreading the word, enrolling peers, and embedding the training into their professional cultures. This section provides a practical dissemination guide tailored to each actor type, along with peer-endorsement strategies and tools to ensure the project's sustainability after the formal funding period ends.

7.1 Why Dissemination and Sustainability Matter

The ACE-EX project has built a training ecosystem that is open-access, multilingual, and free to use. Its value multiplies every time a new learner registers, a company enrolls in its workforce, or an institution embeds a module.

The dissemination of the training courses is a core responsibility of every institution, company, and individual that benefits from the ACE-EX outputs. This section gives each actor type the specific actions, messages, tools, and channels they can use to further disseminate the ACE-EX results.

7.1.1 Internal Dissemination — Reaching Staff and Learners

Before promoting ACE-EX externally, institutions must ensure internal awareness and buy-in. The following actions are required:

Action	How to Implement	Timeline
Present the ACE-EX to all relevant department heads	The ACE-EX Coordinator should present a 20-minute overview at the next departmental meeting. The material shared: the project one-pager from https://ace-ex.eu/en/ and the link to the SKILLSCOURSES platform.	Within the first month of registration.
Send a launch communication to all current learners	Draft an email or newsletter item (see template in Section 7.6) announcing the availability of ACE-EX courses, highlighting the free certification and the relevance to their field.	At the start of each academic year or training cycle.
Include ACE-EX in the institution's course catalogue	Add ACE-EX modules as listed options in the official prospectus, website, and enrolment systems. Use the module descriptions from Section 3.1 and Annex III.	Before the next enrolment period.
Brief all trainers and tutors	Trainers who have completed the SKILLSCOURSES orientation (Section 4.2, Step 2) are the best internal ambassadors. Ask them to recommend the platform verbally to learners in related courses.	Ongoing — each new cohort.

Display ACE-EX materials in physical and digital spaces	Print or display the ACE-EX poster and digital badge in common areas, on the institution's website, and in the virtual learning environment.	Immediately upon registration.
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7.1.2 External Dissemination

Institutions must actively promote ACE-EX beyond their existing learner base. The following external dissemination actions are required as part of the quality cycle:

Channel	Specific Action	Target Audience
Social media (institutional accounts)	Post at least once per month about ACE-EX: new cohort announcements, learner success stories, certification achievements, and links to the Serious Game. Use hashtags #ACEEX #CircularEconomy #GreenSkills #Erasmus.	Prospective learners, partner companies, general public.
Website	Create a dedicated ACE-EX landing page on the institutional website with programme description, enrolment link, certification information, and learner testimonials. Link to https://skillscourses.eu/ace-ex/ .	Prospective learners, employers, and partner institutions.
Events and open days	Feature ACE-EX in institution open days, career fairs, and agricultural sector events. Run a live Serious Game demonstration (5–10 minutes, browser-based) to engage walk-in audiences.	Prospective learners, employers, and media.
Press and local media	Issue a press release when the first cohort completes certification. Pitch a short article to local agricultural or educational media. Template available in Section 7.6.	General public, agricultural sector, policy makers.
Partner network outreach	Share information about ACE-EX with at least three partner organisations per year: local Chambers of Commerce, agricultural cooperatives, and employer associations. Request that they share it with their members.	Agricultural businesses, SMEs, and industry associations.
Professional networks and LinkedIn	Individual staff members post their own ACE-EX trainer credentials and endorse the programme on LinkedIn. Tag the	Peers, employers, sector professionals.

	ACE-EX project page and link to the platform.	
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7.3 Dissemination Guide for Business Companies and Agricultural Enterprises

Companies, whether large agricultural enterprises, SMEs, wineries, oil mills, or agro-industrial operators, are the primary end-beneficiaries of the ACE-EX training courses. They also have a unique responsibility and opportunity to drive participation from within.

The ACE-EX training directly addresses the skills needed for agricultural businesses to comply with the European Green Deal, access CE-related funding, reduce waste costs, and identify new revenue streams from by-products. Enrolling workers in the ACE-EX courses is a low-cost, high-return investment in human capital that also qualifies under many national upskilling and co-financing schemes.

How businesses can benefit:

Business Benefit	How ACE-EX Training Delivers It
Regulatory compliance	The workers who complete the Regulatory Framework module will have the ability to understand EU Circular Economy legislation and its national transpositions, reducing compliance risk and preparing companies for green audits.
Waste-to-revenue opportunities	The Waste Management, Biogas, and Biofertilizers modules can equip workers to identify and implement by-product valorisation projects, turning disposal costs into revenue streams.
Talent retention and motivation	Offering recognised and certified training (ACE-EX Certificate) signals investment in staff, increases job satisfaction, and reduces turnover in a competitive agricultural labour market.
Access to Green Deal funding	Companies with certified CE specialists are better positioned to apply for EU Green Deal, EAFRD, and national CE funding instruments. The certification documents the company's commitment to sustainable practices.
ACE Brand eligibility	Companies whose staff hold ACE-EX certifications are eligible to display the ACE Brand as a market-facing signal of commitment to CE that differentiates them from buyers, retailers, and partners.

7.3.1 How Companies Enrol Their Workers

The following steps can be used by companies in order to enrol their workers.

Step	Action	Resource
1. Identify relevant courses	Map the company's current CE gaps against the micro-credential list in Annex III. Select the 3–5 courses most relevant to the company's operations and workforce (e.g., a winery: CE Principles, Waste Management, Biogas, Business Model Adaptation).	Annex III: Competence Matrix at https://docsend.com/view/aa5qp3mznxbduwfg
2. Register workers on SKILLSCOURSES	Each worker creates a free account at https://skillscourses.eu/ace-ex/ and enrolls in the selected modules. No institutional registration is required for individual company enrolment.	https://skillscourses.eu/ace-ex/
3. Schedule dedicated learning time	Block at least 2 hours per week of protected learning time for each enrolled worker. Assign a line manager or HR contact as an internal champion to track progress and provide encouragement.	Internal HR/training schedule.
4. Connect learning to real tasks	After each module, ask workers to identify one practice in their current role that the module could improve. Document this in a brief (half-page) action note. This builds the reflective log used for RPL if needed.	Module reflection template (Section 7.6).
5. Celebrate and share certification	When workers receive their ACE-EX Certificate, celebrate publicly: internal announcement, social media post, display on the	Certificate template on SKILLSCOURSES.

	company website. This encourages peers to enrol.	
6. Apply for ACE Brand	Once a threshold number of staff are certified, contact ITS Nuove Tecnologie della Vita to apply for the ACE Brand. Display the brand on company materials, packaging, and digital channels.	https://ace-ex.eu/en/

7.3.2 Communicating ACE-EX to Peers and Partners

Share your CE journey: Post a short case study (250–500 words) on your company's website and LinkedIn describing one CE practice your team implemented after ACE-EX training. Tag the ACE-EX project page.

Companies are powerful peer-to-peer communicators. The following actions ensure that each participating company multiplies the dissemination effect:

- Recommendation to suppliers and customers: When renewing contracts or attending trade events, mention ACE-EX to suppliers and buyers. A brief verbal recommendation combined with sharing the SKILLSCOURSES URL is sufficient.
- Engage your Chamber of Commerce: Ask your local Chamber to circulate information about ACE-EX among its members. Provide the one-pager from <https://ace-ex.eu/en/> and the direct enrolment link.
- Participate in the ACE-EX Community of Practice: Companies are welcome to join the annual online Community of Practice exchange. This provides direct access to the project consortium and to other companies' CE implementation experiences.
- Contribute a testimonial video: The project welcomes short (2–3 minute) company testimonial videos on CE practices. Contact the project team via <https://ace-ex.eu/en/> to participate.

7.4 Peer-Endorsement Strategy: Turning Learners into Ambassadors

Individual learners, such as students, workers, NEETs, and professionals, are the most credible disseminators of training programmes. A peer-to-peer endorsement from someone who has completed a course is more persuasive than any institutional announcement. The following structured strategy turns ACE-EX graduates into active ambassadors.

7.4.1 The ACE-EX Ambassador Programme

Upon completing any ACE-EX module or the full programme, every graduate is invited to become an ACE-EX Ambassador. The role is voluntary, informal, and requires minimal time. Ambassadors should follow these three simple actions:

Ambassador Action	What It Involves	Time Required
Share your certificate	Post or display the ACE-EX digital certificate on LinkedIn, institutional profiles, or a personal CV. Tag the project and include the SKILLSCOURSES link. This creates visibility with every connection or follower.	5 minutes per post.
Tell one colleague or peer	In the week after completing a module, personally recommend ACE-EX to at least one colleague, classmate, or peer who would benefit. A direct message or face-to-face recommendation is the most effective channel.	One conversation.
Leave a course review	Complete the SKILLSCOURSES platform feedback form (at course end) and, where possible, post a short public review or testimonial that the institution or company can share in its communications.	10 minutes.

7.4.2 Student-Specific Peer Dissemination (VET and HEI)

Students have specific peer networks that consist of cohorts, study groups, student associations, and social media circles that are highly effective for spreading awareness of relevant training opportunities. The following activities are recommended as structured tasks within course delivery:

Activity	Description	When to Deploy
Course completion social post (assessed or encouraged)	At the course end, students create a short LinkedIn or social media post summarising their key learning from the ACE-EX programme. Trainers/faculty can make this an optional assessed task (e.g., 5% of the reflective portfolio) or a strongly encouraged activity.	Final week of delivery.
Peer recruitment challenge	Each student is asked to share the SKILLSCOURSES link with at least two peers outside the current cohort (e.g., students from another year, friends in	Penultimate session.

	related fields). A brief group discussion on 'who else would benefit?' is facilitated as part of the final session.	
Student association partnership	Faculty or VET coordinators formally partner with the institution's student association or agricultural students' club to promote ACE-EX registration at the start of each academic year. The association shares the registration link in its own channels.	Start of academic year.
ACE-EX module showcase	One session per semester is dedicated to a student-led showcase of ACE-EX work: students present a practical project (CE transition plan, policy proposal, game analysis) to an open audience, including prospective learners.	Mid-semester, open to all.

7.4.3 Worker-Specific Peer Dissemination (Companies and VET)

Workers who complete ACE-EX training are well-positioned to act as internal champions within their organisations. Employers should actively support and facilitate the following:

- Internal presentation: Certified workers present a 10-minute summary of what they learned to their team at the next staff meeting. This is the most effective and lowest-cost internal dissemination tool.
- Buddy system: Each certified worker is paired with one uncertified colleague. The certified worker introduces the SKILLSCOURSES platform, explains the certification process, and offers to answer questions during the enrolment period.
- Inclusion in performance reviews: Managers include ACE-EX module completion as a recognised professional development achievement in annual performance or appraisal documentation.
- WhatsApp / internal messaging groups: Workers share the SKILLSCOURSES link in existing workplace chat groups with a brief personal endorsement message (see template in Section 7.6).

7.5 Sustaining the Project After Funding Ends

Erasmus+ funding for ACE-EX ends on 31 August 2026. The training materials, platform, and certification infrastructure are designed for long-term use beyond this date. Sustainability requires deliberate actions from all stakeholders.

7.5.1 Institutional Sustainability Actions

Sustainability Action	VET Providers	HEIs
Formal curriculum embedding	Formally embed at least three ACE-EX modules as permanent elective or mandatory offerings in the institution's programme catalogue, reviewed annually.	Formally approve ACE-EX module clusters as credit-bearing programme components, with ECTS allocated and stackability documented.
Trainer succession planning	Train at least two staff members per institution as qualified ACE-EX trainers. When one leaves, the second maintains continuity. Document trainer profiles and update annually.	Build a pool of faculty with ACE-EX competence across at least two departments, reducing dependence on individual champions.
Annual review commitment	Commit to an annual review of ACE-EX content relevance, updating local case studies, regulatory references, and localisation materials each academic year.	Include ACE-EX module content in the institution's standard annual quality and curriculum review cycle.
Community of Practice participation	Designate participation in the ACE-EX Community of Practice annual exchange as a formal institutional responsibility (not dependent on a single individual).	Assign a faculty member to represent the institution in the Community of Practice and report back to the department each year.
Financial model	Explore co-financing options: EU Cohesion Funds, national vocational training levies, employer co-payment, or inclusion in national upskilling programmes as a recognised resource.	Explore fee-bearing models for ACE-EX micro-credentials as part of the institution's Continuing and Professional Education offer.

7.5.2 Company Sustainability Actions

Companies that have enrolled workers in ACE-EX training sustain the project's impact by making circular economy training a permanent feature of their human resources strategy:

- Annual enrolment cycle: Schedule ACE-EX module enrolment as a standing item in the annual training plan. New employees joining the company are enrolled in the relevant modules as part of their onboarding process.
- Internal CE policy: Formalise at least one CE practice identified through ACE-EX training as a written company policy (e.g., waste stream audit, water management protocol, renewable energy target). Reference for the ACE-EX training as the basis for this policy in company sustainability reports.

- Supply chain advocacy: Recommend ACE-EX training to at least one supplier or customer per year. Companies that operate in CE-certified supply chains will increasingly benefit from a workforce that can demonstrate CE competency.
- Green Deal alignment reporting: Reference ACE-EX certification in company responses to EU Green Deal due diligence requirements and sustainability questionnaires from buyers and investors.

7.5.3 Platform and Content Sustainability

The SKILLSCOURSES platform and all ACE-EX training content are maintained by the project consortium beyond the funding period. Institutions and companies should be aware of the following commitments:

Sustainability Commitment	Details
Platform availability	The SKILLSCOURSES platform (https://skillscourses.eu/ace-ex/) is committed to remaining available and free to use for at least three years after the project end date (i.e., until at least August 2029). Institutions should monitor the platform for any service updates.
Content updates	Consortium partners will review and update module content annually to reflect changes in EU CE legislation, agricultural technology, and the Green Deal policy landscape. Updated language versions will be released as they become available.
Certification validity	ACE-EX Certificates of Completion issued via SKILLSCOURSES remain valid and verifiable after the project ends. Institutions should keep records of all certificates issued to their learners.
Community of Practice	The annual Community of Practice exchange will continue to be hosted by the consortium. Institutions and companies are encouraged to join the mailing list at https://ace-ex.eu/en/ to receive updates.
Scalability to EQF 6	ITS, UTH, and KHNEU are continuing to develop the EQF 6 Master of Skilled Crafts pathway. Institutions that have embedded the EQF 5 modules will be first in line to integrate the EQF 6 programme when it is finalised.

7.6 Communication Templates

The following ready-to-use templates are provided to reduce the effort required for dissemination communications. Institutions, companies, and individuals should adapt them to their specific context, adding local details as appropriate.

7.6.1 Institutional Email to Learners: Course Launch Announcement

Subject: New Free Training Available — Circular Economy in Agriculture | ACE-EX Programme
Dear [Learner Name],

We are pleased to announce that [Institution Name] is now offering training through the ACE-EX programme — a free, certified, European training initiative on Circular Economy in Agriculture, funded by Erasmus+.

What is available:

- Free online modules on circular economy, waste management, biogas, business models, and more — available in 8 languages.
- An official European Certificate of Completion is issued automatically upon finishing your chosen modules.
- A browser-based Serious Game to explore circular farm management in an engaging, interactive format.

How to register:

Visit <https://skillscourses.eu/ace-ex/>, create a free account, and enrol in the module(s) of your choice.

For questions, contact [ACE-EX Coordinator Name] at [contact email].

7.6.2 Company Internal Message — Enrolling Workers

Subject: Invest 2 Hours a Week in Your Skills — Free Circular Economy Training Available

Hi [Team],

We enrol team members in the ACE-EX programme — a free, Erasmus+-funded training on Circular Economy practices in agriculture, directly relevant to what we do here at [Company Name].

After just a few hours of online learning, you will earn a European certificate in your area of choice — from waste management to biogas, from business models to water conservation.

We have identified the following modules as most relevant for our work: [Module 1], [Module 2], [Module 3]. You can complete them at your own pace, online, in [language].

Register here: <https://skillscourses.eu/ace-ex/> — it takes 2 minutes and is completely free.

Any questions, speak to [HR Contact / Line Manager]. We will block time in your schedule for this learning — dates to follow.

7.6.3 Individual Peer Recommendation Message (WhatsApp / Direct Message)

Hey [Name], I just finished a module on [topic] through the ACE-EX programme — a free European training on circular economy in agriculture. It was really practical, and I now have an official EU certificate. You can do it entirely online, in [language], at your own pace.

Here is the link: <https://skillscourses.eu/ace-ex/> — registration is free and takes 2 minutes. Worth checking out!

7.6.4 Social Media Post Template (Institution or Company)

Option A (for course launch):



We are now delivering the ACE-EX Circular Economy in Agriculture training at [Institution/Company Name]. Our learners/workers are building real skills in waste management, biogas, sustainable business models and more — and earning a European certificate. Free enrolment at <https://skillscourses.eu/ace-ex/> #ACEEX #CircularEconomy #GreenSkills #Erasmus #Agriculture

Option B (for graduate celebration):

Congratulations to [Name / our team] for completing the ACE-EX [Module Name] and earning a European certificate in Circular Economy. This is what the green transition looks like in practice. Join them: <https://skillscourses.eu/ace-ex/> #ACEEX #CircularEconomy #GreenSkills

Option C (for peer recommendation):

If you work in agriculture, agri-food, or environmental management — this free European training is for you. I completed [Module Name] through ACE-EX and it changed how I think about waste and resources. Entirely online, certified, available in 8 languages. <https://skillscourses.eu/ace-ex/> #ACEEX #GreenTransition

7.6.5 Module Reflection Template (for Workers and Learners)

After completing each ACE-EX module, learners and workers complete this brief reflection note. It builds the evidence base for RPL and serves as internal dissemination material for the organisation.

ACE-EX Module Reflection Note

Name: _____ Module completed: _____ Date: _____

1. One thing I learned that I did not know before this module:

2. One practice in my current role/workplace that I could improve based on this module:

3. One colleague or peer I will recommend this module to (name or role):

4. Would you like to become an ACE-EX Ambassador? (Circle: YES / NO). If yes, your coordinator will be in touch.

8. Conclusion

This document provides guidelines as a comprehensive, actionable, and sector-specific framework for the deployment of ACE-EX training outputs across both VET and HEI contexts. It translates the project's intellectual outputs, such as the EQF 4 and 5 Training Programmes, Micro-credentials, VR Modules, Serious Game, and SKILLSCOURSES platform, into step-by-step implementation roadmaps, technical specifications, localisation strategies, and assessment frameworks tailored to the distinct missions and structures of VET providers and Higher Education Institutions.

The ACE-EX training ecosystem is designed for sustainability, flexibility, and scalability. Institutions that implement these guidelines will not only upskill their learners in the critical field of circular economy in agriculture but will also build a foundation for continued curriculum development, research extension, and contribution to the broader European green economy transition.

For further information, technical support, and access to all project materials, please visit:

- SKILLSCOURSES Platform: <https://skillscourses.eu/ace-ex/>
- Serious Game: <https://acefarmexpert.eu/>
- VR experience: <https://fromsmash.com/iueGJA22fm-dt>
- Project Website: <https://ace-ex.eu/en/>

Annex I: Micro-credentials

Circular Economy Principle		MICRO-CREDENTIALS
Circular Economy Principle		Understand the core concepts of circular economy and its differences from the linear economic model, fundamental strategies (eco-design, reuse, recycling, regenerative practices), systemic solutions, key value chains and the role of stakeholders, with a focus on the agricultural sector, including wine, olive oil, and cereal production.
Circular Economy Principle (EQF 4)		Describes the key principles of circular economy, including using resources efficiently, reducing waste, and managing product life cycles to help design and implement a resource management system that follows circular economy ideas.
Life Cycle Assessment		Build core competencies in evaluating the environmental impacts of products, processes, or services across their entire life cycle—from raw material extraction to end-of-life disposal. Participants will develop the ability to apply LCA methodologies, interpret results critically, and support decision-making in sustainability strategies, enabling them to contribute to more responsible production and consumption systems across various sectors.
Regulatory framework		Properly handle the applicable legislation to the circular economy at European, national and local levels and their alignment with the SDG, as well as relevant incentives on circular economy; and the identification of international cooperation skills to standardise CE practices and regulations.
Sustainability reporting		Develop key competencies for measuring, managing, and reporting on sustainability performance within the agri-food sector, with a focus on circular economy metrics and stakeholder transparency. Participants will strengthen their ability to apply life cycle thinking, utilise frameworks like the UN Sustainable Development Goals (SDGs), and communicate environmental and social impacts effectively to support evidence-based decision-making and enhance corporate accountability in a circular economy.
Circular Economy: Agriculture application		
Renewable energy integration		Develop key competencies for assessing, planning, and integrating renewable energy technologies into agricultural operations and value chains. Participants will strengthen their ability to evaluate the feasibility of biogas, solar, and bioenergy solutions, understand their role in decarbonisation and energy security, and manage projects that transition farms from energy consumers to prosumers, contributing to a resilient, low-carbon agricultural sector.
Resource Monetisation and Waste Management		Develop key competencies for transforming agricultural waste and by-products into valuable resources through circular economy principles. Participants will strengthen their ability to design and implement strategies for waste valorisation, by-product synergy, and material flow optimisation, turning waste streams into new revenue streams while minimising environmental impact and supporting the development of a restorative, zero-waste agricultural economy.
Water management		Develop key competencies for designing and implementing water-efficient and resource-recovery strategies within agricultural

	systems. Participants will strengthen their ability to optimise water use through innovative technologies, manage water quality, and close water loops by recovering nutrients and reusing water. This credential empowers professionals to build resilient farming systems that conserve vital water resources, protect ecosystems, and align with circular economy and climate adaptation goals.
Economic impact of energy cost	Achieve competences in implementing sustainable energy practices within agricultural operations. It includes understanding and implementing renewable energy solutions like photovoltaic panels, biogas installations, wind, etc. Presents the essential knowledge, skills, and competencies needed to overcome energy-related challenges and optimise self-sufficiency
Waste management	Demonstrate the ability to create and apply effective waste management strategies that reduce environmental impact and promote circular economy principles by understanding the waste hierarchy, recycling processes, and relevant regulations locally and globally. Also, use diagnostic tools to analyse waste streams, identify reduction opportunities, and design sustainable solutions in agriculture.
Technology and resource recovery	Develop skills to implement circular economy principles in agriculture through innovative technologies. Learn to enhance resource efficiency, recover valuable inputs (water, nutrients, energy), and minimise waste using precision farming, digital tools, and closed-loop systems. This includes waste-to-energy solutions, recycling techniques, and emerging trends like Product-as-a-Service models shaping the future of sustainable agriculture.
Business Management and Entrepreneurial Mindset	
Business model adaptation	Develop the knowledge and skills needed to transition from linear to circular business models through sustainable practices, waste recovery, efficient use of resources, and collaboration among stakeholders in applying circular economy principles in real agricultural contexts. This includes aligning with EU policies and innovation frameworks to promote economic resilience and environmental sustainability.
Project MNG: Enterprise risk MNG and change MNG	Equip project managers and coordinators with an integrated toolkit for planning, risk anticipation and change control in circular-economy contexts—vital for agricultural and agro-industrial transformation.
System Thinking & Global Challenges	Build competences in applying systems thinking to address complex global challenges, such as climate change, resource scarcity, and unsustainable business models. This includes identifying system dynamics, feedback loops, and leverage points, using tools like causal loop diagrams and stock-flow models, and designing sustainable strategies that integrate environmental, social, and economic dimensions.
Innovation management interdisciplinary research	Empower professionals to drive innovation and collaboration aligned with circular economy principles, combining sustainability, interdisciplinary research, and digital transformation. Sustainable Innovation in the field requires a culture of innovation, developing transversal skills like critical thinking and adaptability, and leading diverse, hybrid teams using digital tools and strategic frameworks.

Open management style	Develop advanced skills to foster an inclusive, participatory organisational culture for circular-economy processes—stimulating passion, emotional engagement and cross-functional innovation. Managers and project leaders drive cultural change toward open, collaborative organisational models—essential for successfully implementing circular-economy practices in agricultural and agro-industrial contexts.
Organisational skills	Cultivate the desire to learn and the motivation to engage in new practices. This includes a genuine passion for reducing waste and minimising the environmental burden, which contributes to the joy and satisfaction of one's work. The motivation to wear the hat of sustainability and put in the effort is essential for success in circular economy initiatives.
Marketing & communication	Develop competences in raising awareness about the environmental and social impacts of food production and consumption. Engage customers and the local community in circular economy efforts through clear, honest communication about sustainability initiatives, turning them into active participants and advocates.
Stakeholder engagement, marketing and communication skills	Develop skills in stakeholder engagement, ethical marketing, and effective communication, with a focus on empowering and collaborating with youth for sustainable and social change, development circular economy practices; learning to build trust, craft compelling narratives, and drive impactful initiatives by understanding diverse audiences and applying ethical principles by development a strategic communication approach for a hypothetical or real-world scenario, with a strong emphasis on youth inclusion and ethical considerations to achieve sustainable outcomes.
Leadership	Gain competence in strategising and implementing circular economy initiatives within an organisation. This includes the roles of a Sustainability Officer or Director in larger companies, or the farm manager in smaller operations, to oversee practices that reduce waste and enhance resource efficiency.
Economics, Resilience and Diversification	Build competences in making agricultural businesses more resilient to external shocks, such as climate change or fluctuating market prices, by diversifying income sources and reducing dependency on non-renewable resources. This includes exploring new revenue streams like selling compost or offering agrotourism experiences.
Application of circular economy practices	
Nutraceuticals application	- Knowing and understanding the composition and function of the skin, the largest organ in our body, and both the endogenous and exogenous causes of its ageing - Knowing and understanding the main biochemical mechanisms of production of radical compounds and the chemical structure of Vitamin A, E, and C; squalene, linoleic and oleic acid; Polyphenols, resveratrol and anthocyanins; Selenium and zinc
Biopolymers are also used in 3D printing.	Understands the principles of biomedical imaging, anatomical segmentation, and CAD modelling for the design



	of patient-specific 3D models used in medical applications. • Knows the end-to-end medical 3D printing workflow, including slicing parameters, post-processing techniques & regulatory and quality control requirements.
Biofertilizers	Foster essential competencies for the formulation, application, and evaluation of bio-based fertilisers derived from microbial and organic sources. Participants will gain the ability to integrate agronomic, microbiological, and environmental knowledge to promote sustainable soil management and crop productivity, supporting the transition to eco-friendly agricultural practices and reducing dependence on chemical inputs.
Biogas	Develop key competencies for understanding, designing, and evaluating biogas production systems from organic waste, with a focus on practical application and sustainability. Participants will strengthen their ability to integrate technical, environmental, and project management knowledge to support renewable energy initiatives and contribute to the development of a circular, low-carbon economy.

Annex II: ACE-EX Learning Outcomes Overview (EQF 5)

The following table presents the nine units of the ACE-EX Competence Matrix at EQF Level 5, which serve as the basis for curriculum design, assessment, and RPL in both VET and HEI contexts.

Unit	Description
U1 – Circular Economy Principles	Core CE concepts, strategies (eco-design, reuse, recycling, regenerative practices), systemic solutions, and value chain analysis in the agricultural sector.
U2 – Innovation Management	Driving CE innovation; interdisciplinary research; digital transformation; critical thinking; managing diverse teams.
U3 – Transversal Skills	Project management, data management, sustainability reporting, systems thinking, interdisciplinary research.
U4 – Technical Skills	Sector-specific technical knowledge: energy efficiency, water management, waste management, biochemistry, biogas, biofertilizers, nutraceuticals, 3D printing.
U5 – Regulatory Frameworks	EU, national, and local CE legislation; SDG alignment; international CE cooperation and standardisation.
U6 – Implementing New Business Models	Transition from linear to circular business models; sustainable business design; economic resilience; EU policy alignment.
U7 – Energy Efficiency	Renewable energy solutions in agriculture (photovoltaic, biogas, wind); energy cost optimisation; self-sufficiency strategies.
U8 – Organisational Adaptations	Cultural shift to circular organisational models; open management; passion and motivation for sustainability; engagement of youth.
U9 – Benchmarking	Competitive advantage analysis, market and competitor analysis, effective practices of foreign producers, and implementation experiences of national companies.

Annex III: Quick-Start Checklist for Institutions

For VET Providers

Use this checklist to verify your institution is ready to implement ACE-EX training:

- Institution registered on SKILLSCOURSES platform (<https://skillscourses.eu/ace-ex/>).
- ACE-EX coordinator identified within the institution.
- Curriculum audit completed using the ACE-EX Competence Matrix.
- Trainers identified and completed orientation (minimum 2 hours on SKILLSCOURSES).
- Technical requirements verified (internet ≥ 5 Mbps/user, devices available for learners).
- Delivery schedule designed with a blended learning approach.
- Localisation plan prepared: local agricultural examples, regulatory context, and case studies identified.
- Assessment rubrics prepared based on Competence Matrix learning outcomes.
- RPL process documented and linked to the national accreditation authority.

For Higher Education Institutions

Use this checklist to verify your institution is ready to integrate ACE-EX content:

- Faculty champion (academic coordinator) assigned.
- Curriculum audit completed: gaps in CE content identified across relevant departments.
- Formal module/course proposal submitted to and approved by the faculty curriculum committee.
- Faculty completed ACE-EX EQF 5 programme (or relevant subset) as learners.
- ECTS credit allocation agreed and documented.
- Assessment design completed at EQF Level 6/7 standards.
- Flipped classroom delivery model designed with SKILLSCOURSES as the core platform.
- Industry/company partnership identified for applied learning activities.
- RPL portfolio process documented and linked to the national accreditation authority.
- Credit stackability policy explored or formalised.

Annex IV: Dissemination and Sustainability Checklist

Use this checklist to track dissemination and sustainability actions across all actor types. The ACE-EX Coordinator or company HR champion is responsible for completing and reviewing this checklist annually.

VET Providers and HEIs

Action	Responsible	Completed?
ACE-EX landing page created on institutional website with enrolment link.	Communications / web team.	☐
ACE-EX announced to all current learners via email or newsletter.	ACE-EX Coordinator.	☐
ACE-EX included in the official course catalogue / prospectus.	Admissions / Registry.	☐
At least one social media post published per month featuring ACE-EX.	Communications team.	☐ (monthly)
ACE-EX featured at institution open day or sector event.	ACE-EX Coordinator.	☐ (annually)
Information shared with at least 3 external partner organisations.	ACE-EX Coordinator.	☐ (annually)
Press release issued after first cohort completes certification.	Communications team.	☐
Student association formally partnered to promote enrolment.	Faculty Champion.	☐
Module reflection notes collected from all graduates.	Trainers / Faculty.	☐ (per cohort)
At least 2 ACE-EX Ambassadors identified per cohort and briefed.	ACE-EX Coordinator.	☐ (per cohort)
Annual curriculum review completed and localisation materials updated.	ACE-EX Coordinator.	☐ (annually)
Community of Practice participation confirmed for the year.	ACE-EX Coordinator.	☐ (annually)
Sustainability funding route explored and documented.	Management / Finance.	☐

Companies and Agricultural Enterprises

Action	Responsible	Completed?
Relevant ACE-EX modules identified and mapped to workforce needs.	HR / Line Manager.	☐
All targeted workers registered on SKILLSCOURSES.	HR.	☐
Dedicated learning time (min. 2 hrs/week) blocked in schedules.	Line Manager.	☐
Internal champion / buddy system set up for enrolled workers.	HR.	☐
Worker completion celebrated internally (announcement, social post).	HR / Communications.	☐ (per graduate)
Company case study written and shared on website/LinkedIn.	Communications.	☐
ACE-EX recommended to at least 1 supplier or customer.	Management.	☐ (annually)
Information shared with local Chamber of Commerce.	Management.	☐
New employee onboarding process updated to include ACE-EX enrolment.	HR.	☐
ACE Brand application submitted (once the threshold of certified staff is reached).	Management.	☐
CE practice formalised as a written company policy referencing ACE-EX.	Sustainability Lead.	☐
ACE-EX is referenced in sustainability reports and Green Deal responses.	Sustainability Lead.	☐ (annually)

Individual Learners and Workers (Ambassador Actions)

Action	When	Completed?
Certificate posted on LinkedIn / professional profile.	Within 1 week of completion.	☐
One colleague or peer personally recommended to enrol.	Within 1 week of completion.	☐
Course feedback form completed on SKILLSCOURSES.	Immediately after the module.	☐
Module reflection note completed and submitted.	Immediately after the module.	☐
Ambassador role confirmed (or declined) in writing.	Within 2 weeks of completion.	☐
Social media post published sharing learning (personal account).	Within 1 week of completion.	☐



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Milestone 8

Guidelines for implementation

Responsible Partner

University of Thessaly